Collective hallucinations and inefficient markets: The British Railway Mania of the 1840s

Andrew Odlyzko

School of Mathematics
and Digital Technology Center
University of Minnesota
odlyzko@umn.edu
http://www.dtc.umn.edu/∼odlyzko
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Abstract. The British Railway Mania of the 1840s was by many measures the greatest technology mania in history, and its collapse was one of the greatest financial crashes. It has attracted surprisingly little scholarly interest. In particular, it has not been noted that it provides a convincing demonstration of market inefficiency. There were trustworthy quantitative measures to show investors (who included Charles Darwin, John Stuart Mill, and the Brontë sisters) that there would not be enough demand for railway transport to provide the expected revenues and profits. But the power of the revolutionary new technology, assisted by artful manipulation of public perception by interested parties, induced a collective hallucination that made investors ignore such considerations. They persisted in ignoring them for several years, until the lines were placed in service and the inevitable disaster struck.

In contrast to many other bubbles, the British Railway Mania had many powerful, vocal, and insightful critics. But the most influential of them suffered from another delusion, which misled them about the threat the Mania posed. As a result, their warnings were not persuasive, and were likely even counterproductive, as they may have stimulated increased investments.

The delusions that led to the financial disaster of the Railway Mania arose from experience with the railway mania of the mid-1830s. Seldom even mentioned in the literature, it was about half the size of the big Railway Mania of the 1840s (and thus still far larger than the Internet bubble). The initial financially exuberant phase of it did collapse. But it appears to have been unique among large manias in that a few years later it was seen as having collapsed prematurely, as projects started during its exuberant phase became successful. That mania demonstrates the difficulty in identifying bubbles that are truly irrational. Both railway manias provide a variety of other lessons about the interaction of technology and financial markets.

– Main text: 187 pages.
– Appendices: 63 pages.
– Endnotes: 54 pages.

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1 Introduction

The British Railway Mania of the 1840s was a giant event. At its height, individual capitalists, in pursuit of private profit, were plowing more than twice as much into the construction of a public infrastructure as their nation was spending on the military. (It should be noted that the *Pax Britannica* was not cheap. Among other foreign adventures, Britain had just a few years earlier been involved in the First Opium War and the First Afghan War.) During the peak year for spending, 1847, their investments came, as a fraction of Gross Domestic Product (GDP), to the equivalent of over $1 trillion dollars for the United States today. (If we compare their expenditure to total government spending, federal, state, and local, and not to GDP, it was equivalent to over $3 trillion dollars. Taxes, which might be thought of as proportional to discretionary incomes, were far lower at that time than today.) All the funding came from individuals making private decisions to commit their funds to the new enterprise. Those investors, most new to share markets, involved such scientific and literary luminaries as Charles Darwin, Charles Babbage, John Stuart Mill, the Brontë sisters and William Makepeace Thackeray, as well as such prominent politicians (directly or through their close families) as Disraeli, Gladstone, Palmerston, and Peel. Many famous figures were involved with the Mania in other ways. For example, Herbert Spencer, in an early stage of his career, was a railway engineer during the financially most exuberant phase of the Mania. While he appears not to have invested in it himself, he managed to persuade his father to sell out close to the peak of the market. Most investors did not fare so well, and their hopes for bountiful profits were grievously disappointed. The peak of the Mania excitement was followed by several years of heavy investment accompanied by a slow and agonizing slide in the stock markets. At the end of 1849, just as railway shares were touching their lowest level of that decade (and of the remaining decades of the 19th century), Charlotte Brontë wrote:

> My Shares are in the York & North Midland Railway. ... The original price of Shares in this Railway was £50. At one time they rose to 120; and for some years gave a dividend of 10 per cent; they are now down at 20, and it is doubtful whether any dividend will be declared this half-year.[1]

Charles Darwin, who later in life claimed to be very good at investing money, while at the same time being very modest about his scientific ability, did better[2]. His main personal railway holdings during the Railway Mania were in the London and North Western Railway. At the time Charlotte Brontë wrote her letter, the shares of that line were down only about 55% from their peak.

The damage to the finances of the middle and upper classes was widespread. In the words of Charlotte Brontë:

> The business is certainly very bad–worse than I thought, and much worse than my father has any idea of. In fact, the little railway property I possessed, ... scarcely any portion of it can with security be calculated on. ... However the matter may terminate, I ought perhaps to be rather thankful than dissatisfied. When I look at my own case, and compare it with that of thousands besides–I scarcely see room

> for a murmur. Many–very many are–by the late strange Railway System deprived almost of their daily bread; such then as have only lost provision laid up for the future should take care how they complain.[3]

Charlotte Brontë could afford a relatively calm view of the situation, since by the time of that letter she had achieved literary success, with her novel *Jane Eyre* one of the best-sellers of 1847. But most railway shareholders could not, and neither could she have had a few years earlier. There was wide dismay among railway investors, who once had had high hopes for riches, and instead were faced with ruin. Although railway shares did recover from the depths reached in late 1849, they were not regarded as having properly rewarded those who bought them and made the railway system possible[4]. In 1855, the *Economist* wrote that "[m]echanically or scientifically, the railways, with all their multiplied conveniences and contrivances, are an honour to our age and country: commercially, they are great failures."[5]

At the height of the Railway Mania, the atmosphere was strikingly different, and strikingly similar to that at the height of the dot-com bubble. I strongly recommend reading the short story "The Glenmutchkin Railway" [17], included as Appendix 1 to this manuscript. It was written at the height of the investment frenzy, in the fall of 1845, when effortless riches seemed to be within easy grasp of everyone through the medium of railway shares. The goal of the author, William Aytoun, was to wake up the public to the dangers of the Mania. (He may have had some success in that regard.) It features the memorable pair of protagonists, Augustus Reginald Dunshunner and Bob M'Corkindale, who "abhorred [work] with a detestation worthy of a scion of nobility," and were eager to "[have] a pluck at the public pigeon," as "the magical bands of iron" were uniting "all the populous towns" and creating opportunities to get rich through "a slapping premium." It also has other noteworthy characters in supporting roles, such as Tavish M'Tavish of Invertavish, the Captain of M'Alcohol, and old Sam Sawley, the coffin-maker. This story will be cited many times throughout this text, since it was only a slight exaggeration of what was actually taking place at the time. Aytoun's satire was sometimes exceeded by reality, as the actions of actual promoters in the fall of 1845 occasionally went further into the realm of the implausible than Aytoun could conceive. One of the advantages of the story is that it presents a reasonably accurate picture of how railway companies were created during bubble times in the early Victorian era. Hence a reader who devotes 15 minutes to reading this rousing satirical tale will get an amusing introduction to company promotion during the Mania that is more enjoyable than reading some dry text, even if the latter is factually more nearly accurate. This story also brings up one of the main themes of this manuscript, namely the importance of the Dunshunners and M'Corkindales for technological and economic progress, and the extent to which society's tolerance and encouragement of their activities make destructive bubbles inevitable.

The Glenmutchkin Railway atmosphere did not last long. It was succeeded by several years of anxious waiting and desperate scrounging for resources to pay for the ongoing construction of railways, with steadily diminishing hopes, and in the end utter despair. The reference to "the late strange Railway System" in Charlotte Brontë's letter reflects the bewilderment shared by railway investors. There was no clear explanation available for

the disaster they were enduring. And, strangely enough, no such explanation was ever produced. Corruption and madness were and are usually cited as causes, often with references to the "creative accounting" and even worse activities of George Hudson, the "Railway King." However, as will be shown later, those are only a part, and not the most interesting part, of the whole story[6].

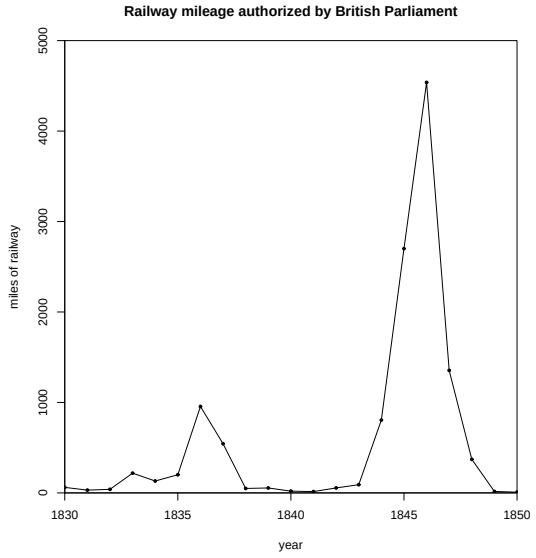

Fig. 1. Railways authorized in the United Kingdom from 1830 to 1850. Not all were built.

The first three figures illustrate the dynamics of the Railway Mania, and provide a timeline[7]. Figure 1 shows how many miles of railways were authorized by the British Parliament each year. This is an index of serious speculative activity, perhaps comparable as an index to the volume of IPOs during the Internet bubble in the U.S. Parliamentary authorizations were preceded by the promotional activities of the type described in the Glenmutchkin Railway story, and were followed by several years of construction. Figure 2 shows railway capital investment in Britain, which lagged behind authorizations. It peaked in 1847, at a level of about £44 million (in contrast to about £50 million for the national government budget). It usually took some time, on the order of a year, from the time that Parliament approved a project to the commencement of construction, and then several years to complete the project.

In Britain, practically all the capital for railway construction came from private sources, overwhelmingly from individuals. This was unlike everyplace else in the world (including the U.S.), where governments were heavily involved in financing the construction of this infrastructure. However, railway promoters in Britain needed government permission to use the right of eminent domain to force landowners to sell the necessary land. Parliament, dominated by the landed aristocracy, and devoted to "the sacred right of property," insisted on extensive hearings before granting such permissions. Railways were private companies, after all, and letting them seize someone else's private property was very controversial,

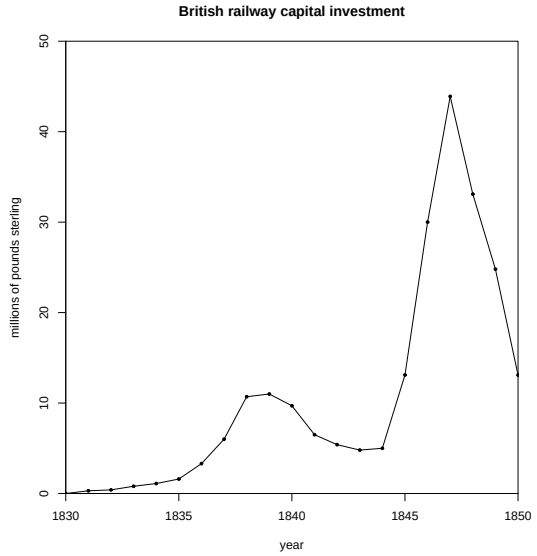

Fig. 2. Railway investment in the United Kingdom from 1830 to 1850.

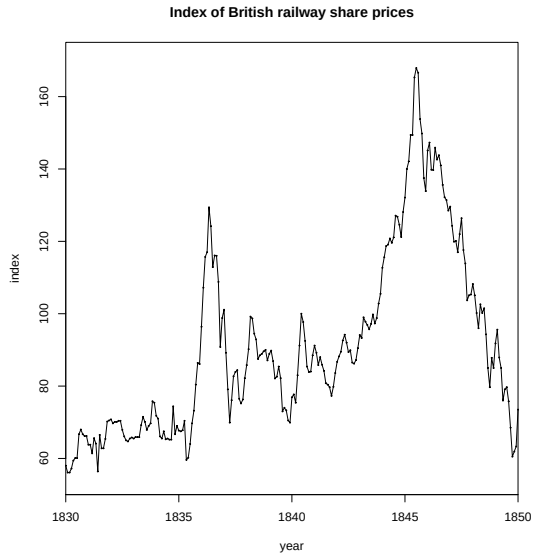

Fig. 3. Railway share prices in Britain from 1830 to 1850.

especially in the early years of the railway industry[8]. In the Glenmutchkin Railway story, there is just a brief mention of these hearings, in the next-to-last paragraph, about the "parliamentary contest." The Glenmutchkin Railway failed to get approved, since its "last antagonist, at the very close of his case, pointed out no less than seventy-three fatal errors in the parliamentary plan deposited by the unfortunate Solder." This hearing was placed in early 1845, with the "parliamentary plan" of "the unfortunate Solder" deposited by the deadline of Nov. 30, 1844. During the Parliamentary session of 1844 (which in most years ran from February to July or August, with approvals of railway projects tending to come late in the season), 805 miles of railways were sanctioned, as opposed to 91 miles in 1843, when enthusiasm for railway investment started rising. The action of the Glenmutchkin Railway story took place primarily in the fall of 1844. In the session of 1845, when Dunshunner and M'Corkindale failed to get approval for their project, 2,700 miles of railways were sanctioned. At that stage, many skeptics were appalled and alarmed, and called for a halt to further expansion. But the Mania instead got into its highest gear, and many famous wild scenes took place in the fall of 1845. That is when Aytoun published the Glenmutchkin Railway story, hoping that satire and sarcasm would be more effective in restoring sanity than reasoned arguments. In spite of this, a flood of proposals were submitted to the government by the Nov. 30, 1845 deadline, and were sifted by Parliament in the session of 1846. That year, 4,538 miles of railways were sanctioned, a record. By this stage, some sobriety returned, and the wild speculative excitement died down. Yet there was still active interest in railway expansion, and in the 1847 session, 1,354 miles of railway were approved by Parliament. Then, as is visible in Figure 1, things went downhill, as there were various types of financial difficulties that will be mentioned later in this manuscript, and in 1850 the trough was hit, with just 8 miles sanctioned. In the meantime, construction proceeded, with peak year for spending in 1847. Even in 1850, when investors felt crushed by the stock market decline, investments were high, higher than they had ever been before 1845. The reason was not that any shareholders were enthusiastic about the spending. Rather, so much money had been spent that it was felt better to go on and complete the lines and earn small returns than abandon them completely and get nothing.

The financial results of the Mania are visible in Figure 3. This index is imperfect, it represents a small number of established lines, and so in particular only indirectly reflects some of the startup activity that is depicted in the Glenmutchkin Railway story. Still, it does show the disaster that befell investors in the late 1840s. The causes of this financial debacle have not been analyzed carefully by anyone so far.

The lack of a deep investigation of what led to the investment debacle of the Railway Mania has an analogy during the Internet bubble. In that episode, the two biggest real investment disasters (i.e., involving actual outlays by companies, as opposed to changes in stock market valuations) were the construction of new long-haul fiber optic networks in the U.S., and the European 3G spectrum auctions, each of which cost on the order of $100 billion to €100 billion[9]. The *Economist* wrote of them[208] that "[b]oth of these episodes are now regarded as embarrassing collective hallucinations over which the industry prefers to draw a veil." The Railway Mania was far larger, more than 10 times larger, and a veil would not have sufficed to conceal it. But a thick curtain is what history appears

to have managed to produce, which served to hide most of the interesting features of the Mania. (Its existence could not be concealed completely, it was too large for that, and some protrusions could be seen distorting the thick curtain. It corresponded, in relation to the size of the economy, to an investment of perhaps $4,000 billion for the United States today.) And that is a great pity, for there are many interesting lessons one can draw from the Mania, especially from comparisons between it and the Internet bubble. There are potential implications for future bubbles, as well as for more general issues of technological innovation and economic development.

The comparison of the Railway Mania and the Internet bubble is the subject of a book in preparation, *Beautiful Illusions and Credulous Simplicity: Technology Manias from Railroads to the Internet and Beyond,* [167], which will be referred to in this manuscript as *BICS*[10]. There are numerous analogies, some amusing, some profound, and some both. In the last category is the close parallel in key mantras that inspired both bubbles. A decade ago, much of the activity was driven by the concept of "Internet time," the notion that everything was now changing much faster than before, and that disruptive new technologies enabled clever teenagers to dethrone well-established corporate behemoths. A century and a half earlier, the phrase one heard frequently, with similar implications, was "railway speed." ("Railway time" would have produced an even closer analogy, but that concept was used to denote the uniform time that railways brought to a world where each town used to follow its own clock.) Both mantras inspired frenzied investments that might well have paid off, had society truly increased its pace as much as claimed. Instead, society decided to adopt the new offerings at its own speed, slower than that expected by inventors, promoters, and investors, and financial ruin followed in both cases.

This manuscript is drawn from material in *BICS*, and is devoted primarily to demonstrating the gross market inefficiency during the Railway Mania. The veil drawn over the telecommunications disasters, and the curtain hiding the Railway Mania, conceal very convincing proofs that markets can be strikingly inefficient, that investors and the general public can fall subject to collective hallucinations that hold them in their thrall for several years, until they suffer a hard collision with reality[11]. The two telecom debacles, and the British Railway Mania, all share the feature that they could have been recognized in advance even by the general public. (They were also recognized in advance by a few people who were not paid attention to, though.) These episodes involved constructing public infrastructures, and there was hard quantitative evidence that once those went into service, there would not be enough demand to provide the expected profits[12].

In general it is hard to tell beforehand how a new product or service will be received by society. The "build it and they will come" mantra (which was very popular during the Internet bubble, but had been preceded by similar sentiments during the Railway Mania) failed spectacularly for investors in the dot-com as well as telecom booms, and it failed a century and a half earlier for railway investors. But while it is easy in retrospect to pour scorn at many of the rosy predictions that animated the recent investment catastrophe, we have to distinguish between reasonable risk-taking on one hand and foolish and obdurate flings of speculation on the other hand. People's reactions are hard to predict. Customers flocked to the Apple iPod and the Apple iPhone, but turned up their noses at the Apple

Newton (and at the more recent Apple-Motorola ROKR and Apple TV). As Yogi Berra is supposed to have said,

If people don't want to come out to the ballpark, how are you going to stop them?

People often decide they have better things to do with their time and money than buy a new product or service, and don't "come out to the ballpark." On the other hand, sometimes you don't have to stop them from not coming, you have to block them from overcrowding the ballpark. There have been many cases where actual demand far exceeded projections. A notorious example is the study that McKinsey did for AT&T in the early 1980s, which predicted that by the year 2000, there would be just 800,000 mobile telephone subscribers in the U.S. Instead, there were over 100 million! In a similar vein, Paul Krugman, best known as a columnist for the *New York Times,* but also a famous professional economist and the winner of the 2008 Nobel Memorial Prize in Economic Sciences, predicted in 1998 that "[b]y 2005 or so, it will become clear that the Internet's impact on the economy has been no greater than the fax machine's" [114]. (The prize was not awarded for his forecasting.)

Overall, it is safe to say that inventors and promoters do tend to be overoptimistic. But in a significant fraction of cases they are too cautious. What is perhaps most fascinating is how often inventors and promoters succeed in spite of very bad judgment calls. At a research conference in 1998, one of the presentations, devoted to Web search, declared that

> [t]he goals of the advertising business model do not always correspond to providing quality search to users. ... we expect that advertising funded search engines will be inherently biased towards the advertisers and away from the needs of the consumers. ... we believe the issue of advertising causes enough mixed incentives that it is crucial to have a competitive search engine that is transparent and in the academic realm.

Of course, the big success story in high-tech startups of the last decade has been Google. It is funded by ads, is extraordinarily opaque, and definitely not in the academic realm, and yet has earned users' trust. Thus it succeeded by doing just the opposite to what that paper predicted. Hence one might be tempted to guess that the authors of that paper sold Google stock short at its IPO, and are now bankrupt. In fact those authors were Sergey Brin and Larry Page [39], the creators of Google, and now among the world's richest and most admired entrepreneurs. They recognized the error of their views, changed their business model, adopted critical additional technologies from outside, and went on to create one of the currently most successful companies.

Yet all the way through the Internet crash in 2000–2002, up to the Google IPO, it was not clear that Google had a viable business plan, and search was regarded as so unimportant that Yahoo! was happy to outsource the core of its search to Inktomi and then to Google. Furthermore, online ads in general were regarded as unlikely to bring in significant revenues. In spite of this, there were several startups, as well as extensive academic research, in search technologies. Thus even if Messrs. Brin and Page had taken their 1998 conclusions seriously, and continued with their graduate studies, we would not have been stuck with the older search engines, and would have had higher quality alternate search solutions, possibly not as good as Google, possibly even better[13]. And all this because

a number of people, investors and inventors, did not accept the consensus view that search was dead, and invested considerable time and effort to prove otherwise.

Success can follow from following contrarian views, especially if the inventors and promoters adjust their goals, methods, and business plans as they bump up against reality. Sometimes success follows even though inventors and promoters are seriously mistaken about important features of their novel product or service, and persist in those mistaken views even as their innovation flourishes. A small example from the early history of railroads illustrates this point. Many British opponents of the new technology argued that it would decrease the demand for horses, leading to the death of the noble art of horse breeding, with detrimental effects on such important parts of upper-class life as fox hunting, as well as deadly threats to national defense through lack of good horses for cavalry. The proponents of railways agreed that there would be fewer horses, but they applauded this development. They argued that the land needed to feed a horse could be used to grow food for 8 people. Hence by adopting steam railways, Britain could support a larger population, and would not need to send its sons and daughters to the rebellious former colonies across the Atlantic. As it turned out, both sides were wrong, railways created an increased demand for horses. The rails provided efficient transport once one got to them, but the "first-mile problem" of getting to the rails (reminiscent of today's "first-mile problem" of connecting homes and businesses to the Internet at high speed), as well as the general stimulus given to the economy by the new technology, called for more horses. In fact, railways themselves used horses extensively, not only for local deliveries of goods they handled as carriers, but also within rail yards, to move wagons around. Thus this was one of many cases of promoters "stumbling to success."

While it is difficult to predict the future of technologies, there are usually many predictions that are correct, or nearly so, simply because of the diversity of opinions. But most of the time these are just opinions that happen to turn out correct. Some successful predictions are founded on more solid grounds, even when they deal with revolutionary technologies, as they rely on well-established patterns that there is no reason to think will be broken. Thus, for example, an American commentator at the height of the Railway Mania wrote that "[t]he lawyers have thus far had the lion's share, and, in the long run, they are likely to come out by far the most fortunate and successful operators." And that person was exactly right[14].

Still, the prediction about lawyers' gains from the Mania were based on continuation of a well-established pattern that there was no reason to believe would be broken. But what happens when one is faced with something novel, such as a revolutionary new technology? Sometimes, even under such circumstances, it is possible to make a correct prediction that does not involve a simple continuation of current and historical trends. "If people don't want to come out to the ballpark, how are you going to stop them?" Hence you cannot be sure a venture will succeed, as people may decide, for whatever reason, not to come out to the ballpark. But if the ballpark has 50,000 seats, and your business plan is based on packing 100,000 people in, you will fail. And the Railway Mania investors, as this manuscript shows, were implicitly expecting to pack between 150,000 and 300,000 people into a ballpark built for 50,000[15].

It might seem astounding that the early Victorians could make such a basic mistake. But it pales compared to what the long-haul fiber network investors did a decade ago. The mistakes there were far more glaring, as will be shown in *BICS.*

The most interesting and astounding factor is that in all these cases, mainstream planning and opinion ignored the size of the ballpark. There was furious activity on multiple fronts, equivalent to ensuring there would be enough hot dog and soda vendors, that ads would air on all local TV and radio stations, that security patrols would be on site early enough, that the cheerleaders got enough practice and the right kind of music, that the athletes were accommodated in quiet hotel so they could have a restful sleep the night before the game, that car traffic would flow smoothly into the parking lots, that other athletic events would not detract from the attraction of the game, ... But practically nobody in any of these cases (with rare exceptions that were not paid attention to) took into account that the ballpark could not accommodate enough fans to make the game pay.

Once one compares the size of the ballpark to the expected number of attendees, the problem becomes obvious. Table 2 in Chapter 3 shows that in 1845, total railway revenues in Britain reached £6 million. As will be shown later in this manuscript, the implicit expectations of British railway investors were for these revenues to reach £60 million by 1850 or 1852. (They turned out to be just £15 million in 1852.) Now a tenfold jump in revenues in half a dozen years is not impossible by itself for a new product or service. It was comparable to what the British railway industry achieved a dozen years earlier, as a result of the smaller railway mania of the mid-1830s, which will be spelled with lower case letters, to distinguish it from the Railway Mania of the 1840s. This mania, still gigantic by modern standards, is visible in figures 1–3 in the form of blips smaller than those for the Mania. It will be discussed later, as it had a gigantic influence on attitudes towards railway investments in the 1840s. However, by 1845, railways were neither a new phenomenon, nor small, as their revenues were already over 1% of GDP and about 10% of total government spending. The expected revenues after the anticipated buildout of the Railway Mania would have amounted to over 10% of GDP. Further, largely because of the observation made earlier about railways stimulating demand for horses instead of diminishing it, these railway revenues would have come not from substitution for other transportation spending, but from totally new economic activities, in a very slowly growing economy. Not only that, those hoped-for post-Mania revenues would have been as large as the entire tax burden (see Table 1 in Chapter 3), in a country that regarded its existing tax load as barely tolerable. (This tax burden was laughably low by our standards, but primitive economies did not allow taxmen as much opportunity for squeezing money from the populace as modern industrialized ones do.) To put this into current terms, the U.S. commercial airline industry, which is almost a century old, attained revenues of $186 billion in 2008, which was about 1.3% of GDP that year, and about 4% of spending by all levels of government[16]. So the British railways in 1845, at the peak of the first phase of the Railway Mania, were certainly comparable in size, and perhaps even a couple of times larger, than the U.S. airline industry is today. And yet the Mania enthusiasts were expecting an additional tenfold growth in just the next half a dozen years[17]. Yet, with very few (but interesting)

exceptions, no one pointed out the absurdity of such expectations. Not only that, but (just as with the telecom bubbles) practically no one even thought about future demand.

So why not stop right here (aside from documenting the claim about revenue expectations) and say the argument is settled, the Railway Mania markets were inefficient, and investors irrational? There are two main reasons. One is that investors of that time were not operating completely blind, and were being bombarded with warnings. For example, one of the railway papers published the following commentary on a railway project where John Stuart Mill was the very first (and so apparently very eager) subscriber:

> The Directors of this Company have advertised that the allotment letters have been issued, "directed to those parties who, upon the strictest enquiry, have been selected as responsible and capable of completing their undertaking," and that the subscription deeds are now ready for signature! If any parties can really be found to sign the deeds, we recommend the Directors to construct a branch to Bedlam, for the especial accommodation of such madmen, as we are fully convinced that none but lunatics would bind themselves to carry out such a wild and ridiculous scheme.[18]

That the investors went on, even in the face of widespread skepticism and considerable adversity, testifies to their faith in the soundness of the schemes they were funding. Not all of them were fools, and it behooves us to try to understand how and why they went astray.

The other, and even more substantial reason for a deeper investigation of the Railway Mania is that the optimism that investors displayed for railway expansion was not completely crazy, and the size of the eventual railway network would have astounded Mania skeptics. In the second paragraph of the introduction to the 1858 book edition of the Glenmutchkin story (see Appendix 1), Aytoun noted that "[a]lthough the *Glenmutchkin line* was purely imaginary, and was not intended by the writer to apply to any particular scheme then before the public, it was identified in Scotland with more than one reckless and impracticable project." Apparently one of the schemes that this line was identified with was a proposed railway through the valley of Strathfillan (cf. [209]). Lo and behold, half a century after the Mania, an article in *The Times* noted that

> Strathfillan is, it is believed, the valley immortalized ... in ... "Glenmutchkin Railway," so that the year 1894 sees two railways through a valley which the caricaturists of 1846 regarded as too desolate to deserve the attention even of the maddest of promoters in the height of the mania of 1846.[19]

Thus the basic intuition about the power of the new technology was sound. It just took longer to be realized than hoped for (as neither "Internet time" nor "railway speed" applied to the extent imagined).

As will be shown in Chapter 21, Railway Mania enthusiasts were thinking of growing what was in 1845 a 2,400 mile railway network to something like 20–30,000 miles by 1850 or 1851. Well, at its peak in the early 1920s, the British railway industry had about 24,000 miles in service. In 1905, half a century after the Mania, revenues from railway services in Britain (and Ireland) came to £109.4 million per year, far more than the £60 million that had been (implicitly) expected during the Mania. Inflation was not a large factor,

but the economy grew during that period, so it is more meaningful to compare railway revenues to GDP and government budgets. In 1905 they amounted to 6.0% of GDP, 73% of the national budget, and 166% of the spending on the military[20]. Had railway investors obtained 6.0% of the 1850 GDP in revenues in 1850, about £30 million, they would have been pretty happy. (Although the expectation was for £60 million, that was for a larger network than was actually built. Further, usually expectations do not have to be met in full to make investors happy.)

Railways were a revolutionary innovation, and they satisfied a pressing demand for better transport. Modern venture capitalists (VCs) sometimes ask inventors and promoters: "What itch are you scratching?" In other words, do your potential customers feel they have a real problem that your product or service will solve? Inadequate transport in early 19th century Britain was not an itch, it was a searing pain. Deforestation was increasing, and the country was relying more and more on coal for heating, cooking, and manufacturing. Even where good roads existed, the cost of coal would double from the mine mouth to places a dozen miles away. Railways alleviated this searing pain. They led the transformation of the economy by solving the basic problem, but even more through spill-over effects, by providing new services, in particular by making substantial steps towards the "real-time" economy. Such topics will not be covered in this work[21].

The eventual size of the railway system makes the assumptions of Railway Mania investors appear less irrational than they might seem otherwise. That they did not have our understanding of the economy (with tools like input-output tables that help us understand how different sectors interact), and that their mode of thinking was conducive to the idea of quantum jumps (something dealt with at length in Chapter 15 and Appendix 8) also suggest that one needs to investigate their situation in more detail before concluding the markets were truly inefficient.

A deeper look does provide a more convincing proof that the markets were inefficient, that there was enough information to allow investors to deduce that railway investments were bound to crash[22]. This certainly held for investors like Charles Darwin and John Stuart Mill, who were wealthy, educated, well-connected, and lived in or near London, in close proximity to all the necessary sources of information about railways. Arguably this held even for the Brontë sisters in their father's isolated parsonage at Haworth. The required information was widely available, and the computations simple, requiring just ordinary arithmetic. Yet these people all went astray, prey to the collective hallucination that gripped British investors in general. But their mistake was deeper than that of the telecom investors a decade ago, where a very simple argument sufficed to show that ruin was inevitable.

This manuscript is long because the entire story is complex, and the context in which decisions were being made is not familiar. There is a puzzling deficiency in the literature, discussed in Chapter 2 and Appendix 2, which means that very little is known about what proponents and opponents of the Railway Mania were saying, or what information they had. The claim earlier that investors did not consider the size of the ballpark is correct, practically nobody considered the shape and role of the railway industry once the spurt of construction was over. But this claim is also slightly misleading, taken out of context. The

main reason that observers and participants in the Mania did not examine how many fans might come to the ballpark is that they were concentrating on the problems of constructing the ballpark. And the reasons they were mesmerized by this issue take some time to explain.

Still, even though they were concentrating on the medium-term issues of construction, investors should have thought about the long-term state of the industry. And that might have led them to uncover the really convincing argument for the inevitability of a financial crash. This argument involved the methodology used to predict revenues of proposed railways. Although there is nothing in the recent literature on this topic, Britain in the 1830s and 1840s had in operation a disciplined process for estimating demand for rail transport. That methodology predicted revenues of railways on the basis of pre-existing traffic on roads and canals. And a careful look at the sterling record this methodology had achieved during the railway mania of the 1830s, as well as at the methodology itself, would have shown that the Mania was destined to be a financial disaster.

As usual, the story has some extra twists. The British railway demand estimation methodology worked brilliantly in the 1830s, and this helped set the stage for the Railway Mania of the 1840s, when this methodology failed spectacularly. In "The Glenmutchkin Railway" one can catch a shadow of this methodology through the reference to "the preparation of our traffic tables" (when the protagonists decide not to publicize the report of their engineer, Watty Solder, soon after the banquet at the Sawleys). But it is only a shadow. In modern scholarly literature, there are similarly just a few hints that there was serious forecasting during the 1830s and 1840s. The one that is most colorful and at the same time most suggestive occurs in a modern transport history book, in a quote from a very obscure publication a century earlier. In the mid-1860s, there was another railway construction mania, followed by another stock market crash. A conference of railway shareholders was then held in 1868. During that meeting, Edward Watkin, an important railway promoter and manager of that era (already an MP, Member of Parliament, and later to become Sir Edward, and frequently called the "Second Railway King"), explained the Railway Mania of the 1840s in these terms:

> [B]etween 1837 and 1845 inclusive, there were gentlemen who rode in their carriages and kept fine establishments, who were called "traffic takers." He stumbled over one of these gentlemen in 1844, who was sent to "take" the traffic on a railway called the Manchester and Southampton. (Laughter.) It did not go to Southampton, and it did not go to Manchester; but it was certainly an intermediate link between those places. This gentleman went to a place in Wilts where there was a fair, and there took the number of sheep on the fair day, and assuming that there would be the same number all the days of the year, he doubled or trebled the amount to give room for what he called "development"–(laughter), and the result was that he calculated that by sheep alone the Manchester and Southampton line would pay fifteen per cent.[23]

Thus Watkin placed the blame for the Mania's debacle on exaggerated demand projections made by a recognizable group of specialists, the traffic takers. That is one of only a few passages in the literature that suggest the presence of any professional demand forecasting,

as opposed to promoters pulling profit numbers out of thin air, as the two Glenmutchkin protagonists do in the preparation of the prospectus for their line.

Watkin's remarks had several facts wrong[24]. That is excusable, since they were impromptu ones, made in response to a formal lecture that suggested unrealistic and futile ways to avoid another investment debacle of the kind investors had just gone through. (In many ways it was similar to the one two decades earlier, during the Railway Mania, but with some interesting differences.) These remarks (as will be discussed at length in *BICS*) most likely represented Watkin's attempt to bring a dose of reality to the discussions taking place at the conference. But while these colorful phrases should not be taken too literally, they are unusual in pointing a finger at the traffic takers. (They are also unusual in implying that there were sophisticated observers who understood the fallacy of the Railway Mania much better than any published accounts then or since. This is explored at greater length in *BICS.*) Through 1846, these traffic takers were responsible for preparing a large part of the detailed business cases that investors relied upon, either explicitly or implicitly. An amazing fact is that the existence of those business plans was forgotten very quickly. It is not only that modern history books don't mention their existence, but that already at the end of the 1840s, as the railway industry was crashing, they were not being mentioned. It would have been natural to blame the disappointingly low revenues on the traffic takers, but that did not happen to any significant degree.

The traffic takers existed as a profession for only about a dozen years[25]. During that period, they attained a very modest degree of prominence. Where they came from, what happened to them, and, most important, what their methodology was, are discussed in the companion paper [165]. The traffic takers played an important role in what is referred to in the next-to-last paragraph of the Glenmutchkin Railway story as "the parliamentary contest," which we have already discussed.

The traffic takers were important in creating the atmosphere that prevailed during the Railway Mania of the 1840s that railways were a sure thing as an investment. They did that because their forecasts during that smaller railway boom of the 1830s turned out to be amazingly accurate. That mania, to be discussed later, was actually a gigantic outburst of economic activity that was seen afterwards as successful. Its success owed much to the engineers and contractors, who managed to build those lines. But they did so at a cost that was typically about twice what had been projected. The perceived financial success of those lines came from the accuracy of the demand forecasts, which were made by the traffic takers. I use the word "perceived," since the profits were far smaller than had been promised by the promoters, because of all those cost overruns. But those profits were still higher than those available elsewhere in the markets, and so investors were happy.

Modern demand forecasts for large transportation projects tend not to be very accurate. This happens even though all of the technologies involved (airplanes, highways, railroads) are old, about a century old for the most recent one (airplane travel). Hence planners have extensive historical data to assist them, in addition to sophisticated computer models that draw on detailed demographic and survey data. Yet the differences between forecasts and reality tend to be very large. An example (on the extreme side, but by no means the most extreme, among large projects) is Eurotunnel, also known as the Channel Tunnel,

which connects England and France. First serious proposals for such a project were made during Napoleonic times, two centuries ago, and later proposals were floated during the Railway Mania. It was finally built and placed into service in 1994, as a largely privately funded corporation. It is a marvellous technological achievement, and provides a popular and useful service. But as an investment, it has been a disaster, repeatedly so, as costs were far in excess of estimates, and revenues a fraction of projections.

In the mid-1830s, railways were very much an untested and still rapidly evolving technology. Yet the traffic takers' forecasts from the 1830s turned out (at least from the perspective of the start of the Railway Mania in 1844-46) to be very accurate, far more accurate than modern ones for Eurotunnel or most other large transportation project. These professionals used a rigorous quantitative model. Now models have to be treated with caution, keeping in mind the Box–Draper dictum ([35], p. 424):

Essentially, all models are wrong, but some are useful.

The crash of 2008 was a perfect demonstration of the validity of this dictum. Financial models which worked fine during the boom, and so were useful for a while, failed spectacularly in the bust, because they were wrong, based on incorrect assumptions (such as average prices of real estate never declining on a national scale) and fed corrupted data (various dodgy mortgages treated like traditional ones that had large down payments and rigorous income verifications). The traffic takers' models were far simpler than what Wall Street uses, but shared the same property, of being useful for a while, and then failing. These models were based on false assumptions, as will be shown in Chapter 24. The mistakes canceled each other out in the 1830s, and gave very reliable estimates in most cases. And that is what made the railway mania of the 1830s a success, in spite of the failure by technologists and promoters to forecast costs appropriately. And that, to a large extent, is why the Railway Mania of the 1840s grew as large as it did.

During the big Mania of the 1840s, traffic takers again used their methodology to predict demand. But this time the outcome for investors was perceived, after the fact, to be an unmitigated disaster. There were cost overruns, again. But the major reason was that this time the traffic takers' forecasts turned out to be far too optimistic. This can be seen in Table 2 in Chapter 3. The last column there shows a big drop in revenues per mile. (This is analyzed in more detail in Chapter 23.) This was the key element in the financial failure of the Railway Mania. As will be shown in the crucial Chapter 27, this failure of the traffic takers was easily predictable, since their models, if applied to all the projected railways produced impossible answers. That should have led investors to reconsider their basic assumptions.

Amazingly, even in retrospective, this failure of the traffic takers was understood by only a few people (such as Edward Watkin). And although there were some people who appreciated the sterling record of these specialists during the earlier railway mania of the 1830s, such people left very few traces, and not very prominent ones. Investors in the 1840s operated under a serious delusion about the accuracy of the traffic takers' estimates. This was the most serious of many delusions that led them astray, although not the only one.

Collective hallucinations seldom occur in isolation. They usually require a supporting set of illusions and delusions to provide a consistent, although twisted, view of the world.

If you believe the Earth is flat, and are not totally insane, you also have to believe there is a vast conspiracy of scientists, astronauts, and government officials who create all those pictures of Earth from space, run experiments that show the rotation of the Earth, and the like. And among a substantial crowd of flat-Earthers, there will usually be enough rational thinking to lead to a development of such a conspiracy view.

There were many (normally) rational people investing in the Railway Mania, and so their collective hallucination was not a simple one, of just believing what Augustus Reginald Dunshunner and Bob M'Corkindale wrote in the prospectus of the Glenmutchkin Railway. Among other factors, their rosy expectations were supported by seemingly solid revenue estimates by the traffic takers. Those experts promised good, although not spectacular, profits. But investors neglected to do the simplest checking, and instead relied on a widespread belief that traffic takers' demand projections had in almost all cases been substantially exceeded. This false belief arose from an intensive public relations campaign by the railway interest, supported by some scholarly studies. This campaign was based on diverting the public's attention from the metrics for success that truly mattered, namely revenues and profits, to another one, namely the raw number of passengers. That other metric did provide support for the exaggerated claims, but only because of intentional or unintentional misinterpretations of available data. This led investors to expect profits considerably higher than promised by the traffic takers. Their belief was bolstered by some other delusions that are discussed in later chapters. What is most astonishing (both then and during the telecom bubbles, which also were sustained by a collection of delusions, often very similar ones) is that any single one of these delusions was easily shown to be false. Hence one might think that with more opportunities to find fatal defects in the rosy profit projections, investors could not but wake up and realize they were being led astray. But that simply did not happen (just as it did not happen during the telecom bubbles). The multiple delusions, each easily falsifiable, reinforced each other and created a powerful collective hallucination that required a hard fall off a cliff to dispel.

Investors' profit expectations were also bolstered, paradoxically, by the opponents of the Railway Mania. Unlike the Internet bubble or the recent real estate/financial bubble, the Mania had some very prominent, insightful, and influential enemies. The three whose positions will be presented (briefly, again) later were *The Times* (of London), at that time by far the most influential paper in the history of the press, the *Economist,* a very new publication, but highly respected for its coverage of the economy, and James Morrison, a very insightful and knowledgeable public-spirited tycoon, who may have been the world's richest person at that time. The main concern they expressed was that railway investment was proceeding at too rapid a pace, and was threatening to drain capital from, and thereby disrupt, other parts of the economy. However, these Mania opponents were all enthusiastic about railways as a wealth-creating infrastructure, and none of them denied that the new lines were going to produce good profits. In fact, Morrison's concerns, dating back from the earlier railway mania of the 1830s, were that railways, through their monopolistic control of key transportation links, would earn exorbitantly high profits that would strangle the economy. Listening to his speeches in Parliament, or reading his pamphlets, railway investors could easily have concluded that by getting their charters they would be getting

keys to the Royal Mint. Hence even if the concerns of these skeptics were valid for the economy as a whole, for individual investors (aside from some unusually altruistic ones) they could only act as spurs towards faster buildout. The prospect of exorbitant profits could hardly be a deterrent.

The multiple collective delusions that the proponents and opponents of the Railway Mania suffered from are not easy to describe, and this accounts for much of the length of this manuscript. A closely related reason for the length is that it is necessary to devote some space to the railway mania of the 1830s. It is simply impossible to say anything intelligible about the financial and economic aspects of the Mania of the late 1840s without some understanding of what had happened a decade earlier. The railway mania of the 1830s was a part, by some measures about half, of the more general investment mania of the mid-1830s. The speculative part of that mania collapsed, and most of the non-railway pieces of it vanished. However, contrary to the universal perception about investment bubbles, the railway part of that mania did lead to the construction of a substantial railway network. Compared to the size of the current U.S. economy, British investors set out to put about $1 trillion into the new technology. By the time they were done, by 1844, say, they had invested more like $2 trillion, due to cost overruns. And they were happy (the ones who persisted, that is, and even more the ones who bought at the bottom during the tough years in between)!

The universal perception of financial bubbles[26] is that rapid rises in valuations of a large asset class are always followed by crashes. That was the main, and often apparently only, motivation behind many warnings from skeptics about the recent real estate/finance bubble. Paul Krugman claimed in early 2009 that "bubbles always burst sooner or later," [115]. Investment manager Jeremy Grantham, who is often referred to as a "legendary investor," and who was bearish on both the Internet bubble and the recent real estate/finance one, claimed in 2001 [216] that a study that his colleague Ben Inker and he had carried out, which covered the 28 manias they had found over the centuries that met their criteria for a bubble, showed that "[e]very one of the 28 went back to trend, no exceptions, no new eras, not a single one that we can find in history." And the financial journalist Ed Chancellor, who wrote a book on the history of financial speculation [51], recently stated categorically that "claims that 'this time is different' are invariably proven wrong," [52].

The railway mania of the mid-1830s is a counterexample to these claims. This mania does seem to be unique in history in that respect (at least among large manias), but "that time was different." It took place in an atmosphere of extreme skepticism, much of it very reasonable. Railway projects of that time were wildly speculative, much more so than telecom projects of the Internet bubble. They called for putting astronomical sums into constructing ballparks where it was not clear that the ballparks could be built, nor whether people would come to them if they were built. They were not as outlandish in the abstract as many of the dot-com projects, but when one considers how much money was involved, one could consider them far more outlandish. Amusingly, there was one skeptic at that time who described almost exactly how Eurotunnel (built around 1990 between England and France) was going to become a financial disaster for its investors. (He is described in Chapter 8.) However, while this skeptic's argument did come true for Eurotunnel a century

and a half later, it failed for the railways of that decade. They became financial successes. However, success took some excruciatingly painful years to arrive. This experience had a profound influence in shaping attitudes of both proponents and skeptics of the Railway Mania of the 1840s. It also shaped the response of investors during the Mania. Hence it is necessary to devote some space to it.

The focus of this manuscript is on investors, their motivations, the information they had, and, most important, on how efficiently they processed this information. But there are many other topics that can be illuminated by the study of the Railway Mania period. The pace of the Industrial Revolution accelerated noticeably right around that time. At the same time (and likely not merely coincidentally) modern corporate capitalism came into existence, involving changes in laws, institutions, and attitudes. Up until 1825, it was basically illegal to form corporations in Britain without an explicit permission from Parliament. Starting in 1825, the law was changed, but limited liability did not become generally available until the mid-1850s. (It was routine for railway companies). As a result this period provides a wealth of interesting insights on topics such as:

- ability of government to influence economic development
- role of willingness to violate property rights in promoting growth
- corporate governance
- ability of monetary policy to restrain bubbles
- effectiveness of Keynesian or pseudo-Keynesian stimuli
- controlling the financial industry
- importance of "animal spirits" and "beautiful illusions"
- effective intelligence assessment

These will be treated in *BICS,* since they require more space than is available here, and it is best to treat them when comparing the Railway Mania to the Internet bubble. Of course, one can question how much relevance events of a century and half might have for the present and future. However, human nature and economic principles do not change much, so when evaluating how society reacts to a novel technology, it is useful to consider disparate settings.

The period of the Railway Mania provides some striking contrasts to modern times. Then, hunger was a perpetual concern, even in Britain, the most industrialized country in the world, and the Irish Potato Famine took place during the Mania. In modern industrialized countries, obesity is a greater problem than hunger. Hence we can view the evolution of economy over this period, when the basic needs for sustenance and shelter became fulfilled for most people in rich countries, as one in which society's demands for circuses came increasingly to dominate demands for bread. Much of what we observe, such as growing emphasis on providing experiences and not goods, and the economy's shift from goods production to services, fits this mode of thinking, as do many developments in politics, investments, and corporate governance. This of course creates new challenges; as economic and social values move further from tangible objects, the potential for collective hallucinations grows.

One item that was not included in the list above was detection and classification of bubbles. This topic will again be treated in more detail in *BICS,* in combination with the

evaluation of the Internet bubble. But it is so central to this manuscript that I will devote a few paragraphs to it here. Over a decade ago Ben Bernanke, the current head of the Federal Reserve, published (together with Mark Gertler) a paper which claimed, for example, that "[a]dvocates of bubbles would probably be forced to admit that it is difficult or impossible to identify any particular episode conclusively as a bubble, even after the fact" [30][27]. This manuscript shows that this claim is definitely false for the Railway Mania, and *BICS* will demonstrate it for the telecom bubbles. (No claim is made for the existence of any general mechanism for detecting all bubbles, though, not even for the recent finance/real estate one[28].)

The sophisticated mathematical models that are ubiquitous in economic and financial modeling today (and contributed greatly to the bubble that burst in 2008) were not available at the time of the Mania. But they would not have helped in protecting against it, just as they did not help at the time of the Internet bubble. All that was needed then (just as during the telecom bubbles) was some common sense, ability to do simple arithmetic, and knowledge of a few basic facts about the economy. It was clear that promoters were counting on packing 150,000 fans into a ballpark built for 50,000.

Modern economic theory has been criticized on various grounds, even aside from the fact it provided no assistance in predicting or even understanding the crash of 2008. One attack has come from behavioral economics. But the observations about the Railway Mania here (and about the telecom bubbles in *BICS*) suggest even more fundamental objections. A collective hallucination that makes the market ignore the size of the ballpark appears to go beyond the phenomena that behavioral economics has explored. Furthermore, there was the equivalent of all the fans showing up to buy tickets being sumo wrestlers, and even though many people noticed them, effectively nobody observed that one could not squeeze 50,000 sumo wrestlers into a ballpark built for 50,000 average-sized fans. Thus we have demonstrations of relevant information being widely available, but not reaching the right people, or not being related by those people to the problem at hand. This undermines the notion that markets digest properly all available information. Hence to build economic models with predictive powers, it will be necessary to develop ways to incorporate mass psychology into them, and there does not seem to be any hope of doing that any time in the near future.

What is most interesting is that during the Railway Mania, unlike during the Internet bubble, there were several prominent, powerful, and insightful agents who were doing their best to oppose the Mania. However, the three discussed at some length later, in Chapter 12, and most other skeptics, suffered from another collective hallucination that made them miss the fatal defect of the Mania and concentrate on other aspects of it, with the result that their warnings were likely counterproductive. This is in great contrast to both the Internet bubble and the recent financial/real estate mania. While there were many skeptics, there were no strong opponents, nor even deep investigations into the dangers that might arise. Just the opposite. Fortified by the Bernanke–Gertler papers cited above, most economic policy makers refused to look for bubbles. Consider just the three most prominent professional economists among recent powerful economic policy makers, Alan Greenspan, Ben Bernanke, and Larry Summers. They were among the most gullible among a very gullible profession,

who not only practiced the "see no bubble, hear no bubble, speak no bubble" philosophy, but discouraged investigations by others into investment manias[29].

Given the inability of *The Times*, the *Economist,* and James Morrison to detect the fallacy of the Railway Mania, perhaps our society has gone to the other extreme, and is increasingly selecting its leaders on the basis of credulous simplicity. If so, is that the optimal strategy? This is not a rhetorical query. Interestingly enough, some observers at the time of the Railway Mania (who often seemed much more perceptive than modern ones, perhaps because that was the dawn of the new age, and so much was new, and could be seen in a fresher perspective) did consider such questions. They had a much more nuanced view of investment bubbles than we do today, when they are essentially universally condemned and regarded as something to be avoided at all costs. Those observers saw economic value in manias, and were willing to encourage the Dunshunners and M'Corkindales, and tolerate a fair number of Bernie Madoffs, in order not to miss out on the Sergey Brins and Larry Pages. They also perceived additional non-financial benefits to society as a whole and to individuals from bubbles. (One example of such thinking is presented in Appendix 6.) Thus perhaps it might be appropriate to discuss openly the value of bubbles, and the extent to which current policies promote them.

The core of the argument that markets were not efficient at the time of the Railway Mania is contained in Chapter 27. However, to understand it, it is necessary to refer to chapters 3, 11, 21, 22, 23, and 24. The other chapters, as well as the appendices and endnotes, provide additional information to help in understanding the environment in which Railway Mania investment decisions were made.

2 The Railway Mania and history

The Glenmutchkin Railway story, as well as most accounts of the Railway Mania in the literature (for example, in the books [51, 82, 184]) concentrate on the period of greatest excitement in the early stages of the Mania, especially in the runup to the crucial deadline for depositing plans at midnight of Nov. 30, 1845. At that time, many companies were being established based on prospectuses not much different from the one for the fictional Glenmutchkin Railway. The events that transpired then would have been difficult for any fiction writer to imagine beforehand. Some of the memorable scenes included a collision of two express trains carrying the documents and their accompanying officials, bundles of papers conveyed secretly in a hearse, companies bribing printers to sabotage rivals' efforts, and many people (including such eventually famous figures as George Augustus Sala and John Tyndall) working without sleep for several days in a row to complete the plans on time. Much of that episode is covered extensively in the existing literature, and reinforces the impression of an irrational frenzy.

However, the actions at that stage were more rational than is often supposed. At that stage, promoters and investors attempting to launch new schemes were going after what were in effect just options, the opportunity to participate in a gold rush. (An interesting comparison can be made between public attitudes towards the Railway Mania and towards the California gold rush, which started just as the Mania was entering its final collapse, as well as towards the Australian gold rush, which began a few years later. In the gold rush

cases, there was no obvious and hard limit to what could be gained, no way to say that the ballpark could only seat 50,000 spectators. One could apply rules of thumb, based on historical precedents, but these would all be just opinions, even if informed ones, without hard quantitative data to substantiate them.) The railway opportunities that resembled gold deposits seemed rich and extensive, so people were willing to brave an environment that everybody told them was full of shysters, unreliable suppliers, crooked officials, sneaky and underhanded competitors, and even armed bandits. The actual amounts at stake then, required to prepare the plans for Parliamentary scrutiny, and thus obtain access to those rich gold fields, were not all that large, although far larger than was invested in the dot-coms, and comparable to what was invested in telecom during the Internet bubble[30]. (There were opportunities for huge short-term gains and losses in the stock market, as is described in the Glenmutchkin Railway story, when Augustus Dunshunner gets fifteen thousand pounds from "Old Sam Sawley, the coffin-maker',' through what is called a "short squeeze." But that is a different type of activity. It only transfers money from the pocket of one speculator to that of another, with generous subtractions for various intermediaries, of course. But it does not necessarily affect economic activity to any significant extent.) The real irrationality took place later, in the years 1846 through 1849, when huge sums were poured into building lines that, when placed into service, did not produce anywhere close to the expected profits. There is relatively little on this period in the literature. Even the events of 1845 are not covered in adequate detail.

It is not only the Railway Mania that has been neglected in history. There were four large bubbles in Britain during the 19th century that deserve much more treatment. They are the speculation of the mid-1820s, the mania of the mid-1830s, the Railway Mania of the mid- and late-1840s, and the railway mania of the mid-1860s. Little has been published about them, especially when compared to the vast literature about the Dutch Tulip Bulb Mania, the South Sea Bubble, and John Law's Mississippi scheme. And practically nothing has been published about these 19th century manias compared to the studies of the literature and politics of that period. Any large research library will have bookshelves, and often bookcases, devoted to any single prominent writer or politician of that time. There is even a periodical, *The Dickensian*, devoted just to Dickens. And even more striking contrasts arise when one looks at coverage of wars of that time.

By the end of 1850, British investors had put about £250 million into their country's railways, almost half of their GDP, equivalent to about $7 trillion for the United States today. (See tables 1 and 2 in Chapter 3.) Their financial losses can be estimated (as will be done in *BICS*) at about a third of that, or about £80 million, equivalent to $2.3 trillion for the United States. A few years after the Railway Mania had wound down, Britain got involved in the Crimean War of 1853–1856. Its cost to Britain is estimated at about £70 million, about what British investors had lost on railways. (The Afghanistan and Iraq wars so far have cost the United States about $1 trillion, about half of that.) The size of the British Army during this war reached about 250 thousand, twice its more normal strength in the 1840s. That was just about the size of the labor force constructing railways in 1847 (when there were also another 50 thousand workers on railways in service). But there is a huge disproportion in the coverage of the Crimean War and the Railway Mania.

A search of an online catalog just for books with the phrase "Crimean War" in the title produces several hundred items. There are many called just *The Crimean War,* but there are also many others, covering an astonishing variety of facets of that conflict[31].

By comparison, a similar search for books with "Railway Mania" in their titles produces just a handful, and only one that is devoted just to the Railway Mania, Lewin's study [132]. This work is indispensable to researchers of this subject, but limited in its coverage and over 70 years old[32].

Some of the neglect of the Railway Mania could be attributed to its mundane business aspects. There were some exciting moments, such as those scenes at the end of November 30, 1845, with several hundred cabs converging on a government office to deposit required plans to the amusement of the gathered multitudes. Crowds also often assembled to watch railway construction[33]. Still, the Mania was largely about money, which the Victorians did not hold in high regard, at least not in public discourse. Overall, there was not all that much excitement about railways, other than accidents, which newspapers devoted a lot of space to, especially where death or serious injury was involved. But even if we include accidents, the Mania did not produce anything as bloody, or as spectacular, or as celebrated, or as senseless, as the Charge of the Light Brigade during the Crimean War.

A nice illustration of the different attitudes towards war and towards construction of a useful public infrastructure (even when it entails spectacular ruin to shareholders) is provided by the career of William Howard Russell (later to become Sir William). His bronze memorial bust in St Paul's Cathedral carries (with good justification) the inscription "the first and greatest of war correspondents" ([13], vol. 2, p. 388). He first attained wide fame during the Crimean War, where he coined the phrase "the thin red line." His reporting on the Charge of the Light Brigade, on other instances of commanders' incompetence, as well as on the squalor of military life and related issues, was instrumental in bringing down a British government.

A decade earlier, in 1845, Russell was reporting as well as managing and editing others' reporting for *The Times* on the railway hearings in Parliament. And there the eloquence that would stir readers' imaginations about the battles in the Crimea was used to pour scorn on the bloodless but hectic and costly battles inside Parliamentary committee rooms, which would later prove to have extremely costly consequences for investors. One passage that Russell wrote stands out for its ridicule of the traffic takers' work:

> Mr. Greenwood produced those sibylline leaves called traffic-tables, into which counsel, hon. members, and the witness plunged with the greatest avidity, and soon became overwhelmed in the usual inextricable confusion and bewilderment consequent upon every attempt to explain or understand the deep mysteries of those documents. For all practical purposes, so diverse are the principles on which those tables are compiled, so various the methods of estimate and computation, so opposite the results deduced by friend and foe from the same data, that they might as well be tables of logarithms or algebraic formulae for all the service they render the committee. The result, however, is always to show a good per centage, ...[34]

Over four decades later, in a draft of his autobiography, Russell wrote about this period that

> In sheer *ennui* I ridiculed witnesses and counsel without the least notion, till I heard it many months afterwards, that I was suspected by the other side of being paid and bought.[35]

In several of his 1845 reports, Russell wrote passages such as this one:

> A great number of witnesses were called to testify to the merits of the line, and gave evidence of a character precisely similar to that tendered on behalf of every line before every committee this session. Transposing the various localities and articles of traffic, there was nothing whatever to distinguish the elaborate and circumstantial details, tending to show that the project under consideration was the best possible ..., from those which have already appeared in print ...[36]

It is hard to imagine Russell, or any other journalist, sending off a dispatch about a battle in the Crimean War that read:

> A great number of soldiers were called to fight on this occasion, and their battle had a character precisely similar to that of every other battle in this war. Transposing the various localities and military unit names, there was nothing whatever to distinguish the elaborate and circumstantial details, tending to show that they fought the best fight possible ..., from those which have already appeared in print ...

Yet it was a war, although a bloodless one, that was being waged in Parliamentary committee rooms. And other comparisons with war were being constantly made during the Railway Mania. The "alarmists" calling for slowing down railway expansion, such as *The Times,* the *Economist,* and James Morrison, were claiming that Britain could not afford to spend all that money on railways. The most frequent rejoinder to that, from Mania defenders, was that their country had spent far more fighting France just a few decades ago. And if it could spend that much on destroying an enemy, why could it not spend a substantially smaller, although comparable, amount building a productive transportation infrastructure? Unlike the destructive wartime activities, railways could be counted on to pay dividends, literal ones to shareholders, and figurative ones, through provision of superior and less expensive services, to the whole nation. It is hard to dispute the logic of this argument.

In extent and intensity of effort for Britain, the Railway Mania exceeded the Crimean War. But in fatalities, the loss was orders of magnitude lower for the Mania. On the other hand, what was left behind was the world's most extensive, modern, and effective transportation infrastructure. While shareholders lost heavily, hardly any of the lines went bankrupt, and almost all lines continued in service. It is quite likely that as a nation, Britain gained economically from the experience, with the benefits to users outweighing the losses to shareholders. (This does not even count some indirect benefits, such as possibly helping prevent a revolution in 1848.) But history reflects very little of this. Nor can one find much reflection on just what went wrong, or how it could have gone otherwise, or even (aside from coverage of the disgraced "Railway King," George Hudson) on individual roles in the Mania, something that almost all wars lead to in profusion. William Howard Russell's autobiographical sketches don't reflect any real understanding of the Mania, nor

an appreciation of what a great opportunity he had passed up. With a little more attention to "those sibylline leaves called traffic-tables" and a little incisive thinking, he might have been able to figure out, from the traffic takers' testimony, the basic fallacy involved in the Mania and thereby save investors fortunes.

The biography of another distinguished Victorian reflects this same strange, but universal, phenomenon, of a lack of understanding of the Mania, and a seeming lack of interest in gaining such understanding. Henry Cole would eventually become Sir Henry Cole, KCB, acquire the monicker "Old King Cole," and play a key role in setting up numerous exhibitions, as well as schools of art and design, and many of the major London museums. At the time of the Mania he was already a senior civil servant. He also moonlighted as a railway journalist and a public relations activist for one of the large railway companies. Those positions consumed more of his time, and paid more, than his government job. In his autobiography [60], he did get into far more detail about his railway work than most people from that period did in their reminiscences. But the overall evaluation of the episode was just that

> In this year, 1845, England was visited with one of its periodical epidemics of commercial folly, the Railway Mania as it was called, which rivalled in intensity the South Sea Bubble of 1720. Peers, peeresses, commoners, merchants, tradesmen, domestic servants, operatives, were all involved in the madness, and the ruin entailed by it.

There was no sign of a serious understanding of the Mania, nor any reflections on his own role in it, of how he could have stopped it. Yet, in his role as both a foot soldier and the commanding general on one side of the famous gauge wars, he had a great opportunity to prevent the financial debacle. The gauge wars (involving the choice of the railway gauge, the spacing between rails) have been written about frequently from the standpoint of technology. They, as well as other aspects of the Mania, do provide valuable lessons about standardization, and the role of technology, path-dependence, corporate policy, and government intervention in the marketplace when a new industry springs up. But what really drove the gauge wars in Britain in the 1840s was the competition between two giant railways, competition that in retrospect each would have been better off losing completely. The public attention that these wars attracted was the result of the intense public relations battles waged by the two sides. Interestingly enough, some of the studies that Cole commissioned for his side had some of the most insightful analyses of railway economics. With just a slight change of focus, they could have led to a discovery of the key fallacy of the Mania. (That fact provides some interesting hints on how one might try to detect and control financial bubbles.)

Given the neglect of the Mania in the literature, one might be tempted to think that railways as a whole were boring and did not attract much attention from historians. But nothing could be further from the truth. The published (but still seriously incomplete) bibliographies of just the British railway history contained almost 20,000 items as of a decade ago [36, 168, 169], and updates today would surely bring these numbers up to 25-30,000. Railways have attracted, and continue to attract, intense interest among the public, especially in Britain. But there are several serious gaps in the coverage of this literature. This is

discussed in Appendix 2. After some general observations, that appendix concentrates on the coverage of railway development in the first half of the 19th century in the widely read and oft-quoted *Industry and Empire* of Eric Hobsbawm [102]. That discussion serves as a nice introduction to some of the key misconceptions about railways, some instrumental in leading investors astray during the Railway Mania.

The lack of deep investigations of the Railway Mania affects not just popular history books like Hobsbawm's *Industry and Empire* but also some more technical works, such as Kindleberger's *Manias, Panics, and Crashes* [111] and Perez's *Technological Revolutions and Financial Capital* [174]. Some of what they write about the Railway Mania (and the fact that they don't write about the smaller railway mania of the 1830s) calls parts of their books into question.

The intensity of the Mania led many observers to think and write about it, people who might not otherwise have paid attention. (This was especially important in the early Victorian times, when issues of "trade" were looked down upon.) Much of what people do, say, and write during a period of such intense activity and excitement as the Mania has to be treated with caution, as it often consists of rushed reactions in "the fog of war." But the same is of course true of real wars. And, just as in real wars, not everybody was deeply involved in a direct way, and there were many observers who had time to reflect on what was happening. Precisely because of the scale and intensity of the activities, they were forced or induced to reflect on railways. It was not just transportation and commerce that were impacted, the entire socio-economic order seemed to be in upheaval. George Hudson, the "Railway King," a *nouveau riche* potentate who was regarded by resentful aristocrats as just a "haberdasher of York, a vulgar brute" ([94], p. 132) had a concert at his residence in London attended by two dukes, "six earls, three marquesses, and innumerable countesses, viscounts, lords and ladies" ([10], p. 152). And although later in life they avoided writing about the Mania[37], contemporary observers did produce voluminous writings on railways and related topics at that time. (Much of it is in articles, pamphlets, books, etc. on other economic and financial issues, where railways come up because their influence was so large they impacted the main topics of discussion.) Even aside from railway ads (which, at the peak of excitement in the fall of 1845, accounted for over half the space in many newspapers), there was an upsurge in coverage on these subjects, to a level comparable to what a major war induces[38]. Since some of the brightest people wrote in the public media at the time, as can be seen, say, by the list of John Stuart Mill's contributions to a variety of newspapers and periodicals, it is not surprising that many interesting insights were obtained.

The intense activity and gushers of money that were associated with the railway enterprise drew in some of the most prominent people of that era, whether they were willing or not. Let me just mention in a little detail two, neither one of whom, as far as is known, was a railway investor. Charles Dickens was enticed at the end of 1845 to become the chief editor of the *Daily News,* a new paper that started publishing in January 1846, a paper that had multiple deep connections with railways. The attractions for Dickens were likely a munificent salary, a profit-sharing deal, and a chance to have major influence on British politics. The two main goals of the backers of this paper were support for free trade and for

railways. The largest shareholder was Joseph Paxton, later to become Sir Joseph Paxton, MP, and best known to history as the architect of the Crystal Palace. Paxton's fortune and influence, though, came largely from his success in railway speculations, and the business plan for the *Daily News* appeared to be based largely on a continuation of the flood of railway ads that was invigorating British Press at the end of 1845 (and which dried up soon afterwards). Dickens lasted only a few weeks as editor. Apparently his resignation was stimulated primarily by the interference of the major shareholders in the operations of the paper. However, the lack of the temperament needed for editorship of a daily also seems to have played a role, as did his concern that the *Daily News* was losing credibility through its overly-enthusiastic and uncritical support for railways. It is very likely that Dickens wrote some of the leaders for this paper that touched on railways, but we cannot identify them, as they were (as was the rule) published anonymously. Thus, aside from a few brief remarks in his surviving letters and his fiction, our understanding of Dickens' views on railways is poor.

Another well-known and prolific writer of this period was pulled into railway issues against his will. Thomas Babington Macaulay, MP, was already a renowned writer and scholar and a well-known, although minor, politician. He would eventually be made Lord Macaulay, and today is best known for his *History of England.* During the Mania he was one of the many MPs yoked into service on the House of Commons railway committees. His correspondence shows he embraced this duty with considerably less than total enthusiasm. In one letter he wrote:

> I am detained at Westminster every day and all day long by three railway-bills. May he-asses defile the mothers, sisters, wives and daughters of the parties, counsel, solicitors, and witnesses in all three![39]

Unfortunately neither this nor any of his other known writings tell us what he thought of the financial and other prospects of the railway industry. Yet, as part of his official duties on the committee, he had to come to some judgment on those, and defend it in committee discussions and votes.

Even the railway papers, which had very low reputation (see Appendix 3), attracted some distinguished writers. Henry Cole was mentioned earlier. He worked for the *Railway Chronicle,* which was edited by John Scott Russell, who had already gained wide recognition as an engineer and naval architect. (Russell was also the first railway editor for the *Daily News.*) Henry Mayhew, the famous social reformer and journalist and one of the founders of *Punch*, was also a cofounder of the *Iron Times,* another of the railway papers. John Herapath, who ran *Herapath* (see Appendix 3 for details, in particular about the various official names for this railway paper that I am suppressing by using the standard convention of calling it just *Herapath*) was a mathematical physicist of some distinction (although also of considerable controversy), a pioneer in the development of the kinetic theory of gases.

The above passages show that there were some very distinguished and insightful people who were contributing to the discussion of railway issues at the time of the Mania. Since almost all publications were anonymous, it is only seldom that we can associate authors with particular articles[40]. But it is not to be wondered that one can find some very interesting ideas in print at the time of the Mania, not restricted just to railway issues, but also

about the nature of capitalism and its relations to society, and about the role of investment manias.

Still, the insightful pieces are rare. When one reads the literature of that period, most of it is repetitious and frequently naive. Much of it is also very unsophisticated from an economic point of view. But then that appears to be universal in human history. A Martian who arrived on Earth in early 2009, and started reading the press in the U.S., would surely have concluded that the greatest economic problem was the $165 million in so-called "bonuses" paid to AIG employees. If it read more, it might find out about the more than $165,000 million that the U.S. government had to plow into AIG to keep the financial system afloat. But it would take extensive digging to learn about the more than $16,500,000 million ($16.5 trillion) decline in valuation of all real estate and financial assets. But it was the general collapse in asset valuations that was the root cause of all the other problems.

In considering published information at the time of the Railway Mania, it is necessary to keep in mind the wide spectrum in quality. There was the great mass of information and misinformation that was pouring out of most organs, and which was the bulk of what the public saw. And then there were a few valuable nuggets that appeared every once in while, and sometimes would get wider distribution, and sometimes not. If the markets were efficient, the rare but important insights would diffuse and be taken into account through the market pricing mechanism, whether the general public were aware of them or not. And indeed that does happen much of the time. But this failed to happen on numerous occasion during the Railway Mania (and also during the telecom bubbles). Not only that, this manuscript shows that those nuggets were not necessary for the investing public to see that prices set by the market were wrong, and that they were destined for ruin. Even the widely distributed news and commentary contained enough information to conclude that. All that was needed was a little bit of skeptical thinking.

The focus of this manuscript and of *BICS* is on the investors, and their motivations. This is explored primarily by investigating contemporary printed material. In general, it is hard to tell how different types of information influence decisions to fund ventures. But in a few cases we can tell where the information came from, and what it was. For example, in April 1845, as the Railway Mania was heating up, Charlotte Brontë wrote to a friend ([203], p. 390) about the sisters' decision to invest in railways:

> Emily has made herself mistress of the necessary degree of knowledge for conducting the matter, by dint of carefully reading every paragraph & every advertisement in the news-papers that related to rail-roads ...

It is fascinating that it was Emily, the least worldly and most reclusive of the Brontë sisters, who got interested in railway investing. And, isolated as she was by personality, location at the remote Haworth parsonage, and gender, she must have received information about railways almost exclusively from newspapers[41]. For others, there were often other influences, such as the conversation overheard in the Tontine by Augustus Dunshunner of the Glenmutchkin story, in which Jimsy and his friend exchange their opinions and influence each other through the words recorded by Aytoun, as well as the unrecorded body language, intonation, etc. But we have little knowledge of such interactions, and have to rely

on written records, both published material as well as various private communications and internal corporate and government documents. During the Mania the volume of printed material (newspapers, journals, books, pamphlets, leaflets) was very high, considerably higher than during the previous investment manias of the 1820s and 1830s. All indications are that passive investors relied heavily on such material, even if not to the degree the Brontë sisters did. That is what this manuscript draws on primarily, although occasionally some other archival material is cited as well. Press references are drawn preferentially from the *Leeds Mercury*, since this was one of the newspapers that the Brontë sisters read regularly. Appendix 3 presents a brief introduction to the nature of the press and other printed information sources at the time of the Mania.

3 British economy of the Railway Mania period

Figure 4 and Table 1 should dispose of any notions that a gold standard automatically leads to steady, smooth growth in the economy. In the 40-year period from 1830 to 1870, Britain had what was probably the closest approach known to history to both a *laissez faire* economic policy and a gold standard. The first half of that period, though, which is when the first two large railway manias in Britain took place, exhibits violent fluctuations, with depression about as frequent as prosperity. However, the gold standard should not be blamed for this behavior. It most likely played a minor role, only somewhat accentuating the natural up and down trends. Those trends were due to the nature of the economy, which depended heavily on Mother Nature. Even Britain, the most industrialized country in the world, was still heavily dependent on agriculture, and grew most of its own food. (This does not mean, of course that there was a shortage of savants who exhibited considerable ingenuity in inventing simplistic policy nostrums, usually of monetary nature, to assure prosperity. They then showed even greater ingenuity in explaining away the failures of their prescriptions. History does not repeat, but it rhymes!)

William Aytoun, in the fourth paragraph of the *Glenmutchkin Railway* wrote of the onset of the Railway Mania that "[t]wo successful harvests had given a fearful stimulus to the national energy." Other contemporary observers agreed that it was primarily the prosperity brought about by abundance of food that gave rise to the Mania. It is hard for people reared in modern industrialized countries, where obesity is a greater problem than hunger, to understand just how important food was in the early 19th century even in Britain, the most industrialized country in the world. Contemporary readers of Dickens' *Oliver Twist* could easily relate to the famous scene where the request "Please, sir, I want some more" was treated as an outrageous impudence. Famines were generally becoming less frequent, but were still regarded as common. The Irish Potato Famine, one of the great tragedies of modern European history, in which about one million out of the 8 million inhabitants of Ireland perished, took place during the Mania, with most of the deaths in 1847. To some extent the reaction in Britain and elsewhere, which seems callous to modern minds, was caused by the traditional attitude that famines are inevitable. It took some time (including development of a modern transportation network that combined railways with ships, better communication, and greater and freer international trade) to persuade the public that famines could be eliminated.

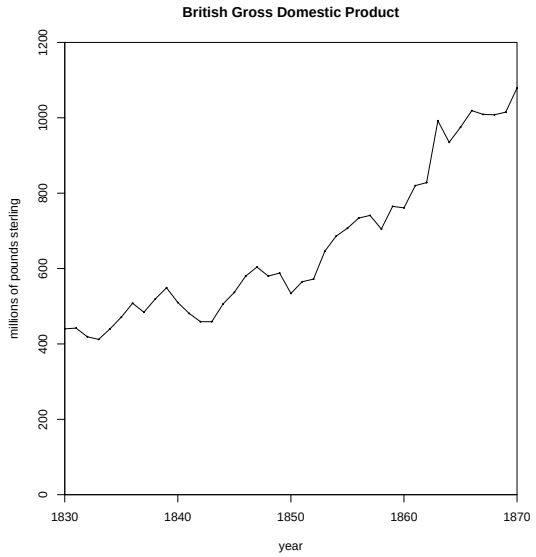

Fig. 4. Gross Domestic Product at current prices in the United Kingdom from 1830 to 1870.

While at the time of the Mania the British economy still danced largely to the tune of the harvest, the business cycle and technological innovation were growing in importance. The Industrial Revolution was picking up speed. Starting around 1850, the British economy entered a period of sustained rapid development that stretched for a quarter century, the "Great Victorian Boom" [55]. It is noticeable in Figure 4, with growth not only becoming smoother, but much faster. The contribution of railways to this change has been debated, starting already in the 1850s. This is not the place to consider this issue. But the question of how the public looked at growth is important. As will be shown in Chapter 15, investors in the Mania were led astray by incorrect perceptions of the nature of growth and of technological innovation, perceptions that the growth of the 1850s and 1860s did much to change. Those investors were influenced by the violent ups and downs visible in the first half of that graph, for the period 1830–50.

For the moment, let us note that that the economy's move from agriculture towards industry, and in modern times towards services, has many implications, and helps explain many modern phenomena, including growth in finance and high tech. As the Introduction observed, as bread has become abundant, the demand for circuses has become more pronounced. That appears to be one reason "beautiful illusions" have become more important with time. But that again is not a crucial point for this manuscript. What is important is to realize that the British economy of the 1840s was very different from the current one. Figure 4 gives just a rough indications of the fluctuations in the economy. Table 1 presents a wider range of data in more precise numerical form[42].

Several things stand out on perusal of the table. One is the substantial fluctuations not just in GDP, but also in investment and price levels. Another is the strange disconnect that sometimes appears between claimed business conditions and GDP figures. For example, in 1839, GPD grows almost 6% compared to 1838, to a record level (following a 7% jump

Table 1. British economy, 1830–1860.

GDP, taxes, total investment, and railway investment in millions of pounds sterling.

year	GDP	taxes	total investment	railway investment	wholesale prices	consumer prices	business conditions
1830	440	54	25	0.0	94.5	135	depression; revival
1831	442	51	26	0.3	95	137	recession; depression
1832	419	51	21	0.4	91.5	130	depression
1833	412	50	21	0.8	89	122	revival
1834	440	50	25	1.1	86.5	116	prosperity
1835	471	50	39	1.6	84.5	109	prosperity; stock exchange panic
1836	508	53	42	3.3	95	126	prosperity; financial panic
1837	484	50	46	6.0	94	129	recession; panic; depression
1838	519	51	53	10.7	98	139	depression
1839	549	52	56	11.0	104	144	depression
1840	510	52	55	9.7	102.5	140	depression
1841	481	52	35	6.5	98	135	depression
1842	459	51	31	5.4	89	126	depression
1843	459	57	27	4.8	80	113	depression; revival
1844	506	58	30	5.0	81	118	mild prosperity
1845	537	57	46	13.1	83	115	prosperity
1846	580	58	69	30.0	86	121	prosperity
1847	604	58	88	43.9	97	141	prosperity; panic; recession
1848	580	58	71	33.1	82	115	depression
1849	588	57	60	24.8	74	105	depression; revival
1850	534	57	47	13.1	73.5	102	prosperity
1851	565	56	46	9.9	91	100	prosperity
1852	572	57	53	9.7	92	102	prosperity
1853	646	59	59	10.2	112	115	prosperity
1854	686	62	64	12.7	120	122	recession
1855	707	70	62	11.3	119	121	mild depression
1856	734	72	56	9.0	119	121	revival; prosperity
1857	741	67	53	9.6	124	124	prosperity; panic; recession
1858	705	64	51	9.3	107	113	depression
1859	765	70	54	9.9	111	115	revival
1860	761	70	59	10.9	116	120	prosperity

the year before), yet the country is in a depression, and prices rise[43]. That comes from the nature of the British economy of the time, as well as lack of good measurements. For us, the precise numbers or characterizations do not matter much. What is important is that the economy fluctuated to a great extent, as will be discussed in in Chapter 15. What is also important is to have some sense of the magnitudes of various sectors of the economy.

What is even more important is that practically none of the numbers in Table 1 were available to contemporary observers. This table draws on extensive modern scholarship that relied on careful sifting through the scraps of historical data that the early Victorians left us, an effort on a scale that was not conceivable then[44]. The only numbers in that table that were known to contemporary British observers were those for taxes, which meant taxes collected by the national government[45]. The precise definition and trustworthy measurement of GDP, the Gross Domestic Product, was far into the future[46]. There were some observers who had estimates of the size of the British economy. What they seemed

to have in mind was not dissimilar to GDP, and some of their estimates were in the right range, around £500 million per year, e.g. [205], p. 160. But they did not have precise numbers, nor any way to compute the variations from year to year. Price indices were also unknown. The levels of savings and capital investment were understood even less, and one of the achievements of James Wilson, the founder and editor of the *Economist* was to obtain fairly decent estimates of them at the height of the Railway Mania. But even Wilson could only get long-term averages. Railway investment started being tracked during the Mania only.

Unlike the other categories in Table 1, taxes were very familiar to everybody. The quarterly reports on collections by the national government ("The Revenue") were eagerly scrutinized, in that different taxes (most either from customs or from what were essentially sales taxes) provided information about the health of different sectors of the economy.

Table 2 provides statistics for the British railways industry. As with Table 1, many of the figures in it were derived by modern scholars[47]. Comprehensive and systematic data collection by the government only started with 1843, until then there were only a few estimates made here and there by various observers.

There was one additional statistic that the public was very aware of, a prominent part of the discourse concerning railway investments. That was the national debt. It was about £800 million, roughly 160% of GDP. Today, among industrialized countries, only Japan has debt that high, although it appears that as a result of the crash of 2008 and the government actions that followed, many other countries will reach similar levels in the next few years. But, as was mentioned before, GDP may not be the right quantity to compare the national debt to. The level of taxation was far lower in Britain in the 1840s than it is today, even though it was felt to be intolerably harsh[48]. If we consider the ratio of debt to all taxes, it was about 13, which is far higher than in any country today, where even in Japan it is under 5, and in the U.S. it is under 2.[49] Over half of the national tax revenues went to debt service, so maintaining good credit standing was regarded as imperative.

The huge national debt was incurred during more than a century of incessant wars with France. It has been said that half the debt came from trying to push the Bourbons off the throne of France, the other half trying to get them back (in place of Napoleon). British ability to quickly raise huge sums through both taxes and loans was widely felt, both in Britain and outside, as a key element in its victories over France, a larger and richer country. The peak in spending (in current, somewhat depreciated money) came in 1814, the year before Waterloo, when expenditures came to £107 million, a third of that borrowed[50], in an economy that is estimated by modern scholars to have had a GDP of about £300 million. That was a gigantic, but victorious effort, and Railway Mania supporters cited it frequently in attempting to refute the arguments of the skeptics. If their nation was able to afford over £100 million per year to fight Napoleon when it was poorer[51], why could it not afford to spend a comparable amount 30 years later to build a productive transportation network?

For comparison, the total capitalization of all corporations in Britain in the early 1840s was estimated at only about £220 million, [205], p. 157. Railways already accounted for £57 million of that, with the entire canal network coming in at £18 million[52]. To add

Table 2. British railway industry statistics, 1830–1860.

Length of railways in service in miles, revenue and cumulative capital invested in railways in millions of pounds sterling, revenues per mile in pounds sterling.

year	miles of railways	invested capital	passenger revenue	goods revenue	total revenue	revenue per mile
1830	98	1.8				
1831	140	2.4				
1832	166	3.0				
1833	208	4.0				
1834	298	5.4				
1835	338	7.5				
1836	403	13.1				
1837	540	17.5				
1838	743	27.3				
1839	970	37.5				
1840	1498	48.1				
1841	1775	55.3				
1842	1939	62.4				
1843	2044	67.5	3.1	1.4	4.5	2202
1844	2148	77.5	3.4	1.6	5.0	2328
1845	2441	88.5	3.9	2.2	6.1	2499
1846	3036	126.3	4.6	2.8	7.5	2470
1847	3945	167.3	5.0	3.3	8.4	2129
1848	5345	204.4	5.6	4.2	9.8	1833
1849	6032	234.4	6.0	5.4	11.4	1890
1850	6621	245.8	6.5	6.2	12.7	1918
1851	6890	253.0	7.6	6.9	14.4	2090
1852	7336	268.7	7.3	7.7	15.0	2045
1853	7639	278.4	8.0	9.2	17.2	2252
1854	8054	286.1	9.6	9.7	19.3	2396
1855	8280	297.6	10.0	10.5	20.5	2476
1856	8707	307.6	10.6	11.4	22.0	2527
1857	9094	315.2	11.1	11.9	23.0	2529
1858	9542	325.4	10.9	11.9	22.8	2389
1859	10002	334.3	11.7	12.8	24.4	2440
1860	10433	348.1	12.2	14.2	26.4	2530

another £80–100 million per year over several years was thought by the skeptics to be madness and a deadly danger to the rest of the economy.

In comparing investments in the British economy of the 1840s to those in the U.S. today, given how different they are, we can use some round numbers, as given in Table 3.

Actual GDP for the U.S. was closer to $14 trillion, taxes (and this includes all levels of government) were about $5 trillion in 2008, but were lower in 2009, after the financial crash, etc. So these numbers should not be taken as exact, but they do provide a way to get a sense of the magnitude of the Railway Mania. Thus railway investments of £44 million in 1847 came to 7.3% of a GDP of £600 million, which is comparable to $1.1 trillion for the U.S. today. If we compare this investment to government spending, though, we find that it was about 73%, which for the U.S. would come to about $3.7 trillion.

GDP or total taxes are a good way to compare the magnitudes of major projects. The 47,000-mile U.S. Interstate Highway System cost $129 billion over 35 years, and adjusting

Table 3. Rough comparison of British economy of 1845 to U.S. economy of 2009.

	UK in 1845	U.S. in 2009	multiplier
population	30 million	300 million	10
GDP	£600 million	$15 trillion	25,000
taxes	£60 million	$5 trillion	80,000
GDP per capita	£20	$50,000	2,500

for inflation brings that cost up to around $450 billion in current dollars [159], about 3% of GDP. Building out a fiber network that would connect practically every house or business in the U.S. is thought to require perhaps $200 billion, or at most $400 billion, or 1.3 to 2.5% of GDP. And those are regarded as giant undertakings. By comparison, just one line, the 112-mile London and Birmingham Railway, one of the main trunk lines in Britain, cost about £5 million in the 1830s, or 1% of GDP, which would be $150 billion for U.S. today. Relative to taxes, the comparable cost is far higher, over $400 billion. (Even the far smaller fictional Glenmutchkin Railway, concocted over the remains of "a fourteen gallon cask of Oban whisky," had a capitalization £240,000, which is comparable to $6 billion.) Construction of the London and Birmingham was completed in 5 years, financed entirely by private investors. And that was just one of many lines being built at the time. Construction was expensive, as technology was primitive, and almost all the work was done by hand. That such projects were undertaken shows how serious a bottleneck transportation was, and how attractive the prospective profits must have been to investors.

By way of comparison, the largest (relative to the size of the economy) transportation project in U.S. history was the Panama Canal. It was completed in 1914, at a cost of $375 million, which was almost exactly 1% of the GDP for 1914, equivalent to $150 billion today. This was exclusively a project of the federal government. This was exclusively a project of the federal government.

To assess how costly various products or services were, it is more meaningful to compare prices against incomes, which here will be taken as GDP per capita. This is not a perfect measure, but appears preferable to adjusting prices by various inflation factors, as is often done. Price indices are misleading, because they do not account for the rising standard of living. Thus a year of *The Times,* or one of the other London daily newspapers, cost £6.5, which, relative to GDP per capita, compares to $16,000. That is about what banks, hedge funds, etc. pay for a Bloomberg or Reuters terminal today, and explains the limited circulation of this paper, and why copies were often rented by the hour, or studied in clubs or member-only reading rooms. (For more on the British press and other information sources, see Appendix 3. In particular, most newspapers were weekly, which lowered the cost by a factor of 6.)

Even relating prices to average incomes does not give a fair comparison, because the economies were so different. The Brontë family had an income of about £200 per year, which, by the GDP per capita standard, would be comparable to $500,000 per year. Yet they were lower middle class. (Charles Darwin and John Stuard Mill in the late 1840s were each living on about £1,000 per year, which translates by this standard to $2,500,000 per

year. They were both only in the upper middle class.) There are certainly some people who feel that $500,000 per year does not allow for an adequate standard of living (for example, the banking executives who were being threatened in early 2009 by the Obama administration's proposal to set a pay ceiling at that level, [192]). For almost everybody, though, $500,000 per year represents almost unimaginable affluence, not lower middle class. But Britain of the 1840s was different. The distributions of wealth and income were extremely unequal, with most of the population very poor, and frequently illiterate. The middle class was still small. The Brontës, in spite of being only lower middle class, had servants. It might be appropriate to think of Britain of that period as being similar to the way India is now, and especially the way India was a decade or two ago. Some very rich people, some excellent schools comparable to the best in the world, much high technology, including nuclear weapons, but most of the population in abject poverty, on the verge of starvation if the monsoon fails.

Before moving on to railway developments that led to the Mania, a few additional remarks might be helpful. So far I have mostly been talking of British railways, British economy, etc., with only a few brief occurrences of the term United Kingdom. Great Britain consists of England, Scotland, and Wales, which together had about 20 million inhabitants in the 1840s. The United Kingdom in the 19th century included those, as well as all of Ireland, with about 8 million people. Ireland was the main political issue in the UK throughout the 19th century, and understandably there is an enormous literature on the subject. As has often been said, it might be most appropriate to think of Ireland as a colony of Britain.

Railways throughout the UK were largely the creation of English capital (and largely of English engineers, with a lot of Irish labor), and most of the mileage was in Britain (and of that, most was in England). So for simplicity I will continue referring to British railways and British government. Further, in the interests of brevity, I will say very little about Ireland and Irish railways. That is a pity, since Ireland provides extremely valuable perspectives on railway development. There was an intense discussion about government aid for Irish railways at the height of the Irish Famine (which by itself provides novel insights into the importance and impact of railways). But even aside from that, throughout the late 1830s and 1840s, there were many discussions about potential Irish railways, which often brought out some of the key issues about expected demand for railway transport, and about potential effects of expanding a new infrastructure on economic development, as well as about general ways for government to stimulate economic activity. Thus omitting Ireland from a treatment of the Mania is a little like a "comprehensive" tour of Paris that omits the Louvre and Versailles. But unfortunately some compromises have to be made, and so only a few remarks will be made about Irish issues in this manuscript, and only where they are most pertinent. More material on this topic will be provided in *BICS.*

Another point that needs to be made is about rates of return. Table 1 shows that there were violent oscillations in price levels as well as in GDP. Still, over long periods, on the order of a decade or more, there was something close to price stability. This was certainly nothing like the experience of the industrialized countries in the 1970s, which had galloping inflation, often on the order of 10% per year, or even in recent years, with persistent inflation

of something like 2% per year (which in the language of modern economic policy makers is defined as stability). Interest rates on long-term British government obligations (called the "gilts" today, then often referred to as the "funds" and similar terms) were close to 3%. Investments in agricultural land were also expected to yield around 3%. Secured passive investments in businesses were expected to earn about 4% (and we find Darwin earning that much on mortgages on land properties, as well as on a loan to Liverpool Docks). (These rates were essentially the same pre-tax and after-tax, as the recently re-introduced income tax had a top rate of only about 3%.) Anything higher on secure investment was (except in periods of monetary tightness) regarded as a wonderful bonus. For somewhat riskier investments, such as in shares in corporations, 5% was thought a good normal return. The Railway Mania was driven (as will be discussed later) by expectations of 10% profits, a level that was achieved by a few lines before the Mania, and was regarded as hog heaven. Profits of 10% were regarded as normal, but only for active investors putting in their own time and intelligence into running the businesses, such as tenant farmers or shopkeepers, in which cases they represented not a simple profit on capital, but also on the work of the investors. This was in contrast with modern times. It appears from surveys that investors expect, even in depressed times, to be able to earn 10% on stock investments, and during bubbles their hopes mount towards 20% annual returns. To what extent this is realistic, and to what extent it is the result of "beautiful illusions" created by promoters and "credulous simplicity" on the part of investors, are a topic for another forum.

The final point to be made is that investments were made overwhelmingly by individuals. There were no giant mutual funds or pension funds. Insurance companies and university or church endowments concentrated on land and government obligations. Thus there were no layers of investment managers deciding where to direct individual's money. There were also no investment banks underwriting share offerings. Instead, just as in the Glenmutchkin Railway story, railway companies would solicit investors directly, through newspaper ads and other promotional literature. Even long-term loans taken by railway and other companies were primarily derived from individuals, again directly. Thus we find Darwin lending money to the Liverpool Docks at 3.5% in 1844 for 7 years, and to the Earl of Powis at 4% in 1849, for 5 years. This meant that investors were much closer to their money than in modern times. (See Appendix 4 for more details about railway company organization, management, and finance.)

4 Economic and financial history of early railways

The Glenmutchkin Railway story is a fairly accurate depiction of many projects started at the height of the Railway Mania. William Aytoun, the author, was involved as a lawyer with some Scottish lines, so well aware of the promotional activity that gave rise to them. In his story, as in most satire, he went considerably beyond what was happening around him. But he lived and worked in Scotland, and the Scots were far more sober in railway promotions than the English. So Aytoun's satire came close to describing exactly what took place on some projects further South in Britain. Aytoun did take some liberties by simplifying the promotion process. Promoters could not just concoct a prospectus and publish it the next day, there was a provisional registration process that had to be followed.

Also, promoters had to line up bankers who would collect deposits, and who would be listed in the prospectus, and so on. And they had to get lawyers, but that was often a non-problem, since the promoters were frequently lawyers. As one observer of the time described the origins of many railway projects:

> A lawyer–perhaps a brace–not over-burdened with legitimate business, and thinking to take advantage of the popular mania, procures a map of England (Spain and Sardinia are also favoured spots, and with one mark of his pencil fixes a railway from A– to B–, distance by one hundred miles, over heaps of hills, streams, streets, towns, &c., &c.[53]

BICS will discuss at length the notorious Direct London and Exeter Railway project, which fits this pattern almost exactly[54]. It was started by a single lawyer (not a brace this time) pretty much looking at a map, inspired by the desire to have "a pluck at the public pigeon."

The ubiquity of folks like Augustus Reginald Dunshunner and Bob M'Corkindale in railway and other promotions was known widely, especially at the heights of investment manias, when "the public pigeon" was easiest to pluck. In practically all public discourse they were castigated as Pied Pipers, leading innocent investors astray. But one can find a few voices, influential ones at that, who had a more nuanced view of the contributions of such agents, as can be seen in Appendix 6. It is not only that it was often hard to tell them apart from what were almost universally called *bona fide* promoters. These observers also realized that occasionally projects started by the Dunshunners and M'Corkindales led to productive outcomes. They appeared willing to consciously accept the occasional Bernie Madoff.

Whether a project was a Glenmutchkin, concocted in the space of a few hours, or the prototypical *bona fide* one, backed by numerous merchants and landowners, and based on years of study and deliberations, at some stage considerable attention had to be devoted to the economic viability of the proposal. Even the fictional Glenmutchkin Railway, 12 miles long and with capital of £240 thousand, and thus about half the average size, involved investments comparable to $6 billion for the U.S. today if we look at GDP, and perhaps $600 million if we base the comparison on GDP per capita. These were large sums of money, and not spent lightly. At the height of the Mania people might buy in without careful investigation, but the money involved was much less, and was just an option to get involved in the full project[55]. To put up the much larger sums of money involved in real construction required some persuasion, and usually investors had some time to read, consult, and deliberate. (Starting in the mid-1830s, and continuing until 1846, detailed financial projections also had to be presented to Parliament, as will be discussed later.)

For many railway projects (and canal ones before), promotion started years, sometimes decades, before construction commenced. Transportation bottlenecks were a searing pain for the economy, and the search for solutions was intense. There were many visionary, often crackpot schemes. In almost all cases in Britain, it was private capital that financed canals and railways, and private capital looked for decent prospects of profit[56]. And so, even though there is little space devoted to this topic in the literature, cost and revenue estimates absorbed much effort, whether the scheme looks, from our current perspective, with the benefit of hindsight, as reasonable or not. An interesting example is that of

the Newcastle and Carlisle Railway, which opened in 1838. Newcastle (the center of coal mining) is on the Eastern side of England, on the North Sea. Carlisle, about 60 miles away, is on the Western side, on the Irish Sea, and with Newcastle it spans the narrowest neck of land in England. Improving transportation between those two cities was a long-sought goal, as it offered a chance to capture much of the trade between East and West costs of England. A wealth of material about the various attempts is available in the Archives of the London School of Economics[57]. The earliest item there is dated 1795, and is a pamphlet by William Chapman, an engineer. It is entitled *Report on the Measures to be Attended to in the Survey of a Line of Navigation, from Newcastle upon Tyne, to the Irish Channel; With an Estimate of the Probable Annual Revenue that may be Derived from it.* The title serves to show that "the Probable Annual Revenue" was recognized publicly as a key ingredient in deciding whether to embark on the venture. (As it turns out, the canal surveyed by Chapman was not built, and instead, over four decades later, a railway was constructed. This was preceded by many more engineering surveys and many more estimates of probable demand.)

While much effort went into cost and demand estimates for canals, the results were not very impressive from the standpoint of accuracy. Estimates varied wildly, depending on whether they were made by proponents or opponents of projects. The optimistic scenarios seldom played out, and this was widely known. For example, during the debates about a proposed railway from Edinburgh to Glasgow in the early 1830s, opponents pointed out that the Union Canal (covering some of the same route) had been estimated to cost £246,322 and produce annual revenues of £52,728. Instead, by 1827–8, the actual figures were £448,956 and £15,538, respectively, so that instead of earning a 20% profit, shareholders had to be content with 2.7% ([188], p. 113).

Canals were the first large privately-owned and operated transportation infrastructure. (Turnpikes, which also absorbed considerable capital, were run as non-profit trusts. They raised their funds privately, through loans, and were run under restrictive rules imposed by the British government. There were some profit opportunities, from graft and corruption as well as patronage, but they were limited.) There was even a Canal Mania in the early 1790s, although a far, far smaller one, either in absolute numbers or as a fraction of the economy, than the Railway Mania. There were some extremely profitable canals, referred to by one historian as "[v]eritable gold mines before the arrival of railway competition" (see [12]), but they were rare. There is still no comprehensive study of canal industry finances. One widely cited study [107] in 1825 concluded that average dividends were 5.75%. This seemed a nice return, but this estimate ignored how long it took to attain that level of profitability (see [106] for some examples), as well as various abandoned projects. It also ignored the retained earnings that were plowed into these projects, which served to present an overly rosy picture of profitability [12]. Hence the words of an American observer ([3], p. 68) from 1825, that British canals "have been ruinous to their *proprietors*" were not completely inappropriate[58].

Early British railways (i.e., railways started before 1830) were also justified by estimates of costs and revenues. Again, there were wide variations, depending on who was making the estimates, and what their goals were. An amusing and also instructive example is that

of the Berwick and Kelso Railway study in 1836, which is discussed in some detail in Appendix 5. It is studded with phrases such as

> Your Committee think, they need not take up time with any farther remarks, to prove that the calculations [about demand for coal transport] have as little foundation in probability, as the other calculations of the annual revenue which precede it.

This quote comes from a report of a committee of the shareholders of this line, and is based on a very careful study that exhibits the information available to knowledgeable investors of the time. More than anything else, though, it shows the classical "differences of opinion make for horse races" conundrum. Different people looking at the same situation could come to differing conclusions. There was no proven demand forecasting method, nor a reliable cost estimation methodology.

Just as with canals, we do not have any comprehensive studies of the finances of early British railways. An excellent book on the economic and financial aspects of the industry up until the onset of the Mania is Colin Robertson's *The Origins of the Scottish Railway System, 1722–1844,* [188], which will be cited extensively in this manuscript. Although it concentrates on Scottish lines, much of what it says applies to English lines as well. Robertson wrote about the early Scottish railways ([188], p. 76):

> Much of the evidence suggests that at best they grew only slowly to prosperity, and that in many cases they never rose above marginal financial viability.

In spite of intensive research by that author, that is about all he could say, since there is simply a lack of data. But his conclusion appears correct, and it likely applied to the early English railways as well. A nice quote that illustrates both the lack of reliable profitability data for early English railways, and what appear to have been generally pitifully low profit rates, is available on p. 180 of [96]:

> The Croydon Railway enjoyed slightly better financial returns than the [Surrey Iron Railway]; dividends, probably of 2 per cent, were paid in all but two years from 1809 to 1820 and thereafter at irregular intervals.

Even the Stockton and Darlington Railway, opened in 1825, which played a key role in development of modern railroads, was paying only 5% dividends by the end of the 1820s ([112], Appendix 1). By the early 1840s it would get up to 15% for a while. That was an outstanding figure for a railway, and it was cited frequently by proponents of railway expansion as an example of what railways could do. But up through the crucial year of 1830, it was not an outstanding financial success[59].

The lack of information about profits of the early railways is symptomatic of a general scarcity of information in the early 19th century. There is some additional, although still limited, discussion of this phenomenon in Appendix 3, on the British press. A company like the Stockton and Darlington Railway would sometimes not even print up financial statements for distribution to shareholders. Instead, management would come up with the profit figure, this would be verified by the shareholder auditors (professional accountants

were not involved), and it would be proposed to the shareholders at the regular semi-annual meetings[60]. Thus it was not easy for the general public to find out even what the dividends were. (Share prices would be quoted in specialized publications, but not in general newspapers. Share sales would often be negotiated, or handled through advertised auctions. And so on. It was a very different financial world from the one we are used to, or even that of the 1840s, at the time of the Railway Mania.) Investors considering new projects would be handed prospectuses and other promotional materials. This was not new with railways, the practice went back far further, and Erasmus Darwin and Josiah Wedgewood, Charles Darwin's grandfathers, devoted much effort to writing and speaking on behalf of the canals and turnpikes they were promoting. And there would almost always be opposition, with its own pamphlets, etc., so that information and misinformation would mix freely.

5 The investment bubble of the mid-1820s

Although early railways were not outstanding financial successes, they did play a minor role in the mania of the mid-1820s. But that is not saying much, anything even remotely plausible as an investment showed up in that bubble. And that mania also had only a minor direct impact on railways. But a few remarks about that episode are necessary, since that bubble had a deep impact on early Victorian perceptions of the financial markets, and so had a substantial influence on attitudes towards later manias. During the debates before and during the Railway Mania, the 1820s event was ranked with the South Sea Bubble of a century earlier as an example of a destructive collective hallucination[61].

Many individuals lost heavily because of their personal speculations. The publishing venture that Sir Walter Scott was a partner in collapsed, and he spent the remaining half a dozen years of his life in frenzied writing, trying to pay back his and his partners' debts[62]. There was also extensive collateral damage. Harriet Martineau, a famous 19th century writer, wrote in her autobiography ([142], vol. 1, Period III, Chapter III)

> In the reviews of my "History of the Thirty Years' Peace," one chapter is noticed more emphatically than all the rest;–the chapter on the speculations, collapse, and crash of 1825 and 1826. If that chapter is written with some energy, it is no wonder; for our family fortunes were implicated in that desperate struggle, and its issue determined the whole course of life of the younger members of our family,–my own among the rest. One point on which my narrative in the History is emphatic is the hardship on the sober man of business of being involved in the destruction which overtook the speculator; and I had family and personal reasons for saying this. My father never speculated; but he was well nigh ruined during that calamitous season ...

Many victims of the crash of 2008 will surely empathize with this passage. They will also understand why it was that the question of whether financial speculation, often called "financial inovation," should be allowed to run amok, especially given the collateral damage it can cause, was a central one in many policy deliberations in the early 19th century.

In the South Sea Bubble, there was very little real investment, but huge transfers of wealth (the most prominent one, and the one that was behind the original design of the South Sea scheme, from holders of government debt to the government). In the mania of the mid-1820s, there was no government involvement, and the projected investments were huge. However, actual investments, and even actual transfers of wealth, were far more modest. Recall that in the Glenmutchkin Railway story, this imaginary line had shares of £20 each, with a £1 deposit. In the story, the full deposit, or £12,000 on the 12,000 shares, was received by the company. It never raised the remaining £228,000 because it lost its "parliamentary contest" after having "fought for three weeks a most desperate battle." Hence the concern was wound up, "and after all preliminary expenses were paid, sixpence per share was returned to the holders upon surrender of their scrip." What that meant is that out of the £12,000 collected in deposits, £300 (the sixpence were of the old English pennies, of which there were 240 in each pound sterling) went back to the investors. (This is one of the many cases where William Aytoun, the author, pushed the reality envelope. While there were certainly many cases of absolutely nothing being returned during the Mania, it seems, although I have not tried to collect any systematic sample of cases, that scripholders may more typically have gotten about half their money back.) So even though the notional amount of money involved in the Glenmutchkin Railway was £240,000, only £12,000 was ever paid up. Even in many projects that advanced further than the Glenmutchkin Railway (and most non-railway ones did not require any "parliamentary contest" or other government intervention, but did require convincing shareholders) both during the Railway Mania and during the mid-1820s bubble, only a fraction (not infrequently a very small fraction) of the deposits were paid up by shareholders. Moreover, even for going concerns, often only part of the notional capital was paid up[63]. Thus estimating the actual magnitude of the real and proposed investments is not trivial. Although there are various modern estimates, they may not be much more reliable, and are generally far less detailed, than the source I will use, namely a careful contemporary overview of the finances of the mid-1820s mania [70].

Henry English was a young stockbroker in the mid-1820s mania, one with a taste for systematic data collection[64]. In the 1830s, he moved into mining, establishing and running the *Mining Journal,* one of the earliest specialized industrial serials in Britain, and one that thrives even today. As editor and owner of that publication, he became a tireless advocate for improving mining safety and for raising the level of education about geology and mining, as well as a scourge of corrupt or incompetent mining managers. From his perch at the *Mining Journal,* he also provided some of the most interesting commentary on the railway manias of the 1830s and 1840s[65]. In 1827, after the markets and the economy settled down into a depression, he published an accounting of the recent mania [70]. A brief summary of his estimates is as follows[66]:

– total proposed corporate investments during bubble	£372.1 million
– total investment in British corporations prior to 1824–25 bubble	34.1 ”
– proposed canal and railway investments during bubble	43.1 ”
– actual investments in all bubble corporations	17.6 ”
– foreign government loans during bubble	25.3 ”

Note that during the Railway Mania, in the years 1846–48, railway investments were absorbing £30 to 44 million *per year,* while the total of all investments made in all corporations prior to the mania of the 1820s came only to £34 million[67]. The proposed schemes would have increased this 10-fold, and, relative to the size of the economy, would have involved investments of perhaps $12 trillion for the U.S. today. Even the canal and railway projects amounted to more than all previous corporate investments. There were many schemes that, judging just from their names, ranged from the plausible to the extremely improbable, such as Original Metropolitan Bread and Flour, Law Stationery Depot, Patent Fire-proof Paint, and Society for the Encouragement of Literature. There were clearly many Dunshunners and M'Corkindales, "having a pluck at the public pigeon." This was widely recognized by skeptics during the mania, and was the universal view afterwards. In the words of Henry English ([70], p. 32),

> In most instances ... it will be found that the projector was either an attorney, who by the concoction of a scheme availed himself of the advantage which it afforded by a bill of costs; or some unprincipled person actuated solely with a view to pecuniary profit, and to obtain which, the measures adopted were in such cases neither justifiable nor honourable ...

The actual investments were far more modest, although still considerable. And they were almost uniformly disasters for investors (although not necessarily for promoters). Foreign loans, mostly to newly independent Latin American countries, took £25 million in actual cash outlay by British investors, equivalent to perhaps $1 trillion for the U.S. today[68]. Almost all went into default, some right away, others after a few years.

Corporate investments came to £18 million, comparable to perhaps $700 billion for the U.S. today. (Recall that is about the size of the Obama administration's early 2009 economic stimulus program.) The most prominent part of this financing was in Latin American mines, which absorbed about £5 million, comparable to about $200 billion for the U.S. (The total real investment of the Internet bubble in the U.S. was of about this size.) These mines offered a beguiling promise. Spain used to draw famed riches from the mines of its possessions in the New World. In the first few decades of the 19th century, wars from independence from Spain, civil wars, and wars between the newly independent states led to neglect and abandonment of the mines, so that output plummeted. Promoters dangled the promise of British capital, British energy, British skills, and British steam engines restoring those mines to their old productive glory and going beyond to even greater riches. The promoters included many people like the fictional Augustus Dunshunner and Bob M'Corkindale, as well as the real-life Benjamin Disraeli.

History buffs know Disraeli as one of the major figures in British politics in the second half of the 19th century. He served twice as Prime Minister, and was instrumental in creating the Conservative Party that was a recognizable ancestor of the current one. Some of these history buffs, as well as many readers of Victorian literature, know also that Disraeli first gained prominence as a writer of novels that were often regarded as controversial, sometimes even scandalous. But few people know that Disraeli's fiction-writing career started earlier, preparing promotional material for Latin American mines. He wrote the anonymously-published pamphlets *Lawyers and Legislators* and [67], where (pp. 8–9) he

explained that the problem was lack of information, and divergence of opinions about these concerns:

> From the brilliant expectations which are entertained by many, of the success of these undertakings, we should be almost tempted to believe, that Eldorado was no longer an idle dream, were not the identical speculations from which such gorgeous effects are anticipated, denounced at the same time by others, as the base conceptions of designing men, as devised by fraud, and supported through delusion, conceived by cheats, and patronised by gamblers.

He then proceeded to argue in effect "that Eldorado was no longer an idle dream," using his budding literary talents to the fullest[69].

Investors who listened to the siren call created by Disraeli and other promoters came to rue their decisions. Many of the schemes were indeed "the base conceptions of designing men," men like Disraeli's pal John Diston Powles. A charitable summary of his career is that "[m]any of his business operations would now be considered fraudulent, but they were not illegal by the looser standards of his time" [144]. The history of the British companies set up during the mid-1820s mania to develop Latin American mines presents a record of almost unrelieved misery for outside investors. (The record of promoters like Powles was often, but not always, different.) An index of mining company shares [88] reached a peak of 3327 in January 1825, and went down (with some ups along the way) to 23 in mid-1841. (That's not a misprint, it really was a 99.3% decline.) A particularly prominent disaster was that of the Real del Monte Company, documented in [183]. Launched with great fanfare, this company attained a huge share price during the mania, and then it struggled on for a quarter century, until the shareowners gave up and dissolved the corporation at the end of 1848, just as the Railway Mania was also winding down.

However, sometimes sad stories have surprising endings. The shareholders of the original Real del Monte company got to watch, with considerable chagrin, one can guess, as the new Real del Monte company that arose on the ashes of the old one became a gold mine for its new owners! (It was a gold mine only in a figurative sense, the main output was silver.) Thus although Disraeli, with first-hand knowledge of neither mining nor Latin America, was "having a pluck at the public pigeon" in his promotional writings, he did help stimulate economic activity that paid off eventually, even if not for the original shareowners. There were several other mining ventures, besides Real del Monte, that were similarly given up by the investors of the mania of the 1820s, but which eventually paid off for others. But that did not help those original investors, nor did the full story become apparent until the 1850s or later, after the Railway Mania. For Mania investors, and especially non-investor skeptics, the Real del Monte was a frequently cited example of the folly of falling for promoters' claims "that Eldorado was no longer an idle dream."

The promise of Real del Monte took decades to be realized. Still, there were some observers, including some very influential ones, who took a more positive view of promoters than the common one that held them as Pied Pipers who led investors to their destruction. In Henry English's statistical compilation, canals and railways came in with proposed capitalization of £43 million for the new projects, roughly a third for canals and two thirds for railways. That meant that promoters were proposing to put more into canals than

had been invested in that industry in its entire history. In the end, none of those projects came to fruition. Of the railways in English's list, also practically none were constructed (or even approved by Parliament). But it was noted that many of them were resuscitated later, often in modified forms, and built to their investors' and the public's advantage. This showed that even promoters like Augustus Dunshunner and Bob M'Corkindale, interested primarily in "having a pluck at the public pigeon," had at least some incentives to select schemes that made economic sense.

The attitudes towards promoters of some of the contemporary observers were also affected by their view of markets. While they believed in free markets, for the most part they did not believe the markets were efficient (in the modern notion of appropriately reflecting all publicly available information about likely profitability). Had someone related to them any version of the Efficient Market Hypothesis, they would likely have been seized with a bout of mirthful laughter. Once they recovered, they would likely have said this was a tall tale ranking with the best of the Baron Munchhausen stories. (The term science fiction had not been coined yet.) After the investment mania of the 1820s, and especially after the next mania of the mid-1830s, they *knew* that British investors were subject to periodic attacks of madness, and that markets were then, and often also at other times, exceedingly inefficient. Whether what they *knew* corresponds better to reality than what many modern academic experts in economics and finance *know,* is another question. But that is what they believed, and during mania periods looked favorably on anything that would steer capitalists' foolish irrationality into domestic investments of even modest prospects of utility.

As for promoters of the mania of the mid-1820s, their fates varied. Some certainly did very well. But many got swept up in the mania and lost themselves. Disraeli, in particular, lost heavily, both in speculating in mining company shares, and in publishing ventures. (In general, having promoters who genuinely believe their own "beautiful illusions" is likely to maximize the chances of persuading others. This is a case where gullibility is clearly a highly desirable job qualification. Today, when we have more laws in force to protect investors than in the far more *laissez faire* atmosphere of the first half of the 19th century Britain, gullibility also works very well as a defense against lawsuits, civil and criminal alike. Stupidity works equally well, and better yet in concert with gullibility.) Disraeli's first novels were stimulated by a desperate need for money. He did not settle the last of his debts arising from the mania of the 1820s until the end of the Railway Mania, almost a quarter century later. And at least one of his foreign trips was less for education or health, and more to avoid debtor's jail. Thus one could discern another silver lining from the investment disaster of the mid-1820s, namely that it spurred Disraeli, Martineau, and Scott to greater literary productivity.

As far as the general public was concerned, though, their view of the mid-1820s mania was unremittingly negative. They felt they and the whole country had lost heavily. But within a decade they got involved in another investment mania, that of the mid-1830s. This time, railways played a major role. In the view of critics, they were just duplicating the folly of the 1820s. But the outcome was different this time, at least in the part of the mania that involved railways. The fuse for the railway part of this mania was lit by an event that took place in September 1830, the opening of the Liverpool and Manchester Railway. While

continental Europe was visited by many bloody revolutions that year, Britain experienced a peaceful one.

6 The 1830 revolution in the railway industry

Most of the railways promoted during the mania of the mid-1820s were Glenmutchkins, evanescent creations that disappeared, only to be realized years later, mostly in somewhat different forms. The two key railways in the evolution of the industry, and in inspiring the railway mania of the 1830s, were the Stockton and Darlington and the Liverpool and Manchester lines. Both had connections to the 1824–25 mania, but only slight connections. The Stockton and Darlington line was opened in September 1825, a few months before the collapse of that mania. The Liverpool and Manchester Railway was authorized by Parliament in 1826, and opened in September 1830. But the planning for the latter line had started years before its authorization, so it was not an offspring of the mania.

The significance of these two lines for railway development has long been recognized and described in detail in railway history literature. There is still an unresolved (and unresolvable) question about the relative importance of these two lines to history. But both were important, and both were recognized as important by their contemporaries. In this section I will just briefly sketch a few of the well-known historical facts, concentrating on the less known financial issues that affected investor expectations, and led to the railway manias of the 1830s and 1840s.

Both the Stockton and Darlington Railway and the Liverpool and Manchester Railway attracted considerable attention during their construction. American press, for example, followed the developments of the latter project in detail. Both lines had huge crowds attending their openings. Even the Duke of Wellington, the commander of the victorious armies at the Battle of Waterloo, and one of the most important political figures in British politics in the first half of the 19th century, participated in the opening of the Liverpool and Manchester line. Both lines were short by modern standards (about 25 miles for the Stockton and Darlington and 30 miles for the Liverpool and Manchester), but long for that era, and both involved large investments. They were also both public railways, open to all, and relied on rails that are similar to those in use today. (In this manuscript I avoid practically all issues of technological progress, even though that was certainly the key enabler of the technology manias. This topic has been covered well in existing literature, so I am just taking it for granted.)

The Stockton and Darlington Railway demonstrated the feasibility of steam locomotive propulsion. But this did not spark a railway investment mania. For one thing, the mania of the mid-1820s collapsed right around the time this line opened. While there was a revival in the economy in the late 1820s, this was followed by another recession and other oscillations. In addition, the memory of the disastrous startups of the mid-1820s mania lingered, and people were not likely to trust golden-tongued promoters like Disraeli and their "beautiful illusions." Furthermore, both financially and technically, the Stockton and Darlington was less than a roaring success at the beginning. It had several brushes with bankruptcy, and even at the time of the opening of the Liverpool and Manchester Railway in 1830, was paying only 5%. This was not noteworthy, especially considering the long time

that investors' money had spent in unproductive construction phases. And the locomotive gave problems. The existing record does not enable us to be certain just how close managers came to reverting to traditional horse power, but such a move was apparently considered very seriously, see [112]. (On some other lines, steam propulsion was in fact given up.) The key roles of George Stephenson, the engineer, and Edward Pease, the main promoter and investor, in perfecting the steam locomotive railway, have been widely recognized. Edward Pease was crucial first in deciding to build a railway instead of a canal, and then in believing Stephenson's tales about the promise of steam power and in persuading his fellow promoters to adopt locomotives as the main motive force. (Horses and inclined planes were also used on this line for a long time.) Pease's faith in Stephenson's "beautiful illusions" of the economy of locomotive transport was stronger than that of most of the other investors. Especially as cost overruns materialized, and additional capital was required, Pease ended up drawing on his family and other Quaker contacts for funds, and ended up with a controlling stake in the concern. This stake ended up extremely lucrative, but only after many years. A more detailed investigation leads to interesting speculations about what motivated Pease, as well as Stephenson. Profit was certainly a large part, but, as with much of corporate capitalism, there were other important factors at play as well. (And other motives not related to profit were also influential on the negative side in the rise of the railway industry. The first attempt to get Parliamentary approval for the Stockton and Darlington Railway in 1818 failed, largely because the planned line would have interfered with fox hunting by the Duke of Cleveland. The revised plan, submitted a year later, bypassed those fox-hunting grounds and was sanctioned.)

What really changed investor expectations for railways was the opening of the Liverpool and Manchester Railway in September 1830. This line demonstrated to investors that there was a new, initially unanticipated, and until that opening very speculative, source of demand for railway transportation, namely passenger travel. The bountiful stream of revenues that this source promised led to dramatic changes in business plans, and gave rise to the railway mania of the mid-1830s. Here is what William Aytoun, the author of the Glenmutchkin story, wrote on this topic in 1845, at the peak of the Railway Mania ([18], pp. 636–37):

> ... it is very instructive to remark, that until the opening of the Liverpool and Manchester line in September 1830, not one single railway was constructed with a view to the conveyance of passengers. The first intention of the railway was to provide for the carriage of goods at a cheaper rate than could be effected by means of the canals, and for the accommodation of the great coal-fields and mineral districts of England. In the Liverpool and Manchester prospectus–a species of document not usually remarkable for modesty or shyness of assumption–the estimate of the number of passengers between these two great towns was taken at the rate of one half of those who availed themselves of coach conveyance. Cotton bales, manufactures, cattle, coals, and iron, were relied on as the staple sources of revenue. Had it not been for the introduction of the locomotive engine, and the vast improvements it has received, by means of which we are now whirled from place to place with almost magical rapidity, there can be no doubt that the railways would, in most instances,

> have proved an utter failure. The fact is singular, but it is perfectly ascertained, that the railroads have not hitherto materially interfered with the canals in the article of transmission of goods. The cost of railway construction is incomparably greater than that attendant on the cutting of canals, and therefore the land carriage can very seldom, when speed is not required, compete with the water conveyance. But for passengers, speed is all in all. The facility and shortness of transit creates travellers at a ratio of which we probably have as yet no very accurate idea. Wherever the system has had a fair trial, the number of passengers has been quadrupled–in some cases quintupled, and even more; and every month is adding to their numbers.

This was a case of serendipity, or what I called "stumbling to success." In fact, Aytoun could have made an even stronger case for the unanticipated appearance of demand for passenger travel on railways. He apparently did not see too much of the documentation on the Liverpool and Manchester Railway. An early prospectus[70] did not mention passengers as a source of revenue at all. Yet in the first half of 1838, passengers and freight provided about half of the revenues each on that line[71]. For the entire British railway system in 1844 (see Table 2), passengers provided more than two thirds of the revenues, and a few years earlier the proportion was even higher[72].

That passengers would not only be able, but would demand, to be "whirled from place to place with almost magical rapidity" was not at all obvious in the 1820s. Early locomotives, such as those on the Stockton and Darlington Railway, were slow-moving machines. And even if they were improved, would fast travel be either safe or sought after? Many skeptics said no. The most famous, or most notorious, to be precise, argued his case in an article that appeared in the *Quarterly Review* in March 1825, at the height of the mania of the mid-1820s [28]. Afterwards, this passage was cited frequently (and continues to be cited) because of its eloquent and wrong-headed language:

> As to those persons who speculate on making rail-ways general throughout the kingdom, and superseding all the canals, all the waggons, mail and stage-coaches, post-chaises, and, in short, every other mode of conveyance by land and by water, we deem them and their visionary schemes unworthy of notice. ...
>
> It is certainly some consolation to those who are to be whirled at the rate of eighteen or twenty miles an hour, by means of a high pressure engine, to be told that they are in no danger of being seasick while on shore; that they are not to be scalded to death nor drowned by the bursting of the boiler; and that they need not mind being shot by the scattered fragments, or dashed in pieces by the flying off, or the breaking of a wheel. But with all these assurances, we should as soon expect the people of Woolwich to suffer themselves to be fired off upon one of Congreve's *ricochet* rockets, as trust themselves to the mercy of such a machine, going at such a rate; their property, perhaps, they may trust; but ...

Although this did not become known until recently, the author of this article was the 60-years old Sir John Barrow, famous for his promotion of exploration as well as his prolific writings. He was far from a hidebound conservative, and the article [28] is full of interesting insights. Even some railway enthusiasts of the Railway Mania period, who actually bothered

to read the work about two decades later, and made the obligatory comments about his "curiously-ludicrous remarks," and about his writing "emphatically on the absurdity of attempting what has since been so triumphantly effected," were led to note that it had "a large amount of sound reasoning and very sensible remarks," [8]. Those same railway enthusiasts of the Mania period wrote about railway proponents of the 1820s [7] that:

> It is, in truth, curious to look back and examine the singular mistakes into which the friends of the railway system, as well as its foes, fell, while descanting on its then position, and presuming to unfold its future prospects. Never, perhaps, were predictions hazarded with more self-complacent rashness; never, certainly, has time more fully upset the theories and arguments which *proved* that such and such an event could not by possibility, or must of necessity, take place; and we question whether any one of the many eminent men whose names and fame now rest on the success of railway, could at this moment look back for a dozen years, without some feeling of mortification, to what he would *now* be the first to admit were the crude, vague, and guess-like speculations in which he then indulged.

Still, even though Barrow was right on many things, he was wrong on the key issue, the promise of railways, and so has been the target of ridicule ever since. On the other hand, the railway advocates, however foolish, or even fraudulent (something that [7] delicately did not get into), were right about that issue. By hitching their star to the revolutionary technology, they often achieved both fame and fortune.

While the demand for fast passenger travel did provide a very welcome bonus that made railways a success, this bonus did not materialize totally unexpectedly at the opening of the Liverpool and Manchester Railway in September 1830. There had been visionaries talking about it in the mid-1820s. And thoughtful observers were aware that the development of the stage-coach industry, and the closely related expansion and improvement of the turnpike system, were driven by the demand for speed. Perhaps most important, it was observed that on the Stockton and Darlington Railway, there was a surprisingly high demand for passenger transport. That line, as was mentioned before, used slow locomotives to pull coal trains. But it also had outside carriers using their horse-drawn coaches to carry passengers on its rails, and such traffic far exceeded what had been observed on the roads prior to the opening of that line. There does not appear to be any study of just how quickly various people, and in particular the managers of the Liverpool and Manchester Railway, realized that passengers were likely to be a large source of revenue. But after the successful conclusion of the famous 1829 Rainhill trials, which demonstrated the feasibility of fast locomotives, there were insightful people who became convinced that passengers were the future of railways. A very good example is the article [44] of George Buchanan, a civil engineer, published in March 1830, half a year before the opening of the Liverpool and Manchester line. Based on his personal observations of travel on the Stockton and Darlington Railway and the results of the Rainhill trials, he was sure that, contrary to Barrow's predictions, the public were going to be willing to "trust themselves to the mercy of such a machine, going at such a rate." And so it proved to be.

It should be mentioned that the Liverpool and Manchester project was a wildly speculative one. The initial cost estimate was for £510,000, comparable to at least $15 billion

for the U.S. today, relative to GDP (and more if we adjust for the lower GDP of 1825 as opposed to 1845, and far more if we make comparisons relative to the size of the government). The eventual cost was two and a half times as high. When the project started, the promoters and their shareholders did not even know whether they were going to rely on horses, locomotives, or stationary steam engines pulling wagons by ropes (similar to the San Francisco cable car system) for propulsion. The project almost foundered, and was assisted to completion by a substantial loan from the national government as well as a large investment from an aristocrat whose self-interest clearly lay in strangling the railway company[73]. But in the end it did succeed, largely because it "stumbled to success" by serving passenger transport needs.

Overall, the Liverpool and Manchester project demonstrates a remarkable willingness to accept not just risk, but uncertainty. There was a pressing need, a searing pain felt by the merchant and industrial community, and they seized on a promising if still unproven technology as a means to alleviate it. They got the best technical advice they could, they investigated alternatives, and they modified their business plans to take advantage of the unexpected demand that materialized. And they reaped rich rewards, as the railway was both a technical and a financial success from the beginning. One can quibble about some of the decisions that were made, but one cannot say that promoters or investors were acting under any false delusions.

Table 4. Edinburgh and Glasgow Railway, revenue estimates and actual results.

All figures in thousands of pounds sterling.

	Oct. 1830 estimate	Dec. 1830 estimate	Nov. 1831 estimate	1836 estimate	1838 estimate	1844–45 actual
passenger revenue	17.6	48.0	45.0	75.5	82.6	82.3
goods revenue	43.2	35.8	55.5	16.8	41.6	35.1

The demand for passenger transport had many effects on the railway industry beyond providing much higher revenues than had been expected initially. It also led to greater predictability of demand[74]. This is illustrated nicely by the example of the Edinburgh and Glasgow Railway, shown in Table 4. This table presents successive estimates for annual passenger and freight revenues, and the actual results obtained in the year ending in June 1845, at the peak of the Railway Mania[75]. This line was sanctioned by Parliament in 1838, and opened for service in 1842. The 1838 estimate in the table was the so-called Parliamentary estimate, made in accordance with the methodology that had evolved in the preceding half a dozen years, and was accepted by Parliament. This estimate was made by those traffic takers that Edward Watkin ridiculed in his quote about "[taking] the number of sheep on the fair day" and about "development."

There are three noteworthy features of the estimates presented in Table 4. One very noticeable factor is the extreme variability in the estimates for revenue from goods transport. Initially, as was discussed in the section on early railways, there was no reliable methodology for estimating just what kinds of goods, and in what quantities, would be offered

to a new railway. Part of the difficulty was that water transport was often a competitive alternative in cases where speed was not of essence. And water transport was not a static alternative, its operators could and did respond to rail competition. The 1846 survey "Railways at home and abroad" by Dionysius Lardner, which will be cited many times later in this manuscript, had this to say about the Liverpool and Manchester Railway at its opening ([125], p. 484):

> If the traffic in passengers exceeded all anticipation, the transport of goods, on the contrary, fell short of what was expected. The canal lowered its tariff to the level of the railway charges, and increased its speed and its attention to the accommodation of customers. The canal, moreover, winding through Manchester, washed the walls of the warehouses of the merchants and manufacturers. At the other end it communicated directly with the Liverpool docks. The goods were therefore received directly from the ship, and delivered directly to the warehouse, or *vice versa*; without the cost, delay, and inconvenience of intermediate transhipment and cartage. These considerations went far to counterbalance the superior speed of the railway transit for goods; ...

On the other hand, passenger transport offered speeds double or treble those of horse-drawn alternatives, at lower cost as well, and so it monopolized this branch of transport[76].

The second important point about Table 4 is that the estimate of likely passenger traffic jumped dramatically between October and December of 1830. This increase is likely due more than anything else to the impact of the Liverpool and Manchester Railway, which opened on Sept. 15, 1830. It was known from the beginning that it attracted many passengers, but by the time the October 1830 estimate for the Edinburgh and Glasgow Railway was being made, there were probably no revenue figures available. By the time of the December 1830 estimate, some financial data had been publicized, and that presumably was factored into the estimated demand for the Scottish line.

The final point to make about Table 4 is that the 1838 estimate, the one that was presented to Parliament, using the traffic taker methodology that had become standardized by that time, was amazingly accurate in predicting passenger revenues of 1844–45, while being somewhat overoptimistic on goods traffic. This was a very common phenomenon (although usually not with the same amazing degree of accuracy on passengers), as will be discussed later. Furthermore, passenger revenue estimates were made by assuming that "development" that Watkin made fun of, the growth in volume of traffic compared to road transport. This feature, very questionable and frequently questioned in the 1830s, will also be discussed later. The prospectus of the Liverpool and Manchester line that Aytoun referenced in the long quote at the beginning of this section expected that half of the stage coach passengers would be attracted to the railway. It was a pleasant surprise to find that not only did essentially all coach passengers switch to the new technology, but that there were far more railway passengers than there had been coach ones.

Of course, the accuracy of the Edinburgh and Glasgow estimates, or those for other lines, was not apparent when they were made in the 1830s and when they involved a lot of controversy. But from the standpoint of potential investors at the height of the Railway Mania, in 1844–46, the accuracy of the predictions made a decade earlier was amazingly

good. Amazingly, those investors were not aware of that accuracy. They were under the influence of a collective hallucination about traffic estimates that led them astray. The quote above from Dionysius Lardner refers to "the traffic in passengers [that] exceeded all anticipation," while the first long quote in this section, from William Aytoun, says that "[w]herever the system has had a fair trial, the number of passengers has been quadrupled–in some cases quintupled, and even more." Both quotes, from the time of the Mania, were based on a small kernel of truth, but were terribly misleading, in ways that led to the investment disaster of the Mania. But before that disaster, the British public went through the interesting experience of the railway mania of the 1830s, which involved other types of delusions and "stumbling to success."

7 The investment mania of the mid-1830s and its outcome

George Buchanan, who was cited earlier, was a railway engineer and an enthusiastic supporter of the new technology. But even he was cautious about railway expansion. The article [44] was published shortly before the Liverpool and Manchester Railway opened, but anticipated a great success for the line. Still, looking forward to other railway projects, it was circumspect:

> Works of such magnitude and expense cannot be undertaken without serious consideration, and without due time to mature the different designs, to reconcile jarring interests, and to open the public mind to all their manifold advantages. It is only where there is a very considerable traffic, that such speculations can ever be of any advantage; hence it is evident that a long period must elapse before they can be extended from the crowded and populous districts of the country into its remoter parts. In all cases of this nature, we must wait the slow and spontaneous progress of improvement, which cannot be hurried artificially forward, to suit the views of projectors: and the results which we have already witnessed have so far outstripped all calculations and experience, that it is, in an especial manner, necessary to guard against the delusion of visionary schemes, introduced with dazzling prospects of profit and advantage, fairly drawn out upon paper, and arithmetically correct; but which, nevertheless, may be followed by an extent of ruin to individuals, and injury to the community at large, that may, for a century to come, throw discredit on all attempts at improvement, however sober and practicable. We hope, therefore, to see this mighty improvement adopted zealously, but not rashly–and in those situations, in the first place, in which it is actually called for by such pressing inconveniences as we have been referring to at Manchester, Liverpool, and London.

But investors were not in a mood for such cautious approaches. Instead, they fell for those "visionary schemes, introduced with dazzling prospects of profit and advantage" that promoters are ever ready to produce. And, amazingly enough, while considerable "ruin to individuals" did ensue, it was temporary. By the time of the Railway Mania, this experience was looked upon as an unqualified success.

This section and the next one are devoted to a brief overview of the runup to the mania of the mid-1830s and that mania itself. The earlier mania of the mid-1820s was

most intense in 1824 and 1825, and the crash in the financial markets came in December 1825. The summary of Henry English's compilation in Chapter 5 showed that of the £372 million that promoters were trying to raise for corporate startups, only about £25 million, or about 7%, was for railways. Thus the new technology was not a large factor in that episode, and very little real railway investment resulted from it. In the mania of the mid-1830s, railways were a central part. That mania was by some measures only about half as large as the one a decade earlier. It resulted from a combination of good harvests, the spur to investors' "animal spirits" given by the prospects of railway enterprise, and interaction with the U.S. economy [145]. The crash came in the spring of 1837, when the wildly speculative bubble in the U.S. burst, and took down many large establishments on the other side of the Atlantic. The most intense speculation in Britain was in 1835 and 1836. Railway mileage authorizations, which lagged the popular excitement, see Figure 1, were 201 miles in 1835, 956 in 1836, and 544 in 1837 (dropping to 49 in 1838, when the Edinburgh and Glasgow line was approved).

Let's consider where the speculative investments went in the 1830s, and what happened to them. Note that the large investments of the mid-1820s mania were primarily in loans to Latin American governments and in mining companies in that region, and all those turned out badly. During the 1830s, a very large destination for British investments was the U.S., largely through loans to individual states, to finance construction of railroads and canals. After the panic of 1837, the U.S. went into a very long depression, and many of those loans went into default. Worse yet, from the British investors' point of view, several of the states "repudiated" their debts. This meant that not only did they stop paying interest on their bonds, but they found technicalities (the wrong person signing the loan documents, ...) that they claimed excused them from having to pay anything, interest or principal. This sent the British public, wedded to the notions of "the sacred right of private property" and "the sanctity of contracts," into a frenzy of moral indignation at the depravity of their trans-Atlantic cousins. Their resentment was greatly magnified by the fact that they suffered what they regarded as an oppressive tax burden, by some estimates five times as heavy as that of the Americans[77]. The Rev. Sydney Smith, a famous British writer and wit, wrote a widely cited letter to the U.S. Congress, asking it to step in and correct the injustice perpetrated by the Pennsylvanians:

> ... If their refusal to pay ... had been the result of war, ... if it were the act of a poor state struggling against the barrenness of nature–every friend of America would have been contented to wait for better times; but the fraud is committed in the profound peace of Pennsylvania, by far the richest state of the Union, after the wise investment of the borrowed money in roads and canals, of which the repudiators are every day reaping the advantage. It is an act of bad faith which (all its circumstances considered) has no parallel, and no excuse.[78]

But Congress was in no mood to accede to Smith's request. The federal government was extremely solvent. High protective tariffs served to pay off the national debt, and in some years there was the embarrassing problem of what to do with the surplus revenues. But while the feds would not tolerate gunboats sailing up the Delaware to enforce payment from the recalcitrant inhabitants of Philadelphia, they would not pay the states' debts.

(It should be noted that the British government was not inclined to send gunboats up the Delaware, or the River Plate, for that matter. At that time British industrial policy was to leave investors on their own.) Thus American investments came to be regarded by British investors as another folly.

Aside from American loans, there were also domestic investments. About half (in nominal terms) were for various projects, most prominently corporate banks. Most of those came to grief very quickly, often from fraud. Thus so far, the experience of the mania of the 1830s was perfectly parallel to that of the mania of the previous decade, with those who did not resist those "visionary schemes, introduced with dazzling prospects of profit and advantage" suffering heavily.

But there was another part of the domestic investments scene that turned out differently. That was in railways. Their promotion was regarded by skeptics as just as questionable as any other, perhaps more so. At the beginning of the Railway Mania almost a decade later, though, they were seen in retrospective as sterling success stories.

8 The railway mania of the 1830s and its opponents

George Buchanan warned in 1830 that the public "must wait the slow and spontaneous progress of improvement, which cannot be hurried artificially forward, to suit the views of projectors." But promoters were not willing to wait, and investors were willing to put up the funds. And they did so in the face of withering, and frequently well-reasoned, skepticism. Transportation bottlenecks were a searing pain, and there was wide interest, and prospects of high profits, in alleviating that pain.

Railway promotional activity went into high gear right after the opening of the Liverpool and Manchester Railway in September 1830. Many of the proposals to be mentioned below had been under consideration for years, some even had concrete plans during the mania of the mid-1820s, but it was the tangible success of the Liverpool and Manchester, with its high passenger revenues, that energized backers. The London and Birmingham scheme, perhaps the most prominent of all the British lines, was before Parliament in the spring of 1832, just a year and a half after the opening of the Liverpool and Manchester. This line was estimated initially to cost £2.5 million, five times the first estimate of the Liverpool and Manchester, and comparable, in relation to GDP, to about $75 billion for the U.S. today. (It got its charter a year later, in 1833, and ended up costing about twice its initial estimate.) This line was 111 miles long, and this length represented one of the major leaps of faith that its backers took, namely that the experience of the 30-mile Liverpool and Manchester Railway could be extrapolated to something almost four times as long. To skeptics, this seemed patently absurd.

The London and Birmingham Railway was not the only long line that investors were willing to back. The Grand Junction (from Birmingham up to the Liverpool and Manchester Railway, thus providing, together with the London and Birmingham, a connection from London to the largest manufacturing centers in England, Birmingham and Manchester) and the London and Southampton lines, each almost 80 miles long, got sanctioned, and so did the Great Western Railway (GWR), from London to Bristol, of 116 miles.

All these long lines, as well as many shorter ones, were incorporated by the end of the 1835 Parliamentary session. But very few were in service. Construction was proceeding on some, was yet to start on others, and even by year-end 1835, there were just 338 miles of railway in service, see Table 2. If all lines authorized through the 1835 session were completed and in service, the mileage would go up to about 1,000. That additional mileage was supposed to take (if the initial cost estimates were to hold) about £13 million, comparable to $400 billion for the U.S. today. And then, in 1836 and 1837, Parliament was hit with a flood of additional requests. Just the projects that were sanctioned in those two sessions were for 1,500 additional miles, at an estimated cost of £35 million, comparable to $1 trillion for the U.S. today. And all this without any hard evidence whether those giant earlier experiments, such as the London and Birmingham Railway, were going to be successful. That line did not go into service along the full length until 1838. Even the Grand Junction Railway did not start service until the end of the 1837 Parliamentary session. In the meantime, only a few short lines were completed. Their results were scrutinized eagerly to divine what would happen to the trunk lines.

For a visual illustration of just how big a task railway promoters of the mid-1830s were undertaking, it helps to look at maps of the British railway system. Fortunately, there is a nice set of maps online, prepared by Philip Brassett, at

⟨http://www.brassett.org.uk/rail/rindex.html⟩

These maps are not ideal for our purposes, as they only show those segments of the old rail lines that are in current service. But the missing segments that have been retired were not all that extensive, so we do get a decent set of the scale of transformation of this transport system. The map labelled "Beginnings (1825–36)" depicts British railways as of 1836, basically just a collection of short local lines. The map labelled "First Main Lines (1837–43)" shows what was accomplished based on the authorizations from the mid-1830s by 1843. By 1843, there was a recognizable national network of lines, connecting practically all the major cities, with only a few very obvious gaps (such as the lack of a rail link from England to Scotland). And the map labelled "Railway Mania (1844–50)" shows what was accomplished during the rest of the 1840s. The change was certainly extensive, the tripling of mileage led to filling in of many gaps, such as that of the England to Scotland link (there were now three links there). But this change was not as dramatic as the one accomplished by the mania of the 1830s, which led to a 10-fold growth in mileage, as well as the evolution of a national network.

Given the sizes of railway investments, and the likely changes they would bring to society, it is not surprising that there was extensive debate about them. Many people were not just cautious, like Buchanan, but actively hostile to the new technology. It was mentioned earlier that the Stockton and Darlington Railway had to modify its route so as not to interfere with the fox hunting by the Duke of Cleveland. Another incident from its history provides a nice illustration of the hurdles that were placed in the way of railway projects, as well as an illustration of the difficulty in predicting or regulating new technology.

> It is worthy of remark that in order to check the use of [the Stockton and Darlington Railway] for conveying coals for shipping, and to confine it to inland

> traffic, parties interested in rival ports contrived to insert a clause limiting the charge for the haulage of all coal to Stockton for shipping, to one halfpenny per ton per mile, whereas the rate of fourpence per ton per mile was allowed for all coals transported for land sale.
>
> It was supposed by all parties that it would be impossible to carry coals at such a low rate without loss; but this rate not only turned out profitable, but formed ultimately the vital element in the success of the railway.[79]

While some fights, such as the two involving the Stockton and Darlington line mentioned above, were waged in Parliament, often behind closed doors, there was extensive debate on others. As is mentioned in the description of corporate promotion and management in Appendix 4, public opinion mattered, in order to influence Parliament, to persuade landowners, to acquire shareholders, and so on.

The spirited debate of the 1830s is reminiscent of what we are used to today. What we find then ranged from simple differences of opinion to those often elaborate and alluring tapestries of half-truths that we now call spin, and all the way to outright lies. We are familiar with "Astroturf" groups, supposedly grass-roots organizations like *The left-handed lesbian Elbonians of Podunk for broadband freedom.* They supposedly arise spontaneously at grass-roots levels to push for some public-interest moves, but in fact are set up by large entrenched political or industry groups to fight for obscure, but lucrative, changes in rules, such as pole attachment fees (don't ask, you don't want to know, but they are worth hundreds of millions of dollars per year). Those were already present in the early railway years. Information and misinformation mixed freely. And it was not just railway opponents who engaged in questionable tactics. Among railway promoters there were many interested in "having a pluck at the public pigeon," and not loath to create "beautiful illusions" out of little or nothing.

The Liverpool and Manchester Railway was a great technical and financial success. But was it really? There were doubters, the most prominent of them Richard Cort (representing canal interests), who published a series of pamphlets with titles such as *Rail-road Impositions Detected: Or, Facts and Arguments to Prove that the Manchester and Liverpool Railway Has Not Paid One per cent. Nett Profit; And that the Birmingham, Bristol, Southampton, Windsor, and Other Railways, are, and must for ever be, only Bubble Speculations.* His claim, for which he adduced voluminous computations, was that the claimed profits were an accounting invention, and the dividends were being paid out of capital.

There were many warnings not to be taken in by Glenmutchkin schemes. Some featured satire. None of the ones I have seen was a gem like Aytoun's story, or Thackeray's Jeames de la Pluche stories, published in *Punch* in 1845–46, but the intent of the authors was the same, to warn investors about promoters. The pamphlet [4] presented *The Lawyers' United Association for the Formation of a Railway to the Infernal Regions*, where "[t]he application for shares in this Company was, on the first day of its announcement, so great, among the *lawyers themselves*, that the public had no chance–only ONE unhappy wight could get a share, ..." This same pamphlet warned, in a more serious tone, that

> The projectors of these Companies are, usually, either needy men living by their wits; or swindlers, who have raised sums of money by constantly attending the gambling

> tables of London. They are well aware of the gullibility of the public, and on this they build all their schemes. They never stick at any means, *however dishonorable*, to bring about the objects they have in view, nor do they 'back out' till they have ample funds at their disposal; and *then*, they are never to be found ...

The problem was that deciding which projects were Glenmutchkins was not easy. Some schemes (as was realized by a few observers later) that started out like the Glenmutchkin Railway worked out well in the end. And many seemingly *bona fide* (a term used *ad nauseam* in that era) schemes were not exactly that. As just one example, in Table 4, the Oct. 1830 estimate for the Edinburgh and Glasgow Railway was put forth by a committee initially formed in 1825. There were credible suspicions at the time that this group, full of eminent and wealthy men, was set up as a decoy, to block other railway proposals, and protect the members' canal interests ([188], p. 100ff).

Thus investors and the public had to cope with confusing information. In this manuscript, I am concerned less with promoters' rosy stories, and more with the warnings of skeptics, since the goal is to estimate to what extent investors could have or should have been able to detect some schemes as unlikely to succeed. A concise but comprehensive list of objections to the railway mania of the 1830s was presented in *John Bull,* a London weekly newspaper. It appeared at the end of 1835, just when the excitement was reaching a peak[80]. This article started out by invoking the specter of the previous big investment bubble, of the mid-1820s: "To those who remember–and the stretch of recollection is not very great–the fatal year 1825, in which millions of property, hundreds of individuals, and thousands of characters and reputations were lost, the present rage for railroad speculations must appear beyond measure marvellous." And then it went into more detailed objections. "Those people who judge by the success of the Manchester and Liverpool railroad, and take it as a criterion for similar speculations, are dunces and blockheads," it claimed. On that line passengers provided most of the revenue, and of those, "a very great many [were on it] from curiosity," and so not likely to continue patronizing the line. Even with this temporary traffic, according to a cited authority (not Cort, there were others who were making allegations similar to Cort), this line was not profitable, and was paying dividends out of capital. But even if that authority were wrong, and profits were genuine, this line was a special case, two major cities with extensive commercial ties, a situation not duplicated elsewhere in the country. Railways elsewhere would not get enough passengers due to concerns about comfort and safety. "Does anybody mean to say, that decent people, passengers who would use their own carriages, and are accustomed to their own comforts, would consent to be hurried along through the air upon a railroad, from which, had a lazy schoolboy left a marble, or a wicked one a stone, they would be pitched off their perilous track, into the valley beneath; ...?" And even if people would "consent to be hurried along through the air," they should not, since that would be detrimental to society, by giving monopoly power over a vital part of the economy to the railways. *John Bull* cited another author on this topic, quite important to many observers (and relevant for public policy even today):

> The general authority now given under railway legislation, to the proprietors of the railway, as a body, to engage in trade as carriers, on their own railway, cannot be too soon put an end to. If it were desired to frame a system expressly calculated

> to sap and destroy the prosperity of the country, no device more effectual for the purpose than this could be suggested. No one who considers the subject but must see the ruinous effects of permitting joint-stock companies to possess themselves of the avenues or lines of communication ....

And there would be all those generally deleterious effects of railways on the country:

> We ... go farther, and denounce the *mania* as destructive of the country in a thousand particulars–the whole face of the kingdom is to be tattooed with these odious deformities; huge mounds are to intersect our beautiful valleys; the noise and stench of locomotive steam-engines are to disturb the quietude of the peasant, the farmer, and the gentleman; and the roaring of bullocks, the bleating of sheep, and the grunting of pigs, are to keep up one continued uproar through the night, along the lines of these most dangerous and disfiguring abominations.

John Bull continued in the same vein, to conclude:

> Railroads, without the slightest permanent advantage to the subscriber, or the public in general, will, in their efforts to gain ground, do incalculable mischief. If they succeed, they will give an unnatural impetus to society, destroy all the relations which exist between man and man, overthrow all mercantile regulations, overturn the metropolitan markets, drain the provinces of their resources, and create, at the peril of human life, all sorts of confusion and distress. If they fail, nothing will be left but the hideous memorials of public folly, not cured by the exposure of Poyais bonds, Greek loans, and all the mining, and canalling, and other speculations of 1825, in the shape of ruinous, rotting mounds, the objects at once of the disgust and ridicule of those who have sense to appreciate, and prudence to preserve, the order of things as it exists, in perhaps the highest state of civilization England has yet known.

John Bull, which delighted in being called the foremost enemy of railways, was an extreme case. But some of the doubts that were raised in this piece, in particular, whether there would be enough passengers to pay for the lines, were widely shared, even among railway proponents. Two of the foremost economists of that era, John Ramsay McCulloch and John Stuart Mill, were supporters of improved communication technologies, but were doubtful the projected lines would be profitable. Mill [152] claimed that "the test, the unerring test, of the usefulness of a railroad is its yielding a profit to the subscribers," and that "on the face of the matter it seems absurd to suppose that both the Great Western Railway, and the London and Southampton, can pay; though it is just possible that either of them might, if the other did not exist." (Both lines were flourishing financially by the time of the great Mania of the 1840s. It is not known whether Mill invested in any railways in the 1830s, but he was an active participant in the Railway Mania of the 1840s.) John Herapath, who was editing the *Railway Magazine,* and would later rename it *Herapath's Railway Journal,* referred throughout this manuscript as *Herapath,* was certainly a railway enthusiast. As an example, in early 1836 he wrote:

> If it is a mania, it is therefore a mania which is not confined to England, nor it is bounded by the limits of the ocean, ... To endeavour to resist it then would be

> like endeavouring to exhaust the ocean, or to stop the rising and setting of the sun. No; so thoroughly are matters changed, that it is no longer the promoters of well-planned railroads, but the opponents who are become the madmen, and who will need the particular care of their friends. That railroads will go on, and must go on, is inevitable, and to try to stop them is a mark, not of wisdom, but of superlative folly.[81]

Still, he was cautious about profits, and felt

> bound to acknowledge our conviction that several now before the public, and not a few of them which have even received the sanction of the Legislature, will end in disappointment and loss. ... one cannot but smile at the absurd doctrines permitted respecting the traffic. ... And then the complacency with which rival lines and those that are not rival take credit for each other's traffic, and for traffic they never can carry because of other and cheaper means, are vastly amusing.[82]

Both the *John Bull* piece cited above, and the first piece by Herapath warned (as almost every publication warned) about the plethora of Glenmutchkin lines about the projects dangled in front of the public, and echoed the pamphlet cited earlier [4]. According to *John Bull*,

> The commonest observation, a moment's thought, must show, that of these mad-cap undertakings, more than half, aye, perhaps two-thirds, must fail, and involve all the dupes of the prospectuses–for many have only got to that–before they know where they are.

And Herapath wrote that

> A needy adventurer takes it into his head that a line of railway from the town A to the town B is a matter of public utility, because out of it he may get private benefit. He therefore procures an Ordnance map, Brookes's or some other Gazetteer, and a Directory. On the first he sketches out a line between the two towns, prettily curving here and there between the shaded hills for the purpose of giving it an air of truth, and this he calls a survey, though neither he nor any one for him had ever been over a single foot of the country. ... The Gazetteer, Directory, and a pot of beer to a cad or coachman, supply him with all the materials for his revenue, which fortunately never fails to be less than 15, 20, or 30 per cent. per annum, and is frequently so great that his modesty will not allow him to tell the whole.

John Herapath also mentioned a concern that was being expressed with increasing frequency as the mania progressed. It was also prominent after it collapsed, as the projects proceeded, that too much was being invested at once, to the detriment of both the investors and the economy as a whole, and echoed the warning from Buchanan cited in the previous section about advisability of proceeding slowly:

> The only apprehensions in honourable minds are, that we are progressing too fast for our means; that we are grasping to accomplish in one or two years what ought in common reason be the work of some sixteen or twenty; and that the popular

> prejudice in favour of railways will furnish food for villany to feed on, to the injury and ruin, perhaps, of thousands of innocent persons[83].

Curiously enough, in the pieces cited above, neither *John Bull* nor John Herapath (who had once tried his hand at railway engineering) was too concerned about cost overruns. But others were. I will cite just three. The first is Dionysius Lardner, the same Lardner who has come up a short while earlier, and will appear many times later in this manuscript. He was a very prominent, although as time went on, also increasingly controversial, figure of the 1830s and 1840s. A famous lecturer and writer on science and technology, he was the author of a popular book on the steam engine. While not an engineer, he was regarded as an expert on railways, and testified as such before several Parliamentary committees. He was an ardent supporter of the steam engine and railways, as is shown by some extended quotes from his book in Appendix 8, A8.1. As the railway mania of the mid-1830s was raging, he prepared a new edition, the 5th, of his steam engine book [120]. Reacting to the public interest in railway investment, he added a concluding chapter to it, one that was a bit out of place in a work on technology, entitled[84] "Plain rules for railway speculators." It was meant, according to Lardner's Preface, "for the instruction and guidance of persons desirous of making investments or speculating in railway property." This entire chapter was warmly welcomed by the public that was hungry for information about choice of investments. It was widely reprinted, sometimes just as it was, sometimes in abbreviated form, as just the list of rules, without the introductory material in that chapter, and sometimes with the addition of favorable comments[85]. Lardner noted that

> the tide of opinion, which, for a time, had turned against railways, has now, by the usual reaction, set in so violently in their favour, that it becomes the duty of those who professionally devote themselves to such inquiries, to restrain and keep within moderate bounds the public ardour, rather than to stimulate it.
>
> The projects for the construction of great lines of internal communication which have been announced would require, if realized, a very large amount of capital. Considering that the estimated capital is invariably less than the amount actually required, we shall not, perhaps, overrate the extent of the projected investments if we estimate them at fifty millions. The magnitude of this amount has created alarm in the minds of some persons, lest a change of investment so extensive should produce a serious commercial shock. It should, however, be considered that, even if all the projected undertakings should be ultimately carried into execution, a long period must elapse, perhaps not less than fifteen or twenty years, before they can all be completed: the capital will be required, not suddenly, but by small instalments, at distant intervals of time. ...

We will have occasion to return to the "Plain rules for railway speculators" later, since one of those rules played an important role in luring the investors of the Railway Mania of the 1840s to their doom. At this point, let us just note that Lardner, a railway enthusiast, whose livelihood was to a large extent tied to the success of steam and railway technologies, was cautious. He felt the need "to restrain and keep within moderate bounds the public ardour," he seemed doubtful that "all the projected undertakings" would indeed "be ultimately

carried into execution" (practically all were), and he thought it would take 15–20 years to do so (almost all were completed within 7 years). But he sagaciously observed "that the estimated capital is invariably less than the amount actually required," and came up with good estimate of the final cost[86].

The second warning about cost overruns (accompanied by a warning about profitability) that I will cite appeared in the *Athenaeum,* the famous London weekly devoted primarily to reviews of arts, literature, and science. It was generally very supportive of railways. In early 1836, it devoted an unusually long original piece, not a review, to an in-depth survey of the new industry. Included in it was a full page map of England with all the railways then "in operation, in progress, and in contemplation[87]. The map showed graphically what a giant step forward in the construction of railways was already underway, and how much more was being proposed, similar to what one can see in the Brassett online maps mentioned earlier. On profitability and cost, the article was very skeptical:

> The general convenience and usefulness of iron roads as the means of communication, may be considered as pretty well ascertained. How far the cost of their formation will, in every instance, be repaid to the proprietors, is another question; and one that, we imagine, has not been sufficiently examined by the projectors of many of the schemes now brought forward. ...
>
> While we observe with pleasure all indications of national wealth and adventure, and look forward with hope to the public benefits which must result from an improved system of internal intercourse, we are nevertheless far from entertaining any sanguine views as to the immediate prosperity of many of the projects now announced. They seem to have been hastily taken up, in consequence rather of a speculative epidemic, (which this year has settled on railways,) than of counsels of sufficient judgement or experience. Their estimated cost is, we are persuaded, far below the mark; the calculations of income, we fear, will hardly be realized for years. We fully concede the efficacy of practical improvements in increasing an intercourse already established; their influence is slow in creating one that does not yet exist. Time must elapse before trade can be drawn into any new channel, even where its convenience is manifest.

Many more examples of this nature could be cited. I will close with an amusing one, which accurately predicted how Eurotunnel (Channel Tunnel, or Chunnel, connecting England and France) would become a disaster for its investors, and did it a century and a half before the event. This tunnel is an engineering triumph, but has gone through a couple of restructurings of its finances. The problem was that its costs turned out about twice as high as projected, while revenues are not much more than half the expectations [49, 92, 134]. Hence the promised 18% dividends are remembered as just a bad dream by the original shareholders. A letter in the *Mechanics' Magazine* in 1836, published under the initial "H.," predicted just that[88]. More precisely, "H." discussed a proposed suspension bridge across the English Channel. At that time, both a bridge and a rival tunnel were under discussion, so "H." surely meant his principles to apply to a tunnel as well. This writer did not mention cost overruns explicitly, but cited high costs per mile of railway, so high that the editor of the magazine (which, as one might expect, was strongly pro-railway) felt

compelled to add a footnote saying that on "many" lines the cost was far lower, one third or even less of "H."'s estimate. (It was "H."'s estimate that turned out correct, extremely accurate on average.) But in the context of both railway projects and the bridge across the English Channel, "H." wrote that

> I believe it seldom happens that a railway projector does not calculate upon securing every particle of traffic on his line, to the exclusion of every other mode of transit. The possibility of competition ... never enters into the composition of railway prospectuses; the fortunate shareholders of the concern whose glorious prospects are being held out to view, are always to *engross* the whole trade, not only of their own line, but of all the neighbouring country ...

And indeed, that was one of the major miscalculations in the planning of Eurotunnel. It was assumed that competition would fade out. Instead, ferries and airlines responded with technological and business innovations, and managed to hang on to much of the traffic. Thus "H." was prophetically brilliant when it comes to Eurotunnel. But he turned out to be wrong with regard to railways, or at least half-wrong. He was right about cost overruns. But to a substantial extent (to be discussed later) railways did manage not just "to *engross* the whole trade," but to stimulate more trade, that "development" that Watkin made fun of, and came to be regarded as successful speculations. But it took many years to achieve that state.

The problem with the prophecy of "H." and other predictions is that they were basically just opinions. And there is always a range of opinions, and some turn out to be right, and some turn out to be wrong. Moreover, some opinions may seem wrong at one time, but right at another. Many of the objections or concerns that were cited about railways in this chapter were very reasonable. For example, the objection that *John Bull* expressed to railway being carriers reflected general concerns about the discriminatory practices of monopoly carriers, and eventually led to strict regulation of railways, both in Britain and the U.S. The claims that steam carriages were preferable to railways, which were behind some of the passages in *John Bull*, were also well-founded. Eventually, the descendants of the steam carriages, the cars, buses, and trucks powered by the internal combustion engine, did replace much of the railway industry, since they were far more flexible[89]. Finally, there were numerous examples of promising technologies that showed great promise during that early Victorian period, but did not go far. Steam carriages and atmospheric railways have already been mentioned. In addition, there were two other developments that will be come up naturally in Chapter 30. Steam travel across the Atlantic was offered as a regular service starting in 1838. But most of the shipping firms that got into this business had to leave in defeat. The only success for a long time was Cunard, and it was a success only because it had the monopoly mail carriage contract, in effect the government using its power to keep transatlantic mail rates high and transfer the profits to Cunard to provide regular service. Finally, the Thames Tunnel, which opened in 1843 to great acclaim, was a great tourist attraction. But contrary to promoters' predictions, it never attracted enough traffic to pay, and the number of pedestrians was actually declining during the Mania. Thus even the prediction in *John Bull* (which had been made earlier by other skeptics) that the

Liverpool and Manchester Railway would lose revenues as tourists stopped coming was not as outrageous as it might seem.

Thus the general conclusion is that the railway skeptics of the 1830s had good reasons for their skepticism. It's just that they turned out to be wrong. "If people don't want to come out to the ballpark, how are you going to stop them?" And people just did not care come out to many of the ballparks that were built then (and since). In forecasting demand, though, investors of the mid-1830s also had access to a relatively well-defined demand estimation system, for estimating how many people would come out to the (railway) ballpark. It was the system that was used by the traffic takers.

The traffic taker methodology was developed early in the 1830s, and was applied to almost all the projects that went to Parliament during that decade. Just what the methodology was, how it was developed, and what its results were is considered in detail in [165], and sketchily later in this manuscript. This methodology was based on just a few scraps of solid data, and was fortified with some more as the decade progressed. But there was no large scale validation of this procedure until the end of this period, when the lines started in the 1830s went into service. To a Martian who suddenly appeared on the scene, it would probably have appeared no better than the opinions of "H." Furthermore, as is shown in [165] and later in this manuscript, this methodology was based on several wrong assumptions, which, however, cancelled each other out to produce good results. Thus the investments made during the 1830s, gigantic as they were, were a gigantic gamble, based on hope more than experience.

9 Railways after the crash of 1837

Although 1837 brought authorizations for an additional 544 miles of railways, bringing the total through that point up to about 2,200, those schemes were hatched during the exuberance of the previous year. The year 1837 brought in a financial panic, leading to a deep depression that did not lift until late in 1843. In 1838, just 49 miles of new railways were authorized.

The 1837–43 depression was associated with an unusually long series of bad harvests. But the business cycle played a bigger role than in many previous economic fluctuations. The financial exuberance of 1835–36 was fed by general prosperity (which owed much to several plentiful harvests), which was boosted by the booming exports to the U.S., which were fed by the rapid growth and speculation there, which was assisted by loans from British capitalists, which boosted British exports and thus its industry, ..., in the usual process in which multiple positive feedback cycles reinforce each other. In 1837 these feedback cycles went into reverse, and that led to the defaults and repudiations of American states and the collapse of many British domestic corporate banks and other projects that had been set up during the boom. Many of those schemes were revealed to have been not just Glenmutchkins, set up to "[have] a pluck at the public pigeon," but to have engaged in outright fraud and thievery. It is worth noting that Aytoun's Augustus Dunshunner and Bob M'Corkindale did not commit any illegal acts by the standards of that *laissez faire* era. They actually showed remarkable restraint, as Dunshunner related:

> Under these circumstances, a two-handed banquet was proposed and unanimously carried, the commencement of which I distinctly remember, but am rather dubious as to the end. So many stories have lately been circulated to the prejudice of railway directors, that I think it my duty to state that this entertainment was scrupulously defrayed by ourselves and *not* carried to account, either of the preliminary survey, or the expenses of the provisional committee.

Many, perhaps most, promoters of that time did not hesitate to have similar banquets "carried to account, either of the preliminary survey, or the expenses of the provisional committee." And many went way further.

While most of the non-railway schemes did collapse, in a reprise of the mid-1820s collapse, the railway projects went on, and by the end of the depression, about 2,000 of the 2,200 miles of railway that had been authorized were in service. The work that Lardner thought might take 15 to 20 years was accomplished in about 7. But getting there was a struggle. Labor and supplies were easy to obtain in the depressed conditions, but financing was not.

The skeptics did not all go away, and often used the information that was accumulating about railways to strengthen their case. Consider Henry Parnell, MP, soon to become Sir Henry. A prominent politician, "he achieved a high reputation as a political economist and as a writer on finance" [144]. Furthermore, while he was not trained as an engineer, he was knowledgeable enough about it, and active enough in promoting and overseeing road construction to be elected an honorary member of the Institution of Civil Engineers, and to write a technical book about roads [171]. In the 1838 edition of this treatise, he concluded, in a magisterial tone (p. 101):

> The eagerness which was so generally displayed by vast numbers of persons to give credit to the representations of the great profits to be realized by railway shares, gave so much encouragement to all those adventurers, who looked to derive immediate advantage from railway projects, that acts of parliament have been passed for railways in every part of the kingdom. The experience, however, which has been gained from those already completed, and from the enormous expense incurred on those which are in progress, has led to a general opinion that there is little probability of more than a few of these works affording any ultimate return for the money expended upon them.

Parnell had been cautious about railways from the start[90]. But his opinion was not uncommon, and may have become much more common over the next few years.

With opinions such as Parnell's floating around, it is not surprising that railway investors would be having second thoughts, something that was natural in any case after the collapse of the mania. This was exacerbated by two important factors. One is that many of those investors did not have the money that was expected of them to invest. The other one is that cost overruns reared their ugly head early on, and just kept getting larger and more prominent as construction proceeded.

The experience of railway investors during the 1837–43 depression was extremely important in shaping the opinions as well as actions of both railway expansion skeptics and

advocates during the Railway Mania. The thinking of both sides was channeled into ruts shaped by the experience of the previous decade. But those ruts were different, the result of viewing the same experience in different ways. So to understand the debates and expectations during the Mania, we need to look what happened a decade earlier.

To avoid extraneous details that are arise in all real histories, I will illustrate the basic financial history of most of the railways started in the 1830s using the fictional Glenmutchkin Railway. What follows next is a fictional alternate "history" of that project. Suppose that this story had been set in the mid-1830s instead of the mid-1840s, and that the promoters emerged victorious from "the parliamentary contest" after having "fought for three weeks a most desperate battle." The Glenmutchkin Railway then became properly incorporated, and within a few months held its first formal shareholder meeting. In principle, this was a natural time to just abort the whole enterprise, if enough shareholders had second thoughts about the advisability of the project[91], but in our "history" enough of the Glenmutchkin Railway shareholders had been convinced of the bright prospect of the enterprise to go forward. Then, at this first meeting, regular management was elected. Management at the time meant the Board of Directors, and was usually drawn primarily from members of the Provisional Committee. (See Appendix 4 for more background on corporate promotion, organization, and operation during that era.) The directors then proceeded to negotiate for land purchases, construction contracts, etc. And they started issuing "calls," requests for more money from shareholders. Recall that this line had 12,000 shares of £20 each, and that the deposit was £1 per share. That was all that the shareholders (or scripholders, to be precise) had paid up to the time of incorporation was that initial deposit[92]. But now they were being called to come up with the remaining £19 per share, typically in amounts of a few pounds every few months. This lessened the pain, but stretched it out considerably, and allowed for buildup of anxiety. What happened then explains some features of the Aytoun story that would have been obvious to his contemporary readers, but do require a few words of explanation for modern ones.

Legitimate railway projects looked for what were in those days called *bona fide* investors, ones who would hang onto their shares for years, and pay the calls. People without wealth, hunting premiums by applying for shares beyond their means, were called "stags," and were guarded against. In Aytoun's story, we see the two protagonists playing on both sides of the fence. Initially they were "stags," and unfortunate ones to boot, as they "never, in a single instance, succeeded in procuring an allocation of original shares." This they found oppressive. As Bob O'Corkindale complained,

> I thought we were living in an enlightened age; but I find I was mistaken. That brutal spirit of monopoly is still abroad and uncurbed. The principles of free trade are utterly forgotten, or misunderstood. Else how comes it that David Spreul received but yesterday an allocation of two hundred shares in the Westermidden Junction; whilst your application and mine, for a thousand each, were overlooked? Is this a state of things to be tolerated? Why should he, with his fifty thousand pounds, receive a slapping premium, while our three hundred of available capital remains unrepresented? The fact is monstrous, and demands the immediate and serious interference of the legislature.

From the standpoint of the Westermidden Junction allocation committee, or any serious and disinterested observer of the time, there was no mystery, and "this ... state of things" was not only to be tolerated, but encouraged. David Spreul "with his fifty thousand pounds" could usually be counted on to pay his calls, and if he failed to do so, could be sued to compel payment. With possessions worth £50,000, coming up with £4,000 for his 200 shares should not have been a hardship. On the other hand, the Glenmutchkin boys, with a combined capital of £300, had no "deep pockets" to dip into. But such niceties were not something that Dunshunner and O'Corkindale worried about while they were trying to quench their "thirst for national improvement, internal communication, and premiums." Had they gotten their requested allocation "for a thousand [shares] each," they would have borrowed money to pay the £2,000 deposit, and turned around and sold the shares for £6,000, if the "premium" of "Twa pund a share, and maybe mair," predicted by a customer of the Tontine for the Glenmutchkin Railway materialized for the Westermidden Junction[93]. On the other hand, if the premiums did not materialize, they would disappear. (In a later story Aytoun has the two protagonists "[embark] for a short run upon the Continent," to hide away from creditors after subsequent speculations miscarried.) But that of course was far from the minds of Dunshunner and O'Corkindale while they were stags.

Once Dunshunner and O'Corkindale shed their stags' antlers and became railway promoters, their incentives changed. When M'Corkindale came back to tell his confederate about the huge demand for shares that a broker reported, Dunshunner asked whether they were "good names." M'Corkindale responded: "The first names in the city, I assure you, and most of them holders for investment. I wouldn't take ten millions for their capital." This meant that, like David Spreul, they had enough money to pay their calls. With total capital of over £10 million, they could afford to put up the £240,000 needed for the Glenmutchkin Railway. Further, being "holders for investment," they would not turn around and sell their scrip for the premium. As promoters, Dunshunner and O'Corkindale needed such *bona fide* investors, even before the money was needed for construction, both to keep them involved and supportive during the promotion process, and also to persuade Parliament the line was going to be built if approved. And if the line got approved, as we are assuming in our alternate continuation of Aytoun's story, such investors were needed to actually pay up.

Let us return to our "history" of the Glenmutchkin Railway, as construction proceeded, and the calls went out. Many of the shareholders turned out either not to be quite "[t]he first names in the city" in the first place, or to have fallen on hard times in between, as many businesses collapsed after the panic of 1837, or else simply had gotten cold feet. And so not everybody responded. After calls for £13 per share (including the initial £1 deposit), only £120,000 had been collected, not the £156,000 that should have arrived. At this stage, the management borrowed £80,000, the maximum it could under its charter[94]. That allowed construction to go on for a while. But when those funds were exhausted, management went back to issuing more calls. By the time those amounted to £18 per share, only £180,000 had been collected, instead of the £216,000 that should have arrived. And the shares, with the £18 per share paid up figure displayed in newspaper share tables,

were trading at £9 each. Thus the market was telling shareholders they had thrown away half the money they had invested. And then the final call, for £2 per share, was issued. Shareholders who fulfilled their obligation and sent in their £2 per share saw the market price go up, but only to £10 per share. In other words, the market told them that after throwing away half of their previous investments, they had just thrown away half of the latest installment, money they had to scrounge around for, often with great difficulty. In the end, the market turned out to be wrong, but it kept being wrong year after year, testing the patience of those shareholders who had faithfully paid up, and increasing the conviction of the skeptics.

As the calls proceeded, shareowners' concerns kept mounting. Their management was doing its best to maintain "beautiful illusions," assuring all and sundry that the prospects for the future were bright, that construction was proceeding on schedule and on budget, sometimes providing additional reassurance that the anticipated demand would materialize. But investors were hearing rumors about their line suffering cost overruns and delays. Such rumors gained credibility from solid stories about many other railways suffering the same problems. And then, as the authorized capitalization limit was approaching, management went to the shareholders for approval for plans to seek higher authorizations from Parliament, revealing for the first time that there were huge cost overruns. (They naturally presented plausible excuses for those.) While not totally unexpected, this step was very discouraging to investors, and fed their growing concerns about the competence and honesty of management. In the colorful language of an investor in the Mania a decade later [9]:

> At the Seventh Half-yearly Meeting [i.e., three years since the line was officially incorporated], ..., the cloven hoof displays itself; instead of the original Capital of [£2.1 million] being sufficient, you are now for *the first time* told that a gross total of [£3.363 million] will be wanted, or an excess of more than 50 per cent. *beyond* the original estimates and calculations, ...

But the shareholders were hooked, with huge sums already spent, and destined to be totally wasted if they gave up at that point. Reactions varied, but on balance they decided they had no choice, and proceeded with the quest for Parliamentary authorization and additional spending. There was an element of cold financial calculation, since there might still be decent, if not spectacular profits, if the demand projections held up, and cost overruns did not spiral out of control much beyond what had already been revealed. And there was that additional psychological element that has been explicated in recent decades by behavioral economists, but which has been a key tactic of marketers and politicians for thousands of years: once people get committed to a course of action, they tend to take an overly optimistic view of its prospects, and stubbornly hold on. Whatever the mixture of motives for any individual, the Glenmutchkin Railway investors, just like investors in most of the lines started in the 1830s, persevered. Parliamentary approval was obtained, the additional funds raised[95], and the line was completed. It went into service, and by 1845, when the Railway Mania excitement was at its peak, was paying decent dividends, and its £20 shares, which had been at £10, were trading at £40. Those shareholders who paid all their calls, thus £20 per share, and then, in despair, sold out at £10 per share, were kicking themselves. Many had faith in the project, but had not been able to raise new funds to

pay their calls when their shares had £10 per share paid, so sold some of their shares (at £5 each) to fulfill their obligations on the remaining shares. Those sometimes had slight gains, sometimes slight losses. On the other hand, those who had not participated in the initial funding but bought in at the bottom price of £10 per share had a four-fold gain in the space of four years (in addition to some dividends along the way). This might not sound like much today, not when we have authenticated stories of each of the first four investors in Google seeing his $250,000 stake in that enterprise turn into shares worth over $1 billion. But in the 1840s, with small equity markets and relatively stable prices (aside from catastrophic declines when firms went bust), a totally legitimate four-fold gain in four years was spectacular. (At the height of the Mania, even more spectacular gains were recorded, and far more spectacular ones were rumored.)

This brings us to the end of our fictional "history of Glenmutchkin Railway." In a brief sketch, it displayed the key features that characterized most of the real railways built as a result of the railway mania of the 1830s. The next section will describe how the initially modest profits of these lines led to the Railway Mania. But first, it is worth discussing three issues:

- how the experience of 1835–43 affected attitudes towards the new Mania railways
- how people looked at railway promoters and managers
- what people thought of the financial history of railways.

Both opponents and defenders of the Railway Mania drew on the history of railways after the mania of the mid-1830s, but they drew diametrically opposed conclusions. The opponents, faced with the prospect of another burst of construction activity, much bigger than the one a decade earlier, warned that the same disastrous events were going to take place, but on a vastly larger scale: the original investors would take on bigger commitments than they could fulfill, and when calls started coming in, would be forced to sell their shares at a discount, putting further pressure on prices. To the defenders of the Railway Mania, this scenario seemed laughable. The depression in share prices after the previous mania was due to lack of faith in the new technology. The railways built then ended up being profitable, and the new ones would as well. So there would be no need for shareholders to lose heart and sell out. They would beg, borrow, or steal the money needed for the calls. And if they could not do that, they would sell to somebody else who would find the money[96]. The basic assumption on both sides, though, was that the vast majority of sound schemes (putting aside the Glenmutchkins, which all and sundry agreed were plentiful) would pay in the end, the dispute was just about the period of construction.

The quote about the "cloven foot" reflects widespread suspicion of promoters, managers, and engineers. Francis Whishaw, in a survey of British railways, wrote in 1840:

> We have heard it frequently remarked, that if real estimates had been sent forth to capitalists, not a tithe of the present extent of railway-communication would have been effected. But we would rather attribute the cause to actual want of experience; which was certainly the case as regards the first estimate for the work under construction. The dictum, however, of a provisional committee has, in more than one instance, been imperative; and the disfigured estimate has been sent forth as a decoy–bird to allure the unwary.[97]

Whishaw, a railway engineer, not unnaturally tried to absolve engineers of responsibility for unrealistic estimates, but did acknowledge that promoters were frequently consciously doctoring cost projections to create "beautiful illusions." Others were even more emphatic about the snake-oil salesmanship, and ready to spread the blame more widely. For example, a review of the Whishaw book [5] said:

> And no doubt there is truth in what Mr. Whishaw relates when he says, "We have heard it frequently remarked that if real estimates had been sent forth to capitalists, not a tithe of the present extent of railway communication would have been effected." We must therefore congratulate the country on the result, however much the mystification practised by projectors, contractors, and committees is to be blamed.

Not atypically, this review, clearly by a strong supporter of railways, took a rather positive view of all that "mystification" that went into inspiring investors. It also said:

> In 1837, ... the speculations regarding these gigantic works appeared to sober-minded and calculating people to have exceeded all practicable bounds, ... We remember to have heard times without number at that period the predictions of sages about the folly of such vast undertakings, the terrible bankruptcies which they would occasion, and all the usual adages about bubble companies. But what are the facts now as described and testified by Mr. Whishaw, after many of the great lines have been completed, are verging towards completion, or have only actually been begun? Why, that more has been achieved than was contemplated by speculators four years ago; neither the enormous sums of money required, nor the immense difficulties physical and legal that were interposing, staying the works or cooling the ardour of capitalists.

Even Parnell, in the book cited before, admitted the benefit of allowing folks like Augustus Dunshunner, Bob M'Corkindale, and Benjamin Disraeli to create those "beautiful illusions" that roused the "animal spirits" of capitalists. In criticizing (incorrectly, from our retrospective point of view) the emphasis on speed in railway transport, he wrote ([171], pp. 103–104):

> The use of steam power and the practice of keeping up an excessive rate of speed has necessarily led to high charges for carrying passengers and goods. A slower rate of speed would, by diminishing expense, admit of the charges being moderate, and in this way the national interests would be best promoted. The object in making railways ought, from the beginning, to have been the reduction of the cost of moving passengers and goods to the lowest possible limit, and not excessive speed. This would have made the money applied to railways go much farther in extending them over the face of the country; the risks of accidents would have been almost wholly avoided; while the charges for travelling and transporting goods would have been considerably less. It is, however, right to admit, that if the raging passion for excessive speed had not been gratified, subscribers, probably, would not have been found for forming railway companies, and what was really useful and necessary in substituting railways for common roads would never have been accomplished.

Similar sentiments can be found in Britain, if diligently searched for, throughout the early 19th century, including among policy makers. If one believes (as many thoughtful observers at that time believed) that *Homo sapiens* is only a distant cousin to *Homo economicus,* and will do foolish things in periods of inevitable financial excitement, then the activities of folks like Augustus Dunshunner, Bob M'Corkindale, and Benjamin Disraeli might appear not just tolerable, but worthy of encouragement. Those creators of "beautiful illusions" might be interested primarily in "having a pluck at the public pigeon," and might not know much about the business or the technology involved. Hence they might end up wasting or misappropriating much of their shareholders' funds. But if those investors are going to waste their funds anyway, then anything that directs them into activities that have some prospect of public utility might be praiseworthy. Whether such views, at gross variance with those of modern policy makers (or at least with the public statements of modern policy makers) were delusions, or whether they represented a more realistic and more honest views of the financial markets and human nature, or whether the nature of the investing public has changed in the last century and a half, is a topic for another discussion. (A very nice exposition of a very insightful contemporary view on railways and speculation is offered by an article published in the *Atlas* in early 1844, presented in Appendix 6.)

The third and final point, what investors at the time of the Railway Mania thought about the financial and economic history of the lines in service, will be considered later, in Chapter 17, when I discuss the various delusions that led to that disaster. Basically, though, the dominant perception about what had happened earlier was wrong in very obvious ways. This resulted from interaction of mass psychology and a conscious public relations campaign by the industry to divert attention from the financial reality towards other views that offered somewhat nicer "beautiful illusions" for investors.

10 A prelude to the Railway Mania: From stasis to ten-fold expansion

Railways incorporated during the mania of the mid-1830s were built during a very deep and prolonged depression that did not lift until late in 1843. What caused it to lift? Contemporary observers did not have to think twice about the answer. William Aytoun in the Glenmutchkin story wrote that "[t]wo successful harvests had given a fearful stimulus to the national energy." After an unusually long string of very poor growing seasons, the harvests of 1843 and 1844 were plentiful, and the events described in Aytoun's satire took place mostly in the fall of 1844, after that year's harvest was brought in.

A few years later, another explanation was offered, in which railways played a central role in ending that depression. Disraeli's novel *Endymion* has the most eloquent, and most often quoted, version of this theory[98]. After describing the "overwhelming" "depression of trade in the manufacturing districts," the riots, the political agitation, and the "depressing effect on the spirit of the country" caused by "[t]he humiliating disasters of Afghanistan," Disraeli explained the recovery from dejected hopelessness in these terms:

> And yet all this time, there were certain influences at work in the great body of the nation, neither foreseen, nor for some time recognised, by statesmen and those

great capitalists on whose opinion statesmen much depend, which were stirring, as it were, like the unconscious power of the forces of nature, and which were destined to baffle all the calculations of persons in authority and the leading spirits of all parties, strengthen a perplexed administration, confound a sanguine opposition, render all the rhetoric, statistics, and subscriptions of the Anti-Corn Law League fruitless, and absolutely make the Chartists forget the Charter.

"My friends will not assist themselves by resisting the government measures," said Mr. Neuchatel, with his usual calm smile, half sceptical, half sympathetic. "The measures will do no good, but they will do no harm. There are no measures that will do any good at this moment. We do not want measures; what we want is a new channel."

That is exactly what was wanted. There was abundant capital in the country and a mass of unemployed labour. But the markets on which they had of late depended, the American especially, were overworked and overstocked, and in some instances were not only overstocked, but disturbed by war, as the Chinese, for example–and capital and labour wanted "a new channel."

The new channel came, and all the persons of authority, alike political and commercial, seemed quite surprised that it had arrived; but when a thing or a man is wanted, they generally appear. One or two lines of railway, which had been long sleepily in formation, about this time were finished, and one or two lines of railway, which had been finished for some time and were unnoticed, announced dividends, and not contemptible ones. Suddenly there was a general feeling in the country, that its capital should be invested in railways; that the whole surface of the land should be transformed, and covered, as by a network, with these mighty means of communication. When the passions of the English, naturally an enthusiastic people, are excited on a subject of finance, their will, their determination, and resource, are irresistible. This was signally proved in the present instance, for they never ceased subscribing their capital until the sum entrusted to this new form of investment reached an amount almost equal to the national debt; and this too in a very few years. The immediate effect on the condition of the country was absolutely prodigious. The value of land rose, all the blast furnaces were relit, a stimulant was given to every branch of the home trade, the amount suddenly paid in wages exceeded that ever known in this country, and wages too at a high rate. Large portions of the labouring classes not only enjoyed comfort, but commanded luxury. All this of course soon acted on the revenue [tax receipts], and both customs and especially excise soon furnished an ample surplus.

Endymion was published in 1880, after Disraeli had retired from politics, and just before his death. The claim that railways had miraculously lifted Britain out of depression dates back to 1847, though. That's when Disraeli, along with his friend and patron, Lord George Bentinck, and their political allies, were searching desperately for some way to justify restoring protective tariffs on agriculture in the face of the tragic and widespread starvation in Ireland and general food scarcity throughout the UK. The scheme they came up with involved a large government loan for the construction of railways in Ireland. To

justify it, they spun tales of the miraculous power of railways in quickening economic life. (Compared to the modern scene, there was an interesting reversal of roles in the first half of the 19th century. At that time, it was the conservatives who were in favor of high taxes, inflation, and government management and stimulus of the economy. The reformers, who were then often called Liberals, but today would be classed as extreme libertarians, were in favor of low taxes, the gold standard, and in general a *laissez faire* policy.) Unfortunately it would take too long to describe the discussions that ensued, so I'll leave this topic aside for the moment. But the intense debate involved questions about the economics of railways, questions that came close to revealing the fundamental fallacy of the Railway Mania. Unfortunately the connection was not made, and a golden (and last) opportunity to avert the financial debacle of the Mania was lost.

Although Disraeli's praise for railways in the economic recovery was inspired (like much else in his life) by politics, it should not be dismissed out of hand. Railway investors' pseudo-Keynesian stimulus to the economy during the depression was not negligible. In the darkest years, 1841–43, it was providing (see Fig. 2 and Table 3) slightly over 1% of GDP each year in direct spending (and, since land acquisition had been accomplished earlier, this was real spending on construction, not money transfers from railway shareholders to landowners). This direct spending had the usual multiplier effect as well. But just the direct spending was comparable, as a fraction of the entire economy, to about $150 billion per year for the U.S. today. If we compare it the size of the government sector, though, it was much larger, on the order of $500 billion for the U.S. today. Hence railway shareholders, by persisting with their investments in spite of the depressed conditions of the country, and the drumbeat of skepticism put out by skeptics, almost surely did contribute materially to keeping the depression from becoming much deeper, and to the recovery that followed. Good harvests were surely the key element in providing that "fearful stimulus to the national energy" that Aytoun wrote about, but railways were not insignificant either.

As an aside, the impact of railway investments on the British economy and society in the early 1840s was dwarfed by that of the late 1840s, as Fig. 2 and Table 3 show. During the Mania, the flow of money into the new infrastructure was gigantic, reaching about two thirds of all government spending. There is a serious argument (which has been made before, but does not seem to have made its way into mainline history books) that it was this huge pseudo-Keynesian stimulus that kept the British economy from sliding into a depression in 1846–47 in concert with the countries of continental Europe, and thereby prevented Britain from following those countries into a revolution in 1848. But that is not relevant to the purpose of this manuscript, and is another story. However, it is interesting that Disraeli did not discuss this issue. It is even more interesting, and subject for speculation, as to why William Aytoun and his colleagues at *Blackwood's Magazine* did not cite railways in the 1850s as an explanation for the prosperity that was arriving with "the great Victorian boom" visible in Fig. 4 and Table 3. By that time Aytoun had become an arch-reactionary, and struggled valiantly in the pages of *Blackwood's*, first to explain away the boom, and then to explain it. Curiously enough, he did not seem to credit railways for this development. (There were several other sources that helped usher

in the boom, and their relative contributions are a subject for interesting speculations. A definitive answer most likely cannot be provided.)

Getting back to the prelude to the Railway Mania, in addition to the support that railways offered to the economy through the direct and indirect effects of railway investments, there were additional contributions. One was in making the economy more efficient, by creating a new infrastructure for less expensive and faster transport of goods as well as people (and thus the information those people carried). Another was on the psychology of capitalists. The growing flow of railway dividends cheered them up by itself, and the prospects of new opportunities in railway expansion helped rouse their "animal spirits." This term was not used then, it remained for Keynes to coin it, but equivalent ones were. General observers, including some policy makers, were much more attuned to the critical role that psychology plays in investments (as well as to the role of people like Dunshunner, M'Corkindale, and Disraeli in creating the "beautiful illusions" that often play a strong role in directing mass psychology) than modern ones are.

Capitalists' "animal spirits" had been down for a long time. Let us recall just how enormous an effort had been undertaken. Initial authorizations for railways in the 1830s were for spending of about £50 million, comparable as fraction of GDP to about $1.5 trillion for the U.S. today. A few schemes were abandoned, but cost overruns pushed the total cost of the ones that were completed to about £75 million, comparable to over $2 trillion for the U.S. And although there were positive returns, they initially seemed meager. Railway papers, of which there were then two, *Herapath* and *Railway Times,* carried many letters asking[99], sometimes plaintively, sometimes in an aggrieved fashion, "can railways pay?" These papers were certainly railway advocates, but they had to admit that the glowing expectations that had been dangled in front of investors had come to nought. One wrote that

> ... taking the opened railways as a whole, there is scarcely any other mode of disposing of available funds that would not have proved more profitable than these works, particularly during the extreme scarcity of money that has for some time past prevailed.[100]

That was at the end of 1841. Two years later, the attitudes were far more positive. What changed (aside from good harvests)? There was a general improvement in the mood of investors. But there were also some quantitative measures that changed (which then helped improve that mood, in the usual collection of complex relationships that drive markets). Dividends had generally increased, sometimes substantially so[101]. And there was a longer track record in paying dividends, making them appear more reliable. And, finally, note that reference to "the extreme scarcity of money" in the quote above. With prosperity, interest rates came down, and money became more easily available, making even those railway dividends that had appeared meager seem considerably more attractive.

In any case, "animal spirits" started stirring in earnest already in late 1843. Still, the Railway Mania that developed came as a surprise to many. Here is what Disraeli wrote about it in *Endymion*:

> What is remarkable in this vast movement in which so many millions were produced, and so many more promised, is, that the great leaders of the financial

> world took no part in it. The mighty loan-mongers, on whose fiat the fate of kings and empires sometimes depended, seemed like men who, witnessing some eccentricity of nature, watch it with mixed feelings of curiosity and alarm. Even Lombard Street, which never was more wanted, was inactive, and it was only by the irresistible pressure of circumstances that a banking firm which had an extensive country connection was ultimately forced to take the leading part that was required, and almost unconsciously lay the foundation of the vast fortunes which it has realised, and organise the varied connection which it now commands. All seemed to come from the provinces, and from unknown people in the provinces.

There were wide expectations that the railways constructed as a result of the mania of the 1830s came close to completing the British railway network. As was mentioned in Chapter 8, and as is most easily seen in the Philip Brassett online maps referenced there, by 1843 England had a recognizable national network connecting almost all of the major cities. The general opinion was that this was the most that could be expected. Herbert Spencer in his autobiography describes how he lost his job on the Birmingham and Gloucester Railway (which will be cited several times in this manuscript) as the construction of that line was completed in early 1841. He was offered a permanent job, but at a lower level and with uncongenial duties. Given what he felt was lack of prospects for the future, he left. There was no expectation that in a few years there would be an explosion of demand for anyone with any kind of railway expertise. (Spencer did get back to railway engineering during the Mania, after a few years of desultory activities.) Around that time, James Walker, a distinguished engineer, in his presidential address to the Institution of Civil Engineers, the main professional organization for technical professionals involved with the new technology, was very explicit about his limited expectations for the industry and profession:

> The Railways, both during the preliminary surveys and in their subsequent construction and management, in addition to other works of Engineering, have given employment to many. But the principal towns are already connected by Railways, or Engineers and Surveyors are now employed in projecting or executing lines where they are yet wanted. Is then the demand for professional gentlemen likely to *increase*? Is it not likely rather to *decrease*? ... we are led to ask, will this country find employment for all these? I freely confess that I doubt it. My object in what I have here said is, not to deter those who may already have resolved and have taken measures to follow the profession, but to advise them not to depend on this country alone, and so to direct their studies as to fit them for other countries also, ...[102]

In the fall of 1845, those engineering students who had not been deterred in their "measures to follow the profession," and had not moved overseas, were being woken up at all hours of the night by desperate promoters, looking for anyone with any experience and credibility to take on new railway projects! But even in late 1843, there were many who could not imagine this happening. Thus in September 1843, the just-started *Economist* in its second issue had a note about railways bills passed in that year's session, and opined:

> The new railways are of small extent, and generally branches or extensions of existing lines. Most of the great lines in England are already executed.[103]

Whence came the explosive rise in railway investment? As William Aytoun wrote in the Glenmutchkin story, "it appeared perfectly certain that all the populous towns would be united, and the rich agricultural districts intersected, by the magical bands of iron." Disraeli wrote that "[a]ll seemed to come from the provinces, and from unknown people in the provinces." That was certainly true at the start of the Mania, although as it progressed, London-based promoters, often of the caliber of Augustus Dunshunner and Bob M'Corkindale, began to play a more prominent role. What drove those provincial efforts was the persistent fact that deficiencies of traditional transportation systems were a searing pain for the commercial and manufacturing interests. With the growing evidence of the salutary effect railways had on the economies of localities they touched, the clamor to obtain those same advantages grew everyplace, and the resistance to railways diminished. (Almost all landowners were now convinced that railways enhanced property values, instead of demolishing them, as had been widely feared, for example.) Thus demand for railway expansion was strong. It even remained strong after the Railway Mania had crashed. Much has been written about the importance of railways to the economy and their impact on society. This includes some revisionist work that argues railways were not as important to the Industrial Revolution as had traditionally been supposed. I won't go into any of these issues here, as they are not germane to the main goal of the manuscript. But let us note that throughout the Victorian era, the perceived importance and desirability of railways grew, and there was constant activity on the part of local interests to either bring railway service to the area, or improve existing services. The opening of a rail connection to a town that had previously been isolated was often celebrated with parades, fireworks, and other festivities. (When a line that was sometimes thought to have been the inspiration[104] for the fictional Glenmutchkin Railway was actually completed in 1880, its inauguration led locals to "move" the Queen's birthday to coincide with the occasion, [209], pp. 73–4. As was mentioned in the introduction, railway mileage about quadrupled from the level at year-end 1849, at the depth of railway investor despair, to the peak in the early 1920s.) Thus the demand for railways was there, at least at the level of influential people asking for more extensive and more intensive service. The opponents of railway expansion, numerous during the 1830s, were from the time of the Railway Mania in the mid-1840s on relegated to increasingly marginal positions. But what about supply? Would investors be willing to fund new projects?

Although the Railway Mania caught most observers, including the *Economist,* by surprise, a few guessed early that railways would be the main object of speculation in the near future. They *knew* (and again I put aside the question of whether what they *knew* is more accurate than what modern observers in comparable positions *know*) that British investors went to irrational extremes when boom times arrived, and were wont to do foolish things. And rival destinations for those investors' funds had all been discredited, so railways seemed the obvious place where money might go. Still, it does not appear that anyone anticipated an explosion of railway promotional activity on the scale that erupted. (See, for example, the piece in the *Atlas* in April 1844 that is referenced in Chapter 9.)

In early 1844, Parliament was grappling with many railway applications, and aware of the rising interest in further expansion of the industry. A House of Commons committee

(the famous Gladstone committee) summarized its views as to why this was taking place in these words:

> From the number of Bills for the formation of New Lines now before Parliament; from the appearance of many New Schemes likely to come under consideration in the next Session; from the greatly increased favour and support which, as compared with the projects of former years, these Undertakings now receive from the owners of Landed Property in the districts through which they are to pass; from the reduced amounts of Estimates of Cost, and the comparative certainty with which they can be made; and from the improvement of Trade and redundance of Capital in the Country, combined with the prevailing indisposition to run the risks which have rendered some kinds of Foreign Investments so disastrous; the Committee anticipate a very great extension of the Railway System within the next few years.[105]

Another, retrospective view was presented by the *Economist* in 1848, looking primarily on the motivations of investors:

> Prior to the commencement of the recent railway mania in 1844 this species of property had acquired a reputation for security and profit greater than any other similar speculations which had preceded them: while nearly every other class of joint stock speculations, from 1824 downward, in which the accumulating capital of the country had been invested, had ended in ruin to the parties engaged, railways, as they then existed, appeared to promise a permanent security for very large dividends. Capitalists began to distinguish and recognise in railway investment a species of security which other undertakings do not offer. They saw that in the case of joint stock banks, which had been the favourite objects of investment in 1835 and 1836, and in all other similar undertakings in which the whole subscribed capital is dealt with by directors in a floating state, which involves extensive credits left to the entire discretion of directors, that not only is the whole paid-up capital always exposed to be lost, but that liabilities to an indefinite amount may be, and in many cases have been, entailed upon the companies, which ended in the entire ruin of whole classes of shareholders. In the case of railways they saw that the subscribed capital was actually invested in a *bona fide* property, which, be it a little more or a little less profitable at any particular time or under any particular management, still represented the subscribed capital entire, and that they could never be exposed to any liability beyond the actual amount of their shares.[106]

Thus Gladstone's committee and the *Economist* agreed on the vital role of improved financial conditions in the country and of the failure of previous foreign ventures (even if investors were foolish, they were not likely to repeat very recent mistakes right away) in directing attention towards railways. And there were various other reasons cited by these sources, some with clear implications for modern issues of corporate governance and the role of the financial markets.

Whatever the exact reasons that led to it, the Mania exploded on the scene, leading to the extreme excitement at the end of 1845 that was referred to in the Introduction and has been described elsewhere. Between 1833 and 1843, the British railway system mileage grew

ten-fold, from 208 to 2044 miles, see Table 2. During the Mania investors set out to grow it by at least another factor of 10, to over 20,000 miles, and do it in half a dozen years. This is shown in Chapter 21, and plays a key role in the proof of investor irrationality during the Mania. First, though, I present a brief history of the Mania, emphasizing some of the features that matter the most for subsequent discussion.

11 A brief chronology of the Railway Mania and sources of investor losses

This chapter presents a brief overview of the entire history of the Railway Mania, and concludes with an evaluation (also very brief) of where investor losses came from, in terms of summarizing just what projections went wrong.

In early 1843, Britain was still in a depression, and in the Parliamentary session of that year just 91 miles of new railways were authorized. By the fall of that year, though, the economy revived (the harvest was good, ...) and railway promotion in the provinces went into high gear. At the beginning of 1844, when Parliament reassembled (sessions lasted half a year, from late January or very early February to mid-year), there was a flood of railway schemes awaiting their consideration. A few observers started talking of a railway mania, and worrying about its getting out of control. But that was still relatively rare while Parliament was in session, and 805 miles of new railways were approved. This represents an increment of about 40% on the 2,000 miles of railways that were in service then. But at the same time, rising prosperity and growth in local agitation for railways, feeding on each other, led to the establishment of many more railway companies. This activity continued intensifying through the end of November, 1844, when the plans to be submitted to Parliament in 1845 had to be submitted to a government office. The skeptics' alarm kept intensifying in parallel during this period, although, just as with promotional level, it was at a low level compared to what came a year later, in late 1845. The Glenmutchkin story, published in October 1845, is set during this period at the end of 1844.

As 1844 rolled over to 1845, Britain was doing well. Prosperity (greatly fortified by the second plentiful harvest, in the fall of 1844) grew, and there were no serious foreign problems. The wounds of the Afghan disaster were healing, and other threats, such as that of war with the U.S. over the Oregon issue (which would give rise on the other side of the Atlantic to the "Fifty-four Forty or Fight!" slogan), were not being considered as serious by most observers. But now Parliament was faced with a far greater number of railway proposals than in 1844, and ended up sanctioning the construction of 2,700 miles of new lines. Together with the 805 miles approved in 1844, these lines were all expected to be built in the next three to five years, and would represent growth in railway mileage by a factor of almost three, compared to the 2,000 miles that had been built over the preceding 15 years. To a growing number of observers, such commitments appeared to be dangerous folly. Their concerns will be discussed later, in Chapter 12. But the rage for railway shares just kept growing, "this thirst for national improvement, internal communication, and premiums" (in the words of Aytoun's Augustus Dunshunner, with "premiums" clearly being the most important). The usual dynamics of financial manias were in operation, as a rising market

and short memories created investment geniuses (to paraphrase the late John Kenneth Galbraith). It helped that most of the warnings coming from skeptics had been issued already a year earlier, and most of the predicted disasters had failed to materialize. (This is another of the universal features of financial manias, that skeptics come to be seen as less and less credible as the bubbles inflate, since they are usually early in their predictions of a crash.)

The celebrated day of Nov. 30, 1845 brought in the flood of about 800 railway schemes that were submitted for Parliamentary scrutiny in the 1846 session. By this time, much of the most speculative ardor had dissipated. There had been a few railway share panics, interest rates had been raised (to a considerable extent to dampen down railway speculations), and the harvest was poor, with the dread potato disease making its appearance. (However, the potato harvest failure was only partial that year, so that few deaths resulted from it in Ireland. It was the almost total failure of the potato harvest a year later, in late 1846, that led to the real tragedy, with about a million deaths, most in 1847.) Investors began to pay more attention to the warnings of the skeptics, and started to worry about being able to pay the calls on the shares they had acquired. Still, in 1846 Parliament approved 4538 miles of railways, so that, combined with the 3,500 miles approved in 1844-45, the country was supposedly on track to getting 10,000 miles of railway in total by 1850 to 1852, compared with the 2,000 miles it had in 1843. On top of that, another 1,354 miles were approved in 1847, and 371 in 1848. (Of the total of almost 12,000 miles all these approvals represent, about 60% were actually built by 1852.) There were second thoughts, an increasing number as time went on, but the bulk of the planned construction was carried out over the next few years.

This manuscript shows that investors had enough information available to tell for certain by mid-1846 that their hopes for high returns were unrealistic, at least on average. The argument presented here does not prove that any particular line was bound to deliver substandard profits, just that the aggregate of all lines was. However, this should have been enough for short-sellers to step in and force prices towards their long-run destinies. It should also have made investors take a more careful look at their demand projections, and this might have made them revise their estimates downwards even for individual lines. One could even make a case that the impending investment disaster should already have been visible by mid-1845. But this argument is not as conclusive, since due to smaller expected investments, the disparity between implicit investor hopes and what can be shown to have been achievable was not as dramatic at that stage.

The railway share price index in Fig. 3 in the Introduction shows a persistent decline in prices from the peak in July 1845 of 167.9 to the trough in October 1849 of 60.5, with only a few brief and minor rebounds in between. It is possible that some short-sellers did make consistently high profits over that period. The railway literature of that period is certainly full of complaints about the "bears" (which was then a synonym for short-sellers) manipulating prices and in particular driving them down, in order supposedly to induce a panic among the long-term holders and buy their property on the cheap. But such short-sellers either did not have much capital, or did not have enough courage to operate on a large scale, as prices took four years to reach bottom[107].

The key observation that leads to the conclusion that Railway Mania investments were destined to tail was laid out very explicitly in the widely read survey of Dionysius Lardner [125], published in October 1846. That survey was cited already, and will be discussed several times later in this manuscript. But investors ignored even this warning, and went on with their projects. The story of the next few years is interesting, and carries several lessons about economic and monetary policy. Although many projects were abandoned, postponed, or slowed down, the torrent of railway money that started flooding the economy in 1846 only intensified in 1847, and continued at only a slightly diminished pace in 1848. Those years were marked by famines, wars, revolutions, epidemics, and several financial panics. The worst of the panics occurred in the fall of 1847, when Britain appeared to face a total meltdown of its financial system, similar to what the world faced in the fall of 2008. This crisis was frequently blamed at least in part on railway investments increasing demand for money and driving up interest rates. *The Times* proclaimed[108] that "[t]he battle is ... one of life or death between railways and trade," and had no doubt that, if a policy of *laissez faire* was left in place, railways would win, and the rest of the economy would be ruined. But the crisis was solved (without huge injections of taxpayer cash that time, just by telling the Bank of England to break the law and provide liquidity to the market), and the *laissez faire* policy continued. One can draw conclusions about the ability of monetary policy to puncture a powerful collective hallucination from the fact that railway investments were little affected by the crisis. Investors were still convinced that a pot of money awaited them at the end of their adventure into railway construction. It was not until the unavoidable collision with cold reality took place in 1849, when dividends were slashed, and George Hudson's "creative accounting" was revealed, that railway share prices reached the bottom that was made inevitable by the decisions of 1845–46.

The story of the end of the Railway Mania is not directly relevant for this manuscript, but will be covered in *BICS.* At this point, let me just mention that the market inefficiency shown by railway share prices of 1845 or 1846 not anticipating the disaster that awaited them in 1849 was repeated again later in slightly different circumstances. In 1846, investors ignored the macro view presented by Lardner, which showed that the railway industry as a whole would produce meager profits. During the period 1847–49, investors went on to ignore the micro view presented by Robert Lucas Nash. This individual was a pioneer in financial analysis and accounting, as will be described in the companion paper [166]. He worked diligently to analyze finances of individual railways and point out the problems that were likely to (and did) bring those lines to grief. Yet he was not paid attention to, at least not enough to bring railway share prices down to the proper level. Moreover, he did not make much money from his prescient publications, and he appears to have been totally forgotten by history.

The blindness to the real danger that was shown by investors in the Railway Mania can be attributed largely to the fact that they were viewing the unfolding disaster through the glasses created by the railway mania of the 1830s. For example, the persistent decline in share prices was attributed to the pressure of calls. Many observers claimed that if only new railway construction were stopped, calls would no longer need to be made, and prices would rebound to their proper level. Such claims were being made even long after the railway

industry had passed the point of no return, where financial failure was already inevitable, and all that was wanting was the final test of actual service and proper accounting[109].

The first quote from a letter of Charlotte Brontë in the Introduction, if we restore the second sentence that I omitted there, starts:

> My Shares are in the York & North Midland Railway. It was one of Mr. Hudson's pet lines and had the full benefit of his peculiar management–or *mis*-management.

This is a beautiful reflection of what appears to be the universal human tendency to look for scapegoats, preferably prominent personalities who can be accused of betrayal of trust. Seeing a few go to the gallows (or to jail, in our more enlightened times), people like Bernie Ebbers of WorldCom, Jeff Skilling of Enron, Dennis Kozlowski of Tyco, or Bernie Madoff of the giant Ponzi scheme of his name, appears to have a cathartic effect on the public psyche. But it usually also serves to disguise the real problems that led to the crash, problems that, when properly analyzed, would distribute blame far more broadly, perhaps uncomfortably broadly. In the case of the Railway Mania, another nice illustration is provided by the pamphlet [225]. It was published by the *Yorkshireman* newspaper, and probably written by its staff. This paper had been a prominent foe of Hudson and his minions, and got sued for libel. Hence, naturally, the whole pamphlet concentrates on corruption. But it also has a few good passages in those "Preliminary Observations on the Railway Mania of 1845–6–7–8" that are advertised in the title about the general problem of the Mania. Those show the underlying problem of the Mania is that profits that came out of it were disappointingly small due to high costs and low revenues. But most of the blame (aside from corruption) is put at the feet of too much money going into railways leading to a disruption of the economy and low share prices.

There was certainly much corruption, and likely even more incompetence, during the Railway Mania. But then those were also present in generous doses during the railway mania of the 1830s. What produced the anguished passages from Charlotte Brontë and others in the late 1840s was a combination of several factors:

- construction costs were about 50% higher than projected
- working expenses were about 50% of revenues as opposed to the expectation of 40%
- revenues were 30 to 40% lower than projected

Even these would not necessarily have been fatal, if not for another key factor: The profits officially projected for the Railway Mania projects were only about 7% of capital, as opposed to the 10–15% during the 1830s. Thus had the the traffic takers, who had made those projections, been taken seriously, as opposed to being regarded as overly conservative, the new lines would have been seen not as founts of riches, but as marginally profitable, depending critically on many potential disasters not occurring.

There was another factor that did not affect the returns to all capitalists collectively, but hit hard at holders of common shares such as the Brontë sisters, who did not have the resources to invest any additional funds in railways. Many established lines bought, or leased, other lines based on expectations of high profits. They also issued preference shares, and borrowed at high rates. The shareholders of the acquired lines, as well as the bond and preference share investors did very well in almost all cases.

After this brief overview that went to the conclusion of the Mania, let us get back to its start.

12 Opponents of the Railway Mania

As the Railway Mania was heating up, so was the alarm of its opponents. And there were many opponents, some the same ones that were opponents of the smaller railway mania of the 1830s and were mentioned in Chapter 8. The newspaper *John Bull* still took delight in opposing anything and everything about railways. (That did not stop it from taking newspaper ads, though, or from publishing a section on railway news.) And as before, everybody, proponent and opponent of the Mania alike, was warning investors about Glenmutchkins, projects started by promoters like Dunshunner and M'Corkindale, who were primarily interested in "having a pluck at the public pigeon."

A balanced view of the debates at the height of the exuberant phase of the Mania is presented by William Aytoun's piece [18], published in Nov. 1845. It is summarized (together with some comments about Aytoun and his changing attitudes towards railways) in Appendix 7. In this section I concentrate on the arguments used by opponents of the Mania, to judge to what extent they did or did not help investors prepare for the financial debacle that followed their decisions to put their money into railways.

Some concerns from the 1830s either disappeared or faded, and so did not affect investment decisions much. By the mid-1840s it was widely known that tunnels would neither asphyxiate passengers, nor frighten them out of their wits. Safety was still of wide concern, with many calls for better management of railways. But that did not stop people from travelling, and anyone who bothered to collect statistics could see that rail travel was far safer than travel by stage-coach.

Moral and social effects of railways also continued to be of some concern, but that also did not count for much. Cambridge and Oxford universities, which had been strong opponents of proposals to extend railway to their towns, were placated by inserting special provisions in the charters of the lines that reached them. Those provisions were supposed to allow those institutions to prevent moral corruption of their students by controlling those students' travel to the fleshpots of London, and by keeping "loose women" from coming from London. Wordsworth wrote a sonnet and letters opposing the spoliation of natural beauty of the Lake District by the Kendal and Windermere Railway, but such concerns did not carry much weight either. Wordsworth asked in his poem, "Is then no nook of English ground secure from rash assault?" And the resounding answer was "Yes, no nook is secure, not when there capitalists willing to build a line there."

There were several prominent opponents of railway expansion in Parliament. One was the notorious Colonel Sibthorp, who was more than a bit of a buffoon (and was sometimes called that to his face). Railways were his main *bete noir,* and a satirical piece in *Punch,* entitled "How to heat the House [of Commons]," claimed that "Colonel Sibthorp, whenever the [House of Commons] is cooling, might be asked for his opinion about railways"[110]. In a debate about railway policy, he claimed that he

> had always felt it his duty to speak in opposition to the propositions of any railroad company whatever. (A laugh.) He thought it was the duty of [all branches of government] to hold sacred the right of the preservation of property, upon which most gross and scandalous attacks had been made by those monopolizing, and, as he had always found them, irresponsible companies.[111]

This quote presents Sibthorp's most substantive objection to railways, namely that they were a violation of property rights. That was also at the bottom of the the opposition to railways of Lord Brougham in the House of Lords. Brougham was not a buffoon, he was one of the major figures in the political life of Britain in the first half of the 19th century (and through almost all of that period, he was almost 70 years old at the peak of the Mania). Although no longer trusted by any major political group by the mid-1840s, he still exerted a powerful influence on national issues. However, the British government had effectively decided on an industrial policy to promote construction of railways wherever capitalists might find them profitable, and was willing to not only violate property rights on behalf of railways, but to tolerate persistent and flagrant violations of the law by those railways. This was a remarkable stance for a Parliament dominated by the landed aristocracy, but it was the basic implicit policy under both Tory and Whig governments. So neither Sibthorp nor Brougham nor their sympathizers made much headway with their property rights arguments.

There were three substantive objections, or at least qualms, concerning railways that had already been voiced in the 1830s, and which one might have expected to be again discussed seriously in the 1840s, namely:

- Would there be enough demand for the new railways?
- Would the final cost of the new lines come in close to the estimates?
- How disruptive would railway investments be to the economy?

The first issue, "would the people come to the ballpark," was by far the most prominent among those voiced by serious railway skeptics a decade earlier. As was shown in Chapter 8, even strong supporters of railways, such as John Herapath, had doubts on this score. At the height of the Mania, in 1845 and 1846, this issue essentially disappeared from public discussion forums. A more detailed look, which I will not pursue here, except for some brief remarks when discussing traffic takers, shows this question of whether people would come to the ballpark fading as the Mania develops from late 1843 to its full bloom in 1845. Why and how this happened will not be discussed in detail here, as it is impossible to establish this with certainty. But it was the failure of people to come to the ballpark that ruined Mania investors. And those shareholders were not prepared for it. As just one example, Richard Cort, who had made a name for himself in the early 1830s with allegations that railway dividends were being paid out of capital, made in pamphlets such as *Rail-road Impositions Detected: Or, Facts and Arguments to Prove that the Manchester and Liverpool Railway Has Not Paid One per cent. Nett Profit; ...,* was quiet at the peak of the Mania. After the collapse of the Mania, when it was discovered that there had been extensive accounting fraud, and that some dividends had indeed been paid out of capital, he resurfaced to tell the world that he had been right all along, in a pamphlet entitled *Railway Reform:*

In a Letter to William Chaplin, Esq., M.P. Chairman of the London and South-Western Railway Company, Showing that the Liverpool and Manchester Railway Company Has Not *Paid a Single Dividend Except Out of* Borrowed *Money; And that all other Railways are, and must be, in the Same Predicament. ....* But at the start of the Mania he was silent.

The second issue, "could one trust the engineers," was understood to be central to the chances of success of railways in both manias. But there was not much that investors could do about it. The engineers were the engineers, and there was limited choice among them. (Often there was no choice at all at the height of the Mania, as in the Glenmutchkin Railway story, where Augustus Dunshunner and Bob M'Corkindale settle on "Watty Solder, the gasfitter, who failed the other day. He's a sort of civil engineer by trade, ..." This was an exaggeration, but not much of one.) Curiously enough, the question of reliability of engineers' estimates seemed to be more prominent in the 1830s than in the 1840s. Yet during the earlier period, railway technology was new, and the engineers had little track record. By the 1840s, the technology had proved itself. In a certain sense, so had the engineers, but these only in a negative sense, namely by consistently exceeding their cost estimates, typically by a factor of two. Yet in the Mania they were trusted to deliver on their new promises of lower costs. This issue will be discussed at greater length in Chapter 13.

The third question, "was there enough money for railway construction," became the focal point for debates about the Railway Mania. It had made an appearance in the 1830s (as is shown by the quotes from John Herapath and Dionysius Lardner in Chapter 8), but did not appear to be taken too seriously by most people at that time. During the Mania, it became central. To some extent this is probably because Mania opponents did not have other objections that appeared credible. To some extent, though (and this was the only reason cited), this occurred because planned railway investments were now gigantic, 10 times higher than in the 1830s, and exceeding total government expenditures. *The Times* went on the warpath with its famous leader of July 1, 1845:

> "Whence is to come all the money for the construction of the projected railways?" is a question which at the present day we often hear familiarly repeated. ... The pace of railway speculation has fairly outrun the power and control of the Legislature; ...

The question of raising funds for the new railways, and the related issues of finding enough labor, horses, rails, locomotives, and all the other things involved in the construction became essentially the sole concern of the Mania skeptics. There were a few observers who worried about other issues, such as whether an unbalanced investment pattern, with almost all money going into railways, was healthy. It was proposed to plow more money each year into this infrastructure than the cost of the entire British merchant marine. Could that be reasonable? But there were few such people, and the trains of thought they pursued could not be quantified. Only one seems to have identified a convincing argument as to why such huge investments were inadvisable, namely that there would not be enough demand for them. But the overwhelming majority of the skeptics were fixated on the short- and intermediate-term problems of simply getting the projected railways built. They simply did not think about what would happen once the construction was completed. In fact, most of them sincerely believed that the new railways would be profitable once they were completed, as we will see in the examples below.

The objections to the proposed astronomical levels of investment in railways were based on intuition that such huge diversion of resources from their regular channels was going to be disruptive. But this was just intuition, and the advocates of such views had difficulty articulating just what the danger was, or how the disruption would take place. Economics, then called political economy, was in its infancy, and what was lacking was not just basic statistics (something discussed already in Chapter 3 and later), but even the basic economic concepts. In *The Glenmutchkin Railway,* Aytoun has Dunshunner say of Bob M'Corkindale that

> [h]e had once got hold of a stray volume of Adam Smith, and muddled his brains for a whole week over the intricacies of the *Wealth of Nations.* The result was a crude farrago of notions regarding the true nature of money, the soundness of currency, and relative value of capital, with which he nightly favoured an admiring audience at *The Crow*; ...

It was not just M'Corkindale, but almost the entire public in the 1840s "had muddled [their] brains .. over the intricacies of the *Wealth of Nations,* [and acquired] a crude farrago of notions regarding the true nature of money, ..." In particular, most skeptics converged on an argument against high railway investments that was based on a notion already in Adam Smith's *Wealth of Nations,* namely about the division of capital into floating and fixed. Floating capital was supposed to be represented by money in hand or in the bank, as well as readily marketable materials such as raw cotton. Fixed capital was supposed to be represented by factory buildings, rails fastened to sleepers on a railway, or even such (literally floating) items as ships. And the idea developed that investments of money in railways corresponded to converting floating capital to fixed. This was supposed to deplete the stock of floating capital, and bring the economy to its knees.

The concept of depleting a limited stock of fixed capital was easy to refute. In *The Glenmutchkin Railway,* Bob M'Corkindale tells Augustus Dunshunner, as they decide to start their own railway, that "[c]apital is indestructible." What M'Corkindale surely had in mind is what was said over and over again by railway advocates during the Mania, namely that when somebody like Dunshunner puts £100 into a business, say as a contractor building a small bridge for a railway (for which he will be paid later), that money goes out to the manual laborers who dig the foundations for the bridge, to the makers of bricks that will go into the structure, etc., and the recipients of that money will then spend it on food for themselves and their families as well as their supplies. The money does not vanish (especially if, in those days of the gold standard, that money was gold, or paper directly convertible to gold). To many observers of the time, this process was to be welcomed. They did not use the phrase "liquidity trap" that was popularized by John Maynard Keynes, but they had a sense for the phenomenon it represents, as they had just emerged from an episode of it during the depression preceding the Mania. One word they used for the process of money being put into circulation was that it was "fructifying." Since Britain was felt to have surplus population and labor, was groaning at the burden of taxes, and was morally uncomfortable with providing welfare to able-bodied adults, anything that would stimulate demand for labor was regarded positively.

From an economics point of view, the debate about the desirable speed of railway expansion during the Mania was confused because neither side had available to it even the basic notions of the effect of an investment on the economy. Today, we are much more sophisticated. Yet it is not clear that we really understand much better what goes on, especially as the economy continues to evolve away from tangible goods towards information, and financial instruments become more sophisticated and harder to understand. (Vide the crash of 2008.) And even some of the old confusion "regarding the true nature of money" continues to dog us. For example, many respectable financial analysts and financial journalists often cite figures about the large volumes of cash held in money market funds, or in checking accounts, as proof that stocks will go up, because where else can that money go? Just as at the time of the Railway Mania, this argument does not make any sense, since when Dunshunner sells some shares to M'Corkindale, the money from M'Corkindale's money market account simply moves to Dunshunner's money market account, and the total balance stays the same (aside from some small amounts for commissions, and possibly taxes). That such arguments continue to be made may indicate the economic illiteracy of those who make them, whatever their reputations or credentials, or else their perception that the public cannot absorb anything complicated, and yet has to be fed some "beautiful illusions," whether they make any sense or not.

Thus the argument on how railway investments were going to disrupt the economy were not very persuasive. Furthermore, the argument that the disruption would take place at the levels of investment suggested by promotional activity at the height of the Mania could also be refuted. Railway advocates all pointed to the war spending in the first 15 years of the 19th century. Even though the economy then was smaller than in the mid-1840s, far more was poured into the destructive military activities than was likely to be spent on the constructive buildout of the railway system in the Mania, and this system was going to be provide improved transport for the nation, and profits for investors. So why the alarm?

Finally, one frequently cited defense of the Mania could be phrased in modern terms as "The market is always right." That term was not used, but numerous observers simply argued that it was wonderful to see all this entrepreneurial activity, and if investors saw good prospects for profits, what could be wrong with letting them pursue them? How could there be any systemic risk, with all the wonderful financial innovation of the Dunshunners and M'Corkindales, and why should one even worry about it? For example, the *Morning Herald,* the London daily that was most vociferous in support of the Mania, exulted that

> No man can entertain the least doubt, that in the ordinary acceptation of the term, England is at present in a high state of prosperity. This is so obvious and indisputable, that we are under no temptation to exaggerate or unduly enlarge the fact. We might, wtihout passing the limits of calmness and temperance, express a doubt whether a like condition of wealth and advancement had ever been witnesses to the same extent before. ... *Ninety millions* of money for new railroads had been subscribed before Parliament, and deposits actually paid on that enormous sum. *Ninety more millions*, at least, have been subscribed since for railroads not yet named to Parliament. Nay, even all this will not satisfy the public spirit of enterprise, but

> all Europe and half of Asia is under the view of our surveyors, in order to spread English capital over almost the whole surface of the earth.[112]

One could say a lot more about the arguments of both supporters and opponents of the Railway Mania. A few additional cases of skeptical opinions will be discussed at the end of this manuscript, in chapters 28, 29, and 30. See also Appendix 7, with a discussion of an article by William Aytoun, which relied to a considerable extent on an appeal to the market, "the wisdom of the crowds," in attempting to judge what should be done with the railways proposed during the Mania. (Aytoun's argument was more sophisticated than the one outlined in the preceding argument.)

At this point, though, I will conclude by discussing the three most important opponents of the Mania, and then talk about their effect on the course of this bubble.

12.1 *The Times* and its thunder

The Times has been the main subject of several books, and many more books about the British press of the 19th century are largely about it. It occupied a uniquely powerful position that is sketched briefly in Appendix 3. It had done its best to deflate the manias of the mid-1820s and mid-1830s, and was by far the most prominent opponent of the Railway Mania in the 1840s. It was often credited with single-handedly pricking the bubble. And some of this credit started flowing very early. For example, in Oct. 1845, the *Law Times* wrote:

> It is to the energetic efforts of the *Times* to expose the folly of the railway mania that the country is mainly indebted for the check which it has received, and which, though attended with present inconveniences, will prevent more extended mischief.[113]

And just three months later, *Titan*, writing about the panic at the end of 1845, wrote that

> then followed the thunder of the 'Times,' accompanied by a rise in the rate of discount by the Bank of England; now every one rushed to sell his shares, ..., and this, of course, produced the memorable crash of 1845.[114]

Yet *The Times* was neither the first to raise an alarm about the Mania, nor the most penetrating. But it was by far the most influential of the critics, and the most vociferous. Hence it received the lion's share of the credit for warning the nation about the dangers.

A whole book could be written about *The Times* and its relations with railways in the 1830s and 1840s. What follows is just a brief summary, pointing out the features most relevant for investors. A large institution like *The Times* was not a monolithic entities, and sometimes one finds different voices showing up on its pages. There were three main parts to the paper (other than ads, which were important in their own ways, for many purposes the most important). One was the leaders, which can be thought of as similar to today's editorials, except that they were often far more extensive, and contained much factual material. Some leaders were written by regular staff, some came from outside, often from eminent people. The second was the business column, then often referred to as the "City article." And then was the selection of news stories, letters from readers,

and reprints of articles, either news stories or leaders, from other papers. In the years preceding the Railway Mania, *The Times* developed a reputation of being unfriendly to the railway industry. When its leaders mentioned railways, it was usually in calling for better management, greater safety, and greater regulation by the government. The business column also often sniped at railways for a variety of reasons. (Railway advocates often attributed these attacks and criticisms to the close relations between *The Times* and the City. As one of the earlier quotes from Disraeli's *Endymion* claimed, railways were products of grass-roots capitalism, whether of the Glenmutchkin or more *bona fide* sort. The City, dominated by the Barings and Rothschilds, largely kept away from the new industry.) There were criticisms of railway promotions during the early development of the Mania, but they were not especially prominent. The attitude of *The Times* towards railways changed dramatically with the July 1, 1845 issue, when the leader quoted earlier, "Whence is to come all the money ...?" appeared. Alarmed by the threat to the economy that the astronomical sums called for by the new railways would pose, this paper went to war against railway promotions. (Railway advocates often claimed that *The Times* had various ulterior motives, for example that it was alarmed by the flood of advertising money flowing to its rivals, which were perceived as more friendly to railways.) Nicknamed "The Thunderer" in the previous decade, it now directed its thunder against railways. Its leaders, business column, and other pages became full of railway material, warning, persuading, and shaming potential investors, and calling for the government to stop the madness. One leader claimed that

> [t]he mania for railway speculation has reached that height at which all follies, however absurd in themselves, cease to be ludicrous, and become, by reason of their universality, fit subjects for the politician to consider as well as the moralist.[115]

The Times also tried satire, reprinting *The Glenmutchkin Railway* in its entirety, as well as other humorous pieces from *Punch* and other places. And it reprinted much of the serious material opposing the Mania that it found in other papers. (However, it totally misjudged the Lardner survey [125], the only one with a convincing argument as to why Mania investments should be curtailed.) Much of the original and reprinted material in *The Times* with strictures against the Mania turned out to be wrong (something it occasionally, but only very occasionally admitted). But then that is true for almost all investment mania skeptics, they are almost all too early, and so wrong for a long time, and they often emphasize the wrong points. Still, such misdirected predictions gave Mania supporters additional grounds for attacking this paper.

While *The Times* found much wrong with the British railway industry, it was enthusiastic about them as a vital transportation infrastructure. A good introduction to its basic philosophy is provided by a leader in March, 1846. James Morrison, to be considered a little later, had just been allowed by the House of Commons to form a committee to consider changing government railway policy. A very brief extract from this leader says:

> The question which Ministers have allowed Mr. Morrison to appropriate is confessedly the greatest difficulty of the day. A vast instrument of utility, wealth, and power is seen all at once to rise up amongst us, and shoot out its ramifications to every corner of the country. All our communications are suddenly occupied, not, indeed, by

> a foe,–on the contrary, by a most useful and generous friend, but a very headstrong and unmanageable one. The new creation is too huge, too energetic, too ubiquitous for our ordinary facilities. ... There [the railway question] lies on the ground, in the mud, till Mr. Morrison picks it up. We said last year that the man who shall master the question will have earned a Premiership. At least he will deserve the honours given to the conciliator of the Canadas, and destined perhaps for the conqueror of Scinde, and the chastiser of the Sikhs.
>
> [Argues that mergers and acquisitions are inevitable, will lead to a single monopolistic system] The question then is, are we in thirty years' time to have a vast *imperium in imperio*,–a railroad union with a capital of a thousand millions, and an income of fifty millions, besides a proportionate expenditure,–in *private hands*; or are we to have this wealth and power in the hands of the state? Is there no inconvenience, no danger in the existence of so vast an independent body? The patronage of the state will be a trifle in comparison. ...[116]

The Times was a conservative paper, and in those days, conservatives were considerably more friendly to the ideas of government ownership, operation, or control than the reformers (by which term I mean various groups that were then called Liberal, Radical, Whig, ...), who were represented by the *Economist*, for example. Still, private enterprise, and property rights were paramount for *The Times*, and the derogatory reference to "[t]he patronage of the state" shows that it did not regard government involvement in any business operation as desirable. Hence its advocacy of government ownership or at least closer government oversight of railways indicates an unusual situation. This paper felt that the potential size, power, ubiquity, and indispensability of the growing new transportation infrastructure called for departure from ordinary principles, including risking all the inefficiencies and corruption that government operations were associated with in most minds at that time.

Whatever *The Times* regarded as desirable in terms of ownership or control, the quote above shows that it had a an extremely optimistic view of how far railways would or should be extended. It expected that the country would go on investing on average about £33 million per year for the next 30 years, and at the end of that time railways would produce net earnings of £50 million per year. (As it turned out, it took 44 years, until 1890, for cumulative railway investments to hit £1,000 million, and net earnings of capital did not reach the predicted level until the eve of World War I.) If we consult Table 2, we find that the average level of railway investment over the four key years of the Mania, 1846–49, came to precisely £33 million per year. In other words, *The Times* was reacting against the proposals to spend higher amounts, on the order of £70 million per year or more (see Chapter 21) that some railway enthusiasts were defending, and did not object to the levels that were actually achieved, and proved ruinous to shareholders[117].

There were many, many leaders and other pieces in *The Times* criticizing the Mania, and the one excerpted above is just one of them, chosen since it illustrates both what seemed to be at the bottom of this paper's concerns about railway policy, and its incorrectly optimistic outlook for the railway industry. The key point is that in the early years of the Mania, say through early 1847, I have not found a single unambiguous prediction by *The Times* that

most railways were destined to be unprofitable. Even some pieces that seem to say that almost certainly were not meant to do so. For example, one leader claimed that

> there does not exist the capital, the labour, or even the material, for more than a certain amount of railway production. There is a limit to the railway capabilities of the nation–a present limit to its present capabilities; and we still adhere to the opinion which we advanced on definite statistical grounds at the close of the session, and have often repeated since, that the authorized projects of 1844 and 1845 have already nearly approximated to that present limit. It is out belief that for years to come not one in ten of the new projects *can* be accomplished, and that certainly not one half of such as will be accomplished will for many years pay the first shareholders a better interest than they can get in the funds. That is, on our calculations, not one in twenty will *win*.[118]

Here we seem to have a clear counterexample, a definite prediction that no more than 5% of the new schemes "will *win*." But note that phrase, "the first shareholders." To a contemporary reader, this almost certainly acted as a code word for the events that followed the railway mania of the 1830s, in which the original shareholders sold out in despair before their lines went into service. This passages did not mean that the lines were not going to be profitable when placed into service, especially if "the first shareholders" managed to get "the capital, the labour, [and] the material" to complete the project promptly.

12.2 The *Economist* and fixed and floating capital

Unlike *The Times*, the *Economist* had low circulation and low visibility. Still, although started in late 1843, it quickly earned a high reputation for its coverage of the economy, and was highly esteemed among sophisticated members of the commercial classes.

The *Economist* in the mid-1840s meant James Wilson, its founding proprietor and editor, who ran it almost completely single-handedly. His paper was one of the foremost opponents of the Mania, and one can argue that it was the only one to make a truly convincing case against this bubble. However, it has sometimes been accused, with various degrees of plausibility, of having fanned the fires of the Mania[119]. The reason for such accusations is that the *Economist* was enthusiastic about railways both as productive public conveniences, and as investments, provided proper limits were placed on the rate of investment. Thus in the major collection of articles on railways in the Oct. 4, 1845 issue, which served to launch the addition of a new section of that paper, called the *Railway Monitor,* Wilson wrote[120]:

> Looking to the development of the system so far, it would be difficult indeed to say in what situation a railway would not be a great benefit, and where it might not ultimately be profitable. But it must be obvious that what would be desirable for an individual to do, if he had sufficient capital, is one thing, and what it is prudent to attempt or possible to do without it, is another thing altogether. So it is exactly with the nation. Much may be desirable that is not possible; and an attempt to do all that even on good grounds appears desirable may prevent even the best part being

> accomplished; or may so far derange the application of the capital of the country in other more important and regular channels, as to do much temporary mischief for which even the permanent advantage of railways will not compensate; ...
> ... [One reason so much capital is available for railways] is the extraordinary effects of railways themselves, and other means now used to facilitate the transit of goods and save the time of travellers. There is no other means by which the resources of a country can be so well developed, and its wealth so much increased, as by facilities of communication by which interchange is rendered easy and cheap, ...

Six weeks later, Wilson wrote:

> That any very large proportion of the newly projected railways can be made for years to come, we hold to be an impossibility. At the same time we readily admit, that, as far as the country can spare capital for fixed investment, there is no undertaking of a public kind which would administer so much to the development of our resources, or which would tend so rapidly to the reproduction of wealth, as such an improvement to our internal communication as well planned railways provide.[121]

And a week later, as railway share prices were sliding further (down perhaps 10-15% from their frothy peak that summer, destined to get down about 60% from that peak by the end of 1849), Wilson counseled the proprietors of established lines to hold on, a disastrously wrong market call[122]. There is nothing here to indicate that *bona fide* projects would not be profitable, if completed.

Yet Wilson was justifiably proud of his attempts to deflate the Mania. Walter Bagehot, Wilson's famous successor as editor of the *Economist* (and also his son-in-law, and therefore on close terms with him, both professionally and personally), wrote in a memorial to Wilson [22]:

> To his writings on the railway mania [Wilson] was especially fond of recurring, since he believed that by his warnings–warnings very effectively brought out and very constantly reiterated–he had "saved several men their fortunes" at that time.

Indeed Wilson produced the most penetrating analysis of the effects of huge investments on the economy, and it is likely that he persuaded some men, possibly quite a few more than "several," to refrain from pouring their money into railways.

Almost all criticisms of the Mania centered on its danger to the economy through absorbing too much money. But what was too much was not specified, nor were the ways in which the derangement was supposed to take place. Wilson's achievement was to provide convincing estimates that the British economy was generating about £60 million per year of capital that went into new investments, not repairs and the like. Thus attempts to invest more than that in all new ventures would require substantial rearrangements of the economy. Further, Wilson managed in the Oct. 4, 1845 issue to get away from the "conversion of floating to fixed capital" bugaboo. He agreed that spending on the wars with Napoleon had been far heavier than what railway enthusiasts were suggesting, and admitted the force of the main argument used for railway expansion. He was not "comparing that wasteful and unprofitable expenditure with the investment in useful and profitable

national undertakings" with a view of looking at final outcomes, but rather to see what happened to the economy during that period of major national exertion. He listed the many economic derangements that took place during those wars, such as paper money, inflation, high interest rates, and so on. He also showed how high investments in railways would produce the same effects, as higher wages would need to be offered to workers, goods would have to be imported, ... His conclusion was that letting railway construction go on at the rates advocated by enthusiasts would lead to a similar experience, and was to be avoided:

> And while this [wartime] temporary excitement, which arose out of an expenditure of the *capital* instead of the *income* of the country, gave a flourishing appearance to the country, yet the reaction which immediately followed was severely felt for many years afterwards. There can, however, be no doubt that, had that expenditure taken place in improvements which would afterwards have developed the resources of the country, and ministered in all ways to its productiveness, the temporary effects would soon have passed away, and permanent benefit would have ensued; but it is difficult to conceive any improvements which would have paid the individuals concerned to have borrowed money [on the terms the government paid during Napoleonic wars]. Nothing short of the most urgent state necessity could have justified such a system.

This was by far the best economic analysis of the likely effects of investing at the high rates that were defended by supporters of the Mania. But one could still question Wilson's conclusions. Why did it take "the most urgent state necessity" to justify the derangements of the Napoleonic wars? If (to borrow a phrase from Disraeli) "Eldorado was no longer an idle dream," was it not worth enduring some economic upheavals to get to it? In any event, there was no warning in Wilson's writing of a lack of profits once the railways were built.

A couple of final comments about the *Economist*. One shows the universal tendency for people to find what they want even in messages that appear to be clearly contrary to their views. Wilson was careful in his articles of Oct. 4, 1845 to explain that the £60 million that he computed as the annual savings available in the British economy had to cover a multitude of needs. Hence only a fraction could be devoted to railways. But some readers, intentionally or not, cited him as having demonstrated that railway investment could safely reach £60 million per year, and so there was nothing to worry about[123].

The second comment is that although in his Oct. 4, 1845 articles Wilson provided the correct description of the effects of high investments in railways on the economy (i.e., inflation, ...), he did not exploit this insight later. Instead, in his later writings on the Mania, he reverted to the common and incoherent complaint about conversion of floating to fixed capital[124]. It's hard to tell whether he lost faith in his original argument, or whether he felt it could not be understood by the populace.

12.3 James Morrison and "small profits and quick returns"

The last opponent of the Railway Mania to be profiled is the fascinating but little-known James Morrison, MP[125]. He was a strong advocate of *laissez faire,* and carried his belief in free trade into practice by engaging in smuggling! (The commercial morality of those

days is an entertaining and instructive topic in its own right that will not be treated here. But smuggling was widespread and widely accepted, with smugglers testifying before Parliament, and insurance companies selling policies against seizures of contraband by customs officials. See [87], especially pp. 73–78, for a brief discussion.)

It is not known how important smuggling was to the making of Morrison's fortune. But it is known that this fortune was gigantic. He may have been the world's richest person at the time of the Railway Mania[126]. What is most remarkable is that he built this fortune by himself, starting from scratch[127]. He started out as a clothing wholesaler and by the time of the Mania was primarily a merchant banker, an occupation that does not exist today, but can be thought of as a combination of commodity trading, private equity, and investment banking.

Having started out in straightened circumstances, Morrison was entirely self-educated. Still, that only hampered him for a few years, as he made up any deficiencies in formal education by reading extensively, and was able to associate on equal terms with many of the leading literary and intellectual figures of the day. Remarkably enough, he managed to self-educate himself while conducting a busy and spectacularly successful commercial career. A sign of the respect in which he was held as a thinker is his election to the famous limited-membership Political Economy Club, one of the earliest professional associations of economists, which played a key role in the evolution of classical economics. He was a very lucid speaker and writer.

Just like *The Times* and the *Economist,* Morrison was enthusiastic about railways' contributions to society. He spoke in very positive terms about the effects of the new technology in Parliament already in 1834, in his response to the King's Speech[128]. Still, he was regarded as a thorn in the side of the railway interests, and in 1846 was thought to be one of most dangerous opponents of the Mania. The main reason he was disliked by the railway industry is that he was advocating limits on railway profits.

To understand why a *laissez faire* advocate like Morrison, who made his fortune out of high profits, would advocate limits on profits, we have to look at his basic philosophy of business. It had much similarity to that of Sam Walton, the founder of Wal-Mart. In the words of his obituary in *The Times*,

> Mr. Morrison was one of the first English traders who reversed his system of management by an entire departure from the old exaction of the highest prices. His new principle was the substitution of the lowest remunerative scale of profit and a more rapid circulation of capital, and the success of the experiment speedily created his pre-eminent wholesale trade. "Small profits and quick returns" was his motto.[129]

Morrison's deep concern with railways was that they would go counter to his motto, and opt for high profit rates at low turnover, and the resulting high levels of charges would strangle the British economy. After considering the economics of railways, he arrived at conclusions that anticipated the natural monopoly doctrine that underlies much of regulatory economics and regulatory law[130]. Hence he did not see how competition could alleviate the evils of monopoly, especially since there was no antitrust law then, and cartels and other combinations were legal[131].

Morrison started advocating government regulation of railways in a notable speech in Parliament in 1836, during the railway mania of that decade. He did not get much attention then, although the Duke of Wellington echoed his recommendations in the House of Lords. During the Mania of the 1840s, though, as more attention was called to railways by the scale of their promotional activities, there was renewed interest in reconsidering railway policy, and Morrison became active again.

The Times, the *Economist,* and Morrison were all advocates of private enterprise, and deprecated government involvement in business. Still, they perceived (together with most contemporary observers) that there were serious deficiencies in corporate businesses. This was especially true, in their views, for railways, with their wide impact on the economy, and their monopolistic tendencies. As Morrison phrased it in Parliament in 1845,

> We have for many years been struggling against monopolies; long before I had a seat in this House, the question of monopoly has proved a subject of keen discussion, of powerful attack. And we now all of us seem agreed that monopolies ought not to be allowed to increase, so plainly have the mischiefs they produce been made manifest to us all, so completely has their impolicy been exposed. Yet what is this House now doing? While combating old monopolies, you have reared up a new monopoly; one more formidable, more extensive in its ramifications, and more injurious than any which preceded it.[132]

James Wilson of the *Economist* was the most doctrinaire of these *laissez faire* adherents, which led him to callous recommendations during the Irish Famine, for example[133]. In 1845 he was trying to deter investors from their headlong plunge into new railway projects by reason alone. *The Times* was willing to go much further, even all the way to government ownership and operation. James Morrison favored a system like that in France, in which concessions were auctioned off to build and run railways for a limited time, at the end of which the lines would become the property of the state. (See Chapter 29 for a little more detail on this approach.) But it seems he did not care too much about the means, what he was after was low charges, and he would accept just about any method that would provide those. Railways in Britain were subject to the usual common carrier restrictions, as well as specific non-discrimination rules in their charters, and in addition had upper limits on their charges. However, Morrison was far ahead of most of the contemporary public in understanding the nature and rates of growth in the economy, a point that will be discussed in much greater detail in Chapter 15, since it contributed significantly to the financial debacle of the Mania. Hence he felt that with time, railways would end up with charges lower than the maximum limits imposed by their charters (and indeed they were in most cases already below those maxima, often significantly so, by the time of the Mania), yet far higher than necessary to attract sufficient capital to the industry, and far higher than other countries would enjoy. (The measure he advocated most frequently was periodic revisions of maximum rates that railways could charge.)

Morrison's preoccupation with railway charges, to make sure they did not hurt the economy and disadvantage Britain in its competition with other countries, comes through very clearly in his speeches and publications. Just like some people have a pet solution that they offer for just about any problem (for example, lower taxes, or limits on carbon dioxide

emissions, or curbs on lawyers), Morrison constantly pressed for lower railway charges. At the height of the Mania, he often argued that the planned level of investment in railways was excessive, but (as will be seen below in a quote from him in 1847) it is not clear how concerned he was with this issue by itself, or whether this was just another way to justify his price control push. His opponents often accused him of resorting to a shopkeeper's tactics, using any combination of arguments to make a sale. This was primarily an attempt at denigration, bringing in his plebeian origins to discredit his ideas. In that era, shopkeepers were in "trade," and so would use servants' doors when coming to see upper class clients, bankers would use the front door. Another avenue to disparaging Morrison was to refer to his recommendations as "pills," often as "bitter pills." This was an attempt to associate him with James Morison, of Morison's Pills. That Morison, with a single "r," was no family relation, and had died in 1840. He had been the notorious manufacturer of certain vegetable pills, which he marketed with the help of what he called the Hygeian system and a shower of promotional publicity.

Still, it is hard not to admit that Morrison's critics had a point in comparing him to a shopkeeper in his advocacy of railway regulation. Morrison advocated government controls of railways in order to lower railway profits, to avoid the problem of high charges. But he also argued that railways should lower fares in their own self-interest, that the increased volume of travel would more than compensate for the lower prices, and increase profits. There was a bit of contradiction in these arguments, as railway advocates were quick to point out. If one accepted both premises, railways would lower their fares, lower fares would increase profits, the high profits would call for even lower fares, which would increase profits some more, which then would lead to yet lower fares, and so on, *ad infinitum*. In a virtuous ratcheting effect, Britain would soon face the delicious prospect of infinite traffic at zero price, and infinite profits[134]. Early Victorians had difficulty accepting such a scenario. It was not until the dot-com area that it became respectable.

Morrison is a fascinating figure, and will be cited many times later in this manuscript. In many ways he was far ahead of his time. But he was not always right. (See Chapter 29 for a particularly interesting case where he seemed not to understand how people thought about the world.) The problem of excessive profits vanished without explicit government regulation. It is amusing (and also relevant for later discussion of investor expectations in the Mania) to note that he was advocating limiting railway profits to 6–7% of capital, as sufficient to attract funding for railways and keep Britain competitive, and yet avoid the overinvestment of the Mania. The railway industry attacked him fiercely, since it had expectations of 10% or higher profits. But just a few years later, they would look at profit rates of even 6% as just a distant dream, and would agitate for government to step in and assist investors to move up towards that level. Although railway profits did recover from the depressed state of 1849, when the share market hit bottom, they spent most of the rest of the century in a downward slide, towards 3%. This level turned out (with extensive assistance of promoters dangling "beautiful illusions" in front of investors) to be sufficient to attract the necessary capital for continuing railway expansion.

In his push for low railway charges, Morrison consistently painted a very rosy picture of the railway industry. This will be shown in many of the quotes from him that appear

later in this manuscript. At this point let me cite his last speech in Parliament in 1847. (He did not run in the elections that were held that summer, so this was the end of his Parliamentary career.) The debate concerned the financial panic of that spring. It was a fairly minor affair compared to the one that was to come in the fall of that year. Still, it aroused serious concern, and railways were often blamed for a large part of the trouble. Morrison opined that

> [n]o rational man doubted that the great extent of railways projected could never be executed. The thing was impossible, and at the same time absurd. Half the lines for which bills had passed could never be constructed. The house had chosen to confer certain privileges on certain railway companies, and the result was that the employment of capital in those lines offered a larger amount of profit than the employment of the same capital in any other way; and if the parties engaged in railway schemes offered a greater interest than other speculators were willing to pay, it was obvious that money must rise in the market to a very high rate of interest, and then how were the manufacturers of the country to go on? ... it appeared to him that a remedy could only be found in preventing too great an increase in the sums paid for the use of capital; it would therefore, he thought, be highly expedient to place such restrictions on future railways as would, by diminishing their profits, deprive them of all motive to pay large premiums for use of capital.[135]

As in all his other speeches and writings up to that point, it is clear that the main danger he saw was high prices and high profits. There is no hint that, once the new railways were built, they would prove unprofitable[136]. Hardly something to discourage investors from going ahead.

12.4 Effect of Mania opponents

What were the effects of the earnest efforts of *The Times,* the *Economist,* and James Morrison, or the satire of William Aytoun? According to one source ([209], p. 15)

> John Anderson, who became secretary and manager of the first railway to penetrate the West Highlands, declared that Glenmutchkin set back railway development in that area by twenty years.

And the quote from Bagehot earlier mentioned that James Wilson, the editor of the *Economist,* was sure that his warnings had "saved several men their fortunes." There is no reason to doubt these assertions. But we need to realize that the Railway Mania had many facets. The feverish activity of setting up new railway companies peaked in October 1845. Plans and various other documents had to be deposited with a government office by November 30, and it took time to do a survey, draw up plans, etc. So if promoters did not have shareholder deposits in hand, engineers lined up, etc., by the end of October, they basically had no chance to meet the deadline. In any event, at that stage, most of the new projects were Glenmutchkins, set up just to have "a pluck at the public pigeon." Investors who got drawn into these schemes typically lost all or a large part of their deposits, but

these were not large in relation to the economy as a whole, although often far more than individual investors could afford. The warnings by James Wilson and William Aytoun likely had their greatest effect at that stage.

The really big financial losses, though, occurred later, in 1846–49, when actual construction was undertaken. And there the role of the skeptics is hard to judge. Most of the warnings to investors were just about the medium-term problems of raising finance for construction, not about the precipice awaiting them once they got over that hump. Even during that year of feverish speculation, 1845, the skeptics may have had a counterproductive effect on some investors. Some of them were calling for the government to step in and control the mania, and there was serious fear in the market that their urgings would be heeded:

> A rumour has been prevalent, both yesterday and to-day, respecting an order in council, said to have been agreed to, for the purpose of prohibiting the registration of more new railway projects, on the ground that those announced are already too numerous for the grasp of Parliament in the next session.[137]

If you are a promoter or an investor, and have a hot prospect in hand, and hear rumors that new projects will be blocked soon, what is the logical thing to do? Rush it through before the door slams shut, of course. And that may well have been the effect on many projects that were started earlier that summer.

As a final comment, when faced with the possibility of planned railways demanding up to £100 million per year for several years, the various skeptics claimed that Britain could not afford to invest more than £20–30 million per year. The average investment in the years 1846–49 was £33 per year, not that far above a level that skeptics felt was justified.

In 1847, the peak year for spending, about £44 million went into this new infrastructure, even though the government did not intervene to impose limits. The market intervened on its own. In the words of a report[138] "[i]f railway companies had experienced no extraordinary difficulty in raising capital during 1847, it may be estimated that their expenditure in that year ... would have been about [£64 million]." Of course, one can speculate that if it had not been for the activities of the skeptics, with their drumbeat of warnings, investors would not have lost heart, would have paid the higher rates demanded by the financial markets, actual investment might have reached £64 million, and the final losses would have been correspondingly larger. But these are just speculations. What is indisputable, though, is that the skeptics overwhelmingly concentrated on the wrong problem, namely level of investment. They overlooked the real problem, namely the inevitable lack of profits at the end of the burst of investment. Their appeals to limit the rate of investment in railways may have been persuasive to some policy makers. At the level of individuals, such appeals could only work through their sense of altruism, and that, although not negligible, is not too powerful. Had these skeptics been able to show that profits on completed lines would be meager, they could have brought in the far more powerful force of self-interest to achieve their aims. (Interesting comparisons between strengths of altruism and self-interest can be made by considering how people reacted to the Railway Mania and to the Irish Famine and the emancipation of slaves in the British empire a decade earlier.)

Self-interest should have induced investors to realize themselves the delusions that they were suffering from, and which led to the disaster of the Mania. The next few chapters discuss these delusions.

13 The reliably unreliable engineers

The trust that investors placed in civil engineers during the Railway Mania could be taken as a *prima facie* proof of a collective hallucination. There was certainly little justification for such trust. These engineers had shown they could build railways that worked, but they had not shown they could build them for anything close to the promised cost. One of the Rothschilds (who made much of their fortune financing railways around the world, although not British ones) is supposed to have said[139]

> *There are three roads to ruin: gambling, women – and engineers. The first two are more pleasant, but the last is the most certain.*

Table 6 in Chapter 18 presents data on several railways started in the mid-1830s. On average, construction costs turned out to be about twice what had been projected. And this was typical, and was well known. The press, even the railway press, was full of references to things such as "the very foolish extravagance" and "the discreditable inaccuracy of Railway Engineers"[140]. Some engineers were very defensive, and came up with a variety of (sometimes imaginative) excuses. Some were more forthright. Thus Charles Vignoles, a well-known civil engineer of that era, wrote in the early 1840s, in an article about railways for Ireland ([213], p. 128), that

> whatever might have been the attention bestowed upon railway projects in Ireland, by speculative capitalists, a few years ago, it is equally clear, from the present state of the sharemarket in England, and from the heavy disappointment of too highly-raised expectations of profit from those undertakings, and from the reckless, ruinous, and unpardonable excess of expenditure over parliamentary estimates of cost, that any thing like an extensive embarkation of private funds, in railway speculations in Ireland, is now utterly hopeless, for a very long, long time to come, except indeed for one or two particularly choice and short lines ...

But deeply ingrained habits are hard to break. The achievement that gained Vignoles the greatest acclaim among the engineering fraternity was the design and construction of the famous suspension bridge in Kiev (capital of Ukraine, then in czarist Russia). This project was started at the end of the 1840s (thus long after he penned the passage above about "the reckless, ruinous, and unpardonable excess of expenditure over ... estimates") and was completed in the 1850s. There the final cost was again "nearly twice the original estimate" ([215], p. 145)!

In general, technologists have not been good at estimating costs. And this applies to all technologies, and all times. And technologists always have a variety of (sometimes imaginative) excuses. And they always promise that they have learned from experience and will not do it again. And so it was with civil engineers of the Railway Mania period.

One of them, Francis Whishaw, in the book cited earlier about British railways of the early 1840s, claimed ([217], p. 292):

> In the last eight years, however, engineers have acquired considerable experience as to the construction and cost of these important works: and we see no reason why every item of future estimates should not be set down with such an approach to accuracy, as shall afford the shareholders of any new line a reasonable hope of their expectations being literally fulfilled.

And investors believed him, and the other railway engineers. It was not necessary to wait "for a very long, long time to come" for them to get excited and accept engineers' estimates again. That, of course, raises the question of how important investors' short memories are to technological progress. A Martian who looked at human history might conclude that the trust shown in engineers, civil or not, demonstrates a high degree of inborn credulity in *Homo sapiens*. Just how essential is that? And is it truly inborn, or is it manufactured by modern society, part of the reason we are where we are? Are the emphasis on credulous simplicity and cheerleading among economic policy makers and economists in general, noted in the Introduction, just part of the general societal atmosphere that helps keep investors gullible?

It was not just engineers' promises that swayed thinking. There were some reasonable arguments and even some solid data substantiating the hopes that costs would now be lower, and closer to estimates. Railway technology had visibly improved, so trains could be trusted on steeper gradients and sharper curves, making it seem believable that lower construction costs were feasible. And there were new ancillary technologies, such as the electric telegraph that promised the possibility of being able to operate single-track lines with their lower costs where earlier double track was required[141]. Furthermore, some of the handful of lines that were built entirely in the early 1840s (one of which, the Yarmouth and Norwich Railway, will be discussed in some detail in the next section) did come in at a much lower cost than the average for the lines from the 1830s.

In addition, there was a very important, and for railway investors very hopeful, development, namely the rise of large and experienced contractors, of whom Betts, Brassey, and Peto became the most famous. In the 1830s, contracts for the earthworks, the cuttings and embankments, the most costly part of railway construction, were typically let to small, inexperienced contractors in small sections (since that was all they could handle). The railway's engineer was then supposed to supervise the work in detail. But this did not work out too well. Those contractors often bid at the estimated cost, but then proceeded to do shoddy work, or walk off the job, or go bankrupt, resulting in delays and cost overruns. An amusing story about railway contractors is told in a biography of one of the most famous of them, Joseph Firbank ([149], p. 26):

> [A] story is told of the well-known contractor, the late Mr. Wythes, in the early days of railway making, tendering for a contract for an important piece of railway work in this country. He at first thought that about £18,000 would be a remunerative price, and, on consulting, like a prudent man, with his wife, it was agreed to put in a tender for £20,000. Thinking it over, however, they agreed that it would not be

> well to run any risk, and that £40,000 would be a safer figure; and after "sleeping over it" the wife, in the morning, said: "I think you had better say £80,000, just to be on the safe side." This sensible advice was followed, the tender was by far the lowest sent in, and being accepted, formed the foundation for the vast fortune which Mr. Wythes subsequently amassed.

This story may well be an embellishment on the truth, but there are other, well authenticated, examples, in the same book [149] as well as in Parliamentary testimony during the 1830s, of the widely divergent estimates that were produced for railway earthworks. Railway construction in the 1830s was a new business, performed on a vastly larger scale than earlier projects. Hence railway investors of the Railway Mania could hope that the investors of the preceding decade had paid for the education of the contractors and engineers. Furthermore, what emerged from that earlier experimental period was a collection of large contractors (men like Brassey, Firbank, and Peto), who could handle the scale and scope of an entire job, and had the resources to pay for occasional mistakes. James Morrison claimed in a pamphlet published in 1846 ([157], p. 11) that

> whatever may have been the risks of the first experiments in railways, there is now perhaps no form of investment depending for its results on the accuracy of estimates, and, therefore, not absolutely certain, in which there is so little room for miscalculation as in English railways. The construction of a line, as planned by the engineer, may be contracted for at once, whatever its length, thus rendering the cost certain; ...

Note that Morrison did not write that engineers could by 1846 be trusted to provide accurate cost estimates. (He was probably too shrewd for that.) What he was pointing out is that due to the rise of large railway contractors, a major business innovation, the risks of cost overruns could be transferred to them.

The arguments about lower costs, fortified by a few examples of railways built at low cost in the early 1840s, before the Mania, were accepted very widely. As one example, the third report from Gladstone's Parliamentary committee in 1844, cited earlier, declared[142] that among the six reasons to expect "a very great extension of the Railway System within the next few years" was "the reduced amounts of Estimates of Cost, and the comparative certainty with which they can be made."

The belief that railway construction costs were now lower and estimates more trustworthy also helped railway enthusiasts during the Mania to refute some of the skeptics' arguments. The question that did get raised from time to time, especially in the early stages of the Mania, was how were all these new projects going to make money, when investors a decade earlier, during the smaller railway mania, turned up their noses at them, and when the currently operating lines were paying only decent, but not spectacular profits? Well, with costs lower, railway supporters argued that profit prospects were now far more promising, and so routes with less traffic would pay[143].

As it turned out, investors' faith in engineers' estimates turned out to be misplaced again. There were, yet again, significant cost overruns. Estimates for lines built during the Railway Mania were about £20,000 per mile. Actual costs were over £30,000 per mile,

roughly what they had been for the lines of the railway mania of the 1830s. Engineers had excuses again. Land cost more than estimated (and engineers had little to do with either the estimates or the negotiations and legal proceedings involved in land acquisition.) Both wages and materials cost more than expected (to a large extent because of intense competition from the other lines being built at the same time). And some of the high cost ascribed to new lines likely reflected improper accounting, with some of the capital expenditure devoted to improvements to the old lines for which the new lines were branches, for example. Most important of all, there was another, little known, factor, discussed in the next section, that was not mentioned in railway promotion. But whatever the reasons, investors' hopes for lower costs were disappointed. The cost overruns were not as bad as during the earlier mania, only 1.5x as opposed to 2x. (And that is nowhere near as bad as on some modern transportation projects. For example, the Boston "Big Dig" had been sold to the public as a $2.5 billion project, but ended up costing around $15 billion.) Still, those overruns were bad enough to greatly reduce investor returns. Had everything else worked out as projected, on average the railways of the Mania would likely have ended up being regarded as indifferent investment, not disasters, but not successes.

Cost underestimates by technologists are almost universal. And there are very few overestimates. Which raises an important question, similar to those about promoters, namely whether engineers are consciously fooling their clients (and there is the question of who their true clients are, the investors, or the promoters), or are fooling themselves, and engaging in too much wishful thinking. David M. Levinson, who has considerable experience in transportation planning, comments (private communication) that

> Recognizing that initial engineering cost estimates are more likely to underestimate an uncertain cost than overestimate it, in practice engineers often double their first estimate, and then sometimes their bosses double that.

There are some quantitative studies on this topic, for example [77], which will be considered in *BICS*, where this topic will be treated in more detail. At this point let us just note that suspicions about railway engineers' honesty (as well as competence) were rife in the 1830s and 1840s. The quotes from [217] and the review [5] of [217] in Chapter 9 illustrated the attitudes after the railway mania of the 1830s. In the aftermath of the Mania of the 1840s, Herbert Spencer, who spent many years working as a railway engineer, wrote in his famous work, "Railway morals and railway policy" ([206], pp. 70–71 of the pamphlet version) that "[t]he morality of railway engineers is not much above that of railway lawyers."

Given the consistent record of cost promises being exceeded, the natural question is why those initial cost estimates are not raised by some multiplier based on the extensive experience we have? And why does that not lead to providers lowering their estimates further, to compensate for the multiplier, leading to an increase in the expected multiplier, etc., in a spiralling arms race? That does not seem to happen, and instead a reasonably stable equilibrium exists. And so at some level, conscious or not, investors must understand that they are being fed "beautiful illusions" that are not likely to be realized precisely. Are they being fooled, or getting help in fooling themselves? Are they perhaps deriving some value from the entire process aside from the financial rewards? These are all important questions that I will put aside for the moment. The main point of the discussion so far,

though, is that at the level of public discourse, investors during the Railway Mania accepted the promise of lowered costs, a promise that was broken.

Not everybody was persuaded by the rosy cost estimates put forth. The Dionysius Lardner survey, "Railways at home and abroad," was published at the end of 1846, and thus in time to affect most serious capital expenditure decisions. He wrote ([125], p. 497):

> The amount of capital of the companies whose Acts were passed in 1845, exclusive of loans, was £29,168,640; which, divided among 1793 miles, is at the rate of £16,268 per mile. Now we have shown that the 2000 miles of railway in operation have absorbed capital to the amount of £35,000 per mile; and it may, therefore, be asked, how nearly an equal length, is now to be constructed, at less than half the cost? [three examples of original estimates compared to actual costs]
>
> In fact, the estimated capital is not even a tolerable approximation to the cost of a railway.
>
> It is contended that, owing to improved machinery and other causes, railways can be constructed at a less expense now than formerly. In some of the items of expenditure this is true: but others, such as the cost of land, certainly are not changed; and some, such as wages of labour, will certainly be augmented. We shall probably be near the truth if we allow £30,000 per mile, for the lines still to be constructed.

And he was almost exactly right[144].

Warnings and even concrete signs that there would be cost overruns started appearing early. There were stories about price of iron going up, locomotive works not accepting new orders except for delivery several years into the future, and so on. A particularly prominent warning was created out of a stray remark by Isambard Kingdom Brunel. He was one of the most prominent railway engineers of that era (and there will be some further comments about him in Chapter 30). In early 1846, when the great flood of proposals spawned during the climactic 1845 season was just beginning to be seriously considered by Parliament, Brunel testified in opposition to the proposed London and Oxford Railway, and according to the report in *The Times,* said:

> The prices have so increased since the acts were obtained, that the lines mentioned above [which had been authorized in the previous sesison] cannot be constructed at the estimated prices. Considers that the construction of railways was now 50 per cent more than at this time last year.[145]

This may have been a poorly thought-out remark, since if it were true, the prospects for many of the new lines that Brunel was engineer for would be shot to pieces. But it more likely represents a misquotation, as the *Daily News* had a much less dramatic report on Brunel's testimony[146]. Still, for many people, the 50% figure was a very convenient weapon to wield in several of the fierce political battles that were being waged. *The Times* cited it in at least two leaders[147]. There were also some prominent ads published in many newspapers trumpeting this claim[148]. It gained much greater prominence by being invoked in a House of Commons debates, which meant that almost all papers mentioned it in one form or another. Peel, the Prime Minister, cited Brunel's 50% estimate to support his (mild)

moves to limit railway expansion. In response, George Hudson disputed Brunel's claims, and said that "the price was not so greatly advanced as to prevent parties embarking on these undertakings." More importantly, B. Denison, in the same debate, declared that he

> had within these few days put himself in communication with several railway contractors on that subject, all of whom had declared that Mr. Brunel's statement was a very extravagant one. There was no doubt that railways could not be made at present at so little cost as they could some three or four years ago; but it was idle to talk of the cost being 50 per cent. greater; it could not be more than 10 or 15 per cent. at the utmost. (Hear, hear.)[149]

So here was a very visible discussion with even an ardent railway expansion supporter admitting that prices were likely to go up 10–15%. And it was extremely visible, since essentially all newspapers carried some coverage of Parliamentary debates, although not in the detail that the London dailies did. Most of the ones I have looked at did cite Peel's reference to Brunel's 50% cost rise claim, but usually did not give details of the Hudson and Denison speeches. The *Leeds Mercury* was unusual, in that its coverage of Parliament did not even mention the 50% rise, instead it cited Peel as saying that "[s]ince 1844, the expense of construction had greatly increased, and it was likely to continue to increase; such was the opinion of Mr. Brunel last year." However, in a leader on the same page on government railway policy it wrote that

> The greatly enhanced cost of all materials and labour for railways since last year, estimated by Mr. Brunel (perhaps, over-estimated) at 50 per cent., is not only an obstacle to the accomplishment of the new projects, but entails serious difficulties on the railways now in course of completion.[150]

Thus the public would have had to be totally oblivious to the news not to notice that costs were certain to escalate beyond the official estimates. Many of the dire warnings were clearly coming from people with a strong political agenda, so it's not likely that much credence was placed in the Brunel prediction of a 50% increase. But even strong supporters of railway expansion appeared to be admitting that a 10–15% rise had already occurred[151]. This may have influenced some decisions to abandon lines. But for the most part, investors shrugged off these warnings. An increase of 15% was not going to kill the profitability of their lines[152].

The 10, 15, or 50% cost increase in the discussion above was not something that could be blamed on the engineers. Rather, it reflected the increased demand for labor and materials caused by the dramatic rise in railway construction. The existence of this increase, although not its exact size, was very visible. However, there was an additional and much substantial increase that was not very visible to investors, although not hidden too well, which engineers and promoters should have been aware of. It will be discussed in the next chapter. It was likely at least 15%, perhaps as much as 30%, and combined with perhaps a 15–25% general construction inflation, produced the 50% increase in total costs that was experienced (on average) during the Mania.

The main argument that investors of the Railway Mania period were irrational, which will come later, does not use the fact of cost overruns as evidence. Yes, Lardner and

some other people had suspicions that the estimates of costs dangled in front of investors were unrealistically low. And there was evidence to back those suspicions up (including comments from eminent engineers such as Brunel and Robert Stephenson). But these were still just suspicions. There was only a little bit of hard data (to be discussed in the next section) that showed cost overruns were inevitable, but it was obscure, and it is not reasonable to expect investors to have known about it. Further, given investor expectations for revenues, even the cost overruns that did occur would likely not have deterred the buildout. More precisely, had the hoped-for revenues come through, even with the costs that were incurred by 1850, say, investors would have obtained returns far above risk-free ones available in the market. Thus this is not a case of expecting to pack 150,000 people into a ballpark built for 50,000. We would not be justified in arguing that the market were irrational just on the basis of cost overruns. What I will show is that even if actual costs had come in at the estimated amounts, investors would still have been ruined.

The main reason for citing the unrealistically low cost estimates is to provide some context for investor attitudes towards demand estimates, which is the focus of this manuscript (and where the main losses for investors came from). In order to embark on the Railway Mania projects, they had to put their faith in the engineers, who had proven during the mania of the 1830s to be grossly untrustworthy. Attitudes towards engineers at that time are a fascinating topic that I have to skip. They were both exalted and reviled. And it should be said that investors were not totally naive about cost estimates. There is plenty of evidence, which I won't go into here in the interests of brevity, that they were suspicious of engineers, and watched them carefully. Unfortunately investors had no choice if they wanted to participate in the perceived gold rush. The engineers were the unavoidable gatekeepers on the way to the gold fields, and sometimes (more like 9 out of 10 times) they charged a toll that was 50% or 100% higher than agreed upon. Once you accept this unwarranted faith in engineers' promises, neglect of demand estimates becomes much easier to understand, especially if you get a sense for how accurate those had been.

14 Tacit collusions and beautiful illusions

Jean Baptiste Colbert, Louis XIV's minister of finance, said that the art of taxation consists in so plucking the goose as to get the most feathers with the least hissing. Perhaps then the art of running financial markets is to fleece the (investor) sheep so as to get the most wool while keeping them so entertained that they don't notice. But that seems far too one-sided a view. Another position might be that for society's good, it is important for most market participants to buy into "beautiful illusions" that will lead them to exertions that most are likely to regret individually, but which will produce general benefits.

The Railway Mania involved various types of fraud and corruption. In this section I concentrate on certain tacit collusions. They were easy to discern for the public with a little bit of digging, but were not obvious, and have attracted little attention so far. They served to produce illusions considerably more beautiful than was justified. They did so by a relatively crude means (crude by the standards of modern financial markets, that is), by omitting some absolutely necessary expenditures from railway estimates. The only

discussions of these omissions in modern books that I have found are in [27, 188]. John Barney wrote ([27], p. 8):

> Coupled with the fact that promoters seldom budgeted for anything more than the bare cost of engineering and laying the line and so frequently failed to allow for such essentials as stations, sidings, signalling systems and even rolling stock, it is hardly surprising that most railways staggered throughout their early lives in a state of financial crisis. Yet had adequate allowance been made initially for all the eventual costs the size of the capital subscription required might have been such as to deter the public from putting up any money at all.

Note that this is not different in substance from the comment in [5], cited in Chapter 9 on the development of the British railway system after the mania of the 1830s, which wrote of "the mystification practised by projectors, contractors, and committees," except that Barney specifies some of the tools of this "mystification." But there is a substantial difference in tone. Barney, writing about the Railway Mania of the 1840s and its disastrous outcome, shows a certain level of bitterness. The anonymous 1841 writer of [5] was inclined to "congratulate the country on the result, however much the mystification practised by projectors, contractors, and committees is to be blamed." But this was in the aftermath of the railway mania of the 1830s, which was not yet perceived as a success, but was not a disaster, and with the assistance of some "beautiful illusions" could be represented as being on the way to success. Let us recall that such differences of view are common in politics, where the same course of action may be called outrageous demagoguery if it fails, and visionary statesmanship if it succeeds.

Barney did not get into the details of items that were not budgeted for, but Colin Robertson in his earlier book [188] did, at least for some lines (p. 79ff and 169ff). How did promoters get away with it? It's a long story that will be dealt with in slightly more detail in *BICS* than here. Much of it can be garnered already from [188]. The earliest railways were meant (both in Britain and the U.S.) to be just rail ways, companies that would put down track and allow it to be used (on payment of prescribed toll) by carriers who were to use their own carriages, horses or locomotives, etc. No thought was given to the need for "stations, sidings, signalling systems" since in the primitive early stages of the industry, when thinking was based on the example of canals, it was not known such were needed. Then, as the industry evolved, and railways became carriers, the need for all the additional expenditure became evident, but promoters could and did argue that because of precedent, they should not have to allow for them in their Parliamentary estimates. And somehow the need for these expenditures faded into the background, and during the Railway Mania they became almost invisible[153].

I will illustrate this process of unavoidable expenses "hiding in plain view" through the example of the Yarmouth and Norwich Railway. It is the subject of a large part of the Barney book [27] as it was one of the two merger partners that formed the Norfolk Railway. This line presents many interesting features (some that will be discussed further in [165] and *BICS*). It was sanctioned by Parliament in 1842, and went into regular commercial service in May 1844. It was therefore one of the very few lines promoted and built in the

interval between the railway manias of the 1830s and 1840s. First, however, a word about railway finance.

Chapter 9 used the "alternate history" of the Glenmutchkin Railway to illustrate the travails of many lines sanctioned in the 1830s. In Aytoun's story, this line's prospectus gives the capital as £240,000. The usual practice by the mid-1830s was to also allow railways to borrow up to one third of equity capital, which in the case of the Glenmutchkin line would have been £80,000. Why have any borrowing powers at all? The capital markets were developing rapidly, but public opinion followed only slowly, and the overwhelming feeling was that ideally only equity finance should be involved in financing corporate endeavors. The cost estimates for railways were supposed to cover acquisition of land and construction, with typically a 10% margin built in for "contingencies." And all of that was supposed to be covered from the authorized share capital. So why ask for the additional 33% in loans? Robertson in his book ([188], p. 180) quoted from the Glasgow Paisley Kilmarnock & Ayr Railway hearings, where the agent for this project was grilled on this issue. He twisted and squirmed as he was pressed:

> How can it be; if everything estimated to be done is brought within [£623,000] and you want to use any of that [additional £208,000 in loans], do you mean to say that it is in the Estimate? – It is quite possible there may be other Expenses not calculated.
>
> Is it in the Estimate? – I do not know that there is any thing necessary but what is in the Estimate.
>
> Then what are you to do with it? – The Estimates themselves may be wrong.
>
> But then is One Third to be added to cover the Deficiency that may be on the Estimates – Yes.

In retrospect, most people felt that promoters were well aware not only that "[t]he Estimates themselves may be wrong," but that they *were* wrong, purposefully understated in order not "to deter the public from putting up any money at all."

The Glasgow Paisley Kilmarnock & Ayr case was considered by Parliament in 1837. In 1842, when the Yarmouth and Norwich project came to Parliament, its prospectus stated that the authorized capital was to be £150,000, with power to borrow an additional £50,000. The public, reading the prospectus or news coverage, could easily have concluded that the line was expected to cost £150,000. However, the promoters were fairly open about the fact that the additional £50,000 would be needed for this line. This was clear in their Parliamentary presentation, where their business case made an allowance for paying 5% on the borrowings when computing the profit to shareholders[154]. It was also clear in the report of Robert Stephenson, engineer, to the preliminary meeting in Nov. 1841, where it was clearly stated that the cost would be £140,000 for construction. However, it would also be necessary to allow £10,000 for contingencies, and £50,000 "for the purchase of engines, carriages, offices, &c."[155] It was also clearly stated in the report of the first regular meeting of this company, once it was approved and officially incorporated. George Parker Bidder, an associate of Robert Stephenson, had been both the engineer and the traffic taker for this project. At this meeting, where the directors' report on finances made it clear that

the official capital of the line was £150,000, Bidder was positive about the cost estimates being firm, and said:

> He need not inform the meeting that Railway Companies and their Engineers had attained no enviable reputation from the additions which it had been found necessary to make to their estimates, but as a very humble member of the profession to which he belonged, he must protest against the whole responsibility of railway estimates and expenditure being thrown in upon the Engineers, and when he informed them that in some cases very little more than one-third the total cost of a railway was either estimated by or expended under the control of the Engineer, they would not doubt perceive the justice of his remarks. In the present case, with the view of defining the responsibility of each department, the estimate was devided as follows, viz.:–Engineering and contingencies, [£150,000]; land and compensation, [£35,000]; Management and salaries, [£15,000]; making an aggregate of [£200,000]. He believed sincerely, that with care and economy none of the above heads of cost need to be exceeded, though the Engineers had nothing to do with the latter portion.[156]

Bidder promised too much. The final cost of the Yarmouth and Norwich turned out to be just a bit under £240,000.[157] Compared to the promoters' budget, that was just a 20% overrun. But someone looking at it from the standpoint of conventional British railway metrics would see a 60% overrun, with costs of £240,000 compared to capital of £150,000. But if a shareholder paid attention, either by attending shareholder meetings and listening carefully, or by reading the specialized railway papers, it was very clear what was expected. The planned budget for the line was £200,000, even though the share capital was just £150,000. Further, interest on the borrowings was provided for in the operating budget.

The Yarmouth and Norwich Railway was very explicit in presenting a detailed estimate of costs to both shareholders and Parliament, one that covered almost everything, and made it clear that the power to borrow would be used to the fullest[158] But that was 1841–42, and as the Mania got going in the next few years, such details seemed to get lost. It is hard to tell just how frequent and extensive the practice was, but it appears that much of absolutely unavoidable expenditure was not budgeted for, at least not in the estimates that were to be covered by the stated capital. This phenomenon was not reported on to any significant extent by the press. Occasionally there would be glimpses of the harsh reality intruding on the "beautiful illusions" that the investing public was treated to. For example, a report in *The Times* on a railway hearing in 1845 noted that

> [the engineer] admitted that he had not included the Parliamentary expenses in his estimate, but that they might be reckoned at [£125,374], which would go into the margin as extra contingencies. He had not put down any sum for carriages, &c. If the company got any traffic they must get carriages (laughter)–which, with the total cost of "the plant," &c., might be put down at [£3,000] per mile, which would come to more than [£1 million] in excess of his estimate [which was around £6.4 million].[159]

Nothing was made of this admission. The impression the public obtained from practically all press accounts (with very rare exceptions such as this one) was of Parliamentary committees working diligently at scrutinizing proposed lines, leaving no stone unturned. For example, an earlier report in *The Times* on the same committee featured in the above quote (surely by the hand of William Howard Russell, the one discussed in Chapter 2, and the one who penned the passage about "those sibylline leaves called traffic-tables" cited there) noted:

> The committee met shortly after 1 o'clock, ... and proceeded with the interminable evidence in support of the above line, which has now occupied the committee 22 days, without the production of any testimony as to the engineeering merits of the line. It must be confessed that the members show every anxiety to make themselves thoroughly acquainted with the merits of the project before them, and frequently cross-examine the various witnesses at nearly as much length as the learned counsel themselves.[160]

So if the Parliamentary committees were so careful, how could promoters get away with not including all those extra estimates in their main projections? It must have varied, but they likely invoked the presence of contingency sums in the budget (as the engineer in the first quote from *The Times* above did), the ability to borrow up to a third of the capital, and of course precedent. In any event, it appears that they succeeded then (as many others have done since) in bamboozling the public.

It is noteworthy that knowledge of these unavoidable expenses that went beyond official estimates does not seem to have been widely known. Lardner did not mention them in his survey [125], even though he almost perfectly predicted the degree of cost escalation. The *Bankers' Magazine* mentioned railway costs in late 1846. This was after all the discussion about Brunel's "extravagant" claims of 50% cost inflation, and after the admission by an ardent railway extension supporter that costs were likely to go up 10–15%. Yet this publication was willing to entertain the idea that costs might exceed estimates by only about 16%[161].

Yet knowledge that carriages and the like were necessary but routinely not part of the estimates must have been widespread. All the engineers, and all the key promoters, as well as contractors, must have been aware of it. In particular, the engineers must have known they were going to be blamed for the cost overruns, and be charged again with "reckless, ruinous, and unpardonable excess of expenditure over estimates," even if all their projections turned out to be correct. Hence they must have been willing to accept the role of scapegoats.

So how come the information did not spread? Well, it simply did not, and is just one of many instances of inefficient markets and ineffective information dissemination systems.

The inefficient dissemination of information about inevitable cost overruns during the Railway Mania is comparatively trivial compared to what has happened in recent years. We have abundant evidence that it is possible to fleece large classes of even supposedly knowledgeable people. A perfect example is that of monetary inflation. Over the last half a century, academic researchers have erected the beautiful edifices of the rational expectations and efficient market theories. But at the same time, governments around the world ran a series of practical experiments. They discovered that irrespective of what the theories said,

economies get disrupted by high levels of inflation, whether expected or not, but appear to tolerate, and even benefit from, low levels. So the reigning monetary doctrine proclaims levels of inflation of 1–2% per year as "price stability," and central banks aims to achieve that. This has the nice benefit (nice for the governments, that is) of taxing away 0.5 to 1% per year of the ready-money savings of the population without being seen to do so.

A more relevant example to cite, since it involves private markets and extensive, if hidden, collusion, is that of the mutual fund scandals of a decade ago. Managers of some mutual funds allowed, and often even encouraged, certain hedge funds to steal from other shareholders of those mutual funds through practices such as 'late trading.' What is particularly interesting about that example is that it did not come to the public's attention until New York Attorney General Eliot Spitzer sued some of the practitioners in these schemes. Yet there had been academic papers showing statistically that some of these abuses had to be going on. Further, many ethical mutual fund managers took steps to bar some of these practices, and were certainly aware of them, since they had been approached by hedge funds. So there were hundreds, more likely thousands, of sophisticated people who were aware of what was going on, but nothing was done for years, and there was little public information.

The conclusion is that there was nothing unusual about the tacit collusion of all the people who were aware that the cost estimates presented to the public and to Parliament were polite fictions. Some contemporaries had a sense of the process, if not of the exact detail. Most likely they regarded this as just part of the general process of fleecing of shareholders. Consider the following passage from the penultimate paragraph in "The Glenmutchkin Railway:"

> When the time came for the parliamentary contest, we all emigrated to London. I still recollect, with lively satisfaction, the many pleasant days we spent in the metropolis at the company's expense. There were just a neat fifty of us, and we occupied the whole of a hotel. The discussion before the committee was long and formidable. ... We fought for three weeks a most desperate battle, and might in the end have been victorious, had not our last antagonist, at the very close of his case, pointed out no less than seventy-three fatal errors in the parliamentary plan deposited by the unfortunate Solder. Why this was not done earlier, I never exactly understood; it may be that our opponents, with gentlemanly consideration, were unwilling to curtail our sojourn in London–and their own. ...

Aytoun, the author of the story, had a keen sense of the dynamics of railway promotions. The parties that traveled to London were numerous, and were paid well, the five guineas a day that M'Corkindale promises Dunshunner in the story being the standard rate. And we do have testimony that they usually had a jolly good time. The lead lawyers and the main actors from the promoters' crew (the main engineer, the head traffic taker, ...) had an incredibly hectic life. But for the minor players, there was only a few hours per day (from noon to 4 pm, typically) that they had to spend in the uncomfortable "temporary" wooden sheds built for committee hearings, alternatively too hot or too cold, and usually overcrowded and stuffy[162]. Aside from that, they were free to enjoy London, a giant metropolitan area that most had never seen before. And they could afford normally

unheard-of luxuries, such as turtle soup (which was often cited by aggrieved shareholders in later years as one of the sinks for their savings). There are good reasons for thinking that not infrequently, parties to these "most desperate battle[s]" did show "gentlemanly consideration" for each other, and "were unwilling to curtail" either their own or their opponents "sojourn in London." Macaulay complained in a letter to a friend ([176], pp. 258–259) that "I have the very leavings of Westminster Hall prating to me against time for ten guineas a day; and I really see no hope of termination."[163]

Many of the people involved in these tacit collusions were likely not outright frauds, and may well have thought they were only "gilding the lily." (Think of all the people involved in the real estate bubble of the last few years, the appraisers who took very optimistic views of the value of houses, the lending officers who did not worry about verifying stated incomes of borrowers, the credit rating agency employees who assigned high grades to all that dodgy paper. Most of them, it appears, did not think of themselves as undermining the whole financial system, just bending the rules a bit in order to keep their jobs and keep up with their competitors.) If the almost universal view that the traffic takers were far too conservative in their projections had been true, and if nothing else went wrong, then cost overruns of 33% would not have changed the attractiveness of the Mania projects too much. If the revenue were sufficient to pay 10% on the officially estimated capital (which, as I will show in Chapter 22 was the almost-universal expectation), then a 33% cost overrun, financed through borrowings at 4% (a rate that was realistic during the halcyon days of 1845), would only lower the rate of return to the shareholders to 8.7%, something they would still have been happy with. However, if the traffic taker projections of 7% return on official estimates were to turn out to be correct, then a 33% cost overrun, even financed at 4% (which became unrealistic in 1847) would lower the expected return to shareholder to 5.7%. That would have been marginal, and even then could be achieved only if nothing else went wrong.

The point of this chapter is to show that information dissemination was inefficient during the Railway Mania. There was information that was known to a substantial body of industry insiders, and that could be dug up with a little diligence even by outside investors, that would have shown the cost estimates they were being shown were fictitious, just "beautiful illusions." However, these facts by themselves would not necessarily have stopped people from investing in railways, and they did require some diligent investigation. It is not realistic to expect the Brontë sisters to have done it, and even for Charles Darwin and John Stuart Mill it would have been a stretch. So I will not use this in the main proof of the market inefficiency at the time of the Railway Mania. What I will show in the next few chapters is that there was a much more convincing argument that the Mania was destined for utter failure even if the cost estimates had turned out to be correct. This argument could have been constructed by any intelligent person, with just a few minutes' reading of the book [178] and a few minutes' scribbling on scratch paper.

Before we get to the core of the fatal fallacy of the Mania (in Chapter 27), let's look at some of the other delusions that obscured it, as well as some preliminary material. As this and the next few chapters show, it is possible for large groups of people to have divergent

viewpoints about the same object or phenomenon, and not communicate, and not settle their differences, even when an objective reality is involved.

Divergent views are nothing novel. We do have a considerable minority who believe the Earth is flat. And political parties appear in many cases to view the world through entirely different lenses. (There are even some careful studies that show committed members of different parties actually interpret the same news in opposite ways.) The promise of markets is that even wildly divergent views should be reconciled to produce unbiased valuations. And there is certainly much evidence for this promise, for example, in prediction markets, which have been used to evaluate the prospects of new products as well as political candidates. However, during the Railway Mania, the dominant view of several aspects of not just the railway industry but of the behavior of the economy was clearly incorrect, subject to mass delusions. Even though there were groups of people with correct views, they did not have any influence on the dominant view, and in some cases seemed not to even be aware that any view but their own was held by anyone.

Myths are easiest to spread when they don't have any immediate implications. There have been some studies on so-called "mythical numbers," such as the claim that was widely accepted four decades ago that there were 200,000 heroin addicts in New York City [186, 197, 200]. They are often pure inventions that happen to suit some group's long-term purposes, or simply catch the public's fancy, and so are widely propagated. On the other hand, since they do not require or even imply any immediate action, their falsity can avoid being established in a public fashion for a long time. To some extent that was true for many of the delusions of the Railway Mania period, although all had serious implications for profitability of the new projects.

Today, "hype makes reality," and the "Steve Jobs' reality distortion field" produces innovations that are eagerly embraced by society. These are signs that we are moving towards ever more importance being attached to circuses, and less to bread. It should not be too surprising, then, if in the future delusions become even more prevalent, and bubbles harder to detect. But that is another topic, and for the moment let us just concentrate on how this played out during the Railway Mania.

15 Economic growth: Quantum jumps or slow and steady development?

The perception of economic and technological progress underwent a revolution around the time of the Railway Mania, a revolution that apparently has not been documented in the literature. It also did not attract any attention as it was taking place. I will describe it briefly, both because it affected investors' attitudes towards railways (contributing to the disaster of the Mania), and because it illustrates a more general point, made in other chapters as well, that there can be large groups in society that have diametrically opposed views of the same subject, and yet the two sides do not debate the issue, and appear not to be aware of views different from their own. Since the topic is involved, most of the material substantiating the claims of this chapter is in Appendix 6.

Sharp differences of opinion are common. As just one example, derivatives were a very prominent feature of the financial landscape of the last decade. Skyrocketing figures, such as the notional values of all of them reaching around 10 times the world's cumulative GDP, caused some alarm. Warren Buffett had for years been talking about them as "financial weapons of mass destruction." Furthermore, Buffett's warnings were not just the mutterings of a has-been in his dotage who does not understand the wonderful products of modern "financial innovation." Buffett had used derivatives, and also had extensive experience of trying to get out of some that he got entangled in through an acquisition. On the other hand, Alan Greenspan, with able assist from Ben Bernanke, Larry Summers, a host of other academic economists, as well as all the Wall Street "Masters of the Universe," hailed them as wonderful products of modern "financial innovation," and thus automatically worthy of praise. This point of view was strengthened by a plenitude of studies that claimed a variety of wonderful attributes of these derivatives, in "distributing the risk to those able to bear it," and so on. This was a sharp difference of opinion, but it was opinion only. Perhaps careful investigation and modeling could have resolved this difference, but no such investigation was undertaken, and it took the crash of 2008 to decide who was right. The main point for us, though, is that this difference of opinion was widely known. Even casual readers of the business pages of ordinary newspapers were able to learn that highly respected financial authorities differed about the danger or promise of financial innovation. But some strong differences never get aired, often to the detriment of society in general, and investors in particular. That was true during the financial/real estate bubble earlier this decade, it was true during the Internet bubble, and it was true during the Railway Mania.

The early Victorians were acutely aware of progress, especially technological progress[164]. Steam power, with its direct descendant, the steam locomotive, played a central role in shaping public imagination and discussion[165]. The electric telegraph was another invention that had a huge impact on popular imagination. Its invention was stimulated by the needs of the railway industry, and its spread in Britain was closely associated with railways, as is shown well by [29]. The telegraph has been compared to the Internet, for example in the popular book[207], but its impact was far smaller than that of the railways, on imagination and especially on the pocketbook[166].

Thus the early Victorians were aware of technological progress, and for the most part embraced it. Some flowery passages about the wonders of recent and anticipated progress, taken from a popular book by Dionysius Lardner, are in Appendix 8, A8.1. The early Victorians were also aware of economic progress: They knew they were wealthier, as a nation and to some extent even individually, than at the close of the Napoleonic wars three decades earlier, and far wealthier than at the time of the American Revolution over six decades earlier. But their notions of both economic and technological change were (for the most part) very different from ours.

Today, we expect relatively steady economic growth. In the rich industrialized countries, if the GDP grows at 3% per year, voters are happy, and politicians are reelected, if it slips to 1%, there are cries of recession, and incumbents get replaced. But nobody expects 5% annual growth, except in brief spurts at the ends of recessions. (In developing countries

like China and India, catching up using the technology, markets, etc. developed earlier, growth rates have recently been in the 7–10% per year range, and populations there have grown to expect continuation of them.) Even in technology, while there is continuing talk of revolutions and breakthroughs, the dominant mode of thought recently has been to rely on phenomena such as various Moore's laws, which predict that each year, for example, a dollar will buy computer memories with about 50% more capacity than the year before.

To the early Victorians, the world looked very different. They saw violent fluctuations around a level that did not seem to change much. Consider Fig. 4 and Table 1 in Chapter 3, but look only at the period 1830–50, ignoring what happened after 1850. We find that this view fit the objective reality, as measured by GDP or price levels, very well. It was a world where malnutrition was rife. Depressions (not just recessions) were frequent. What improvements could be seen tended to be ascribed to jumps, such as the "immortal Watt" (to cite one of the Lardner quotes in Appendix 8) inventing the steam engine, or the "genius of George Stephenson" coming up with the locomotive, or some new channel of trade opening up. Since the economy was subject to big fluctuations, and there was almost a total absence of detailed and reliable statistics, this view of the world was easy to reconcile with everyday experience.

The perception of a static economy explains a phenomenon that has been noted in practically all works on British financial markets, namely that investors valued securities almost exclusively on the basis of yield (dividends for shares, interest rates for bonds, lease payments for land). There was no premium for growth because that no growth was expected. Consider just one example, a late one, from the 1860s. The dividend of the Lancaster and Carlisle Railway spiked up to 11.75% from the more usual 10% or so. Charles Darwin, who had a substantial holding in shares of this concern, acquired over some years, carried out a computation in the notebook where he kept track of his investments. He calculated the straight average of the prices he had paid over the years (£164.35 for each £100 share), and by simple division found (or should have found, correcting some minor mistakes in his arithmetic) that at a dividend rate of 11.75% he was getting 7.15% on his investment, while at 10% he had been getting 6.085%. Darwin and other investors were clearly capable of taking into account special factors, such a war temporarily depressing trade, or a new factory creating additional traffic. Prices of railway shares did reflect such factors, they were not mechanical translations of dividend yield. But the mental attitude they brought to security valuations was that of essentially constant profit rates. In the case of new railways, they of course knew it would take several years to build a line. But once a railway was completed, they expected a short period of that "development" in Watkin's quote about "sheep on the fair day," and then a constant level of dividends. As an example, an article in late 1847 stated that railway investors would get 7% dividends right from the opening of their lines, and there is no indication there of expecting higher levels later ([89], p. 227).

At the same time, there was an awareness of a slow and steady growth in population, and constant worries about how to handle it, as it seemed to exceed the ability of the economy to absorb it. Gregory King in his famous essay of 1696 already discussed growth in population, and projected an increase from about 5.5 million for England and Wales in

1700 all the way to what seemed a high level of 8.3 million in 2000. (That level was reached already by 1800.) King's assumed growth rates, 0.1% per year, did apply for Britain early in the 18th century. But then they accelerated, just as the Industrial Revolution led to higher growth rates in the economy. (Whether greater population led to industrialization or vice versa, or whether both came from some deeper underlying process in society is one of those mysteries that are debated and impossible to answer with certainty.) By the 1840s, population growth was about 1.5% per year, giving rise to increased alarms about the country falling into what we now call the Malthusian trap, in which the number of people outgrows the ability to feed them. Malthusian concerns were widely held, even when Malthus was not cited, in particular in discussions about Ireland[167]. There was wide conviction that either emigration would have to increase, or fertility rates would have to be brought down, the 1.5% annual growth rate could not be sustained for long.

U.S. attitudes towards growth were dramatically different, and this (together with very substantial government involvement in financing railroads in America) makes for interesting transatlantic contrasts that I will not go into in detail here. There was, just as in Britain, little notion of continuing progress on a per capita basis, but population growth was very high, 2.6% per year from 1830 to 1850, with expectations it would continue for several generations. Such a growth rate, due both to high fertility of inhabitants and high immigration, led to a widespread awareness of rapid economic growth that was expected to last for decades. This led to very different planning attitudes, and brought different kinds of issues to the fore, some of which surfaced in an interesting debate in print between Charles Ellet, Jr., a leading American civil engineer, and the editor of the *American Railroad Journal* in the early 1840s.

In Britain, as in the U.S., there was no sense of steady growth in per capita incomes, but there was an expectation that population growth would have to slow down soon, and something close to stability would return. The "prospectus" for the Glenmutchkin Railway that Augustus Dunshunner and Bob M'Corkindale concoct talks of the profits (there called revenue, terminology has changed over the years) being "quite impossible (from [their] extent) to compute," but ones that "may ... be roughly assumed as from seventeen to nineteen *per cent.*" There is nothing about "and growing at 3% per year," say. And while the flowery language of the Glenmutchkin Railway "prospectus" is in general only a slight exaggeration of what one finds in real prospectuses of the period (the 17–19% profit rates there are an exception, a huge exaggeration of what was promised, at least on paper), this basic assumption of constancy of the basic financial parameters was universal in the 1840s. In general, all the economic plans, including prospectuses for railways and other corporations, were based on level revenues, expenses, and profits. It was understood that there would be fluctuations as conditions varied, as well as an initial ramp-up phase, but those were supposed to be passing. As a minor illustration of this attitude, in the spring of 1848, railway share prices were dropping amid economic turmoil and there was rising suspicion among shareholders that the rapid expansion of the industry was going to run up against lack of demand. In attempting to strike a hopeful note, the *Era*, a newspaper extraordinarily friendly to railways, could only suggest[168] that "we have no doubt that the

increasing population of the country will bring increased traffic." The writer apparently could not think of any other credible reason why revenues might increase.

There were certainly many observers who believed that, the big fluctuations aside, the economy was growing steadily, even beyond the increase in population, and that this would translate into similar growth in demand for railway transport. A leader in a London daily paper at the height of the Mania claimed that "[a]mong a people multiplying in numbers and improving in wealth, intelligence, and enterprise, in a ratio far beyond the ratio of their numerical increase the means of internal communication must grow hourly more and more in demand[169]." The quote from the *Atlas* of April 1844, presented in Appendix 6, talks of "a steady increase in the traffic of the country." James Morrison in his famous 1836 speech in Parliament noted the great economic and technological progress since Adam Smith's days, and continued:

> Astonishing as has been the progress of the country during the last half century, there is every reason to conclude that its progress during the ensuing fifty years will be still greater. Every department of industry has been for years, and continues to be, steadily and rapidly progressive. ... If we look at the other great branches of manufacture we shall find a corresponding advance. The improvement in agriculture is not less striking. The application of bone manure, a more effectual system of drainage, improved machinery, and a better and more scientific rotation of crops, have done for agriculture what the steam-engine and the spinning-frame have done for manufactures, and it has made, and is now making, the most extraordinary advances. ...
>
> But besides the improvement of the country, and the consequent increase of traffic, may we not also look for great improvements in the construction of locomotive engines, and in the whole machinery and management of railroads? These are admitted on all hands to be in their infancy; and yet the House of Commons has been legislating with respect to them as if they had already attained to the highest degree of maturity and perfection. Parliament fixes a rate of charge, supposed to be capable of yielding a profit to a company using the present engines upon roads of the present construction; so that if, as is most probable, the engines and roads should be so much improved, and the cost and other charges so much reduced, as to enable them to perform the same amount of work for a half or a fourth part of the present cost, the public will be shut out from all participation in the advantage! Would not this be monstrously injurious to the interests of the public? And is not Parliament bound to provide against such a contingency?[170]

Thus Morrison saw both the economy and technology as "steadily and rapidly progressive." But Parliament did not. It was indeed legislating as if everything was static. And they did so because they, and the vast majority of the population, saw the world in this way, as if almost everything "had already attained to the highest degree of maturity and perfection." Occasionally something new would come up, but that was expected to be rare. In particular, traffic on railways, once opened, was expected to undergo a short period of "development" and then stabilize. This attitude survived amazingly long. I will give just two extreme examples, both some years after the collapse of the Mania, and after many

years of consistently rapid railway revenue increases. In 1849, total British railway revenues grew 12% over 1848, and the growth rates over the next few years were 11%, 11%, 4%, 11%, and 11% (see Table 2 in Chapter 3). Yet many observers, even some intimately involved with the railway industry, either were not aware of these growth rates or interpreted them as reflecting growth in mileage, or else saw and acknowledged the new reality, but had difficulty accepting it. Thus, for example, in 1855, E. Chattaway, a manager on the North British Railway, published a book which declared (p. 27 of [54]) that "traffic returns seem to have reached their culminating point, and, save in a few exceptional cases, the probability of any appreciable increase under this head is very remote." The reviews of his book in the *Railway Times* and *Herapath* were positive, and although one of them raised objections to some parts of of Chattaway's treatise, neither flagged this passage as questionable[171]. An even more striking example of the traditional mind set that expected static revenues is provided by a leader published by *Herapath* in 1853 on the prospects of the industry[172]:

> In the railway world alone we find a remarkable instance; for the establishment of railways, affording as railways to increased accommodation and comfort in travelling, was followed by a vast addition to the number of travellers; and though some railways have been in operation during 12 years or more, their passenger as well as good traffic has never ceased to enlarge, year after year, ever since the opening of the lines. Most of us believe there will come a time when the traffic of a given railway will be fully developed, but such a thing as full development of traffic is at present unknown on the oldest railways. This is a most encouraging circumstance to railway Proprietors. Certainly, one would think that when a railway running from place A to place B had been fully opened for a year or two–say two years–the full amount of traffic it would ever have would have been acquired. But no, that is not so. The traffic of railways opened a dozen years continues to increase. A period for full growth there possibly is, but it appears to be very distant, even on those railways now termed old.

We find here a clear sense of disbelief in what is very clear to anyone who looks at statistics, namely rapid continuing growth. Yet even this publication, an enthusiastic supporter of railways, inclined to take an optimistic view of the future, finds it difficult to accept this view. And it finds continuing growth only on railways, even though British economy had just embarked on its "Great Victorian Boom" [55], and there were plenty of signs of rapid growth throughout the country in all sectors of the economy[173]. What is most amusing, or perhaps astounding, is that this same *Herapath* had been publishing some of the best data documenting rapid continuing growth for years, and sometimes it included commentary that discussed such growth explicitly (surely by other writers on its staff!).

There is a longer discussion of this issue, with many more quotes, in Appendix 8. There was plenty of evidence of steady growth, in particular in railway revenues. For example, consider the statistics for the main line from London to Southampton of the London and South Western Railway (LSWR), which we will hear a lot more about later, presented in Table 5. The compound annual growth rate from 1841 to 1846 is 6.9%, with increases from year to year ranging from a high of 10.1% down to a low of 4.8%. To modern eyes this is clear evidence of a steady growth that is likely to continue, and financial

Table 5. Revenues of main LSWR line.

Full years ending June 30.

year	revenue
1841	£267,000
1842	294,000
1843	316,000
1844	331,000
1845	350,000
1846	373,000

analysts would have no hesitation in cranking in a constant growth rate into their models to project earnings and thereby estimate the value of LSWR shares. But that was not the reaction of early Victorians. Most were firmly stuck in the rut of expecting roughly level, although fluctuating, revenues and profits. Part of the problem is that they seldom had access to a nice set of data, such as that in Table 5. In fact, this collection of data was only made available in the fall of 1848, as a result of an interesting process that is described in Appendix 8. Even shareholders of LSWR did not possess the data of Table 5 before 1848, since the financial statements they had been getting contained data only for all of LSWR, which, in common with most other British lines, was going through a process of building branches. Thus it was easy to explain the reported growth in total revenues as a result of the physical buildout of the network. Moreover, they had other data that contradicted the continued growth idea. For example, the Stockton and Darlington Railway, that significant milestone in the development of modern railways, was paying only 5% dividends in 1830, when the Liverpool and Manchester line opened. Then its profitability grew rapidly in the succeeding decade, reaching 15% for the years ending in mid-1840 and mid-1841. But then in the next three years the dividends slipped back to 12.5% ([112], p. 180) (and plummeted in the late 1840s, as a result of the Mania). During the depths of the depression in the early 1840s, many lines had experienced declines in their revenues. Systematic government collection of statistics for British railways did not start appearing until 1844 (see the figures in Table 2 in Chapter 3). Hence the public of the 1840s had no difficulty in fitting the data that was available into their mental models of a generally static, although violently fluctuating, universe, with occasional jumps corresponding to deployments of new technologies, or other large events.

In general, basic mental models are very resilient. People are extremely adapt at interpreting what they observe in terms that fit their philosophy. This has been explored in recent years in the context of political attitudes, where it has been documented that committed partisans of different parties interpret the same events and speeches in entirely different ways. The same phenomenon holds in the financial sphere. Earlier I discussed the different views on derivatives held by Warren Buffett on one hand, and by Alan Greenspan and Wall Street on the other. It appears that the crash of 2008 has not changed them. Warren Buffett, judging from his presentation to his shareholders in 2009, feels confirmed in his view that these instruments are "weapons of financial mass destruction," whose main effect is to bamboozle even sophisticated players and conceal dangers in layers of impene-

trable complexity. On the other side, while Alan Greenspan does not appear to have said anything about derivatives recently, Wall Street continues to sing their praises (and has managed to persuade much of Congress to parrot such songs), and is willing to concede only minor tweaks as necessary. The unpleasantness of 2008 is regarded as a minor defect in a sterling record, and one that a few hundred billion dollars of taxpayers' money fixed. Not only that, the crash of 2008 eliminated many competitors, converted firms Too Big to Fail into concerns Much Too Big to Fail, and succeeded in converting the very valuable "Greenspan put" into the far more valuable "Bernanke-Paulson put"[174]. What is there not to like about derivatives?

The Wall Street attitude towards derivatives can be cited as a good example of a comment that is commonly attributed to Upton Sinclair:

> It is difficult to get a man to understand something when his salary depends upon his not understanding it.

What is very interesting about attitudes towards growth among early Victorians is that the railway industry (including press organs such as *Herapath* and managers like Chattaway) had salaries that could only benefit from the modern point of view, namely of continuing growth. If they could only have persuaded investors that revenues and profits were going to grow vigorously, the apparent shattering of the "beautiful illusions" that had been spun during the Railway Mania would have been ameliorated by the prospects that they were merely a few years further in the future, but were going to be realized eventually. But even such people, with a strong self-interest in seeing the world through the prism of continuing growth, and with accumulating evidence to support such a view, had difficulty changing their outlook.

Appendix 8 presents some data on railway managers slowly waking up to the reality of continued traffic growth. Special attention is paid there to William Chaplin, who ran the LSWR, and will be referred to many times later in this manuscript, including some in-depth coverage in Appendix 10. The strength of the mind set that viewed the world as basically static is shown by the fact that some of these managers, even after they themselves changed their view, appeared afraid of pushing it too strongly in public, apparently for fear of losing credibility with their shareholders.

What is perhaps most surprising about the early Victorians' views on growth is that while the vast majority embraced the static view, there was a substantial minority who expected continuous growth and incremental technological progress, and that the two groups did not seem to communicate. There was no Newton or Darwin to come out and proclaim the new truth, that growth would be continuous. Nor was there a debate, such as the one between Huxley and Wilberforce about evolution, soon after Darwin's *The Origin of Species* came out. That debate did not settle the question whether evolution was true, but it certainly made it clear there were two radically different positions. On growth, Morrison accused the House of Commons in 1836 of legislating as if a static condition had been attained, but did not seem aware then (nor in his later speeches and pamphlets) that this is precisely what most MPs believed. On the other hand, those MPs did not seem to understand what he was saying, since they did not react to his claims.

A particularly puzzling case is that of the Rev. Dr. Dionysius Lardner. He has been cited several times already, and will be many times later. He was a great technology enthusiast, vaxing poetic about the impact of steam and of the potential of future breakthroughs. But he also made some infamously wrong predictions during the 1830s, and those can be ascribed to a large extent to a belief in progress through breakthroughs, and not through slow gradual improvements. But by 1841 he had seen the light. In that year, in trying to explain away his most famous blunder, which had taken on a life of its own and grown in retelling (see Chapter 30), he wrote (pp. 250–251 of [124]):

> Let me remind you that the efficiency of steam power, more especially as applied to navigation, has been constantly increasing, by the continued application of the resources of engineering ingenuity, both in the United States and in England. It is well known to every one in this country, that scarcely a month has passed for several years in which some improvements, of greater or less practical importance, are not effected. My opinions, therefore, whatever they might be, *founded on the actual state of steam power in* 1835 *or* 1836, would necessarily require modification when applied to performance in subsequent years.

So in 1841 he wrote of "improvements, of greater or less practical importance," being made almost every month as being "well known to every one in this country." Yet this was apparently not "well known" to him back in the mid-1830s[175]. There are some natural factors that likely led him to this revelation, as will be discussed in *BICS*[176]. But, perhaps out of reluctance to admit having held an incorrect view of the world, he did not discuss his change of mind, and pretended that his new view is the one he has always held, and that everyone was expected to hold.

The notion of a static economy, with large fluctuations, and occasional quantum jumps upwards, contributed substantially to the financial disaster of the Railway Mania. It was deeply embedded in the methodology used by the traffic takers to predict demand, as will be discussed in Chapter 24. That methodology worked brilliantly for the projects of the mid-1830s as viewed retrospectively from 1845, but only because of a cancellation of mistakes. Had investors been aware of the natural growth in traffic, they might have investigated demand estimation methodology more carefully, and discovered the fallacy of the Mania. Once the Mania collapsed, investors became unduly pessimistic, as they did not anticipate profits rising from the low levels to which they had fallen.

Investors and railway managers also failed to pay proper attention to freight transport. As is shown in Table 2, revenue from goods transport surpassed that from passengers in 1852. Freight provided a significant part of the anticipated revenues for all railways in the 1830s and 1840s, but, aside from a few lines intended almost exclusively for freight (typically coal or other minerals), this was not a very large part. Furthermore, since (as will be discussed later, in evaluating the accuracy of the traffic takers' forecasts, and as was already mentioned in the quote from Lardner in Chapter 6) at the opening of most lines goods traffic fell significantly short of projections, while passenger revenues were not too far short of estimates, this led to even greater neglect of freight[177]. With proper appreciation of long-term trends, railways could have been better prepared, and made more profit, from this source of demand.

Finally, the notion of a static economy likely made the whole idea of the sudden spurt of railway construction occasioned by the Railway Mania seem more sensible than it would have otherwise, and also led to higher costs than necessary. The perception was that if technological and managerial breakthroughs made new lines possible, one should rush to build them before the opportunity was snatched away. People did not argue that in view of the rate of improvement in technology, and the growth in the economy, they would be able to get 3% return in 3 years, and 5% if they waited 10 years. Furthermore, railway plant was built "to last," unlike the U.S., for example. Across the Atlantic, it was taken for granted that initially demand would be low, so construction tended to be carried out at the lowest possible cost, with full intention of redoing it later. Such an approach would likely have been far more economical on many British lines as well.

Some people, though, did have an appreciation for the true nature of growth. James Morrison was one. But, at least by the mid-1840s, so was Dionysius Lardner. In his 1846 survey [125] he presented some key aggregate statistics for British lines (p. 491), clearly selected carefully to demonstrate his point, and then concluded (p. 492):

> It appears, therefore, that there is an annually increasing amount of traffic; that the rate of increase on the Goods traffic, is even more rapid than the Passenger traffic;
> ...
> ... The increase of traffic, however, indicated in the above table of annual returns, would render it probable that the annual profits would become larger, unless the further extension of railways should check them.

So this observer saw that freight traffic was on its way to overtaking passengers. And he saw that the industry had a rosy future, unless "the further extension of railways" (which is just what was being enthusiastically pursued) checked the growth of profits.

The main conclusion of this section (and the associated Appendix 8) is that British investors of the Railway Mania period were misled by incorrect notions of economic and technological change. With a better understanding they might have been led to the correct insights about the prospects of railway expansion, and might have avoided the huge losses that they ended up suffering. But that is not certain. Of course, one can also argue that not understanding the rapid and continuing growth of railway traffic stopped investors from losing far more money than they did. If they overwhelmingly believed that revenues would continue to grow, in the excitement of 1845 they might have committed to far more projects, and their losses might have been magnified. Americans, with their belief in fast economic growth even in the early 1800s, had no difficulty losingmoney on many of their railroad projects. Finally, British railway investors of the 1860s, by now educated about steady growth rates, also managed to lose money in the railway mania of that decade. In fact, it seems that more sophisticated understanding of the processes of economic and technological progress opens up more opportunities for investors to go (or be led) astray. Unlike the early Victorians, we know about continuing growth, Total Factor Productivity, learning curves, Moore's Law, and a lot of other theories and observations. But during the Internet bubble, all this knowledge seemed only to mislead investors. There were arguments propounded in numerous forums, including prestigious peer-reviewed journals, that were clearly invalid (but did help create or maintain the "beautiful illusions" that inflated that

mania). So we should not place all blame for the excesses of the Railway Mania on the lack of knowledge of growth processes.

The bulk of investors did eventually come around to the new way of viewing railway traffic and economic growth in general. By the mid-1860s, during the next railway mania in Britain, prospectuses routinely talked of traffic growing by some fixed percentage per year. But it did take time for this change in thinking to dominate. And, as mentioned before, there was no public debate, it all seemed to take place quietly.

The final point is that we should not be too hasty in condemning those early Victorians who did not jump on the continuous growth bandwagon of James Morrison, Dionysius Lardner, and others. Zhou En-lai is famously claimed to have said, when asked about the effects of the 1789 French Revolution, that it was too early to tell. So it may be with the growth rate acceleration of the middle of the 19th century. There is no certainty that Earth can support exponential (in the strict mathematical sense of the word) growth at the rapid rates we have been generating recently. Should this growth get out of control, say through a runaway greenhouse effect, *Homo sapiens* might be doomed. And, if that happens, and if another sentient species arrives soon enough to be able to decipher the remains of our current civilization, they might conclude that it was the collective hallucination of continuing rapid growth that destroyed us.

16 The world is local

It seems that every breakthrough in communication or transportation technologies gives rise to enthusiastic predictions of dramatic improvements in economy and society, often involving claims of better understanding among people leading to a new era of peace and comity among nations. (The quote from Lardner's book on the steam engine earlier is in this genre.) Over the last couple of decades, telecommunications has been the hot area, and this tendency has made its expected appearance. Some of the most popular phrases associated with the telecom revolution have been "death of distance" [46] and "the Earth is flat" [83]. During the early railway era, the corresponding slogan was "annihilation of time and space."

Yet while "annihilation of time and space," "the death of distance," and "the Earth is flat" do convey important messages about the changes in the economy and society, they are also deeply and often damagingly misleading. Reality is quite a bit more complicated than the simplistic slogans. While perhaps not as catchy, a simple phrase that does convey the limitations on those buzzwords about drastic change is that "the world is local." Most human activities have always been, and continue to be, local, with much higher intensity of interaction with those close by than those far away.

Globalization has been a pronounced feature of the world scene at least since Columbus' voyages, which brought most of the large world economies into a state of sustained commercial contact. Yet during that period, inequality has dramatically increased (see, for example, [138]). And there have been many interesting instances of counterintuitive divergences. For example, during the early years of railways, while Britain and the United States were being brought into much closer contact through general increase in travel and through

introduction of steamships in particular, a linguistic divergence occurred. During the 1810s and 1820s, the words railroad and railway (often spelled rail–road and rail–way) were used pretty much interchangeably on both sides of the Atlantic. But already by the time of the Railway Mania, in the late 1840s, Americans shifted towards referring predominantly to railroads, while the British preferred railways.

Recently many activities have become dispersed, with call centers for North American operations set up in India. At the same time, many activities have become more concentrated. For example, during the Internet bubble, an investment bank moved its tech office from San Francisco to Menlo Park, a distance of about 25 miles, in order to be closer to Silicon Valley[163]. Apparently in reaction to the popularity of "the Earth is flat" mantra, Richard Florida has collected data and presented it in a readable account [73] that many economic activities are becoming more concentrated, what he calls the world becoming "spiky." Yet that is not the whole truth either. And what is strange is that there are many experts and a considerable literature (going by names such as agglomeration economics, trade theory, gravity models, and the like) with extensive historical and current data, and models, which provide a more accurate picture of the world. Yet in all the public fascination with the latest buzzwords, all this expertise got neglected.

As one example, the 2008 Nobel Memorial Prize in economics, awarded to Paul Krugman, which was mentioned in the introduction, was earned in this area. His considerable achievement was to produce a plausible model as to why, during the 20th century, international trade was expanding far faster locally, with the Dutch drinking Belgian milk and vice versa, than over long distances, with the Germans buying Australian iron ore, say. (The classical models, going back to Ricardo, suggested that free trade should stimulate exchanges primarily between distant countries, each specializing in their core competencies, as in the English raising sheep for wool, and the Portuguese producing wine.) But such trends are not always universal, and Krugman, in his prize acceptance speech [116] did point out that over the last couple of decades, long distance trade grew faster than local, making international trade more "classical" and his models less applicable[178].

The final conclusion is that there is no final conclusion possible as to whether the world is becoming flatter or not. But it does appear that the public and decision makers, both in government and business, tend to get entranced by the image of "the world is flat," or of "annihilation of time and space," and neglect effects of locality. But most economic and social activities have always been and continue to be local. Even around the time of the Railway Mania, when the strongly protectionist Britain was encouraging trade with colonies, about half of its foreign and colonial trade was with other European countries[179]. Therefore it is useful to remind people that "the world is local."

Much of the time, the exaggerated perception of the value of long-distance activities is harmless. But quite often it is seriously harmful. And it turned out to be catastrophic for railway investors during the Mania. Just how much they lost through it is hard to quantify. But it led them into ventures that were hugely expensive and were bitterly regretted afterwards. The main mistake they made was in assuming that the chief contribution to traffic on a line came from the travel from one terminus to another, and that the value of branches was in bringing traffic to the main trunk line.

Lardner in his "Railways at home and abroad" wrote about this as follows ([124], p. 492):

> In estimating the manner in which the railways minister to the public service, the question arises–whether they chiefly serve as means of personal intercourse between those great centres of population and commerce which are usually selected as their *termini*; or, whether they in a greater degree benefit the population located in those districts of the country through which they pass. Unquestionably the general impression was, and, so far as we have observed, still is, that the great mass of their traffic is derived from the large cities and towns at their *termini.* This question has much interest, not merely to the public in general, but to those who engage in railway speculations in particular. Is the population of the country through which a line of railway passes, or the population of its *termini,* to be considered most in calculating its probable success?

He then proceeded to display statistics that showed most passengers traveled short distances: the average trip was 15 miles. And after some discussion, he concluded:

> It is clear, then, that the terminal populations have but little connexion with the financial success of railway projects. The main support is short traffic.

He certainly felt that this was a novel observation, one that his readers would find surprising. And they did.

Appendix 9 presents the reaction of the British press to Lardner's observations, as well as to some earlier ones that made the same point. What Lardner wrote was not an original discovery, there had been earlier, in some cases more thorough studies (in particular [93]). Furthermore, as is shown in Appendix 9, readers of the regular press had ways to tell, starting already in the 1830s, that the reigning dogma of terminus to terminus traffic was false. But the collective hallucination was so strong that they either did not notice, or, when they occasionally stumbled over the inconvenient truth (say by reading Lardner's piece, or more directly), they managed to either explain it away, or just ignore and forget it. As usual, this was not a simple hallucination, there were several mutually reinforcing elements to it, as is shown in Appendix 9. And again as usual, this was not something where knowledge of the truth could be exploited easily in the marketplace. There were arbitrage opportunities, but the hallucination lasted a long time, and if some investors profited from them, they showed remarkable patience. Collectively, though, British capitalists lost dearly (in the long run) because of that hallucination.

How did the myth of terminus to terminus traffic dominance hurt investors? Let us count the (many) ways. Or, better yet, let's consider a hypothetical example, under somewhat fanciful assumptions, but ones that point out the problem that locality caused.

The Glenmutchkin Railway is actually called (in the "prospectus" and also the final paragraph of the story) the Direct Glenmutchkin Railway. This was a little extra element that Aytoun added, to make the satire more obvious for his readers, but it requires some explanation for current ones. During the Mania there was a rage for so-called "direct" lines, which took the shortest possible route between their termini. These included lines like the Direct London and Exeter, which will be covered in some detail in *BICS,* Direct London

and Manchester, and some others. (The Manchester and Southampton Railway, of the "sheep on the fair day" quote, was also sometimes referred to as a direct line.) They were all long-distance lines, and applying the designation to the Glenmutchkin Railway that was supposed to be all of 12 miles long, and go to a spot that had no other railway connection, must have been meant to add another obviously absurd element to the story[180]. But direct lines were anything but ludicrous to the investors of the Mania period. Huge amounts of money and effort went into planning and promoting such lines (and comparable amounts into fighting them by non-direct lines that perceived them as threats), although relatively few were approved by Parliament and built. In particular, two of the foremost opponents of the Mania, *The Times* and James Morrison, were strong advocates of direct lines[181]. Such lines made sense, if one assumed (as most people then did) that the dominant traffic was between distant termini. But that assumption was false, and in reality such lines made no economic sense.

Direct lines make sense to users, provided costs are manageable. In the airline industry today, there is an ongoing debate between advocates of large planes that transport passengers efficiently between hub cities (which would be fed passengers from smaller cities) and those who favor smaller planes that connect those smaller cities directly. If everything else were the same (in particular, prices and frequency of flights) there is no doubt that travelers from Denver to Taipei would rather catch a direct flight than use a smaller jet to reach Los Angeles, where they would get on a jumbo to Tokyo, where they would transfer to another smaller plane to Taipei. But what if the direct flight costs 50% more, and instead of being available twice a day, is scheduled just twice a week? How many people would want to fly direct under such conditions? That is the kind of question that airlines struggle with. That is also the big unknown that underlies decisions to develop or buy planes like the Airbus A380 versus the Boeing 787. And even when customer preferences are known the decision what planes to purchase and how to schedule them is real "rocket science," with PhDs in combinatorial optimization working with sophisticated algorithms and high performance computers to optimize the decisions. But with airplane travel, the problem is in some sense harder, and in another easier, than for railway planners in Britain in the 1840s. Today we have fairly good ideas of what the demand is from one city to another, and (subject to all those myriad side conditions that make the problem hard) if there is enough demand, a plane can be placed on that route. There is no need for gigantic investment to build infrastructure connecting just those two cities, planes can be shifted from route to route. (Within limits, planes last for a couple of decades, and placing small planes on high density routes introduces obvious inefficiencies.) During Mania, the situation was different. Construction of a railway was a giant civil engineering endeavor. And as it turned out, the actual demand for travel between distant city pairs was miniscule. But investors were not aware of this, just as they were not aware that most of the usage on branches would be local.

To make it easier to imagine the financial havoc that local traffic can generate, if not planned for appropriately, let us consider a geographical setting that most readers of this work might recognize, namely lines across the continental United States, from the Atlantic to the Pacific oceans. That is a distance of about 2,500 miles as the crow flies. Suppose

further that links of 100 or so miles are considered as short local links. (So that the transcontinental and local links are about a dozen times longer than what British investors during the Railway Mania were faced with.) Suppose that you are a Philadelphia civic leader around the middle of the 19th century, and want your city to regain its commercial preeminence from New York. Your rivals in the Big Apple have built, or are in the process of building, a line to San Francisco, by way of Albany, Buffalo, Cleveland, Detroit, Chicago, Omaha, Denver, Salt Lake City, Sacramento, Oakland, and San Jose. The line wanders around, to pass through all those cities, and to avoid mountains, lakes, and other natural obstacles. The total length by this line from New York to San Francisco is 3,500 miles. But you think that most of the revenues of that line will come from passengers going all the way from one end to the other. Hence you decide Philadelphia has a chance to surpass its rival by stealing away that through traffic by building the Direct Philadelphia and San Francisco Railway. You hire the best railway engineers and tell them to lay out the straightest possible line, with long tunnels and bridges, if necessary, that cuts the distance to 2,800 miles, for a 20% saving in distance. Moreover, your line has gentle curves, so you can run very fast trains. Your trip time, coast-to-coast, will be a third shorter than that of your Big Apple competitors. You miss most of the big cities, but you count on the inhabitants of places like Denver taking a branch line to your railway, in order to get fast connections to either San Francisco or Philadelphia. And so you also invest in a bunch of branches, such as the one to Denver.

Moreover, since there are already lines from Philadelphia to New York City and to Baltimore, you buy them at fancy prices. The prices are fancy, since the owners know what you are up to, and are also entertaining competing offers from the New York City or Baltimore transcontinental lines, respectively. Controlling those will, after all, let you attract travelers from those places to San Francisco, and, perhaps more important in your mind, prevent your Baltimore and New York City rivals from stealing "your" Philadelphia passengers.

And then the construction proceeds, your line gets built, and suddenly you discover that hardly anyone wants to travel all the way from Philadelphia to San Francisco. Suppose, as an extreme case, that nobody wants to travel more than 200 miles. Now you are stuck, suffering losses from multiple causes. There are few inhabitants close to your line, so your trains, although very fast, are almost empty. Furthermore, even if you run so few trains that they are full, they all lose money, since the fares were calculated on the basis of long trips that might have been profitable, as marginal costs on those are amortized over larger fares, but which are ruinous when trips are short. [182]

Not only do you thereby lose on your main line, you lose on the branches you have built or bought. The branch from Denver to your line is unused, since there is nothing at its junction with your main line for Denver residents to be attracted to, and those residents are not interested in going to either the East or the West coast. There is extensive travel from New York City to Philadelphia, but that costs you a fortune. You were prepared for that, given the price you paid for that line. But you expected to more than make up those losses on the tickets you hoped to sell to those New Yorkers for the trip from Philadelphia to San Francisco. But they turn up their noses at this option, as they are not interested

in going to the West Coast. And they not only add insult to injury, but double the injury by catching a ride from Philadelphia to Baltimore, which also costs you a lot. And then they quadruple the damage by going back the way they came, making two additional short hops, all of them losers for you.

British travelers did demolish railway investors' hopes through doing what people have always done, and continue to do, namely take short trips, whether Hobsbawm approves or even understands this (see appendices 2 and 9). This was recognized at the end of the Mania by some knowledgeable observers, even though public discussion was dominated by claims of either corruption or collective madness. It was even recognized by some who were not very observant in other ways. For example, E. Chattaway, a manager on the North British Railway who was cited in the previous section for not being aware of continuing growth in railway traffic as late as 1855, wrote in the same work ([54], pp. 25–26) that

> [the North British Railway] directors, following in the wake of other companies, promoted several branches which it was thought would be valuable feeders to the main line. They have proved to be the very opposite, and have sucked it financially dry.

And before that, in 1851, Samuel Sidney, one of the very clever soldiers in the public relations of the gauge war of the late 1840s, observed ([199], p. 137)

> Direct lines have generally proved a great mistake, except so far as they have accommodated the local traffic through which they passed. To the shareholders they have been most unprofitable wherever the original shareholders were not lucky enough to bully the main lines into a lease, and, to the average of travellers very inconvenient, by dividing accommodation. But shareholders should look at the local traffic of a proposed direct line, on which alone good dividends can be earned.

And earlier yet, at the end of 1848 (and so too late to save the investors, most of their money had already been irretrievably committed) the *Economist* noted[183] that competition would not be as destructive as many feared, since locality of traffic meant that

> [u]nless ... two railways were actually running parallel to each other through the same country, and serving the same towns, any actual competition which can exist between them must be limited to a very small portion of their passengers.

So eventually the significance of locality of traffic was recognized. But it took years, even though it was very clearly stated in Lardner's survey, which was printed in a very prestigious and widely read publication (there will be more discussion of this later), and even though the crucial passage was widely reprinted in other serials. Now Lardner did not come out and say explicitly, "look railway investors, you are foolish in pursuing direct lines, you are foolish in building branches, you are foolish in devoting all the time and effort to efforts to competition with distant lines, all those moves will be losers for you." What he did was to say, in the first paragraph of the relevant passage, "[t]his question has much interest, not merely to the public in general, but to those who engage in railway speculation in particular." And then, after presenting the table with the data on average trip lengths, he wrote that "[t]he results exhibited here suggest several reflections, which must be as

interesting to railway proprietors as to the public in general." And he closed the passage by writing that "[i]t is clear, then, that the terminal populations have but little connexion with the financial success of railway projects. The main support is short traffic." Thus he did not tell investors, you are about to fall off a cliff, he merely painted a picture of the road they were moving on at full speed, showing that it ended at the edge of a cliff. And, held as the investors were in the grasp of their collective hallucination, they did not pay attention, and duly fell off that cliff.

Some further discussions and many references and quotes on this topic are presented in Appendix 9. They substantiate the claims made here, and provide a more detailed view of the information that was available, and how it was, or was not, absorbed, by the public.

One might have hoped that the disaster of the Railway Mania would have taught the public, once and for all time, about the importance of locality of traffic. But that did not happen. The same misunderstanding led investors astray within a decade, in the planning of the Metropolitan Railway, the world's first subway[184].

Neglect of locality has continued hurting people to this day, and, given all the precedents, will undoubtedly continue hurting them far into the future. It has led the wireless industry astray, for example, through lack of understanding that some of the most valuable uses of texting or Blackberries is to enable people sitting in the same room, at a lecture or other meeting, to communicate unobtrusively. As with many of the delusions noted in this manuscript, this one is not fatal, in that systems (such as the early British railways) designed for long distance transport or communication can usually also be used for local activities, it's just that there is some, often substantial, loss of efficiency. To keep things short, let us just note one amusing example from recent history, of demonstrable neglect of a great opportunity. It comes from the early days of the ARPAnet, the direct ancestor of the Internet. This network was built to connect distant computers. But, as is related in [86], p. 26:

> As soon as Multics and the other machines were hooked up to the IMP, a curious fact was discovered. Even though the intended purpose of hooking to the ARPAnet was to let the computers at MIT communicate with machines at other research sites, almost all the ARPAnet traffic that originated at the MIT computers was going to other MIT computers.
>
> "From our point of view, [the ARPAnet] was the local-area network for the building," remembers Saltzer. "The fact that there were also connections to San Francisco was interesting, but the main purpose was to move files from the AI machine the DM [Dynamic Modeling] machine."
>
> There was so much intra-MIT traffic, in fact, that BBN decided to specifically subtract if from the official ARPAnet statistical accounting. "Such traffic was called 'incestuous,' and it was subtracted from the total because it was an embarrassment," explains Metcalfe. "We were trying to build a network that would connect the world, not MIT." In the process of avoiding embarrassment, BBN fumbled the opportunity to invent local-area networking.

So in this case, BBN did stumble, but not to success, but out of an opportunity for great success. They took the phenomenon they had stumbled over, and swept it under the rug. It

was only after he had moved to Xerox PARC (an infamous example of an extraordinarily productive research lab that managed to stumble out of success in countless ways) that Bob Metcalfe, fortified by the experience with the ARPAnet, invented Ethernet, the main LAN technology.

Delusions about importance of terminus-to-terminus traffic hurt investors by leading to the constructions of "direct" lines, overpaying for acquisitions, and construction of unprofitable branches. The greatest harm they caused, though, may have been indirect, by lending support to the greatest, most clearly false, and most damaging hallucination of the Railway Mania, namely that "traffic has exceeded the most sanguine expectations." This hallucination will be discussed in the next few chapters. In short, at the start of the Mania, revenues from passengers on average came close to the projections made in the 1830s. However, those passengers traveled shorter distances than expected, and to some extent paid less per mile than expected. So revenue projections were fulfilled by many more passengers travelling than expected. Railway enthusiasts enthusiastically emphasized the high number of passengers, and generated the myth of traffic exceeding expectations. This led to the delusion that traffic takers projections were very conservative lower bounds on what was likely to be achieved, which was a key fallacy of the Mania.

Interestingly enough, a few times during the 1830s and 1840s, railway managers did wake up to the overwhelming importance of local traffic, and discussed it publicly, typically when it was convenient to cite it to create or maintain some "beautiful illusions" among their shareholders. (This is detailed in Appendix 9.) But these discussions do not seem to have affected public perceptions. It is not clear just what those railway managers really thought about the issue. For example, William Chaplin of the LSWR, who several times emphasized the importance of long-haul traffic (see Appendix 9) was faced in early 1846 with the threat of a proposed competitor for some of the LWSR traffic, the Direct Portsmouth scheme. To assuage his shareholders' concerns, Chaplin dug up some statistics on goods traffic and declared:

> And it also goes to show there cannot be that large quantity of goods available to those who are speculating in opposing lines to this Company which we find represented to exist, because, out of that 108,950 tons, only 21,000 tons passed to and from London and Southampton, and 16,000 tons of those were import and export goods.[185]

Was he aware of the locality of all traffic? Or was he just using any numbers that were convenient to maintain "beautiful illusions"? (Appendix 10 has a discussion of Chaplin, and he comes up many times in this manuscript, since he presents a very interesting example for considering whether business leaders in investment manias are rogues or fools.)

In the case of locality of traffic, railway promoters and managers did have an incentive not to overemphasize it. Had investors known that most traffic was local, they might have raised more questions, and so the "beautiful illusions" the industry was based on might have been dispelled. On the other hand, locality of traffic would have been a very powerful weapon in fighting the direct line schemes. Since it was not used widely, it seems that most people simply were not aware of it, or at least of its significance.

The main point is that the railway market did not incorporate readily available information. This hurt investors, but it is hard to tell just how badly. But this episode does show how relevant and widely available information can get disregarded.

We next go on to perhaps the main delusion that led investors astray, the view they had of the accuracy of traffic takers' forecasts.

17 Collective delusions about revenue estimates

Chapter 9 described the economic and financial history of British railways after the mania of the 1830s. At the end of that section, three key issues were raised, but the last of them, what people thought of the financial history of railways, was postponed to this section. So now is the place to consider, how did investors in the Mania view what happened over the preceding decade? We saw already in Chapter 13 that there had been huge cost overruns, and that this was widely known. But what about demand? Did people come to the ballpark in the numbers expected? The common mantra at the time of the Railway Mania was that "traffic has exceeded the most sanguine expectations." It was held with rare unanimity by skeptics and opponents alike, with not a single prominent contrarian voice. And it was utterly false. Or, more precisely (which helps explain why it was held with such unanimity), it was true, but only in a certain highly distorted sense.

Amazingly, even though the accuracy of demand forecasts was such a fundamental issue, hardly any careful studies of it were done. In the entire published literature there appear to be just two systematic comparisons of the revenues that had been projected in the 1830s to those realized in the 1840s, one by Samuel Shaen, Jr., in 1847 [196], and one by M. C. Reed [185], in 1975. Both will be discussed in the next chapter.

Let us first consider modern opinions on this topic. An earlier section quoted the Colin Robertson economic and financial history of Scottish railways up to the onset of the Mania [188]. It is an excellent book, very carefully researched, and with a wealth of information that is not available in any other recent work. With just a few reservations, to be discussed soon, I recommend it wholeheartedly to anyone interested in pursuing in more depth many of the topics that are relevant to this manuscript but are not covered or are touched on only slightly here. This book studies just Scottish railways, but their development was similar to that of English ones, typically with some time delay. The points of difference are carefully mentioned. This book presents statistics on a variety of subjects, from cost and demand estimates, to sources of capital, traffic patterns, and others.

Reviews of Robertson's book were generally positive. But one, by John Butt [45], a respected historian (although not a specialist in railways) complained that

> this book occasionally reiterates what was known already (notably the problems of engineers underestimating construction costs and of promoters over-optimistic about potential revenues and profits).

It is interesting that Butt would criticize Robertson for devoting too much attention to the comparison of promise to reality. That is one area where I feel the book, while far deeper than any other, still falls short, as I will explain shortly. But Butt's deeply ingrained

expectation seemed to be that promoters always overpromise, so there is no point in looking at the precise record. And that seems to be a common opinion (well grounded in experience, it has to be admitted)[186]. Butt seemed so certain of his opinion that he failed to notice, or else subconsciously misinterpreted, what Robertson wrote. For Robertson repeatedly emphasized in his book that the ingrained view that promoters are "over-optimistic about potential revenues" was wrong for early Scottish railways. For example, Robertson wrote (p. 163 of [188]):

> It turned out that the promoters and their engineers had underestimated almost everything; unfortunately, although traffic volumes were often much greater than had been anticipated, the costs of construction and operation had escalated even more.

And just two lines below, in support of this claim, Robertson cited a railway engineer's report from 1841, which stated that

> While it has in almost every case been proved, that the Traffic has exceeded all previous calculations, the Expense has been in still greater excess.

And there are many other such claims in Robertson's book, so it is very hard to imagine how anyone could have missed all of them[187].

(But that of course raises the question that came up before, in the discussion of railway engineers, namely why do promoters overpromise, and do investors know about it and compensate for it in their decisions, and why is there not a continuing escalation of this arms race? How important are the various "beautiful illusions" to economic and technological progress? But we'll again leave that question aside for the moment.)

Robertson's claims that demand for railway service in the 1830s and 1840s was far in excess of estimates was a reflection of the essentially unanimous opinion during those times. Some other modern historians who have looked at this period (a very small number, it has to be admitted), have also adopted this view. For example, Hamilton Ellis in ([69], vol. 1, p. 51) wrote about the mid-1830s: "One trouble in England at that time was that the majority of interested people underestimated both the capital cost of a railway, and the returns that they would get for it." In the literature of the 1840s it showed up moderately frequently. But not too frequently, almost certainly because it was so widely accepted that it was not felt to be contentious. Why repeat something that everyone *knows* is true? Robertson gives a couple of citations from pre-Mania sources in his book. To throw in a few more, another occurs in the continuation of the quote in Chapter 9 from [5]. The writer of that piece, after noting the huge cost overruns, wrote that

> there is still another theme connected with these gigantic works which must excite marvel and congratulation, and showing the wisdom and foresight of many of the greatest speculators; we allude to the fact that the profits on several of the grandest and most expensive lines have exceeded all anticipation.

James Morrison, that prominent opponent of the Mania, wrote in one of his pamphlets ([157], p. 40, reprinted in [158], p. 131) about the need to take into account "the extent to which the increase of traffic on [the first lines] has surpassed expectation." (This was not

inconsistent with the claim earlier in the same pamphlets ([157], p. 11) that "the tables of traffic may, taking proper precautions, be compiled with so much accuracy as to reduce within very narrow limits the chances of mistake in the revenue," since that claim referred to new lines under consideration during the Mania.)

The mantra that "traffic has exceeded the most sanguine expectations" was so powerfully embedded in the public psyche that it survived the collapse of the Railway Mania. The widely-quoted 1851 history of railways by John Francis [80][188] claimed ([80], vol. 1, pp. 201–202) that

> [t]he progress of railway statistics and railway calculations so far as regards expenses and traffic is exceedingly interesting. The various corporations and companies have been blamed for suggesting receipts which they could not possibly expect, and for promising dividends which they could not possibly pay. The error into which they fell is common to all new undertakings; but if they understated their expenses, it is noticeable that they also underrated their receipts. Railways have produced results which the wildest prospectus never dared to exhibit.

The Francis volume, although frequently cited, has been been frequently criticized, starting right after publication. But this particular passage does not seem to have been questioned, and similar ones, if less flowery, were common. Chattaway, the North British Railway manager who was cited several times before, claimed in his 1855 book ([54], p. 22) that

> These unfortunate results [low stock prices] have not arisen from over estimating the revenue (which in almost every instance far exceeded the anticipations of the most sanguine), but from swelling the capital accounts far beyond the original estimate.

The opinion that traffic had exceeded expectations was widespread, was held with great conviction, and faced no noticeable public questioning[189].

The prevalence of the myth of actual demand exceeding expectations was so widespread and so unanimous that Robertson accepted it completely, without doing even a simple check. That is the greatest deficiency I can find in his book. He prepared many very extensive and informative tables showing various statistics of pre-Mania Scottish lines, including how actual construction costs compared to estimates. He also delved sufficiently deeply into this subject to realize, and document, apparently for the first time in history, and in the most detailed way, the systematic omission of large and unavoidable elements of railway capital expenditure that essentially guaranteed that costs were going to be higher than estimated. (This was discussed in Chapter 14.) But he did not present a similar careful comparison of actual traffic to estimates. His book appears to contain data allowing precise comparisons for just two railways, the Edinburgh and Glasgow Railway and the Glasgow, Paisley, Kimarnock, and Ayr Railway (pp. 166–167). Their actual revenues in 1844–45 were £117,420 and £79,379, respectively, while their estimates (from from 1838 and 1837, respectively) were for revenues of £126,191 and £124,104. So while the Edinburgh and Glasgow results are close to prediction, just 7% short of original promise, those for the Glasgow, Paisley, Kimarnock, and Ayr line exhibit a serious shortfall, 36% below expectation, and are anything but "a success story." In both cases, realized revenues are below estimates, directly contradicting a major thesis of the book[190].

Yet the collective hallucination of the Railway Mania period that actual traffic had almost invariably exceeded estimates, a hallucination that even infected a historian as careful as Robertson a century and a half later, was false. And it was patently false, so blatantly false that even a moment's reflection should have shown it to be false to anyone with a slightly skeptical and inquisitive turn of mind. As was noted by Lardner in his survey ([125], p. 492), average dividend yield on railway shares around 1845 was about 5%. This could be checked, or computed from scratch, by anyone with access to the railway share tables in any of the railway papers. Those showed not only share prices, but also the nominal capital, the amount paid up, and the most recent semi-annual dividends. (Most regular papers, such as the *Leeds Mercury*, printed only the nominal capital, the amount paid up, and the recent prices. Hence it was impossible from their regular weekly statistics to form an estimate of average dividend rates. One would have needed to also collect reports of the semiannual meetings, say, to find out what the financial performance was.)

It was also widely known that actual costs turned out to be about twice what had been estimated. And profit rates promised in the mid-1830s were mostly in the 10-15% range. Further, operating costs were generally higher than expected, although not disastrously so (42% of revenues as opposed to 33%, [125], p. 492). The only way these statistics could be reconciled is for revenue estimates to have come in close to expectations. Had revenue expectations been underestimated as much as the ones for constructions costs, as some quoted passages asserted, investor profits would have come in close to promised rates, and not at less than half of those. And had there been a significant revenue shortfall, profits would have been miniscule or non-existent[191]. Therefore a simple sober calculation would have shown anyone with access to a few publications that the popular myth about traffic estimates was false. But the collective hallucination was too strong!

The delusion about demand exceeding expectations was so strong, even across the barrier of generations, that it affected Robertson to an inordinate degree. The original hallucination arose, as I will discuss below, after the smaller railway mania of the 1830s. But Robertson claimed in his book that it even applied to the early Scottish coal lines before 1830s ([188], pp. 77, 86). Robertson was unable to provide comprehensive information about their performance, since few statistics about them survive. But what information he was able to collect showed that serious cost overruns were the universal rule, and that profits were in the best cases considerably below what had been promised, and in worst (and not infrequent) cases nonexistent[192]. That rather strongly suggests that revenue estimates not only did not exceed estimates, but likely fell significantly short.

Robertson's book, a revision of his PhD thesis, ends its story of the rise of Scottish railways in 1844, at the start of the Railway Mania. Robertson planned to write a sequel, entitled *The Railway Mania and its Aftermath in Scotland, 1844–54*. It would surely have been very valuable, in light of the contribution of [188]. It might even have become the definitive book about the Mania, and it might have made this work unnecessary. Unfortunately Robertson died before he could write it. According to a report he wrote to ESRC, the agency that funded his research, he had collected most of the information he felt he needed, and what was left was digesting it and writing. His research materials and a partial manuscript are available in the Archives of the University of St. Andrews[193]. There is no

sign there that he realized that traffic takers had overestimated demand during the Mania[194]. Just the opposite, while writing the draft that is left to us, Robertson was convinced that traffic estimates during the Mania were too cautious, just as he thought they had been too conservative during the smaller mania of the 1830s. For example, in the draft chapter entitled "Railway Mania - Post," he wrote:

> Although early railways regularly underestimated their traffic potential, and found their revenues above expectations – the Edinburgh, Perth & Dundee appears to have been unusual, and unlucky, in the accuracy of these estimates – underestimates of capital expenditure were unfortunately much greater.[195]

Robertson was "unusual, and unlucky," in picking the Edinburgh, Perth, and Dundee Railway as the example to look at. (There is no sign in his manuscript of data for any other line.) This line was exceptional with regard to both costs and revenues. Its cost underestimate was far higher than for most Mania lines, and it was one of the relatively few lines that were effectively bankrupt at the end of the Mania, unable to even pay interest on loans, much less provide any dividends. On the other hand, its traffic estimates seem to have been only slightly below forecast[196]. On most new lines, cost overruns were smaller, and traffic estimates were substantially higher than what was obtained when those lines opened. It is not easy to find particular lines that demonstrate this conclusively, because of all the mergers, acquisitions, leases, ..., that took place. But a simple high-level look shows this very clearly, as will be shown later.

Had Robertson lived a few years longer, and completed the work on the manuscript, would he have realized his mistake? Or would the power of this collective hallucination overcome even the overwhelming evidence that during the Railway Mania, traffic estimates fell far short of reality, and made him shortchange the subject, the way he did for his published pre-Mania book, and leave that false claim in? It is fascinating to speculate.

So far we have discussed popular opinions:

- Today's prevailing view that promoters always underestimate costs and overestimate demand.
- The Railway Mania prevailing view that promoters had underestimated both costs and demand during the 1830s.

As it turns out, aside from construction cost overruns, neither of those views is correct. The truth turns out to be far stranger, as the next section shows. Demand forecasts in the mid-1830s turned out to be almost exactly right. Usually not as close to actual results as for the Edinburgh and Glasgow Railway, shown in Table 4 in Chapter 6, but close. Traffic takers in the 1830s managed to do a better job than modern traffic planner can do. And they did it through luck in cancellation of mistakes.

18 The astounding demand estimation accuracy of the 1830s

The preceding Chapter 17 stated that the only two systematic comparisons of the promises of the mid-1830s to the reality of the mid-1840s that have been published were in the books of Shaen [196] in 1847 and of Reed [185] in 1975.

The Shaen book will be discussed in detail in [165] and *BICS*. It appeared in the spring of 1847, still in time to affect many of the eventually disastrous investment decisions that were being made at that time. This book demonstrates several phenomena, among them the already notorious tendency for readers and reviewers to pick out of a publication only the items they care about, and to disregard inconvenient material that conflicts with their preconceptions and prejudices. Shaen's comparison of promise to reality is very obviously biased and not trustworthy as presented. Interestingly enough, Shaen had worked as a traffic taker in the 1830s, but in his book he effectively claimed that engineers and traffic takers were equally unreliable. (This was part of a larger agenda he was pursuing, to discredit Parliamentary methods of dealing with railway cases.) But if one corrects for the clearly illegitimate statistical tricks he uses[197], the results one obtains are very similar to those of Reed. I will now discuss just Reed's work[198]. Reed prepared a table (p. 25 of [185]) comparing the projections made in 1836 for six railways with actual results obtained in 1843. These six lines represented about one-sixth of the capital investment in British railways as of 1843. Aggregating the figures for all those lines, we obtain Table 6. The results for the six lines individually did span a substantial range, but not a giant one, so there were no terrible disasters, nor any spectacular successes. Total company revenues in 1843 as a fraction of those estimated in 1836 were 60, 68, 74, 83, 104, and 106%, respectively. The bottom line, that of total profit (or, to be more precise, earnings to capital, since Reed's profit includes interest on borrowings) was only 10% short of projections, but the investment to achieve that was more than double what had been projected, so the profit rate was 4.5% instead of the promised 10.3%.

Table 6. Railway estimates of 1836 and results of 1843 for six prominent British railways.

All figures in thousands of pounds sterling.

	1836 estimate	1843 actual	ratio
cost	5,686.9	11,596.9	204%
passenger revenue	612.6	553.7	90.4
goods revenue	433.4	287.1	66.2
total revenue	1,046.0	840.8	80.4
working expenses	460.5	320.2	69.5
profit	585.4	520.3	88.9

Table 6 understates the accuracy of the traffic taker projections from the standpoint of prospective investors in the Railway Mania. It compares 1836 to 1843, but the main decisions about Mania investments were made in 1845 and 1846. The reason Reed stopped in 1843 was the reason cited by William Chaplin in 1848 for invoking statistics on a French and not an English line to make a point about continuing growth (as cited in Appendix 8, A8.4): "the circumstances of the different lines in England are so often varied by amalgamation and terms entered with other Companies, that it is almost impossible to make a just comparison." Right as the Mania was getting in high gear, a wave of mergers, acquisitions, leases, and the like swept over the industry, so Reed (and also Shaen) had to

stop before 1845 in order to have a decent and unbiased sample. However, if we look at Table 2 in Chapter 3 (and British investors could get such data from government reports, covered in much of the press, or from Lardner's survey [125], p. 491) we see that revenue per mile for the entire industry grew 13.5% from 1843 to 1845. Since Reed's six lines were well established, it is extremely likely that their revenues grew at least 15% during that period. They probably grew even more. One of the lines that Reed considered was the Birmingham and Gloucester Railway (where Herbert Spencer had worked around 1840.) That is the line that shows in Reed's table the greatest shortfall in revenues compared to projections, achieving just 60% of its promise in 1843. But the traffic takers had a very good excuse in this case. This line had from the beginning been planned as a link in a connection from Birmingham to Bristol, but for several years it operated in an isolated mode. However, once the other link in that connection, the one from Gloucester to Bristol, opened, traffic on the Birmingham and Gloucester jumped 67% between 1844 and 1845 (p. 288 of the Appendix to [137]). Thus around 1845, traffic takers' projections from the 1830s were being satisfied with surprising exactitude, to within 5 or 10%. We have already seen that the same held for the Edinburgh and Glasgow Railway (where Table 4 in Chapter 6 shows the 1844-45 results coming within 6% of 1838 projections), and this conclusion also held for the LSWR, when we compare the 1845 revenue figures in Table 5 in Chapter 15 to the projections that will be cited later, in Chapter 26.

What is surprising is the accuracy of demand forecasts made during that early period. To get within a margin of 5-10%, when dealing with a brand new technology, is remarkable. Today, we rely on advances of the last 150 years in forecasting. To add to those, we have detailed demographic and traffic flow data. Further, we are dealing with stable technologies that have not changed substantially in many decades. Yet modern demand forecasting for large transportation projects does not come close to this degree of accuracy. (This will be considered in greater detail in *BICS,* drawing on existing literature, in particular on [75–78, 172].)

There was no public discussion of the accuracy of traffic takers' forecasts. In general, the "traffic has exceeded the most sanguine expectations" dogma reined undisputed. Traffic takers themselves, when testifying before Parliament, tended to repeat it (as will be discussed in [165]). But some people were aware this dogma was false. We find occasional bits of information about this. For example, a newspaper report on a Parliamentary committee hearing in 1845 said:

> To prove that the *data* of traffic tables were in general correct, and that the principles on which they were formed were authenticated by the results, the witness handed in some tables, in which the estimated and actual traffic on several lines of railroad were compared and shown to be nearly alike.[199]

So here was an item, in a prestigious and widely circulated paper (*The Times*), directly contradicting common wisdom. And yet the markets, the press, and the public ignored its implications. As happened with the telecom bubbles, collective hallucination made people ignore relevant information, and continue to believe that traffic takers had been too cautious in their projections. It appears that in investment manias, what is often needed is not access to special information, or special skills in ferreting out hidden gems,

or sophisticated economic models, but simply an inquisitive and skeptical mind that pays attention to the information that flows by, and decides what bits of the "received wisdom" are bunk.

19 The origins and spread of demand forecast delusions

Chapter 14 mentioned studies of "mythical numbers." Extending the findings of those studies, it appears that a collective delusion spreads and persists most effectively when some of the following conditions hold:

- there is some fact that appears to support it, however implausibly
- there is a strong interest in having the delusion be accepted and little in having it refuted
- there is a lack of systematic scholarly interest in the topic
- there are no operational implications to the delusion

All four factors worked in various degrees in favor of the "traffic has exceeded the most sanguine expectations" myth. The first three are interrelated, and will be discussed in the rest of this section. The last one is worth mentioning separately. For a prospective investor in the Mania, what had happened a decade earlier was of only marginal relevance. Many of them were getting involved because ..., well, because everybody was involved, everybody was making money, ..., in the usual mass psychology dynamics of a bubble. Many, perhaps most, did not intend to be real investors, and were just hoping to benefit from their countrymen's ""thirst for national improvement, internal communication, and premiums" (in the words of the Glenmutchkin story) by just riding the wave and cashing in some scrip premiums. Even the serious, *bona fide,* investors were typically interested in only a few projects at a time, and for those, accuracy of traffic takers' revenue estimates for other lines a decade earlier was of some interest in establishing the credibility of these experts. But it was not something to make them give up suddenly on what seemed a promising new project. Traffic takers provided just one of several evaluations of profitability.

Railway promoters and managers had a strong interest in supporting the "traffic has exceeded the most sanguine expectations" myth. In those dark days of the late 1830s, when economic conditions were difficult, and there was the almost unremitting trickle of stories about delays and cost overruns, they were desperate for stories that would keep "beautiful illusions" alive. As just one example, the Birmingham and Gloucester Railway, which has already come up a few times, initially opened only a segment for service. Management's report to shareholders claimed:

> The traffic upon this partial opening has exceeded the most sanguine expectations of the directors. On this point they particularly invite attention to the table of expectant passenger traffic appended to the report of August, 1838. A reference to that table will show (independently of the traffic between Cheltenham and Gloucester), a list of twenty-two coaches, by which 2,122 persons were calculated to travel weekly, and that number was doubled according to the usual practice of railway traffic returns, making 4,244. Out of the twenty-two coaches there enumerated, eleven are

> still upon the road, and although these coaches are still carrying a fair proportion of passengers, the number of persons conveyed upon the line for the last month has averaged 4,092 weekly. The cheering inference therefore may be fairly drawn, that when the whole line is in operation the traffic will be increased to an amount far exceeding any calculations that have hitherto been made.[200]

The directors' hopes of traffic "far exceeding any calculations that have hitherto been made" were almost certainly grievously disappointed when the full line was placed in service. The Birmingham and Gloucester was the worst of the 6 in Reed's table in terms of fulfilling its promise as of 1843, with actual revenues for the full line only 60% of traffic takers' projections. (But by 1845 it moved to or possibly even ahead of those projections, as was mentioned before, because of some special factors.) But by digging around they came up with some nice numbers they could toss around to create a good impression.

Recall that the "demand has exceeded expectations" story is the standard response from managers, no matter how disastrous the launch of a new product or service is. They don't want to admit mistakes, but perhaps more important, they want to build up "buzz," etc., to spur the diffusion of their offering. In the railway case, promoters and other friends of the industry were assisted by the fact that there was a simple to understand measure that did indeed show "traffic exceedings the most sanguine expectations," especially since the word "traffic" was ambiguous, and could be twisted to serve the user's need. What the quote above from the Birmingham and Gloucester report concerns is the number of passengers. Nothing is said there about revenues, even though it is revenues (and the profits that come from them, assuming expenses are not too high) that ultimately matter to shareholders. The public had the impression that most passengers travelled from one end of a railway to the other. If that were true (and if fares turned out to be as high as projected), then the number of passengers would be proportional to revenues, and everything would be fine. But, contrary to the general expectation, traffic was largely local. Hence it was possible to have passenger counts higher than expected, yet have revenues below or at the initial estimates. But by discussing almost exclusively passenger numbers, the railway interest could present an illusion of great success.

Occasionally some encouraging views could even be derived from revenues. The quote from [5] in Chapter 17 stated "that the profits on several of the grandest and most expensive lines have exceeded all anticipation." Yes, indeed, on some lines total profits were higher than expected, but the capital invested was far, far higher, so that the profit rates were far lower than promised.

The ranks of people interested in refuting the myth of unexpectedly high demand were thin, and becoming thinner by the year. The fierce enemies of railways in the 1830s had pretty much given up. Canals and coaching interests realized they could not stop further expansion of the new technology. Landowners had also come around to the realization that land values rose when a railway passed nearby. They still wanted to be paid a lot for the land, but many fewer were opposed to railways, and so had little interest in proving that new lines would not be profitable. Their interest was now just the opposite, if they could persuade shareholders to build more lines, even at a loss to those shareholders, they would win. Most of the opposition in Parliament was now from rival lines, and to an increasing

extent they were fighting over the same or similar routes, so had common grounds for supporting high demand estimates.

What about scholarly studies of demand for railway service? There were some, but they contributed mightily to the creation of the great myth. The Birmingham and Gloucester report cited earlier in this section referred to "number [of passengers being] doubled according to the usual practice of railway traffic returns." This was a reference to the standard practice in Parliamentary testimony of taking the estimated number of coach passengers between terminal cities and assuming that the numer of railway passengers between those cities would be double that. This was the key assumption in the traffic taker methodology, as I will describe later, and was that "development" that Watkin made fun of in his "sheep on the fair day" quote. On the other hand, the quote from William Aytoun's article [18] in Chapter 6 claimed that "[w]herever the [railway] system has had a fair trial, the number of passengers has been quadrupled–in some cases quintupled, and even more." The belief that passenger numbers grew at least four-fold became almost universal. And it was very convenient for railway promoters. If Parliamentary estimates assumed 2x growth, while actual growth was 4x, then the revenues would be higher than expected, and would provide higher profits, or, in the worst case, insurance against any cost overruns. For example, at a meeting of the Bristol and Exeter Railway in early 1837, a shareholder expressed his confidence in the prospects of the line, and

> referred to the statement of Dr. Lardner, as to the quadruple increase of traffic on all existing railways, while the estimates for the present line were framed on the assumption of only double the present amount.[201]

The Dr. Lardner in this quote is the same Dionysius Lardner we have encountered before, and will encounter again. It appears that he was the father of that 4x growth factor factoid.

In Chapter 8 we were introduced to Lardner's "Plain rules for railway speculators," which contained a prescient warning about cost overruns, and tried to assuage the skeptics' concern about too much money being invested at once. These "Plain rules" were first published in the 5th edition of Lardner's popular book about the steam engine [120], whose preface was dated December 1835. The first of these "Plain rules" was quoted in Appendix 8, A8.2, and declared that for profitable operation, railways have to rely on large passenger traffic. The second rule was:

> A probable estimate of the pumber of passengers to be expected upon a projected line of railroad may be made by increasing the average number of passengers for the last three years, by the common road, in a twofold proportion.

The entire "Plain rules for railway speculators" chapter was warmly welcomed by the investing public that was hungry for information about choice of investments. It was widely cited and reprinted. For example, the management of the proposed Manchester and Cheshire Junction Railway took out an ad, in which they referred to the "plain but excellent rules for Railway Shareholders, from the pen of the eminent Dionysius Lardner, LL.D., F.R.S., &c., &c.," and pointed out ways in which their line satisfied those rules more closely than a competing project[202].

In the middle of 1836, while the investment mania was still hot, another edition, the 6th, of Lardner's book was published, with a Preface dated June 1836. It was only a slight modification of the 5th edition of half a year earlier[203], but in the last chapter, the second rule for speculators had an important modification. The "twofold" growth in the number of passengers was replaced by "threefold," and there was additional data from various lines to support the more optimistic claim. The new edition of the book, and the change in the second rule for speculators, do not appear to have caught much public attention[204].

Just two months after completing revisions of his steam engine book, Lardner participated in the 1836 meeting of the British Association for the Advancement of Science in Bristol. One of his lectures there was on the effects of railway travel and concluded[205] "that the law of increase was fourfold." His conclusions were criticized by other participants at the meeting as being grounded in too little data. But they were eagerly seized upon by railway advocates, and were cited in numerous published accounts, either implicitly or explicitly, and very likely much more frequently in private presentations. As just one example, exactly one week after Lardner's lecture in Bristol, the Hull and Selby Railway held its first regular meeting (meaning the first after the company was approved by Parliament and formally incorporated) at the other side of England. Some shareholders were apparently getting cold feet, concerned about rumors of rising costs. Hence the directors of this concern laid out their rosy views about the prospects of the company in a report that was printed for presentation at the meeting. After dealing with technology (this was a wonderful line with no engineering difficulties, etc.) they discussed prospective demand. Even though they had only had a few days to learn of Lardner's lecture and incorporate it into their thinking, they managed to squeeze into their printed report ([104], p. 13) an account of Lardner saying that on various lines "the number of passengers had increased fourfold; and this, [Lardner] said, was so established that it might safely be received as a statistical fact." For more emphasis, they restated this fact, which, coming from a meeting of a learned society, was likely to carry some credibility, at the end of the appendix to their report (p. 30), where they wrote that "[i]n the foregoing estimate, the number of Passengers is taken at not quite double the number now travelling between Selby and Hull; although, as stated in the Report, a railway has generally been found to quadruple the number of Passengers."

Lardner's 4x estimate appears to have been widely believed. Hence the *Derby Mercury* of Jan. 31, 1838 wrote that "Dr. Lardner has proved abundantly that in every case where a railway has been constructed, the transport of passengers has increased in an immense proportion. In no instance has it been less than four to one, even where the fares have been increased by it." It was even cited across the Atlantic[206]. Further, it received semi-official imprimatur. That famous and careful compiler of statistics, George Richardson Porter, whose credibility benefited from his official position as head of the statistical department of the Board of Trade, and who at times was the senior member of the Railway Department of that body (see Appendix 3), stated ([178], p. 332) that

> Hitherto it has been found, in nearly every case where a railroad adapted for carrying passengers has been brought into operation, that the amount of travelling between the two extremities of the line has been quadrupled.

This citation is taken from the 2nd edition of Porter's book, but the same sentence occurs in the 1st edition, published in 1838. Note that this statement incorporates both the 4x myth, and the terminus-to-terminus traffic delusion that was discussed in Chapter 16. Amazingly, this same statement is repeated, *verbatim,* in the 1851 edition. Adjoining text did get changed, so Porter did not just copy all the old material without thinking about it. But the power of the 4x delusion was such that he did not think twice about it, even though it had just brought the railway share market to its knees!

Lardner and Porter had the greatest scientific credentials of those writing about accuracy of traffic estimates. Some other studies with similar conclusions were prepared or propagated by people with stronger personal ties to this industry. For example, in 1848, Humphrey Brown, who had been one of the foremost traffic takers during the Mania, and was now an MP (Member of Parliament), published a pamphlet advocating state aid for railways in Ireland [40]. After a bow to the reigning doctrine of superiority of private enterprise[207], he noted that in this particular case the wisdom of the market was not delivering what his own wisdom called for (p. 7):

> However correct, as a theory, may be the doctrine of private enterprise, yet political economy abounds with such abstractions, the special application of which, in unsuitable and exceptionable cases, has the tendency to bring the system itself into disrepute. ... Political economy may allow of no exceptions, but political science admits of many; ...

and proceeded to lay out his argument for government aid. (This was neither the first nor the last such call, and a more detailed treatment of the Irish railway question is absolutely necessary for a full understanding of the British railway issues.) To bolster his case, he presented a collection of statistics, many to prove that the estimates presented to Parliament by promoters of English railways in the 1830s were gross underestimates of actual results (pp. 60–65). As just one example, he gave data for the Midland Railway, showing that in 1845 it provided transportation for 1.81 million passengers and 371 thousand tons of goods, as opposed to 551 thousand passengers and 151 thousand tons of goods that had been estimated for the three lines that merged to form this line. Brown's work was then elaborated on by Hyde Clarke [56]. Both Brown's and Clarke's contributions were incorporated into a table (on p. 20) of a pamphlet by Samuel Smiles [201], then the secretary of the Leeds and Thirsk Railway, and later to become the foremost exponent of the Victorian self-help movement and Victorian morality. Smiles flatly declared that "[t]he estimates of traffic laid before Parliament, have in all cases within our knowledge, been greatly exceeded." Smiles' table showed that for the 13 railways it covered, all well-established and substantial British lines, the number of passengers in 1846 was 230% of estimates, and tons of goods were 250% of estimates.

These were all nice and comforting figures, but neither Brown, nor Clarke, nor Smiles touched on what mattered far more to investors, namely revenues and profits. And those presented a dramatically different picture. Profits, while far below what had been projected, were tolerable. Revenues, on the other hand, were almost exactly on target. There was no "exceeding the most sanguine expectations" in either revenues or profits. It was only by interpreting the ambiguous word "traffic," which was used to refer to many measures, as

referring to the number of passengers that one could obtain the rosy picture that was painted.

Was the delicate omission of this not insubstantial consideration the results of a conscious decision to confuse investors, and try to maintain "beautiful illusions"? Or were all these authors themselves subject to the reigning delusion? That is a question I will leave aside for the moment.

In closing, it is worth mentioning that the myth of "traffic exceeding the most sanguine expectations" was an easy one to sell to the public. There were more trips than had been expected, and, especially, far more passengers going through the various local stations. So there was a plausible case to the myth.

20 Ignoring the past and the future

We have seen in the preceding chapters that Railway Mania investors neglected history. Even a cursory comparison of the promises of 1830s with the reality of the mid-1840s would have shown them they labored under a serious delusion, that traffic takers estimates had been exceeded in almost all cases. Had those investors taken the traffic taker predictions for the Mania lines seriously, they would have realized those projects were at most of marginal attractiveness. And if that made them more cautious, they might have examined the traffic taker methodology, and realized those projects were destined for ruin.

However, investors did not examine the traffic taker methodology. And neither did the Mania skeptics. Everybody concentrated on the difficulties of railway construction and its effects on the economy, and ignored what would happen once the lines were built. Would people come to the ballpark? That question was seldom raised.

It is hard to demonstrate conclusively just how seldom the future of the railway industry, beyond the construction phase, was considered, at least without taking the reader through masses of material from the Mania period. So let me instead quote a contemporary witness to this phenomenon. At the end of 1848, the railway share market was in a crisis, with prices plummeting in response to stockholder suspicions. (What was at the base of the suspicions, and the entire episode, will be considered in *BICS,* and to some extent in [166], since it provides an interesting perspective on inefficiency of the markets in digesting available information.) A series of detailed accounting statements and promises to cancel or suspend many construction projects allayed shareowner concerns, and railway shares recovered partially. The recovery was temporary, the depth of the share depression would not be reached until a year later, after revelations of numerous accounting irregularities and disappointing financial results. But for the moment railway managers, shareholders, and many observers breathed sighs of relief. The *Economist*, as often somewhat (but not too much) ahead of its contemporaries, decided to look to the future. In a long piece, "Railways as a permanent investment," it noted that

> During the last four years the discussions on the subject of railways have had reference more to the causes which were likely to effect their immediate than their ultimate and permanent value. They have been treated more as the subjects of "time bargains," and of temporary speculation than as permanent investments.[208]

The entire article is worth a more detailed discussion, not least because it had very accurate projections of the finances of the entire British railway industry, yet failed to follow its own logic to its natural conclusion, namely that common shareholders were bound to feel ruined when the lines were completed[209]. But at this point let's leave that aside, and simply note that the *Economist* was correct, that up to that point (and actually for quite a ways beyond), almost all of the public discussion of railways in Britain was about "their immediate" and not "their ultimate and permanent value." There were a few exceptions. The best that I have found so far the Dionysius Lardner survey from 1846 [125] that has come up several time already, and will be discussed in more detail in Chapter 30. There were also a few others, to be discussed in *BICS,* but almost all that one reads in the literature of the period is about immediate concerns, such as costs, alliances, mergers, and more than anything the "calls," the need to provide money for construction. The overwhelming, and mostly unspoken, assumption was that once investors got over the hump of building the lines, everything would be well, and the dividends would flow plentifully.

21 Investor expectations: Size of network

How many miles of new lines did did supporters of the Railway Mania expect to be built, and how much did they expect to be spent on the task, and over what period? For individual investors, those were not directly relevant questions. They had their own individual plots in the gold rush staked out, and worried mostly about finding enough gold, not overpaying for supplies, not being robbed, etc. But at least some did have to think about the large scale picture, since that was the key element that skeptics concentrated on with their assertions that the nation could not afford to have all that money going into railways. Spackman's famous compilation, published in *The Times* on Nov. 17, 1845, showed that the lines in operation at that time had raised £71 million in capital (in shares as well as in loans). Lines then still incomplete, but already sanctioned by Parliament, had powers to raise £51 million in shares (and £16 million in loans). And then there were 1,263 new projects that Spackman had found (not counting those that showed up on the scene in that month) with projected capital requirements of £563 million, and corresponding to something like 30,000 miles of new lines. *The Times* and other skeptics all pointed at this as an absurd figure. Even the most vocal proponents of railways agreed. But they argued that much of that huge figure was made up of Glenmutchkins, lines that, even if they could get subscribers, would be winnowed out by Parliament. (John Stuart Mill's South London Suburban Railway could not even get enough subscribers to fund the preliminary work, and yet it was on Spackman's list.) Furthermore, there were many competing lines, running along the same or very similar paths, often more than two, and Parliament was not going to sanction more than one in such cases. So the real requirements for capital were going to be far lower than the frightening £563 million. But, since railway promotion was not a centralized activity, there was no single guru we can turn to for an answer of what might have been expected.

On the eve of the Railway Mania, Britain had several transportation infrastructures. Knowledgeable opinion of the time held that excluding Ireland, there were about 25,000

miles of turnpike roads, perhaps 115,000 miles of other public roads, 1,800 miles of navigable rivers, 2,200 miles of canals, and close to 2,000 miles of railways[210].

Canal construction, which came in several waves, was at a standstill. Although every investment mania stimulated the rise of some canal proposals, many of the Glenmutchkin variety, they did not get anyplace. The last large canal project in Britain as of the time of the Mania, the Caledonian, which opened in 1822, had been built with government funds, and produced derisory tolls, not enough to even pay the operating expenses, much less any interest on the capital investment. Hence it was often held up as an example of why governments should stay out of business. (The logic of this argument was diluted to at least some extent by the success of the Erie Canal, which was widely known and admired in Britain. This project, opened for service along its whole length in 1825, cost about 50% more than the Caledonian, and was extremely profitable. However, it was funded and run by the State of New York.) Turnpike construction, which had also been dominated by several large waves, was similarly at a low ebb, with growth in mileage in England and Wales from 20,875 in 1829 to 22,324 in 1848, for a growth rate of 0.35% per year[211]. There was a low level of ongoing investment, improving the turnpike roads and the canals, but it was low. The resulting picture was consistent with the prevailing world view of the early Victorians, namely that once in a while, a major innovation, such as canals or turnpikes, comes along, there is a period of rapid deployment (possibly several such periods), and then the potential of the innovation is exhausted, and stasis prevails.

The most recent transport innovation was the railway. As was discussed before, on the eve of the Railway Mania, the prevailing view was that the 2,000 miles in service or nearing completion was, with a view minor exceptions, such as a link between England and Scotland, as far as this industry would go. The advent of the Mania was closely associated with a dramatic change in view, towards one of almost unlimited possibilities. Sometimes one could hear predictions that eventually "horse and foot transit shall be nearly extinct," and that "every mile of highway will ultimately be replaced by two miles of railway" [1]. In that case it appears clear the writer meant all the 150,000 miles of public roads. That particular piece was extraordinarily visionary, proposing combining atmospheric railways with greenhouses and other agricultural developments. A contemporary observer ([26], pp. 98–99) certainly was convinced that indeed all 150,000 miles of public roads were meant, and criticized that prediction as "a specimen of the wild fantacies that in this season of railway frenzy haunt the brains of even clever and intelligent men!" But only slightly more extreme predictions were widely accepted. For example, in the next issue of the same periodical that published [1], we find another writer concluding that [101]

> There are 27,000 miles of turnpike-roads in Great Britain alone, and the public roads of all kinds (including both cross country roads and turnpike roads) in Great Britain and Ireland extend to a length of somewhere about 150,000 miles! We have now to convert these stone roads, or the greater part of them, into iron roads as speedily as may be practicable, and possibly (as the disposition to travel increases with facilities for travel) find room for twice the number. This is the work Englishmen have set themselves to do, and in this generation, or the next, they will do it.

The restriction to "stone roads" suggests the writer had in mind primarily turnpike roads, and so was in effect saying that at least "the greater part of them" and possibly even "twice the number" would be replaced by railways. Hence he was envisaging between 15,000 and 50,000 miles of railways. Given the difficulty of predicting what society will do with a technology, and the fact that there was a grand total of only about 2,000 miles of railways in service when that passage was written, that was not a bad guess, at least if we don't consider timing. By 1920, Great Britain and Ireland had almost 24,000 miles of railways (which was followed by shrinkage to less than half that level today). The main problem was that this writer, and apparently most observers at the time of the Mania, felt that all those railways should be built "as speedily as may be practicable." Both Mania supporters and skeptics felt that the greatest obstacle would be getting funding to construct the lines fast enough.

This attitude, that one should build out railways on a large scale, and as quickly as possible, persisted even after the Mania collapsed. For example, the *Economist,* the same one that proclaimed at the end of 1843 that the British railway system was essentially complete, would sing a different tune in 1854. In a review of Spencer's "Railway morals and railway policy,"[212] it fretted that the collapse in dividends had "intervened to stop the much required progress of judicious railway making" and brought "some disrepute on private undertakings in contrast to Government works." And it claimed that

> No person can now suppose that [supplying the land with railways] will be completed till railways are carried here, like canals in Holland, to every farm house in the land. They have superseded, or are superseding, common roads, and districts without rails will speedily labour under nearly all the disadvantages which heretofore belonged to the total want of communication.

The clearly exaggerated implied claim that in Holland, canals came "to every farm house in the land" indicates that the author was indulging in a flight of fancy. It is possible that this writer was thinking of some major technological breakthroughs. That seemed to be true of some of the writers of the Mania (such as the one cited before who wrote that because of railways, "horse and foot transit shall be nearly extinct"). It was certainly true of some much earlier writings by Lardner, too. And in a sense all those writers were not too far off, at least if one disregards the key element of time. The internal combustion engine has led, in industrialized countries, to "horse and foot transit" becoming "nearly extinct." And from the perspective of the early Victorians, the car, bus, and truck could be seen as future generations of trains. (Had the internal combustion engine turned out not to work well, it is possible that steam engines would have become the method of choice for powering car and trucks, in which case the line of descent would have been extremely close.) Hence the paving of streets for use by vehicles powered by internal combustion engines can be regarded in a weak sense as railways replacing roads.

But just what were the expectations for the immediate future? Putting aside flights of fancy about the distant past, it does seem that nearly everybody, skeptic and proponent of the Mania alike, agreed that railways should replace most if not all turnpikes. As just one example of what was respectable and considered opinion on the topic, consider the

statement of P. M. Stewart in a debate in the House of Commons in early 1846 about railway policy, where the volume of railway investments was a key element[213]:

> Six hundred bills, in his opinion, had not exhausted the demands for railways, or the capital applicable to the construction of them; and what they were now devising would be applicable to railway legislation for many years to come. We were now making roads through the country in every direction. There were 25,000 miles of turnpike trusts in the country, which were in process of being superseded by railways, yet there were not above 4,000 miles of railway, he thought, now before Parliament. Every session, therefore, they would have to apply to railway legislation the plan which might now be determined upon.

Thus the prevailing opinion certainly envisaged, even if only implicitly, the construction of a total of at least 20,000 miles within a few years[214].

Promoters around 1846 were telling Parliament and their shareholders that their lines were going to cost about £20,000 per mile[215] As I showed before, this figure was known to be a pious fraud to all knowledgeable insiders, with various completely predictable expenses left out of the estimates, but let us ignore it. At £20,000 per mile, a network of 20,000 miles would cost £400 million (even ignoring the higher cost of the original 2,000 or so miles built by 1845).

Spending £400 million on railways did not seem absurd to either the opponents or the supporters of the Railway Mania. The only question that seemed to divide them was how much the country could afford at a time. The *Economist, The Times,* and James Morrison all seemed to feel that £20 million per year, possibly at a stretch £30 million per year, was all that was feasible[216]. On the other side, some tossed around figures as high as £170 million per year[217]. But that was extreme. George Hudson, the Railway King, talked of £70 million per year as being affordable[218] And since everybody was talking of spending at that level for several years in a row, if we assume that such spending continued for 5 years, added to the £70 million that had been spent by the end of 1845 on lines already in service, we find that railway expansion advocates implicitly were assuming that over £400 million would be spent by the end of 1850[219]. Hence to evaluate what railway investors' implicit expectations were, once construction was completed, it is reasonable to think of cumulative investment of £400 million by the end of 1850.

Some investors may have been expecting that the hectic pace defended by people like George Hudson might not be attained at all, or not sustained for long. But by August of 1846, when that year's Parliamentary session came to an end, they should have realized that, no matter what happened to their pet projects, the railway industry was almost surely going to increase by a large factor. Spackman's tables in *The Times* of Nov. 17, 1845 showed that £71 million had been invested in lines already in service, and that lines under construction had authorized capital of £51 million. (Summaries of Spackman's tables with these figures were reprinted very widely.) The session of 1846 authorized share capital of £95 million[220]. So even if there were no cost overruns, and all those unavoidable expenses that had not been put into the estimates were magically avoided, British investors as a class were faced with an absolute minimum of £217 million of capital investment by the end of 1850, say. Some projects might be aborted, but there were also many being planned for

the 1847 session. So any investor taking a macro look had to realize that the capitalization of the British railway industry would be over £200 million by 1850. (It turned out to be £246 million, including Irish lines.)

Either figure, £200 million or £400 million, should have given pause to anyone not subject to the collective hallucination that gripped Britain at the time. And a short pause is all that would have been required to direct thought to the fatal flaw of the Mania, which is explained in Chapter 27. But first let us consider what the profit expectations were, and what the role of the traffic takers was.

22 Investor expectations: Profit rates

Just what were British railway investors expecting? That is a hard question that we can't even answer for today's investors. There is what they tell us, there is what they think or hope (consciously or unconsciously), and there is what they will settle for and be happy with. We have even less information for the investors of the Mania period. The ones in the smaller mania of the mid-1830s had been treated to beautiful illusions of 10–15% dividends, sometimes even more. By the mid-1840s, they were getting about 5–6%, but that average level was rising, and it included several lines paying 10%. It appears many shareholders thought they were getting, or on the way to getting, 10%. And the frequency with which one finds references to 10% dividends shows they had become what in modern language is referred to as an anchor point. People spoke and wrote about their railways joining the elite group of "10 per cent. lines," and managers strove to reach that goal. As an example, at the semiannual meeting of the LSWR in early 1845, Chaplin the Chairman, in asking for approval of the Report of the Directors, said that[221] "it amply proves your resources, which are alone the basis of the expectation which we have had for some time, that ere long you will have secured to you an uniform 10 per cent. dividend. (Cheers.)" Railway ads also tried whenever possible to justify expectations of such a return[222]. Certainly James Morrison was convinced that investors were expecting 10%, as opposed to the 6–7% that he felt would be more than adequate (and which turned out to be far more than investors received in the end), [157]. His campaign was aimed at getting Parliament to force lower fares and lower profits. Morrison also blamed Parliament for reinforcing that 10% anchoring effect through its debates and legislation of 1844 (pp. 20–23 of [158], where on p. 20 he refers to "[c]ompanies having now something like a parliamentary guarantee, or what was considered such by many people."). He was not alone in thinking along those lines. The *Railway Record* even earlier suggested this[223]. And of course throughout this period James Morrison kept harping on the extortionate 10% returns that the excessively high fares would allow investors to obtain.

That the 10% expectation was serious, and was not just a figure of speech, is shown by an incident from August 1846. The London and North-Western Railway, just formed through a merger of the London and Birmingham, the Grand Junction, the Liverpool and Manchester, and some smaller lines, held its first shareholder meeting. George Carr Glyn, the Chairman, in his speech ventured a warning about future dividends:

> I may say, and I do so in my individual capacity, and without in any way committing my colleagues [the other directors], that I do think that, when the new creations are made and the new works finished, it will be impossible for us, unless circumstances should change, to keep up on the whole of our capital the existing dividend. It has been a principle with the London and Birmingham Directors never to conceal anything from the proprietors, and I have thought it right on an early day tomake you acquainted with my individual feelings. It will be some time before the new capital can be brought into operation, and it is impossible to say what the enterprise of this country may not do. Many of my colleagues are sanguine enough even to look for an increased dividend. That is not my individual opinion.[224]

The London and Birmingham was famous as one of the "10 per cent. lines," and even this tentative suggestion that future dividends might slip, although qualified with all the caveats about this being just Glyn's personal opinion, and other directors expecting an increase, caused a dramatic reaction in the stock market. In the words of a railway newspaper:

> The declaration of Mr. Glynn, that, in his individual opinion, the high rate of dividend to which the London and Birmingham proprietors had been accustomed could not be kept up, caused no little sensation. It fell like a thunder shower on the shareholders present, many of whom departed in all haste to Capel Court [where railways shares were traded]. The effect upon the market was instantaneous. On Thursday [the day before the meeting] the shares found ready buyers at 234 to 236; on Friday they fell at once to 228, declining to 225; on Saturday the latter price was in a few instances sustained, but the ruling price was 223, ... There is no reasonable cause for such a reduction.[225]

Thus even though investors on average would surely have happily settled for less than 10% in dividends, this was the figure that stuck in their minds. And a clear demonstration that such expectations were absurd would surely have caused them to reconsider, had they seen one, and been willing to accept it. But they saw only one weak version of such a demonstration, not a very explicit ones, and they chose to disregard it[226].

For most of the schemes of 1845 and 1846, the profits projected by the traffic takers, the ones "proved in Parliament," were actually more like 7%, as we'll see in the next section. But the argument developed later (Chapter 27) shows that with the information available during the Mania, even 5% should have been clearly seen to be unattainable. Most investors, though, regarded traffic taker forecasts only as very safe lower bounds on what they would get from their lines.

Two final remarks. James Morrison was quoted in Chapter 13 to the effect that with the rise of large railway contractors, "a line, ..., may be contracted for at once, whatever its length, thus rendering the cost certain." That passage continued as follows: "the tables of traffic may, taking proper precautions, be compiled with so much accuracy as to reduce within very narrow limits the chances of mistake in the revenue." That says that he believed traffic takers were making accurate estimates of demand. But later in the same pamphlet ([157], p. 40, reprinted in [158], p. 131) he claimed that one needed to remember "the extent to which the increase of traffic on [the first lines] has surpassed expectation." These

claims were not necessarily inconsistent, in that the former referred to the Mania period, 1845, while the latter was about the estimates from the 1830s. However, if he believed that traffic takers were accurate, then why campaign for lower profits (in early 1845 he suggested that 6–7% would suffice to attract capital to railways), if the traffic takers were only promising 7% returns? This is not necessarily a contradiction either, since Morrison was aware of economic growth, and was looking a decade or two into the future, by which time even an initial 6% profit was likely to grow to something far larger. But we should not take these claims of Morrison's too seriously, since he appeared to be willing to use any and all arguments to get what he really wanted, namely lower fares.

The second point is that not everyone bought into the "beautiful illusion" of 10% profits. Some people seem to have taken the traffic taker estimates seriously. For example, Thomas Gisborne the younger, a well-known politician and writer on economic topics, claimed at the end of 1847 that railway investors were going to get 7% returns on their investments ([89], p. 227). That is just about what the traffic takers had forecast. James Aytoun, a cousin of the William Aytoun who wrote the Glenmutchkin story, wrote at about the same time:

> Most of the lines were calculated to pay excellent dividends, and would have done so had the first design been alone carried out. But the original capital on which the dividend was calculated has been in almost every case so enormously increased by the undertaking of new unremunerative branches, and by the immense sums thrown away every year on surveys, ..., that companies which, at the outset, had a fair prospect of paying 8 per cent., are beginning to perceive that the revenue, when fairly made up, without recourse to any bolstering, will not afford a dividend of more than 3 or 4 per cent. upon the extended capital.[227]

James Aytoun, unlike Gisborne, was heavily involved with railway promotion, so likely more aware of the problem of unprofitable extensions (which were beginning to be discussed with greater intensity towards the end of 1847) and so was expecting dividends of just 3–4% in the end. (He was an optimist!) The main point, though, is that the initial expectations were in his opinion around 8%, not the 10% that enthusiasts were touting. This was close to what the traffic takers had promised.

23 The success and failure of the traffic takers

Chapter 18 argued that traffic takers during the 1830s were very accurate in their predictions of revenues for railways around 1845. This was shown by the data in Reed's table, modified to reflect growth in traffic from 1843 to 1845. That table reflected performance of six railways. However, the same conclusion can be obtained from aggregate data. Construction costs were 70–100% higher than projected, operating costs were about 42% of revenues (Lardner's estimate, p. 492 of [125]) as opposed to projected 33%, and dividends were about 5% (Lardner's estimate again, p. 492 of [125]), or, from another computation, rising from 5 to 6% during 1845 (Fig. 2 of [47])[228], while projections in 1836 were for about 11.7% (Shaen's average for 19 lines authorized in 1836, p. 80 of [196]). So at least on average, the revenue projections had to be close to what was realized around 1845.

What about traffic taker accuracy in the Mania of the 1840s? There were certainly many people who felt that actual traffic turned out to be far lower than projected, that the various branches and extensions were not "feeders" but "suckers." Edward Watkin was one of them, as his 1868 impromptu remarks cited in the Introduction indicate, but there were others as well. But I have not found any systematic study of the extent of the shortfall. It would be extremely difficult to carry out such a study for a large sample of individual companies, given the extent of mergers and acquisitions, and the muddled state of railway accounts. We do get some hints, though. For example, the York and North Midland Railway, the one that the Brontë sisters put most of their money into, was one of the lines that set up an independent shareholder Committee of Investigation[229]. This committee devoted almost half a year to their task, and their four reports [224], apparently the most thorough of all such reports, came to almost 200 pages[230]. The committee, after allocating construction and working expenses to various branches that made up this company, concluded that lines authorized before 1845 were earning (after paying interest on debt) 7.65%, those authorized in 1845 were earning 4.15%, and those authorized in 1846 just 0.07%.[231]

We can avoid the difficulty of disentangling the accounts of individual railways by looking at industry statistics. If we consider Table 2 in Chapter 3, we see that by the end of 1845, Britain had about 2,500 miles of railway, producing revenues of about £6 million per year. While we do not have precise statistics, and occasionally one finds complaints about traffic decreasing, all the evidence points to vigorous growth in traffic on these lines over the next few years, so it appears very safe to assume they brought in revenues of at least £6.7 in 1850. But that means that the 4,000 miles of additional lines brought into service by the end of 1850 brought in at most £6 million that year, or about £1,500 per mile per year. The actual number was likely considerably lower, perhaps around £1,250 per mile per year.

Now 1,351 miles of new lines were authorized in 1847 (and 371 in 1848), and traffic takers were not involved in pushing those cases through Parliament, so can't be blamed for any shortfall in revenues in those cases. However, only 136 miles of lines in 1847–48 were in service by the end of 1850, so they could not have affected statistics much[232]. Thus the disastrous financial performance of 1850 can be blamed on the traffic takers.

During the years 1844–46, Parliament authorized a total of 8,110 miles of new railways, let's call it 8,000. Only 4,000 were in service by the end of 1850, a small fraction of the remainder were completed over the next few years, and others abandoned (only to be resuscitated, sometimes with substantial alternations, in future decades). For these 8,000 miles of railway, the estimated cost was £154 million[233], or just about £19,000 per mile, which I'll round to £20,000 per mile. This was the amount of share capital, which officially was supposed to cover all construction costs, with a 10% margin for contingencies. As we saw in Chapter 14, this was pious fraud, well known to all knowledgeable insiders. But we are trying to judge just the traffic takers on their work, and that assumed the engineers' and others' estimates were correct. So let's continue with the assumption of a cost of £20,000 per mile.

Now what were the traffic takers' estimates? We can obtain those for 1844, 1845, and a fraction of those for 1846 from the archival material in the House of Lords Record Office[234].

Fortunately, we can bypass that difficulty by looking at the the compilation published by the *Scottish Railway Gazette* for the projects santioned in 1845[235]. It showed that during that year, lines were authorized with share capital (and thus estimated cost) of £40.9 million. They were expected to produce annual revenues of £4.67 million, and profits of £2.85 million[236] Thus the expected profit rate was 7% (2.85/40.9) and working expenses were estimated at 39% of revenues ((4.67-2.85)/4.67). Also, annual revenues were expected to be 11.4% of capital cost.

Let us apply that 11.4% figure to the 4,000 miles of railway authorized between 1844 and 1846, and built by 1850, and assume that each mile was going to cost £20,000. We then find an estimate of annual revenues of £9.1 million per year from the new lines. The actual revenues were estimated earlier at £6 million (although that was taking the most optimistic view of the situation). Thus the shortfall in revenue estimates was, in this view, only 34%. Still, £6 million in revenues on capital investment of £80 million, with 40% for expenses produces a profit rate of just 4.5%. That was definitely subpar for those days, given that the investment would take several years to yield such profits. Even James Morrison thought that 6–7% was a reasonable rate of return. Furthermore, to get that estimate, it was necessary to assume that costs were going to come in on target.

The accuracy of the traffic takers' forecasts during the Mania was actually even worse than the calculation above makes it appear. Not only did the 4,000 miles of new railways almost surely did not produce the £6 million in revenues. We have to consider the other 4,000 miles that were not built. Traffic takers were implicitly promising that if all 8,000 miles that were authorized during 1844–46 were built, revenues from them would come to £18 million per year, making total railway industry revenues in 1850 at least £25 million, instead of the £13 million that was recorded. That is extremely unlikely[237]. Chances are that even £18 million would not have been obtained. Hence the likely shortfall in traffic taker estimates would likely have been over 50%.

24 Fallacies of the traffic takers

The amazingly accurate forecasts made by the traffic takers in the 1830s were the result of luck, of many methodological errors cancelling out almost perfectly. Curiously enough, those errors were probably not the main cause of the disaster of the Railway Mania of the 1840s, although they contributed to it. Another factor, which was less significant in the 1830s, appears to have played the main role in that debacle, as will be shown at the end of this chapter and in Chapter 27. However, investors in the Mania for the most part appeared to be unaware of any of these factors. Their collective hallucination made them ignore the traffic takers almost completely, and this led them to neglect the main opportunity to detect the fatal fallacy of the Mania.

Before discussing the false assumpions in the traffic taker methodology, let me briefly describe what the methodology was. (More detail will be provided in [165] and *BICS.*) We have already seen some glimpses of it, in particular in the description of the myth of 4x growth in traffic, and in the Watkin "sheep on the fair day" quote. The basic approach is illustrated by the following quote from the *Leeds Mercury*:

> It is well known to all parties interested in railways, that the usual mode of calculating the traffic before Parliament is to take the number of coaches on the road, and allow ten passengers for a four, and eight for a two-horse coach, multiplying that by two, as the probable number that would travel by a railway through the same country.[238]

The "multiplying [estimated number of coach passengers] by two" was a key element, the "development" that Watkin made fun of in his "sheep on the fair day" quote. The other key element was that only coach passengers were counted.

Although passenger revenues dominated in business plans, freight was always counted on for a substantial contribution. While the number of (coach) passengers was expected to be doubled on a railway, for goods transport in general no "development" was assumed. Only the freight that was transported significant distances on roads in the direction of the railway was expected to shift to the new mode of transportation. Further, the prices paid were to be the railway prices, significantly lower than horse-drawn carriage fees.

In the U.S., on the transcontinental and a few other railroads through newly opened territories, there was no significant road traffic to observe, and rail lines were expected to generate new traffic. They were often given grants of land which they would then sell to farmers moving to the area, and the traffic of those farmers was expected to produce service revenues. In settled areas, though, American as well as British promoters relied on existing traffic to estimate rail traffic volumes. Thus, for example, Governor Lowell of Massachusetts wrote in 1828 about the proposed Boston and Providence Railroad[239]: "From satisfactory estimates, and calculations upon the present travel and occasion of transportation, the net receipts ... will amount to ...." There were certainly many instances in Britain where railways were promoted even when there was not much "present travel," but those required special justification. One reason that Edward Watkin may have remembered the Manchester and Southampton Railway project so well is that it fell in this category. Its promoters had a difficult case to make to Parliament, with much controversy about their traffic projections.

The estimation of "the present travel" in Britain, at least for Parliamentary testimony, was usually based on observations over two weeks, day and night, at strategically chosen points. Observers were frequently quizzed as to whether there had been any fairs or other special events that would distort the numbers, and the general reliability of the observers and their figures was questioned.

The traffic taker methodology sketched above was invented by Constantine Richard Moorsom, one of the secretaries of the London and Birmingham Railway, for the Parliamentary hearings on that line in 1832. This methodology was carried out under the supervision of Peter Lecount, an engineer employed on that line. It quickly became the standard, and was widely known. For example, Lecount's book [129] was an enlargement of an article he wrote for the 7th edition of *Encyclopaedia Britannica* [130], and devotes most of the space to engineering issues, but (p. iii of Preface) was intended "to give a plain practical account of every subject connected with the construction of a Railway, from the first organization of a Company to the opening and working of the line." Hence he included, on pp. 4–13, a fairly detailed description of how one should collect statistics on existing

traffic, and derive from that estimates for traffic on a railway. There was even a bit of geometry there, needed to estimate when traffic between two points, neither on the line of the railway, would make detours in order to use the railway for part of the journey[240].

Much of this methodology could also be deduced from newspaper stories and ads. There one could also see promoters trying to build more "beautiful illusions" than the methodology allowed. The quote above from the *Leeds Mercury* of 1839 already displayed the key elements. Here are four more examples, all from ads published on the same page of this newspaper in 1844 (*Leeds Mercury*, Oct. 5, 1844, p. 6):

- Dundalk and Enniskillen Railway: "The following Estimate of Traffic ... is calculated upon merely doubling the existing Traffic, which all past experience has proved to be much under the actual results produced by Railways. ...

  Showing a profit on the amount to be paid by the Shareholders, according to the estimated cost, of about nine per cent., or, if the traffic be trebled (which there is no doubt will ultimately be the case), a profit of twelve per cent."
- Cornwall Railway: "The accompanying estimate of traffic, deduced from very careful observations made at 23 different stations on the roads, shows the following results, ...

  This calculation, which shows a return of upwards of six per cent. on the capital, is made upon principles allowed in proof before Parliamentary Committees, but does not include ..."
- Direct Northern Railway: "Estimated Income, calculated on the usual Parliamentary Data, and based on actual Returns, which are printed, and may be seen at the Office:– ..."
- Blackburn, Darwen, and Bolton Railway: "The Traffic has been carefully taken under the superintendence of a competent Agent employed for the purpose, by whom the following Summary, in the accuracy of which the Committee repose every confidence, has been furnished, showing that a net return of upwards of 8 per cent. on the outlay may be expected to be realized by the Shareholders:–

  Passengers at the present rate of travelling, and allowing for increase an equal amount ..."

These passages reinforce the almost unanimous message one obtains from the British press and other sources of this period, namely that there is a rigorous methodology that is used in Parliamentary hearings, but that it extremely conservative. The Lardner 4x growth estimate for passengers, "so well ascertained that it might be stated as a statistical fact," was naturally very convenient for promoters anxious to "gild the lily."

What was not printed in newspapers, but appears to have been known to some observers, and was easy to deduce from publicly available information, is that there were serious fallacies even in those "principles allowed in proof before Parliamentary Committees." The main ones have already been treated in chapters 15 and 16, about incorrect notions of growth, and about locality of traffic. Incorrect estimates for prices and for working expenses were additional factors.

The traffic takers' forecasts were based on the common notion of a jump and then level performance. There was no notion of traffic growing even 1% per year, it's there are 20,000 passengers by coach today, there will be 40,000 by the railway every year into the

distant future, starting within a year or so of the opening of the line, and they will pay £15,000 per year. Period. By that standard, what I have said so far about the exceptionally accurate forecasts that the traffic takers made is wrong. Their forecasts were supposed to be accurate a year or so after the opening of a railway, not in 1845 and 1846, when actual traffic had caught up to their projections. And a few years later, traffic was ahead of those projections. So all that praise for the amazing predictive power of the traffic takers applies only during that brief period at the height of the Mania. (As somebody once said, "The secret to successful forecasting of stock prices is to never specify a date.") But in terms of influencing investors' state of mind, 1845 and 1846 were the crucial years, and so, even if this was not publicized in print, it likely did influence investors' thinking through the "wisdom of the crowds" effect.

Still, the estimates made by the traffic takers in the 1830s were very accurate at the height of the Mania, around 1845. They were accurate not just on average, but for many (but by no means all) lines. This accuracy arose out of cancellation of errors, errors that allowed the myth that "traffic has exceeded the most sanguine expectations" to persist.

We have already discussed the assumption that the number of passengers by rail would be double the estimated number of stage-coach travellers, with most of them going from one end of the line to the other. In most of the English lines projected during the 1830s, it was assumed that average passenger revenues would come to two of the old English pence (of which there were 240 to each pound sterling) per mile. (The levels for Scottish and especially Irish lines tended to be lower.) Let us consider how these assumptions worked out for the Edinburgh and Glasgow Railway. Its results in 1844–45, displayed in Table 4 in Chapter 6, show almost perfect agreement with the Parliamentary estimates for passenger revenues made in 1838. Here I will compare the 1838 projections against the results for the the first half of 1843, since some of the relevant computations for that period are conveniently presented in [93] (p. 230, last half-yearly entry for this line). The 1838 projections were for 341,421 passengers for a full year, or 170,711 for half a year. The actual figure of 256,108 shown in [93] is comfortably ahead of that by 50%. So to the extent that the Parliamentary estimate was based on 2x growth compared to stage-coaches, this corresponds to 3x growth, not quite Lardner's 4x, but not far from it. (There is a complication in that for the Edinburgh and Glasgow line, many passengers were expected to come from canal boats, so the standard methodology had to be modified a bit, but let's skip such details.) But there are two problems. The main one is that the average revenue per passenger-mile (easily derived from data in [93]) is 1.31 old British pence. The 1838 estimates were based on an average of 2 pence, the most common figure used in Parliamentary hearings[241]. Thus actual charges were 35% below expectation.

In addition to a 35% miss on revenues per passenger miles, the 1838 estimates also has a substantial overestimate of trip lengths. The expectation was that a passenger trip would on average be 29 miles[242]. But the actual length (from [93]) was 23.3 miles, 20% below expectations[243].

The combined price and trip length mistakes almost exactly compensated for the underestimate of the number of passengers, and produced remarkably accurate final financial outcomes. One could argue that the traffic takers were not to blame for the lower fares,

those were the result of business decisions by railway managers. However, at fares equal to those expected in 1838, there would have been far fewer passengers[244].

Finally, working expenses for the Edinburgh and Glasgow Railway in the first half of 1844 were 36% of revenues, as compared to 33% in the 1838 projections[245]. The final result was that this line was regarded as a financial success, although at only a fraction of the expected dividend rate, since construction costs were far higher than expected.

More examples of the "cancellation of mistakes" or "stumbling to success" of various British railways from the 1830s will be presented in [165] and *BICS.* How far different factors differed from original estimates varied from line to line. Generally, average fares were not as far off as for the Edinburgh and Glasgow. (Lardner's 1846 survey [125], p. 493, estimated average fares in 1845 at 1.8 pence per mile, just 10% below what was assumed in the 1830s.) Locality of traffic, though, usually was a much larger factor than for this special Scottish line, with average trip lengths not much more than half those initially projected. And working expenses were usually higher (estimated at 42% by Lardner, [125], p. 492, as opposed to 33% that was generally assumed a decade earlier).

It should be emphasized that the estimates of the 1830s were based on much guesswork. Consider working expenses first. For the Edinburgh and Glasgow Railway, its engineer, John Miller, testified that "[t]here is a good deal of Difficulty in forming a correct Opinion of this Description," (p. 275 of Lords' printed evidence of 1838 hearings). Most of Miller's justification for assuming 33% of revenues as working expenses came from looking at the submissions to Parliament in 1836 and 1837, and noting that 33% was the most frequent figure used in those. So this was a case of the blind leading the blind! But it worked reasonably well for this line, less well for most others.

The greatest leap of faith in the 1830s was in assuming the 2x growth in the number of passengers on a railway as compared to stage coaches. It became established as the Parliamentary standard with the London and Birmingham Railway hearings in 1832. At that stage, there was evidence just from the Stockton and Darlington and the Liverpool and Manchester railways. On the former, a single coach that carried three to four passengers daily by road was replaced by four horse-drawn coaches on the rails, carrying 80 to 100 passengers[246]. (These were the rough estimates by Joseph Pease of the Stockton and Darlington line, with no documentation.) This was a spectacular example of "development," growth by a factor of someplace between 20 and 33. But it seems that everyone understood not much could be concluded from this case, where traffic grew from a minuscule level to a small one.

Between Liverpool and Manchester, there had been extensive coach traffic. According to Henry Booth, the Treasurer of the Liverpool and Manchester Railway, there had been between 22 (in winter) and 28 (in summer) daily coaches in each direction, with an average of 450 passengers per day (for both directions). By the time of his testimony, with just 21 months of railway service, the average number of daily passengers had grown from 450 by coach to either 1050 or 1200 by rail[247]. And this led Richard Creed, the Secretary to the London and Birmingham Railway, in his justification of the traffic projections for his line, to write:

> Mr. Henry Booth in his Evidence before the Lords Committee states, that the Number of Passengers on the Liverpool and Manchester Railway is nearly Three Times what it was by Coaches between Liverpool and Manchester before the Railway was opened, or in the Proportion of 1,200 to 450.
>
> It may be presumed therefore that at least Twice the average Number of the Passengers by Coaches in Statement A would travel by the Railway between London and Birmingham; say ...

There was no questioning on this point, which was clearly an assumption. But one can easily imagine that the lawyers for the opposing side tore into this claim in their summary statements[248]. Whatever the doubts about this assumption, Parliament did pass the bill for this railway, and that established a precedent to be used in future traffic projections. And that is how the "doubling of passenger traffic" became part of the basic traffic taker methodology. There were variations proposed in some cases, but for the most part this was the approved and accepted Parliamentary procedure from then on. Not infrequently, the London and Birmingham precedent was cited explicitly. For example, in the Great Western Railway hearings, the promoters claimed (p. 161 of [38]):

> It has been admitted that the Speed, Cheapness, and Security of a Railway will more than double the ordinary Traffic of the Road. On the Stockton and Darlington Railway the Proportion of Increase has proved Twenty to One; on the Liverpool and Manchester Railway more than three to One. Assuming it in this instance, as was allowed in the London and Birmingham Railway, at Two to One, the foregoing Statement exhibits ....

Why dwell on the fallacies in traffic takers' methodology? It did produce excellent results, after all, as viewed from the height of the Mania. "All models are wrong, but some are useful," and the traffic takers' model was about as useful as one can expect, predicting demand better than today's experts can do. However, subject to their collective hallucination, British investors were not aware just how accurate the model had been, and regarded it as providing only a conservative lower bound on what they were going to get. But even if they had been aware, they should have taken a careful look at this model. After all, "all models are wrong," and so will provide incorrect results under some conditions. (The finance industry, and indirectly the entire world, learned this to their sorrow in the crash of 2008.) Had they taken a careful look, and seen just how wrong many of the fundamental assumptions in the traffic takers' methodology were, they might have investigated the model more carefully, and realized (as will be shown in Chapter 27), that during the Railway Mania, this model was producing impossible predictions.

At a minimum, even a moderately careful look would have told investors that revenue predictions were at least somewhat too rosy. Traffic takers were still largely working with the assumption that passengers on average would pay 2 pence per mile, whereas the actual charges in 1845 were down to 1.8 pence. A 10% loss on the revenue side would not have been fatal by itself, but (i) it should have warned investors that fares were trending down (they were down to 1.5 pence by 1848, [126], p. 236), and (ii) given the marginal profitability predicted by the traffic takers, it should have warned them that extreme caution was called for, that any of myriad things could derail their hopes for good profits.

How far traffic takers could twist their method and evidence to suit their clients will be discussed in more detail in [165] and *BICS*. During the Railway Mania, they not infrequently pushed to modify the methodology, either by using a higher multiplier than two for the number of passengers on rail as opposed to by coach, or by counting travelers other than coach ones. However, they were limited in what they could do on the passenger side to such obvious steps as these, since data for coach travel was hard to massage, as will be discussed in Chapter 27. On the freight side, it was possible to be more imaginative, and there were stories of sheep being passed back and forth through observation points to inflate the counts.

Even aside from cheating, there were traffic takers opposing each other in Parliamentary hearings, coming up with varying estimates, even when they relied on the same measurements. That was why there was a recognized specialty of traffic taking, since some judgment was called for. During a Parliamentary committee hearing on a railway project in 1844,

> Mr Pare was examined on the tables of traffic and income given in evidence by Mr Marshall. Much interest attached to the evidence of this witness, from the fact of his having had great experience in preparing railway statistics. His statement, however, did not shake the soundness of the table of traffic as given in evidence by Mr Marshall.[249]

But the main, and fatal to investors, problem appears to have come from a different direction. We can explain conceptually what was involved by using Fig. 5.

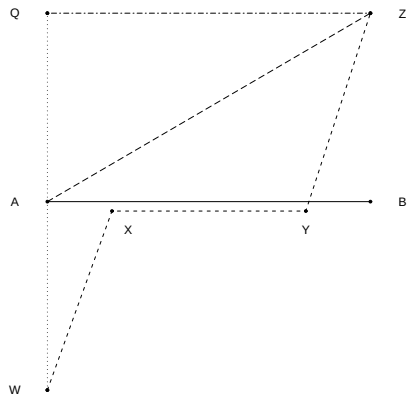

Fig. 5. Competitive aspects of railway demand estimation not captured by traffic taker methodology.

Suppose a railway was proposed to be built between cities A and B. Suppose further that travelers from city W to city Z were taking stage coaches that went by a turnpike from W to X, then by another turnpike, almost next to the proposed line of the railway, from

X to Y, and finally by another turnpike from Y to Z. Traffic takers would collect data on such travelers and on the distances and travel times involved. They would then apply their expert judgment to estimate whether those travelers would switch from the coach to the railway for the portion of the trip from X to Y, and then switch to a coach for the final leg from Y to Z, as opposed to making the whole trip by coach. Expert opinions would differ. The traffic takers for the A to B railway would usually claim that all passengers from W to Z would prefer to shorten their trip by using the railway. Opposing traffic takers would argue that this was absurd, that travelers would not want the hassle of changing from coach to rail and then to another coach. What was not considered was that other railways were being planned, from W to A, from A to Q, from Q to Z, and from A to Z. Each one of those would claim that all travelers from W to Z would be eager to avail themselves of its services. And so many lines would end up predicting they would get revenues from what was essentially the same trip.

There was an awareness that this could be a problem. Traffic takers were frequently asked if they took into account competing proposals, and their answer would usually be no. But there were no tools at their, or the Parliamentary committees', disposal to deal with this multiple counting. Further, it was possible to discount such concerns, since this issue had arisen already in the 1830s. It can be seen in the quote we saw in Chapter 8 from John Stuart Mill [152], that "on the face of the matter it seems absurd to suppose that both the Great Western Railway, and the London and Southampton, can pay; though it is just possible that either of them might, if the other did not exist." Mill turned out to be wrong, both lines were doing fine at the height of the Mania in 1845. The reason Mill's concern did not materialize is that he was almost surely thinking of these lines as competing for the long-distance travelers from London to Exeter, Plymouth, and Penzance, all at the Southwestern tip of England. He was likely imagining that such people would choose one of the two railways to the terminal cities of their lines, Bristol and Southampton, respectively, and then continue by coach to their final destinations. But most trips ended up being local, so such competition for long distance travelers had negligible effects on revenues. During the Mania, though, new lines were built in close proximity to each other, and so locality of traffic did not save them from having to compete for the same passengers and freight.

Chapter 27 will show that it was possible, at least at a high level, for the nation as a whole, to quantify the effect of such competition.

25 Parliamentary contests and the elimination of traffic takers

Practically all railways in the 1830s and 1840s relied on Parliamentary grants of the right of eminent domain to force landowners to sell them the necessary land[250]. Parliament, very protective of property rights, especially rights of landowners, insisted on a detailed scrutiny of all such applications. At the end of the Glenmutchkin story, there is mention of scrutiny by the Board of Trade, a government department. This was a special additional level of scrutiny, applied only during the 1845 Parliamentary session. But in all sessions, there was what really mattered, and what the Glenmutchkin story calls (again at the very end) "the parliamentary contest." This consisted of hearings before two committees of the House of Commons, two committees of the House of Lords, and also debates and votes by those two

full houses of Parliament[251]. A project could be derailed at any of those stages[252]. (The final step, the Royal Assent, which is what made railway projects official, was the only stage that was a formality.) The committee hearings were adversarial affairs, with opponents of particular railway lines presenting evidence to refute the promoters' arguments. There were almost always opponents, if not canals and landlords, as in the early years of the industry, then rival railway projects in later years. The description in the next-to-last paragraph of the Glenmutchkin story of how the proponents of the line "were opposed by four other companies who patronised lines, of which the nearest was at least a hundred miles distant from Glenmutchkin" was an exaggeration, a bit of poetic license, but it does reflect the reality of frequent opposition. Opponents had to prove they had what is called "standing," some argument as to why their interests might be damaged by the proposed scheme.

Complaints about Parliamentary procedures were legion, ranging from satirical to serious. On the humorous side, a piece in *Punch* had the following description of the conclusion of a fictional hearing:

> *The Chairman.* Allow us to ask, sire, whether you think a gradient of two will be sufficient.
>
> A. [An engineer testifying] Certainly I do. If I had a lever and a screw now in the room, I would undertake to show in five minutes that a patent axle, working on a broad gauge and going consecutively in rotation after a double stuffing-box, would be of itself sufficient to do all that is required.
>
> This answer created the greatest excitement in the committee-room, and strangers were at once ordered to withdraw, that the committee might deliberate. In a quarter of an hour the public were re-admitted, and the chairman said he had only one more question to ask of the last witness. It was simply this: Can it be possible for the broad gauge to wear out the cylinder of a single valve, without tearing off the siphon-cock from the main boiler?
>
> The witness, after making a few drawings in his note-book, and a reference to a five-foot rule, with which he measured the table in three different directions, answered deliberately, and with great emphasis–Certainly not.
>
> The chairman immediately announced the preamble of the bill to be proved; and the rush to the door was so overwhemling, that our reporter was carried into Group Z, and thence on to the Palace-yard cab-stand. Expresses were waiting for every part of the kingdom, and the shares immediately went up to 75, at which everybody refused to realise; but a flaw having been discovered after every one had left the room, and before the committee had finally broken up, the bill was subsequently declared to be lost, and the shares fell to 2, with a downward tendency.[253]

On a more serious note, during a debate in Parliament in early 1846, one of the MPs claimed:

> A more incompetent tribunal to decide on railway questions than a committee of [the House of Commons] could not be selected. A committee deciding on traffic tables, and many of the other elements of a railway inquiry, was a practical absurdity.[254]

He was not the only MP to feel that way[255]. Still, Parliament did feel the duty to scrutinize railway proposals in detail. By authorizing lines, it was interfering with private property, and so had to be convinced there was a compelling public interest case for it.

Parliament did not seem to be too concerned with the profitability of the very early railway lines. This issue came up indirectly, in that promoters had to show there was need for the new mode of transportation, so presented "proofs" that many passengers and much freight would use their service. High demand was likely to produce good profits, of course. During the mania of the 1830s, Parliament went further, and required its committees to verify that the lines would be profitable[256]. Committee reports were required to explicitly address 23 points, several of which dealt with financials of the project, and number 20 of which was:

> How far established that the revenue will support the cost of maintenance, and still allow profit to the projectors.

The reason for this requirement was the perception that railways would only be built and placed into service if they offered a good prospect of profit[257]. The worst outcome that Parliament could imagine was a railway project taking land from an aristocrat, digging up that landowner's front lawn, and then, deciding the project would not pay, abandoning construction and leaving a pile of dirt in front of the mansion.

The task of demonstrating that railway projects would produce projected revenues was assumed by the traffic takers. But they were not the only ones testifying about demand, nor the only specialists present. In addition, there were other witnesses appearing before Parliamentary committees with expert knowledge, such as land valuation specialists, and, most important, engineers. Thus Parliament was faced with a number of technical issues that it had to decide, and where it did not have much, if any, expertise. The Board of Trade inquiry mentioned in the Glenmutchkin story was an attempt associated with the 1845 session to have outside experts sift through the applications and lessen the load on Parliament. For various and still debated reason, this did not have much effect, and in the 1846 session Parliament was completely on its own. As in all previous sessions, it helped that the hearings were adversarial affairs. Therefore the opponents of a project, who were increasingly other powerful railway projects with resources to hire their experts, could be counted on to point out the weaknesses in a scheme. But that still did not solve the problem completely, any more than it does today, where we are faced with similar tasks. William Aytoun, the author of the Glenmutchkin story, had some experience in this area, from his work as a lawyer on railway cases. He wrote two semi-fictional articles about Parliamentary hearings. Let me cite one, written in the form of a letter from London to a friend back in Scotland:

> Certainly, of all tribunals ever invented by the ingenuity of man, a Parliamentary Committee is the most extraordinary. It is a court of enquiry consisting of five members, whose principal qualification is absolute previous ignorance of the localities and conflicting interests with regard to which they must decide. Of their impartiality, therefore, there can be no doubt. You or I might just as well sit down at a moment's notice, and adjudicate upon the merits of three competing lines between Pekin and

Canton, with an equal chance of arriving at a satisfactory conclusion. Of course they must be guided entirely by evidence, and have plenty of materials laid before them from which they may pick and choose. It is the richest thing in the world to see two crack engineers pitted against each other. The first, who appears on behalf of the line, does not know and cannot conceive the slightest engineering difficulty. If a mountain stands in his way, he plunges fearlessly into its bowels, finds in the interior strata of surpassing mineral wealth, yet marvellously adapted for the purposes of a four-mile tunnel, and brings you out sound and safe at the opposite side, as though he had been perforating a gigantic cheese instead of hammering his path through whinstone coeval with the creation. If a lake stands in the way, he will undertake to drain it, with immense advantage to the neighbouring proprietors. If a valley intervenes, he will bridge it with a viaduct, which shall put to shame the grandest relics of antiquity, He has no knowledge of such bugbears as steep gradients or dangerous curves; a little hocus-pocus with the compasses transforms all these into gentle undulations, and sweeps of the most graceful description. He will run you his rails right through the heart of the most populous city,–yea, even Glasgow herself,–and across the streets, without the slightest interruption to the traffic. He will contrive so, that the hissing of the locomotive shall be as graceful a sound as the plashing of a fountain in the midst of our bisected squares; and he is indignant at the supposition that any human being can be besotted enough to prefer the prospect of a budding garden, to a clean double pair of rails beneath his bedroom window, with a jolly train steaming it along at the rate of some fifty miles per hour.

The opposing engineer has a contrary story to tell. He has the utmost confidence in the general ability of his scientific friend, but on this occasion he has the misfortune to differ in opinion. Very carefully has he gone over the whole of the line surveyed. He is sorry to say that the gradients are utterly impossible, and the curves approaching to a circle. Tunnelling is out of the question. How are two miles of quicksand and two of basaltic rock to be gone through? The first is deeper than the Serbonian bog, and would swallow up the whole British army. The second could not be pierced in a shorter time than Pharaoh took to construct the pyramids of Egypt. He considers a railway in the heart of a town to be an absolute and intolerable nuisance; and, on the whole, looking at the plan before him, he has come to the conclusion, that a more dangerous and impracticable line was never yet laid before a committee of the United Parliament of Great Britain.

So much for the engineering Hector and Achilles. Out of these two opinions, of necessity, must the five respectable members on the bench form their jndgment; for of themselves they know nothing, having been purposely selected on account of their superior ignorance. Cross–examination makes the matter still worse. A cantankerous waspish counsel, with the voice of an exasperated cockatoo, endeavours to make the opposing engineer contradict himself. He might as well try to overturn Ailsa Crag. He of the impossible gradients is the hero of a hundred committees, quite accustomed to legal artifice, cool, wary, and self-collected. He receives every thrust with a pleasant smile, and sometimes returns them with damaging effect. If close pressed, he is conscious that behind him is a thicket of algebra, into which neither

> counsel nor judges will dare to follow; and so fortified by the mysteries of his calling, he is ready to defy the universe. Then come the hordes of subordinate witnesses, the gentlemen who are to give evidence for and against the bill. One side represents the country as abounding in mineral produce and agricultural wealth: the other likens it unto Patmos, or the stony Arabia. Tims swears that the people of his district are mad, insane, rabid in favour of the line. Jenkins, his next–door neighbour, on the contrary, protests that if the rails were laid down to–morrow, they would be torn up by an insurrection of the populace *en masse.* John thinks the Dreep-daily Extension is the only one at all suited to supply the wants of the country; Sandy opines that the Powhead's Junction is the true and genuine potato; and both John and Sandy, Tims and Jenkins, are backed by a host of corroborators. Then come the speeches of the counsel, and rare specimens they are of unadulterated oratory. I swear to you, Bogle, that, no later than a week ago, I listened to such a picture of Glasgow and the Clyde, from the lips of a gentleman eminent alike in law and letters, as would have thrown a diorama of Damascus into the shade. He had it all, sir, from the orchards of Clydesdale to the banks of Bothwell, the pastoral slopes of Ruglen, and the emerald solitudes of the Green. The river flowed down towards the sea in translucent waves of crystal. ... Not a Glasgow man in the committee–room but yearned with love and admiration towards the gifted speaker, who certainly did make out a case for the Queen of the West such as no matter–of–fact person could possibly have believed. And all this was done by merely substituting a Claude Lorraine glass for our ordinary dingy atmosphere. The outline was most correct and graphic, but the secret lay in the handling and distribution of the colours. I shall not wonder if the whole committee, clerk inclnded, come down this autumn to catch a glimpse of that terrestrial paradise.[258]

Today we are far more used to such divergence of opinions among experts testifying in court. As just one example, during the 1999 Microsoft anti-trust trial, the main witness for that company was a famous economist, dean of a major school. A witness for the prosecution, another eminent economist, one who was then a colleague and had been the PhD thesis advisor of the first one, called the offered economic analysis "peculiar," "ridiculous," "credulous," and "naive." And when the Microsoft witness was presented with some of his academic papers "that held opinions contradicting statements he had made in court," he explained that "his views had evolved."[259] The early Victorians were not unfamiliar with the phenomena of professionals disagreeing, and of conveniently adopting supposedly ubiased expert views to those of their clients. But the railway hearings, with over 50 committees in just the House of Commons in each of the sessions of 1845 and 1846, presented society with a concentrated dose of such treatment, and many were uncomfortable with it. Here is a passage from another article by William Aytoun, also written in the form of a letter from London to a friend in Scotland:

> When I said, in the commencement of this letter, that I was swearing before the committees, I made use of a wrong term. We are not sworn–not even examined on soul, or on conscience, or on honour; and I must say that the recollection of that circumstance is sometimes a great comfort when I lie in bed awake of nights. What

> is technically termed at Westminster, engineering evidence, would, I am afraid, were an oath to be interposed, become very like the thing called perjury; which, not to mention its effects on a future state of existence, is popularly supposed in Scotland to bring one under the unpleasant but especial attention of the High Court of Justiciary. The beauty of the present system is, that it gives ample scope and rein to the imagination without imposing any restrictive fetters upon the conscience. It allows a fair latitude for that difference of opinion which always must prevail amongst professional gentlemen, and relieves them from whatever qualms they might otherwise have felt in replying without any hesitation–the leading quality of a witness–to questions upon subjects of which they are utterly and entirely ignorant. I have found this advantage in my own case. I am positive that I could not, had I been on oath, have given any satisfactory evidence as to the amount of the bathing traffic on the line; though I certainly admit that I have sometimes of a Saturday afternoon sauntered along the shore with a cigar, to enjoy the *poses plastiques* of our northern aquatic Nereids. But as all such formality was dispensed with, I had no hesitation in stating the numbers of the amphibious animals, male and female, at eight hundred per hour during seven mouths of the year; which, on an average of nine hours a day, and at the rate of sixpence a head, would increase the income of the company by about £37,800 per annum. Such was one item of my evidence yesterday, for the clearness and accuracy of which I was politely complimented by the chairman.[260]

Whatever the feelings about morality and truth of the testimony presented to them that they may have had, or about their own qualifications, members of Parliamentary committees had to make decisions based on the information that was presented to them. Such decisions were highly estemeed by the investing public. They were often questioned, it was understood they were not perfect, but Parliamentary scrutiny was felt to provide a generally impartial evaluation of projects. In Chapter 24, in the quotes from the four ads on the same page of the *Leeds Mercury* from 1844, we saw how promoters struggled to go beyond the "principles allowed in proof before Parliamentary Committees." Naturally, outside investors were glad that such "principles" existed, and limited the promoters' freedom of action. This meant they were not completely at the mercy of Augustus Dunshunner and Bob M'Corkindale simply concocting stories of their project promising "at the lowest estimate [to] yield a revenue larger, in proportion to the capital subscribed, than that of any Railway as yet completed within the United Kingdom." Many blunders of engineering as well as business planning were caught at the Parliamentary hearing stage. There was certainly general conviction that most Glenmutchkins would be detected and rejected by railway committees[261]. Of course, this also meant greater willingness to engage in speculation in new projects, since the initial commitments (the "deposits") were relatively small, and Parliamentary scrutiny was relied upon to stop the most absurd projects.

Parliamentary hearings varied in length and depths, and often the House of Lords committee on a particular line would concentrate on other issues than that of the House of Commons. Traffic takers sometimes played prominent roles, and sometimes not. And then, during the 1846 session they were phased out, and were essentially entirely gone starting with the 1847 session. How could this happen? The financial exuberance of the

Mania peaked in late 1845, with somewhere around 1,500 new railways being projected. Fewer than half became mature enough to come for consideration by Parliament in the 1846 session. Still, that was a huge number, more than twice the workload of the 1845 session. And the 1845 burden was felt to be intolerably hard. So, to ease the work, the House of Commons Select Committee on dealing with railway bills reported (among other measures):

> As our committee, however, believe that much of the time of the select committees on railway bills is consumed, with little public benefit, in minute and detailed inquiries into the amount of traffic and the probable profit to the projectors, your committee are of opinion that the standing orders on these points should be altered, and that it should no longer be obligatory on committees on railway bills to make special reports on them.
>
> At the same time, your committee have no wish to fetter the discretion of the select committees to make such inquiries as they may judge proper with regard to population, and to the extent of accommodation that would be afforded to the public, where they consider such information to be required.[262]

This recommendation was adopted. The suggestions for the committees, drawn by the Chairman, did say, though[263], that "[i]t will of course be competent to the Committee, if they shall see sufficient cause, to require further evidence as to traffic."

Note that the Select Committee did not suggest doing away with any consideration of demand, they were still supporting looking at some rough measures of demand. The suggestions from the Chairman to the committees on merits said, for example that "the promoters of a bill shall be required to append to the foregoing statement a printed list of the chief citites or towns intended to be accommodated, with their respective distances from the proposed line, together with the amount of population of such cities or towns, taken from the returns of the last general census." During that same 1846 session, many of the railway committees did not take advantage of the modified rules, and did accept the evidence of the traffic takers, presumably to some extent because such evidence had already been prepared. And a considerable number of newspaper reports did mention traffic testimony in their coverage of Parliamentary business, so investors could have some reassurance that standard procedures were being followed. However, many 1846 committees did skip this stage, and promoters did not even bother to employ traffic takers in future sessions. Thus the traffic taker profession came to an abrupt end[264].

This describes how traffic takers were eliminated, but still leaves a substantial question as to why. Although various modifications were made to the rules and requirements of railway proceedings, it was only the traffic takers' testimony that was completely eliminated. Yet theirs were the only quantitative estimates that had proven correct back in the 1830s. The engineers' "reckless, ruinous, and unpardonable excess of expenditure over ... estimates" was already discussed in Chapter 13. The experts on real estate valuations had a similarly poor record. All the other testimony, about inadequacies of current transport alternatives, about new business opportunities that railways would open up, etc., was anecdotal!

An interesting perspective on the abolition of traffic testimony is provided by a lawyer writing for the benefit of promoters interested in getting Parliamentary sanction. (Laywers not only made giant fortunes from fees during the Mania, but also what seems to be have been not inconsiderable fortunes from publishing books on the laws and regulations pertaining to railway promotion.) In a treatise published in the spring of 1846, right after the rules were changed, J. Scott had the following to say ([193], pp. 124–27):

> It is usual (in order to establish the expediency and practicability of the measure, and after the address of counsel in opening the case for the promoters) to call evidence, on the subject of the population of the district through which the line is intended to pass; its extent of trade and commerce, its productions, &c. Perhaps the fittest and best witnesses to establish this part of the case, most to the satisfaction of the committee, will be the owners of property in the said district; manufacturers, merchants, bankers, farmers, and indeed representatives of the various classes of the community who are most likely to feel the want of and derive benefit from the formation of the projected railway. From such witnesses valuable and appropriate testimony can be obtained with respect to the statistics of the towns through which the line would pass; their manufactures; the present accommodation in conveyances, and its defective character; the advantages to be obtained from increased facilities in travelling and conveying merchandize, goods, &c. The importance of a good and, if it can be obtained, a complete set of witnesses (if the term may be allowed) on this part of the case is very great; and it will be most desirable, therefore, to prove satisfactorily the above-mentioned and other similar points, as regards the entire route of the contemplated line, and to show that such line is wished for and supported by landowners thereon and the inhabitants of the towns through or near which it will run.
>
> The traffic tables then (according to former custom) used to be produced, and verified by the evidence of the parties who had prepared them (by being stationed along the roads that contributed traffic to the line of proposed railway, or in that direction and calculating the results by the number of passengers, conveyances, &c. passing along those roads in a given time). The proving, opposing and discussing these tables occupied an immense proportion of the time of the committees on Railway Bills, and when the attention of Parliament was this Session (1846) called to the subject of railway legislation and to the great pressure of railway business, from the number of projects laid before Parliament, the attention of the Select Committee of the House of Commons on Railway Bills was directed, among other matters, to this point. The result was [new rules eliminating requirement for traffic testimony].
>
> .... The effect of this valuable alteration will be greatly to diminish the superfluous and somewhat unnecessary work and tedious investigation hitherto imposed on committees on railway bills. The time has long since arrived when these proofs of traffic, present and prospective, were no more required; for, whatever may be the existing extent of conveyance in any district of the country, the undoubted readiness of capitalists to invest their money for the construction of new and additional modes

> of transmitting passengers and goods practically settled a question that it was wasting valuable time for committees to be so many hours engaged in considering and investigating. The result of the change will be greatly to expedite the progress of bills through committee, by reducing the number of matters to be inquired into, discussed and proved.

In this author's view, it was still valuable to inquire into general benefits of a proposed line by asking local notables about it. But the detailed quantitative analyses produced by traffic takers seemed superfluous. This seemed consistent with the general public opinion (although whether this opinion evolved independently or was nudged by the railway industry is another story).

There was very high interest in traffic projections in the 1830s. There was also considerable attention paid to this issue in the early stages of the Railway Mania. The four ads on the same page of the *Leeds Mercury* in Oct. 1844 that were cited in Chapter 24, all of which referred to traffic estimates, were only slightly atypical. But already by then, detailed traffic tables (showing precisely what kind of traffic, and on what routes, was being counted) were fading out. Instead, as the Mania moved into its most feverish 1845 phase, attention shifted increasingly towards the size and composition of provisional committees[265]. In the Glenmutchkin Railway story, as Augustus Dunshunner and Bob M'Corkindale concoct their provisional committee list, they regret that they have "little chance of ... producing a peer to begin with," and have to settle for a baronet, Sir Polloxfen Tremens, who "has not a sixpence to lose." Provisional committees were extremely important, and this being Britain, the more aristocratic the members, the better. An early prospectus of the Manchester and Southampton Railway, the one in the Edward Watkin "sheep on the fair day" quote, had 67 members on the provisional committee, and the list, aside from the chairman and vice-chairman, was headed by "The Right Honourable Lord Duncannon, M.P., Derby." But he was the only aristocrat on the list[266]. Joseph Paxton, who later gained great popular fame as the architect of the Crystal Palace, and became Sir Joseph Paxton, MP, was on that list as well. But at that time he was neither Sir Joseph, nor an MP, merely a rich and influential railway magnate, so even though he was on the management committee of this project, in the listing ranked as number 21. But a single aristocrat was not competitive, so a month later, another prospectus had 101 names on the provisional committee (with Paxton now down at number 34), and was headed by "The Right Hon. Earl Bathurst, Cirencenster," followed by "The Right Hon. Earl Wilson," and "The Right Hon. Lord Duncannon, M.P., Derby" was this time only third[267]. But there were no details of traffic estimates[268]. The Glenmutchkin Railway, with its 13 members on the provisional committee, would not have been regarded as serious by this time[269].

The attention given to provisional committees during the Railway Mania reflects how railway promotion was handled. It was not just something for the ignorant multitudes, as even sophisticated insiders were paying attention. It was not entirely irrational, as the size and eminence of the committee was a form of signalling, just like a peacock's tail is a form of signalling that is critical to the propagation of that peacock. It also served various other purposes. By signing up prominent, rich, and otherwise distinguished people as provisional committeemen, promoters could stop other projects from signing them up (although that

was not always entirely successful, as some signed up with competing lines as well, or defected), could hope to get their support in recruiting other shareholders, in persuading landowners to support the line, ... This was a very complicated socio-economic system with numerous links, and so I won't try to get more deeply into it here. But let us note that some aspects of this process are not dissimilar to what we observe in modern times, especially when the action gets hot, as during the Internet mania or the financial market crash in 2008. During the latter occasion, Warren Buffett (or, more precisely, Berkshire Hathaway that Buffett runs) made investments in GE and Goldman Sachs on terms that were not available to ordinary investors, nor to the federal government. Those firms were desperate for the sign of approval that his investment would send to the markets and thus serve to reassure their investors and partners. (Federal investments sent just the opposite signal, so no wonder the terms there were different.) The same phenomenon was observed during the Internet mania (and is present in all current business dealings). Then again careful considerations of technologies and business plans gave ground to looking who else was involved, and a company with Larry Sonsini of Wilson Sonsini as its lawyer, Frank Quattrone of Credit Suisse First Boston as its investment banker, and John Doerr of Kleiner Perkins as the VC could count on floods of money, no matter how visionary the scheme. One of the justifications of having such famous people involved was that they would presumably have scrutinized the prospects of the venture, and their judgment could be trusted.

Of course, these types of signalling, while they do serve a function, also have defects. One is that they promote herd mentality. The eminent people derive most of their evaluations from those of the other eminent people they interact with, without much, if any, knowledge of the subject area. All too often they all end up entrusting their money to Bernie Madoff. Another defect is that they can be subverted. During the Railway Mania, for example, MPs (Members of Parliament) and FRSs (Fellows of the Royal Society) sold their names (or their titles, to be precise) to promoters.

Whatever the defect of this method of judging railway projects by its provisional committee, that is what dominated in the British market. As just one final illustration, let us consider the article [25] published as the first, most financially exuberant, part of the Mania was breaking down. The crucial Nov. 30, 1845 data for deposits of plans was over, which served to eliminate most of the ephemeral projects. But there were still many hundreds of projected railways that passed this first step, and whose scrip was trading. The author of [25], writing under the pseudonym "Morgan Rattler, Esq., M.A., An Apprentice of the Law," was warning the public that most of the remaining projects were Glenmutchkins, ""brought out" for the mere purpose of putting money into the pockets of some speculative attorney," and strongly condemned the "extreme folly of the multitude" and the "insane gambling operations." But he was clearly a supporter of railway enterprise, and was "satisfied every considerable town in the United Kingdom, every populous or productive district, will have its railway." He even dismissed the alarms of *The Times* and other skeptics about excessive investments in railways, and expressed faith in the ability of Parliament to winnow out the Glenmutchkins: "I do not think that there will be the slightest difficulty for the country to find the resources necessary to construct such lines as shall receive the sanction

of parliament." To determine whether a line was worth investing in, he claimed that three tests should be applied, with the third one needed only for foreign projects:

- "First, he should ascertain the character borne by the attorney; it that be bad, or indifferent, or doubtful, he may be certain the scheme will never find its way before a parliamentary committee, and equally certain that he will lose the whole or a large portion of whatever he may deposit. ..."
- "Secondly, a man should look to the character of the provisional committee, and especially to those whose addresses are in London, for out of them will be made the managing committee. A very little inquiry, or even the use of the *London Directory,* would enable a person pretty well to satisfy himself. ..."
- For "lines out of Great Britain," "if any rational human being wanted to speculate in any project of this sort without the certainty of being, sooner or later, swindled, he would ascertain generally the physical features of the country, the state of the population, the nature of the government, &c., and so judge whether a railway was feasible as a commercial speculation; whether it could be made at a moderate cost through the country; whether the country was in a sufficiently advanced state of civilisation and prosperity to require such a mode of intercommunication; and lastly, whether there was traffic and travelling enough in the region to support it, and whether, even if there were, the foreign speculator would not be defrauded of his gains by the injustice and bad faith of the government or the violence of the people."

So this writer was aware that the issues of costs of construction, "whether [a railway] could be made at a moderate cost through the country," and "whether there was traffic and travelling enough in the region to support it," were important. But in cases of domestic lines an investor did not have to worry about this, provided "the character of the provisional committee" was good enough. And in fact when one looks at the prospectuses published in late 1845, the ones for foreign or colonial lines (and to some extent also Irish ones) were far more likely to have traffic tables than domestic ones.

Thus during the initial promotions of a railway at the peak of the Railway Mania, the provisional committee became the main criterion by which a project was judged, and traffic estimates were being taken for granted. Service on a such a committee carried some prestige, and, most important, entitled a member to a generous allocation of scrip, which, at least before the peak of the Mania, could be sold right away for a nice premium. (In the Glenmutchkin Railway story, "[t]he allocation passed over very peaceably," and Dunshunner and M'Corkindale guided the process so as to give "the M'Closkie and Vich-Induibh" all of "twenty shares a-piece," which was low for the time.) The legal responsibilities of a provisional committeeman were less well defined, and took years of painful (but very lucrative for lawyers) litigation to establish. But that is not relevant for us here. The provisional committee's function, in the jaundiced (but often accurate) view of many observers, was to act as "decoy ducks," to bring in subscribers, who would pay their deposits, and, if the line was sanctioned by Parliament, would become shareholders. And this worked. On the other hand, traffic takers and their estimates faded into the background.

There will be further discussion of this issue in [165] and *BICS.* I am still puzzled as to how the British investing public and the British decision makers could have persisted

for so long in ignorance of the astounding accuracy of traffic taker forecasts in the 1830s, and could have dispensed with their services during the Mania. But a Martian who looked at this history, and looked at similar disdain for accurate measures of demand during the telecom bubbles of a decade ago, would probably conclude that there is something in the genes of *Homo sapiens* that makes people carefully observe the penguins, and totally ignore the icebergs.

26 The reputation of the traffic takers

The quote from J. Scott in the preceding chapter, as well as other passages elsewhere, suggests that the general public view was that traffic takers were not necessary any longer, that promoters, investors, and Parliamentary committees knew enough about estimating railway service demand to be able to do without them. But I also have a suspicion, although it is just a suspicion, with only weak circumstantial evidence to support it, that railway promoters may have pushed to get rid of them. The argument will be laid out in [165] and *BICS,* which will have much more information about this evanescent profession. That promoters might have been glad to eliminate traffic testimony is easy to grasp though. Traffic takers in 1845 and 1846 were projecting profits of only about 7%. This was not terrible, but not exciting, and it assumed that estimates of costs of construction and operation were valid. There would be serious danger if investors were to believe these profit estimates were the most they could hope for. The reason is that hints of rising costs were multiplying as time went on. Furthermore, large lines were taking control of smaller ones by pledging to pay high rates, rates that were not sensible if returns were limited to 7%[270] Hence giving too much prominence to traffic takers' estimates, and treating them as credible, could lead investors to question the "beautiful illusions" they were being treated to.

Thus it is possible that traffic takers lost their jobs because they were too honest. (Their testimony does carry references to jobs they turned down since they could not in good conscience justify the traffic projections that promoters were asking for.) If so, they may well have been the most honest of the various professionals engaged with railways during the Railway Mania. But this is just speculation, with only a little bit of evidence to support it.

As far as the public record is concerned, traffic takers were regarded as responsible professionals. An ad for the Shrewsbury and Birmingham Railway in 1838 said:

> In order to obtain a correct estimate of the probable traffic and revenue of the undertaking the Commitee have availed themselves of the services of Mr. William Pare, of Birmingham, a gentleman who has had much experience in investigations of this nature, having been engaged for the London and Birmingham and other Railway Companies, in all of which he has entitled himself to public confidence by the care and accuracy of his calculations. His report is subjoined to the printed prospectus; and whilst it appears that his estimate of revenue is such as to afford an ample return for the capital embarked, the Commitee feel satisfied that he has framed his calculations upon solid data with great caution and moderation, and that practically the result will give a much larger revenue than that which he sets

> forth, for which opinion they may safely refer to the experience of all railways now in operation, in every one of which the passenger traffic has increased in a far greater ratio than that adopted by Mr. Pare, and allowed by Parliamentary Committees as the minimum.[271]

William Pare was universally regarded as the most eminent of the traffic takers. But, as with all other professions involved with railway promotion, there were accusations (some involving Pare) of views that evolved with time to suit the clients' needs. And there were many instances of "that difference of opinion which always must prevail amongst professional gentlemen." Just about any time a traffic taker testified, one or more testified to the contrary for the opposition. But then this held for every other class of witnesses before Parliament as well.

While there does not seem to have been any extended public discussion of the fallacies of the traffic takers' methodology, there are hints here and there that sophisticated observers knew it rested on very shaky foundations. For example, at the end of 1845, John Robertson published a short pamphlet, [189], on measures that he felt Parliament should take with regard to railways[272]. Towards the end of this work he suggested:

> There is yet another way in which the Government and Legislature could diminish the expense of making and maintaining railways. Everything is new and inexperienced in these affairs. Rewards could be offered for the best information regarding the modes for ascertaining traffic. Scientific and business men might be tempted by the prospect of honours, to apply their minds to the discovery of improved methods of constructing, working, and maintaining railways. There are minds indifferent to mammon, who thrill to the hope of fame. There is boundless scope for improvement. ...

So Robertson was not satisfied with accepted methodology, but did not feel improving it was urgent. This item came at the end of his wish list, and "ascertaining traffic" was mixed in with other issues. The general opinion seemed to be similar, that demand estimation was not ideal, but fixing it was not urgent. There were two technical controversies in the Mania that were regarded as important enough to lead to official studies, namely that of gauges and of atmospheric railways. The reports of those studies, with their voluminous expert testimony and committee evaluations, although in both cases not completely conclusive, were widely read and cited, and informed public discussion of the issues. Nothing of this nature was done with "modes for ascertaining traffic."

There were only a few signs of regret at the passing of the traffic takers. Most of the people who even noticed appeared to effectively say "good riddance." An interesting perspective on the wrong-headed attitude towards traffic takers comes from the speech of William Chaplin, the chairman of the LSWR, at that line's semi-annual meeting in August 1847. He declared[273]

> [The Richmond line] having been opened, it might be gratifying to the shareholders to know what the traffic upon it had been. In June and July of this year they found, at Wandsworth, 9,486 passengers; at Putney, ... That was without the facility of getting to Waterloo-bridge. It would be very interesting to them to hear, and he

> spoke from [official data from coach license office], that in the year 1846, from the 5th April to the 5th July, before this railway was opened, there were 6,050 journies in three months by public conveyances, whereas in 1847 they had 136,010 passengers travelling in two months on the railway. This showed that there was not much necessity for traffic evidence before the Standing Orders Committees.

So he basically tossed out numbers that had some, but not direct, relevance for shareholder returns, but which did show impressive growth in passenger traffic, and concluded that the conservative predictions of the traffic takers were worthless[274]. But it is easy, at least in retrospect, with the benefit of data that was not made public until more than a year later, to reach a different conclusion by looking at Chaplin's own brief venture in traffic taking. In the summer of 1837, while the LSWR (then still called the London and Southampton) was under construction, serious doubts were being expressed about demand projections. To alleviate those concerns, the directors of this line commissioned three studies[275]. The directors' report "[began] by reciting the statement made in the original prospectus, which was fully borne out by evidence before the Committees of both Houses of Parliament previous to the obtainment of the Act of incorporation." This statement, presented in a table, showed that the estimate that had been made of existing traffic (existing back in 1833–34, when the line was being planned) included £118,499 in passenger traffic, which, being doubled, and added to other sources of revenue, led to a projection of annual revenues of £344,285[276]. Chaplin, at that time not involved in railways, but a coach operator, was asked to provide an estimate of existing coach traffic. This he did, and arrived at a figure of £123,824 (for the coach passengers alone, in 1837, at railway fares). If one uses Chaplin's figure instead of the £118,499 "which was fully borne out by evidence before the Committees of both Houses of Parliament," one obtains annual revenues of £354,935. The directors in their overview thanked Chaplin, Lacy, and Pare, the authors of the three reports they had commissioned, and in particular noted that

> Of the preceding statements, the Directors prefer that of Mr. Chaplin, not because it is the most flattering as regards the interests of the proprietors, but because it is founded upon positively existing data–upon facts, and not upon assumption; and because the experience of Mr. Chaplin in such matters entitles his opinions to great respect.

Still, the directors proceeded to argue that all three reports omitted some sources of traffic. After incorporating some of those, they professed "the absolute certainty of an ample revenue," namely of at least £402,654 per year. And they listed many additional sources of revenues that were likely to materialize, but were not used to boost the estimate, in order to be conservative.

What happened once the LSWR was opened? The results initially fell significantly short of expectations. But then they started growing. The revenues are presented in Table 5 in Chapter 15. That table shows that in 1845, revenues were just at the mid-point of the original Parliamentary estimate, and that obtainable with Chaplin's data. And even in 1846, when it got above Chaplin's projections, it had not yet gotten to the figure that the directors in 1837 proclaimed with "absolute certainty." So if we go by Chaplin's brief brush

with traffic taking, and look at it from the perspective of a potential railway investor of 1845 or 1846, it seems that there was, if not "much necessity for traffic evidence," at least great benefit in taking if seriously. He had managed to predict the revenues of 1845 almost perfectly back in 1837.

Chaplin is the subject of Appendix 10, since his actions and his pronouncements, such as the one presented above, give rise to interesting thoughts. But his disdainful attitude towards traffic takers seems to have been dominant. What is very interesting is that once the Mania crash took place, traffic takers did not get much blame. Certainly some people understood well what had happened. This is clear from the Watkin quote in the Introduction. This also seems to be implied by the quote from the *Railway Chronicle* of 1849 in Appendix 9, A9.6, which mentions "the fallacies and exaggerations in which traffic-takers were at one time too prone to indulge." But there was no careful investigation of their roles in the Mania debacle. How could that be? Part of the reason was the general reluctance to look into the origins of this event. Managers and promoters were eager to avoid in-depth examinations of their actions, whether they involved "the mystification practised by projectors, contractors, and committee," or even more innocent functioning. (There is nothing unusual in that, the same behavior dominates today.) In addition, a few other factors were operating, and I will close by citing two.

The York and North Midland Railway reports [224] that were cited earlier, were very thorough, but did not mention traffic takers by name at all. They did consider some branches and extensions in detail. The most careful was the treatment of the Harrogate line (p. 111), where it was noted that the original promoters, before the York and North Midland got involved, had estimated revenues of £20,000 per year. Instead, revenues (after construction by the York and North Midland at a cost that was 4x the original estimate) were just £10,557, but this is said to be "owing to the other routes," since there were now three lines to Harrogate, instead of the monopoly that this line was expected to achieve. It was not stated whether the original £20,000 estimate was made by a traffic taker, or by the promoters. But in any case, the blame for the shortfall in revenues is placed on competing lines. That, as was mentioned at the end of Chapter 24 and as will be discussed in the next chapter, was likely the main reason traffic takers' estimates in the Mania came up short.

The York and North Midland report apportioned blame for that company's financial downfall as follows ([224], p. 114):

> Of this there is no doubt whatever, that the Company's lines in operation up to the time of the Railway mania in 1844 yielded a bona fide 10 per cent Dividend; and much of the subsequent evil has arisen from not sufficiently discriminationg between Trunk lines and Branches, and from the pernicious system of Engineers and Chairmen of Directors setting forth the working charges as a certain per centage of receipts without reference to the particular circumstances of the case, and thereby adding to the delusion and excitement which prevailed, and causing the aggressive schemes which were encouraged and fostered by Parliament.
>
> Competing lines to some extent on the one hand, and unprofitable Branches on the other, have combined to reduce your original dividend of 10 per cent. to what it now is. There is one satisfaction, though but a poor one, which is yet left, which

> is, that the worst is seen, and that each succeeding year may be expected to add something to the traffic of each line, without any increase of the working charges, and that therefore such addition, whatever it may be, will be profit.

This conclusion shows that the committee did not understand railway economics[277]. But in any event the only blame here that can be ascribed to the traffic takers comes through indirectly, in the reference to "unprofitable Branches."

The second factor that I will mention that prevented an understanding of the role of the traffic takers in the Railway Mania crash was the persistence of the "traffic exceeding the most sanguine expectations" myth. To add to the citations from the 1850s in Chapter 17, consider William Newmarch. He was an eminent economic statistician as well as a prolific writer and a successful businessman and banker. In 1857 he wrote (p. 359 of vol. 1 of [212]):

> And extravagant, and wild, as were most of the statements made in 1844 and 1845, before the Parliamentary Committees, by the singular race of men, who then occupied so large a share of attention under the title of Traffic Takers that is, persons who undertook to prove, by certain data, that the traffic of a given district justified a particular projected line of railway we are compelled, by the strongest evidence, to admit, that even men like these, urged on all sides to indulge an unbounded license in anticipations of the future, were unable to imagine a rate of progress so rapid as that which has actually taken place.

How could any responsible person write this, unless suffering from a hallucination, given how far actual revenues had fallen short of expectations? Well, Newmarch's statement had some facts to support it. Even if one interprets traffic to mean revenues, by 1857 actual receipts were in many cases in excess of traffic taker projections of the Railway Mania period. The traffic tables they submitted did not envisage continuing growth in traffic, just a one-time period of that "development" that Watkin ridiculed, followed by leveling off. Apparently even in 1857 Newmarch had difficulty adjusting to the continuing rapid growth in railway usage (something that Morrison understood very well in 1836). If one interprets traffic to mean the number of passengers, then the recorded numbers were ahead of projections from the very beginning, even in the depth of the railway depression, for the reasons discussed earlier, namely locality of travel and lower fares (to a large extent reflecting shift towards more travel in 3rd class).

In any case, while there was much wailing and gnashing of teeth among investors, there was little blame attached to the traffic takers. When William Pare showed up again as a witness before a Parliamentary committee in 1862, after a 16-year absence, he was asked about his work in the intervening years. But nobody suggested his testimony should be tossed out, since his supposedly expert professional work in the 1840s led to the ruin of so many investors.

27 The fatal fallacy of the Railway Mania

We now come to the heart of the argument that the Railway Mania was irrational, that investors (and critics) should have known railway shares were bound to crash. We have

seen that investors were expecting, or at least should have been expecting, to have between £200 million and £400 million invested in railways by about the end of 1850. And this was under the best case scenario, of no cost overruns. And they were expecting to get 10% dividends on their money. So the railway industry was expected to produce net profits of between £20 million and £40 million per year by 1850. (Recall that the mind set was that all the capital should be in the form of equity, with loans used only for temporary purposes, in cases of necessity. So we don't have to worry about bond interest, etc. in this high level discussion.)

During the smaller railway mania of the 1830s, business plans, such as those presented to Parliament, usually assumed that operating expenses would come to about 33% of revenues. This was recognized to be a very uncertain estimate, but it was accepted in the absence of anything more solid. By the time of the big Railway Mania, it was recognized that actual expenses were higher, but not disastrously so. There were no good statistics, but in the words of Lardner's survey ([125], p. 492)

> The proportion of this gross revenue, absorbed by the current expenses of the transport, is different on different lines. In some it is above 50 per cent; in some below 40 per cent. In 1842 it was estimated at 44 per cent of the gross revenue; but it is probable that, by improved machinery and increased economy, it is now diminished. It may be taken at present at 42 per cent of the revenue.

Most of the business cases presented to Parliament in 1845 and 1846 seem to have built into them assumptions that operating expenses would run at about 40% of revenues. But it's possible that the Mania investors had secret or not-so-secret dreams that things would turn out to be rosier than promoters had predicted, and that expenses would only run at one third of revenues[278]. Let us assume this figure, as we are trying to give investors the benefit of the doubt. In that case, to produce a net profit of 10% on their capital, gross revenues would have to run at 15% of capital. (If we assumed working expenses of 40% of revenues, gross revenues would have to run at 16.7% of capital.) Hence, to satisfy investor expectations, British railway industry would have had to obtain, by 1850 or so, between £30 million and £60 million in revenues. That was quite a step up from the £6 million that was collected in 1845, growth by a factor of 5 to 10 in 5 years[279]. This should have alarmed observers by itself. But they were deluded by the collective psychology of the Mania, and distracted by concerns about the immediate problems of funding railway construction.

To summarize, at the height of the Mania, in late 1845, railway enthusiasts were blithely expecting that in half a dozen years, railway industry revenues would increase from £6 million per year to £60 million, and the jump of £54 million would come from totally new economic activities. A year later, in late 1846, they knew that even if no new projects were undertaken, they would need, by 1850 or 1851, to obtain revenues of about £30 million per year to fulfill their profit expectations.

The expectations coming out of traffic taker estimates were slightly more modest. As was computed in Chapter 23, the approximately 8,000 miles of railway authorized by Parliament in 1844–46 were expected to be in service by 1850 or 1851 at the latest (by the optimists, anyway, some acknowledged that construction might have to be stretched out a bit), and provide, together with the earlier lines, total railway industry revenues of at least

£24 million per year. Even that should have been seen to be unobtainable, as I will now show.

Recall that the basic assumption was that railway traffic was related to the road traffic in existence before a railway was built. Further, it was assumed by the traffic takers that the number of passengers by rail would be double that by road. But we have to worry about ambiguities. Remember that the "traffic has exceeded the most sanguine expectations" myth arose and was sustained because of the ambiguity in the word traffic. This myth was justified by reference to the number of passengers, whereas what mattered was revenues, which were also covered by the word 'traffic.' There was a further ambiguity, which was exploited by many promoters, in the term 'passenger.' In the Lardner 4x estimate, as well as in the traffic takers' 2x assumption, it was basically only the stage-coach passengers who were counted[280]. British roads carried a variety of other vehicles, cars, gigs, cabs, wagons, and the like, with new varieties springing up, and names not being consistent across the country. An interesting story is that of the 'Bians' of Ireland, designed and operated in several versions that evolved with time by Charles Bianconi, who moved from Italy to Ireland in 1802 (where he had been born as Joachim Carlo Giuseppe Bianconi) and became famous and rich as a result of his transport entrepreneurship[281]. Further, there were many foot travelers. Therefore the claims that railways stimulated greatly increased passenger travel have to be treated with a grain of salt. Much of the passenger traffic seen on rail represented diversion of pedestrian traffic, for example.

Unfortunately, there is very little quantitative evidence about the actual traffic on British roads. In the words of Porter's *Progress of the Nation*:

> It is a difficult thing to obtain accurate estimates of the amount of traffic upon roads or canals. In ordinary cases no one is interested in keeping an account of the number of vehicles or of passengers, or the quantity of goods conveyed upon the roads; and as the property in canals belongs to individuals or to private associations, it is judged prudent to conceal such facts, lest the knowledge of them should encourage rivalry. The only occasions on which information of this kind is collected and made public, are, when the promoters of some new undertaking are desirous of making out a case in favour of their own project, and it must be obvious that statements thus proffered are liable to some exaggeration, and must be received with caution. In the way here mentioned much information has been given in evidence before Committees of the House of Commons, appointed to examine the numerous railway bills brought forward, and in the absence of more extensive and authentic returns, selections from the information thus given may be interesting.[282]

Fortunately for us, there was one type of traffic that was measured very closely, and it was that of stage-coaches, the ones that played the dominant role in traffic takers' estimates. The reason is that there were very high taxes on coach travel, and coaches were licensed for specific routes, for specific numbers of runs on those routes, and for specific numbers of passengers. This went so far that ([106], p. 316)

> [c]oach proprietors felt the necessity of reducing [coach taxes] to the lowest possible amount, and, accordingly, it was customary, when winter was coming on, to lessen

> the number for which the license was taken out at the Stamp Office. In this way a coach might be licensed for the winter to carry only four inside and eight outside; but when summer returned, and business increased the license might be altered at the Stamp Office, and by the payment of the additional duty the number of persons that the coach could carry might be increased from twelve to eighteen.

Thus at least in principle tax data provided a very precise measure of the capacity of the stage-coach industry. (Taxes were based on capacity, not actual traffic.)

All tax data from that period has to be treated with some skepticism. In the early Victorian times, tax evasion was a national sport, with even MPs such as James Morrison engaging in smuggling, as was mentioned in Chapter 12. While today, many economists derisively call the "Laffer curve" (which led to the claims that lower tax rates would stimulate economic activity and produce higher tax collections) a "laugh curve," for many observers in the first half of the 19th century this concept (but obviously not the name, which came a century and a half later) was a demonstrated fact. They could cite many examples where lower rates did indeed lead to increased tax revenue. But many of those cases resulted less from increased economic activity, and more from decline in tax evasion. For coaches, though, tax evasion, although widely practiced, was not easy, and so was probably limited. Coaches had to have prominently painted on their sides details of their licenses, and there were substantial rewards for informers. Some of those informers made a living out of this trade[283]. Still, the extent to which coaches managed to carry illicitly large loads is not too important for our purposes. At Parliamentary hearings on railways, it was the official coach capacity that mattered the most, and that was attested to by sworn statements by clerks from the Stamp Office.

What was the capacity and average load of coaches? The main published source for this information was Porter's *Progress of the Nation.* Here is what he wrote on this topic:

> The calculations as to the number of passengers conveyed by stage–coaches upon the different lines of road embraced by the foregoing estimates, were for the most part grounded upon information furnished by the Stamp Office in London, in which department the necessary particulars are registered, upon the issue of the license, without which no person is allowed to convey passengers for hire from one part of this kingdom to another. In order to obtain some approximation to the extent of travelling by such means in England, a careful calculation has been made upon the whole of the returns so made to the Stamp Office, and the licenses for which coaches were in operation at the end of the year 1834. The method followed in making the calculation has been to ascertain the performance of each vehicle, supposing that performance to have been equal to the full amount of the permission conveyed by the license, reducing the power so given to a number equal to the number of miles which one passenger might be conveyed in the course of the year;–for example: a coach is licensed to convey 15 passengers daily from London to Birmingham, a distance of 112 miles. In order to ascertain the possible performance of this carriage, during the year, if the number of miles is multiplied by the number of journeys, and that product multiplied again by the number of passengers, we shall obtain, as an element, a number equal to the number of miles along which one person might

> have been conveyed: viz. 112 X 365 X 15 = 613,200. In this case the number of miles travelled is 40,880, along which distance 15 persons might have been carried during the year; but, for the simplification of the calculation, the further calculation is made, which shows that amount of travelling to be equal to the conveyance of one person through the distance of 613,200 miles. Upon making this calculation for the whole number of stage–coaches that possessed licenses at the end of the year 1834, it appears that the means of conveyance thus provided for travelling were equivalent to the conveyance during the year of one person, for the distance of 597,159,420 miles, or more than six times the distance between the earth and the sun. Observation has shown that the degree in which the public avail themselves of the accommodation thus provided is in the proportion of 9 to 15, or 3-5ths of its utmost extent. Following this proportion, the sum of all the travelling by stage–coaches in Great Britain may be represented by 358,295,652 miles; ...[284]

This passage, cited from the 1847 edition of Porter's book, is exactly the same as in the original 1838 edition. This estimate was widely known and cited[285]. Porter did not use data more recent than 1834, since "[t]he progressive opening of railways since 1834 would interfere materially with the correctness of any calculation based upon the Stamp Office returns of later years."[286]

Porter assumed that coaches were on average running at 60% of capacity (9 out of 15), an assumption he likely derived from the observations presented by traffic takers before Parliamentary committees. Sometimes arguments would be made that for rural areas average utilization should be lower, in some special cases that it should be higher, and often separate averages would be presented for two-horse, three-horse, and four-horse coaches. But all such variations from the 60% assumption were relatively minor, and would not affect our arguments. Almost certainly there was a much more serious fallacy hiding in Porter's analysis and in the traffic tables that traffic takers presented, but it also does not affect the main argument[287]. What matters for our argument is that traffic takers worked with the official coach capacities, as determined by Stamp Office data, and assumed an average load for the whole trip of about 60%. And the resulting estimates for passenger revenues were very close to actual ones in 1845.

So now we come to the crucial point of the argument. Suppose that in the mid-1830s, some tooth fairy came and dropped on Britain a complete system of about 25,000 miles of railways, about all the lines that the promoters and investors thought it was reasonable to build at the height of the Mania. This would have essentially duplicated the turnpike system, and would have accounted for practically all coach traffic. (Turnpikes were universally regarded as encompassing all commercially important roads.) What would the passenger revenues for the resulting system have been by 1845? By the traffic taker methodology, passenger miles on railways in 1845 would have been twice what they had been estimated on the coaches of 1834, or twice the 358,295,652 figure in Porter's treatise.

During the Mania of the 1840s, traffic takers did on various occasions argue (and get Parliamentary committees to accept) that one should triple the volume of coach travel, or else include other types of travel, when projecting railway revenues. But that is a different model. The model for which there was extensive empirical validation was the model they

used in the 1830s, which relied just on doubling of coach travel, nothing else. To change a validated model is to do what the real estate and financial industry did over the last decade, apply default statistics that had been gathered for conventional mortgages, with large downpayments and rigorous verification of incomes, to the new no-documentation "liar" loans, with no downpayments. To avoid that trap, we have to use the validated model, which is to double the estimated passenger miles of coach travel to get a figure for the expected passenger miles on the rails. On average, in Parliamentary estimates, each passenger mile was to bring in revenues of two old English pence, for total passenger revenues of $4 \times 358,295,652$ pence, or just a little under £6 million per year. This is the most that one could expect for passenger revenues from proper application of the traffic taker methodology of the 1830s.

We need to make some adjustments to the £6 million figure above. First of all, the data for coach travel presented by Porter [178] excluded coaches operating exclusively within Scotland and Ireland. Ireland I will omit in these estimates, since planned Irish railway investments were comparatively small, and Ireland has to be treated in special ways. For Scotland, there does not seem to be any convenient source for coach statistics. However, turnpike tolls (which will be discussed at the end of this chapter) for Scotland were about one sixth of those for England and Wales[288]. So if we assume the same relation for coach travel as for turnpike tolls between Scotland and the rest of Britain, we have to raise the potential estimate for total passenger revenues on rail in Britain to £7 million per year. On the other hand, even by the end of 1848, the total of all authorized railways for the U.K was only about 12,000 miles (see Chapter 11), about half the length of the turnpikes. So most likely the coach travel that corresponded to these routes did not amount to much more than $\frac{3}{4}$ of the total, and certainly not to as much as $\frac{6}{7}$. So we can safely lower the £7 million figure back down to £6 million as the most that the traffic taker methodology would allow for British passenger travel revenues in 1845, or 1850, or 1855. (Recall that one of the foundational assumptions of the methodology was a static universe, with quantum jumps coming from innovations like railways, but no steady growth.)

What about freight revenues? In 1845, passenger revenues came to £3.9 million, freight revenues to £2.2 million, see Table 2 in Chapter 3. Ignoring the fact that even in 1845, freight brought in quite a bit less than had been projected in the mid-1830s, we find that for each hundred pounds sterling coming from passengers, 56 pounds came from goods. So applying this same proportion, we can say with some confidence that no more than $6 \times 0.56 \sim 3$ millions of pound sterling in freight revenues could have been obtained for 1851.

The bottom line is that the traffic taker methodology, if applied properly with corrections for double counting, could not have predicted, even for the network planned in 1848, much less the one actually built in 1851, total industry revenues for 1851 of more than about £9 million. That is a rather far cry from the £24 million that the traffic takers were forecasting, or the £30–60 million that investors appeared to be expecting.

So that is the basic argument. It appears very solid. Still, it has to deal with a little awkward fact. Table 2 shows that in 1851, British railways collected £14.4 million from their customers. And they did so with a bit under 7,000 miles of track, not the 12,000 that was

assumed in the projections above. But that does not negate our argument. The argument was that the only validated quantitative model that was available to British investors was producing impossible results. "All models are wrong, but some models are useful." The traffic taker model worked spectacularly well in the 1830s, even though, as we have seen, it was wrong in very fundamental way. But in the 1840s, it was producing absurd results, which showed that something was badly wrong, and strongly pointed at double counting as a likely culprit behind the nice-looking profit projections coming from the traffic takers. Investors should have seen this, and should have investigated their revenue expectations.

The high revenues of 1851 (high relative to what the argument above shows was possible from correct applications of the traffic taker methodology) came from yet another fundamental fallacy of that methodology, namely the assumption of a static universe. The railway industry, and the whole economy, were growing. Note that passenger revenues in 1851 came to £7.6 million, only about a quarter higher than the basic methodology could have predicted. (They were also boosted temporarily by travel to the Great Exhibition of 1851, which accounts for the decline in passenger revenues in 1852.) On the other hand, freight revenues, which the traffic taker methodology predicted could not be higher than about £3 million, came to £6.9 million that year. Hence railway investors did benefit from a factor they had not anticipated and that was not part of the traffic taker model, namely continuing economic growth.

The argument above built on the statistics of the stage-coach industry. There was one other rather reliable set of transportation statistics, those for revenues collected by turnpikes, cited above. Turnpikes were non-profit trusts, a restriction imposed by Parliament because of the sensitivity involved in limiting access to crucial public highways. Hence they were tightly regulated (even though, or, more likely, because, there was a generous dose of graft and corruption, as well as incompetence). Therefore we do have extensive data for them. Unfortunately, it is not the data that would be most useful, namely about the detailed breakdown of the traffic on them. Still, we do have very detailed statistics of their revenues, cited above, which show total toll collections in Britain of about £1.5 million per year. Estimates are that turnpike tolls took on the order of 10 to 15% of total revenues of commercial carriers (stage-coaches as well as goods carriers), which would argue that revenues of all road carriers in Britain were at most £15 million per year. In the traffic taker methodology, only goods already moving on roads were expected to use railway transport, there would be no "development," and rates would be substantially lower. For passengers, the volume of coach travel was expected to double on the rails, but at considerably lower cost per mile than by coach. So the general conclusion is that starting from this perspective, one could also conclude that if properly applied and corrected for duplicate counts, the traffic taker methodology could not have predicted total railway revenues for 1851 higher than £15 million, say. I don't go into the details of this argument (they will be presented in *BICS*), since much of the evidence about the various figures used is either anecdotal or based on a few scraps of scattered information[289].

Interestingly enough, the argument sketched above that limits potential railway revenues based on turnpike tolls was not beyond the powers of British observers of the Mania

period. In fact, it was used already in 1829 by Charles Maclaren, the editor of the *Scotsman*, for other but related purposes[290].

28 Prophets of a profitless future

Although almost all skepticism and opposition to the Railway Mania was confined to the construction period, there were a few voices predicting that there would be no profits afterwards. But there were only a few such voices, and in almost all cases all that they expressed were opinions, with no quantitative arguments to support them, nothing like pointing out that there were only 50,000 seats in a ballpark when the business plan for an event called for 150,000 fans to buy tickets.

One of the most interesting skeptics of this type was the *Era,* a small weekly newspaper. Started in late 1838, it was an official organ of the Licensed Victuallers (i.e., the pub-keepers). Although its circulation was not large (about 4,000, about one-seventh that of the daily *The Times,* and one twelfth of the *Weekly Dispatch*), it was supposed to be widely read in the countryside, in the inns and pubs. It did not receive much attention from the rest of the press, perhaps because of its association with pubs, or because of its subject concentration, either of which may have made it less than fully "respectable.". The *Era* specialized in coverage of sports and entertainment, and it is an indispensable source for modern scholars of Victorian theater. But it also covered railways. The space devoted to this industry was tiny compared to what sports and entertainment received, but was still more than most British newspapers devoted to the subject in the late 1830s and early 1840s. The business and railway columns also seemed to be written consistently by the same person through the 1840s. They are remarkable for the strong support for railways during the dark years of the early 1840s. The *Era* constantly urged shareholders to hang on, that better times would come soon. But then, as the Railway Mania was just sending its first shoots into the air, the *Era* was the first (at least among all the publications I have seen) to warn of the dangers of a bubble, far ahead of *The Times*, the *Economist,* and other media. As the Mania blossomed, *Era* became ever more vociferous in its warnings. The comments in the *Era* were often very penetrating, not only about railways as an investment, but about the nature and functioning of corporate capitalism. Not infrequently they were wrong or at least lacking insight[291]. On the topic of ruin awaiting the new railway schemes, though, they were right. But in all cases these were comments, personal evaluations not backed up by evidence. They will be discussed at some length in *BICS.*

There were other voices of caution that cropped up from time to time. For example, the *Spectator,* another London-based weekly (and one that survives to this day) raised the question in late 1845, "how many of these railways, if established, would really afford a paying revenue from the fares?"[292].

In this chapter I will discuss in some detail just one railway investment skeptic, one who will also receive much more coverage in *BICS.* John Ramsay McCulloch was the most prominent British economist of the 1840s. Not the greatest (although his reputation as an original thinker was greatly enhanced by the recent study [162]), but the most visible, because of his strong advocacy of free trade, where he was the anointed disciple of David Ricardo, and especially because of several reference works that he kept updating. Precisely

because he kept issuing new editions of his books, we can follow his thinking about railways better than that of most other economists of that generation, who seem not to have paid much attention to this revolutionary new technology, at least not in their writings. In mid-1846 he wrote a passage that was published in early 1847 (pp. 56–58 in [148]), thus still in time for investors to pull back from many of their projects:

> [railways] rank among the most important and most advantageous improvements and discoveries of modern science, have effected a total revolution in the means and methods of conveyance. ... are all but miraculous.
>
> ... there can be no doubt that the country has profited very largely by the railway system, the facility of intercourse having been prodigiously extended, at the same time that the greater number of the principal lines of road have proved, in a pecuniary point of view, exceedingly beneficial to the parties engaged in them. Latterly, however, railway projects have been carried to an absurd extent; they have been made the pretence for many swindling schemes, and have given birth to an amount of gambling highly prejudicial to industry, and disgraceful to the public. Of the innumerable schemes, that are now (1846) before parliament, that are likely to be sanctioned, a very large proportion can hardly fail of being ruinous to their projectors.

Here McCulloch is unambiguously predicting losses for investors, even from schemes that survive Parliamentary scrutiny. But just reading this passage alone, there is still a question as to whether he means ruin in the sense that the railways are going to be unprofitable once built, or ruin in the sense that "swindling" will cost them money, or that, as in the late 1830s and early 1840s, there will be trouble raising funds, etc. In this case we can be confident that it is the first alternative, that the lines will simply not be profitable, that McCulloch had in mind. The reason is that this is what he had been saying all along, starting in 1832. He was always enthusiastic about railways as an innovative breakthrough that would help the economy. But he was also convinced that shareholders would do poorly. And until the Mania of the late 1840s, he had been consistently wrong on this point. Not terribly wrong, his caution was not unreasonable. But the railways of the 1830s did far better financially than he had expected. This time, in 1846, one could say he finally turned out to be right. But one also could say that this time he was again incorrect, in this case from not being pessimistic enough. He only warned about "the innumerable schemes" of 1846, of which "a very large proportion" he deemed of questionable profitability. In fact, essentially all lines, new and established, turned out to be "ruinous to their projectors."

McCulloch was an intelligent observer, but he appears never to have investigated railways in detail. His evaluations of the industry were not unreasonable, given all the uncertainties, it's just that they turned out to be wrong. And in any case they were just his personal opinions, not substantiated by any quantitative arguments.

29 James Morrison's amazing forecast

Chapter 20 outlined the argument that Railway Mania investors were ruined because they did not look carefully at either the past or the future. But this claim has to be modified.

Some people looked to the very distant future, and some of them managed remarkable feats of financial and technological forecasting. This chapter presents the example of James Morrison, who was discussed in Chapter 12 and was quoted in a few other places as well.

During the 1830s and 1840s there were many voices in England arguing against leaving railways entirely in private hands. Their argument was that the new transportation infrastructure was too important, and too much subject to monopolistic tendencies, to allow it to be run just for profit maximizing motives. Although that was an era of worship of free markets, even some of the most ardent advocates of free enterprise felt that markets could not be trusted in all cases to provide what was best for society, and that private railways were bound to abuse their monopoly positions. (The issues, and the arguments, were very similar to the ones we hear today about the Internet.) While some argued that the government should build and operate railways, others advocated strong regulation, and others yet, perhaps most numerous, inclined towards the French model, or rather some version of one of the French models (since the French were experimenting with their approach). The latter involved the government deciding on lines to be built, and offering some assistance in finance, but leaving the construction and operation to private companies. However, after a set period of years, the entire railway would become the property of the state (which could then lease it to the same or another operator). There were problems with this approach, and the French did run into various difficulties implementing it, but that is not relevant for us here. In principle, anyway, such a policy was consistent with the operations of the dominant element of the British economy at the time. Almost all land, for agriculture as well as housing, was leased, not sold. Even the U.S. does not own the land under its embassy in London today. The promoters of the idea of using such a policy for railways dangled in front of the public not just the prospect of better and lower cost service, but the promise of relief from the heavy burden of taxation. Their hope was that once railways passed into government hands, their profits would serve to replace taxes, which were almost universally regarded as so high as to be barely tolerable. James Morrison cited this as one of many arguments in his 1846 pamphlet [157] (reprinted in [158]). And in the process he came within a whisker of identifying the reason investors in Railway Mania lines were bound to suffer.

Morrison wrote (pp. 41–42 of [157]):

> ... the vast magnitude of the question with which Parliament has to deal may be best shown by comparing our railway [profits] with the National Debt. The interest on the latter does not much exceed [£28 million]. A capital of [£560 million] therefore, if producing 5 per cent, would yield a sufficient annual [profit] to pay this interest.
>
> Now, the cost of the railways already completed in Great Britain and Ireland is about [£70 million], and the estimated cost of the lines now in course of present construction is more than [£60 million]. But it is the opinion of every one best acquainted with the subject, that the amount already vested in railways in this country is but a small part indeed of what will ultimately be required. The host of schemes now before Parliament confirms this view; at the same time that the actual [profit] on the lines already completed, and the estimated [profit] from those that are being made or before Parliament, considerably exceeds 5 per cent. And if we take

> into account the steadily progressive and apparently boundless increase of business on almost every line, it is more than probable that the receipts on our railways, after the system has been completed, will amount to a gigantic sum.
>
> At all events, it may, I am satisfied, be unhesitatingly laid down that the total [profit] of our railways, in some 20 or 30 years, will amount to a large proportion indeed of the interest on our Debt, or of [£28 million]; and it is neither absurd nor unreasonable to expect that it may even equal or surpass that amount. And if such be the case, it is plain that the adoption from the commencement of a system of terminable leases, which the experience of France has shown to be of easy introduction, would have relieved us within the present century, and perhaps in a much shorter time, from the burden of the whole or of the greater part of our Debt.

At one level, this is an extremely perceptive passage, and a wonderfully accurate exercise in futurology. Morrison understood "the steadily progressive and apparently boundless increase of business on almost every line," something that most of his compatriots had great difficulty grasping. And he was talking of railway investment amounting to £560 million and producing £28 million in profit, at a rate of 5%, possibly as soon as "in some 20 or 30 years." As it turns out[293], total capital investment reached £560 million in 1872, 26 years later, operating profits (including interest on borrowings, guaranteed and preference dividends, etc.) reached £28 million in 1875, or 29 years later, and profit rate varied between 4.74% and 4.45% during the period 1872–1875. One could hardly ask for a more accurate long-term financial projection than Morrison's. It obviously involved a fair amount of guesswork, but it also appears to have been based on his very deep understanding of the dynamics of the British economy[294].

At the same time as he was making his brilliant projection, Morrison appeared not to realize that Railway Mania investors were expecting those profits not in "20 or 30 years," but by 1850 or 1851, in 4 or 5 years. How could he not have realized this? It's a puzzle, but then in his 1836 speech in Parliament, cited in Chapter 15, he also seemed not to understand that his fellow MPs did not believe in continual growth. As it is, railway expansion enthusiasts likely had no difficulty in dismissing this passage. It reflected Morrison's warnings that investments in railway should be kept in check (£560 million in 20 years corresponds to £28 million per year, just about what Morrison claimed was the prudent limit), and his prediction of 5% profits was anathema to prospective investors. But had he just turned his attention to general expectations of annual £28 million profits within a few years that were prevalent, he might have figured out what was wrong, and how to explain it to the public.

30 Dionysius Lardner, the reticent Cassandra

Several times in this manuscript we have encountered the Rev. Dr. Dionysius Lardner, mostly through quotes from his survey, "Railways at home and abroad" [125], which was published in the October 1846 issue of the *Edinburgh Review*. The quotes show how perceptive this work was, puncturing several of the key myths of the Railway Mania. Just the quotes about continuing growth, about faster growth of freight than passenger revenues,

about the implausibility of cost projections, and about locality of traffic, would by themselves make this by far the most penetrating and important work of the period. But those observations were not completely novel, they had been made by others earlier. However, there was another passage in that survey which demonstrates a clear understanding of the fundamental fallacy of the Mania, a clearer understanding than I have found in any other contemporary observer. One can find in the British press traces of a few other skeptics thinking along those lines, but none had as clear an understanding of the industry, and as clear a formulation of the problem it faced. Lardner's passage on this topic should have served as a wake-up call for investors, telling them they were destined for ruin. But they ignored it.

"Railways at home and abroad" was a striking work, presenting an unusually detailed and comprehensive coverage of the worldwide railway industry in very clear terms. It was long, 53 pages and about 25,000 words, but that was not unusual for Victorian quarterlies. It covered a multitude of topics, from history to policy prescriptions. Hence reviewers could, and in all cases did, pick up just one or two particular themes that struck their interest for detailed comments.

Buried in the middle (the 20-th page, p. 498 of [125]) of this work is an important passage. After discussing the finances of the lines in service, and the relation between costs of construction, revenues, working expenses, and profits, Lardner moved to discussing the 9,000 miles of railways that had been authorized in the 1846 session of Parliament and in preceding ones[295]. He noted:

> But let us assume the work to be done. Let us suppose the capital to be sunk, and the 9000 miles of railway to be in full operation. The shareholders will expect at least as good average profits as those who have already made a like investment. We have seen that a gross revenue of £3000 per mile, on the existing lines, only pays an average profit of about 5 per cent. What must be the gross revenue of the system of lines, now contemplated, to give the same profits?
>
> In order that 9000 miles of railway should produce £3000 per mile, it is necessary that the public should expend on that species of inland transport twenty-seven millions a-year! Assuming that this expenditure is distributed between passengers and merchandise, as it is at present, seventeen millions will be paid for passengers and ten millions for merchandise.
>
> At present the number of passengers booked on 2000 miles of railways annually is nearly thirty-four millions. When the enlarged system comes into complete operation, the number must be an hundred and fifty-three millions!
>
> This subject opens many curious and interesting views; but our limits warn us that we must at present dismiss it.

It is a great pity that Lardner did not expound on those "many curious and interesting views." It is hard to take the claim of lack of space seriously, not when he had 25,000 words at his disposal (and the article is rather wordy) and devoted just 200 to this prediction of financial disaster[296]. On the other hand, he did something similar with his long discussion of locality. As was mentioned in Chapter 16, he emphasized several times that the facts he

was citing were of interest to investors, but he did not tell them directly that those facts demonstrated that they were about to fall off a cliff.

Was Lardner aware of the arguments in Chapter 27 that the traffic takers' model for predicting demand was faulty and delivering clearly impossible results? We just don't know. His tantalizing mention that "[t]his subject opens many curious and interesting views" suggests he might have been. Certainly he had all the necessary facts at his disposal, and must have been intimately aware of the traffic takers' work through his testimony before several Parliamentary committees in the 1830s. We have his side of the correspondence with Napier about the article, but while it is illuminating in many ways, it only deepens the mystery in others. But whether he was hiding this knowledge up his sleeve or not, this passage should have acted as a spur to investors to investigate financial prospects of the industry more carefully. But that did not happen.

Lardner's survey was widely read and reviewed. The *Edinburgh Review* was one of the "great triumvirate of nineteenth century periodicals," [103], one of the best known and most respected serials in Britain. Further, it was a semi-official organ of the Whigs, who came into power just before the 1846 Parliamentary session closed. Thus the policies of the new government were still not established, and any hints about what might be done in the next session of Parliament, such as those that might appear in the *Edinburgh Review*, were bound to be carefully scrutinized. That this survey appeared as the last article in an issue signified that the editor regarded it as especially important, too.

Lardner's survey concluded on what was unquestionably a "Morrissonian" tone. It claimed that "[b]y the system so wisely pursued in France, and most other countries, the advantages arising from private enterprise are combined with sufficient security for the public, against the abuse of the powers intrusted to railway companies." This was contrasted with the British system, which involved "the singular imprudence, of surrendering, without available conditions, and for an indefinite time, its public communications into private hands." As a result, much of the railway press was bound to be hostile[297]. Elsewhere, on both sides of the Atlantic, reception was generally positive. But reviewers generally picked on only a few items that caught their attention, often ones that were could be interpreted as supportive of huge railway network expansion.

Lardner's survey was published anonymously, in accordance with the customs of the time. But several reviewers quickly deduced that Lardner was the author, based on the style, references, and other indicators. This may have influenced the reception of the work to some extent, since Lardner was very controversial, as I will discuss below, and had many enemies.

Of all the British reviewers and editors who did anything with Lardner's survey, and whose work I have seen, only one appears to have noted the importance of the passage cited above about the implausibly large revenue expectations that railway investors were implicitly counting on. And even that person did it without any comment, just through selection of what to reprint from Lardner's work, so it is not absolutely certain he understood Lardner's argument. On the other hand, there were at least two Americans who grasped what Lardner was saying, namely that British railway investors were about to fall off a cliff. (All these cases, as well as other reviews of Lardner's survey, will be treated

at some length in *BICS.* It should be noted that the sample of the American press that was examined was far smaller than that of the British one.) Why would Americans be so much more perceptive than the British? Most likely because they were physically at a great distance, and therefore did not fall for the collective hallucination that consumed British investors. Further, American railroads of the late 1830s and early 1840s not infrequently went bankrupt, unlike British ones, which almost always were paying dividends, even if modest ones. This surely helped prepare the minds of the American observers for a skeptical view.

Why was Lardner so much more perceptive than other contemporary British observers, including James Morrison and the staffs of the *Economist* and *The Times*? We can only speculate, but very likely it was his outsider status that kept him from being drawn into the general collective delusion. So it is worth presenting a brief sketch of his career.

Lardner had been an extremely well-known popularizer of science and technology in the 1820s and 1830s, a prolific writer and editor. He was the first to popularize Babbage's work on the Difference Engine. There are a few articles about Lardner and his career in the literature, but the first book biography is only now in preparation, by Anna Martin [140]. There will also be considerable coverage of Lardner and the evolution of his thinking in *BICS.*

Lardner was an inspiring speaker. An American who had heard him, wrote a few decades later that

> [Lardner] had the rare talent to lecture on the most abstruse science and make his audience understand every word he uttered. ... Faraday, as a lecturer, was most probably the only man ... that could approach Lardner in making light out of darkness, knowledge out of ignorance, and so magnetizing an audience as to hold them "spellbound" until he chose to break the charm by shutting down on his own voice.[298]

John Scott Russell is today known best either as a naval architect, or as the discoverer of solitons. He also worked on steam engines, steam carriages, and railways, and during the Mania was for a time the editor of the *Railway Chronicle* and the railway editor of the *Daily News.* He knew Lardner well, and in late 1840, after Lardner's forced departure for America in a major scandal to me described below, had the following to say about him:

> In [his capacity as popularizer of science] he must undoubtedly stand peerless who could keep an audience of "Beauty and Fashion" hanging on his lips for hours, as he detailed the tractive value of the various railway gradients, the cants of their curves, and the cause of variation in the locomotive duty of a pound of coke. In fact, it may be safely adduced as the crowning peculiarity of his professional career, that he could make any one of ordinary talent, who chose to devote to him a few hours of attention, comprehend any point of art or science, quite as perfectly as it was known to himself.[299]

Russell, no mean lecturer himself, clearly had high regard for Lardner's expository skills. However, the last part of the quote above, about Lardner being able to teach "any one of ordinary talent ... quite as perfectly as it was known to himself," is actually a sharp barb.

It implies that Lardner did not know much. The passage cited above was preceded by some more caustic and direct sentences:

> As College Tutor to the junior youths he was a favourite. The older students passed over to profounder men. As a lecturer in the London University, no man gave better attended lectures on the elementary parts of Science, and no one could have addressed a greater number of empty benches when the profounder abstractions of mathematics were to be developed.

Russell was not alone in this opinion. However great he was as a popularizer, Lardner was never regarded by serious contemporary observers as either innovative or profound. And in the decade before the Mania he disgraced himself in the eyes of the public, first on technical grounds, then on moral ones. He was involved in several technical controversies, in which he was generally (although not necessarily appropriately) regarded as having taken the wrong side. The most spectacular was in his strong public stance as a skeptic about the possibility of steam travel across the Atlantic, a feat that was first accomplished in 1838. The story of his skepticism seemed so excellent an example of hidebound conservatism that it grew in the retelling. For example, in 1858, Henry Ward Beecher said:

> I remember when the first steamer crossed the Atlantic, and I have been told, though the story may be too good to be true, that the first steamer that made the passage to New York carried with her the newspaper containing the news of the impossibility of making the voyage by Dr. Lardner.[300]

At least Beecher did add the qualifier that "the story may be too good to be true." It was indeed "too good to be true," but in later versions, the qualifier often got dropped. But the story was "too good to be true" only in the flourish about the newspaper with Lardner's "proof" being carried on the first trans-Atlantic steam voyage. Lardner did indeed claim to have demonstrated the infeasibility of such travel. But even this simple statement does not convey all the subtleties involved. These subtleties enabled Lardner (and some disinterested observers, too) to claim later he had been right all along. But as far as public opinion was concerned, he had simply been dead wrong on an important and publicly visible technical issue.

Lardner has not been treated kindly by railway historians. An extreme example is a passage by a modern writer (pp. 185–186 of [190]) that said of Lardner that "this egregious ass [kept] popping up to provide comic relief to the dullest piece of research. Lardner was forever trying to sail with the prevailing wind, but he was such a bad navigator that by the time he got his sails up the wind had changed and he was invariably dismasted." Unfortunately this description says more about the writer's ignorance of history and his love for flowery language than it does about Lardner. Still, there are only a few historians who have kind words to say about Lardner. On the other hand, he is well-regarded by economists and accountants, primarily based on his 1850 book *Railway Economy* [126], which made substantial contributions to the development of microeconomics, spacial economics, and accounting[301].

Two years after the first trans-Atlantic steam voyage that disgraced him techically, in 1840, Lardner disgraced himself morally by eloping with another man's wife. (This was not

his first such escapade. Two decades earlier, while still living in Dublin, and separated from his first wife, he appears to have fathered Dion Boucicault, one of the foremost dramatists of the Victorian era, by the wife of another man. But that story never made much of a splash.) The couple ran away to Paris, pursued by the enraged husband and the wife's father. Newspapers had a field day, covering the sinners' travails, including a sensational trial at which the aggrieved husband won a giant financial judgement against Lardner for adultery. Lardner and the wife (who eventually got a divorce and married Lardner, and lived with him, apparently very happily, until Lardner's death) then moved to the U.S., where after a year he launched a very successful lecturing career. In 1845, the couple moved back to Europe, but settled not in England, but in Paris.

Thus Lardner, once quite securely ensconced inside the British scientific and intellectual establishment, found himself on the outside, and forced to think through his very public mishaps. Further, he gained the benefit of extensive experience in America, as well as in continental Europe. And he lived at some distance from Britain. This may have allowed him to avoid the collective hallucination that ruled Britain, and take a more sober view of the Mania.

But there still remains a big mystery about Lardner. Why did he not develop the implications of his observations, and explicitly warn investors they were rushing towards bankruptcy? Some speculations are presented in *BICS*. But they are just speculations, and will likely have to remain such, unless some unknown trove of Lardner's correspondence is discovered.

Whatever the reasons that led Lardner not to emphasize the implications of his observations for railway investment, his survey did convey a clear implication that the Mania was bound to collapse. But British railway investors chose not to pay heed, and went on their merry way until the inevitable collapse arrived.

What can one say about Lardner's contribution to the Railway Mania? Of all the contemporary observers, he seemed to have by far the best high level understanding of the railway industry, He saw the manifold illusions and delusions that were driving British investors astray. And he did explain the fatal fallacy of the Mania clearly and publicly. Yet this perceptive work is totally unacknowledged in current history books, and Lardner most frequently crops up only as an example of obstinate and foolish techno-pessimism.

Lardner did have many faults. What is interesting is that many of these faults he shared with his frequent antagonist, Isambard Kingdom Brunel. In a poll taken by BBC early last decade, Brunel, one of the two most prominent railway engineers of the Railway Mania period (the other was Robert Stephenson), was ranked as the second most famous Briton in history[302]. He easily beat Charles Darwin, William Shakespeare, and Isaac Newton. He was even ahead of Princess Diana, David Beckham, and the Beatles. Only Winston Churchill came out ahead, and even then only by 15%. Yet if we consider only peacetime economic activities, it is hard to think of anyone who destroyed more shareholder wealth than Brunel. He was notorious from the very start of his career for extravagant expenses. His career started with assisting his father, the distinguished engineer Sir Marc Isambard Brunel, to build the Thames Tunnel. A marvelous technical work that introduced the breakthrough innovation of the tunnelling shield and demonstrated the feasibility of underwater tunnels,

it was a complete disaster for the investors who backed it. After their money ran out, work was suspended for half a dozen years, until a government loan was obtained to complete the project, just a few years before the Mania. The long-time chairman, Benjamin Hawes, declared, just as the tunnel was opening for service, that "[a]s yet the shareholders had received no interest for their money, but he hoped and believed that they soon would." But after three years of experience with steadily declining revenues, down to an annual level of about 1% of the construction cost, he was reduced to "stating that the tunnel remained a monument of art, but not an investment of a profitable nature. The proprietors, therefore, must as yet content themselves with the honour of completing so extraordinary a work."[303] And such honor was to be their only reward, even while the engineer, the older Brunel, received the honor of a knighthood, as well as great fame. The tunnel itself was a major tourist attraction for a while. After a quarter century it was converted for railway service, with the rail company paying only enough to cover a fraction of the government debt, with nothing for the shareholders. But society at large gained tremendously from the project, as many successful tunnels used the technology first applied under the Thames.

The experience with the Thames Tunnel kept repeating in the younger Brunel's career. Many of his projects did make money, but almost all of them could have made far more money with more economical approaches to construction. In the words of a historian writing a few years after Brunel's death (p. 190 of [66])

> With Mr. Brunel, public roads and carriages ought not to be constructed, or arches raised, unless the one can be made luxurious, the other lofty, and the third imposing. The profit was of minor consideration. If the public did not pay, they ought to be made to pay.

Lardner "could keep an audience of "Beauty and Fashion" hanging on his lips for hours, as he detailed the tractive value of the various railway gradients, the cants of their curves, and the cause of variation in the locomotive duty of a pound of coke." Brunel does not appear to have possessed comparable ability at popular exposition. But he had what seems to have been even greater ability to keep his directors enthralled, and through them, the shareholders. Some might say he excelled at bamboozling people, but that seems far to crude a term. It might be better to say he managed to create truly enchanting "beautiful illusions." How essential is that ability, not just for individual advancement, but for technological progress? And to what extent is it sufficient to have the "proprietors ... content themselves with the honour of completing so extraordinary a work"? It is not just "the honour of completing ... extraordinary ... work[s]" that investors get, but all the hopes and dreams before completion, as well as other non-financial rewards. Especially as circuses become more important than bread, are such rewards becoming more important and more frequent?

Getting back to the similarities between Brunel and Lardner, both were apt to jump to hasty conclusions, and to refuse to acknowledge mistakes. The main difference is that Lardner did not build anything. He only lectured and wrote, and the cracks in the intellectual edifices he built remained in print, and could be, and were, ridiculed by his critics and opponents. Brunel, on the other hand, built railways, bridges, tunnels, and steamships. When cracks appeared in his creations, he filled them in with generous dollops of his share-

holders' money. He, along with other railway engineers, did alter the face of Britain. Much of what he built is still in use, and can be admired for its esthetics and engineering talent. And today he ranks as the second most famous Briton in history.

What would have happened had British investors paid attention to Lardner, and stopped their ruinous ventures? They would have lost a couple of years of (declining) hopes for easy riches. And that kind of intangible stirring of hopes should not be underestimated. But they would collectively have saved huge amounts of money, comparable for the U.S. today to about $2 trillion, and, to borrow the language of Charlotte Brontë, "many–very many" would not have been "by the late strange Railway System deprived almost of their daily bread." Beyond that, we can only speculate. Their country might have experienced a revolution in 1848 (and so those investors might have lost even more money, and perhaps in some cases their lives). And even if that had not happened, the British economy would not have received the boost that came from the giant new railway infrastructure in the 1850s and 1860s. And that might have prevented Britain from sprinting into a clear lead for a few decades in the Industrial Revolution, in spite of the manifold impediments that British society posed, impediments that caused it to lose that lead eventually.

So perhaps history has been just. Brunel ruined his investors, but he provided them with enough "beautiful illusions" to keep the money flowing that made Britain what it is. Lardner was head and shoulders above his contemporaries in understanding the problems of the Mania, but he could only hope to crack the "credulous simplicity" of the investors. That would have saved the investors much money and angst, but would have slowed their country's transformation. And so perhaps the disparate treatments of Lardner and Brunel, with one misunderstood, neglected, and even denigrated, while the other is exalted, reflects what society needs if it is to advance technologically.

31 Conclusions

Was there any chance at all for the British railway industry to earn enough to provide its investors with a satisfactory profit? Certainly. Finance and economics are not like mathematics, where one can prove that there is no way to square a circle. Almost-miracles do happen in business. A single discovery of rich auriferous ore during construction of one of the British lines, say one containing 3,000 tons of gold[304], would have been worth about £400 million, about double the entire British investment in domestic railways as of 1850, and would have made the whole railway enterprise appear wildy successful. Rather unlikely, admittedly. And it seems even less likely with our current knowledge of geology than with that of the early Victorians[305], but not physically impossible. Of course a single gigantic gold strike would have provided profits for just the shareholders of the one railway involved, but had it happened, one could still maintain that on average British railway investors had done well[306].

Far less likely than a rich gold strike in the British Isles was the possibility that the British population would suddenly develop an irrepressible urge to travel by railway, and would thus provide enough revenues to meet investor expectations. As the numbers presented in an earlier section showed, this would have required a huge rearrangement of the economy, something that should have been seen as absurd even in those days.

Could there have been some totally new, unexpected source of demand for railway services? After all, passengers had not been considered as a serious source of revenue for the industry until 1830, and yet they contributed the majority of the funds railways were collecting during the Mania. Could something similar have happened to rescue railway investors in the late 1840s? There is nothing we can point to. And there is no sign that any British investors were counting on some totally new, surprising sources of demand. Even if their expectations for passenger and freight traffic demand were unrealistically high, that is all they were talking about.

(in fact, got continued growth)

Considerably more likely than either a gold strike, or a rail travel fever, either of which would have made railways a success as enterprises, was a financial success for railway investors without the railways producing large profits. Had these shareholders managed to persuade other capitalists that railways were truly a no-lose deal, they might have succeeded in swapping their shares in railways for other, more solid, property[307]. This is not entirely fanciful, as the most contentious economic policy issue in late 1845 and 1846 was not rail investment, but free trade, and in particular the impending abolition of tariffs on agricultural imports. The protectionist advocates, with Disraeli as one of their main leaders, were predicting that food imports would "place the English farmer upon the footing of the half-fed and half-clothed Pomeranian corn-grower" and that since "in every country the LAND is the basis upon which commercial enterprise rests," the rest of the economy would also be devastated[308]. Had the "landed interest" for whose interests Disraeli was fighting been as scared by their propaganda as they hoped the populace would be, they might have tried to shift their wealth into other assets, such as railway shares[309], and railway shareholders would have had a chance to bail out at nice prices. But that did not happen[310]. And even if it had, a financial success for railway shareholders at the expense of landlords, say, is still not a success for railways as economic entities. And the expectations of railway shareholders were based on that, and those were not attainable.

Hence we can safely conclude that the market in the 1840s was inefficient, grossly so, comparably to the market at the time of the telecom bubbles a decade ago. Investors in the British Mania, and even the vast majority of opponents of this bubble, did not see very clear signs that expected revenues and profits were not going to materialize.

Based on the experience of the Railway Mania, especially when combined with observations of the recent Internet bubble, we can safely predict that there will be many more technobubbles that will not be identified as such ahead of time (and possibly even afterwards) even though there will be obvious ways to do so. But, as they say in the computer industry, is that a bug, or a feature?

During the Railway Mania, some powerful and insightful thinkers, such as those represented by *The Times,* the *Economist,* and James Morrison, did not have to be persuaded they faced a dangerous mania. But they misidentified the root problems, and may have inadvertently helped inflate the bubble they were fighting. Since that time, society has advanced. Over the last decade, people in similar positions of authority, influence, and access to knowledge, not only refused to look for bubbles, but discouraged others from looking, and denied any could exist, until those bubbles blew up in their faces (and sometimes

not even then). Thus while we can say that we grew in access to data, information, and knowledge, by some standards we seem to have regressed in wisdom. But perhaps this is the wrong way of looking at the situation. If we ignore the financial debacles in either case, and consider society over the last century and a half, we find not only that there are many more people alive, but they show tremendous improvements in living standards, longevity, education, and numerous other indicators of well-being. It is tempting to look at the first observation, about lack of insights into bubbles, as a blemish on the rosy picture that the second observation evokes. But what if the two share an unavoidable correlation (if not causation)? What if progress requires increasing gullibility on the part of both investors and of government, technology, and business leaders? What will the next step in economic development be in that case? Alan Greenspan, that enthusiastic disciple of Ayn Rand, recently shocked some, and amused others, by speculating about the possible need to nationalize the financial system once a century[311]. Natural progression might then yield, in a generation, say, another central banker who is just as fervent a free-market advocate, but even more gullible, and ends up presiding over actual nationalizations of the financial system every decade! "This subject opens many curious and interesting views; but our limits warn us that we must at present dismiss it."

Appendix 1: *The Glenmutchkin Railway* by W. E. Aytoun

The Glenmutchkin story [17] was published in 1845 by William Edmondstoune Aytoun, an ardent Scottish nationalist, poet, writer, lawyer, journalist, and University of Edinburgh professor [144]. The first wave of truly manic railway promotion took place in 1844. By the summer of 1845, when Aytoun was presumably writing this piece, the British Parliament was finishing its consideration of the projects hatched in 1844, approving some lines and rejecting others. But at the same time a much greater wave of railway promotion was gathering speed, with even sillier (and more destructive to investors) projects being planned. Aytoun's warning in the last sentence of the story, that

> [i]t contains a deep moral, if anybody has sense enough to see it; if not, I have a new project in my eye for next session, of which timely notice shall be given.

was not heeded. Few people had the sense to see the moral of the story. "Timely notices" of new projects were being given literally by the dozen every day just as the tale, written specifically to warn the nation of the folly and fraud of the mania, was being published in the October 1845 issue of *Blackwood's Magazine*. It was just one of many pieces appearing at that time that made fun of the scramble for supposedly effortless riches that the revolutionary new technology was offering. (The satirical weekly *Punch* was especially active in disseminating such satire.)

Aytoun wrote several other pieces about railway promotion (such as [16, 18–21]). He had deep knowledge of this subject, since he worked as a lawyer in connection with several Scottish lines. He knew enough about the work of the supposedly expert witnesses involved in railway promotions to have one of his satirical stories [20] cited as that of a real witness by a historian (footnote 36 on p. 116 of [113]). He is discussed at some length in the body of the book.

The Glenmutchkin story was published anonymously, according to the custom of those days. In 1858, in the first volume of the short story collection, *Tales from "Blackwood"* (the first of many editions of that famous work), this story appeared as the lead one. (It has since been republished many times, and is available for free on the Internet at several sites.) This time Aytoun was listed as the author, and he prefaced the story by two paragraphs, as follows:

> The following tale appeared in [*Blackwood's*] *Magazine* for October, 1845. It was intended by the writer as a sketch of some of the more striking features of the railway mania (then in full progress throughout Great Britain), as exhibited in Glasgow and Edinburgh. Although bearing the appearance of a burlesque, it was in truth an accurate delineation (as will be acknowledged by many a gentleman who had the misfortune to be *out in the Forty-five*); and subsequent disclosures have shown that it was in no way exaggerated.
>
> Although the *Glenmutchkin line* was purely imaginary, and was not intended by the writer to apply to any particular scheme then before the public, it was identified in Scotland with more than one reckless and impracticable project; and even the characters introduced were supposed to be typical of personages who had

> attained some notoriety in the throng of speculation. Any such resemblances must be considered as fortuitous; for the writer cannot charge himself with the discourtesy of individual satire or allusion.

Aytoun presumably (and surely correctly) figured that memories had grown dim in the intervening decade. Hence the two paragraphs were inserted as reminders. In later reprintings, the title of the story was simplified to *The Glenmutchkin Railway,* most likely because few readers could be expected to appreciate the fine points of railway investment in the 1840s. The original title was *How we got up the Glenmutchkin Railway, and how we got out of it.* "Getting a railway up" is largely self-explanatory. But "getting out of it" is less clear, and refers to the murky legal status of railway ventures during that period. If the promoters did not handle the deal carefully (for example, if they did not submit their plans to the government by the deadline of November 30, a consideration that comes up obliquely in the story without detailed explanation), they could potentially be held liable for all expenses of the venture. Furthermore, the entire liability could fall on any single promoter. Many of the lawsuits arising from such situations dragged on for years, to the great benefit of lawyers.

Here are some other points about the story that would have been obvious to the audience of 1845, but are less likely to be understood by today's readers. Further details, for example about the importance of recognizable and preferably aristocratic names on the provisional committee, are available in the body of this book.

- In general, the Glenmutchkin story does go a bit further into the realm of ridiculous than the wilder of the actual promotions during the Railway Mania did, but not by much. In a few respects reality occasionally exceeded even Aytoun's satire. For example, when the two protagonists of the story begin to hatch their scheme, they talk of how having enough money to pay for advertisements might be enough to get a venture started. Often even that much money was not necessary, as printers commonly did the work on credit. When the railway schemes died, this frequently led to attempts to extract payments from anyone who had been involved in their promotion. Such attempts were often futile, but usually protracted and expensive in terms of legal costs. Also, after the two protagonists compose the prospectus of their line, one asks where they will find the money to pay the deposits on the shares they plan to allocate to themselves. The other's response is that banks will be happy to lend them the money. Historically, there were instances where the directors simply did not pay their deposits at all, at least not until scrip reached a premium, and it was profitable to jump in.
- Listing well-known (and preferably aristocratic) individuals without their permission as members of the provisional committee and even inventing entirely fictitious members was not uncommon, although very controversial.
- There was considerable uncertainty about the legal status of companies being organized. This led to numerous potential liabilities for participants, and even more numerous lawsuits, which in some cases dragged on for years, into the 1850s. As just one example, there was an unsettled question whether trading in scrip (the certificates entitling owners to obtain shares of the railway, once that company was sanctioned by Parliament and properly registered) was legal at all. But aside from that, most of the maneuvers de-

scribed in the story (such as manipulating prices, insider trading, "naked short-selling," disseminating false information, ...) that today could place investors and executives in jail (if detected and proved), were not illegal in the *laissez faire* atmosphere of the 1840s.

- Being "in the Gazette" refers to getting listed as insolvent in the *Edinburgh Gazette,* or similar official publications for England and Ireland. Insolvency was a very serious affair, as it often did lead to the defaulter going to debtors' jail, and his family having to rely on the (scanty) support provided to the poorest by the local parish. (And it was almost always *his* family, women were a very minor presence on the business scene then. Their involvement in stock investments during the Railway Mania was a cause for scandalized comment.)
- Whether Sunday travelling should be allowed on railways was one of the most prominent religious/moral/legal/political issues of the day, especially in Scotland. There were many debates on the topic in Parliament, and pressure was exerted on railway directors to shut down operations on the Sabbath. (And in late 1846, when a new set of directors took over the Edinburgh and Glasgow Railway, they did stop Sunday train travel between those cities on their line for the next two decades. This reversed the very controversial decision in favor of Sunday travel that had been made by previous management when service was inaugurated in 1842.)
- The remark that "[c]apital is indestructible" by Bob M'Corkindale, as he and Augustus Dunshunner, the narrator of the story, begin to hatch their scheme, refers to one of the prominent notions that railway promoters used to try to refute the main objection of the opponents of the Railway Mania. This notion, and related ones, are discussed in some detail in this book.
- The prospectus for the Glenmutchkin Railway given in the story and also the final paragraph call this line the Direct Glenmutchkin Railway. This little twist was inspired by the rage during the Railway Mania for so-called "direct" lines, which bypassed intermediate cities, and provided shortest feasible routes between the endpoints.
- The most glaring omission in the story is that of lawyers. This is extremely surprising since Aytoun himself was a lawyer, worked on railway cases, and in his other writings was not loath to criticize and satirize lawyers. Lawyers played an important role in all railway promotions, and were often key to them. They were almost certainly also the greatest beneficiaries of the Railway Mania.
- A much less noticeable omission for a contemporary reader was that of the "traffic takers," whose important (but little-known) role is covered extensively in this book. Their existence is implied in the brief reference in the story to "the preparation of our traffic tables," as well as in the "prospectus" that lists various sources of demand for service on the projected line. (But it should be said that the 17–19% returns in that "prospectus" are one of the author's exaggerations, typical returns being promised were considerably lower, although still far higher than what was realized when the lines went into operation.)
- Most share prices in the story are quoted in terms of the "premium." This was the excess of the market price over the amount that the investors had paid to the company. Thus when the Glenmutchkin Railway, which in the story has a deposit of £1 per share, is quoted at a premium of £2, this means that shares were trading at £3 each. (To be

more precise, it was scrip that was trading at £3 each, as the term shares was supposed to be used only for companies that had been approved by the government and officially registered, a status the Glenmutchkin Railway never attains.) The dreaded opposite of a premium was a discount, when shares traded below the amount paid in by investors.

– While in the body of the book British currency has been rendered in decimal fractions of pounds sterling, the Glenmutchkin story is reprinted below just as it first appeared, with shillings (of which there were 20 to the pound) and pence (of which there were 12 to each shilling), and guineas (which consisted of 21 shillings, and so were equal to £1.05). In the 1840s prices were usually written in the form 4*l.* 8s. 5d., which amounts to £4.4208....
– Finally, a brief bibliographic note: This version of the Glenmutchkin story is derived from the Project Gutenberg text file. That version appears to be taken from one of the book publications versions. It was compared, therefore, to the original 1845 *Blackwood's Magazine* version, and made faithful to the latter, in both the title and the body of the story.

So, after all these preliminaries, here is the Glenmutchkin story itself. To paraphrase the preface to its first book edition, any resemblances in this story to the recent Internet bubble "must be considered as fortuitous; for [this writer, just as Aytoun] cannot charge himself with the discourtesy of individual satire or allusion."

HOW WE GOT UP THE GLENMUTCHKIN RAILWAY, AND HOW WE GOT OUT OF IT

I was confoundedly hard up. My patrimony, never of the largest, had been for the last year on the decrease,–a herald would have emblazoned it, "ARGENT, a money-bag improper, in detriment,"–and though the attenuating process was not excessively rapid, it was, nevertheless, proceeding at a steady ratio. As for the ordinary means and appliances by which men contrive to recruit their exhausted exchequers, I knew none of them. Work I abhorred with a detestation worthy of a scion of nobility; and, I believe, you could just as soon have persuaded the lineal representative of the Howards or Percys to exhibit himself in the character of a mountebank, as have got me to trust my person on the pinnacle of a three-legged stool. The rule of three is all very well for base mechanical souls; but I flatter myself I have an intellect too large to be limited to a ledger. "Augustus," said my poor mother to me, while stroking my hyacinthine tresses, one fine morning, in the very dawn and budding-time of my existence– "Augustus, my dear boy, whatever you do, never forget that you are a gentleman." The maternal maxim sank deeply into my heart, and I never for a moment have forgotten it.

Notwithstanding this aristocratic resolution, the great practical question, "How am I to live?" began to thrust itself unpleasantly before me. I am one of that unfortunate class who have neither uncles nor aunts. For me, no yellow liverless individual, with characteristic bamboo and pigtail,–emblems of half a million,–returned to his native shores from Ceylon or

remote Penang. For me, no venerable spinster hoarded in the Trongate, permitting herself few luxuries during a long protracted life, save a lass and a lanthorn, a parrot, and the invariable baudrons of antiquity. No such luck was mine. Had all Glasgow perished by some vast epidemic, I should not have found myself one farthing the richer. There would have been no golden balsam for me in the accumulated woes of Tradestown, Shettleston, and Camlachie. The time has been when–according to Washington Irving and other veracious historians–a young man had no sooner got into difficulties than a guardian angel appeared to him in a dream, with the information that at such and such a bridge, or under such and such a tree, he might find, at a slight expenditure of labour, a gallipot secured with bladder, and filled with glittering tomauns; or, in the extremity of despair, the youth had only to append himself to a cord, and straightway the other end thereof, forsaking its staple in the roof, would disclose amid the fractured ceiling the glories of a profitable pose. These blessed days have long since gone by–at any rate, no such luck was mine. My guardian angel was either woefully ignorant of metallurgy, or the stores had been surreptitiously ransacked; and as to the other expedient, I frankly confess I should have liked some better security for its result than the precedent of the "Heir of Lynn."

It is a great consolation, amid all the evils of life, to know that, however bad your circumstances may be, there is always somebody else in nearly the same predicament. My chosen friend and ally, Bob M'Corkindale, was equally hard up with myself, and, if possible, more averse to exertion. Bob was essentially a speculative man–that is, in a philosophical sense. He had once got hold of a stray volume of Adam Smith, and muddled his brains for a whole week over the intricacies of the *Wealth of Nations.* The result was a crude farrago of notions regarding the true nature of money, the soundness of currency, and relative value of capital, with which he nightly favoured an admiring audience at *The Crow*; for Bob was by no means–in the literal acceptation of the word–a dry philosopher. On the contrary, he perfectly appreciated the merits of each distinct distillery; and was understood to be the compiler of a statistical work, entitled, *A Tour through the Alcoholic Districts of Scotland.* It had very early occurred to me, who knew as much of political economy as of the bagpipes, that a gentleman so well versed in the art of accumulating national wealth must have some remote ideas of applying his principles profitably on a smaller scale. Accordingly I gave M'Corkindale an unlimited invitation to my lodgings; and, like a good hearty fellow as he was, he availed himself every evening of the license; for I had laid in a fourteen gallon cask of Oban whisky, and the quality of the malt was undeniable.

These were the first glorious days of general speculation. Railroads were emerging from the hands of the greater into the fingers of the lesser capitalists. Two successful harvests had given a fearful stimulus to the national energy; and it appeared perfectly certain that all the populous towns would be united, and the rich agricultural districts intersected, by the magical bands of iron. The columns of the newspapers teemed every week with the parturition of novel schemes; and the shares were no sooner announced than they were rapidly subscribed for. But what is the use of my saying anything more about the history of last year? Every one of us remembers it perfectly well. It was a capital year on the whole, and put money into many a pocket. About that time, Bob and I commenced operations. Our available capital, or negotiable bullion, in the language of my friend, amounted to

about three hundred pounds, which we set aside as a joint fund for speculation. Bob, in a series of learned discourses, had convinced me that it was not only folly, but a positive sin, to leave this sum lying in the bank at a pitiful rate of interest, and otherwise unemployed, whilst every one else in the kingdom was having a pluck at the public pigeon. Somehow or other, we were unlucky in our first attempts. Speculators are like wasps; for when they have once got hold of a ripening and peach-like project, they keep it rigidly for their own swarm, and repel the approach of interlopers. Notwithstanding all our efforts, and very ingenious ones they were, we never, in a single instance, succeeded in procuring an allocation of original shares; and though we did now and then make a bit by purchase, we more frequently bought at a premium, and parted with our scrip at a discount. At the end of six months we were not twenty pounds richer than before.

"This will never do," said Bob, as he sat one evening in my rooms compounding his second tumbler. "I thought we were living in an enlightened age; but I find I was mistaken. That brutal spirit of monopoly is still abroad and uncurbed. The principles of free trade are utterly forgotten, or misunderstood. Else how comes it that David Spreul received but yesterday an allocation of two hundred shares in the Westermidden Junction; whilst your application and mine, for a thousand each, were overlooked? Is this a state of things to be tolerated? Why should he, with his fifty thousand pounds, receive a slapping premium, while our three hundred of available capital remains unrepresented? The fact is monstrous, and demands the immediate and serious interference of the legislature."

"It is a bloody shame," said I, fully alive to the manifold advantages of a premium.

"I'll tell you what, Dunshunner," rejoined M'Corkindale, "it's no use going on in this way. We haven't shown half pluck enough. These fellows consider us as snobs because we don't take the bull by the horns. Now's the time for a bold stroke. The public are quite ready to subscribe for anything–and we'll start a railway for ourselves."

"Start a railway with three hundred pounds of capital!"

"Pshaw, man! you don't know what you're talking about–we've a great deal more capital than that. Have not I told you, seventy times over, that everything a man has–his coat, his hat, the tumblers he drinks from, nay, his very corporeal existence–is absolute marketable capital? What do you call that fourteen-gallon cask, I should like to know?"

"A compound of hoops and staves, containing about a quart and a half of spirits–you have effectually accounted for the rest."

"Then it has gone to the fund of profit and loss, that's all. Never let me hear you sport those old theories again. Capital is indestructible, as I am ready to prove to you any day, in half an hour. But let us sit down seriously to business. We are rich enough to pay for the advertisements, and that is all we need care for in the meantime. The public is sure to step in, and bear us out handsomely with the rest."

"But where in the face of the habitable globe shall the railway be? England is out of the question, and I hardly know a spot in the Lowlands that is not occupied already."

"What do you say to a Spanish scheme–the Alcantara Union? Hang me if I know whether Alcantara is in Spain or Portugal; but nobody else does, and the one is quite as good as the other. Or what would you think of the Palermo Railway, with a branch to the

sulphur-mines?– that would be popular in the North–or the Pyrenees Direct? They would all go to a premium."

"I must confess I should prefer a line at home."

"Well then, why not try the Highlands? There must be lots of traffic there in the shape of sheep, grouse, and Cockney tourists, not to mention salmon and other et ceteras. Couldn't we tip them a railway somewhere in the west?"

"There's Glenmutchkin, for instance–"

"Capital, my dear fellow! Glorious! By Jove, first-rate!" shouted Bob in an ecstasy of delight. "There's a distillery there, you know, and a fishing village at the foot–at least, there used to be six years ago, when I was living with the exciseman. There may be some bother about the population, though. The last laird shipped every mother's son of the aboriginal Celts to America; but, after all, that's not of much consequence. I see the whole thing! Unrivalled scenery–stupendous waterfalls–herds of black cattle–spot where Prince Charles Edward met Macgrugar of Glengrugar and his clan! We could not possibly have lighted on a more promising place. Hand us over that sheet of paper, like a good fellow, and a pen. There is no time to be lost, and the sooner we get out the prospectus the better."

"But, Heaven bless you, Bob, there's a great deal to be thought of first. Who are we to get for a provisional committee?"

"That's very true," said Bob, musingly. "We *must* treat them to some respectable names, that is, good-sounding ones. I'm afraid there is little chance of our producing a peer to begin with?"

"None whatever–unless we could invent one, and that's hardly safe; *Burke's Peerage* has gone through too many editions. Couldn't we try the Dormants?"

"That would be rather dangerous in the teeth of the standing orders. But what do you say to a baronet? There's Sir Polloxfen Tremens. He got himself served the other day to a Nova Scotia baronetcy, with just as much title as you or I have; and he has sported the riband, and dined out on the strength of it ever since. He'll join us at once, for he has not a sixpence to lose."

"Down with him, then," and we headed the provisional list with the pseudo Orange-tawny.

"Now," said Bob, "it's quite indispensable, as this is a Highland line, that we should put forward a chief or two. That has always a great effect upon the English, whose feudal notions are rather of the mistiest, and principally derived from Waverley."

"Why not write yourself down as the Laird of M'Corkindale?" said I. "I dare say you would not be negatived by a counter-claim."

"That would hardly do," replied Bob, "as I intend to be secretary. After all, what's the use of thinking about it? Here goes for an extempore Chief;" and the villain wrote down the name of Tavish M'Tavish of Invertavish.

"I say, though," said I, "we must have a real Highlander on the list. If we go on this way, it will become a Justiciary matter."

"You're devilish scrupulous, Gus," said Bob, who, if left to himself, would have stuck in the names of the heathen gods and goddesses, or borrowed his directors from the Ossianic

chronicles, rather than have delayed the prospectus. “Where the mischief are we to find the men? I can think of no others likely to go the whole hog; can you?”

“I don’t know a single Celt in Glasgow except old M’Closkie, the drunken porter at the corner of Jamaica Street.”

“He’s the very man! I suppose, after the manner of his tribe, he will do anything for a pint of whisky. But what shall we call him? Jamaica Street, I fear, will hardly do for a designation.”

“Call him THE M’CLOSKIE. It will be sonorous in the ears of the Saxon!”

“Bravo!” and another chief was added to the roll of the clans.

“Now,” said Bob, “we must put you down. Recollect, all the management, that is, the allocation, will be entrusted to you. Augustus–you haven’t a middle name I think?–well then, suppose we interpolate ’Reginald;’ it has a smack of the crusades. Augustus Reginald Dunshunner, Esq. of–where, in the name of Munchausen?”

“I’m sure I don’t know. I never had any land beyond the contents of a flower-pot. Stay–I rather think I have a superiority somewhere about Paisley.”

“Just the thing!” cried Bob. “It’s heritable property, and therefore titular. What’s the denomination?”

“St Mirrens.”

“Beautiful! Dunshunner of St Mirrens, I give you joy! Had you discovered that a little sooner–and I wonder you did not think of it –we might both of us have had lots of allocations. These are not the times to conceal hereditary distinctions. But now comes the serious work. We must have one or two men of known wealth upon the list. The chaff is nothing without a decoy-bird. Now, can’t you help me with a name?”

“In that case,” said I, “the game is up, and the whole scheme exploded. I would as soon undertake to evoke the ghost of Croesus.”

“Dunshunner,” said Bob, very seriously, “to be a man of information, you are possessed of marvellous few resources. I am quite ashamed of you. Now listen to me. I have thought deeply upon this subject, and am quite convinced that, with some little trouble, we may secure the cooperation of a most wealthy and influential body–one, too, that is generally supposed to have stood aloof from all speculation of the kind, and whose name would be a tower of strength in the moneyed quarters. I allude,” continued Bob, reaching across for the kettle, “to the great Dissenting Interest.”

“The what?” cried I, aghast.

“The great Dissenting Interest. You can’t have failed to observe the row they have lately been making about Sunday travelling and education. Old Sam Sawley, the coffin-maker, is their principal spokesman here; and wherever he goes the rest will follow, like a flock of sheep bounding after a patriarchal ram. I propose, therefore, to wait upon him to-morrow, and request his cooperation in a scheme which is not only to prove profitable, but to make head against the lax principles of the present age. Leave me alone to tickle him. I consider his name, and those of one or two others belonging to the same meeting-house–fellows with bank-stock and all sorts of tin–as perfectly secure. These dissenters smell a premium from an almost incredible distance. We can fill up the rest of the committee with ciphers, and the whole thing is done.”

"But the engineer–we must announce such an officer as a matter of course."

"I never thought of that," said Bob. "Couldn't we hire a fellow from one of the steamboats?"

"I fear that might get us into trouble. You know there are such things as gradients and sections to be prepared. But there's Watty Solder, the gasfitter, who failed the other day. He's a sort of civil engineer by trade, and will jump at the proposal like a trout at the tail of a May fly."

"Agreed. Now then, let's fix the number of shares. This is our first experiment, and I think we ought to be moderate. No sound political economist is avaricious. Let us say twelve thousand, at twenty pounds a-piece."

"So be it."

"Well then, that's arranged. I'll see Sawley and the rest to-morrow; settle with Solder, and then write out the prospectus. You look in upon me in the evening, and we'll revise it together. Now, by your leave, let's have in the Welsh rabbit and another tumbler to drink success and prosperity to the Glenmutchkin railway."

I confess that, when I rose on the morrow, with a slight headache and a tongue indifferently parched, I recalled to memory, not without perturbation of conscience, and some internal qualms, the conversation of the previous evening. I felt relieved, however, after two spoonfuls of carbonate of soda, and a glance at the newspaper, wherein I perceived the announcement of no less than four other schemes equally preposterous with our own. But, after all, what right had I to assume that the Glenmutchkin project would prove an ultimate failure? I had not a scrap of statistical information that might entitle me to form such an opinion. At any rate, Parliament, by substituting the Board of Trade as an initiating body of inquiry, had created a responsible tribunal, and freed us from the chance of obloquy. I saw before me a vision of six months' steady gambling, at manifest advantage, in the shares, before a report could possibly be pronounced, or our proceedings be in any way overhauled. Of course, I attended that evening punctually at my friend M'Corkindale's. Bob was in high feather; for Sawley no sooner heard of the principles upon which the railway was to be conducted, and his own nomination as a director, than he gave in his adhesion, and promised his unflinching support to the uttermost. The Prospectus ran as follows:–

"DIRECT GLENMUTCHKIN RAILWAY.
IN 12,000 SHARES OF L.20 EACH. DEPOSIT L.1 PER SHARE.
Provisional Committee.

– SIR POLLOXFEN TREMENS, Bart. of Toddymains.
– TAVISH M'TAVISH of Invertavish.
– THE M'CLOSKIE.
– AUGUSTUS REGINALD DUNSHUNNER, Esq. of St Mirrens.
– SAMUEL SAWLEY, Esq., Merchant.
– MHIC-MHAC-VICH-INDUIBH.
– PHELIM O'FINLAN, Esq. of Castle-rook, Ireland.
– THE CAPTAIN of M'ALCOHOL.

– FACTOR for GLENTUMBLERS.
– JOHN JOB JOBSON, Esq., Manufacturer.
– EVAN M'CLAW of Glenscart and Inveryewky.
– JOSEPH HECKLES, Esq.
– HABAKKUK GRABBIE, Portioner in Ramoth-Drumclog.
– *Engineer*–WALTER SOLDER, Esq.
– *Interim Secretary*–ROBERT M'CORKINDALE, Esq.

"The necessity of a direct line of Railway communication through the fertile and populous district known as the VALLEY OF GLENMUTCHKIN, has been long felt and universally acknowledged. Independently of the surpassing grandeur of its mountain scenery, which shall immediately be referred to, and other considerations of even greater importance, GLENMUTCHKIN is known to the capitalist as the most important BREEDING STATION in the Highlands of Scotland, and indeed as the great emporium from which the southern markets are supplied. It has been calculated by a most eminent authority that every acre in the strath is capable of rearing twenty head of cattle; and as it has been ascertained, after a careful admeasurement, that there are not less than TWO HUNDRED THOUSAND improvable acres immediately contiguous to the proposed line of Railway, it may confidently be assumed that the number of cattle to be conveyed along the line will amount to FOUR MILLIONS annually, which, at the lowest estimate, would yield a revenue larger, in proportion to the capital subscribed, than that of any Railway as yet completed within the United Kingdom. From this estimate the traffic in Sheep and Goats, with which the mountains are literally covered, has been carefully excluded, it having been found quite impossible (from its extent) to compute the actual revenue to be drawn from that most important branch. It may, however, be roughly assumed as from seventeen to nineteen *per cent* upon the whole, after deduction of the working expenses.

"The population of Glenmutchkin is extremely dense. Its situation on the west coast has afforded it the means of direct communication with America, of which for many years the inhabitants have actively availed themselves. Indeed, the amount of exportation of live stock from this part of the Highlands to the Western continent has more than once attracted the attention of Parliament. The Manufactures are large and comprehensive, and include the most famous distilleries in the world. The Minerals are most abundant, and among these may be reckoned quartz, porphyry, felspar, malachite, manganese, and basalt.

"At the foot of the valley, and close to the sea, lies the important village known as the CLACHAN of INVERSTARVE. It is supposed by various eminent antiquaries to have been the capital of the Picts, and, among the busy inroads of commercial prosperity, it still retains some interesting traces of its former grandeur. There is a large fishing station here, to which vessels from every nation resort, and the demand for foreign produce is daily and steadily increasing.

"As a sporting country Glenmutchkin is unrivalled; but it is by the tourists that its beauties will most greedily be sought. These consist of every combination which plastic nature can afford–cliffs of unusual magnitude and grandeur–waterfalls only second to the sublime cascades of Norway–woods of which the bark is a remarkably valuable commodity. It need scarcely be added, to rouse the enthusiasm inseparable from this glorious glen, that

here, in 1745, Prince Charles Edward Stuart, then in the zenith of his hopes, was joined by the brave Sir Grugar M'Grugar at the head of his devoted clan.

"The Railway will be twelve miles long, and can be completed within six months after the Act of Parliament is obtained. The gradients are easy, and the curves obtuse. There are no viaducts of any importance, and only four tunnels along the whole length of the line. The shortest of these does not exceed a mile and a half.

"In conclusion, the projectors of this Railway beg to state that they have determined, as a principle, to set their face AGAINST ALL SUNDAY TRAVELLING WHATSOEVER, and to oppose EVERY BILL which may hereafter be brought into Parliament, unless it shall contain a clause to that effect. It is also their intention to take up the cause of the poor and neglected STOKER, for whose accommodation, and social, moral, religious, and intellectual improvement a large stock of evangelical tracts will speedily be required. Tenders of these, in quantities of not less than 12,000, may be sent in to the interim secretary. Shares must be applied for within ten days from the present date.

"By order of the Provisional Committee,

"ROBERT M'CORKINDALE, *Secretary.*"

"There!" said Bob, slapping down the prospectus on the table, with the jauntiness of a Cockney vouchsafing a pint of Hermitage to his guest–"What do you think of that? If it doesn't do the business effectually, I shall submit to be called a Dutchman. That last touch about the stoker will bring us in the subscriptions of the old ladies by the score."

"Very masterly indeed," said I. "But who the deuce is Mhic-Mhac-vich-Induibh?"

" A *bona-fide* chief, I assure you, though a little reduced: I picked him up upon the Broomielaw. His grandfather had an island somewhere to the west of the Hebrides; but it is not laid down in the maps."

"And the Captain of M'Alcohol?"

"A crack distiller."

"And the Factor for Glentumblers?"

"His principal customer. But, bless you, my dear St Mirrens! Don't bother yourself any more about the committee. They are as respectable a set–on paper at least–as you would wish to see of a summer's morning, and the beauty of it is that they will give us no manner of trouble. Now about the allocation. You and I must restrict ourselves to a couple of thousand shares a-piece. That's only a third of the whole, but it won't do to be greedy."

"But, Bob, consider! Where on earth are we to find the money to pay up the deposits?"

"Can you, the principal director of the Glenmutchkin Railway, ask me, the secretary, such a question? Don't you know that any of the banks will give us tick to the amount 'of half the deposits.' All that is settled already, and you can get your two thousand pounds whenever you please merely for the signing of a bill. Sawley must get a thousand according to stipulation–Jobson, Heckles, and Grabbie, at least five hundred a-piece, and another five hundred, I should think, will exhaust the remaining means of the committee. So that, out of our whole stock, there remain just five thousand shares to be allocated to the speculative and evangelical public. My eyes! won't there be a scramble for them?"

Next day our prospectus appeared in the newspapers. It was read, canvassed, and generally approved of. During the afternoon I took an opportunity of looking into the

Tontine, and whilst under shelter of the *Glasgow Herald,* my ears were solaced with such ejaculations as the following:–

"I say, Jimsy, hae ye seen this grand new prospectus for a railway tae Glenmutchkin?"

"Ay. It looks no that ill. The Hieland lairds are pitting their best fit foremost. Will ye apply for shares?"

"I think I'll tak' twa hundred. Wha's Sir Polloxfen Tremens?"

"He'll be yin o' the Ayrshire folk. He used to rin horses at the Paisley races."

("The devil he did!" thought I.)

"D'ye ken ony o' the directors, Jimsy?"

"I ken Sawley fine. Ye may depend on't, it's a gude thing if he's in't, for he's a howkin' body."

"Then it's sure to gae up. What prem. d'ye think it will bring?"

"Twa pund a share, and maybe mair."

"'Od, I'll apply for three hundred!"

"Heaven bless you, my dear countrymen!" thought I, as I sallied forth to refresh myself with a basin of soup, "do but maintain this liberal and patriotic feeling–this thirst for national improvement, internal communication, and premiums–a short while longer, and I know whose fortune will be made."

On the following morning my breakfast-table was covered with shoals of letters, from fellows whom I scarcely ever had spoken to–or who, to use a franker phraseology, had scarcely ever condescended to speak to me–entreating my influence as a director to obtain them shares in the new undertaking. I never bore malice in my life, so I chalked them down, without favouritism, for a certain proportion. Whilst engaged in this charitable work, the door flew open, and M'Corkindale, looking utterly haggard with excitement, rushed in.

"You may buy an estate whenever you please, Dunshunner," cried he, "the world's gone perfectly mad! I have been to Blazes the broker, and he tells me that the whole amount of the stock has been subscribed for four times over already, and he has not yet got in the returns from Edinburgh and Liverpool!"

"Are they good names, though, Bob–sure cards–none of your M'Closkies and M'Alcohols?"

"The first names in the city, I assure you, and most of them holders for investment. I wouldn't take ten millions for their capital."

"Then the sooner we close the list the better."

"I think so too. I suspect a rival company will be out before long. Blazes says the shares are selling already conditionally on allotment, at seven and sixpence premium."

"The deuce they are! I say, Bob, since we have the cards in our hands, would it not be wise to favour them with a few hundreds at that rate? A bird in the hand, you know, is worth two in the bush, eh?"

"I know no such maxim in political economy," replied the secretary. "Are you mad, Dunshunner? How are the shares to go up, if it gets wind that the directors are selling already? Our business just now is to *bull* the line, not to *bear* it; and if you will trust me, I shall show them such an operation on the ascending scale as the Stock Exchange has not witnessed for this long and many a-day. Then, to-morrow, I shall advertise in the papers, that the committee, having received applications for ten times the amount of stock, have

been compelled, unwillingly, to close the lists. That will be a slap in the face to the dilatory gentlemen, and send up the shares like wildfire."

Bob was right. No sooner did the advertisement appear than a simultaneous groan was uttered by some hundreds of disappointed speculators, who, with unwonted and unnecessary caution, had been anxious to see their way a little before committing themselves to our splendid enterprise. In consequence, they rushed into the market, with intense anxiety to make what terms they could at the earliest stage, and the seven-and-sixpence of premium was doubled in the course of a forenoon.

The allocation passed over very peaceably. Sawley, Heckles, Jobson, Grabbie, and the Captain of M'Alcohol, besides myself, attended, and took part in the business. We were also threatened with the presence of the M'Closkie and Vich-Induibh; but M'Corkindale, entertaining some reasonable doubts as to the effect which their corporeal appearance might have upon the representatives of the dissenting interest, had taken the precaution to get them snugly housed in a tavern, where an unbounded supply of gratuitous Ferntosh deprived us of the benefit of their experience. We, however, allotted them twenty shares a-piece. Sir Polloxfen Tremens sent a handsome, though rather illegible letter of apology, dated from an island in Lochlomond, where he was said to be detained on particular business.

Mr Sawley, who officiated as our chairman, was kind enough, before parting, to pass a very flattering eulogium upon the excellence and candour of all the preliminary arrangements. It would now, he said, go forth to the public that the line was not, like some others he could mention, a mere bubble, emanating from the stank of private interest, but a solid, lasting superstructure, based upon the principles of sound return for capital, and serious evangelical truth, (hear, hear.) The time was fast approaching when the gravestone with the words "HIC OBIIT" chiselled upon it, would be placed at the head of all the other lines which rejected the grand opportunity of conveying education to the stoker. The stoker, in his (Mr Sawley's) opinion, had a right to ask the all important question, "Am I not a man and a brother?" (Cheers.) Much had been said and written lately about a work called *Tracts for the Times.* With the opinions contained in that publication he was not conversant, as it was conducted by persons of another community from that to which he (Mr Sawley) had the privilege to belong. But he hoped very soon, under the auspices of the Glenmutchkin Railway Company, to see a new periodical established, under the title of *Tracts for the Trains.* He never for a moment would relax his efforts to knock a nail into the coffin, which, he might say, was already made, and measured, and cloth-covered for the reception of all establishments; and with these sentiments, and the conviction that the shares must rise, could it be doubted that he would remain a fast friend to the interests of this company for ever? (Much cheering.)

After having delivered this address, Mr Sawley affectionately squeezed the hands of his brother directors, and departed, leaving several of us much overcome. As, however, M'Corkindale had told me that every one of Sawley's shares had been disposed of in the market the day before, I felt less compunction at having refused to allow that excellent man an extra thousand beyond the amount he had applied for, notwithstanding his broadest hints, and even private entreaties.

"Confound the greedy hypocrite!" said Bob; "does he think we shall let him Burke the line for nothing? No–no! let him go to the brokers and buy his shares back, if he thinks they are likely to rise. I'll be bound he has made a cool five hundred out of them already."

On the day which succeeded the allocation, the following entry appeared in the Glasgow sharelists. "Direct Glenmutchkin Railway. 15s. 15s. 6d. 15s. 6d. 16s. 15s. 6d. 16s. 16s. 6d. 16s. 6d. 16s. 17s. 18s. 18s. 19s. 6d. 21s. 21s. 22s. 6d. 24s. 25s. 6d. 27s. 29s. 29s. 6d. 30s. 31s. p^m."

"They might go higher, and they ought to go higher," said Bob, musingly; "but there's not much more stock to come and go upon, and these two share-sharks, Jobson and Grabbie, I know, will be in the market to-morrow. We must not let them have the whip-hand of us. I think upon the whole, Dunshunner, though it's letting them go dog cheap, that we ought to sell half our shares at the present premium, whilst there is a certainty of getting it."

"Why not sell the whole? I'm sure I have no objections to part with every stiver of the scrip on such terms."

"Perhaps," said Bob, "upon general principles you may be right; but then remember that we have a vested interest in the line."

"Vested interest be hanged!"

"That's very well–at the same time it is no use to kill your salmon in a hurry. The bulls have done their work pretty well for us, and we ought to keep something on hand for the bears; they are snuffing at it already. I could almost swear that some of those fellows who have sold to-day are working for a time-bargain."

We accordingly got rid of a couple of thousand shares, the proceeds of which not only enabled us to discharge the deposit loan, but left us a material surplus. Under these circumstances, a two-handed banquet was proposed and unanimously carried, the commencement of which I distinctly remember, but am rather dubious as to the end. So many stories have lately been circulated to the prejudice of railway directors, that I think it my duty to state that this entertainment was scrupulously defrayed by ourselves and *not* carried to account, either of the preliminary survey, or the expenses of the provisional committee.

Nothing effects so great a metamorphosis in the bearing of the outer man as a sudden change of fortune. The anemone of the garden differs scarcely more from its unpretending prototype of the woods, than Robert M'Corkindale, Esq., Secretary and Projector of the Glenmutchkin Railway, differed from Bob M'Corkindale, the seedy frequenter of "The Crow." In the days of yore, men eyed the surtout–napless at the velvet collar, and preternaturally white at the seams–which Bob vouchsafed to wear, with looks of dim suspicion, as if some faint reminiscence, similar to that which is said to recall the memory of a former state of existence, suggested to them a notion that the garment had once been their own. Indeed, his whole appearance was then wonderfully second-hand. Now he had cast his slough. A most undeniable Taglioni, with trimmings just bordering upon frogs, gave dignity to his demeanour and twofold amplitude to his chest. The horn eyeglass was exchanged for one of purest gold, the dingy high-lows for well-waxed Wellingtons, the Paisley fogle for the fabric of the China loom. Moreover, he walked with a swagger, and affected in common conversation a peculiar dialect which he opined to be the purest English, but which no one–except a bagman–could be reasonably expected to understand. His pockets

were invariably crammed with sharelists; and he quoted, if he did not comprehend, the money article from the *Times.* This sort of assumption, though very ludicrous in itself, goes down wonderfully. Bob gradually became a sort of authority, and his opinions got quoted on 'Change. He was no ass, notwithstanding his peculiarities, and made good use of his opportunity.

For myself, I bore my new dignities with an air of modest meekness. A certain degree of starchness is indispensable for a railway director, if he means to go forward in his high calling and prosper; he must abandon all juvenile eccentricities, and aim at the appearance of a decided enemy to free trade in the article of Wild Oats. Accordingly, as the first step toward respectability, I eschewed coloured waistcoats and gave out that I was a marrying man. No man under forty, unless he is a positive idiot, will stand forth as a theoretical bachelor. It is all nonsense to say that there is anything unpleasant in being courted. Attention, whether from male or female, tickles the vanity, and although I have a reasonable, and, I hope, not unwholesome regard for the gratification of my other appetites, I confess that this same vanity is by far the most poignant of the whole. I therefore surrendered myself freely to the soft allurements thrown in my way by such matronly denizens of Glasgow as were possessed of stock in the shape of marriageable daughters; and walked the more readily into their toils because every party, though nominally for the purposes of tea, wound up with a hot supper, and something hotter still by way of assisting the digestion.

I don't know whether it was my determined conduct at the allocation, my territorial title, or a most exaggerated idea of my circumstances, that worked upon the mind of Mr Sawley. Possibly it was a combination of the three; but, sure enough few days had elapsed before I received a formal card of invitation to a tea and serous conversation. Now serious conversation is a sort of thing that I never shone in, possibly because my early studies were framed in a different direction; but as I really was unwilling to offend the respectable coffin-maker, and as I found that the Captain of M'Alcohol–a decided trump in his way–had also received a summons, I notified my acceptance.

M'Alcohol and I went together. The captain, an enormous brawny Celt, with superhuman whiskers, and a shock of the fieriest hair, had figged himself out, *more majorum*, in the full Highland costume. I never saw Rob Roy on the stage look half so dignified or ferocious. He glittered from head to foot with dirk, pistol, and skean-dhu; and at least a hundredweight of cairngorums cast a prismatic glory around his person. I felt quite abashed beside him.

We were ushered into Mr Sawley's drawing-room. Round the walls, and at considerable distances from each other, were seated about a dozen characters, male and female, all of them dressed in sable, and wearing countenances of woe. Sawley advanced, and wrung me by the hand with so piteous an expression of visage that I could not help thinking some awful catastrophe had just befallen his family.

"You are welcome, Mr. Dunshunner, welcome to my humble tabernacle. Let me present you to Mrs Sawley"–and a lady, who seemed to have bathed in the Yellow Sea, rose from her seat, and favoured me with a profound curtsey.

"My daughter–Miss Selina Sawley."

I felt in my brain the scorching glance of the two darkest eyes it ever was my fortune to behold, as the beauteous Selina looked up from the perusal of her handkerchief hem. It was a pity that the other features were not corresponding; for the nose was flat, and the mouth of such dimensions that a Harlequin might have jumped down it with impunity–but the eyes *were* splendid.

In obedience to a sign from the hostess, I sank into a chair beside Selina; and, not knowing exactly what to say, hazarded some observation about the weather.

"Yes, it is indeed a suggestive season. How deeply, Mr. Dunshunner, we ought to feel the pensive progress of autumn toward a soft and premature decay! I always think, about this time of the year, that nature is falling into a consumption!"

"To be sure, ma'am," said I, rather taken aback by this style of colloquy, "the trees are looking devilishly hectic."

"Ah, you have remarked that too! Strange! it was but yesterday that I was wandering through Kelvin Grove, and as the phantom breeze brought down the withered foliage from the spray, I thought how probable it was that they might ere long rustle over young and glowing hearts deposited prematurely in the tomb!"

This, which struck me as a very passable imitation of Dickens's pathetic writings, was a poser. In default of language, I looked Miss Sawley straight in the face, and attempted a substitute for a sigh. I was rewarded with a tender glance.

"Ah!" said she, "I see you are a congenial spirit! How delightful, and yet how rare, it is to meet with any one who thinks in unison with yourself! Do you ever walk in the Necropolis, Mr Dunshunner? It is my favourite haunt of a morning. There we can wean ourselves, as it were, from life, and beneath the melancholy yew and cypress, anticipate the setting star. How often there have I seen the procession–the funeral of some very, *very* little child"–

"Selina, my love," said Mrs. Sawley, "have the kindness to ring for the cookies."

I, as in duty bound, started up to save the fair enthusiast the trouble, and was not sorry to observe my seat immediately occupied by a very cadaverous gentleman, who was evidently jealous of the progress I was rapidly making. Sawley, with an air of great mystery, informed me that this was a Mr Dalgleish of Raxmathrapple, the representative of an ancient Scottish family who claimed an important heritable office. The name, I thought, was familiar to me, but there was something in the appearance of Mr Dalgleish which, notwithstanding the smiles of Miss Selina, rendered a rivalship in that quarter utterly out of the question.

I hate injustice, so let me do the honour in description to the Sawley banquet. The tea-urn most literally corresponded to its name. The table was decked out with divers platters, containing seed-cakes cut into rhomboids, almond biscuits, and ratafia drops; but somehow of other they all looked clammy and damp, and, for the life of me, I could not divest myself of the idea that the selfsame viands had figured, not long before, as funeral refreshments at a dirgie. No such suspicion seemed to cross the mind of M'Alcohol, who hitherto had remained uneasily surveying his nails in a corner, but at the first symptom of food started forward, and was in the act of making a clean sweep of the china, when Sawley proposed the singular preliminary of a hymn.

The hymn was accordingly sung. I am thankful to say it was such a one as I never heard before, or expect to hear again; and unless it was composed by the Reverend Saunders Peden in an hour of paroxysm on the moors, I cannot conjecture the author. After this original symphony, tea was discussed, and after tea, to my amazement, more hot brandy and water than I ever remember to have seen circulated at the most convivial party. Of course this effected a radical change in the spirits and conversation of the circle. It was again my lot to be placed by the side of the fascinating Selina, whose sentimentality gradually thawed away beneath the influence of sundry sips, which she accepted with a delicate reluctance. This time Dalgleish of Raxmathrapple had not the remotest chance. M'Alcohol got furious, sang Gaelic songs, and even delivered a sermon in genuine Erse, without incurring a rebuke; whilst, for my own part, I must needs confess that I waxed unnecessarily amorous, and the last thing I recollect was the pressure of Mr. Sawley's hand at the door, as he denominated me his dear boy, and hoped I would soon come back and visit Mrs Sawley and Selina. The recollection of these passages next morning was the surest antidote to my return.

Three weeks had elapsed, and still the Glenmutchkin Railway shares were at a premium, though rather lower than when we sold. Our engineer, Watty Solder, returned from his first survey of the line, along with an assistant who really appeared to have some remote glimmerings of the science and practice of mensuration. It seemed, from a verbal report, that the line was actually practicable; and the survey would have been completed in a very short time, "If," according to the account of Solder, "there had been ae hoos in the glen. But ever sin' the distillery stoppit–and that was twa year last Martinmas–there wasna a hole whaur a Christian could lay his head, muckle less get white sugar to his toddy, forbye the change-house at the clachan; and the auld luckie that keepit it was sair forfochten wi' the palsy, and maist in the dead-thraws. There was naebody else living within twal' miles o'the line, barring a tacksman, a lamiter, and a bauldie."

We had some difficulty in preventing Mr Solder from making this report open and patent to the public, which premature disclosure might have interfered materially with the preparation of our traffic tables, not to mention the marketable value of the shares. We therefore kept him steadily at work out of Glasgow, upon a very liberal allowance, to which, apparently, he did not object.

"Dunshunner," said M'Corkindale to me one day, "I suspect that there is something going on about our railway more than we are aware of. Have you observed that the shares are preternaturally high just now?"

"So much the better. Let's sell."

"I did so this morning–both yours and mine, at two pounds ten shillings premium."

"The deuce you did! Then we're out of the whole concern."

"Not quite. If my suspicions are correct, there's a good deal more money yet to be got from the speculation. Somebody has been bulling the stock without orders; and, as they can have no information which we are not perfectly up to, depend upon it, it is done for a purpose. I suspect Sawley and his friends. They have never been quite happy since the allocation; and I caught him yesterday pumping our broker in the back shop. We'll see in a day or two. If they are beginning a bearing operation, I know how to catch them."

And, in effect, the bearing operation commenced. Next day, heavy sales were effected for delivery in three weeks; and the stock, as if water-logged, began to sink. The same thing continued for the following two days, until the premium became nearly nominal. In the mean time, Bob and I, in conjunction with two leading capitalists whom we let into the secret, bought up steadily every share that was offered; and at the end of a fortnight we found that we had purchased rather more than double the amount of the whole original stock. Sawley and his disciples, who, as M'Corkindale suspected, were at the bottom of the whole transaction, having beared to their heart's content, now came into the market to purchase, in order to redeem their engagements. The following extract from the weekly share-lists will show the result of their endeavours to regain their lost position:–

	Sat.	Mon.	Tue.	Wed.	Thurs.	Frid.	Sat.
GLENMUTCHKIN RAILWAY, L.1 paid	$1\frac{2}{8}$	$2\frac{1}{4}$	$4\frac{3}{8}$	$7\frac{1}{2}$	$10\frac{3}{4}$	$15\frac{3}{8}$	17

and Monday was the day of delivery.

I have no means of knowing in what frame of mind Mr Sawley spent the Sunday, or whether he had recourse for mental consolation to Peden; but on Monday morning he presented himself at my door in full funeral costume, with about a quarter of a mile of crape swathed round his hat, black gloves, and a countenance infinitely more doleful than if he had been attending the interment of his beloved wife.

"Walk in, Mr Sawley," said I, cheerfully. "What a long time it is since I have had the pleasure of seeing you–too long indeed for brother directors! How are Mrs Sawley and Miss Selina–won't you take a cup of coffee?"

"Grass, sir, grass!" said Mr Sawley, with a sigh like the groan of a furnace-bellows. "We are all flowers of the oven–weak, erring creatures, every one of us. Ah, Mr Dunshunner! you have been a great stranger at Lykewake Terrace!"

"Take a muffin, Mr Sawley. Anything new in the railway world?"

"Ah, my dear sir–my good Mr Augustus Reginald–I wanted to have some serious conversation with you on that very point. I am afraid there is something far wrong indeed in the present state of our stock."

"Why, to be sure it is high; but that, you know, is a token of the public confidence in the line. After all, the rise is nothing compared to that of several English railways; and individually, I suppose, neither of us has any reason to complain."

"I don't like it," said Sawley, watching me over the margin of his coffee-cup. "I don't like it. It savours too much of gambling for a man of my habits. Selina, who is a sensible girl, has serious qualms on the subject."

"Then, why not get out of it? I have no objection to run the risk, and if you like to transact with me, I will pay you ready money for every share you have at the present market price."

Sawley writhed uneasily in his chair.

"Will you sell me five hundred, Mr Sawley? Say the word and it is a bargain."

"A time-bargain?" quavered the coffin-maker.

"No. Money down, and scrip handed over."

"I–I can't. The fact is, my dear young friend, I have sold all my stock already!"

"Then permit me to ask, Mr Sawley, what possible objection you can have to the present aspect of affairs? You do not surely suppose that we are going to issue new shares and bring down the market, simply because you have realised at a handsome premium?"

"A handsome premium! O Lord!" moaned Sawley.

"Why, what did you get for them?"

"Four, three, and two and a half."

"A very considerable profit indeed," said I; "and you ought to be abundantly thankful. We shall talk this matter over at another time, Mr Sawley, but just now I must beg you to excuse me. I have a particular engagement this morning with my broker–rather a heavy transaction to settle–and so"–

"It's no use beating about the bush any longer," said Mr Sawley in an excited tone, at the same time dashing down his crape-covered castor on the floor. "Did you ever see a ruined man with a large family? Look at me, Mr Dunshunner–I'm one, and you've done it!"

"Mr Sawley! are you in your senses?"

"That depends on circumstances. Haven't you been buying stock lately?"

"I am glad to say I have–two thousand Glenmutchkins, I think, and this is the day of delivery."

"Well, then, can't you see how the matter stands? It was I who sold them!"

"Well!"

"Mother of Moses, sir! don't you see I'm ruined?"

"By no means–but you must not swear. I pay over the money for your scrip, and you pocket a premium. It seems to me a very simple transaction."

"But I tell you I haven't got the scrip!" cried Sawley, gnashing his teeth, while the cold beads of perspiration gathered largely on his brow.

"That is very unfortunate! Have you lost it?"

"No!–the devil tempted me, and I oversold!"

There was a very long pause, during which I assumed an aspect of serious and dignified rebuke.

"Is it possible?" said I, in a low tone, after the manner of Kean's offended fathers. "What! you, Mr Sawley–the stoker's friend–the enemy of gambling–the father of Selina–condescend to so equivocal a transaction? You amaze me! But I never was the man to press heavily on a friend"–here Sawley brightened up–"your secret is safe with me, and it shall be your own fault if it reaches the ears of the Session. Pay me over the difference at the present market price, and I release you of your obligation."

"Then I'm in the Gazette, that's all," said Sawley, doggedly, "and a wife and nine beautiful babes upon the parish! I had hoped other things from you, Mr Dunshunner–I thought you and Selina"–

"Nonsense, man! Nobody goes into the Gazette just now–it will be time enough when the general crash comes. Out with your checque-book, and write me an order for four and twenty thousand. Confound fractions! in these days one can afford to be liberal."

"I haven't got it," said Sawley. "You have no idea how bad our trade has been of late, for nobody seems to think of dying. I have not sold a gross of coffins this fortnight. But I'll tell you what–I'll give you five thousand down in cash, and ten thousand in shares–further I can't go."

"Now, Mr Sawley," said I, "I may be blamed by worldly-minded persons for what I am going to do; but I am a man of principle, and feel deeply for the situation of your amiable wife and family. I bear no malice, though it is quite clear that you intended to make me the sufferer. Pay me fifteen thousand over the counter, and we cry quits for ever."

"Won't you take Camlachie Cemetery shares? They are sure to go up."

"No."

"Twelve hundred Cowcaddens' Water, with an issue of new stock next week?"

"Not if they disseminated the Ganges."

"A thousand Ramshorn Gas–four per cent guaranteed until the act?"

"Not if they promised twenty, and melted down the sun in their retort!"

"Blawweary Iron? Best spec. going."

"No, I tell you once for all! If you don't like my offer–and it is an uncommonly liberal one–say so, and I'll expose you this afternoon upon 'Change."

"Well, then–there's a checque. But may the"–

"Stop, sir! Any such profane expressions, and I shall insist upon the original bargain. So, then–now we're quits. I wish you a very good-morning, Mr Sawley, and better luck next time. Pray remember me to your amiable family."

The door had hardly closed upon the discomfited coffin-maker, and I was still in the preliminary steps of an extempore *pas seul*, intended as the outward demonstration of exceeding inward joy, when Bob M'Corkindale entered. I told him the result of the morning's conference.

"You have let him off too easily," said the Political Economist. "Had I been his creditor, I certainly should have sacked the shares into the bargain. There is nothing like rigid dealing between man and man."

"I am contented with moderate profits," said I; "besides, the image of Selina overcame me. How goes it with Jobson and Grabbie?"

"Jobson had paid, and Grabbie compounded. Heckles–may he die an evil death!–has repudiated, become a lame duck, and waddled; but no doubt his estate will pay a dividend."

"So then, we are clear of the whole Glenmutchkin business, and at a handsome profit."

"A fair interest for the outlay of capital–nothing more. But I'm not quite done with the concern yet."

"How so? not another bearing operation?"

"No; that cock would hardly fight. But you forget that I am secretary to the company, and have a small account against them for services already rendered. I must do what I can to carry the bill through Parliament; and, as you have now sold your whole shares, I advise you to resign from the direction, go down straight to Glenmutchkin, and qualify yourself for a witness. We shall give you five guineas a-day, and pay all your expenses."

"Not a bad notion. But what has become of M'Closkie, and the other fellow with the jaw-breaking name?"

"Vich-Induibh? I have looked after their interests as in duty bound, sold their shares at a large premium, and dispatched them to their native hills on annuities."

"And Sir Polloxfen?"

"Died yesterday of spontaneous combustion."

As the company seemed breaking up, I thought I could not do better than take M'Corkindale's hint, and accordingly betook myself to Glenmutchkin, along with the Captain of M'Alcohol, and we quartered ourselves upon the Factor for Glentumblers. We found Watty Solder very shakey, and his assistant also lapsing into habits of painful inebriety. We saw little of them except of an evening, for we shot and fished the whole day, and made ourselves remarkably comfortable. By singular good-luck, the plans and sections were lodged in time, and the Board of Trade very handsomely reported in our favour, with a recommendation of what they were pleased to call "the Glenmutchkin system," and a hope that it might generally be carried out. What this system was, I never clearly understood; but, of course, none of us had any objections. This circumstance gave an additional impetus to the shares, and they once more went up. I was, however, too cautious to plunge a second time into Charybdis, but M'Corkindale did, and again emerged with plunder.

When the time came for the parliamentary contest, we all emigrated to London. I still recollect, with lively satisfaction, the many pleasant days we spent in the metropolis at the company's expense. There were just a neat fifty of us, and we occupied the whole of a hotel. The discussion before the committee was long and formidable. We were opposed by four other companies who patronised lines, of which the nearest was at least a hundred miles distant from Glenmutchkin; but as they founded their opposition upon dissent from "the Glenmutchkin system" generally, the committee allowed them to be heard. We fought for three weeks a most desperate battle, and might in the end have been victorious, had not our last antagonist, at the very close of his case, pointed out no less than seventy-three fatal errors in the parliamentary plan deposited by the unfortunate Solder. Why this was not done earlier, I never exactly understood; it may be that our opponents, with gentlemanly consideration, were unwilling to curtail our sojourn in London–and their own. The drama was now finally closed, and after all preliminary expenses were paid, sixpence per share was returned to the holders upon surrender of their scrip.

Such is an accurate history of the Origin, Rise, Progress, and Fall of the Direct Glenmutchkin Railway. It contains a deep moral, if anybody has sense enough to see it; if not, I have a new project in my eye for next session, of which timely notice shall be given.

Appendix 2: Gaps in British railway history literature

One of the main deficiencies in railway literature is that the motivations of the people whose money made the railways possible, the shareholders, are usually ignored completely. Typically one reads about the engineers, promoters, and managers struggling to get a project off the ground, and then complete it. And later, as a railway is in service, one gets scraps of information about restive shareholders, as dividends are cut, and sometimes a line flirts with bankruptcy. As we read about the steps that managers take to deal with the problem, there is a clear sense they are unwillingly responding to the unhappiness of those

shadowy creatures, the shareholders. But we almost never read about the reasons for the unhappiness. One can guess that whatever "beautiful illusions" led the shareholders to fund the railway have been shattered. But we don't get to find out how realistic those "beautiful illusions" were, nor who was responsible for creating them, nor how they were created. A possible reason for this gap in the literature is that the heroes of published works tend to be the engineers, promoters, and managers who took leadership positions in creating a line. Questions about shattered "beautiful illusions" would force direct comparisons of the promises that were dangled in front of shareholders with what was actually achieved. And that would bring to the fore some rather indelicate questions about the honesty and competence of the stories' heroes, the engineers, promoters, and managers. So perhaps this gap is a delicate way for railway history writers to avoid such indelicate questions[312].

An even larger, but related gap in British railway history is in the treatment of the Railway Mania. The deficiencies in the existing literature are illustrated by the book of Hamilton Ellis [69]. In the introduction to that work, Roger Lloyd characterized the strengths and weaknesses of the railway literature, and noted (p. vii) that it was "most astonishing" that when he was writing, in 1953, there was no "single and uniform history of the British railway companies as a whole" from the beginnings of the industry. Lloyd also noted a major gap in the coverage of the 1840s. Still, Lloyd claimed that the Ellis book filled those gaps. But, as it turns out, Lloyd seriously mischaracterized the problem, and Ellis' book, for all its virtues, provides a very poor treatment of the 1840s. For example, Lloyd claimed that British railway history gets complicated in the 1840s because of the arrival on the scene of George Hudson, the "Railway King," and then becomes easier, as "[w]ith the Railway Mania drama comes back to the story to help the historian." But that is exactly backwards. Hudson's career, at least until the Railway Mania, is that of a typical tycoon, pursuing a strategic vision. It is the Railway Mania, and the spontaneous blossoming of hundreds of Glenmutchkins that creates the great complexity that has not been explicated. And the "drama" of the Mania has almost uniformly been a distraction for historians, leading them to concentrate on the most spectacular events of 1845, and ignore the lengthy period afterwards when most of the waste occurred, and most of the investors' dreams got broken.

The Ellis book itself is very poor in its treatment of the Mania. Ellis avoided doing any serious research himself on this period. He claimed that because of the "abl[e] and exhaustive[]" description in Lewin's book [132], he could not "presume to do more than recollect the main features of Mr. Lewin's picture, and fit them into the larger perspective of general railway history" ([69], p. 154). Unfortunately, while the Lewin book is excellent in what it presents (primarily the basic transport rationale for various railway schemes, as well as the basic chronology), it is limited in its scope. Further, Ellis' fitting of it "into the larger perspective" is unsuccessful. Not only is it unbalanced and lacking insight into the Mania, but it has some glaring errors. One of the least important of such errors is the claim (pp. 160–61) that this bubble "was gently but irreparably pricked by discreet barbs of two successive leaders in *The Times*" in early 1846. One could not justify the claim that any two early 1846 leaders in *The Times* had any special impact on the Mania.

In general, British railway history literature is notable for avoiding dealing with the Railway Mania. Many excellent books cover their subjects only up to the beginnings of the Mania (e.g., [185, 188]), and so do some not so excellent books, such as *A History of the English Railway* by Francis [80], published in 1851. The Francis work is often cited as a source of material about the Mania. Yet, as even its subtitle declares, it goes up only to 1845 (and has a variety of much more serious faults). As a final example, W. T. Jackman's book [106], published almost a century ago, is a work of prodigious scholarship even by today's standards, and far more for its time. But while it contains extensive information from the 1850s and 1860s on some topics, to the Railway Mania it only "give[s] brief consideration," and this consideration is not too accurate, not meeting the standards set by the rest of the work. For example, Jackman places the famous Spackman report that appeared in the Nov. 17, 1845 issue of *The Times* a year earlier. He also presents George Hudson's dominant position as due primarily to "his gambling in railway shares and his ability to exercise undue influence over railway directors." He also expresses puzzlement as to the cause of the Mania, since the financial results of the railway industry in 1841 were rather disappointing. The observation about 1841 is perfectly accurate, and is discussed in Chapter 9. But by the time the Mania took off, in 1844, both railway financial results and the general economic climate had changed dramatically.

The inadequate investigation of the Railway Mania in railway history affects more general works. This can be illustrated through the example of the widely read and oft-quoted *Industry and Empire* of Eric Hobsbawm [102]. This particular book is chosen because its defects serve to illustrate some of the delusions that led Railway Mania investors astray, and continue to lead people astray today. It also presents more instances of "stumbling to success." Hobsbawm's book is unusual in that it devotes a full six pages to expansion of railways in Britain in the 1830s and 1840s (pp. 88–93). Unfortunately, almost all the substantive statements there fall in the range from slightly questionable to clearly and demonstrably incorrect.

One of the least questionable claims is that the construction of railways provided "a vast economic stimulus ... at the very moment when the economy was passing through its most catastrophic slump of the century (1841–2) [and so] could hardly have been better timed," (p. 92). There is a problem with the logic of Hobsbawm's argument here, since this claim is preceded by statistics for railway investment in the late 1840s, which clearly had no influence on what happened in 1841–2. But if we look at the numbers in Table 1 in Chapter 3 of this manuscript, we find that there was indeed a large stimulus in 1841–2. However, there was a far larger stimulus from the spending during the Railway Mania, especially in 1847–8, whose effects Hobsbawm does not discuss (except for giving some indications of its size). It is likely that this latter stimulus was the main reason that Britain did not experience a revolution in 1848, when continental Europe was swept by a wave of upheavals. Most of the mainstream history books leave this British exceptionalism as a puzzle, and sometimes speculate that it may have been due to British love for their aristocracy. But a much more plausible reason, mentioned by only a few observers, is that while, in the runup to the revolutions of 1848, most of Europe was mired in a depression, Britain was experiencing a period of high prosperity, courtesy of the gigantic pseudo-Keynesian stimulus provided by

railway investors[313]. By comparison, the assistance that railways provided to the British economy in the early 1840s was likely far more marginal.

At the other extreme, let us consider some clearly wrong claims in Hobsbawm's book. He writes that of the capital that went into railways, "much ... was rashly, stupidly, some of it insanely invested." Rashly, yes. Stupidly, perhaps. But definitely not insanely. When Hobsbawm claims that "many of the railways actually constructed were and remained quite irrational by any transport criterion," he is simply wrong. Hardly any of the lines that were built during the Mania went out of service. There was enough demand to pay running costs, and Parliament limited the leverage that could be used in financing construction, so very few lines went bankrupt, it was just the shareholders who suffered. And it has been argued convincingly that the benefits to society as a whole were greater than shareholders' losses. Furthermore, while there was little interest among investors in building new railways in 1850, by the end of the century British railway mileage tripled, while investment and revenues grew approximately five- and ten-fold, respectively[314]. And the investment losses were not as large as often imagined. As was mentioned before, and as will be shown in *BICS,* total losses to capitalists as a whole were likely on the order of one third of the amount invested by the end of 1850, or £80 million out of £240 million. Even at the bottom of the railway share market, railway earnings on total invested capital were on average about 3%, the risk-free rate on government obligations. Darwin's personal holdings in the common shares of the LNWR were down by half from their peak, but the guaranteed shares of the Leeds and Bradford Railway that he purchased for his wife's trust fund held their value. Because of the lack of leverage and consequent rarity of bankruptcies, bond holders and preference share holders came out very well, with above-market returns. Their good fortune came out of the hides of the holders of common shares, who were the only ones to suffer. Hence Hobsbawm's claim that "much of [capital invested in railway] was sunk without trace" is incorrect.

Hobsbawm arrogantly dismissed "this remarkable development" of the railway system resulting from the manias of the 1830s and 1840s as not "reflect[ing] the needs of an industrial economy for transport." But that just reflects his lack of understanding of the subject. How can one say that something as large as the railway network does not "reflect[] the needs of an industrial economy" when that economy pays huge sums to use that network? As was noted in the Introduction, around 1905, half a century after the Mania, revenues from railway services in Britain (and Ireland) came to 6.0% of GDP, 73% of the national budget, and 166% of the spending on the military. And all that spending, by individuals and businesses, was voluntary, without any Central Planning Commissar forcing people at the point of a bayonet to hand money over to the operators of the network.

One reason for concentrating on the misconceptions that abound in Hobsbawm's book, as opposed to some other publication, is that his presentation very naturally leads to one of the key misunderstandings that led to the financial debacle of the Mania. Hobsbawm justifies his dismissal of railways as not "reflect[ing] the needs of an industrial economy for transport" and "quite irrational by any transport criterion" on the grounds that "[m]ost of the country was within easy access of water-transport by sea, river, or canal, and water-transport was then–and still is–by far the cheapest for bulk goods." This claim demon-

strates as clearly as any that Hobsbawm is ignorant of railway economics. The mainstay of British railways was always short-haul traffic. (And hasn't Hobsbawm heard of commuter trains, which are inherently short-haul, and don't involved "bulk goods"?) This topic is explored at great length in Chapter 16 and Appendix 9, since the same misunderstanding that hobbles Hobsbawm was a major contributor to the investment disaster of the Railway Mania.

Appendix 3: The British Press and other information sources

The Brontë sisters relied on information in newspapers in making their investment decisions. How detailed and how reliable was the information that they could obtain from that source? This section provides a few brief comments that illustrate this point, and assist in understanding what was available to investors in general.

During the investment mania of the mid-1820s, and even during the one of the mid-1830s, there was relatively little printed in British newspapers about new corporations being organized to build railways, canals, waterworks, or other projects. One could certainly find some snippets, often announcements of meetings, sometimes some accounts of meetings, letters supporting or attacking new projects, and the like. But it is hard to imagine that many people would actually commit to invest based just on that, without attending the meetings and holding discussions with promoters and other observers. The Brontë sisters, with their multiple degrees of isolation, would have been unlikely to participate, had they even been old enough to do so, and had they had any money to invest. But by the early 1840s, when they were old enough and had received a modest inheritance after the death of their aunt, British newspapers had greatly increased their coverage of business affairs, although, as will be discussed below, it was still scant. And even though the sisters were isolated at Haworth, they were not far from one of the main centers of railway speculation, Leeds, and the two papers they read regularly, the *Leeds Mercury,* and the *Leeds Intelligencer* (from opposite ends of the political spectrum), both had extensive coverage of railways[315]. The owner and editor of the *Leeds Mercury,* Edward Baines, well known for his newspaper as well as political activities, and was himself involved in many railway ventures. Thus the sisters had better access to information about railways than most Britons.

Charlotte Brontë mentioned that Emily read not just articles about railways, but also "every advertisement in the news-papers that related to rail-roads." The ad columns were used for a variety of communications. Railways would publish in the ad pages prospectuses, notices of meetings, invitations to contractors to bid on projects, and so on. And often they would publish minutes of meetings in such pages, and other communications with their shareholders. Individuals who could not get their letters published *gratis* would also occasionally pay to insert them in the ad pages, and in some cases these letters would contain detailed critiques or supporting arguments for various railways. Overall, in a paper like the *Leeds Mercury,* readers would find more information about railways in ads than in the main pages.

The *Leeds Mercury,* like most of the approximately 500 newspapers in Britain, was a weekly. (The *Economist,* which started publishing in September 1843, was also a weekly,

although a specialized one. It still refers to itself, quaintly to some ears, as a newspaper.) That was the terminology of the time. There were a number of papers that appeared two or three times a week. And a handful were daily (meaning six times a week), almost all in London. They (and especially the morning ones among them) were by far the most influential in the country as a whole, and also delivered the greatest volume of information. Among the London dailies of the Railway Mania period, *The Times* occupied a special position. There is an unresolved debate about the precise balance between the role of *The Times* in shaping public opinion, and in discerning which way public opinion was moving, and jumping to the forefront. (Similar debates are unresolved about roles of political, business, and technology leaders. To what extent do they succeed by setting directions, and to what extent do they succeed by finding a parade that is starting and grabbing positions in front?) But in any event, *The Times* was at the core of the British Establishment.

It is hard for modern readers to appreciate just how influential *The Times* was in the eyes of the public. In the mid-1840s, its circulation was about equal to that of all the other London dailies put together. By the mid-1850s, helped to a non-negligible extent by the (considerably exaggerated) reputation that it alone had opposed the Railway Mania, it had achieved a circulation several times as large as that of all other dailies. And this was in the days when there was no Internet (and thus no Google, Yahoo!, and other services), no radio, no TV, so that newspapers were the dominant means of information dissemination. So think of a single entity today controlling (in the U.S., say) Google, Yahoo!, *New York Times*, *Wall Street Journal*, CNN, Fox News, CBS, and a few other information sources. That was roughly what *The Times* was. (Its rise was assisted by the same winner-take-all, decreasing marginal costs, ..., economics that make many observers worry about the dangers that dominance by Microsoft or Google or Facebook might have. The mechanics of this process were well understood in the early Victorian period, even if the language used to discuss the phenomenon was different, and the economic theory was not as developed as it is today.) In the mid-1830s, as *The Times* was growing in power, one English peer inquired of another, a fellow minister in the British government ([100], p. 135) "whether [the government] should declare open war with The Times or attempt to make peace." *The Times* was so powerful that it negotiated with political parties, and in the mid-1830s shifted its support from the Whigs to the Tories only after getting some substantive policy concessions[316].

The point of the observations about the power of *The Times* is to demonstrate that the Railway Mania could not have had any single opponent more powerful than this paper. At the same time, it should be mentioned that the general reputation of the press was still low. Just two generations earlier, the British press, including *The Times*, was an exceedingly corrupt and disreputable institution, supported partially by government bribes and partially by blackmail (asking influential people to pay "suppression fees" not to publish negative articles about them, ...). This reputation was changing in the early Victorian period, but newspaper employees tended to conceal their affiliations in "respectable" company. The changing position of the press is illustrated by a reported cartoon in *Punch,* in which a footman announces to his master, "M'Lord, three reporters and a gentleman from *The Times.*" This signified that reporters from *The Times,* but only from *The Times,* had

crossed a critical line in respectability. (For those not familiar with English manners of the time, gentlemen included professionals, and would enter through the front door, while reporters were classified as tradesmen, and would have to use the servants' door.) During the Railway Mania, the *Morning Herald* would note with satisfaction that

> [n]ot many years since, any connection, even in the highest capacity, with a newspaper, was regarded as comparatively discreditable; but here we have a body of men, in dignity and intelligence inferior to none in the country, publicly recognising a connection with a subordinate department of a newspaper, and proclaiming to the world that such a connection is not unworthy of a gentleman and a scholar.[317]

The press of the time was fiercely partisan. Those worried about polarization of audiences into non-diverse groups can draw lessons from the early Victorian period! There was little attempt at non-partisan coverage (or, as the newspapermen of that period might have said, if they came to life today, at a pretense of non-partisan coverage).

The position of a paper was most explicitly represented in the (relatively recently introduced) "leading articles." The *Economist* today, harking back to its origins, calls its editorials "leaders," and that is how I will refer to those "leading articles." But unlike the short "leaders" in the *Economist* today, the "leaders" in those days were often far more extensive than today's editorials, frequently presenting very extensive combinations of facts, analysis, and opinion.

The 1830s and especially the 1840s saw also the rise of specialized papers, such as the *Economist,* and in particular, the rise of a vigorous railway press. The Railway Mania was accompanied by a Railway Press Mania. At the peak of the speculative excitement at the end of 1845, there were more than two dozen railway serials, such as *Herapath*[318]. Others were the *Railway Times,* the *Railway Chronicle,* and the *Railway Record.* Most were weekly (although some switched to publishing two or three times a week for a while at the peak of the Mania in late 1845), and there were even two daily railway papers for a short period! For some additional information, including references to other sources, about the railway press, see the website ⟨http://www.dtc.umn.edu/∼odlyzko/rrsources/index.html⟩. The railway press is an invaluable source of information about the Railway Mania, but a source that has to be treated with caution, since, even more than the general press, it had a reputation for corruption (as well as for something that is more understandable, namely strong partisanship in favor of railways). And this reputation was well deserved.

With very rare exceptions, material was published in the British press anonymously, and even editors and owners of press organs were not named[319]. The language was often full of invective, and the railway press often seemed to compete in inventing the worst imprecations to hurl at perceived opponents of railways, such as *The Times* and James Morrison. There were many attacks on bubble companies of the Glenmutchkin Railway type, but mostly in generalities, without naming names (to a considerable extent because of British libel laws, which were then, just as they are now, considerably more stringent than American ones, say). Explicit attacks, such as the one on a railway project where John Stuart Mill was a subscriber that was quoted in the Introduction would lead an experienced reader to wonder whether this represented an honest evaluation or some opponent's attempt to sabotage the project. In this particular case, it seems that the critique was apt, whether

it was honest or not. The quote itself is heavy on sarcasm, but provides no reasoned argument backed by data to support its conclusions. However, there is also available a detailed criticism of this projected railway[320]. That the project was not promising can be deduced from the fact that even though it was launched in the middle of 1845, as the Railway Mania was gathering strength, it never attracted more than 28 subscribers, who pledged only 2.3% of the required £800,000 of capital, [41].

It seems that every age complains of an information overload. The Bible already says that "[o]f making many books there is no end, and much study wearies the body" (Ecclesiastes 12:12). Some early Victorians also indulged in such complaints. But the volume of data, information, and knowledge has continued to grow steadily[321]. The same cannot be said for wisdom, though. Ignoring that issue, by today's standards, investors of the Railway Mania period were suffering from an information drought. *The Times* of 1846, say (avoiding 1845, when railway ads swelled newspaper pages far beyond anything seen before, or for many years to come), consist of 8 or 12 pages, and these were broadsheets, printed in small type, so that a reprint of the entire Glenmutchkin Railway story fit on about 80% of a single page in the October 31, 1845 issue. (Other dailies usually had fewer pages.) But these papers were very expensive (largely because of heavy taxes), so they often rented by the hour. (This happened in spite of vociferous opposition of the papers, which tried both shame and invocations of a law making the practice illegal. This was yet another of the many examples of content providers trying to control usage of their productions on a fine scale. The number of such examples is almost exactly equinumerous with the failures of this approach.)

A year of *The Times* or another of the London dailies cost over £6. This is equivalent to perhaps $15,000 today, relative to GDP per capita, about what a Reuters or Bloomberg terminal costs. The cost of a weekly paper like the *Leeds Mercury* was about £1 per year.

Circulation of *The Times* in the mid-1840s was around 25,000, which seems very small compared to the million plus circulation of the *New York Times* or the *Wall Street Journal.* But we have to remember that the population of Britain was less than a tenth that of the U.S. today, and much of it was illiterate, and that on average each copy was read by 5, 10, or even more people. (Much reading was done in reading rooms, with entry typically through a subscription, or in coffee houses.) In the provinces, relatively few people would read the London dailies, but the staffs of the provincial papers would peruse them carefully.

To appreciate the different scale on which media organizations operated in the early Victorian times, today, even after the recent rounds of cuts, the newsrooms of large national papers such as the *New York Times* and the *Wall Street Journal* have over 1,000 people each. In the 1840s, even *The Times* had just a few dozen. The entire editorial work of a specialized weekly that played an important role in the final collapse of the Mania, the *Money Market Examiner and Railway Review,* was done by just two people. The *Economist* was run for its first few years almost single-handedly by James Wilson, its founding editor and owner. And so much of the material even in papers such as *The Times* came from other papers. There was no way that a single paper could have the staff to cover everything. Business news was particularly sparsely covered, by our standards. Up until the 1820s, there was very little coverage of business in the British press. This was primarily a reflection of

social attitudes, which held business in low regard. But then it grew (in the shape of what was usually called "the City article," often entitled "Money market and City intelligence," with City denoting the central business district of London). Still, that was small. As one illustration, even in the 1850s, after the huge expansion of private corporations due to the Railway Mania, the editors of *The Times* begrudged the business editor the space and manpower he used. After one of his two assistants quit, he was not allowed to replace him and had to make do with just one other newsman in the department ([211], pp. 595–96).

By our standards the business coverage in places like *The Times* during the Railway Mania seems sadly insufficient. But we have to keep in mind that the business world then was far simpler than it is today. Even though their understanding of the Railway Mania was dpoor, one can easily argue that the staff in the business sections of the London papers understood the railway industry far better than the vastly larger staffs at modern papers (or even the staffs of investment banks) understood the complexity and significance of CMOs, CDO-squareds, CDSs, and other wonderful creations of modern finance.

Finally, a few works about other printed matter communication media. There was also a flourishing industry of monthly, quarterly, and other serials. In fact, the most prestigious publications during the 1840s were the quarterlies, with the *Edinburgh Review,* the *Quarterly Review,* and the *Westminster Review* (all of which are cited in this manuscript) at the pinnacle of the hierarchy. The monthly *Blackwood's Edinburgh Magazine,* where the Glenmutchkin Railway story appeared, was sometimes ranked at almost the same level of prestige.

And then there were pamphlets, which could be produced at a few days' notice, and books. Activist shareholders, or promoters, had various avenues for making their views known. They could write letters to editors of newspapers, they could pay to have those letters published as ads, or they could have them printed as pamphlets (with a variety of arrangements, sometimes with the author paying for the printing). In the London dailies, it was common to see a letter published one day, a rebuttal the next, and a rejoinder to the rebuttal the day after. It was not quite the blogosphere, technology did not allow that speed (and in the case of most provincial papers, the business model of publishing just once a week slowed everything by a factor of 7). But there was an active public discourse through the press.

Today, a person interested in some item of information, say about the dates of the U.S. war with Mexico, might 'google' it (or perhaps 'bing' it), or else go to Wikipedia. A decade or two ago, such a person might have called up the local public library and asked the reference librarian. During the Railway Mania, there was neither Google nor Wikipedia, and libraries were few in number and generally not free, but rather member-only, and had limited material available, and no reference librarians. What many people relied upon were correspondence sections of newspapers, which would sometimes go to considerable lengths to supply answers. The *Weekly Dispatch,* in the early 1840s the paper with the highest circulation in Britain, was especially famous for its extensive coverage of this subject. As a taste of what was provided, here are a few of about 100 items (some considerably longer than the ones selected here) in the Jan. 8, 1843 issue, selected in a very non-scientific way, to be both informative and amusing:

- G. A. asks us where he can find a good astrologer. Apply to the Stationers' Company, who have in their employ a creature of the species alluded to.
- A. G. (Deptford.)–The most eminent man in the cure of diseases of the ear is Mr. Yearsley, Saville-row, Regent-street.
- X. Y. Z.–The easiest introduction to Geometry is "Dr. Ritchie's principles of Geometry, familiarly illustrated." Taylor, Gower-street.
- J. B.–The New Poor Law took effect in August, 1834.
- J. J. (Coventry.)–A debtor cannot now be arrested on mesne process, on a debt above £20, unless the existence of such debt be sworn to, and that such debtor is about to leave the country, and a Judge make an order for the arrest, but after judgement the arrest may be made, whether or not the debt amount to £20.
- R. G. should take out of the Savings' Bank no more than will allow the process of accumulation to go on. Take out £75, and invest in $3\frac{1}{4}$ per Cents. Be content with moderate interest.
- S. L.–Wisconsin was praised beyond its deserts during the violent fever for land speculations, which raged in the United States about eight years ago. The population is subject to ague and low fever from the general marshiness of the country. L. can go to Wisconsin from New York for about £5, but we recommend him to look at the farms in the county of Genesee, in the State of New York, and also at New Brunswick, where land is as cheap as in Wisconsin, labour cheaper, and climate more healthy.

One interesting source of printed information that we have little knowledge about are brokers' circulars. It was common for share brokers, bankers, and even some trading houses, to distribute to their customers printed newsletters with evaluations of market conditions, and specific investment advice. Such circulars were occasionally quoted in newspapers, but very few have survived, and there does not seem to be any systematic collection of them around. This is a serious gap in our understanding of the information that investors had available.

The *Leeds Mercury* will be cited preferentially in this manuscript in order to illustrate the range and depth of information that the Brontë sisters had access to. Another source that will be cited frequently is the book *The Progress of the Nation, in Its Various Social and Economical Relations, From the Beginning of the Nineteenth Century,* [178], by George Richardson Porter. The cited version is the second edition, which, according to its Preface, was completed in Nov. 1846, and was published in early 1847. Thus it came rather too late to affect most railway investment decisions of the Mania. However, the first edition was published in three volumes in 1836, 1838, and 1843, and all the essential statistics of the second edition are present there. In particular, the passage about volume of coach travelling, which will play a major role in the arguments of this manuscript, is identical in the two editions. The collection and dissemination of economic statistics in the early Victorian era was growing rapidly, but from a very low base. While there were various compilations published around that time, Porter's appeared the most respected. He was a distinguished civil servant and statistician, a Fellow of the Royal Society, a member of the Political Economy Club, in charge of the statistical department of the Board of Trade (a government ministry dealing with trade and industry issues), and at times the senior

member of the Railway Department of that body [144]. His work was frequently cited, for example in newspaper responses to reader queries.

The main conclusion of this appendix is that there was a flood of printed material about railways during the Mania, and a substantial trickle of that flood reached even such remote places as the Haworth parsonage where the Brontë sisters lived in relative isolation.

While the volume of data and information has been growing very fast, the same can be said, although to a more limited extent, about knowledge. During the Mania, people would read about the advancing cholera or potato disease, and live in dread of their effects, without knowing what caused these scourges. Today we generally know the diseases we suffer from, and often we can deal with them, even if, in many cases, as with the swine flu in the summer of 2009, we are not in that different a position from the early Victorians, as we can only wait and hope for the best. But at least we know. So the growth of knowledge is undeniable. Still, it needs to be kept in perspective. There is so much knowledge that an individual today can have a confident grasp of only a small fraction. As a result, we have growth of a multitude of specialties, and lack of effective communication among them. The time for Renaissance men was already past during the early Victorian era, a casualty of growth in information and knowledge. But it was still easy to move among professions. The career of Samuel Smiles [144] is instructive, with a sequence of positions as a physician (which in those days did not require much training, a reflection of the poor knowledge of medicine), a journalist, a railway company secretary, a writer, and a lecturer. And it is hard to imagine today one government minister writing to another "I should like a little previous consideration before I move in a thin house of country gentlemen, a large vote for the creation of a wooden man to calculate tables from the formula $x^2 + x + 41$," and expecting the correspondent to understand the significance of the polynomial $x^2 + x + 41$, as happened in Britain in the 1820s[322].

The early Victorian society had very limited education, and by some standards, about half the population was illiterate. But even among the literate and educated minority at the top, innumeracy, the inability to understand quantitative reasoning, was rife. As just one little example, a leader in the *Morning Chronicle* during that period[323] came to the conclusion that "the amount of railway travelling [then was] six times the entire amount of stage-coach travelling in Great Britain during the year 1834." The writer reached this conclusion, which should have aroused immediate suspicion, by dividing the annual coach passenger-miles estimated for 1834, which was 358,295,652, by 52 weeks, to get a weekly figure of 689,000, exactly one-tenth of the correct value. This might seem shocking, but again we have to keep things in proper perspective. During the Internet bubble, and even today, we find newspapers, as well as investment analysts, making mistakes just as simple. In fact, one could argue that both the Railway Mania and the telecom bubble were blown up to a stage where a collapse was inevitable because of a lack of understanding of the power of compound interest.

Appendix 4: Railway promotion and governance

A few words need to be said company promotion at the time of the Railway Mania. There were substantial differences from current practice, differences that should be appreciated

at least slightly in order to understand how people thought and behaved at that time. I will illustrate the differences through the example of the fictional Glenmutchkin Railway (GR). Its "prospectus" stated that the company was to have 12,000 shares of £20 each, with a deposit of £1 per share. A prospective GR investor might apply for 300 shares (as the customer of the the Tontine, overhead by Augustus Dunshunner the day the prospectus appears in the papers, plans to do). The company (in practice meaning some subset of the provisional committee as well as people like the company secretary, Bob O'Corkindale, as well as the company lawyer, who often were the ones running things behind the scenes) would then go through the allocation process, which "passed over very peaceably" for GR. (This process was often far from peaceable.) If the prospective investor were allotted 100 shares, say, the secretary would notify him (or her, in a very small fraction of cases, this was a very gender-biased culture) and ask him to pay £100 in deposits (£1 per share) and sign the subscription agreements. The pooled deposits from all the investors would be used for company expenses, including the costs of going to Parliament. If Parliament did sanction the project by passing the appropriate private bill, the company would proceed to buy land and construct the line. As the project moved along and money needs grew, the company would send out "calls," requests for more money, to shareholders, typically in amounts of a few pounds per share per call. The £20 par value of each share meant that an investor could not be forced to come up with more than £20 per share in all. And until Parliamentary approval was obtained, shareholders were on the hook for only £1 per share. Therefore, if we ignore a few complications that did cause a lot of grief to many investors, and much profit to lawyers, the £1 per share deposit was really an option. Viewed in this light, much of the seemingly irrational activity at the height of the Mania, such as that in the Glenmutchkin Railway story, makes more sense than might appear at first.

Today, individual investors don't have the risks and complications of this ancient process. An investor who buys 100 shares at $15.71 per share in an IPO can put them away in a drawer (if she is old-fashioned enough to get physical certificates) or leave them in her broker's custody, and forget about the matter. But the old process that applied during the Railway Mania is still used for venture capital or private equity funds. There, investors (largely large pension funds, university endowments, and the like) again initially put up just a fraction of their commitment, and then pay in more as required. And some of what we saw in the fall of 2008 mirrors the problems that would bedevil Railway Mania investors. Many American universities scrambled to adjust their finances, since the values of their endowments had plummeted, while they still were obliged to continue funding their venture capital and private equity commitments. It appears that while this caused some embarrassments, it did not lead to any disasters, in that university endowments placed only a moderate fraction of their funds in these types of investments, and could meet their contracts. But during the Mania of the 1840s, as well as earlier investment manias, there were many individuals who had committed to far more than they could pay. Chapter 9 describes, through an alternate 'history' of the fictional Glenmutchkin Railway, what kinds of problems this gave rise to, and how promoters tried to avoid them.

Stock exchanges proliferated during the Railway Mania. But they played only indirect roles in funding the companies, by providing what are today called "liquidity" and "price

discovery." Initial sales of all shares were made by companies directly, as in the GR story, with subsequent transactions handled by brokers or privately, on exchanges or not. This was real grass-roots capitalism (with the numerous lawyers and Glenmutchkin boys playing substantial roles). Large financial institutions played an insignificant role in raising equity capital. In *Iolanthe* by Gilbert and Sullivan, the Lord Chancellor's nightmare song has the verses

> The shares are a penny, and ever so many are taken by Rothschild and Baring,
> And just as a few are allotted to you, you awake with a shudder despairing–

But that comes from a much later period. During the Mania, neither Rothschild nor Baring played a significant role. Even loans were mostly contracted from individuals, such as Darwin, who put a substantial part of his fortune into loans to companies and people. Railways and other companies advertised they were open to offers, although there banks did play a noticeable role.

The period of both railway manias was extraordinarily friendly to private business, likely the closest any economy has come to *laissez faire.* Forming a business was trivial, without the protracted permission and license processes that completely stifle enterprise in some countries, and impose significant burdens even in the U.S. There were no class action suits, and minimal regulation. Ayn Rand would surely have approved of the degree to which private ventures were exalted, and government ones denigrated. The Marquis of Lansdowne, Lord President of the (Privy) Council (and thus a member of the Cabinet), and leader of the House of Lords, declared that "[i]t is universally admitted that Governments are the *worst of cultivators,* the *worst of manufacturers*, and *the worst of traders.*" And when government ministers had to admit in Parliament that they got the latest news from India by reading *The Times,* the *Economist* rejoiced at this proof of the superiority of the private information transmission methods over government ones[324].

However, while private enterprise was embraced enthusiastically, corporations were rated only a smidgeon above government ventures. The prejudice against corporations (which were called joint-stock companies, corporations in Britain referred to municipal organizations, I am using modern American terminology) was deeply rooted. It is very evident in Adam Smith's *The Wealth of Nations,* and in other sources. John Ramsay McCulloch was a prominent free-trader, an anointed disciple of Ricardo. In his attack on many of the corporate speculations of the mid-1830s ([147], p. 423), he felt compelled to note that he did not regard "the formation of joint-stock companies ... as being in all cases an evil." When properly conducted, and confined to narrow sectors of the economy, they could be "among the most beneficial as well as powerful instruments in the economy ... and calculated to confer the greatest benefit on society." Note his strictures about corporations being properly conducted, and confined to narrow sectors of the economy. In the Glenmutchkin Railway story, Sam Sawley tries to settle his obligations to Augustus Dunshunner by offering him shares in Camlachie Cemetery, Cowcaddens' Water, and Ramshorn Gas, i.e., companies set up to run a cemetery, provide water, and distribute gas for lighting. These were the kinds of routine operations that were regarded as appropriate for corporations. And that is what McCulloch meant by having them confined to narrow sectors of the economy. The last non-cash offer that Sam Sawley makes to Dunshunner is of shares in

Blawweary Iron, an iron foundary. This was already stepping beyond what many people thought was appropriate for corporations.

Railway companies were originally envisaged as very routine operations. They were to only build and run rail ways, parallel tracks of iron rails that independent carriers would use with their own wagons and either horses or locomotives. These carriers were expected to pay tolls to the railway companies for the use of those companies' rails, and to be the ones offering transportation services. (In modern discussions of telecommunications, this was a form of structural separation.) But this design did not last, and railway companies, instead of being simple toll-collecting organizations, became large organizations operating complicated businesses, organizations that shareholders had difficulty comprehending.

What did the early Victorians find objectionable in corporations? Going back to Adam Smith and his predecessors, they regarded such organizations as inefficient, and dangerous tools for swindling customers and especially shareholders. If some of those observers were to come alive today, it is not unlikely that they would conclude that their opinions about corporations had been vindicated. The interesting question is whether such resurrected observers would accept the argument that the progress of the last century and a half was due to overriding their anti-corporate prejudices. And if they agreed, would they accept this as a worthwhile change?

Chapter 25 noted that service in Parliament was a part-time occupation. The expectation for top railway managers was similar. Since corporations were expected to be used mostly for relatively routine operations, all serious executive decisions were expected to be made by the board of directors, which would meet periodically. The evolution of the current system, where most of the power resides with a full-time executive, took a long time. The book [91] presents a case study of a professional manager, Mark Huish, whose career shows the growth in power of people of his class.

As a final illustration of the attitudes towards corporations, their promotion, operation, and role in the economy, the following quote from the height of the mania of the mid-1830s is very illustrative:

> There are certain signs by which observant men determine when a particular speculative mania has reached its crisis, and are enabled to give warning within their own circle to keep out of the way of danger. This appears now to be pretty nearly the case with many of the joint-stock companies, notices of which figure daily before the public, and a more distinct caution upon that head may be useful to the public generally. When it is seen, therefore, that announcements abound of undertakings which, either from their nature or extent, are fitted solely for private enterprise, and do no require a joint-stock purse; when there is appended to these notices no lists of well-known and respectable names, as a guarantee that the first step has been made in ascertaining the feasibility of the undertaking proposed; and when to these circumstances it is added, that only a very small deposit is required in the outset of the project, it may be safely taken for granted that they are mere traps to catch the unwary, and that nothing serious is intended beyond appropriating a share in the funds that may be subscribed. There may be danger, of course, in embarking in schemes not liable to these objections, but when they do exist they ought to be

> avoided with special care. It is only when the rage for joint-stock companies has reached to a certain extent that these appearances take place. It was so in 1825, and also in the memorable period of the South Sea bubble, when there were adventurers who pocketed and made off with large sums, on the announcement of a company the name and objects of which were to be a subject of future notice. No one can be so absurd as to say that these companies are an unmixed evil, as the mines of this country could never have been worked, nor its great canals formed, nor could we have had gas in our streets, or water so conveniently laid on in our houses, without the aid of a joint-stock purse; not to mention the utility of the best class of banking, insurance, and other companies of that description; but a proper consideration of the object and means in the multitude of plans now daily submitted, the public cannot be palpably gulled and imposed upon, except by their own fault. All the illegitimate projects will then be abandoned to the "little–go" men and gamblers of the lower class, who, having only each other to prey upon, must soon become extinct."[325]

Appendix 5: The Berwick and Kelso Railway: Shareholder skepticism in the 1830s

An interesting example of the economic and financial planning that went into railway promotion is given by the Berwick and Kelso Railway. It is not a representative example. Just the opposite, in the length of time that it was under consideration, in not being built, and in the documentation about it, it is unusual. But it displays some interesting features relevant to our subject[326]. In common with many of the main railways, it was not invented in the heat of an investment mania, and it appears to have been started not by a "lawyer–perhaps a brace–not over-burdened with legitimate business," but was the result of many citizens from various walks of life trying to alleviate the searing pain of high transport costs. Berwick is a city in North-east of England, on the Scottish border, and Kelso a city on the Scottish side of the border, about twenty miles up the Tweed river. Already in the first decade of the 19th century, there was a proposal to build a railway from Berwick to Glasgow (on the other side of the island of Britain, on the Irish Sea) through Kelso. This was in the infancy of public railways, before the locomotive had been established as a viable method of propulsion, so the proposals were for horse-drawn vehicles for goods transport[327]. In 1811, the Berwick and Kelso Railway Company obtained its act, which listed (as was usual in those days) the original 132 subscribers, who were authorized to raise up to £150,000 for the undertaking[328]. The low capitalization, under £7,500 per mile, seems ludicrous in view of the costs that were eventually incurred in construction of railways around Britain (typically £20–30,000 per mile), but what was envisaged had but scant resemblance to the railways that were built three decades later. What was planned was for horses pulling relatively light wagons at low speeds as opposed to what came later, namely heavy locomotives pulling heavy trains at high speeds[329]. Somehow the early enthusiasm dissipated, and no construction was undertaken. But the company continued in its existence[330], and during the investment mania of the mid-1820s, some of the shareholders called[331] for a meeting "for the purpose of proceeding to put the ... said act into execution

generally." Nothing came of that. Then, during the investment mania of the mid-1830s, another attempt was made to bring the line into existence. The impetus came from outside the body of railway shareholders, from the Border Association for the Encouragement of Agriculture (the "Border" referring to the English-Scottish border). This organization set up a subcommittee which prepared a report projecting a wonderful future for the Berwick and Kelso Railway. They were surely encouraged by the railway mania then underway. But their interest undoubtedly came primarily from the fact that transportation was a searing pain, and they could see the benefits to their agricultural businesses from an improved infrastructure. This report woke the Berwick and Kelso shareholders from their somnolent state. A group called a meeting of all shareholders on Oct. 5, 1836[332]. At that stage, the railway mania was slowly dissipating, although the financial market crash did not come until the spring of 1837. That meeting, though, instead of charging ahead with construction, set up a committee to consider the prospects of the venture. The committee was headed in the listing by the Duke of Buccleuch (presence of titled individuals was *de rigueur* in most corporate promotions), with Sir David Milne as the convenor, and completed its report by Nov. 16, in just 6 weeks[333]. Given the limited transportation and communication technologies available, this was a remarkably fast turnaround. The committee did not make new projections of demand, and instead examined those in the Border Association report, and also considered traffic data collected in 1827 by a clerk of the project, a certain Mr. Smith. It is worth noting that there were no traffic takers involved, nor any reference to Parliamentary standards for traffic evidence. The procedure was an ad hoc one to estimate possible sources of traffic. This harked back to the pre-1830 days, without any systematic forecasting procedure.

A noteworthy neglect in the estimates was that of passengers. The Border Association report said about these that

> in most of the railways which are already completed, or are in progress, the principal part of the estimated revenue is for the conveyance of passengers. This would also, no doubt, be a considerable source of revenue to the Berwick and Kelso Railway when once set agoing, and the expense of travelling reduced; but as the committee having confined their inquiries to the traffic *at present existing*, they have not entered into any minute speculation as to the profit that may be expected to arise from the conveyance of passengers. At present during the sea-bathing season at Berwick Spittal, a public stage-coach runs from Kelso to Berwick and back every lawful day; and, during the remainder of the year, it runs three days a-week. And there are numerous other modes of conveyance.

But aside from the reluctance to embrace the prospects of passenger transport, the Border Association was unremittingly positive in its assessments of the potential revenue of the railway. The railway shareholder committee, on the other hand, was just the opposite. It proceeded to dissect the Border Association projections, relying on their own knowledge of the region, of agriculture in general, and on information they collected about other railways. To mention just a few items, in considering the "Grain" section of the Border Association document, the shareholders' committee concluded:

> The Report [of the Border Association] ... states that the exports from Berwick for the year 1835 (should be 1834) at 108,446 quarters. But surely, to take only *one* year, and that the *highest* of the five years, ending September, 1835, is a very imperfect way of informing the shareholders of the annual amount of grain usually exported from Berwick. The following is a statement of the exports for five years, ending September, 1835, taken from the books kept in the harbour master's office by order of Government:–
> ...
> Deduct from this average the 72,510 quarters said in the Report to be drawn from the Kelso district and exported at Berwick, and only 16,394 quarters remain, as the proportion of the exports, on an average of five years, ...

And then it went on:

> But there are other circumstances to be now adverted to, which render it highly improbable, that, were a Railway formed, it would ever, in any degree, supersede the present mode of carriage of farm produce. Every person, even those little conversant with such subjects, must be aware, that the natural and ordinary plan for the farmer to transport his grain to market, is by his own carts; and though to an individual of this class, living very near a Railway, it might *occasionally* prove an accommodation to use it, there cannot be a doubt (without laying any stres on the inconvenience and expense, attending the carrying of the grain to the Railway, and the removing of it, afterwards, from Tweedemouth to the stores of the corn merchants) that the farmer would, as he now does, make his bargain as, that he might deliver his grain to the purchases, as it suited his own convenience. As the fact is, perhaps, not generally known, your Committee beg here to state, that it is very customary for a tenant to keep an extra number of horses; in order that they may be available at seed time, and other periods of the year, when, in this variable climate, greater exertion is required; and these, at other times, would be nearly useless, and consequently a serious loss to the tenant, if they were not to be employed in what is technically termed, the carriages of the farm; amongst which, leading the crop to market, naturally ranks foremost.

The committee followed this by citing the Edinburgh and Dalkeith Railway, which had negligible revenues from carriage of agricultural products, and concluded " that little or no dependence ought to be placed on prospective calculations, of the carriage of farm produce, to market, by a railway, in preference to the natural mode."

A few more highly skeptical quotes from the Kelso and Berwick committee report:

> ... the amount of grain said to be annually raised in the different parishes, as stated in the appendix to the Border Association's Report, is unreasonably large. ...
> ... This supposition, which, under any circumstances, must appear extravagant, cannot fail to take its own refutation along with it to the minds of those who are in any degree acquainted with the customs of the district; ...
>
> Your Committee think, they need not take up time with any farther remarks, to prove that the calculations in the Report [of the Border Association] (p. 43) (22,762

> tons of coal) have as little foundation in probability, as the other calculations of the annual revenue which precede it. ...

And they supported most of their conclusions by citing examples of overoptimistic predictions for other railways, such as that "[t]he Edinburgh and Dalkeith Railway has never carried above 93,000 tons of coal in one year, being somewhat above *one-third* of the amount (240,000 tons) originally calculated on in the prospectus," or that "[t]he Liverpool and Manchester Railway, ..., on which the Directors calculated that 624,000 tons of coal would be annually carried, [but] has never hitherto carried, in any one year, above 140,000 tons, or a little more than a *fifth* of the gross amount contemplated." And then the report devoted another dozen or so pages of text to construction costs, where, based on specific examples it cited (including that of the Liverpool and Manchester Railway, where it expressed some doubts as to whether it would be able to maintain its 10% divided), it did not see any good reasons for hope either:

> ... your Committee presume to think, that the examples they mean to cite, will amply demonstrate how enormously the capital required, has exceeded the anticipations of the Subscribers, in these instances; but it is a feature in their history, for which they are by no means singular, as the same difference has invariably been found to arise on the construction of all Railways; which, amongst the many now established facts, in relation to these projects, it seems to your Committee, it would be well for those who may feel disposed to embark their money in such speculations, carefully to bear in mind.
>
> The estimates [for the Leeds and Selby Railway], which were prepared with the greatest care, and after experience had been acquired by the completion of the Liverpool and Manchester Railway, amounted to £210,000. The actual expenditure, though the contracts were made at a most favourable time, when labour, iron, and all materials were unusually low in price, amounted to £337,000, or nearly £17,000 per mile, ... This Railway is only paying a dividend of one and a half per cent. The annual expenses are enormous, ...
>
> Thus, it would appear, after a careful, as well as impartial review has been taken, of the actual circumstances of these three Railways, that considerable doubts may reasonably be entertained of the success of Railway undertakings, even of those which possess the utmost advantages from their vicinity to large populous towns, with extensive trade and manufactures; advantages, without which, it is surely not too much to assert, that the Railways above referred to would scarcely have made any returns, though established, as they all are, in rich *mineral districts*, from which they derive a large sum of annual revenue. Your Committee, therefore, think they are justified in offering it, as their decided opinion, that a Railway form Kelso to Berwick would never make any return to the Shareholders for the great outlay of money which would be required to complete it. ...

These comments are just some of the more colorful ones from a report of a rather unusual case, so they are certainly not representative of railway proceedings of the late 1830s. But they do serve to illustrate several points. One is that the Berwick and Kelso shareholders

in late 1836 were a very conservative bunch. They (or, more precisely, their fathers, as life expectancy was low in those days, and one of the shareholder resolutions at the Oct. 5, 1836 meetings addressed the need to appoint a new committee of management, since "the number of the Committee of Management, formerly appointed, has been greatly reduced, in consequence of the death of many of their members, and from other causes") had already been conservative in 1811, since they had not pushed forward with the construction of the line right after getting their charter. And in late 1836 they were ultraconservative. Their report demonstrates there were serious data collection and demand estimation efforts involved. But there was no systematic forecasting methodology involved, and the committee chose to cite facts and figures that were the most damaging to the case for their railway. One can easily understand that the Border Association (as well as people interested in overall economic development) may have regretted there were no Dunshunners and M'Corkindales to create some "beautiful illusions" that would have enticed the shareholders to invest in constructing their line.

The Berwick and Kelso Railway died as a result of the committee report. This report was signed by David Milne. Less than a decade later, as the Railway Mania was raging, the Berwick and Newcastle Railway proposed to build a branch from Berwick to Kelso. A meeting was then held in Coldstream (the place where the Berwick and Kelso shareholders met back in 1836, a town about midway between Berwick and Kelso) to oppose the proposed course of that line, because it would be too far away from Coldstream. At this meeting, a letter from David Milne was read, apologizing for his inability to attend the meeting, and providing evidence of how Coldstream would indeed be disadvantaged if the Berwick and Newcastle extension plan was not altered. The letter made it very clear, though, that Milne was enthusiastic about the idea of a railway from Berwick to Kelso, as long as it went through Coldstream[334]. Did he change his mind about the prospects of a remunerative investment? Or was he just enthusiastic about somebody else making the investment, to gain the benefit of improved transportation?

Appendix 6: The *Atlas* on markets and railway speculation in 1844

The article reprinted below appeared under the title "Progress of railway speculation" in the *Atlas*, a London-based weekly newspaper, on April 20, 1844, p. 262. It was widely reprinted, either in its entirety, as in the *Glasgow Herald* or April 29, 1844, or in a shortened form. At a superficial level, one could criticized it for not anticipating how large and durable the Railway Mania, which was just heating up, was going to get. The *Atlas* anticipated a severe "reaction at no very distant day," and talked of railways that were to be built only as a result of the speculations of 1844. It was going to take a full year and a half of increasingly frenzied speculation before a serious reaction occurred. But then it seems impossible to predict how far irrationality will go, so it is hard to blame the writer of this piece for not getting everything right.

At a deeper level, this piece is one of the more insightful articles from the time of the Mania on the structure, function, and benefits of corporate capitalism. It is possible to

argue that it is far more insightful on these topics than almost everything that is being published today.

Here is a complete transcription:

> The superfluous energy and passion for excitement which, in less civilized countries, such as Spain and Portugal, manifest themselves by a never-ending succession of revolutions and civil wars, appear, in the more regular and settled state of English society, to take the shape of periodical crises of commercial speculation. Instead of getting up a *pronunciamento* against an unpopular Ministry, our energetic, aspiring adventurers get up a *pronunciamento* in favour or a new railway loan or mining speculation. In both cases the actuating motives are pretty much the same; the desire to grow suddenly rich, to grasp power and patronage, to burst through the trammels of the present by a lucky throw of fortune's dice. In both cases the principal actors and originators are of a very similar description,–clever, aspiring, dissatisfied men, with no great stake to lose and everything to gain, and inveterate gamblers in excitement, impatient of the tardy progress of honest industry. The secret history of most of the speculative schemes brought before the public in a period like the present of feverish excitement would be both amusing and instructive. The magnificent enterprises which astonish the world originate very frequently in the scheming brain of some ex-secretary in search of a place, some attorney with a keen nose for a job, and some engineer or scientific man on the look-out for employment. A canvass is then made for respectable names to fill the direction, and if the fish are in biting humour, a few large ones are speedily hooked by the bait of patronage, importance, and a couple of guineas a day for sitting for half an hour round a green table. Then comes the prospectus with its capital of five millions, its dividends of 20 per cent., and other glittering announcements, like a huge gawdy fly, resistless to every gudgeon. Shares are snapped up eagerly by the knowing calculator of the Stock Exchange, trusting to part with his scrip at a premium, by the habitual speculator, who cannot resist the temptation of another throw, by the simpleton who bites because he sees other biting. Thus, like some humongous mushroom, the concern starts into life in a single night, and, encouraged by its success, a fresh crop springs out of the soil on each succeeding day.
>
> So the thing goes on prospering and thriving as long as the warm fostering influence of an abundant market is felt; but, by and bye, comes a sharp blast from the north, the exchanges turn against us, bullion disappears, the Bank draws in its horn, everybody is pinched for money, and down, in a single night, go half the crop of companies which, on the preceding day, flourished so luxuriously. But the other half have struck roots into the soil, and, though sorely blighted and crippled, they contrive to struggle on until more favourable times, and, at an immense sacrifice often to the original shareholders, arrive at completion, and become prosperous concerns and national benefits. This is especially the case with regard to railways, canals, and other similar projects, which are based on solid improvements for the benefit of domestic trade and industry. No matter how problematical the origin of

the enterprise may have been, in its result it becomes a permanent investment of national capital in national improvement.

Such are the results of civilization. The irregular forces of society, which in less advanced countries are continually exploding in wasteful volcanic eruptions spreading desolation around them, are here tamed like the forces of nature, and made to do useful work. It is an extraordinary triumph of science, no less wonderful, if we consider it rightly, than those of the locomotive and steam engine.

These reflections have been forced upon us by the present extraordinary state of the money market and the revival of the mania for joint-stock enterprise. It must be admitted, we think, by any sober person, that many of the schemes now before the public are of a very visionary character as far as profitable return for capital is concerned. Four railway projects into Scotland; five for accommodating the little town of Lincoln, a scheme with a capital of four millions to bring York an hour nearer London; no sensible person can imagine that speculations of this character contain a reasonable hope of remunerating the projectors who now press forward to invest their money under the influence of a temporary excitement. No one can entertain much doubt that a reaction must ensue at no very distant day, when three-fourths of these projects will either disappear or be continued only at a ruinous sacrifice of the capital originally invested. At the same time, we cannot but think it a favourable symptom of the progress of the age that the speculative mania no longer takes the direction of absolutely visionary and baseless enterprises, such as foreign loans, mining speculations and the like. We hear no more of the childish extravagancies of 1825; of Buenos Ayres dairy companies, and milk-maids shipped off by the gross to manufacture butter in a climate where the substance exists only in the shape of liquid oil. We hear no more of gold and silver mines, and other fairy-like delusions resembling the stories of El Dorado. Our speculative folly, if we must indulge in it, is, at any rate, of a more sober and practical character, and shows a considerable advance on the part of the public mind in common sense. The railway enterprises, towards which at the present moment the greater part of the spirit of speculation is directed, are at any rate useful and feasible enterprises. They are founded on a solid basis of speculation–namely, the great diminution in the expense of construction, and the prospect of a steady increase in the traffic of the country. These calculations are, no doubt, often carried to a fallacious extent, but still they are, as far as they go, sound and tangible, and have no relationship to the visionary cent. per cent. returns of joint-stock companies for flying round the world and mining in the moon. Come of it what may we shall certainly have to thank the speculative fever of 1844 for the construction of a vast number of public works of national utility.

Appendix 7: William Aytoun and 1845 railway promotions

It would take books, and not just chapters, to give a faithful picture of the range of opinions expressed about the Railway Mania at its peak. Chapter 12 described the opinions of the foremost opponents of the Mania, namely *The Times,* the *Economist,* and James Morrison. That section also sketched how railway advocates refuted those opinions. But what about

the intelligent observers in the vast middle, who had not quite made up their minds about the hurricane-like movement that was sweeping up everything? An interesting perspective, not claimed to be representative in any way, is given by a carefully thought out piece by William Aytoun, the author of "The Glenmutchkin Railway." Entitled "The railways," it appeared in the same serial, *Blackwood's Edinburgh Magazine,* or *Maga,* as it was known to its aficionados, as the Glenmutchkin satire, and just a month later [18]. Aytoun [141, 144] was then on the staff of *Maga,* in addition to serving as professor of rhetoric and *belles-lettres* at the University of Edinburgh. He also continued his practice of law, which included railway cases (or, to be precise, cases against railways, since he seems to have worked largely for landowners opposing railways). (Later he would also become a railway director.) "The Glenmutchkin Railway" was an attempt to deflate bubble schemes like the Glenmutchkin one, and it may have been partially successful in that. But success was only partial, and many of Aytoun's friends lost fortunes in the Mania. This seems to have embittered him towards railways, and provided an additional impetus to his move from a deep conservative to a crabbed reactionary. But that happened later in the 1840s. His first piece in which railways crop up was a humorous short story, "My first spec in the Biggleswades," which appeared in *Maga* in May 1845 [15]. There railway speculation plays an important role, but is in the background. The narrator is ignorant of railways, and it is his uncle who spends his time "poring over the Railway Journals and the Money-market article in the Times." But the uncle's speculations in railway shares, using the narrator's small legacy, result in a small fortune, which enables the narrator to marry the girl of his dreams (which was impossible before, as her father insisted any suitor had to be able to support her appropriately in life). The story concludes:

> On that day three weeks I married Mary Morgan, and have never taken another share in any railway since. If the reader wishes to know the reason, he may consult the list of present prices.

So railways are a nice prop for a standard human interest story, are treated relatively positively, but there is that note of caution, about not touching railway shares in view of "present prices." As it turned out, that precaution was premature, the railway share market had several months of rapidly rising prices ahead of it, leading to the mad scenes in the fall, which stimulated the writing of "The Glenmutchkin Railway."

"The railways" [18] is completely unlike "The Glenmutchkin Railway." There is only a little satire and sarcasm in it. Instead there is much careful thinking by a pretty knowledgeable observer, one of the most thoughtful pieces written in that period. The article covers much material in its 16 pages, so I present only a few significant highlights. There are several passages that reflect concern about the proliferation of Glenmutchkins, for example (p. 639):

> A glance at the newspapers of last month, and their interminable advertising columns, is quite enough to convince us that the thing may be overdone. True, not one out of five–nay, perhaps, not one out of fifteen–of these swarming schemes, has the chance of obtaining the sanction of Parliament for years to come; ...

In fact, just about "one out of five" of those schemes did get "the sanction of Parliament" the very next session, in 1846, but the guess that few of the new projects would get anywhere was not unreasonable. (It was shared by many railway enthusiasts who defended the substance of the Mania.) And the way "the chance of obtaining the sanction of Parliament" is used indicates the substantial faith that almost everybody had in Parliamentary committees being able to winnow out most of the Glenmutchkins. There was certainly much skepticism about these committees. Aytoun, in particular, was vociferous in many of his pieces on the incompetence of those bodies. (See Chapter 25 for some samples.) In "The railways" he does not dwell on this aspect so much as he does on the horrible chores that committee members face (p. 640): "If, after three days' patient hearing of the witnesses and lawyers, [a committee member] has one tangible idea floating in his head, he is either ... a heaven-born genius or the mere incarnation of a fool!" Still, these committees did provide an additional level of scrutiny beyond the promoters' promises. In particular, since the hearings were adversarial affairs, committees had the benefit of expert opinions from both advocates and opponents of the various projects. Overall they were held in very high regard by the investing public.

In spite of various other wise words of caution (as on p. 636, in the statement that "[i]t does not, however, follow, as a matter of course, that home speculation shall always prove profitable either to the investor or to the nation at large") Aytoun's piece is optimistic about the future of railways. It cites the "almost magical rapidity" with which people were "now whirled from place to place," and asserts (in a positive way) as fact the widespread but misleading myth (discussed in detail elsewhere in this manuscript) that "[w]herever the [railway] system has had a fair trial, the number of passengers has been quadrupled– in some cases quintupled, and even more," (pp. 636–37). Aytoun starts off his article by contrasting the diametrically opposed attitudes of the writers of the leaders in two London dailies. "One of them is quite clear, that if the present railway *mania* (as he calls it) is permitted to go on unchecked for a short time further, the country will not only be on the verge of bankruptcy, but a general crash will be inevitable," while the other "can see no topic of alarm, but "matter of high exultation, and almost boundless hope."" And then Aytoun proceeds to argue that neither of these extreme views is accurate. He disposes of many of the alarmist arguments by invoking the wisdom of the market: The value of railway shares is growing, showing this industry is creating wealth. The shares of railways authorized the previous year, and so still under construction, are holding up, so the argument about lack of capital to complete these lines is invalid. The fact that many of the shares are in the hands of people who are not wealthy enough to pay all the future calls is not fatal, since other, wealthier, capitalists will, if necessary, step in and buy those shares and take on the obligation to pay the calls if necessary. (This was an argument in the spirit of modern beliefs in efficient markets, and far from what most people at the time of the Railway Mania held.) The exact amount that the country can afford to invest in railway cannot be determined. Still, one can get hints from the behavior of the money markets. And since there are clear signs of interest rates going up, a limit on what it is wise to invest is likely being reached, so some action might be reached to limit the extent of new lines. Further, the number of laborers available for railway construction is too small for all the

new projects being planned (as shown by some numerical data from Porter's book [178]). Bringing in foreign workers, which had been suggested by some, calls for "government ... to interpose by the most stringent measures," since it would be (p. 645) "dangerous ... to inundate the country with an alien population, whose mere brute strength, without a particle of productive skill, is their only passport and certificate!"

On balance, Aytoun in this piece is very supportive of railways, and rejects some proposed measures (such as an immediate bar on formation of new railway companies) as illegal and violating free market norms. But he feels that some constraints are called for, to be imposed by Parliament in the upcoming session of 1846. He concludes with a stirring passage (p. 648):

> The speculative spirit of the age may be checked and controlled, but it cannot be put down, nor would we wish to see it pass away. All great improvement is the fruit of speculation, upon which, indeed, commerce itself is based. We have, therefore, no sympathy for that numerous class of gentlemen who profess a pious horror for every venture of the kind, who croak prophetical bankruptcies, and would disinherit their sons without scruple, if by any chance they detected them in dalliance with scrip. ... The nation must progress, and the true Conservative policy is to lay down a proper plan for the steadiness and endurance of its march. ... That Parliament must do something, is apparent to every reflecting man. The machinery of it cannot dispose, as heretofore, of the superabundant material. It must devise some method of regulation, and that method must be clear and decisive. A question more important can hardly be conceived, and so with the legislature we leave it.

So here we have an intelligent, knowledgeable observer, who considers the arguments he has heard, and sees only a cause for moderate action, some barriers to construction, but is not worried about profitability of lines that manage to survive Parliamentary scrutiny (in spite of his disdain for Parliamentary committees, see Chapter 25.).

Appendix 8: Economic growth (mis)conceptions

This appendix collects some more observations on the notions of growth that prevailed at the time of the Railway Mania, and how the views of railway managers and investors changed as that event unfolded. It is meant as a supplement to Chapter 15. No simple description description is possible. The British population was going through a fundamental transformation in its view of the economy, and doing it without any public debate. So there were millions of individuals, all struggling (or, more likely, trying to avoid having to struggle, and just trying to fit what they saw happening around them to their world view) with the change taking place, moving back and forth, and influencing each other. Thus the most that can be done is to give a few pictures of the evolution of thinking about change, organized into small pieces. There is certainly much more that can be investigated, such as the influence of the railway industry on general British conceptions of change, and so on, that will not be treated here.

Many people find the mind set of the early 19th century hard to comprehend. We are just so used to growth and change, it seems absolutely basic to our society. But that's not

how it was then. It might seem strange that anyone who looked at Porter's *Progress of the Nation* [178], with its voluminous statistics, could walk away without seeing continuing growth. As an example, the statistics for the London and Birmingham Railway on p. 334 seem hard to interpret in other than modern terms. But then, if we look at the statistics for the Liverpool and Manchester line on p. 333, we find figures for 1830 through 1836, and then for the second half of 1840 through the first half of 1845. There are large seasonal variations (the second half of the year produced higher revenues than the first), a big jump in the first half of 1845 when third class passengers started to be carried, and a drop from 395 thousand passengers in the second half of 1840 to 362 thousand in the second half of 1844. To contemporary minds, this was easy to fit into the traditional view of largely static but wildly fluctuating economy. And most people did not have Porter's data. As an example, the history of the British railway industry published in 1852 (p. 27 of [221]) presented Table 7, showing what happened on the Liverpool and Manchester Railway. Note that it only goes up to 1835, is fragmentary, and the drop in the number of passengers from 1831 to 1832 and 1833 is consistent with the arguments that railway opponents were making during the 1830s that much of the early success of this line was due to curious tourists, not to sustained demand. That the author would publish such a table in 1852 shows the lack of widespread and consistent statistics.

Table 7. Liverpool and Manchester Railway data.

year	passengers	revenue
1831	445,047	£101,829
1832	356,945	88,165
1833	386,492	98,816
1834		111,063
1835		120,336

A8.1: Dionysius Lardner and the past and future of technology

It was common to read or hear flowery passages, such as the following one, from a popular book on the steam engine by that renowned popularizer of science and technology, Dionysius Lardner (who appears several times in this work) ([123], pp. 4–5):

> But if the contrivances by which this vast power [steam] is brought to bear on the arts and manufactures, be rendered attractive by their great mechanical beauty, how much more imposing will the subject become when the effects which the steam engine has produced upon the well-being of the human race are considered. It has penetrated the crust of the earth, and drawn from beneath it boundless treasures of mineral wealth, which, without its aid, would have been rendered inaccessible; it has drawn up, in measureless quantity, the fuel on which its own life and activity depend; it has relieved men from their most slavish toils, and reduced labour in a great degree to light and easy superintendence. To enumerate its present effects,

> would be to count almost every comfort and every luxury of life. It has increased the sum of human happiness, not only by calling new pleasures into existence, but by so cheapening former enjoyments as to render them attainable by those who before could never have hoped to share them: the surface of the land, and the face of the waters, are traversed with equal facility by its power; and by thus stimulating and facilitating the intercourse of nation with nation, and the commerce of people with people, it has knit together remote countries by bonds of amity not likely to be broken. Streams of knowledge and information are kept flowing between distant centres of population, those more advanced diffusing civilisation and improvement among those that are more backward. The press itself, to which mankind owes in so large a degree the rapidity of their improvement in modern- times, has had its power and influence increased in a manifold ratio by its union with the steam engine. It is thus that literature is cheapened, and, by being cheapened, diffused; it is thus that Reason has taken the place of Force, and the pen has superseded the sword; it is thus that war has almost ceased upon the earth, and that the differences which inevitably arise between people and people are for the most part adjusted by peaceful negotiation.

These enthusiastic words came from the pen of a writer who was not only enthusiastic about steam, but who made his living writing and lecturing about it. And one can certainly find passages from that period lamenting the changes that technology was imposing on society. (The Luddite movement was only a quarter century in the past by the time this book was published, and the opinions that animated it, as well as other anti-technology groups, had not disappeared.) But overall, British society, in particular the decision makers, was embracing technology with great hope and warmth. Railway engineers were treated as celebrities. Robert Stephenson, perhaps the most eminent, was interred in Westminster Abbey after a funeral ceremony that was attended by crowds one cannot imagine coming to a similar event for any modern scientist or engineer[335].

It is not only that previous technological breakthroughs were celebrated. So were unknown future ones that were expected to come. For example, the Lardner volume cited above went on to deal with the concerns that were already being expressed about exhaustion of the coal deposits that the steam engine depended on ([123], pp. 8–9):

> in speculations like these, the probable, if not certain progress of improvement and discovery ought not be overlooked; and we may safely pronounce that, long before such a period of time [as will exhaust coal deposits] shall have rolled away, other and more powerful mechanical agents will supersede the use of coal. Philosophy already directs her finger at sources of inexhaustible power in the phenomena of electricity and magnetism. The alternate decomposition and recomposition of water, by magnetism and electricity, has too close an analogy to the alternate processes of vaporisation and condensation, not to occur at once to every mind: the development of the gases from solid matter by the operation of the chemical affinities, and their subsequent condensation into the liquid form, has already been essayed as a source of power. In a word, the general state of physical science at the present moment, the vigour, activity, and sagacity with which researches in it are prosecuted in every

> civilised country, the increasing consideration in which scientific men are held, and the personal honours and rewards which begin to be conferred upon them, all justify the expectation that we are on the eve of mechanical discoveries still greater than any which have yet appeared; and that the steam engine itself, with the gigantic powers conferred upon it by the immortal Watt, will dwindle into insignificance in comparison with the energies of nature which are still to be revealed; and that the day will come when that machine, which is now extending the blessings of civilisation to the most remote skirts of the globe, will cease to have existence except in the page of history.

The degree of techno-optimism in this passage rivals anything we might hear today.

A8.2: Slow recognition of growth in freight traffic

The first of those "Plain rules for railway speculators" in Lardner's book [120] that were cited in chapters 8 and 19 was:

> No railroad can be profitably worked without a large intercourse of passengers. Goods, merchandise, agricultural produce, &c., ought to be regarded as of secondary importance.

And back in the 1830s, the overwhelming majority of revenues of British railways did come from passengers. But this then changed, and changed in a gradual way that caught most observers by surprise[336].

The second quote from Disraeli's *Endymion* in Chapter 10 referred to a single London bank that "by the irresistible pressure of circumstances" got involved in financing railways, and thus "almost unconsciously lay the foundation of the vast fortunes which it has realised." That bank was Glyn, Mills, Hallifax, Glyn, Mills & Co., led by George Carr Glyn (later to become first Baron Wolverton). In the words of [144]:

> Personally, and through the medium of his family bank, Glyn made a significant contribution to the development of railway transport, not only in Great Britain but in many other parts of the world. By the 1850s his bank was known as the railway bank and probably had the largest business of any of the London banks.

Thus, as is not uncommon, an established business hitched its future to a rising star, and achieved great success. But in addition to setting his bank on a course to wealth and influence through providing banking services to railways, Glyn personally became involved in railway management. He was the chairman of the London and Birmingham Railway, and later, when that line got into a giant merger, of the successor London and North Western Railway (LNWR). He was widely regarded as the most respected and (especially after Hudson's disgrace) most powerful railway manager in Britain. He was unusually forthright (a quote that demonstrates this is presented in Chapter 22) and appeared to be very intelligent. But even he was slow to recognize the growing importance of freight traffic. A report from a shareholder meeting of the LNWR in 1850 said (*Morning Chronicle,* Aug. 17, 1850, pp. 4–5):

> Mr. Glyn especially referred to the increase in the goods traffic, as one of the most astonishing and gratifying circumstances in the recent experience of the Company. We venture to think that every additional year will render it increasingly manifest, not only on the North-Western but to most other railway companies, that the transit of merchandise, as the railway system becomes more perfect, will have to be regarded as perhaps their most important source of revenue. This is not the occasion for discussing the reasons which seem to warrant such an expectation, but an ample amount of evidence and argument in support of this view could easily be adduced.

So even though goods traffic had been growing far faster than passenger traffic for years, and though his had been noted years before (e.g., by Lardner in 1846, [125], p. 492), Glyn found it "astonishing." And this was just two years before goods revenue (for all British railways collectively) exceeded passenger revenue!

A8.3: More examples of dominant static view

The Gladstone committee of 1844 was cited earlier on the reasons that a substantial extension of the railway system was anticipated. That same committee also reported an expectation that revenues would increase:

> The rapid and regular Increase of the Traffic of the Country in past years, and the undiminished vigour of its productive energies at the present moment, seem to render it probable that a very large augmentation of the aggregate Receipts derivable from its Internal Communication will be realized within the lives of the present generation.[337]

British railways were about to report a 10% increase in their revenues compared to the previous year, and the following year were to achieve a 20% gain, and would double their revenues in the next 5 years. (All these numbers reflect growth in mileage as well as growth in traffic on existing lines.) Yet this committee was very cautious in its expectations for the future, reflecting the general lack of preparedness for persistent growth.

But there was this rapid growth taking place right then, in 1844 and 1845. How did people explain it? It seems that some of those who did think about such issues ascribed it to the recovery from the deep depression of the first few years of that decade, with the growth of traffic representing a delayed phase of the "development of traffic" that would normally have happened earlier. As an example, consider a letter published in *Railway Times* of April 19, 1845, p. 532, about the London and South-Western Railway (LSWR). A previous letter had wondered about what seemed to the writer to be an unjustifiably low price for this company's shares. The April 19 letter responded by comparing the increases in revenues over the previous year for LSWR and almost a dozen other lines. Among those lines, the LSWR had the lowest increase, just 4.25%, while the increases for the others ranged from 8 to 50%, with a median of 18%. The writer (aside from mentioning a potential diversion of traffic by another line that was about to open, and would likely also serve to lower LSWR valuations) concluded that "there is either some want of management, or that the resources of the line are incapable of further increase." Thus even when faced with multiple

examples of vigorous growth, the writer of this letter was anticipated that growth potential was limited, it's just that investors were enjoying a delayed phase of it.

Another explanation for the growth in revenues at the start of the Mania was intimately tied to the locality delusion that is discussed in Chapter 16 and in the next Appendix. This led observers to think that the opening of a new line connecting to an established one would lead to a large increase in traffic on the latter, from the new passengers that would come to the junction of the two lines. An article in *Herapath* in early 1846 attributed most of the increase in revenues and especially profits to this factor[338].

A8.4: Slow recognition of fundamental changes

As was mentioned in Chapter 15, railway managers and others allied with the railway interest had nothing to lose, and much to gain, from adopting the view that traffic would continue rising indefinitely. But that seemed a very radical change, and even as the advantages of making it grew (as investors were getting more and more concerned about their projects), it was slow to be adopted.

The quote from *Herapath* of 1853 in Chapter 15 stated explicitly that the general expectation had been that "when a railway running from place A to place B had been fully opened for a year or two–say two years–the full amount of traffic it would ever have would have been acquired." And indeed the general expectations had been for a short period, with more emphasis on a year than on two. But in 1848, as the Mania was rushing to its now inevitable collapse, investors were getting restive, with share prices continuing their decline, as shown in Fig. 3 in the Introduction. There was growing evidence, reinforced by the warnings from Robert Lucas Nash (to be described in [166]), that traffic on the new lines that were getting opened was not meeting expectations. To pacify the shareholders, George Hudson, the Railway King, claimed in early 1848 that[339] "it could not be expected, that, upon the immediate opening of new lines ... traffic ... should be suddenly developed, three years being the average time usually allowed for that process." Thus Hudson was trying to stretch the one or two years to three. But the sense of alarm among shareholders continued to grow. Six months after Hudson's speech, William Chaplin, the chairman of the LSWR (and somebody who appears many times in this manuscript) said[340]:

> On the subject of the development of traffic on the new lines, it is difficult to make any parallel case, because the circumstances of the different lines in England are so often varied by amalgamation and terms entered with other Companies, that it is almost impossible to make a just comparison; but having had some experience in the Paris and Rouen Railway–84 miles in length–and which has neither been added to nor subtracted from, I find, with reference to the growth of traffic, that [list of average weekly revenue figures from 1843 to 1847]. So if you take the first figure at [£3,796], and in the fifth year at [£7,657] per week, the traffic is more than doubled. Now, gentlemen, I know not why we should not anticipate the same results; if we have not succeeded so well as we might have done, it is most certain we may calculate in a given time upon a very large increase of traffic on the whole of these new lines. I recollect mentioning at one of our meetings, from my experience in other pursuits, that the number of passengers would increase, and had increased in many parts,

> and the traffic to all the leading towns will increase to the extent of doubling every seven years.

After the August 1848 semiannual meeting of the LSWR, from which the quote above is taken, the railway share market continued deteriorating, reaching crisis proportions. Boards of directors of many railways responded with official statements, laying out in detail the financial and economic positions of their lines, in order to assuage shareholders concerns[341]. The LSWR was among them, issuing its "Statement of the Directors" on Nov. 8, 1848. It did not come out with a bold claim that traffic would double in 7 years. But, towards the end of the statement, it did include the paragraph ([194], pp. 242–243)

> The following statement of the traffic of the line, from London to Southampton, from the first entire year of its opening, and for the five following years, will show, in some degree, the effect of time in augmenting receipts, though it is right to mention, that the fair comparison from year to year is somewhat disturbed by the opening of the line to Gosport (15 miles) in February, 1842, and of the Guildford Branch (6 miles) in 1845, neither of which, however, at those early periods, brought any large accession to the previous traffic, though some addition is no doubt attributable to these causes:

which was followed by Table 5 of Chapter 15, which shows revenues growing steadily, at rates between 5 and 10% per year. There were no additional comments on this topic. Now at the August 1848 meeting, Chaplin cited data for the Paris and Rouen line (for which he was a director), since at that time he did not have corresponding figures for other railways, including his own LSWR. But he must have felt the topic was important enough to presumably press the LSWR staff to assemble comparable data for LSWR, and presented the table above in the November 1848 "Statement of the Directors." But there was much less emphasis on the topic in the "Statement." Was it because some of his fellow LSWR directors were not convinced? Or was it because they were trying to be ultra-conservative in the "Statement," and avoid accusations of using some illusory notions to pacify the shareholders? In either case, it seems safe to say that the notion of rapid growth continuing for many years was very controversial.

If we examine the other official statements from the October-November 1848 period that are reproduced in [194], we see little awareness of continuing growth, or at least little attempt to convince shareholders of its presence and prospects. If we consider the earliest, and most influential, of these statements, that of the London and North-Western Railway, we find statements such as ([194], p. 53) "when time has been afforded for the full development of [some branches'] resources, it is not unreasonable to expect that profit also will be derived from them." That still seems to be in the mind set of a few years of growth, and then levelling off. A bit later there is a more modern-sounding sentiment, with a mention of "that steady annual increase, which, with the exception of periods of severe depression, has taken place since the lines were opened" (p. 56), but little is made of that observation. The Midland Railway statement does say "that the traffic of a district is not thrown all at once upon a railway, but that it requires some years for its development" (p. 126), but that still implies that after a few years full development will be reached.

The York, Newcastle and Berwick Railway statement talks of the unprecedented economic upheaval that led to an "unprecedented" decline in passenger traffic. And then then it says that "there can be no doubt that the revival of commerce will restore that steady progressive improvement of railway traffic in all departments which has been previously experienced" (p.220). And two pages later, in their conclusions, the directors talk of their "confidence [in the prospects of their line] founded upon their experience of the steadily increasing traffic which every year has brought upon the lines, notwithstanding the check occasioned by the recent extraordinary commercial depression." So this also hints strongly at continuing growth. But other lines' statements implicitly assume the notion of a short development period followed by stasis. For example, consider the following from the North British Railway statement (p. 677):

> It is very difficult to present in detail, data for enabling shareholders to form an accurate estimate of the ultimate traffic on a line, so much of which is still in progress of formation and unproductive, and where, even on the main line, the traffic is very imperfectly developed. Several causes have prevented that development, which, under the most favourable circumstances, it takes many years to complete, especially in an agricultural district.

Thus here we still see the notion of limited development, although "it takes many years to complete."

A8.5: *Herapath*, J. T. Hackett, and conflicting views of change

The quote from *Herapath* of 1853 in Chapter 15 shows an extremely conservative attitude by this railway paper towards growth in railway traffic, which was echoed in a later leader cited in an endnote to that Chapter. However, *Herapath* was not uniformly backward in this topic, and those quotes surely reflect particular personal views[342]. There were many pieces in that paper, already back in the 1840s, that showed a keen awareness of continued and rapid growth. For example, an article by a correspondent in late 1848 tried to estimate the gain or loss from branches by looking at available aggregate statistics and assuming that traffic on old lines grew at 5% per year from 1842 to 1848, which certainly represents the modern way to proceed[343].

A more interesting perspective on evolution of thinking about growth, and especially railway traffic growth, is provided by the writings of one of the *Herapath* reporters, James Thomas Hackett. Towards the end of his life Hackett, who died in 1876, wrote about railways for *The Times,* but before that he spent several decades working for *Herapath* ([144] and the *Athenaeum,* April 15, 1876, pp. 535–6). Early in his life he was involved with some unconventional areas, such as phrenology and astrology. The interest in astrology may have stemmed from the same fascination with numbers that led him to prepare an annual statistical summary that appeared in one of the first issues of *Herapath* each year together with his brief commentary summarizing the salient point[344]. These compilations, while not as complete or as reliable as those of the government, were available much more promptly.

In his 1844 commentary, Hackett talked of the "astonishing price" of railway shares, and warned that unless construction costs were lowered and accounting improved, "ruin

must, at the expiration of some years be the consequence to Shareholders in many" lines. As time went on, these concerns dissipated (only to reappear at the collapse of the Mania), and in 1846 he claimed that his tabular compilations

> show that the tendency of railway traffic is to increase in a still greater proportion as the facilities of railway communication are extended. Few are prepared to say at what point the railway traffic of the United Kingdom will cease to increase, or to how many millions per annum the revenue derived therefrom will ultimately reach. Judging from the fact before us, it would seem that the annual amount of railway traffic would go on for many years increasing in amount every year.

So at that time he was envisaging many years of increase, but the increase he foresaw seemed to him to be coming from the extension of the entire system, as will be discussed in the next Appendix. In 1848, as shareholder concern about traffic on lines coming into service was mounting, he wrote:

> It will be observed by the reader, how very prominently the traffic of each succeeding year exceeds that of the preceding year. Even during the long depression which existed in 1847, together with other unfavourable circumstances of a commercial nature, the traffic has risen conspicuously above all former years. This of itself shows well for the development of railway traffic and the judicious extension of the railway system. If the railway system should continue to develop its traffic in the same favourable manner for the next ten years as it has for the past six years, it will certainly amount to an annual sum far beyond that which many would at present presume to anticipate.

But the next week, in another part of his contribution, he wrote that "[d]uring the years 1846 and 1847 an additional length of 1,400 miles of new railway was opened, and, of course, it will require two or three years before the traffic can come into play." Thus Hackett, a person with a good sense for statistics, and closely involved with the industry, still had difficulty adjusting mentally to growth continuing almost indefinitely.

Appendix 9: Locality of railway traffic

A9.1: Reception of locality observations by Lardner and others

The *Morning Chronicle,* one of the main daily London papers, reviewed Lardner's survey favorably, and reprinted large excerpts from it, including the passage about "short traffic" being the dominant source of revenue[345]. Since the reprinted material was very extensive, though, it is hard to say how much attention the editors of this paper attached to the "short traffic" section. On the other hand, when the *Morning Herald,* another prominent London daily, similarly gave a favorable review and reprinted excerpts from Lardner's piece, we can be certain that the "short traffic" passage was regarded as important, since it was a much larger fraction of the total material reprinted[346]. And, as one more example, when the *Perthshire Courier* got around to reviewing "Railways at home and abroad," it first printed an excerpt from the historical part to Lardner's piece, about the great improvements that

had taken place in speed and comfort of travel in Britain. Then, a week later[347], it reprinted a local traffic excerpt, prefacing it with the note

> With regard to the question , whether railways derive their traffic from the great towns usually selected as *termini*, or from the districts through which they pass, the writer says,–

Thus the British press pretty clearly thought that Lardner was pointing out something novel, contrarian, and important. But did they realize what it meant for railway investments? That is not clear. As happened during the telecom bubbles, when people are in the deep trance induced by a powerful mania, it takes a very hard collision with reality to make them aware of how obvious facts around them contradict their delusions.

Lardner's was not the only account in the British press to point out the dominance of local traffic on railways. A month before it reprinted excerpts from the Lardner survey, the *Morning Chronicle* published an article "Short and long traffic," based on a piece in the French railway weekly, *Journal des Chemins de Fer,* which was in turn based on statistics of Belgian railways[348]:

> The *Journal des Chemins de Fer* contains an article upon the great importance and value of partial circulation, or short journey traffic, over the through traffic. Its calculations are based upon the circulation on the Belgian lines, showing that the intermediate distance between the extremities of a line yield much greater advantages with regard to traffic than the entire line produces, however important may be the character in a commercial point of view or otherwise, of the main ends of the route. In support of this statement, the circulation of the state line is quoted for the year 1845, with the comparison of the distances, and the number of passengers starting from Brussels, namely: ... [extensive table]
>
> Thus Brussels sent 57,326 passengers to Velverde, containing only 4,000 inhabitants, and being a town of no commercial importance, but its distance from the capital being only six miles. ... To Gaud, a town of great commercial importance [but 47 miles away], and containing a population of about 96,000, there were only 39,443 passengers. ...

Thus on this occasion the *Morning Chronicle* editors clearly recognized that locality of traffic was a novel concept, and apparently important enough to justify considerable space. But did they realize just how important it was, and in what way, or did they think it was just an interesting curiosity? We can't tell.

It appears that many Englishmen had difficulty accepting the idea that local traffic dominated. A few weeks after the *Morning Chronicle* article cited above, the *Leeds Mercury* published an article "Long and short lines," also based on Belgian statistics[349]. It said:

> It is a curious fact in the case of continental lines, that the shortest railways pay the best. ... It is the reverse in England; the longest lines are by far the most productive. ...

The writer was clearly confused and did not understand the difference between revenues and profits. But the main point is that he rejected evidence from Belgium, and felt England was different (which it wasn't).

Lardner's 1846 survey [125] is cited here on locality of traffic because it plays an important role in several other chapters. However, Lardner himself had written about this phenomenon, and much earlier, at the very dawn of the era of modern railways. In his 1834 survey [119], p. 115, he quoted studies done on the Liverpool and Manchester Railway to explain why locomotive expenses were much higher than projected. One of the factors that were judged as important was that for freight traffic, "instead of the tonnage being conveyed the whole way, many thousand tons are conveyed only half the way." What is most noteworthy about this observation is that the Liverpool and Manchester line was regarded as running through barren lands, so if any railway could be expected to be dominated by terminus to terminus traffic, it was this one.

A9.2: Scholarly studies on locality of railway traffic

Lardner appears to have derived his statistics on locality of traffic directly from government reports. The Railway Department of the Board of Trade started collecting statistics on railway traffic in the early 1840s, and fairly early started looking at distances traveled. It included such data in its reports, starting in 1843[350]. Samuel Laing used such data to point out why looking just at the number of passengers was misleading, and why British railways were not likely to lower their fares, even though that would have produced much higher passenger counts[351]. Other observers published analyses of the phenomena, too, cf. [93, 177]. In particular, W. A. Graham [93] published detailed tables, covering all the significant railways in Britain, which showed unmistakably that relatively short trips dominated. For example, on the LSWR, a line of almost 80 miles, in the first half of 1843, the average length of a passenger trip was 33.4 miles. However, there was no discussion of the implications of such data for investors.

A9.3: Pervasive myth of terminus-to-terminus traffic and its falsity

That British managers, investors, and the general public overwhelmingly thought that long distance traffic was the most important can be shown by a variety of quotes. In a discussion of the Eastern Counties Railway (ECR) in 1838, for example, the *Railway Times* in 1838 wrote[352]:

> There is this important peculiarity, too, in the Eastern Counties' line, that it does not, like many others, depend for success solely, or even principally, on the traffic that may be carried on between the places at the extremities of the line, London and Norwich and Yarmouth. Throughout the whole of the line, there are tributaries on all sides; all hence a prospect of future increase, such as cannot reasonably be expected on lines where the greater part of the Companies' returns is to be derived from one or two sources. There are limits to the increase from one town, but none whatever to the increase from an extensive tract of country, standing in need of nothing but the means of ready communication with the metropolis to expand its energies. A moderate rise in twenty tributary streams will swell the main channel, into which they flow, into a deep and wide-spreading river.

The explicit assumption is that for most lines, the most important source of revenues is traffic between terminal cities. The ECR is not supposed to fit that pattern, but still is expected to depend on long distance traffic, with rural inhabitants going not to "gay Paree," but to London, the "gay metropolee." And this attitude continued. A decade later, during the Railway Mania, the writer of a letter about railways as investments to the same periodical claimed[353]

> So long as the inhabitants of all the more remote parts of the kingdom have to travel 60, 80, or 100 miles by coach, before reaching railways by which they may get to the metropolis, the railway traffic of the country can scarcely be considered as more than half developed, and should this view prove to be correct, an increase rather than a decrease of dividends on the great trunk lines might be looked for.

Even when lines did not lead to London, the reigning assumption was that it was the traffic between the end points that was going to dominate. An ad in 1844 for the Dundalk and Enniskillen Railway would have shown anyone with even elementary arithmetic skills that the promoters were expecting most passengers to travel almost the full 57-mile length of this line[354]. And a few quotes from meetings of the London and South Western Railway (LSWR, which will be cited extensively later) help reinforce the point[355]. At one meeting, the Chairman, William Chaplin, declared, in discussion of proposed branch projects,

> I do hope that I have already said enough to convince you that in these measures, independently of enhancing the value of your present property by their tributary effects to your main line–that they embrace sufficient means to pay you a respectable dividend.

Thus while the focus appears to be the traffic enhancements on the main line, he was offering assurances that even by themselves, the branches would be profitable. And a few months later, at another meeting, Chaplin emphasized the feeder nature of extensions, how the traffic they brought to the main line would travel the full 77 miles "to our terminus." And about a year after that, a shareholder declared that

> Their own line, the South-Western, for instance, had no large towns upon it, except at its termini. Taken in parts it would have been a losing concern; but relying on the through traffic, it proved a profitable undertaking.

At another meeting, J. Croker (a famous conservative politician, writer, and intellectual), claimed (without anyone contradicting him):

> There was no safety as to the success of any railroad which did not go in a direct line between two important points. That was an axiom which was not discovered for some time, but when their 3 per cent. premium got down to par then everybody found out that circuitous lines would not do, and that there was no safety for railway property except by taking the shortest line.

Thus the myth of long distance traffic dominating was pervasive.

Even without access to the Board of Trade reports, the Graham study [93], or the Lardner survey, curious outsiders could easily have discovered that at least on some lines,

traffic was mostly local. Many newspapers published what were usually called "railway traffic returns," statistics on revenues of various lines. As one example, in 1840 one issue of the *Leeds Mercury* had a news item, to the effect that over the preceding week, the Hull and Selby Railway carried 4,827 passenger and received £592 from them[356]. Assuming average fares of two of the old English pence per passenger per mile (the figure assumed in almost all Parliamentary applications), one finds that the average trip was 14.7 miles. And this was on a 31-mile line. Many similar computations could be made, most leading to the same conclusion, that most trips were local[357]

A9.4: *Herapath* and locality and non-locality of railway traffic

The delusion that long distance transport dominated railway revenues received theoretical support from John Herapath, the owner and editor of *Herapath* at the height of the Mania, and J. T. Hackett, a reporter from that paper (who appeared already in the previous Appendix). At the beginning of his editorship, Herapath seemed to be aware of the importance of locality. In 1836, he proposed as a rule that

> [i]n laying down a line of railway between two distant towns, an especial regard should be had to intermediate traffic and population; and every town, other things being alike, should approximate to the line of railway in the direct ratio of its public importance.[358]

Two years later, some data about the first few months of operation of the Grand Junction Railway (data that will be referenced below, in A9.5) led Herapath to propose a quantitative theory of locality of traffic[359] However, he seems to have forgotten this theory, or else decided it was not valid, in less than two years. In 1839 it was observed that on several lines that were only partially open, traffic was lighter than expected. Herapath came up with a plausible explanation. He observed that people did not like switching from one mode of conveyance to another. Why take a coach for 10 miles, then a railway for 30 miles, and then a coach 50 miles to the final destination, when one can go by coach without any changes the full 90 miles? Further, being a scientist, he came up with a "law," a quantitative formula that predicted the degree to which passengers would find use of the railway preferable as more of it was opened[360]. (The savings in time, money, and comfort from taking a train for 30 miles on a 90 mile journey might not be worth, but what if another 30 miles of railway opened, so the two coach trips at the ends were only of 10 and 20 miles?) Herapath's "law" was based on scant evidence, and applied to only a limited range of situations. But this work was then stretched to support theories far beyond what was justified. According to an observer writing some years later [6]

> ... Mr. Herapath was the first to point out, statistically, that the traffic on any given line depends chiefly for its progress on the extension of other lines in connection with it, and his establishment of this point. ... When, however, Mr. Herapath had shown that the increase of traffic on further openings was not in arithmetical but in geometrical progression, an instrument was given to railway chairmen wherewith they could keep up the confidence of the shareholders, and urge forward the prosecution of the works.

> Mr. Hackett some years ago showed that the extension of the railway system was accompanied with a progressive increase of traffic per mile and per cent., and his successive annual reports on this subject, extensively quoted in the papers, have done more than anything else to explode an error which was formerly prevalent to some extent–that the railway system was all very well as far as it had gone, but the prime lines of traffic had been picked and culled, and as the refuse only was left, extension was fruitless. ...
>
> At he present moment this is not such an important matter, but when Mr. Hackett first directed attention to the subject, the policy of extension was denied by nearly every railway chairman ; in particular, by Mr. Glyn, Mr. Chaplin, and Mr. Baxendale. ... The effect of the prevalent error was, that the best time for extension was lost, and several of the old companies have been endangered from having left vantage ground to their antagonists. Now, we suppose, there is no chairman who would stand up and object to any legitimate extension.

And *Herapath* certainly did advocate expansion. A leader in 1842 argued that railways "must be carried over every part of the island," and supported this by claiming that

> Were there no other motive, the working of the system has demonstrated as a statistical fact, that with the extension of lines an increase of traffic is the result, and the Companies are bound, therefore, for the improvement of their own property, to use every exertion for increasing the number of their feeders.[361]

Earlier in this Appendix we saw several quotes that reflected expectations that branches or connections to other lines would bring additional traffic to a given line (such as Chaplin's quote about "tributary effects" of branches). They fit in with the Herapath "law" as stretched by Hackett, and also helped explain the growth in traffic on lines even beyond what was regarded as the natural length of time for "development of traffic," as we saw in the previous Appendix[362]. Thus multiple delusions helped reinforce each other, and kept investors (and apparently most managers) from seeing that the "feeders" would turn into "suckers."

A9.5: Railway managers invoke traffic locality when it helps them

As was noted, it was easy to tell, even for complete outsiders to the railway industry, just by looking at financial and operational data for various lines that was published in newspapers, that most traffic was highly local. Interestingly enough, this was noticed early, as was its importance for railway investment and management. The Grand Junction Railway, the first long (87 mile) trunk line to open in Britain, had been in operation for only about two months in 1837, when, at the regular half-yearly meeting, the directors presented a report on operations up to that point[363] They included a table of receipts for various types of trips, and noted:

> From the foregoing analysis are elicited two facts, highly important to the interests of the company, namely, the large amount received in what is called road money or short fares, a portion of the revenue which cannot easily be alienated; and the

> small receipts, whether considered positively or relatively, of the Manchester part of the traffic. This latter result, though it has disappointed the expectations of the directors, may be looked upon as having a favourable bearing upon the permanent prosperity fo the concern. It has not only shown how exaggerated were the estimates of the Manchester business, but it has added another to the many proofs of the fallaciousness of Parliamentary evidence; and by removing the delusion which has so long existed on this subject, it may tend to limit the views of the subscribers to railways for which acts have been lately obtained.

So the directors of the Grand Junction recognized, after just a few weeks of operation, that actual traffic patterns were not what had been expected, and that local traffic dominated. And they realized what this meant, namely that competitors coming in to the large cities would not be able to grab this business ("alienate" it) away from the Grand Junction.

A few words are needed to put the Grand Junction report in context. This line went from Birmingham to a station on the Liverpool and Manchester Railway about halfway between those two cities. Hence traffic from Birmingham to Manchester would take the Grand Junction up to that station, and then travel on the Liverpool and Manchester Railway to Manchester. Parliament was considering a proposal for a "direct" line from Birmingham to Manchester, and this was perceived to be a deadly threat to the Grand Junction. Hence the directors of this line had a strong incentive to (i) persuade their shareholders that a new line, if built, would not divert too much of their traffic, and, more urgently (ii) find evidence to show that the new line would not be viable, which would hopefully make Parliament kill the proposal. And locality of traffic served to do both. This is a nice illustration of how necessity is the mother of invention. With the right incentives, management did manage to see the obvious. But once the incentive disappeared, the key observation about the nature of traffic and the insight about what it meant seemed to be forgotten, only to be rediscovered when the necessity arose again. Thus, for example, at the end of Chapter 16, we saw a quote from Chaplin of the LSWR from 1846, pointing out the locality of freight traffic. And in 1848, the Monklands companies explained their high operating costs were due to the short distances that their freight moved, "30% of all traffic travelled less than a mile, and half of it less than $2\frac{1}{2}$ miles" ([188], p. 85). And Glyn, the chairman of the LNWR, who was quoted in the previous Appendix on growth of freight traffic, which seemed to have caught him by surprise, in 1851 declared at another shareholder meeting:

> The North Staffordshire candidly confessed that they had been grievously disappointed in the amount of traffic which they had derived from their arrangement with this company in connexion with Manchester, and the meeting might rest assured of this fact, that that was an error into which all those companies that were anxious to come in competition with the London and North-Western were every day falling. They saw the large returns of that company, and they fancied that those returns were based upon the receipts from places like Liverpool, Manchester, and Leeds. The experience of the North Staffordshire as regarded Manchester was applicable to other towns. But it was not upon points like those that their immense prosperity and vast property existed and arose. (Hear.) They received that large amount which was

> every week granted to them by and through the development of traffic which came from 188 different stations. (Cheers.) And it would astonish gentlemen to know the comparatively small amount such towns as Liverpool, Manchester, and Leeds gave them of that large ratio which they saw quoted. [gives data on Liverpool traffic] If they could live and compete with that why let them do it. They were quite welcome. (Cheers and laughter.) Let them pay their working expenses, ...[364]

Thus when they had an incentive to do so, railway managers did manage to either realize for the first time, or else to state what they had known, namely that traffic was mostly local.

A9.6: Locality of traffic and direct lines

Railway promoters did have an incentive not to make the dominance of local traffic be too widely known, since knowledge of that fact may have led investors to question the myth of traffic exceeding expectations. On the other hand, railway managers of existing lines had an incentive to make locality widely known, since it would have helped them still worries about competition from other lines, and also to fight the proposals for direct lines. That this did not happen to a significant extent indicates that even these managers were slow to realize that traffic was local, and what this meant. To add to all the other examples, let us note that as late as the end of 1849, the *Railway Chronicle,* one of the railway weeklies, ran a leader entitled "Importance of cultivating short traffic:"

> Examined along with the statistics so readily furnished when each line was only an idea or was being shaped into existence, the present returns are in many instances curiously blank, and serve but to express the fallacies and exaggerations in which traffic-takers were at one time too prone to indulge. On the long lines the terminal traffic is alone thought of any consequence; the short passenger traffic is looked upon with contempt, because the provisions necessary to evoke it thoroughly have never been rightly studied. Generally speaking, branch lines even running into the metropolis have been thought cumbersome, and of no gain to the parent enterprize.[365]

There was a lot of opposition to direct lines in general. The *Railway Chronicle,* shutting down at the end of 1849, in its valedictory address, "Our Christmas farewell," reviewed its career, and boasted of various contributions to the development of the railway industry. Among them was that it did "oppose many errors of the day," among them the "[t]he fallacy of the "direct and independent" system, which has ruined so many properties"[366]. And many individuals did that, as well. For example, the writer of a letter to the editor in 1846 claimed "I have, from the very first, considered that what are termed "direct lines" are for the most part "direct humbugs," take for example the Direct Exeter, ..."[367]. But for the most part these were just opinions, often cloaked in invective. Occasionally there was a glimmer of a an argument, as in yet another letter, this one from 1845:

> Of all the follies and delusions connected with the existing Railway mania, and the outrageously wild and impossible schemes daily put forth, one of the foremost is the

> "Direct" mania, according to which it would seem as if mountains had been solely created to be bored through, and valleys to be filled up by Railwawy engineers, ... in ordinary the resources of a line are mainly drawn from its local population and capabilities.[368]

This shows that many people had the right intuition, but few could come up with convincing arguments to support it. The data showing that most traffic was local, which would have been very persuasive in this context, was not getting used.

Appendix 10: William Chaplin: Fool or rogue?

One person who has shown up several times in this work already is William Chaplin, the chairman of the London and South Western Railway (LSWR). The main reason for citing him so frequently is that he ties many of the strands of this manuscript together. Furthermore, as I will show now, he provides a link to one of the main topics of *BICS,* but one that has unavoidably come up obliquely several times before, namely about the degree to which the principal actors in the drama of the Railway Mania were either fools or rogues.

Appendix 8 (Section A8.4) showed that Chaplin became aware of the steady growth in railway traffic during the Mania, ahead of most of his shareholders, and ahead of most railway managers. On the other hand, he occasionally, when it suited his needs, seemed to grasp the concept of locality of traffic, while other times he disregarded it (Chapter 16 and Appendix 9, A9.3). In addition, he often tossed out almost meaningless traffic numbers, without proper context, that served to feed the misleading myth of "traffic exceeding the most sanguine expectations." Most seriously, he indirectly denigrated the traffic takers, in clear contradiction to his own sterling example of wonderfully accurate traffic taker work.

After every financial crash, the question arises of whether the business, financial, and government leaders who were involved were fools or rogues. (The phrase most often heard during and after the Railway Mania was "fools and knaves.") And there is always much convincing evidence that many were one or the other or both. But often that question is hard to answer, and Chaplin is an excellent illustration of the difficulty.

William James Chaplin [72, 79, 144] was a remarkable person, even in that era of many remarkable personalities. Born in 1787, he rose by the mid-1830s to own and run the largest coaching establishment in Britain (with various related business, such as hotels), employing around 2,000 people. And then, soon after his consulting about traffic for the London and Southampton Railway in 1837 that was cited in Chapter 26, and very likely partially as a result of that effort, he concluded that the coaching industry was doomed, and proceeded to sell out. Once that was done, "he left England, peremptorily closing up all avenues by which any business communication could reach him, and went for six weeks into the heart of Switzerland, there to cogitate in silence and solitude over his future prospects and proceedings" ([79], pp. 223–224). When he returned, he invested much of his money in the London and Southampton Railway (which later became the LSWR), in addition to running other businesses on the side. In the LSWR, he was soon elected first to the Board of Directors, then vice-chairman, and in 1843, chairman. So here we have a person, very

rich and powerful, at the pinnacle of his industry, who decided at age 50 that the industry he had devoted his career to was destined for decline. And he switched to the newcomer that he saw as eclipsing his old one, and succeeded brilliantly at it. He was one of the most respected railway managers of the era.

A few items about Chaplin add some color to the story, and also illustrate how railways were managed. LSWR, in common with many railways, had a number of activist shareholder gadflies, who were not not loath to make their opinions known. One of them was Serjeant (meaning a high legal title) Gazelee, who at one meeting declared[369] that "he had confidence in them [the Directors] only so long as they were well watched and looked after." But such outbursts did not phase Chaplin, he handled them with aplomb. At another meeting[370]

> Mr. Serjeant Gazelee hit out unsparingly right and left at the Directors, and complained most bitterly that the South Western Company had been outwitted by the Great Western. The Chairman [Chaplin], however, in his usual bland and smiling manner, smoothed everything away; and all the resolutions were passed with the utmost unanimity.

Yet another gadfly was Alexander Hoyes. He mounted a campaign, including letters to newspapers, petitions to government authorities, and the like, to stop the (ultimately ruinous) expansion plans of the LSWR[371]. His resolutions were routinely voted down at shareholder meetings. Yet he persevered, all in good humor, and at one meeting moved a resolution to thank Chaplin "for his dignified and courteous conduct in the chair." When the *Railway Times* applauded such collegial conduct, Hoyes responded with a letter emphasizing that it was only Chaplin's conduct of the meeting he was appreciative for, and that he continued to oppose the policy the company was embarked on[372]. A few months later, when the dire state of the railway industry was clearer, Chaplin had the grace to publicly thank Hoyes for his efforts, which had been partially successful, in that they kept the LSWR from embarking on even more extensions:

> I do not see our old acquaintance Mr. Hoyes here. (A laugh.) (Mr. Hoyes–I am here, Sir.) (Loud laughter.) I shall be happy to afford my tribute of praise to that gentleman. What he did was done openly, manfully, and publicly; ... I must say Mr. Hoyes deserves our thanks in not putting us to the trouble and expense which ... I thank him kindly, and the Directors join with me in that matter.[373]

One point in citing such amusing tidbits is to show that shareholders were far more closely involved in setting strategic directions for companies than they are today. They certainly felt qualified to do, and to a large extent they were, since the business was far simpler than it is today, and closer to what many of them were involved in every day.

Another point is that shareholder meetings were often methods for owners to get a sense for the opinions and knowledge of others. It was not uncommon for several attendees to raise sharp questions, only to conclude with a unanimous vote. Much more of this will be presented in *BICS.*

Returning to Chaplin, his cleverness, and the smooth manner (which had earned him in his stage-coach career the soubriquet of 'Bite 'em sly,' [144]) that have been discussed so

far, all are still consistent with a snake-oil salesman, one out to present whatever "beautiful illusions" seem called for. But there are several additional facts that need to be brought out that change the picture. One is that he was clever enough to recognize earlier than most people that the railway industry had overexpanded, and frank enough (confirming his reputation as "a clear and plain speaker" [180]) to say so openly to his shareholders[374].

Perhaps the most important fact about Chaplin that needs to be mentioned is that much, and apparently most, of his considerable wealth was tied up in the LSWR, with his stake being the largest among all shareholders, and amounting to about £200,000 at the end of 1849[375]. Given the uncertainty as to the amount and the time, and the difficulty of comparing wealth in those early Victorian years with today, we might imagine an individual investing something like $500 million up to perhaps $5 billion, the bulk of his fortune, in a company in which he ends up owning about 3% of the shares. Today, economists would say that having such a person as chairman would avoid the "agency problem," while investors and corporate governance experts would say that "the interests of management are aligned with those of the shareholders." And even though the language was different in the 1840s, the same opinion prevailed. At one meeting of the LSWR, a shareholder said[376]

> that the large stake held by the Directors themselves in this concern was a sufficient guarantee that they would do nothing that was likely to be detrimental to the interests of the Company with which they were connected. (Cheers.) He thought that was the best protection that they could have.

This was clearly in reference to Chaplin's known investment in the concern. This does not mean that he was not suspected of enriching himself at the expense of other shareholders. Such suspicions were extremely common in all corporations (*vide* the quote from Serjeant Gazelee earlier). And when dividends plummeted, at the depth of the railway share depression at the end of 1849, Serjeant Gazelee levelled strong abuse charges against Chaplin and the other directors, which led to setting up of a special shareholder committee of investigation. This group found various improprieties, but exonerated Chaplin. While some of the transactions put Chaplin in a position to enrich himself, he did not take advantage of these opportunities. The committee report, as presented at a shareholder meeting, declared

> that wrong as all this most decidedly was, Mr. Chaplin made the interests and prosperity of the Company his first objects (cheers), and from a long and constant connection, considered his own affairs identified with those of the South-Western Company.[377]

This judgment was based partly on the fact that Chaplin had never sold any of his LSWR shares. His early investment in the company in the late 1830s represented, by luck or design, brilliant timing, as they came at the trough in the financial fortunes of the company. (The market price was about half of the paid-up capital per share, just as in the fictional alternate history of the Glenmutchkin Railway in Chapter 9.) But most of the money he invested in this line came at the height of the Mania. Many of the improprieties the investigation committee complained about arose because he had difficulty paying his calls on the new LSWR shares.

Not only was Chaplin's fortune tied to that of LSWR, and continued in that way on the way down. He and his fellow directors were pushed against their better judgment into the overexpansion that ruined this company as well as most others[378]. At the end of 1846, the directors called a special meeting to ratify plans for many new branches. This was necessary by law. As in many other things, shareholders were far more deeply involved in running corporations than they are now. One of the shareholder rose to castigate the directors:

> I beg to second the Report, and in doing so I must be allowed to say that I am a little surprised at the manner in which the hon. Chairman, in the name of the Directors, has appealed to us to support them in their projects; why the shareholders had always been urging upon the Directors the necessity of pursuing precisely the same course they now recommended in their Report, and so they suppose we shall be now backward or behind-hand in carrying out our own propositions? (Cheers.) I wish to give the credit where it is due, and I can only say, if you had followed the advice of the shareholders, you would have been down in the west long before now. ... You call upon the shareholders to support you; why, of course they will support you, because you are going in the right direction. Support you!–to be sure they will. They supported you in your blunders, and of course they will support you now that you are going right. ("Hear," and laughter.) ... I am glad to see that the Board is not so careful and tender-minded as they were wont to be formerly. (Cheers.) There is an apparent improvement in the direction, and the Report is, in my opinion, a convincing proof that they will not allow this or that Railway Company to tamper with our interest, but that they are resolved to "go a head" at once. ("Hear," and laughter.)[379]

The resolution to move ahead was then "carried unanimously." The shareholder cited was Serjeant Gazelee, the same Serjeant Gazelee who would a couple of years later rail against ruinous extensions and accuse directors of corruption!

It has been said of many technology and finance leaders in the recent manias, who were fully invested to the bitter end, that they "drank their own Kool-Aid." Chaplin recluctantly drank his shareholders' Kool-Aid. But in any case, it appears impossible to call him either a fool or a knave. And there were observers of the Railway Mania, both while it was unfolding and after it collapsed, who felt that such dichotomies were far too restrictive, that bubbles call forth leaders at the extremes of credulous simplicity. Some are selected on that basis, it appears, while others are induced into it. A sadly neglected question is just how this process works. (And today we have wonderful tools of experimental economics and neuroscience that could be brought to bear on the issue.) In Chaplin's case we have a direct demonstration of how he was led to a "willing suspension of disbelief" by his constituency. A jury of some of the observers of the Railway Mania, asked to decide whether Chaplin was guilty of being either a fool or a knave, might have declared him not guilty by reason of collective hallucination.

Notes

[1]Letter of September 27, 1849 to George Smith, p. 264 of [204].

[2]There is little in print about Darwin as investor. He was very wealthy, largely through inheritance, and was an active investor, including some activities that we might call "angel investing." The best source currently available about his finances is [42]. There will be a bit more detail in [167], based on a brief investigation of Darwin's account books.

Citing [42], in 1873 Darwin, in responding to Francis Galton, answered a question about "Originality, or Eccentricity" in very modest terms: "I suppose that I have shown originality in science, as I have made discoveries with regard to common objects." But when he was asked about "Special talents," he wrote: "None, except for business as evinced by keeping accounts, replies to correspondence, and investing money very well."

[3]Another letter to George Smith, October 4, 1849, p. 267 of [204].

[4]Charlotte Brontë's York and North Midland shares recovered from 20 at the time of the letter to about 55 by mid-1854, just as this line was merging with others, and shortly before her death in March 1855. Darwin liquidated his London and North Western holdings in late 1852, without experiencing such a large bounce, but at only a modest loss on his original purchase price.

[5]The *Economist*, September 15, 1855, pp. 1010–1011.

[6]The famous 1857 biography of George Stephenson by Samuel Smiles, [202], notes on pp. v-vi of the Preface that railways were "mixed up ... with much fraud and folly." The work that is often cited on corruption is Herbert Spencer's *Railway Morals and Railway Policy,* [206].

[7]References for the data in these figures are given in Chapter 3.

[8]There were precedents for this, of course, for example with canals. Still, railways were being built on a much larger scale than canals, and initially were regarded as much more objectionable. Note that such applications of eminent domain continue to be controversial, as with the recent decision in the U.S., the Kelo vs. City of New London lawsuit.

[9]Much higher figures are often mentioned. For example, the article "Crash course" in the Feb. 28, 2009 issue of the *Economist* estimated that the decline in stock market valuations of telecom companies from the Internet bubble crash was $2.8 trillion, as opposed to $4.6 trillion for banks in the crash of 2008. However, those were just stock market valuations, which were far, far higher than real tangible investments. The growing disparity between real investment and valuations is one of the interesting trends of the last two centuries.

The entire real investment in the telecom bubble in the U.S. was only about $150 billion. This estimate is obtained by subtracting from total telecom investment during that period the trend line from before and after that bubble. Of that, somewhere close to $100 billion appears to have been devoted to long-haul fiber networks.

The real dot-com investments were far lower.

[10]The phrase "beautiful illusions" is drawn from the trial of Ferdinand de Lesseps for corruption in connection with the French Panama Canal company, in the 1890s. "Credulous simplicity" comes from another Victorian creation, the operetta *The Pirates of Penzance* of Gilbert and Sullivan.

[11]After the 2008–2009 crash, most people don't need to be persuaded that markets are inefficient. But many do, as they regard that catastrophe, along with other financial crashes, as one of those unforeseeable events that just happen. Wall Streeters, as well as academic experts, frequently claim of the debacle that "nobody could have seen it coming." The problem is that this financial debacle does not provide a clear proof of inefficiency, since there were stacks of peer-reviewed scholarly articles and a stream of speeches by business and government leaders reassuring the public that everything was sound. There were also numerous skeptics, but they did not have hard evidence in the form of validated quantitative models to prove a disaster was coming. Hence we hear declarations such as that of Burton Malkiel, a famous economist, who said in mid-2009 [160], so after quite a bit of time for retrospection, that "bubbles exist. The problem with bubbles is that you cannot recognize them in advance." The aim of this manuscript is to show the second part of Malkiel's claim is incorrect. At least some bubbles can be recognized in advance.

However, no claim is made about ability to detect all bubbles, or even the recent financial/real estate one. Further, nothing is said about the dot-com bubble, the other component (along with the telecom bubble) of the Internet mania. In that case, if we consider just the real investments, and not IPO or later valuations, it is easy to argue that this bubble was rational. The successes of the few successful dot-coms, Google, Yahoo!, eBay, and Amazon, more than paid for all the disasters of Webvan, eToys, and the like.

[12]The European 3G spectrum auctions did not result in such a disaster. After handing over about €100 billion of their shareholders' money to governments for the spectrum, the wireless service providers abandoned their expansion plans and slowed down 3G deployments. But it is clear from what has happened subsequently with 3G, as it should have been clear beforehand, that had service providers gone ahead and invested another €100 or €200 billion in a fast rollout of 3G services, the result would have been a fiasco. As it is, actual damage to the economy was very minor; aside from the voluntary transfer of €100 billion from shareholders to governments (which can be applauded or criticized, depending on one's political views), general economic activity was not greatly affected by this episode.

[13]There are disagreements among experts as to which search engines are best. But in any case it is clear that the differences are not large. The dominance of other search engines

in a few countries around the world shows that technology is not the main differentiator, and marketing, local connections, inertia, etc., determine market share.

[14] *New York Herald,* October 21, 1845.

The paramount role of lawyers in the Mania is a fascinating topic that will be skirted in this manuscript. They benefited from it to an incredible extent. A very good source of information is the book [113].

The castigation and ridiculing of lawyers were frequent during the Mania. One paper wrote that "Moses never gazed on the Promised Land from Mount Nebo with more fond delight than we hope, some day, from the top of Oxford-street to gaze down its long vista, and behold every lamp-post adorned with a pendant lawyer," the *Era,* March 14, 1847, p. 9.

[15] There is a more accurate, but more complicated, analogy. It is of ballpark built for 50,000 that the promoters need to fill at high ticket prices in order to make money. But there are only 100,000 inhabitants in the region who could possibly come for a game, and given how much money they have to spend, and how many have ever shown any interest in the game, there is no way that more than 15,000 will ever come, no matter how exciting the game is.

[16] The data for the airline industry, but not the comparisons to the economy as a whole or to government spending, is taken from [2].

[17] The comparison of modern airlines to railways in the early 19th century can be carried further, and is quite enlightening. Rail travel was in those early days still rare and expensive. The approximately 300 million inhabitants of the U.S. took 741 million air trips (more precisely, enplanings in industry parlance, meaning boarding a plane, with a simple round trip counting as two enplanings) in 2008, or about 2.5 trips per person. In the United Kingdom of 1845, there were about 1.2 railway trips per person ([125], p. 493). A train trip was comparable, in rarity and cost, to an airplane trip today.

The most noticeable difference is in the distance traveled. The average train ride in Britain in the mid-1840s was 15 miles (an important figure that will be discussed at great length later), while the average plane ride in the U.S. today is about 1,100 miles (including international flights), with average flight length of 725 miles.

[18] *Railway Times,* June 14, 1845, p. 842. For an explanation of "allotment letters" and related language in this quote, see Appendix 4, which discusses how railway companies were set up. For some discussion on how to interpret such attacks, given the low reputation that the railway press had, see Appendix 3, about the British press.

It might be worth noting that Bedlam in the 1840s referred to an actual physical facility, the famous Bethlem Royal Hospital, the world's first institution to specialize in mental illnesses. It was then located on the South bank of the Thames, so an extension

to it of the South London Suburban Railway, the line referred to in this quote, was not totally fanciful.

[19]Article "The West Highland Railway" in the August 7, 1894 issue of *The Times*, about the opening of that line. This article also noted, in an interesting echo of the language of the Glenmutchkin Railway prospectus (which praised "the surpassing grandeur of [the Glenmutchkin Valley's] mountain scenery"), that the West Highland Railway "opens up to tourists a wide district, hitherto practically inaccessible, which in historic interest can match, and in scenic beauty perhaps surpass, any other similar district in the United Kingdom."

The Times correspondent was wrong in attributing the Glenmutchkin story to a joint effort by Aytoun and Sir Theodore Martin, as well as in placing the story and the Mania in 1846. Aytoun published the story in late 1845, and the events it describes were clearly placed in the first wave of the Mania in 1844.

[20]Data from [154]: 1905 GDP of £1,817 million (p. 829), railway revenues of £109.4 million (p. 547), national government spending of £149.5 million, with military taking £66.0 million of that (p. 589). The year 1905 was chosen in preference to 1900, say, in order to avoid the distortion in expenditure accounts caused by the Second Boer War that was taking place in 1900.

[21]While there have been revisionist studies, starting with the work of Fogel [74], that argue that the impact of railroads on economic growth was not as great as had been commonly assumed, there is no disputing that most contemporary observers felt railroads were critical, and railroad investment was huge. This work is primarily about the dynamics of financial markets and technology, and so global issues, such as the overall significance of railroads, will not be dealt with here.

[22]The inefficiency at the time of the Railway Mania was not created by any fundamental limitations of the capital markets. Short selling, even what is called today "naked short selling," was legal and widely practiced (as is illustrated in the Glenmutchkin Railway story). It would have been consistently profitable over many years. There were no big spikes in prices, at least at the level of a broad railway share index, with the biggest bear market rally amounting to only about 20%, in late 1848, see Fig. 3. The only qualification to this claim is that there is no no study of just how effective and widespread short selling could have been, even if the opportunities it represented were widely known. Share turnover was low, and short squeezes (as in the Glenmutchkin story) not unknown. Towards the end of the Mania, many railway shareholders were blaming shortsellers for declining prices, and were calling for the government and the exchanges to stop theer practices, and for shareholders not to lend their shares.

[23]This quote is from the pamphlet [182]. Among major research collections, it appears that only the British Library has a copy. The modern book that presents it is [23], p. 94. Many newspapers covered the meeting to various levels of detail, but of the ones that I

examined (and those included *The Times, Daily News, Liverpool Mercury, Economist, Pall Mall Gazette, Manchester Times, Herapath,* and *Railway Times*) none reported Watkin's remarks in detail, and in particular none mentioned traffic takers.

[24]Traffic takers were active over a slightly longer period than just 1837–45. In particular, as will be mentioned later in this manuscript, and is discussed in detail in [165], they played a considerable role even in 1846, but not beyond. The encounter with the traffic taker for the Manchester and Southampton Railway must have taken place in late 1845 or early 1846, and not in 1844. That this line "did not go to Southampton, and ... did not go to Manchester" was not an indication that the promoters were taking advantage of ignorant and naive investors, but rather that they planned to avoid duplicating existing lines, and route traffic over other railways near those two terminal cities. And the traffic takers always insisted that they did not base their projections on traffic during fair days. On the other hand, "development of traffic," or expecting railway traffic to be larger than existing road traffic, was a standard and time-tested process with considerable evidence for its validity, as will be discussed later. While traffic takers for this line did take sheep transport into account in computing likely revenues, it formed only a tiny fraction of the estimated demand. Finally, the Manchester and Southampton Railway traffic takers did not project dividends of anywhere near 15%, much less from sheep alone.

[25]Properly speaking, people such as the one that Edward Watkin met, "taking the traffic" for the Manchester and Southampton Railway, the ones "who rode in their carriages and kept fine establishments," were at the pinnacle of this profession, and preferred to be called "traffic statists." A "statist" then was essentially a synonym for "statistician," a term that was also in use. Traffic takers proper were the people employed by the traffic statists to collect data, which was then analyzed by the traffic statists in order to prepare their traffic tables (which are mentioned in the Glenmutchkin story). I will use the term traffic taker for all those involved in this process, including the traffic statists. (Traffic enumerator was yet another term for people in this area of work. In many publications, for example in news stories or in Parliamentary records, they were sometimes referred to as accountants.)

[26]I am using the term 'bubble' in the current popular sense, of a quick increase in asset values that is usually followed by a crash. For modern economists, a bubble occurs when asset values substantially exceed their fundamentals. In those terms, the railway mania of the 1830s was not a bubble, since high prices reflected eventually high profit rates (although there one has to argue about the appropriate time to use for determining the right profits). For investors and economists in the 1840s, a bubble meant not a general inflation in prices of some asset class, but a specific company like the Glenmutchkin Railway, floated to attract naive investors for the benefit of the promoters. (They actually had a more nuanced view of the subject, and one parliamentary committee even devised a set of three categories of bubbles, but that is another story.) The South Sea bubble was one in just that last meaning, since it concerned primarily shares in the South Sea Company, although various other promotions were built on the coattails of that one.

[27]See also [31]. The main argument of those works was that on the basis of the authors' models, it was better to let any bubbles that might occur blow off, and use monetary policy to mop up afterwards.

[28]For the finance/real estate bubble that crashed in 2008, the evidence that is accumulating suggests that it would not have been difficult to build very convincing models showing it could not be sustained. But this would have required data gathering and modeling that are beyond the abilities of a lay person, certainly not something that could be done in a few minutes in an armchair with widely available publications, as was true for the Railway Mania.

[29]Alan Greenspan has shown that he is capable of learning. The Internet crash of a decade ago convinced him that accountants needed to be regulated [90]. And the 2008 crash famously convinced him that bankers could not be trusted either. Shareholders and taxpayers might complain about the length and especially cost of these lessons, but they do show his ability to learn. The more interesting question is how come somebody so naive could stay at the helm of the world's most influential central bank for two decades without anyone in authority taking note? Is it perhaps an indication of the system's bias towards credulous simplicity?

Ben Bernanke's contributions to the benign neglect of bubbles through his decade-old academic work with Gertler was mentioned earlier. His many official pronouncements, as head of the Fed, in the runup to the crash of 2008 that the financial system was in good shape do not need retelling.

Larry Summers contributed to the recent events in multiple ways. At the the Treasury in the Clinton administration, he apparently played a key role in preventing regulation of derivatives. Afterwards, at Harvard, he seems to have pushed that institution's endowment into some disastrous investments. And, when Raghuram Rajan, one of the few economists to take a serious look at dangers developing the financial system, presented his findings, Summers publicly found "the basic, slightly lead-eyed premise of [Mr. Rajan's] paper to be misguided," [117].

The aim here is less to point out mistakes made by these three economic policy makers, and more to observe that their views were well known when they were placed in positions of power. Moreover, two of them, Bernanke and Summers, are now in charge of much of U.S. economic policy, and of carrying out reforms. Can they be expected to do that well? Are they even truly expected to do so? After all, the political process that had placed them in positions of power years ago is still in operation.

The political process that rewarded gullibility was well supported by academic literature. As just one nice example, in the fall of 2008, a paper [62] in one of the most prestigious journals of the American Economic Association surveyed the voluminous literature on the Great Moderation, the observation that the world economy had "experienced a striking decline in the volatility of aggregate economic activity since the early 1990s."

The aim of this work was to apportion credit for this phenomenon, and there was not even a hint that volatility might increase, much less that, as the paper was going into print, the world economy would go into a free fall that was only cushioned by a bale of taxpayers' shredded money. (Another paper on this same topic was published soon afterwards in another journal of the American Economic Association, [84].) There were a few economists, such as Raghuram Rajan, Nouriel Roubini, and Robert Shiller, who worried about stability of the system. But most of the literature appeared to be devoted to justifying the growing excesses in the economy (which, of course, was explained as a "brave new world," called by different words of course, such as the "Great Moderation.").

A deeper question yet is whether all the credulous simplicity and cheerleading are truly essential to the success of the market system. Some further comments on this issue are in Chapter 13. But again, that is not a core issue for this manuscript, and can be put aside.

[30]The Glenmutchkin story has a deposit of £1 per £20 share, typical for the Mania period. This is the money that would be used for preparation of plans and the various required steps, including the "parliamentary contest." A potential investor would apply for shares, and for each one allocated by the company, would be asked to send in one pound. The remaining £19 per share would only be requisitioned from shareholders (in stages, as construction proceeded) if Parliament approved the project.

[31]Just among the first 100 items, one finds

- *Russia's Crimean War*
- *The Origins of the Crimean War*
- *Death or Glory: The Legacy of the Crimean War*
- *The Limits of American Isolation: The United States and the Crimean War*
- *Austria, Great Britain, and the Crimean War; The Destruction of the European Concert*
- *The Crimean War; A Reappraisal*
- *The Crimean War: British Grand Strategy, 1853-56*
- *Renkioi: Brunel's Forgotten Crimean War Hospital*
- *The Crimean War: A Diplomatic History*
- *Historical Dictionary of the Crimean War*
- *I Have Done My Duty: Florence Nightingale in the Crimean War, 1854-56*
- *Realism and Politics in Victorian Art of the Crimean War*
- *The Thin Red Line: An Eyewitness History of the Crimean War*
- *Neutrality as Independence: Great Britain, Serbia and the Crimean War*
- *Ireland and the Crimean war*
- *The Crimean Karaites and the Crimean war*
- *Wrapped in Whirlwinds: Poems of the Crimean War*

And that of course misses many works that don't have the exact phrase "Crimean War" in their title or subtitle, such as the famous 9-volume treatise by Kinglake, *The Invasion of*

the Crimea: Its Origin, and an Account of Its Progress Down to the Death of Lord Raglan that is indispensable for any one interested in the detailed account of the military action of the allies in the first part of the campaign in the Crimea.

[32]There are several books that a search for "Railway Mania" in the title uncovers that are relevant, but not about the Mania as a whole, or else treat it briefly, such as [27, 71, 225]. The only recent book that has extensive coverage of the Mania is Miller's *railway.com,* [153], but it relies on secondary sources and is devoted to a comparison of the development of early British railways and modern information technologies.

There are many valuable books that cover particular aspects of the Mania, such as the study [113] of British law and lawyers. The main point of this observation is that there is a dearth of studies of the Mania as a whole, and in particular of its economic and financial aspects.

[33]Freeman's book [82] is an excellent guide to how railways affected the Victorian imagination.

[34]*The Times*, July 31, 1845, p. 7, reporting on Group X. We do not know for certain that Russell wrote this passage. However, his editor, the famous John Thadeus Delane, had rebuked him in an undated letter ([13], vol. 1, p. 53) for "entrusting the most important of the Committees to the worst man," and instructed him to "attend it in future yourself, and let it have a larger report and closer attention than any of the others." This message from Delane must have been at an early date in the hearings on Group X, at the end of April 1845. If so, then, especially in view of some of the passages from Russell's fragments of an autobiography in [13], vol. 1, pp. 50–53, he was the writer of the cited passage, as well of some cited a bit later.

[35]Quoted in [13], vol. 1, p. 52.

[36]Taken from the same July 31, 1845, p. 7, report cited above.

[37]As an example, the person cited before for his description of George Hudson as a "haberdasher of York, a vulgar brute," was Sir William Gregory, MP. In his autobiography [94] he writes almost nothing about railways, aside from a sentence about his support for the Bentinck scheme for government support for railway construction in Ireland (p. 133). On the other hand, he devotes considerable space to the dress he bought in 1845 for a ball held by Queen Victoria, a dress that cost him £70-80 (which, relative to GDP per capita, is comparable to $150,000 or so today (p. 126).

The Gregory autobiography draws heavily on his contemporary journals. If those still exist, it might make for an interesting exercise to compare what he wrote in those journals with what is in his published autobiography. There are indications that in many cases, Victorians writing their personal reminiscences or autobiographies, or people writing their biographies, consciously or unconsciously skipped over the material dealing with the Mania. Further research might lead to interesting findings.

The Gregory autobiography also brings up another issue. Just how important was the Mania in making the British aristocracy, and the rest of British society, wake up to the potential for dramatic economic change?

[38]An interesting statistic is obtained by looking for articles listed in the *Wellesley Index* [103] that have the word railway or a related one in the title. The number jumps from 1 in 1842 to 4 in 1843, to 5 in 1844, to 9 in 1845, and then declines to 6 in 1846 and 2 in 1847. These are all small numbers, even the 9 in 1845. There are several ways to view this. The search picked up only a small subset of articles that dealt with railways, since many other ones about various aspects of the economy were not caught by the search criteria. And the number of periodicals covered by the *Wellesley Index* is not all that large, although the most prestigious ones are included. On the other hand, railways represented the grubby world of commerce that these serials preferred to stay away from, dedicated as most of them were to the more respectable literature, art, religion, and politics, so in a sense it is remarkable that there were even that many.

[39]May 12, 1845 letter, [176], pp. 191–92.

[40]Exceptions are dominated by the *Wellesley Index* [103]. There are a few other noteworthy instances of author identification, such as *The Collected Works of John Stuart Mill,* which show the great variety of newspapers and periodicals that he contributed to.

[41]We know from this and other letters of Charlotte Brontë that Emily was the sister who had made the decision to invest in railways, and that up until the quoted letter, the sisters had not discussed this decision with any outsiders.

[42]The figures in Table 1 are taken from [154, 155], with the pound sterling numbers in current money, not adjusted for inflation. GDP figures are for "Gross Domestic Product at factor cost." The last column, with qualitative descriptions of business conditions, is derived from [210].

[43]The rise in wholesale prices parallels almost exactly the rise in GDP, meaning that inflation-adjusted GDP was essentially constant. Using consumer prices, we get a slightly different conclusion.

[44]The lack of data was keenly felt, and there was a growing movement to collect and analyze statistics. But this effort was very small, as was the attention that could be devoted to such subjects. The entire Board of Trade, essentially the ministry of trade and industry, employed a grand total of 29 people in 1835, [148], p. 524. This was just one instance of the phenomenon that had been observed before, namely that the Victorian government, aside from tax collections and armed forces, was very small.

[45]The numbers that were known and discussed extensively were somewhat different, using somewhat different conventions than in the sources used for Table 1. Those numbers usually ran in the range of slightly more than £50 million per year. For example, [148] p. 483 gives the taxes for 1845 as £53 million, not the £57 million in Table 1. In addition, it

was widely known that there were various local taxes, amounting to about £10 million per year. However, they were not known precisely, since there was no central data collection about them.

[46]While that future is here, it is not all that clear that we are much better off than the early Victorians in understanding the economy. The GDP measure is increasingly perceived as inadequate, not providing proper information about factors such as the value of education, or about the damage we do to the environment. It could be that in a generation or two people will look at our decision making the way we look at that of the Railway Mania period, as having been based on ludicrously inadequate understanding of the economy, and using the wrong statistics.

[47]Most of the data in this table is taken from [154]. The revenue per mile figure is derived by simply dividing total revenue by miles of railways in service, which provides a rather distorted view (and [165] gives other numbers, derived from other sources). Table 2 provides the data for Fig. 2. Fig. 1 is based on data in [131], p. 186 for years up to 1843, and on statistics in reports of proceedings of the Railway Department of the Board of Trade for 1851 and 1858, Parliamentary Papers 1852 [1533] XLVIII.1 and 1859 Session 2 [2560] XXVII.637, respectively. Fig. 3 is based on [88]. All these statistics have problems, but not to an extent that would affect the conclusions of this work.

[48]The hated income tax, first brought in during the wars with France, and abolished afterwards, was re-introduced in the early 1840s on a "temporary" basis, only to be extended a few times on a "temporary" basis again, and to be made permanent later. But it should be noted that the income tax was brought back in order to reduce other taxes. In fact, the tax burden and the debt, measured as fractions of GDP, were both dropping as a result of economic growth. The big fluctuations in the economy concealed this from most contemporary observers, though, and the reigning perception was that taxes and debt were close to constant.

[49]However, the modern debt figures are only for monetary debt, and excludes health and retirement benefits promised, but not guaranteed, to the population. Including those produces far higher ratios. It is hard to find a single yardstick that will provide a fair comparison of the economy of early Victorian Britain, in the early stages of the Industrial Revolution, with modern economies.

[50]Figures taken from p. 483 of [148]. Modern sources, which make various adjustments to get consistent statistics, provide slightly different numbers, viz. [154].

[51]They did not know exactly how much poorer Britain had been back in 1815, but they were well aware it was considerably poorer.

[52]All the figures in [205] have to be treated with caution. They were for the official share capital, which often differed substantially from the money actually invested. For example, for financial institutions, such as banks and insurance companies, shareholders

would typically put up only part of each share's value in cash, and would only be called upon for the rest if there was a special need. For most corporations, retained earnings were often used for investment, but would not be reflected in the official capitalization. For example, the Glenmutchkin Railway had stated capital of £240,000. Suppose it had been built (and built for the stated amount, basically an unheard-of occurrence), and earned £10,000 in its first year of service. And suppose that it was decided not to pay any dividend that year, but put the entire £10,000 into expanding a station to provide better freight service, say. The early Victorian managers and shareholders would still have regarded the Glenmutchkin Railway as having capital of just £240,000. This was just one of the many problems with accounting in that period. A recent paper [12] documents through a careful study of the finances of five British canals just how serious a distortion this produced, in that dividend rates significantly overstated true profitability of capital that was employed.

[53] *Railway Times,* July 12, 1845, p. 1013, letter to the editor on "Railway prospects."

[54] This project was notorious because of the involvement of *The Times* in it. This paper published a brief "puff" about the line, and some of the people associated with this paper were also involved, however slightly, with the railway scheme. Therefore other papers, always eager to attack and discredit "the leading journal of Europe," kept citing this as an example of the corruption their competitor was supposedly involved in. In addition, the Direct London and Exeter was involved in protracted litigation. The original projector got pushed out of the project and, perhaps in order to justify himself, and also to avoid blame, wrote a detailed account of the affair. Thus we have a wealth of material about this affair.

[55] This is a considerable simplification. Railway projects were actually legal minefields for anyone who got involved. Such dangers were naturally disregarded or discounted at the height of the Mania, but once the financially exuberant phase of it had burst at the end of 1845, there followed much grief for investors, and much profit for lawyers. This will be discussed in *BICS* and is already covered in considerable detail in [113].

[56] This is again a simplification. There was some involvement of local governments, there was substantial national government involvement in Irish schemes, and there were some singular exceptions, such as the Caledonian Canal, paid for by the UK government for a mixture of reasons, economic gain a minor one.

[57] In volumes of *Early British Railways,* items COLL MISC 189/1 through 189/8.

[58] The anonymous author of [3] was arguing for railways as against canals, so it is not surprising that he would be prejudiced against the latter. His pamphlet was part of the great debate taking place in many parts of the U.S. as to whether to favor canals or railroads in expansion of the transportation network. In Britain, canal construction had pretty much come to an end by 1825. In the U.S., though, there was a burst of canal construction, stimulated to a considerable extent by the great success of the Erie Canal. The author of [3] wrote, in the same paragraph from which the previous quote was taken, that

> [canals] have been ruinous to their proprietors, but *porbably* have been beneficial to the public. Hence the absurdity of that canal mamia, which is beginning to prevail in the United States, – the absurdity of supposing because canals and other works have proved beneficial when constructed in *proper situations* that they are beneficial in every situation.

But in spite of his advocacy, many of the decisions were in favor of canals over railroads, and they were in retrospect seen to be mistakes. However, in the mid-1820s, the choice was not clear, since railroad technology was not very advanced yet, and the unexpected demand for high speed passenger transport to be discussed in the next section had not yet materialized.

[59]It should be mentioned that low profit rates for early railways are not necessarily a proof of the economic failure of the technology. Many if not most of those early lines had as major investors local landowners and especially mine owners, whose individual commercial interests were advanced by the construction of the new infrastructure. Hence these actors were often satisfied with low rates of return on their railway investments, since increased profits on their main businesses more than compensated. But from the standpoint of outside investors, these lines were failures.

[60]Corporate democracy was much more direct then than now, and dividends as well as management pay had to be approved by a vote of the shareholders.

[61]There seems to be only one recent book about the mid-1820s bubble, Dawson's *The First Latin American Debt Crisis,* [63], which, however, concentrates on foreign loans made during that period. There are also various technical articles. Overall, though, the coverage of this period is poor.

[62]Early 19th century Britain was very friendly to private enterprise, However, the friendliness was largely limited to successful private enterprise. Failure often led to debtor's prison, as happened with Dickens' father, for example, a formative experience in that writer's childhood.

The modifications of bankruptcy laws, driven to a considerable extent by the desire to promote economic activity, have been documented in detail in the literature. They were accomplished in spite of concerns about offending morality, intruding on private property rights, and the like. The discussion on this topic was far more extensive, and more public, than about tolerance for snake-oil salesmen, or for managements lining their own pockets at the expense of shareholders, another important aspect of the evolution of the financial markets.

As an aside, in the words of his Wikipedia entry (downloaded Nov. 27, 2009), "[t]hough [Scott] died in debt his novels continued to sell, and he made good his debts from beyond the grave."

[63]This was especially frequent for financial concerns, such as banks and insurance companies. The famed Lloyd's of London used to work on that basis until recently, with individual "names" only guaranteeing to pay the losses that might arise from particular insurance deals if such losses materialized, and not putting up much cash. In those cases, partial payment of capital was by design. In many other schemes, not enough subscribers were interested in the concern in the first place, or else they got cold feet after a while.

[64]During that mania, English wrote two pamphlets surveying the Latin American mining ventures.

[65]There were direct implications of railways for mining, in terms of enabling more efficient transport, and providing demand for iron rails and other products that increased flow of money to the mining industry. In addition, since railways absorbed far more capital than mines, there was the temptation to dip into the large money flows in that industry. Hence from an early stage, the *Mining Journal* had "Railway and Commercial Gazette" in its subtitle. And then, as the Railway Mania was reaching its climax in August 1845, English changed its name to *The Mining Journal and Atmospheric Railway Gazette, Forming a Complete Record of the Proceedings of all Public Companies.* Atmospheric railways were an interesting technological innovation that proved to be a flop, but attracted much attention for a while, with proponents claiming it would take over the industry. English undoubtedly was trying to boost his circulation and influence by filling a niche he saw in the coverage of the railway press. After a couple of years the "Atmospheric Railway Gazette" was dropped from this paper's title. In this respect the *Mining Journal* differed from the em Economist, which kept the "Railway Monitor" as part of its title until 1933, even though its coverage of that industry had long dwindled to insignificance.

[66]English only considered corporate ventures and foreign loans. There were also numerous individual or partnership ventures, such as the publishing businesses that Benjamin Disraeli and Sir Walter Scott were involved in.

[67]This figure is certainly an underestimate from a more sophisticated point of view that looks at total real investment. As was mentioned earlier in this manuscript, all accounts from that period deal just with the capital paid in by shareholders, and ignore reinvested earnings. Still, since we are looking at the situation with the eyes of a contemporary investor, this is the figure to use.

[68]A fuller treatment of the 1820s mania would discuss some earlier foreign loans. Considered wildly speculative when made, they provided spectacular payoffs for investors, in particular for the banking house of Barings. As usual for investment manias, the one of the mid-1820s was inspired at least in part by some tangibly successful ventures.

[69]He also, somewhat in anticipation of [85], and in full consonance with the *laissez faire,* anti-government views of that day, argued that the South Sea Bubble was not as irrational as was often supposed, as

> the South Sea scheme was the acknowledged undertaking of the nation; that by authority of the legislature persons were invited "to exchange their government for the securities of their South Sea Company," and thus, of course, inquiry was, in a great measure, stifled. The most cautious might be excused a very strict examination of what *the legislature had adapted.*

Had Disraeli undertaken some serious research into the history of the South Sea Company, he could have made this passage far stronger. Modern investigations show that not only did the government endorse the scheme, but that government insiders concocted it in order to swindle lenders got the benefit of the government.

[70]Prospectus of the Liverpool and Manchester Railway, dated Oct. 29, 1824. Available at the Guildhall Library, Microfiche 1824,170.

[71]*Railway Times,* Aug. 4, 1838, p. 413.

[72]Aytoun's claim that if it had not been for the appearance of demand for passenger transport, "railways would, in most instances, have proved an utter failure" should be qualified a bit. Had it not been for the passenger demand for fast trains, railways would have been built much more economically, and so might have been modest successes in many cases.

[73]This aristocrat was the beneficiary of the trust that controlled the Duke of Bridgewater's Canal. The munificent profits of that enterprise were predicted, and were destined, to be vaporized by the railway.

The story of the Liverpool and Manchester Railway provides many interesting lessons about markets and technology. As just one example, George Gilder has often said that "monopolies are good." What he meant is not that they are good in themselves, but that they stimulate innovation that bypasses or demolishes the monopoly. To some extent that is what happened in England with early railways. The canals that carried goods between Liverpool and Manchester formed a cartel that raised prices and inhibited commerce and industry in the region. That was the main reason the merchants of those cities put forth the gigantic effort of promoting and building the railway. But it took two decades, so one can question whether the Gilder prescription is always worth following.

[74]Among other effects was the transformation of railways into carriers. Early charters envisaged that railways would be rail ways, companies constructing the iron roads, and letting anyone use them upon payment of tolls. This is just one of the episodes from that period that have public policy implications for us today and for the future.

[75]Table 4 is derived from Table 27 on p. 111 and Table 34 on p. 166 of [188]. The Oct. 1830 estimate for passenger revenue was actually £17,887, see [68], p. 9, but I have left the figure as it given in [188].

[76]An interesting comparison can be made with the spread of steamships. Passengers did not find that technology as compelling as railways, and so the transition from sail to steam on the oceans took many decades. But that is another story.

[77]One of the fascinating questions is why the Industrial Revolution took off first in Britain, and not in the U.S., say. The light tax burden was just one of the many advantages that the U.S. might be considered to have had.

[78]Published in the *Morning Chronicle*, May 18, 1843.

[79]*Royal Com. on Railways of Great Britain and Ireland. Report, ...,* Parliamentary Papers 1867 [3844] XXXVIII Pt.I.1, p. viii.

[80]*John Bull,* Nov. 16, 1835, p. 365.

[81]*Herapath,* March 1836, pp. 32–35.

[82]*Herapath,* Sept. 1837, pp. 257–60. It might be worth noting, though, that this quote was made after the financial panic of 1837, when the general atmosphere was much more cautious than a year and a half earlier, when the quote about "[railway] opponents who are become the madmen" was printed.

[83]*Herapath,* Sept. 1837, pp. 257–60.

[84]In the title of the book, this part is referred to as "Plain maxims for railway speculators," but in the body of the work, the title of the chapter is given as "Plain rules for railway speculators." This same divergence was preserved in the 6th edition. This chapter was eliminated from the 7th edition of 1840 and later ones.

[85]*The Times* of Jan. 16, 1836, p. 5, and also *Scotsman* of Jan. 20, *Preston Chronicle* of Jan. 23, *Derby Mercury* of Jan. 27, *Manchester Times* of Jan. 30, and *North Wales Chronicle* of Feb. 9, and this is drawn from just a small sample of newspapers of the time.

[86]Table 2 shows total investment in British railways of £77.5 million by the end of 1844, quite a bit more than Lardner's estimate of £50 million. But Lardner was clearly writing only about the projects being considered in 1836 and possibly 1837, not the ones approved through the Parliamentary session of 1835, which had authorized capital of about £10 million, and ended up costing about twice that. Hence, given all the uncertainties, his estimate was remarkably accurate.

[87]*Athenaeum,* Jan. 23, 1836, pp. 67–70.

[88]*Mechanics' Magazine*, June 4, 1836, pp. 138–40.

[89]Had the internal combustion engine not worked for one reason or another, one can imagine that steam carriages would have become the dominant mode of transport instead,

once technology improved enough. After all, there were some relatively successful steamer cars, such as those of the Stanley company, a century ago.

[90]In the first edition of [171], published in 1833, he was worried about the economics of railway transport, and repeated another skeptic's computation that the annual working expenses of a locomotive on the Liverpool and Manchester line were £2,108, instead of the originally estimated £271. At that time he also seemed to think that speeds of 10–15 miles per hour were high.

[91]There were legal complications. In theory, the shareholders, by signing the various documents that had to be submitted to Parliament, were obliging themselves to carry out the project, and there was no legal way to back out of the commitments. In practice, though, Parliament never enforced such commitments, so the project could just be allowed to slide into obscurity, especially since the powers to raise money and acquire land were granted only for a fixed period of time.

[92]During the 1830s, shares were usually denominated in larger amounts, like £50 or £100. Further, in the 1830s, when Parliamentary scrutiny started, scripholders were usually asked to come up with additional funds for the deposit that Parliament demanded to guarantee this was a serious project. But let us not bother with these and a few other similarly minor technicalities.

[93]In situations like this, the development of the financial markets during the Railway Mania of the 1840s in some ways seemed to outstrip Aytoun's imagination. There were trades of the allotment letters, which seemed to avoid having to even borrow the money for deposits. But it is important to note that this only "seemed" to avoid that complication, since the law did not keep up with the financial markets, and when the market stopped going up, the chains of transactions often enmeshed all participants in legal travails.

[94]The usual provisions allowed railways to raise up to one third of their equity capital in loans, but only after half of the nominal capital had been raised. This limitation on leverage is the main reason so few of the British railways (unlike American ones) went bankrupt. It was just the shareholders who suffered.

It should also be mentioned that there were various other types of borrowings, all of uncertain legality, that took place, but we do not have to worry about that.

The stated purpose of making any allowance for loans will be discussed later, in Chapter 14. The official position, the only one that was regarded as respectable, was that a railway should be financed out of equity capital exclusively. There were certainly people who in good times explicitly advocated use of leverage to increase the rate of return on equity. But this was not regarded as proper, a sign of the relative immaturity of the financial markets. In practice, borrowings were resorted to primarily to slow down or lessen the calls on shareholders, when times got tough.

Those shareholders who did not pay their calls could be sued to compel payment, or else their shares could be declared forfeit, with a prescribed procedure for dealing with those. Understandably, both courses of action were avoided by managers to the maximal extent possible, as they were costly, cumbersome, and upset the shareholders.

[95]In practice, the extra capital was raised in a variety of ways, sometimes by selling common shares at discount to par value, sometimes through sales of "preference" or "guaranteed" shares. This represented development of the sophistication of the capital market, but it was not perceived as such by shareholders.

The new shares were offered to existing shareholders on a nominally *pro rata* basis. However, many proprietors did not have the money, or were not willing to put up the money, to buy their shares.

[96]We can see the efficient markets approach developing in this context. The attitude was that the market would be able to estimate the eventual value of a railway. Share price would reflect it, and there would not be any shortage of capitalists willing to assume the burden of paying the calls. William Aytoun presented this argument in [18], but so did many others.

[97][217], p. 292. I am citing the 1842 edition, the only one I have seen, but, judging from the review [5] cited next, this part of the work did not change from the original 1840 edition to the 1842 one.

[98]All unattributed quotations that follow in this section are taken from Chapter 78 of *Endymion*.

[99]For example, *Railway Times,* Dec. 12, 1840, p. 1074.

[100]*Railway Times,* Nov. 6, 1841, pp. 1165–66.

[101]J. T. Hackett in his "Ability of the public to make the projected railways" in *Herapath* of July 18, 1846, p. 909, estimated profits (by which he likely meant dividends, although that is not clear) of 5.03% in 1843, 5.27% in 1844, 6.01% in 1845, and a probable 6.50% in 1846. For a modern estimate, see [47]. The lack of consistent and credible measures of industry profitability is just one of many signs of the immaturity of the capital markets of the Mania period.

[102]*Civil Engineer and Architect's Journal,* vol. 4, April 1841, pp. 128–29.

[103]The *Economist*, Sept. 9, 1843, p. 24.

[104]It was not exactly the same line, the name and plan and of course the management had changed in the intervening decades, see [209].

[105]*Select Committee on Railways, Third Report,* Parliamentary Papers 1844 (166) XI.5, p. 1. Also *The Times,* April 5, 1844, p. 7.

[106]The *Economist*, Nov. 18, 1848, pp. 1297–99.

[107]Gareth Campbell has recently done an extensive study of prices of railway and non-railway shares in the 1840s in relation to dividends [47]. As has been known to experts on the capital markets of the early 19th century, shares were then valued almost exclusively on the basis of dividends. Campbell's work is very valuable, since it compares prices of railway shares to those of non-railways. During the late 1840s, there were many economic upheavals, leading to substantial oscillations in security prices. Thus looking at just railway shares (or even at those and government bonds, which could be combined productively with Campbell's data for further insights) can be misleading, and incorporation of non-railway data provides useful controls. Campbell has found that changes in railway share prices were strongly correlated to changes in dividends, leading him to conclude ([47], Abstract):

> Dividends rose and fell considerably during these years, and there is evidence that the railways were priced consistently with the non-railways, given the short-term dividend growth which they were experiencing. The key failure of investors during the boom was their inability to forecast the longer-term falls in dividends which would eventually occur. As assets were not obviously mispriced at the market peak there is the implication that it may be difficult to predict and prevent an asset price bust ex-ante.

The main result of this manuscript is that the "asset price bust" experienced by Mania investors was predictable, they had enough information to "forecast the longer-term falls in dividends," and it was indeed a "key failure" that they did not. Hence although I do agree with Campbell "that it may be difficult to predict and prevent an asset price bust ex-ante," his work therefore does not support this conclusion.

[108] *The Times*, Aug. 11, 1847, p. 6, business column.

[109]See, for example, the article from *Herapath* that was reprinted in *The Times* of Oct. 7, 1848, pp. 8–9 and the letter-to-the-editor of Frederick Spackman that was published in *The Times* of Oct. 11, 1848, p. 8. There was an interesting reversal. At the height of the Mania excitement, in 1845, it was railway expansion advocates who argued that markets were efficient, and so it did not matter who held scrip or shares, eventually those would get into the hands of people with the capital to pay the calls if the railways were promising. By 1848, railway advocates were in effect arguing that the markets were inefficient. Only railway share were depressed; a famous quote from *The Times* of Oct. 10, 1848, p. 6, said of the railway share decline,

> Where is this to end? It is evident the evil is peculiar to railways; it affects them alone, and hence, no revival in business, no abundance of money, nor even the assurance of universal peace, could bring a cure.

Railway industry defenders argued the depression was due to all the money for calls having to come from railway shareowners.

[110] *Punch,* vol. 8, Jan.-June 1845, p. 158, reprinted in *The Times*, April 3, 1845, p. 6.

[111] *The Times,* Feb. 6, 1844, p. 4, debate on Gladstone's motion for a select committee to consider new rules for dealing with railways.

[112] Leader in the *Morning Herald,* July 9, 1845, p. 10. Yet another example of a similar nature is presented by a leader in the *Glasgow Argus* of Oct. 2, 1845, p. 2:

> We think those who sound the alarm of an approaching railway crisis have somewhat exaggerated the danger. It may appear wise to the careless or to the ignorant to trace resemblances between the South Sea mania of our own country and ... Those, however, who look more deeply into the matter and think for themselves cannot discover sufficient resemblance of cause to anticipate a similarity of effect; but, on the contrary, so much difference as to lead to the very opposite conclusion from that reached by the alarmists. It cannot be denied that, amid the multiplicity of schemes which every day brings forth, too many are concocted and buoyed up for a short period by men of straw; that many are fraudulent, and instituted for merely stock-jobbibng purposes, and that sooner or later a day must come when the *bona fide* holders of shares in such projects must incur heavy loss, and perhaps ruin. But, allowing their full weight to all these drawbacks, we think it is equally undeniable, that railway extension has rightly occupied the attention of the people of this country, and that we ought not to expect or wish for any diminution of the present excitement until the length and breadth of the land is ribbed with iron, and horse and coach traffic has entirely disappeared.
>
> ... With Railways the foundation is broad and secure. They are a necessity of the age. They are a property real and tangible in themselves, and they must of necessity increase and lead to still further and beneficial developments as soon as they have pased that period of infancy, strong though it be, in which every man who can look before him cannot help feeling them to be. Success of them must be the desire of every friend of humanity; and both the quiet philosopher and the active man of business can perceive that there is not a more noble, or a more advantageous employment of British capital than in these projects; ...

[113] The *Law Times*, Oct. 25, 1845, p. 61.

[114] *Titan*, Feb. 28, 1846, p. 8.

[115] *The Times*, Oct. 18, 1845, p. 5.

[116] *The Times*, March 21, 1846, p. 4.

[117] Once the Mania crashed, *The Times* was, if not the first, then certainly the first influential paper to realize that the main problem had been overinvestment, and that

economic growth could solve the industry's depression. However, it implicitly claimed that if its warnings to limit railway outlay to £30 million per year had been followed, everything would have been fine. But on average railway investments did not go much above this figure. So in this regard we can certainly claim *The Times* was wrong.

[118] *The Times*, Nov. 13, 1845, p. 4.

[119] Jackman, [106], p. 585, wrote that "[e]ven such journals as the *Railway Times* and *The Economist* were encouraging this vast expenditure of money and declaring that railway securities would constitute important means of investing capital." The *Economist* certainly did claim "that railway securities would constitute important means of investing capital," and so it proved to be. Railway shares became the prototypical "widows and orphans" equity investment, as relatively low returns were combined with low volatility. As for the *Economist*, though, it did not tout railways as good speculation. It argued forcefully, as is discussed in the main text, on slowing down "this vast expenditure of money," and it takes a considerable stretch of the imagination to class it together with the *Railway Times*, which was a supporter of the Mania, although, along with all other railway papers, it railed against Glenmutchkins.

Guilcher, [95], p. 33, wrote that "[e]ven *The Economist*, which introduced a special column 'Railway Monitor,' refused to condemn the Mania, probably as a matter of principle." A strong supporter of *laissez faire* principles, the *Economist* did refuse to call for government intervention to deflate the Mania, on both doctrinaire and practical grounds. But it strongly condemned the Mania, and called on investors to come to their senses.

[120] The *Economist*, Oct. 4, 1845, pp. 949–953. Reprinted as the Preface to [223].

[121] The *Economist*, Nov. 15, 1845, p. 1141.

[122] The *Economist*, Nov. 22, 1845, p. 1173.

[123] The *Economist*, Oct. 11, 1845, p. 982.

[124] See, for example, the *Economist*, April 10, 1847, pp. 405–408, reprinted as Article XIII in [223], as well as the article on Sept. 18, 1847, pp. 1073–74.

[125] There is a brief biographical note in [144]. The only book-length biography is the hard to find [87] that was printed privately in a small edition. While invaluable, this volume devotes just one chapter to Morrison's involvement in railway policy. However, the authors of both [87] and [162] cite Morrison's diary and papers that were in possession of his descendants. Hence there is hope that some of the many questions this study raises about Morrison will be answered in the future.

According to [87], Morrison was closely connected with both *The Times* and the *Economist,* and so their assaults on the Railway Mania may have been coordinated. *The Times* certainly supported Morrison's efforts in Parliament, and in late 1846 allowed

Morrison to arrange for a writer to publish a series of "Morrisonian" letters on railway policy under the name of "Cato."

[126]According to William Rubinstein, an expert on British elites, James Morrison "was probably the richest commoner of the nineteenth century," [191], p. 56. The restriction to commoners reflects the lack of knowledge of the real wealth of the landed aristocracy. A few certainly possessed properties valued at more than the £4 to 6 million that Morrison left behind, but those aristocratic estates were often heavily indebted. Outside Britain, John Jacob Astor, regarded as the richest American of the first half of the 19th century, left an estate of about $20 million (£4 million) on his death in 1848. (The American plutocrats who significantly outshone any European competitors came a generation or two later.)

[127]It is true that he married his boss's daughter, but this happened only after he had already been made a partner, to keep him from going into business by himself, and after the pair overcame her parents' objections.

[128] *The Times*, Feb. 5, 1834, p. 2.

[129] *The Times*, Nov. 2, 1857, p. 12. A more detailed description by John Bowring, a long-time friend and associate of Morrison, is in [34], p. 58. Bowring's account makes the similarity to Sam Walton even closer, by describing Morrison's approach as that of concentrating on obtaining goods at the lowest possible cost, and trusting that sales will materialize if prices were low.

Some recent studies have attributed much of the increase in the standard of living in the U.S. to the effect of Wal-Mart in increasing the efficiency of the supply chain and lowering costs. This effect was done both directly, through its own sales, and through forcing competitors to follow suit. Morrison operated on a smaller scale than Wal-Mart, but likely had a similar, if smaller, effect on the British economy.

[130]He presented his observations and recommendations in a speech in Parliament in 1836. A brief account of this speech is in *The Times*, May 18, 1836, p. 4, and a full one in [158]. This speech is often cited in works on regulation as a pioneering contribution.

[131]He could point to examples that illustrated his predictions. Canals, as was mentioned earlier, were not too profitable in general. But some had huge profits, in the (deficient) accounting of that time, of over 100% per year on their capital. And some of those profits came from maintenance of discipline in cartels over long stretches of time, for example among the three canals service Liverpool and Manchester. Their price fixing lasted for two decades, and helped stimulate the creation of the Liverpool and Manchester Railway.

[132]Report available in *The Times,* March 21, 1845, p. 3. This quote comes from the version printed in [158].

[133]But even he was not completely pure, from the standpoint of the purists of *laissez faire* doctrines. Towards the end of the Mania he became the author of the government guarantees to investors that brought railways to India

[134]Morrison was aware of such criticism, and had an answer to it, see [158], but it was an involved answer, and for public debate the above point carried some weight. He did not mean for fares to go down to zero (although, interestingly enough, there were some people, mostly later, who argued for the government to provide free rail transit out of taxation). He, as well as many other railway critics, was pushing for fares at the levels of Belgium, which was often cited in unfriendly analyses of British transport.

[135] *The Times*, May 15, 1847, p. 3.

[136]There are some hints that he started realizing the inevitably low profits to come in the pamphlet [158]. It was published in 1848, although according to [87], it was written at the end of 1847. It collects his previous pamphlets and texts of some of his Parliamentary speeches, but most of it is an extensive new section, a sort of valedictory, telling the nation "Here is the good fight I fought for you, you did not listen, now you will have to suffer." In that section there are some passages about unprofitable branches that indicate Morrison was becoming aware of the problem that would soon become acute. Hopefully further research will illuminate the issue of "what did he know, and when did he know it."

[137] *Morning Chronicle,* Sept. 25, 1845, p. 6.

[138] *Coms. of Railways. Report, 1847, Appendix,* Parliamentary Papers 1847-48 [938] XXVI.289, p. 46.

[139]Translated and slightly paraphrased from pp. 124–125 of [65].

[140]These phrases come from the *Railway Times,* Dec. 25, 1841, p. 1331.

[141]The electric telegraph under consideration was that of Cooke and Wheatstone. Its potential, through better signalling, of allowing single-track operation, was hailed in a leader in the *Railway Times*, June 11, 1842, p. 620, for example. While the history of the electric telegraph is old and involves many inventors, the Cooke and Wheatstone one was the first to be deployed commercially. It had been invented specifically for to improve railway operation. And its wide deployment in the 1840s was greatly stimulated by the Railway Mania, which was promising to generate huge new business. For this story, see [29].

[142] *The Times,* April 5, 1844, p. 7.

[143]There is another aspect of decreasing costs for railways and its significance when evaluating just how rational the investors were during the Railway Mania. However, I will not explore it here in order to limit the length of this work, and also because there is no simple conclusion. The issue is that if costs did drop further in the future, as claimed by various people, such as James Morrison and Robert Peel, the Prime Minister (*The Times,* Feb. 6,

1844, p. 4), as well as various inventors, the lines built during the Mania could be driven into bankruptcy by later competitors building lines with the improved technologies. Was the market far-sighted enough to guess correctly that such threats would not materialize, or was it simply irrationally oblivious to the threat? A careful consideration of this issue requires consideration of a vast literature, especially of attitudes towards atmospheric lines, and does not lead to a conclusive answer.

[144]Lardner's survey [125] does have some mistakes, and the figures he cited in this quote are one clear example. (I mention this since this paper plays a major role in the discussions later.) Railway acts passed in 1845 were for 2,700 miles of railway, not 1,793, and the share capital authorized was £45.56 million, so average estimated cost was £16,874 per mile, actually very close to Lardner's figure. The 2,700 miles figure is taken from Table 2, while the £45.56 million is from pp. 30–31 of *Return of Railway Acts, 1844–47,* Parliamentary Papers, 1847–48 (731) LXIII.275, although the latter source gives mileage authorized in 1845 as 2,695 miles, one of the frequent minor discrepancies one finds even in official statistics of that period.

[145] *The Times,* April 7, 1846, p. 7.

[146]The *Daily News*, April 7, 1846, p. 7 quoted Brunel as saying "The estimate he had referred to would unfortunately not be carried out, the price of labour being now much higher; and if many more bills were granted, the cost of constructing lines would be fifty per cent. more than it was last year." Thus the 50% rise is represented here only as a hypothetical threat that would arise only if Parliament approved too many new projects that session.

The *Morning Chronicle* of that same day had a report that seemed identical to that in *The Times,* perhaps the result of these two bitter rivals sharing the services of the same reporter in this case.

[147] *The Times*, April 8, 1846, p. 4 and April 17, p. 4.

[148]For example, *The Times*, April 16, 1846, p. 3, and *Railway Chronicle,* April 18, 1846, p. 391.

[149] *The Times*, April 24, 1846, pp. 2–3. The *Daily News* of that same day cited Denison as saying that the contractors he had consulted "had informed him that the increase would be ten or fifteen per cent., not fifty as stated by Mr. Brunel." So this was a stronger indication of a price increase. The *Morning Chronicle* of that day cited Denison as saying construction expenses would be "as much as 10 or 15 per cent. higher."

[150] *Leeds Mercury*, April 25, 1846, p. 4.

[151]At that stage, the projects of the 1846 session were still being considered. However, it is likely that the price rises occurred in anticipation of many of them being approved. So

optimists may have consoled themselves with the thought that there would be no further increases.

[152]If they believed their project would pay 10%, a 15% cost increase, financed through a loan at even 5%, would lower their dividends only to 9.25%. If they were realistic enough to believe only in the traffic taker projections of a 7% profit, such a cost increase would lower that to 6.25%. A 50% rise, though, would lower dividends from level of 10% or 7% down to 7.5% and 4.5%, respectively, which surely would have caused some more serious reconsideration.

[153]One comment that needs to be made is that I don't have a good estimate of just how much expenditure was thus hidden from public view. This appears to have varied from line to line, and it would take careful investigation of accounts of individual railways to find out.

[154]House of Commons hearings records, House of Lords Record Office, HC/CL/PB/2/8/12, April 19, 1842, p. 62.

[155]*Railway Times,* Nov. 27, 1841, pp. 1231–32.

[156]*Railway Times,* Aug. 20, 1842, pp. 848–49. Bidder also warned that an additional £10–20,000 might be needed if freight traffic was as high as he thought it might be, as opposed to the small amount that he put into the traffic tables he presented to Parliament. The need for such spending would arise only if the traffic materialize, and if it did, it would be a very profitable addition to what they were counting on.

[157]*Railway Times,* Feb. 15, 1845, pp. 201–202. Financially, this project was a disaster for shareholders, but not because of cost overruns. Instead, revenues were just a fraction of those projected. One of the arguments for the presence of a collective hallucination among British investors is that they did not investigate this case of a serious shortfall in demand. A careful look at the Yarmouth and Norwich project might have made them more cautious.

There will be some details on revenue estimates for the Yarmouth and Norwich in [165] and *BICS.* George Parker Bidder, who was the traffic taker here, was also the traffic taker on the Manchester and Southampton Railway, the abortive project that came up in Watkin's quote about "sheep on the fair day" in the Introduction. He was a prominent engineer and a calculating prodigy. He was unusual among engineers in being interested in traffic taking.

[158]Even that estimate did not cover everything. A substantial part of the £40,000 cost overrun was due to paying interest on calls. This was a practice that became common in the 1840s, in which railways paid shareholders interest on the calls that had been paid, up to the time the lines went into service. This was of course just an early return of capital to shareholders, and it was understood as such. It helped to overcome the limitation of large denomination shares, though, and may have produced a nice psychological effect. By modern accounting standards, that early return of capital should not have been counted

as a capital expenditure, but the prevailing thinking at the time of the Mania held it as such, and it was treated as such in company accounts. So a non-negligible fraction of the roughly 50% cost overrun that was observed by investors was just an illusion, the result of faulty accounting. On the other hand, railway promoters appeared to be happy to foster that illusion.

In some railway projects in the early 1840s, there was explicit discussion of all the financial factors. For example, during a about the proposed Devon and Cornwall Railway in early 1842, it was stated explicitly that revenue would be sufficient "at the rate of $11\frac{1}{2}$ per cent. to pay dividends upon the subscribed capital, excluding the interest of money for five years during the construction of the Railway, or at the rate of 10 per cent upon the subscribed capital if interest during 5 years be allowed upon the calls at 5 per cent." For that project, it was also explained that the full borrowing powers were expected to be used, in order to lower the amount of share capital that would have to be attracted (*Herapath,* Jan. 15, 1842, pp. 51–52).

[159] *The Times*, June 2, 1845, p. 3.

[160] *The Times*, May 30, 1845, p. 6.

[161] The *Bankers' Magazine*, Sept. 1846, pp. 437–439. The article proclaimed the impossibility of raising all the money that the railway projects of the 1846 session would require. After adding up all the likely demands for capital, it concluded that "this result is too preposterous to be seriously contemplated." As part of the calculation, this monthly showed the exact statistics for lines authorized in 1844 and 1845, and then, in deducing what the actual spending would be, wrote: "We will place the matter in a favourable point of view, by supposing that under the Acts of 1844 only a sum of 13 *millions* is raised, instead of the full limit of £14,793,000 [and similarly for 1845 projects]." The 1844 authorizations were for equity of £11.121 million and loans of £3.672 million. So this organ did not believe the official claims that only the authorized equity capital would be needed, but seemed willing to accept cost overruns would amount to only about half the authorized loans.

[162] The current Parliament building was under construction, after the disastrous fire of 1834. Parts of it started to be used for committee hearings during the session of 1846.

[163] The "leavings of Westminster Hall" referred to lawyers specializing in Parliamentary railway cases, who did not have much prestige among the legal fraternity, but were getting tremendously rich by, among other things, giving long speeches. They had strong incentives to give such long speeches, as they were being paid for each day, and so some managed to carry on for days on end. Their pay was higher than the five guineas per day that ordinary witnesses received.

[164] Although Queen Victoria was not crowned until 1837, for convenience I will count all of the 1820s and 1830s as part of the Victorian era.

[165]For a general and thorough discussion of the impact of railways on Victorian attitudes, see [82].

[166]It is hard to get precise figures for the 1840s, but on the eve of the nationalization of the telegraphs in the UK in 1868, the accumulated investment in the industry was around £2.5 million. There were estimates that the plant could have been reproduced for about £2 million, but the government paid £5.8 million in compensation. Revenues were only about £0.7 million per year, less than a sixth of the revenues of the Post Office alone. (Postal services were always far larger than telegraph ones, see [163], in terms of revenues, and, one can argue, also in terms of impact on society and on imagination.) The source for the figures for the telegraph is [110]. For the railway industry in 1868, capital was around £512 million, and revenues £40 million per year. See [154].

The comparison of the Internet to the electric telegraph is very apt at one level. Both involved very small investments, the telegraph because it did not go to the home, just to some offices, and the Internet because it was able to rely on the large infrastructure built for voice telephony. At another level, they differed. The Internet has had a much larger impact on the economy. And if we consider the Internet not in isolation, but rather as the culmination of the ICT (information and communication technologies) revolution, then the relevant investment is much larger, comparable to that in railways. The Internet bubble, from *a priori* view, then makes much more sense, as a way to capture the gains from the entire ICT investment. But that is another topic, not relevant for this manuscript.

[167]Ireland, which to us may seem laughably close to England, was a distant and foreign country to most Englishmen of the early 19th century. One writer, describing his travels in the Emerald Isle, wrote ([105], pp. 80–81):

> I particularly inquired, of persons of all conditions and opinions, as to whether any improvement was discernible in the condition of the people, within the last twelve or fifteen years; and I regret to say, that I heard but one opinion: that a visible deterioration had taken place in the condition of the labouring classes and of the small farmers. How often do we hear the question mooted, Is Ireland an improving country? The reply ought to depend altogether on the meaning we affix to the word improvement. If by improvement, be meant more extended tillage, and improved modes of husbandry, – more commercial importance, evinced in larger exports,– better roads,–better modes of communication,–increase of buildings,– then Ireland is a highly improving country; but, up to the point at which I have arrived, I have found nothing to warrant the belief, that any improvement has taken place in the condition of the people.

[168]*Era*, March 26, 1848, p. 9.

[169]The leader is from the *Standard,* one of the second-rank London dailies. It is quoted as reprinted in the *Perthshire Courier* of Oct. 2, 1845, p. 4. The leader was defending the

Mania against its critics. A longer version of the quote, which illustrates better what the writer had in mind, and in particular is:

> Among a people multiplying in numbers and improving in wealth, intelligence, and enterprise, in a ratio far beyond the ratio of their numerical increase the means of internal communication must grow hourly more and more in demand; indeed, the means of such internal communication may be said, as the great poet says of jealousy, to "make the meat it feeds on;" thousands travel, thousands send goods, because the means are offered to them at little cost of money or trouble, who would not either travel or send goods if these means were wanting or costly. Every railroad commencing with even an inconsiderable traffic, is sure to be almost overwhelmed with passengers and goods at the end of a few years. The short experience of railroads that we have had proves this; but indeed, common sense would have anticipated experience in making the deduction.

[170]Speech of May 11, 1836, in the House of Commons, as reprinted in [158], quotes from pp. 105–106.

[171]*Railway Times*, Oct. 27, 1855, p. 1141, and *Herapath*, Oct. 6, 1855, p. 1021.

[172]*Herapath*, April 16, 1853, pp. 430–431.

[173]A year later, this same publication quantified its hope for growth by saying that it "believe[d] that traffic of the existing lines will not stop before it reaches, in the course of years, [a level 50% higher than at time of publication]" (another leader in *Herapath*, July 15, 1854, p. 703). These were extremely modest expectations, and by the end of the 19th century, just 46 years after this publication, traffic on lines that existed in 1854 must have grown at least 3x, as opposed to the 1.5x expectation. (It is hard to be precise, since the prediction is about just "existing lines," and it is hard to tell what their traffic was, given all the extensions and amalgamations that took place. However, over that half a century, mileage tripled, and revenues grew over 5-fold, so it is not unlikely that over the lines in existence in 1854, traffic grew as much as 3-fold.)

[174]The "Greenspan put," as Wall Street liked to call it, was the conviction that in cases of financial blowups, Alan Greenspan as head of the Fed would slash interest rates, thus transferring money from savers to financial institutions, and thus allow the latter to make up any losses they had suffered. It worked very well on several occasions (well for the financial industry, that is, and perhaps for the economy, but not for the savers). The "Bernanke-Paulson put" adds to the "Greenspan put" an essentially unlimited access to taxpayer funds.

[175]Just one illustration of Lardner's thinking in the 1830s is offered by the pamphlet he wrote proposing a scheme for steam navigation to India [122]. In his financial analysis of the project, he assumed (pp. 56–57) that the steamships he recommended would be used

without any major modifications for 15 years. That is clearly not consistent with a vision of technology progressing so rapidly as to make those ships obsolete in 5 or 10 years.

[176]In particular, data for Cornish steam engines appear to have influenced the thinking of many technologists, and persuaded them that much efficiency gains should be expected from small incremental improvements. Perhaps even more important for Lardner was the criticism he faced for his incorrect prediction, and the enforced exile from Britain, discussed in Chapter 30, which exposed him to American thought and American realities.

[177]An American railroad manager had scathing comments about what he thought was shameful neglect of freight in all of Europe, and especially in England, [64]. Of course, one has to mention that in the U.S., goods transport had from the beginning provided higher revenues than passengers, so his point of view was biased.

There was an interesting and very public controversy towards the tail end of the Mania. John Whitehead campaigned for railways to stop or at least further de-emphasize freight transport. There will be some discussion of this controversy in [166].

[178]It is worth noting that locality dominates even when costs do not enter into the picture. It has been observed that traditional mail, with its "postalized" uniform pricing (within a country) has most communications local, and that some recent online communities also show strong locality.

[179]Based on tonnage of shipping employed in such trade, [178], p. 410. A similar conclusion emerges from looking at the declared value of exports, pp. 366–367 in that volume.

[180]It is a bit of a surprise that Aytoun did not call his line the Direct Atmospheric Glenmutchkin Railway, to add yet another hot buzzword to the title. Perhaps he belonged to the ardent minority who thought that atmospheric lines were actually going to work and be competitive.

One of the more famous spoofs of that era was an ad drafted by Henry Cole and published in the *Railway Chronicle* of Oct. 11, 1845, p. 1524. (Cole was on the staff of this publication, in addition to working as a civil servant.) It was for "The Great National Direct Independent Land's End and John O'Groat's Atmospheric Railway, with Steam Ferries to the Scilly and Orkney Isles, and Coasting Docks at both Termini." It was to go between the two points in Great Britain furthest apart, and was claimed to be designed to transport passengers from one end to the other in 7 hours, without any stops. The satire was laid on very thick, but Cole reported ([60], vol. 1, p. 70) that "[i]t was received as serious!" Perhaps as a result, in the next issue of the *Railway Chronicle*, p. 1632, it was explicitly labelled as "absurd."

[181]For example, Morrison, in his March 20, 1845 speech in the House of Commons, pp. 147-148 of [158], said

> It may indeed be said that my plans and safeguards are proposed too late, because all the principal lines of railway are finished. ... This, however, is not the case; a great number of important trunk lines have yet to be constructed. ... There is no direct line to Exeter; the Great Western can only be considered a trunk like as far as Bristol. The report of the Board of Trade upon the Western Railways, states that a direct line from London to Exeter would diminish the distance upwards of twenty miles. I have been told it would be much greater; at all events this circumstance is an important one, as the comparative shortness of a competing line is now considered a great element in its favour.

So in Morrison's opinion, a saving of 20 miles out of 200 justified constructing a special line!

[182]And you cannot raise the fares. Your application for a charter was in competition with another projected line, say the Direct Atmospheric San Francisco and Philadelphia Railway. Parliament did not run auctions, but was using what are today called "beauty contests," in which different applications were supposed to be judged on the basis of their benefits to society. In the evaluations of the gains from a new line, fares were a major factor, so you (and your competitor) asked for rates that would have been profitable with many long trips, but are ruinous with short ones. And now you are stuck with them.

[183]The *Economist*, Nov. 18, 1848, pp. 1297–99, reprinted in an abbreviated version by the *Scotsman* of Nov. 22, 1848, p. 1.

[184]It had been planned as a connection between large railway stations in London, and was supposed to carry considerable freight. Instead, from the beginning it was dominated by passenger traffic between intermediate stops. But this is a story we don't have space for here.

[185]*Railway Times,* Feb. 21, 1846, p. 243.

[186]As another example, the M. C. Reed study mentioned a few paragraphs earlier says, after presenting statistics that revenues of the lines being studied came to about 80% of estimate, that ([185], p. 24) "the table is evidence that the schemes were not basically unsound: traffic expectations were largely realized." The implicit attitude seems to be that this is a rather unexpected finding, and that the writer had expected revenues far lower.

[187]For example, on pp. 230–31 Robertson claimed that "[t]he figures for income from traffic [presented in tables in the book] ... are in general a success story." Other passages with similar claims occur on pp. 77, 86, 200, and 237. There may also be others that I overlooked. It is intriguing that in the final "Summary and conclusions" chapter, Robertson did not use the categorical language cited elsewhere in the book and only provided some general positive comments about traffic coming close to expectations (p. 322).

[188]Quote below occurs in [188], p. 231, for example.

[189]A few other quotes to the same effect have been cited in other context earlier in this work. For example, William Aytoun, in the passage from [18], pp. 636–37, cited in Chapter 6 in connection with the unexpected arrival of demand for passenger transport, without which "railways would, in most instances, have proved an utter failure," also claimed that

> Wherever the system has had a fair trial, the number of passengers has been quadrupled– in some cases quintupled, and even more; and every month is adding to their numbers.

This 4x or 5x growth factor was an important element of the myth of demand exceeding expectations, as we'll see. A little later in that section, the citation from Lardner's survey [125], as to why freight transport did not meet expectations, started with the statement "the traffic in passengers exceeded all anticipation."

[190]In partial exoneration of Robertson, it should be mentioned that on p. 165 he had a discussion of the financial performance of these lines. There he stated that if instead of the estimates presented to Parliament, one uses the more modest ones that had been published earlier in the prospectuses of these two lines, the comparisons look better, and in one case "the results may reasonably be said to have exceeded expectations." But that is playing with data, and he did not even present the prospectus estimates. In any event, since the Parliamentary estimates carried the greatest weight with the public, and involved the traffic takers, I feel it is best to use those.

[191]There is an additional element that is neglected in this analysis, namely loans, but it does not affect the conclusion significantly.

[192]See p. 77 of [188], for example. Two of the very best lines, the Monkland and Kirkintilloch Railway, and the Ballochney Railway, had averaged, by the late 1840s, 5.5% and 7.5% over the preceding two decades, respectively.

[193]University of St. Andrews, Special Collections, ms38288–ms38295.

[194]Robertson did not mention traffic takers in the book [188], although he surely must have seen references to them in the literature he studied. He only discussed traffic estimates, and on p. 191 he claimed that from the mid-1820s to the mid-1840s, the engineer was in charge of everything, including "ascertaining traffic levels and calculating the likely amount on the new railway." That claim was to some extent true for the first 10 years of this period, but not for the second. Even during that first period, demand estimates were often made by people other than engineers. For example, in Table 27 on p. 111 of his book, Robertson exhibited details of the various demand forecasts for the Edinburgh and Glasgow Railway, which are summarized in Table 4 in Chapter 6. The Oct. 1830 estimate there was attributed by Robertson to James Jardine, the engineer for the project at that time. However, a reading of the report [68] shows clearly that while Jardine wrote the engineering part of it, the traffic forecasting was done by the committee.

While Robertson in his book did discuss the ordeal of Parliamentary scrutiny, he did not get into much detail. In particular, he did not write about the various specialists, such as the traffic takers.

[195]This passage occurs on p. 3 of that draft chapter. The "early railways" phrase could cause confusion, but Robertson clearly had Mania lines in mind, as the Edinburgh, Perth & Dundee Railway was promoted and built during the Mania.

[196]Robertson, on p. 2 of the "Railway Mania - Post" chapter, cites the *Railway Times* of April 3, 1852, p. 344, to the effect that costs "turned out to be as correct as the original estimates of traffic, the company would now have been in a comparative state of prosperity." That citation comes from the report of the directors. But there are no numbers there, or in Robertson's book, to substantiate the claim about demand. The cost overruns are well documented, see the various reports and comments in that issue of the *Railway Times*, pp. 343–344, 347, 353, and 355. A line that had been projected to cost £650,000 in 1845, was on the way to costing more than £3 million. But these were not pure cost overruns, since there were many extensions and related ventures along the way. On a per mile basis, it seems that costs increased from £15,625 per mile in the 1845 estimate to about £42,000 in 1852, so the growth in costs was not quite the 4x factor that the directors of this line cited.

In 1845, this line, then known as the Edinburgh and Northern Railway, was projected to have length 41.6 miles, and to earn annual revenues of £73,863 (*Supplement to the Votes and Proceedings of the House of Commons,* Session 1845, House of Lords Record Office HC/CL/JO/6/235, pp. 937–946). By the end of 1850, those sections of the line in service were 72.07 miles long, and brought in revenues of £121,900 ([195], p. 126). Thus the expectation of 1845 was for annual revenues of £1,775 per mile, while the actual revenues in 1850 came to £1,691. Thus by this measure, the traffic estimate was indeed very accurate.

[197]Such as including in the estimates from the 1830s a line that was authorized by Parliament, but never built, and showing it as producing zero revenues in the 1840s.

[198]An abbreviated and edited version of Shaen's table is presented in [165].

[199]*The Times,* May 9, 1845, p. 6, report on Group X, the notorious bunch of proposals that included the London and York Railway.

[200]Directors' report, presented to the shareholders on Aug. 21, 1840. Printed as an ad in the *Derby Mercury,* Sept. 2, 1840, p. 1.

[201]*Bristol Mercury,* Feb. 25, 1837.

[202]*Manchester Times,* Jan. 23, 1836, p. 1.

[203]According to Lardner's testimony in the House of Commons hearings on the London and Brighton proposals in 1837, the 5th edition sold out in a few months. It was printed in 3,000 copies, so this was a significant publishing success.

[204]It is rather surprising that Lardner used the 2x growth projection in the 5th edition of his book. In an earlier publication, from late 1834 [119], he several times asserted that one should expect at least 3x growth.

While there did not seem to be much public attention paid to the changes between the 5th and 6th editions of Lardner's book, he was grilled on those in the House of Commons hearings on the London and Brighton proposals in 1837. However, the focus of the attention on that occasion was on his engineering recommendations, about permissible gradients, and not about traffic estimates. Interestingly enough, Lardner claimed in his testimony that he regarded both editions as valid, in spite of the differences in the rules.

[205]The *Athenaeum,* Sept. 3, 1836, pp. 626–27. This was also reported in the *Morning Chronicle* of Aug. 26, p. 3, which in its brief account did note Lardner's claim that the 4x increase "was so well ascertained that it might be stated as a statistical fact." There was also a full account of Lardner's lecture in the *Bristol Mercury* of Aug. 27, p. 4, and briefer ones elsewhere. See also [121].

At the same conference he also lectured, separately, and much more controversially, on steam navigation across the Atlantic, a topic to be dealt with in *BICS.* The lecture about effects of the railway system had one other claim that also attracted criticism, but was widely distributed, namely that it was speed more than low cost that were responsible for the popularity of railway travel. This may also have influenced railway investors in ways that damaged their financial interests.

[206]*American Railroad Journal,* Nov. 12, 1836, p. 709.

[207]On p. 6, Brown wrote that "[a]s contrasted with government action, private enterprise has proved more active and energetic; and if we consider its operations in England, we are bound to admit that it has shown a power and copiousness of resources, such as no government could rival, and such as are well worthy of cultivation and encouragement, as an independent and self-acting organization, coming in aid of the general government, and without the same liability to financial derangement, or party action."

[208]The *Economist*, Nov. 18, 1848, pp. 1297–99. This article was reprinted in the *Scotsman* of Nov. 22, 1848, p. 1, although the reprint omitted some interesting parts that indicated the *Economist* was beginning to grasp the concept of steady and essentially unbounded growth.

[209]Processing the numbers in the article, we find that the *Economist* implicitly or explicitly expected that in 1851, capital investment in British railways would come to £230 million, and annual revenues would be £15 million. (The actual figures turned out to be £253 million and £14.4 million, respectively, so this was not a bad estimate.) Hence even if we

assume just 40% of revenues were to go towards working expenses. we find that £15 million would produce just £9 million to pay for the capital investment of £230 million, or a bit under 4%. Since there were many loans at 5% (although most were for only a few years), and many leases and guarantees at 6, 7, and 8%, and sometimes even higher rates, this necessarily implied that shareholders holding common stock were bound, on average, to get terrible returns, in spite of all the assurances of a reasonable future that the *Economist* was providing. But the *Economist* did not make this obvious deduction, even though it did discuss the loans, leases, and guarantees. This reluctance to explore deeply the dismal state of railway investment seems rather general. Although this is a very subjective judgment, it does seem as if most publications of this period were afraid to peer under the rocks of the railway enterprise, as if in fear of finding worms or snakes underneath.

[210]Rough estimates based on [178], pp. 293–294, 304. Variants of these figures were floating around, for example [101] estimated that there were 27,000 miles of turnpikes in Great Britain, and a total of about 150,000 miles of all public roads in Great Britain and Ireland combined.

[211]The figure for 1829 taken from p. 294 of [178], that for 1848 from *Return of Length of Road in each Turnpike Trust in England and Wales,* Parliamentary Papers, 1847-48 (752) LX.413.

[212]The *Economist,* Oct. 21, 1854, pp. 1148–1149.

[213] *The Times,* Jan. 27, 1846, p. 4. The *Daily News* in its report on the debate quotes him as mentioning 20,000 miles of turnpikes, while the *Morning Chronicle* only wrote that he mentioned the "immense" "extent of turnpike roads in England and Wales," and *Hansard* did likewise.

[214]One can provide many more quotes that support this view. For example, *The Times* of Aug. 9, 1845, p. 6 reprinted a piece (almost certainly a leader) from the *Globe* entitled "Railway speculation." It was "alarmist," in the sense the term was used then, worried about the damage the Mania was likely to inflict on the economy (which is surely why *The Times* reprinted it). It made some very cogent points seldom seen in other "alarmist" literature of that period, for example about the proposed expenditure dwarfing various other important economic activities, and about the volume of existing traffic providing a bound on how much demand railways were likely to generate. (Had this last insight been followed up in a quantitative way, the real fallacy of the Mania might have been exposed there and then. But it should also be said that this piece had some unrealistic estimates for cost of railways that showed the writer was not in a position to make credible quantitative estimates.) And it predicted, although again without convincing quantitative estimates, "that no new line can be expected ultimately to return much more than the ordinary interest of money." (As it turned out, most returned less "than the ordinary interest of money," the reason the Mania was so destructive to investors' pocketbooks.) But the *Globe* was enthusiastic about railways in general. It wrote:

> We do not for an instant doubt the very great practical value of railways. As means of cheap and rapid internal communication, they are, perhaps, the most valuable improvements that can be made in a commercial and manufacturing country. Nay, if, instead of projecting and completing within the next few years 1,000 or 2,000 miles of these new roads, we could make 20,000 or 30,000 miles, we do not doubt that the result would be a proportionate addition to the real wealth and the productive capabilities of the country.

Thus the main concern the *Globe* had was about the rate of investment. The main point for us, though, is that this paper felt that investing in "20,000 or 30,000 miles" of railway in "the next few years" would be a productive use of capital if such capital was available.

The *Scottish Railway Gazette* of Sept. 27, 1845, p. 431, in a leader "Investments in railways" wrote that

> Some of [the former opponents of railway who have become supporters] even go so far as to say that ... every town and village will speedily have its railway, and that a line of railway will yet run parallel with every mile of the thirty thousand miles of turnpike at present existing. As to this last we give no opinion. It *may* be the end, but if so, it will be at the end of many years. We are satisfied, however, that many hundred miles of railroad will be led where common roads would never have been led; because the facilities which the common road would have given would not have answered the purpose which railroads will answer, of making conveyance cheap.

Thus the *Scottish Railway Gazette* writer was skeptical whether railway mileage would soon equal that of turnpikes. However, he felt that many people thought it would.

[215]According to pp. 30–31 of *Return of Railway Acts, 1844–47,* Parliamentary Papers, 1847–48 (731) LXIII.275, the 4,593 miles authorized in 1846 had share capital of £95.46 million, which works out to just under £21,000 per mile. The 1845 authorizations came in at £16,900 per mile according to that source.

[216]For example, *The Times* in its leader on Nov. 17, 1845, p. 4, which accompanied the publication of Spackman's tables, wrote that "[e]arly in September we reckoned [the limit on investment in railways] at thirty millions as the very outside." Morrison, in various places, including a House of Commons debate a couple of months later, claimed that £20 million "was quite as much as could be each year safely applied to such purposes," (*Hansard's Parliamentary Debates,* 3rd ser., vol. 83, 1846, col. 218).

[217]J. T. Hackett, in a letter published in *Herapath,* July 18, 1846, p. 909. His (implied, it must be admitted) claim was based on the exaggerated estimate that Britain had raised that sum of money in taxes and loans in just one year, 1815, in its final struggle with Napoleon. However, he seemed to raise this figure as an extreme, to make his real estimate seem more reasonable. By considering railway authorizations of 1845 and 1846, he concluded that "only" £30 million per year would be needed over the next five years

[218]This figure was attributed to him by James Morrison in a debate on Jan. 26, 1846 in the House of Commons, *Hansard's Parliamentary Debates,* 3rd ser., vol. 83, 1846, col. 217, and also *Daily News,* Jan. 27, 1846, p. 3. (*The Times* did not report this claim in its coverage of the debate.) Since Hudson was present, and did not rise to contradict Morrison's statement, we can safely assume he did make such a claim someplace.

Hudson's role at the height of the Railway Mania was an interesting one. He was not infrequently cited as an opponent of the Mania. He definitely was an opponent of Glenmutchkin railways, but he was not an opponent of rapid railway extension. Most likely he just did not see any point in sharing the glory and the profits with the Dunshunners and M'Corkindales. As Aytoun wrote in the introduction to the Glenmutchkin Railway story, "[s]peculators are like wasps; for when they have once got hold of a ripening and peach-like project, they keep it rigidly for their own swarm, and repel the approach of interlopers."

[219]As an aside, the peak year for spending was 1847, when about £44 million was spent, even though the government did not intervene to impose limits. The market intervened on its own. In the words of a report (*Coms. of Railways. Report, 1847, Appendix,* Parliamentary Papers 1847-48 [938] XXVI.289, p. 46) "[i]f railway companies had experienced no extraordinary difficulty in raising capital during 1847, it may be estimated that their expenditure in that year ... would have been about [£64 million]."

[220]*Return of Railway Acts, 1844–47,* Parliamentary Papers, 1847–48 (731) LXIII.275, pp. 30–31.

[221]*Railway Times,* Feb. 15, 1845, p. 180.

[222]As just one example, the prospectus of the Eastern Counties Junction and Southend Railway on p. 3 of *The Times* of Oct. 3, 1845, said that "[t]he estimated traffic from the above sources shows a clear profit of more than 10 per cent. upon the capital of the Company."

[223]The *Railway Record* of April 20, 1844, p. 39, had a leader on Gladstone's reports and proposed legislation, which had not yet been passed, and was under discussion. It said:

> Fortunate it will be for many a speculator in new stocks should one out of ten of the schemes now so rife come under the operation of the Committee's propositions [which allowed the government to intervene when profits reached 10%]. If they could but make sure of 10 per cent., the projectors would have less need than they daily exhibit of puffing off their several undertakings, and of propping up a declining market. In point of fact, few of the new lines *promise* more than 10 per cent., and perhaps one effect of the Committee's Report may be to persuade the public that that dividend is likely to be secured; for why should a law be passed, hinging upon that amount of return, if it were not likely to be reached?

[224]The *Railway Times,* Aug. 8, 1846, pp. 1093–96.

[225]Leader in *Bradshaw's Railway Gazette,* Aug. 15, 1846, p. 141.

[226]Notice that there is an element of irrationality in the share values. If the shareholders of the LNWR really believed that they were going to continue getting 10% dividends on their entire investment once all the branches, extensions, and the line were complete, LNWR price should have been considerably higher. The main LNWR shares, of £100 par value (and with the full £100 paid up), had been trading, at the height of the boom, at £250, to yield 4% on the market price. That was approximately the market standard in those days, about 4% on a stable and safe passive investment. Now suppose, for simplicity, that LNWR got the right to build extensions that would involve getting from each shareholder £100 for each £100 share, and that this investment would be just as profitable. Then, a few years down the road, when the construction was complete, each holder of one original share would have paid in £200, and would have property worth £500 in the marketplace. So at that time, in the summer of 1846, each share should have been worth a bit less than £400 (the £500 to be realized around 1850, say, minus the £100 that would have to be paid, and minus some discount for having the money tied up for a few years, and some contingencies), but certainly at least £350. That it was not, indicates the lack of consistent pricing that we can also see in today's financial analyst evaluations.

[227]Letter published in the *Scotsman,* Oct. 13, 1847, p. 3. Reprinted in [14], p. 14.

[228]The historical data about expected costs and revenues were not widely distributed. It could be obtained from old newspapers from the 1830s, or from Parliamentary papers. In addition, the *Railway Register,* a monthly edited by Hyde Clarke, also distributed, starting with vol. 4 in the second half of 1846, the *Railway Portfolio,* a publication devoted to reprinting old railway prospectuses.

[229]Shareholder democracy was far more direct then. Among other features, if enough shareholders wanted it, an independent shareholder committee would be set up, with access to all company records and all company personnel. Using company funds, they could also hire outsider experts (such as accountants or engineers) to assist in the investigation. This was done in some railways in the early 1840s, and in many in the late 1840s.

[230]A leader in *Herapath,* Nov. 3, 1849, pp. 1117–18, noted that "[i]f the present report can have any fault found with it, it must be on account of its length, but the matters it treats of are of that important character, that, long as it is, we do not wish it shortened." This was in reference just to the last part of the third report from that committee. It should be said that most of the 200 pages consists of appendices, financial statements, and the like.

[231]Summary in a table on p. 110 (p. 33 of the Conclusion of the Third Report) of [224], reprinted in *Herapath,* Nov. 3, 1849, p. 1113.

[232]Statistics on mileage opened each year, in relation to year of authorization, are taken here and elsewhere in this section from p. viii of *Report of Proceedings of Railway Dept., 1851,* Parliamentary Papers 1852 [1533] XLVIII.1.

[233] *Return of Railway Acts, 1844–47,* Parliamentary Papers, 1847–48 (731) LXIII.275, pp. 30–31.

[234] In 1846, as will be explained later, the requirement for traffic taker testimony was eliminated, so only some committee hearing transcripts contain their estimates. However, in those cases that were checked and had such testimony, the results were consistent with the estimates given in this section. More cases will be checked later, in the preparation of *BICS.* It appears that promoters did employ traffic takers for all or essentially all lines considered by Parliament in 1846, since the decision not to require their estimates was made late, and it was not certain whether individual committees would dispense with it.

[235] *Scottish Railway Gazette*, Sept. 6, 1845, p. 380.

[236] The figure for share capital in this listing is actually £44.3 million, and differs from the £45.6 million in the *Return of Railway Acts, 1844–47* that was cited earlier. The total mileage given, 2,841, also differs somewhat from the official figures cited earlier. This was not unusual in those days, even different government documents would produce somewhat different figures. The problem in assembling reliable statistics were serious, since railway acts had provisions for extensions, acquisitions, and abandonment of previously authorized mileage.

I have further modified these numbers. The *Scottish Railway Gazette* compilation listed capital for all lines, but for 14 projects, provided neither revenue nor profit figures. I subtracted these entries, with total capital of £3.43 million, from the published figure, resulting in the £40.9 million estimate used here. Further, for one project, "London & South-Western–Metropol. Exten. No. 1," there was an annual revenue figure, £48,642, but no profit data, so in that case I assumed 40% working expense estimate and added the resulting £29,185 to the profit (dividend) entry.

[237] An unexplored question that probably can be attacked, at least partially, is about the extent to which the 4,000 of unbuilt railways were the less promising half of the authorized mileage. There were extensive debates among promoters and shareholders as to whether to go on or not, often stretched over several years. The prospects of the proposed lines played central roles in such discussions. The reliability of revenue forecasts played an important role, either directly, or indirectly, through attempts to gauge how committed various shareholders were.

[238] *Leeds Mercury*, Sept. 14, 1839, report on the regular half-yearly meeting of the Manchester and Leeds Railway.

[239] Cited on p. 90 of [57].

[240] The book [129] was published in 1839, and says the *Encyclopaedia Britannica* had already appeared. However, the copy of the relevant volume of this reference work that I saw [130] is dated 1842, very likely a second or third printing of this popular publication.

The passages about traffic taking and creating a railway company appear to be identical in the [129] and [130].

[241]House of Lords Papers 1838 (185) XX.1, p. 277. All references to 1838 estimates and testimony for this line that are made in this section are to this report. The charter for this line allowed charges as high as 3.5 pence per mile. Management in 1843 charged 2.09, 1.56, and 0.85 pence per mile in the three classes that were offered.

[242]The simplest way to see this is to take the expected passenger revenues of £82,629, convert to pence, divide that by the estimated number of trips, 341,421, and divide that by 2.

The Edinburgh and Glasgow Railway was 46 miles long, so this figure is not consistent with the claim that on most lines most of the traffic was expected to be from one terminal city to the other. However, this particular line had special features that made it deviate from the standard pattern.

Passenger and freight transport in Britain had to be based on distance according to railway charters, one of the many interesting public policy issues that have implications for modern infrastructures

[243]For simple average. If we do this more properly, weighting by fare levels, in order to reflect the longer average trips of first class passengers, we get an estimate of 25 miles, somewhat closer to the expected 29, with only a 13% miss.

[244]Just how many fewer is a matter of debate, and will be discussed in *BICS*. This was a topic of extensive discussion during the Mania. But as a first order approximation, the experiments carried out by railway managers in the 1830s and 1840s, although not systematic, suggest that overall, elasticity was close to 1, so that lowering fares would have boosted passenger numbers without much of an effect on revenues.

[245]*Railway Chronicle*, Aug. 31, 1844, pp. 481–82, gives the 1844 figures, and the House of Lords testimony cited earlier provides the 1838 estimate, p. 275.

[246]All quotes from the London and Birmingham hearings are taken from the House of Lords Papers 1831-32 (181) CCCXI.167.

[247]This was an important difference that will be discussed in more length in [165] and *BICS*. It reflected neglect of local traffic. An awkward fact that contradicted general expectations was brought up in the hearings, and was swept under the rug.

[248]Lawyers' statements were not transcribed as part of committee records, and so unfortunately have in almost all cases been lost, with a few exceptions.

[249]*Caledonian Mercury*, April 1, 1844.

[250]Extensive collections of rail roads (in the sense of various types of specially engineered roads for transport of coal by horse-drawn wagons), a few hundred miles in total, had already arisen in the coal country near Newcastle at the end of the 18th century. But little is known about them. They arose through private agreements, called wayleaves, largely between landowners and coal mine operators, so no official notice was taken of them. However, these contracts did give rise to a multitude of lawsuits. Hopefully therefore some one will be able to exploit what records might remain from such proceedings to provide a better picture of the transaction costs involved in building a large scale infrastructure through private agreements. Railway promoters apparently felt those costs were prohibitive even for moderately long lines, and avoided use of wayleaves whenever they could.

[251]There were some complications to this picture. Most committee hearings could be avoided if there were no opponents. Normally, the House of Commons would treat railway proposals first, and then only the projects that survived that ordeal would go to the House of Lords, where opponents would have a second chance to defeat them. During the 1846 session, because of the unprecedented volume of work, some cases were started in the House of Lords.

[252]The world 'derail' was introduced to the English language by the same Dionysius Lardner that we have encountered before and will encounter again.

[253]*Punch*, vol. 9, July–December 1845, p. 12, article entitled "Engineering evidence."

[254]*The Times,* Jan. 27, 1846, p. 3.

[255]Whether it was a serious consideration for this MP or not, many of his colleagues were looking with dread to the session that had just opened. Parliament met for half a year, and even when it was meeting, it was normally a part-time affair. The House of Commons would not usually meet until 4 pm, and often there would be far fewer than 100 out of the 658 MPs in attendance. Thus it was possible to combine a regular career with service in Parliament, and that is indeed what many people did. For example, George Carr Glyn, elected in 1847, was head of his bank, and chairman of the London and North Western Railway. Similarly, James Wilson, the founding editor of the *Economist,* did most of the work on this paper, handled a regular job, and served as MP. Railway committees were a major disruption of the accustomed lifestyle of the MPs. Starting in 1845, attendance was mandatory, and meeting usually ran from noon to the opening of the House of Commons at 4 pm. Although many of the committees dispatched their cases quickly, some turned into marathon affairs. The most infamous was the Group X committee, which occurred in the "sibylline leaves called traffic-tables" quoted in Chapter 2, which ran for three months, including (atypically for railway committees) sessions on most Saturdays. The session of 1846 faced about twice as many railway cases as the previous one, so naturally there was anxiety about being able to handle the workload, and about having one's life disrupted.

In the words of William Aytoun ([18], p. 639),

> It was not without much flattery and coaxing that the adroit Premier ... could persuade the unfortunate members that an unfaltering attendance of some six hours a-day in a sweltering and ill-ventilated room, where their ears were regaled with a constant repetition of the jargon connected with curves, gradients, and traffic-tables, was their great and primary duty to the commonwealth. Every morning, by times, the knight of the shire, albeit exhausted from the endurance of the over-night's debate, rose up from his neglected breakfast, and posted down to his daily cell in the Cloisters.

[256]To be precise, each project had to undergo scrutiny by a Standing Orders committee, and a separate Committee on Merits in each house of Parliament. It was the merit committees that were required to report on the financial viability of projects.

[257]This will be one of the major themes of *BICS.* The Railway Mania appears to have catalyzed a big shift in thinking on this issue. Until then, the general perception, among decision makers as well as the general public, was that investors had to be properly rewarded for an enterprise to be regarded as successful. This was shown by the citation in Chapter 8 from John Stuart Mill [152] that "the test, the unerring test, of the usefulness of a railroad is its yielding a profit to the subscribers." One of the unsung but substantial effects of the Mania was to change minds by demonstrating that society could prosper on the ruins of shareholders. That suggests new ways of looking at policy making regarding markets and especially corporations.

[258][16], pp. 173–75. The other article is [20], and there Aytoun is much harsher, likely the result of the embitterment he experienced watching the Mania unfold and sweep many of this friends and acquaintances to their doom.

[259]Articles by J. Brinkley in the New York Times, June 2 and 25, 1999.

[260][20], p. 70. Aytoun is simplifying a bit. While witnesses before the House of Commons were not sworn, those before the House of Lords were. Just how important that was in eliciting honest answers is subject to some doubt. Aytoun, with his harking for feudalism, very likely put an exaggerated weight on it.

[261]As just one of many examples, when the *Caledonian Mercury* of Jan. 15, 1847, p. 3, declared that "[a]ll the railway undertakings before the public are sound and legitimate," it almost surely meant that the Glenmutchkins had been weeded out.

[262]The Third Report of the House of Commons Select Committee, *The Times,* Feb. 19, 1846, p. 3.

[263]*The Times,* March 3, 1846, p. 7.

[264]In his 1847 article about railway witnesses that was mentioned earlier, [20], William Aytoun wrote that "[t]he trade is not quite so good a one as it was two years ago, when any

intelligent and thorough-going calculator of traffic commanded his own price, and therefore invariably stood at an exorbitant premium."

[265]This did not pass entirely unnoticed, at least by those of a skeptical mind. The business section of the *Era,* a weekly that will be mentioned later, complained in the May 11, 1845 issue that "[t]here was a time, in the good old times of Railways, when something like a traffic table was put forth in each prospectus, but now that essential is entirely dispensed with."

[266]*Railway Times,* Aug. 9, 1845, p. 1202.

[267]*Railway Times,* Sept. 6, 1845, p. 1464.

[268]There was absolutely nothing about traffic in the second prospectus referenced here. In the first, about half the space was devoted to a list of the provisional committee, and half to listing all the advantages of the line, in particular to providing a direct connection between the port city of Southampton and the industrial heartland of England. There was a table listing how much shorter the connection would be to various places. But about revenues, all it said was that the promoters were confident their "line ... guarantees to the proprietors as large a return upon the capital to be invested as any railway in the kingdom."

[269]There were many ads for railways which did not list the provisional committee, but those usually noted that a "highly respectable" one was being formed, and would be announced soon.

[270]The typical long-term lease provided for a guarantee of 6% on invested capital in a branch line, plus half of the profits above that level.

[271]*The Times,* Nov. 30, 1838, p. 2.

[272]This John Robertson was almost surely the highly respected editor of the *Railway Record,* and prior to that for many years the editor of the *Railway Times.*

[273]*Railway Times*, August 7, 1847, pp. 1011–1012.

[274]Chaplin also made a mistake, a rather strange one, for somebody as experienced as he was. Traffic evidence was presented before the committees on merits, not before the committees on Standing Orders.

[275]*Morning Chronicle,* Aug. 31, 1837, pp. 3–4, and *Herapath*, Sept. 1837, pp. 196–219.

[276]The £118,499 came from estimate of existing passenger traffic, at railway rates.

[277]The expectation that additional revenues would be pure profit reflects the belief that marginal costs were zero. That is true in the short run, but not in the long run. The earlier practice, which this committee assigned much blame, of estimating working expenses as a

fixed fraction of revenues was also false. Unfortunately there was little solid understanding of railway economics at that time, something that Lardner's 1850 book *Railway Economy*, [126], did much to remedy.

[278]The historical record shows the ratio of expenses to revenues for the British rail industry climbing rather consistently, exceeding 60% by early in the 20th century. But that is hindsight, and one could not have expected investors in the 1840s to anticipate that. It was not uncommon to read of estimates and projections of working costs below 40% of revenues. For example, an article in *Herapath,* Jan. 3, 1846, p. 21, was estimating that by that point working expenses were down to 35–36%.

[279]While early promoters of railways assumed that railways would replace horses, by the time of the Mania it was well established that nothing of the sort had happened. There were no reliable statistics about the total number of horses, or even of those used in transport, but it was known to be growing. Statistics of horses in Great Britain appear to be available only from 1867, and show they grew from 1.27 million in that year to a peak of 1.57 million in 1905. Even in 1938, on the eve of World War II, there were a million horses in Britain ([154], pp. 202–203). *The Times* in 1841 (Feb. 12, 1841, p. 4), in looking for ways that railways had hurt the country, could only complain about the supposed deterioration in the quality of horses, and not about their quantity:

> We pass over, among other collateral effects of the oppression of the stage-coach and posting interests, the effect which must necessarily be produced upon the breed of horses. It is a mere fallacy to suppose that the same class of horses which formerly excited the admiration of travellers will now be employed upon the short cross lines of road by which railways are supplied; a very inferior animal is found to be sufficient for that purpose. So long as we have occasion to maintain cavalry regiments, any cause which tends to diminish the supply of good horses must be regarded as a national evil. Even the wisdom of the 19th century has not yet invented a plan for mounting cavalry upon steam-engines.

And indeed it took the wisdom (or otherwise) of the (early) 20th century to mount cavalry upon the descendants of steam-engines, the tanks. But that is not relevant for us. What matters is that the ranks of horses used in transport were not decreasing, so expenses of non-rail transport, which were dominated by the costs of horses, were not declining. Thus railway revenues represented new economic activities, not just a diversion of existing funds flowing through this new channel.

[280]There were some exceptions, for example for passengers expected to be diverted from water transport, as well as from the relatively small number of mail coaches, and so on.

[281]See Chapter 6, "Bianconi and his cars," by T. P. O'Neill in [161] and [144].

[282][178], p. 300. Another instance of a complaint about lack of information about traffic occurs in a book from that period by a civil engineer, Edmund Leahy, [127], pp. 158–59.

He was concerned with insufficient data for estimating expenses of road maintenance, and wrote:

> If we except the comparatively few localities through which lines of railways have been projected, public attention has been little, if at all, directed to the amount of traffic on common roads; and even where it has, the inquiry has been conducted for another and far different purpose, and so the information acquired can be turned to but little account in the present case without some further investigation.

[283][106], pp. 316, 319–20. Some of these informers were apparently not too scrupulous, see the article "Prosecution of a coach driver" in the *Scotsman,* Oct. 1, 1831, p. 3.

[284][178], pp. 301–302.

[285]For example, in the *Morning Chronicle,* July 31, 1838 and Sept. 15, 1840, and the *Preston Chronicle,* Sept. 19, 1840.

[286][178], p. 302. Frederick Williams in his history of British railways presents statistics on coach travel ([221], p. 273). He used this to illustrate his claim that "the number of horses now employed in public vehicles does not appear to have fallen off in any perceptible degree, and that there is not even a proportionate falling off in stage-coaches." His data is given in Table 8. I have not seen it in any other sources from that era, and based on the text of [221], it seems likely these statistics were prepared by Williams based on data he obtained directly from the tax authorities. Unfortunately this table does not distinguish between different types of coaches, so we can't conclude much about the number of passenger-miles of capacity, much less passenger-miles actually traveled. (For example, one might expect that for local service, coaches would be smaller than for heavily-traveled long routes, and might have lower rates of utilization.) But it provides an interesting perspective on the extent to which coaches were not eliminated totally, just moved to shorter, feeder, routes.

Table 8. Stage-coaches in Britain, 1836–49.

year	millions miles run
1836	48.0
1839	40.0
1842	43.0
1844	37.0
1847	35.0
1848	31.5
1849	30.0

[287]This fallacy was tied up with our old friend, locality of traffic. The 60% load factor was based on observations near large cities, and the general assumption was that passengers on a long distance coach would mostly travel from one terminal city to the other. But from

everything we know of locality of traffic, that is very unlikely. And we certainly do have anecdotal evidence of people catching a coach or getting off a coach in the middle of a route, often in ways that would not show up in the coach company accounts. For example, the famous biography of George Stephenson by Samuel Smiles mentions, in describing the first meeting of Stephenson and Nicholas Wood with Edward Pease, which led to locomotives being used on the Stockton and Darlington Railway ([202], pp. 186–87), says that at the close of the meeting

> the two visitors prepared to take their leave, informing Mr. Pease that they intended to return as they had come, "by nip," that is, they would obtain a sort of smuggled lift on the stage-coach, by tipping Jehu, for in those days the stage-coachmen were wont to regard all casual roadside passengers as their special perquisite. And thus the two contrived to make a cheap journey of it between Killingworth and Darlington.

For some further comments on this issue of passengers getting off or onto coaches on the road, see [106], p. 319. Unfortunately, there do not seem to be any statistics on how widespread this practice was.

Since coach operators were taxed on the capacity of their coaches, not on actual traffic, they had an incentive to sell tickets primarily to passengers from one end of their route to the other. But it is extremely unlikely they succeeded too well in this.

[288] *Abstract of General Statements of Income and Expenditure of Turnpike Trusts in England and Wales, 1845,* Parliamentary Papers 1847 (695) XLIV.421, p. 2, gives tolls in England and Wales in 1845 of £1.323 million. *Abstract of General Statements of Income and Expenditure of Turnpike Trusts in Scotland, 1848-49,* Parliamentary Papers 1851 [1343] XLVIII.463, p. 2, shows Scottish turnpike tolls of £0.238 million over a one-year period in 1848-49.

[289] As an example, in spite of hard effort, Jackman [106] had to give up on estimating the average coach fares. Lardner in his survey, [125], p. 495, claims they were four pence per mile, which is almost surely too high (as is his claimed saving by rail of 2.5 pence, which is not consistent with his estimates of 4 pence for coach and 1.8 pence for railways).

[290] Article entitled "Steam coaches and loco-motive engines," the *Scotsman*, Nov. 25, 1829, p. 6, reprinted in the *Morning Chronicle,* Nov. 28, 1829, p. 1. This article was not signed, but since the *Scotsman,* like most provincial newspapers, was a small operation, and Maclaren not only was the editor, but had published in 1825 a famous series of articles evaluating the prospects of railways, which were expanded into a pamphlet, it is hard to imagine that anyone else could have penned the piece. Maclaren used the estimated total revenues of road carriages, as deduced from turnpike tolls, to squash some over-exuberant estimates of John Herapath. Herapath, who would later come to own and edit the railway newspaper *Herapath,* was in the late 1820s an enthusiastic proponent of steam carriages. He published an outlandish estimate of the savings that would be achieved in transport costs if horses were replaced by steam carriages. Maclaren showed this estimate was impossibly large,

since it exceeded by at least a factor of 5 the entire spending on inland transport: "How then we ask, is it possible to save [£100 million] when the whole internal carriage of the country costs only [£16 or 18 million]!"

A similar argument, on a local scale, was made by the committee that proposed a railway from Edinburgh to Glasgow [68]. They estimated total cost of carriage between those two cities from tolls on turnpikes connecting them.

[291]For example, in the Aug. 15, 1847 issue, writing about the shareholder meeting of the London and South-Western Railway that was discussed before, the *Era* referred to Chaplin's "glowing expectations of the future, and in his statistics, which were admirably got up," without pointing out the obvious inadequacy of them, namely the concentration exclusively on the number of passengers carried, and lack of discussion of revenues and profits. There was just a touch of doubt expressed in writing that "[a]ll we say is, we hope they may be amply realized, ..."

[292]The *Spectator,* Nov. 1, 1845, p. 1044. Most of this leader concentrated on the "usual suspect," namely danger to the economy from diversion of too much capital to railway investment.

[293]*Railway Returns for England and Wales, Scotland, and Ireland, for 1905,* Parliamentary Papers, 1906 [Cd. 3106] CVI.601.

[294]The "neither absurd nor unreasonable" phrase makes the projection sound tentative. This may have been a concession to the public's unwillingness to embrace the idea of persistent growth.

[295]The actual number was closer to 10,500 miles, for all years up to and including 1846, which is what Lardner had in mind. There are several mistakes in Lardner's work, some typos, others probably the result of lack of access to detailed information, and a few that are puzzling.

[296]We know from Lardner's letters to Macvey Napier, the editor of the *Edinburgh Review,* that the latter had shortened Lardner's draft. However, Lardner pronounced himself happy with the abridgment in his Nov. 2, 1846 letter, British Library, Macvey Napier papers, Add 34626 f. 473. Thus we have to conclude that he intentionally left this passage in its enigmatic state.

[297]At the end of 1846, this segment of the press was doing its best to fight the Cato letters that were appearing in *The Times.* Morrison had arranged for these to push his proposed changes in British railway policy. Given the arrival of a new government that might be more receptive to Morrison's arguments, the "railway interest" was fighting to preserve what it still thought were promising prospects of high profits

[298]Letter in the *New York Times,* Jan. 17, 1881, p. 2.

[299]The *Athenaeum,* Dec. 5, 1840, p. 962, in a review of the 7th edition of Lardner's *Steam Engine.*

[300]Henry Ward Beecher was a prominent American speaker, clergyman, social reformer, and abolitionist, and brother of Harriet Beecher Stowe, the author of *Uncle Tom's Cabin*, as well as of several other prominent siblings. The speech was on the occasion of the celebration of the completion of the first trans-Atlantic telegraph cable, the one that worked only intermittently for a few months before going completely dead. The source for the quote is the *New York Times,* Aug. 11, 1858, p. 1.

[301]This book is clearly a development of the "Railways at home and abroad" survey, a fact that does not seem to have been noticed before.

[302]2002 poll, ⟨http://news.bbc.co.uk/2/hi/entertainment/2509465.stm⟩. One should not take the results of this poll too seriously, since it was not run on the best scientific practices, and it was alleged that students at Brunel University went to great lengths to stimulate votes for the engineer whose name adorns their institution.

[303] *The Times,* March 27, 1843, p. 6 and March 5, 1846, p. 6.

[304]This is more, but on the order of what was mined in California and Australia during the 1850s.

[305]There were substantial, although unsuccessful, efforts to find and explore gold deposits in Britain in the mid-nineteenth century. One of the great corporate scandals of the era was the collapse of the Royal British Bank in 1856, in which Humphrey Brown, a traffic taker earlier in his life, in fact one of the most prominent traffic takers, was involved (and briefly jailed). The economic loss in that collapse was due to a large extent to a big investment in a Welsh gold mine.

[306]Such a happy outcome was actually even less likely than it might seem based just on knowledge of geology. The default in railway real estate acquisitions was for mineral rights to remain with the landlord, the Railways' Clauses Consolidation Act, 1845, 8 Vict. cap. 20, sec. 77 (which basically codified standard provisions that had been present previously in separate acts). It was not unheard of for railways to purchase mineral rights, but they had to negotiate for them separately, and could not force a sale if the landowner was not interested.

[307]Note that shareholders in the original AOL did very well in this fashion through the merger with Time Warner. That merger is usually presented as an unmitigated disaster, with citations of the combined market valuations of the two companies at the time the merger was announced of $300 billion, versus May 2009 valuation of Time Warner and Time Warner Cable, the two companies descended from that merger, of just $40 billion [175]. And from the standpoint of society, or of capitalists as whole, it seems certain that this merger led to huge losses. Time Warner was distracted from its core competencies. And even AOL may have lost some opportunities, since as the dominant ISP it was well-

positioned to benefit from the trends that gave rise to Google, Facebook, Twitter, YouTube, and other popular services. On balance, though, it does seem unlikely that it could have taken full advantage of those opportunities, and so would likely have gone bankrupt, just like Excite@Home. Hence the merger with Time Warner was a coup for the shareholders of AOL, who, to the extent they held onto the shares of the merged company, have ended up with something worth about $20 billion today, instead of zero. Therefore, Steve Case's apology for the merger [187] seems misplaced. He should be celebrated as a hero to his original shareholders, with a statue in Investors' Hall of Fame.

In a similar vein, Qwest, once a high-flying long-distance fiber supplier, survived only through its purchase of U S West, one of the Baby Bells. Joe Nacchio was sent to jail for his insider trading activities, which worked against the interests of long-term shareholders of Qwest. But he deserves great credit for preserving at least a slice of their equity by using the stock of Qwest for this purchase. The deal was a disaster for those U S West shareholder who held on, as well as for ratepayers in U S West territory, who were saddled with a company on the brink of disaster that charged high rates and did not invest much in new technologies. But Nacchio should be a hero to the original Qwest shareholders.

[308]The *Morning Herald* of Jan. 26, 1846, as reprinted in the *Scotsman* of Jan. 28, 1846, p. 2.

[309]Ludicrous as it might seem today, there were some who claimed that railway shares were safer than government bonds. See for example [218]. Or consider the article "Railway loans, interest, and guarantees" from pp. 95–102 of the *Monthly Railway Record* of April 1847, reprinted on p. 402 of the *Railway Record* of April 10, 1847, and cited in the pamphlet [218], which claimed not to understand why railway preferred shares paid 1.5% more per year than government obligations. After all, available information "fails to furnish an adequate prudential cause, why the borrower with an immense surplus of tangible, realised security [i.e., the railway industry], must pay one-third more for his advances than the borrower who has nothing but the credit of an over-burthened exchequer to appeal to [i.e., the British government]." But then those were the days when anything that involved the government was deprecated, at least as long as good profits seemed profitable. When dividends and share prices collapsed, the language changed, and the same John Whitehead who wrote so negatively about security of government obligations in 1847 in [218] was asking for low-cost government loans and government guarantees for railway dividends in 1849 [219].

After making fun of John Whitehead and his colleagues and their claims that railway property was more secure than government bonds, it is necessary to admit that they did have a point where investor returns are concerned. Unlike railway common shares, which generally fared very poorly, guaranteed (and preference) shares did well in the long run. Because of the low leverage that Parliamentary charters allowed, hardly any British railways went bankrupt, and those guaranteed dividends were almost uniformly paid in full and on schedule. Hence investors who bought them and had the financial resources and fortitude to hold onto them for a decade did earn excellent returns. (This was the case

for some shares that Darwin bought for his wife's trust fund.) Of course, they also had to suffer (or enjoy, depending on disposition) some exciting times when market prices of their shares dipped, in response to exaggerated fears for railway solvency.

A noteworthy feature is that Whitehead in [218] referred to the general prejudice against guaranteed shares, and claimed they were just a transitory phenomenon, not to be issued again after the monetary tightness experienced in 1847. In fact, guaranteed and preference shares grew in popularity, part of the increasing sophistication of capital markets that were developing instruments to fit desires for varying combinations of risk and return.

[310]The fervently free-trade *Daily News* had great fun at Disraeli's expense, as it turned out that "whilst the protectionist party were so loudly exclaiming about the distress of the farmers, the rents upon the estate of Mr. Disraeli had undergone a considerable advance," Jan. 19, 1850, leader on p. 4.

[311]K. Guha and E. Luce, "Greenspan backs bank nationalisation," *Financial Times,* Feb. 18, 2009 cited Greenspan as saying "It may be necessary to temporarily nationalise some banks in order to facilitate a swift and orderly restructuring. I understand that once in a hundred years this is what you do."

[312]A strong counterexample to this characterization of railway history publications is the Cleveland and Powell book on railway promotion, [57]. It is based on American experience, but quite a lot of what it says applies also to Britain. In particular, the role of "snake oil salesmen" in building the railway system is discussed there, although briefly. But it is an unusual work in that it does touch on this key subject.

[313]Railway investments in 1841–2 came to about 1.25% of GDP. For United States in 2007 (i.e., before the crash of 2008), that would have amounted, compared to GDP, to about $200 billion. If we compare to total government spending, we come up with a much higher figure, of perhaps up to $500 billion. By contrast, railway investment in 1847–8 was comparable to $1 trillion dollars per year, as proportion of GDP, and $3 trillion dollars as proportion of government spending.

One could ask whether the Railway Mania, in addition to preventing a revolution in Britain, did not contribute to the revolutions on the Continent. By pulling in capital from there, or at least deflecting British capital that might have been invested on the Continent, the Mania likely made the depression there worse. But the relative magnitudes of the economies of Britain and the Continent suggest this was only a minor factor.

[314]In this connection Hobsbawm betrays a stunning lack of understanding of technology and economics. He cites the skepticism about railway investments expressed by McCulloch (without specifying the dates, but McCulloch was consistently skeptical throughout the 1830s and 1840s) as "anticipating by more than a century the rationalization proposals of the 1960s." But this entirely ignores the 70 years of persistent expansions of the railway system after the Mania. The "rationalization proposals of the 1960s" were a response to

the spread of cars, trucks, and buses. Powered by the internal combustion engine, they were a far superior solution to short-range communication needs than railways. Had those not appeared, there is little doubt that railway mileage would have continued to grow. And after those "rationalization proposals of the 1960s" were implemented, the British railway system was far larger than at the conclusion of the Mania.

[315]It appears to be known for certain only that the sisters read these two papers on a regular basis in 1829, see footnote on p. 117 of [203]. But it does not seem unreasonable to believe they continued reading them into the 1840s.

[316]There is a vast literature about the British press in the 19th century and the role of *The Times* in it. These are just a few brief comments.

[317]Leader in the *Morning Herald*, Nov. 17, 1845, p. 4. It concerned a meeting between lawyers whose writing on the side for newspapers was being threatened with curtailment and the Attorney General.

[318]The formal title by 1845 was *Herapath's Railway Journal,* with various subtitles. It was a lineal descendant of the *Railway Magazine,* the oldest British serial devoted to railways, established in 1835. However, it was not the first English-language serial. That honor belongs to the *American Railroad Journal.* Since the *Railway Magazine* was taken over by John Herapath soon after its foundation, and eventually had its name changed to reflect that of its owner and editor, I will refer to all all versions of this publication as *Herapath.*

[319]Where contemporary sources are listed in the bibliography of this paper with the name of the author, the attribution usually comes from [103], a great achievement of modern scholarship.

[320]Letter to the editor in the *Railway Times* of July 12, 1845, p. 1013.

[321] For extensive statistics on growth in volume of communications, see [163].

[322]Peel writing to Croker about Babbage's request for funds to build his difference engine, cited in [135], pp 49–51. The polynomial x^2+x+41 has the unusual property that its values for $x = 0, 1, 2, \ldots, 39$ are all prime, and in a certain well-defined sense is the last polynomial with this property, in that one cannot replace 41 by a larger integer. This is the famous class number one problem, which was only solved half a century ago.

[323]*Morning Chronicle*, Sept. 15, 1840.

[324]As usual, the matter was not as simple as one might like. James Wilson, the owner and editor of the *Economist*, was also the author of the system of government guarantees for investors in East Indian railways.

[325]*The Times,* May 5, 1836, p. 5.

[326]Many published histories of British railways have discussions about their origins, but seldom much detail. An excellent collection of primary material about several lines, and especially about the Carlisle and Newcastle Railway, is available in the London School of Economics Archives, in volumes of *Early British Railways,* items COLL MISC 189/1 through 189/8. It consists mostly of newspaper clippings and related material, printed matter that was available to the public, or at least to the shareholders of the line. Early plans for a canal, and then, as technology advanced, the switch, attended by much controversy, to a railway, are covered in detail. Questions of costs of construction and operation, and of demand, are covered in depth. (The coverage of the the Carlisle and Newcastle line in that collection is very thorough, that of other railways less so.)

[327]See the letter in the *Caledonian Mercury* of May 21, 1810, p. 4, and its second and concluding part in the issue of May 28, for example. For additional background information and detail about this project, see [188], p. 34.

[328]A brief description of the act is in [181], pp. 59–60.

[329]This is an issue that is relevant for other evaluations of early proposals. Many of them seem badly off from a retrospective view, whether one looks at costs or revenues, but the railway world was revolutionized by the 1830 opening of the Liverpool and Manchester Railway, so the railways planned afterwards were for a different environment than earlier ones.

[330]Unlike most railways, which had just a few years in which they could exercise their powers of raising money and acquiring land, the Berwick and Kelso Railway did not have such limit in its charter, [181], p. 60.

[331]Ad on p. 1 of *Caledonian Mercury* of Dec. 6, 1824 and on p. 4 of the *Scotsman,* Dec. 11, 1824.

[332]Ad on p. 1 of *Caledonian Mercury*, Sept. 10, 1836.

[333]All otherwise unattributed quotes and statements in the rest of this Appendix are drawn from the 34-page report [32], which also has appended to it the 22-page report of the Border Association.

[334]*Scottish Railway Gazette,* Jan. 10, 1846, pp. 700–701.

[335]For a general and thorough discussion of the impact of railways on Victorian attitudes, see [82].

[336]As usual, there were dissenting voice all along. For example, a letter in the *Railway Times,* Jan. 1, 1842, p. 11, took railway managements to task for not paying enough attention to the potential of freight transport.

[337]*Select Committee on Railways, Third Report,* Parliamentary Papers 1844 (166) XI.5, p. 2.

[338] *Herapath*, Jan. 3, p. 21, article entitled "The advantage of judiciously extending the railway system."

[339] *Herapath,* Feb. 26, 1848, p. 229, report on the semiannual meeting of the Midland Railway.

[340] *Railway Times,* Aug. 26, 1848, p. 920. There is a very interesting assertion in this quote, namely that Chaplin had talked about passenger numbers doubling every 7 years, for a 10% annual growth rate, at some earlier LSWR meeting. I have not yet located a reference for that claim. In the pamphlet [53], written at the end of 1845, he wrote (pp. 62–63)

> Neither am I ashamed to confess that my opinions as to the amount of traffic which railway facilities will draw out of any given district have undergone considerable modifications, and that I see much occasion to believe that most of us may even yet be not fully, or even well informed on this matter.

but did not provide any details as to what his new opinions were.

[341] Many of these statements, including the LSWR one that will be quoted below, were reprinted in [194].

[342] We see such contradictory views in other places as well. For example, the *Economist* of Oct. 3, 1857, pp. 1090–91 claimed that "We are now rapidly approaching the end of our era of railway making." But two years earlier, in the Sept. 15, 1855 issue, pp. 1010–11, it claimed that railways were "a great system of communication which must be extended to every parish, and almost every homestead, to give individuals and districts equal advantages." Not all that much construction was accomplished during the intervening two years, so the changed tone reflects either change in authors, or a change in the railway share market.

[343] *Herapath*, Nov. 4, 1848, p. 1162, article entitled "Railway traffic," signed "T." Reprinted in *The Times,* Nov. 6, 1848, p. 5.

[344] It was very unusual for an author's name to be published in *Herapath* or other newspapers or periodicals in the 1840s. For some reason, though, Hackett did get his name attached to some of his work (although almost surely just a tiny fraction of it, although not just the statistical start-of-year studies). The ones from the 1840s appeared in the issues of Jan. 7, 1843, p. 18; Jan. 20, 1844, pp. 50–51; Jan. 18, 1845, p. 70; Jan. 10, 1846, p. 46; Jan. 2, 1847, p. 9; Jan. 1, 1848, p. 9 and Jan. 8, 1848, p. 33; and Jan. 6, 1849, pp. 8–9. Some of these pieces were not identified as being by Hackett, but since their continuations, in the sense of having the same title and similar content, in later issues (Jan. 5, 1850, pp. 4–5 and Jan. 4, 1851, pp. 2–3) did carry his name, it seems safe to assume that the earlier ones were his as well. Hackett may also have been responsible for the weekly compilations of revenue statistics for British railways. The ones at *Herapath* were distinctly more infor-

mative than the ones at the *Railway Times,* which may reflect Hackett's better sense for statistics.

[345] *Morning Chronicle,* October 12, 1846, p. 2.

[346] *Morning Herald,* October 28, 1846, p. 4.

[347] First piece is in the *Perthshire Courier*, October 28, 1846, p. 2, the second is in the Nov. 5 issue, p. 4. The second piece, in addition to the passage about "short traffic" (about one-third of what Lardner had written), also included a passage about average fares and contributions to revenue from passengers travelling in different classes.

[348] *Morning Chronicle,* Sept. 19, 1846, p. 7. The French article, "De la circulation sur les chemins de fer," appeared in *Journal des Chemins de Fer,* Sept. 12, 1846, pp. 758–59, and was considerably more detailed than the *Morning Chronicle* version.

[349] *Leeds Mercury*, Oct. 3, 1846, p. 10. This article was reprinted in the *Manchester Times* on Oct. 9, 1846, without any indication of source. Thus it is not certain whether it was published first in the *Leeds Mercury,* or whether it came from yet another paper. It was not derived from the earlier *Morning Chronicle* article, nor from the *Journal des Chemins de Fer* article, since Belgian city name spellings were different.

[350] *Report of the Railway Department for 1842*, Parliamentary Papers, 1843 (440) XLVII.1.

[351] Laing's argument was that the passengers traveling in first class went further, while lowering fares brought in primarily third-class customers who made short trips,, [118].

[352] *Railway Times*, Feb. 10, 1838, p. 57.

[353] *Railway Times*, April 10, 1847, p. 532.

[354] The *Leeds Mercury,* Oct. 5, 1844, p. 6. The ad specified the average railway fare, the total number of through passengers by coach, the number of "Local and intermediate Traffic" passengers, and total revenues. Going through the calculation one finds that the promoters were claiming that there were 70 coach passengers going in each direction per day all the way, that is 57 miles, between Dundalk and Enniskillen, and 34 in each direction between intermediate points for an average of 34 miles each. The ad says, in the usual language of the day, "This Traffic doubled, as before stated," and the obvious assumption, that investors surely made, was that the pattern of travel by railway passengers would be the same as assumed for coach passengers, namely 140 in each direction per day all the say, and 68 per day in each direction for some shorter distances.

[355] Quotes from the *Railway Times*, from Dec. 14, 1844, p. 1455, from Feb. 15, 1845, p. 181, and Jan. 24, 1846, p. 108, and from *The Times,* Nov. 29, 1847, p. 6, respectively.

[356] *Leeds Mercury*, Sept. 5, 1840, p. 5.

[357]The availability and level of detail varied greatly. That same issue of the *Leeds Mercury* that was quoted above also had, on the same page, a table of "railway traffic returns" for 26 lines in the usual form that this paper presented it, which included length of line, weekly revenues, and number of passenger. But the revenue figure was not separated out into goods and passengers, so it was hard to estimate trip lengths without making some assumptions about what fraction of revenues came from goods. (But that could be estimated fairly accurately if one had one of the semiannual financial reports, which were often printed in newspapers. The ratio of passenger to goods revenue did not vary too much.) And many railways provided either no data or incomplete data. Railway papers usually provided more information, from which one could make educated guesses (more educated, if one also obtained fare tables, say). For example, the "railway traffic returns" table in the *Railway Times* of Aug. 15, 1840, p. 652, lists 32 railways with various pieces of information. But only six of these lines provided data for both the number of passengers and passenger revenue, which is what is needed to estimate average trip length.

[358]*Herapath*, April 1836, p. 51. This was axiom no. 5 in his "Rail-road axioms," published on pp. 49–59, which were likely his response to the Lardner's "Plain rules for railway speculators."

[359]*Herapath*, March 1838, pp. 137–142.

[360]*Herapath,* Nov. 30, 1839, p. 374.

[361]*Herapath*, Jan. 22, 1842, pp. 85–86.

[362]A very eloquent statement of this theory is available in a leader in *Herapath*, Jan. 3, 1846, p. 21, entitled "The advantage of judiciously extending the railway system" that was quoted in the previous Appendix.

[363]*Morning Chronicle,* Sept. 15, 1837. A more detailed version available in *Herapath*, Sept. 1837, pp. 271–278.

[364]*The Times,* Feb. 22, 1851, p. 8.

[365]*Railway Chronicle,* Oct. 6, 1849, pp. 690–91.

[366]*Railway Chronicle,* Dec, 29, 1849, pp. 881–82.

[367]*Herapath,* Oct. 3, 1846, p. 1271.

[368]*Herapath,* Oct. 18, 1845, p. 2179.

[369]*Railway Times,* Feb. 27, 1847, p. 305.

[370]*Railway Times,* Aug. 16, 1845, p. 1259

[371]Just a few examples of Hoyes' efforts are available in the *Railway Times,* p. 64 of Jan. 15, 1848 issue, pp. 89–90 of Jan. 22, 1848, and p. 140 of Feb. 5, 1848 issue. In the last example cited, Hoyes admitted he had been for extension, but now was adamantly opposed. However, neither here nor in other places have I found a clear description of what led to this change of mind, which was so clearly correct in a retrospective view, and should have been clearly seen to be correct beforehand.

[372]*Railway Times*, 1848, pp. 338, 350, and 380–381.

[373]*Railway Times*, Aug. 28, 1848, p. 921.

[374]At the same meeting from which the quote above about the Paris and Rouen Railway came from, Chaplin said that "it is our fault ... if we go in advance of that which is reasonable in the increase of the traffic. Gentlemen–we must wait patiently before the development of traffic can equal our wants and views in the requirements of the lines we open." This was at a time when Wyndham Harding, the Secretary of LSWR and thus Chaplin's subordinate, was presenting pollyannish views. At the August 14, 1848 meeting of the Statistical Society of London, Harding ([98], p. 324) used, or, more properly, misused, rather old data, through the middle of the preceding year, to conclude that the numbers he obtained

> must be regarded as a very favourable general feature in the state of railways; there was much reason to fear, that as the first railways ran between the great towns or traversed the manufacturing districts, the railways which were next opened would show a great falling in the receipts. Hitherto, then, we find that this is not so–a fact which tends to give confidence as regards the great length of railway which has been sanctioned by Parliament but is not yet open.

Similar misleading reassurances were emanating from most people connected with railways, reassurances that proved fatally wrong.

[375]He prepared a report for shareholders at the end of 1849, when accusations of fraud and abuse were flying about, a report that was effectively endorsed by the subsequent committee of investigation. It showed that by that time he had already invested about £200,000 and was obliged to invest almost another £50,000 through calls, *Herapath,* Dec. 22, 1849, p. 1281.

[376]*Railway Times,* Dec. 14, 1844, p. 1458.

[377]*Railway Times,* March 2, 1850, p. 204.

[378]In the words of [180], Chaplin "has been always slow in his railway measures."

[379]*Railway Times,* Nov. 21, 1846, p. 1645.

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