HONG KONG INSTITUTE FOR MONETARY RESEARCH

DÉJÀ VU ALL OVER AGAIN: AGENCY, UNCERTAINTY, LEVERAGE AND THE PANIC OF 1857

Timothy J. Riddiough and Howard E. Thompson

HKIMR Working Paper No.10/2012

April 2012

Hong Kong Institute for Monetary Research
(a company incorporated with limited liability)

Déjà vu All Over Again:
Agency, Uncertainty, Leverage and the Panic of 1857*

Timothy J. Riddiough

University of Wisconsin

Hong Kong Institute for Monetary Research

and

Howard E. Thompson

University of Wisconsin

April 2012

Abstract

The panic of 1857 is revisited with the benefit of hindsight provided by the panic of 2007-08, where a number of parallels are identified between the two panics. We present new evidence on causes of the failure of the financial institution that triggered the panic of 1857 and conduct a detailed analysis of railroad financial and accounting practices. New financial innovations are also studied—the railroad farm mortgage and farm mortgage-backed security—which had similarities to the modern sub-prime mortgage loan and MBS. Neglected risks and Knightian uncertainty appear to be fundamental reasons why investors continued to participate in a boom market that was also extremely fragile.

* We thank Gideon Martin and Jeff Swhier for their research assistance, and participants in the joint Monetary Authority of Singapore-Bank of International Settlements conference on property markets and financial stability for their comments. We are particularly grateful to the Hong Kong Institute for Monetary Research its research support.

1. Introduction

Financial crises are extremely disruptive and costly, and are usually the result of a complex set of factors and series of events that make causal identification difficult. For example, there are typically many relevant and difficult-to-measure microeconomic variables that exist within the "plumbing" of the financial and regulatory systems.[1] Furthermore, these variables will be structurally related to one another as well as other more macro-level variables, making proper model specification a difficult task. Given the complexities in causal identification, "large sample" cross-sectional econometric studies will invariably paint an incomplete picture of the first-order causes of financial crises. Complementary approaches to traditional deductive analysis can thus play an important role in enhancing our understanding financial crises and panics. In particular, inductive analyses can be quite valuable, as they provide an opportunity to study the details of specific historical events—particularly those that possess strong similarities to contemporary political economy.

In this paper we revisit the panic of 1857 in light of the more recent financial crisis, where recent events provide a new perspective through which to reinterpret the events leading up to the failure of OLITC. Relative to Calomiris and Schweikart (1991), who conclude that "the declining fortunes of western railroads and declines in western land value, along with a concentration of asset risk and reserve drain in New York City banks, ultimately explain the origins of the panic," we concentrate on the details as to why those declines occurred to begin with and why the concentrations of risk existed. In doing so we provide a detailed examination of the structural variables that led to OLITC's failure and caused the crisis, focusing specifically on distortions associated with agency, uncertainty and leverage.

In our detailed analysis, we present new evidence regarding OLITC's asset investment and operating management practices. While there is little question that OLITC's collapse triggered a banking panic and a sharp recession, there is significant disagreement as to what caused the collapse. Much of the previous literature simply blames embezzlement instigated by the head cashier (Mr. Ludlow), implying that OLITC's demise was an idiosyncratic event that was not linked with the real economy and the broader financial system. We instead find that Ludlow engaged in a systematic gamble to resurrect the declining fortunes of OLITC's major investment partners, and therefore his own firm. He did so while acting on his own behalf without adequate internal controls or external monitoring, but also on behalf of a firm that had clear long-standing interests in western railroad and economic development. The companies whose declining fortunes Ludlow tried to reverse had long-term business and personal associations with OLITC, including most importantly the Cleveland & Pittsburgh railroad whose President was Ludlow's previous supervisor and mentor at OLITC.

[1] For additional background on financial market plumbing, see the Winter 2010 issue of the *Journal of Economic Perspectives*.

Relative to the existing literature, we place great importance on the collapse of OLITC as a signal information event that caused a convergence of opinion amongst the public. That is, we find that OLITC's failure neatly encapsulated and confirmed many of the worst fears of the investment community regarding banks, pyramiding leverage, the railroads, general business practices, and the macro economy. OLITC, a prominent shadow bank at the nexus between eastern finance and western economic development, was in effect the poster child as well as nerve center for all that was wrong in the economy at the time, which is why its failure "struck on the public like a cannon shot" (Gibbons (1859)) with everyone eying each other suspiciously, asking themselves "Do you go next?" (Janey (1885)).

To substantiate our conclusions, we conduct a detailed analysis of 17 representative railroads for the four years leading up to the panic. It was well known at the time that many railroads, particularly railroads located in middle and western states, were highly levered and faced with declining revenues due to a drop in agricultural commodity demand as well as increased competition. There was also a general recognition that railroad accounting practices were problematic during the ante bellum period, where, in particular, the accounting for depreciation and the amortization of discounted security issuance were ignored in calculating net income. But, it was not well understood at the time, nor analyzed in detail until now, how high leverage (which was typically underreported to begin with) and a rapidly depreciating capital stock combined to create an unsustainable business model in the face of weakening demand and overcapacity.

As a final exercise we analyze three prominent Wisconsin railroads that were located at the northwestern frontier of the U.S. in the 1850s, and which were instrumental in developing a new financial innovation—the farm mortgage-backed security. These railroads, which were building ahead of demand in anticipation of a continued rapid pace of western expansion, were challenged by an inability to source local capital in this land-rich but cash-poor region of the country. Wealth constraints of local residents combined with state law that prohibited the funding of railroad construction to cause local farmers to mortgage their properties in return for an equity stake in the nearby railroad. The railroad then took these farm mortgages out east and turned them into mortgage-backed securities—the proceeds from which were used to fund railroad construction.

Analysis reveals similarities to sub-prime mortgages and their securities issued prior to the most recent panic. Analogous lending and securities practices include no-doc mortgage loans with a "deferred" interest payment obligation, inflated property appraisals in support of high loan amounts, inadequate and misleading disclosure to potential security investors, and improper accounting at the time of securities issuance in which the issuer assumed significant liability in the event of poor securities investment performance.

In the face of uncertainty and measurable factors that can predict a banking panic and subsequent recession (Gorton (1988), Calomiris and Gorton (1991)), we ask the following question: Why don't markets self-correct in an incremental fashion rather than wait for triggering events that result in

dramatic downward adjustments and market failures? In other words, why are financial systems fragile? Our analysis of the panic of 1857 in relation to recent events provides support for "rational bubble" proponents that emphasize agency and information as explanations. Suppliers of securities and informed investors will have clear short-term incentives to possibly start and then to perpetuate trading and asset prices that get out ahead of fundamentals (see, e.g., Allen and Gorton (1993)). Along the way, investors exhibit tendencies to neglect certain risks that are new or that may have been unimportant in recent years, but which are now relevant and assume increasing importance (Gennaioli, Shleifer and Vishny (2010)). A dramatic event or series of linked outcomes cause investors to reassess their beliefs and redefine their information sets, resulting in a panic as assets held by financial intermediaries become information sensitive.[2]

This rest of the paper is organized as follows. The failure of OLITC is considered in detail in section 2, preceded by a brief discussion of the economic landscape in the years and months leading up to the failure. In section 3 we analyze financial structure and the effects of asset depreciation on expected financial performance for a sample of 17 representative railroads. Important financial innovations, the railroad farm mortgage and the farm mortgage-backed security, are analyzed in section 4 as representative examples of novel financing methods and pyramiding leverage that occurred in the years and months leading up to the panic of 1857. The paper concludes in section 5.

2. The Failure of Ohio Life Insurance and Trust Company

In this section we consider available historical evidence related to the suspension and failure of the Ohio Life Insurance and Trust Company (OLITC). Doing so is critical to identifying the true structural causes of the 1857 panic, an issue which remains unsettled to this day. It is also critical in understanding the nature of banking panics more generally, and sets the stage for our subsequent detailed analysis of agency, leverage and uncertainty as fundamental contributing factors to the panic. But first, to set the stage for our detailed analysis, we briefly describe the macroeconomic environment in the years and months leading up to the failure of OLITC.

2.1 Brief Overview of the Economy and Key Events Leading Up to the Failure

In their tome, "The History of Interest Rates," Homer and Sylla (2005) remark that the panic of 1857 was the "first worldwide crisis and the first that was purely economic, without political or natural cause." It caused a run on the powerful Bank of England, and was an extremely unsettling influence on events leading up to the Civil War. Disraeli said of the crisis: "All the bubbles, blunders, and dishonesties of the five year's European exuberance and experimentation in credit were tested and revealed." Given the significance of the crisis it is relevant to ask, what were some of the key background events that led to such a revulsion?

[2] Also see Krishnamurthy (2010), who stresses the interaction of Knightian uncertainty and leverage in amplifying reactions to information shocks.

The story really starts with the aftermath of the panic of 1837. Economically speaking, it is fair to say that there was a relatively quiet 10-year period in the U.S. following the major financial and economic market meltdown of 1837. After several years of depression, the economy gradually stabilized and began to grow. Foreign investors, who lost vast sums of money as a result of the 1837 panic, mostly stayed away from the U.S.—many saying never again. But things began to change markedly with the California gold strikes of 1848 and 1849, where it: 1) Simultaneously improved the purchasing power of the U.S. relative to Europe and created inflationary pressures; 2) Created a renewed sense of optimism, and indeed sparked a new speculative wave that eventually spread across the entire country; 3) Encouraged further western expansion, putting western railroads at the front edge of economic development; and 4) Initiated a credit boom during the Free Banking era that also triggered the modern development of securities trading and investment banking (i.e., Wall Street became Wall Street).

Foreign trade expanded rapidly after 1848, with imports growing to a pre-Civil War high of $360 million in 1857. As Dunbar (1904) emphasizes, many analysts at the time attributed the underlying economic cause of the 1857 panic to trade imbalances, with U.S. consumers spending far beyond their means. In fact, however, Dunbar and more recent writers have shown that foreign trade was roughly in balance in the years leading up to the panic, where, for example, 90 percent of English imports originated from the U.S. (Van Vleck (1967)). Import growth has instead been attributed to the rapidly increasing real incomes of U.S. consumers. Thus, rather than trade imbalances, there is general agreement today that a credit boom and pyramiding leverage introduced fragility into a weak and poorly regulated banking system, where we will show in detail that one of the major real distortions that triggered the financial meltdown was overinvestment in western railroads.

Although many said “never again,” foreign investment in the U.S. returned with a vengeance shortly after the California gold strikes. Estimated to be a net outflow of $3 million in 1849, a net investment inflow of $56 million was realized in 1853. Inflows then grew to $240 and $250 million in 1856 and 1857, respectively (Van Vleck (1967)). Most of this investment activity originated from England, but France and Germany were also big players. Fishlow (1966) and Van Vleck have estimated that more than half of the approximately $400 million in railroad bonds outstanding in the middle 1850s were financed by foreign investors (with bond yields declining in conjunction with increasing inflows). Against this backdrop were vast increases in Federal land grants (and hence vast increases in land speculation) made during the early and middle 1850s, much of which went to western railroads.

The Bank of England was *the* most important bank and monetary “authority” around in the 1850s, where its actions created ripple effects throughout the western world. The bank’s discount rate changed 40 times in the 1850s. Short-term bank rates were volatile, reflecting general uncertainties in Europe and the U.S. For example, there were unsettling events in France in 1857 that occurred prior to the U.S. crisis that caused much consternation in bank loan and bond markets. One possible contributing cause to interest rate volatility was the fact that Bank of England fully repealed its usury laws in 1854, with similar initiatives underway in the U.S. at the same time.

Finally, not unlike the more recent crisis, there were negative shocks that occurred in 1857 prior to the OLITC failure that shook the confidence of investors and consumers, but that were not important enough to trigger a full collapse. One was the closure of N.H. Wolfe, the oldest flour and grain company in New York City, on August 11. This closure was in large part caused by declining demand for U.S. foodstuffs in post-Crimean war Europe. A second event was the August 19 resignation of Edwin C. Litchfield, President of Michigan Central Railroad, who was accused of accounting fraud and other malpractices. A third event, which actually occurred after the OLITC failure, was the closure of the respected securities firm of E.W. Clark, Dodge, and Company. A partner in that firm was Jay Cooke, who immediately thereafter took a job with the New York Herald as a journalist to report on the causes and consequences of the panic. This is the same Jay Cooke who triggered the panic of 1873 due to failed investments in the Northern Pacific Railroad (see, e.g., Sobel, Chapter 5, 1968).

2.2 Analysis of the OLITC Failure

OLITC announced suspension of operations on the morning of August 24, 1857. The suspension was, to say the least, unanticipated, and has been variously described as "a clap of thunder in a clear sky" (*Cincinnati Daily Gazette*, August 25, 1857) and as having "struck on the public like a cannon shot" (Gibbons (1859, p.244)). The underlying reasons for the suspension and subsequent failure of OLITC have been clouded in mystery and controversy ever since, owing in large part to the disputed role of OLITC's cashier, Edwin C. Ludlow. There is, however, little controversy about the consequences of OLITC's failure, which is that it accelerated declines in share prices—particularly western railroad share prices—triggering a banking panic that culminated in the suspension of specie convertibility in New York in mid-October. It further marked the start of a sharp economic downturn from which western economies did not recover until the onset of the civil war.[3]

What exactly was OLITC? It was nominally an insurance company, but in reality it was one of the first banks whose assets were largely longer-term loans and whose liabilities were almost exclusively demand deposits (it did not issue its own bank notes). Although located in Cincinnati, its controlling base was actually in New York City, which was where the cashier and three directors resided. OLITC was in effect a vehicle for eastern investors to participate in western economic development without explicitly revealing non-local control or the destination of profit flow.[4]

In modern terms OLITC can be characterized as operating like a "shadow bank" in that its operations and oversight did not conform to contemporary banking standards. The 1840s and 1850s were known as the "free banking" era. Free banking was a response to wildcat banking problems of the 1830s that culminated in the panic of 1837, where the resulting regulatory focus was on safe and credible liquidity (that is, banknote) creation (Moss and Brennan (2004)). Free banking was not, however,

[3] For additional background, see Jalil (2010, pp.25-26) who states that the panic of 1857 (along with the panics of 1833 and 1873) "did not break out in the midst of a downturn and they were not caused by output fluctuations, according to the newspaper records."

[4] OLITC was also a vehicle for Ohio-based banks to park capital in "liquid and safe" eastern investments. Also see Calomiris and Schweikart (1991) for a concise summary of OLITCs business activities leading up to its failure.

focused on addressing the centralized aggregation and distribution of financial capital, nor on the possibility of deposit-based bank runs.

At the same time, OLITC had a reputation for conservative management and sound business practices, which did much to counteract growing concern about economic conditions in the West. Consequently, when OLITC closed its doors, like a clap of thunder in a clear sky the public realized that the extant banking structure was not nearly as sound as had been thought. Indeed, if "the safest banking institution in the country" (*New York* Herald, August 26, 1857) could fail due to embezzlement and fraud by its cashier under what were "supposed to have been watchful eyes of its officers and trustees" (Van Vleck, (1943, p.65)), what might be in store from lesser quality banking firms. More importantly, this failure of governance mirrored broader weaknesses in business principles and practices that cut across the entire economy—including particularly those of railroads and even consumers that were engaged in various forms of land and stock speculation. As stated by Janey (1885, p.170)), "In August 1857, the business of the country had got into such a condition that it needed but the failure of the Ohio Life Insurance and Trust company to make every person look his neighbor in the face with the mutual inquiry, 'Do you go next?'"

After realizing the initial shock of the failure, the next logical question was what really caused OLITC to fail? Was it something as simple as stock market manipulation and embezzlement by the cashier? Based on our review of the available evidence, we conclude that the answer is no; rather, it was something more fundamental and complicated. It was more fundamental in the sense that the business practices and activities of OLITC neatly encapsulated those of many of the economically important organizations at the time, and more complicated due to the true motives and actions of OLITC's cashier, Mr. Ludlow.

Consider first the motives and actions of Mr. Ludlow. From the perspective of the present day, in his role as cashier of a bank, one gets the impression from the literature that he was a mid-level management operative that somehow got away with the deception—think of Jimmy Stewart's bumbling uncle cashier in "It's a Wonderful Life". In fact, Mr. Ludlow was no mid-level manager or bumbling uncle. Rather, he was an experienced high-level banker with many connections in both the east and the west. For example, according to the State of Ohio Executive Department Report of March 8, 1859 that investigated the defalcation and failure of OLITC: "Ludlow… associates with bankers and brokers of the fastest sort, and borrows and lends money profusely, and takes delight and pride in being the most seductive and sharpest financier in New York."[5] Mr. Ludlow was, furthermore, on the board of the Ohio & Mississippi railroad, which had strategic interests in the success of the Marietta & Cincinnati railroad and other railroads in the region. OLITC was also listed as Treasurer for the Cincinnati, Hamilton and Dayton railroad, which had a long association with OLITC, and which had networked road connections with many of OLITC's other borrowers in the area. Ludlow served as OLITC's representative on that board.

[5] The discussion of OLITC's suspension and failure is mainly contained in section VII of the State of Ohio Executive Department Report of March 8, 1859, authored by A.P. Edgerton, Charles Reemelin and W.D. Morgan.

The discretion that Ludlow enjoyed as cashier at OLITC was considerable. According to Spiegelman (1948, p. 249), "A letter by the president, Charles Stetson, dated June 5, 1848, stated clearly the purpose of the cashier in New York: 'He is placed there to receive and take charge of any bills of exchange, or notes, … He is also Transfer Agent of the State of Ohio…Any funds in his hands, not wanted for immediate use, from whatever source they may have been derived, he has the authority to invest, in a manner set forth in his instructions.'" While this description of the cashier's position largely focused on standard banking operations, the final sentence, clearly meant to deal with short-term investments, over time became the primary focus of cashier position.

Ludlow's predecessor was Charles W. Rockwell, who held the head cashier position at OLITC from 1853 to 1855. Prior to joining OLITC, Rockwell had been Commissioner of Customs with the Taylor and Filmore administrations, and clearly had significant influence in financial and political circles both inside and outside of New York City. Ludlow, who had been an employee of OLITC's since at least 1848 when the above-quoted position description had been written, served directly under Rockwell as Associate Cashier prior to taking over as Head Cashier in 1855. Rockwell served as a role model and mentor to Ludlow, as it was known that he was a "follower" of Rockwell. A very important fact that has not, to our knowledge, been disclosed previously in the literature is that Mr. Rockwell left OLITC in 1855 to become president of the Cleveland & Pittsburgh railroad.[6]

By the early 1850s OLITCs investment portfolio was heavily concentrated in western railroad mortgage bonds (Ohio Report, March 8, 1859). Railroad stock prices, particularly those in the west, had been in general decline since at least 1854. Stampp (1990), Van Vleck (1943) and others have attributed the declines to softening stock and bond investment demand from Europe as a result of better opportunities developing on the continent due to the end of the Crimean war. Huston (1983) and others also point out that the end of the Crimean war caused a decline in demand for U.S. agricultural foodstuffs. At the same time railroad construction continued unabated at a furious pace, particularly in Illinois, Indiana and Wisconsin, where populations were thin but land speculation was rampant.[7] Cut-throat competition between railroads further caused revenues to decrease.[8]

Beginning in 1855 or 1856, Ludlow, who through his business dealings was close to many of the Ohio-based OLITC board members, and without the admitted knowledge of the President, made call loans to railroads in the Ohio region with their securities held as collateral. The loans during this time period were made to the Cleveland & Pittsburgh railroad and a few other major recipients. He also made loans to himself, from OLITC's accounts, to make personal investments in the same as well as

6 *New York Times,* February 19, 1855.

7 From 1854 to 1857, 4,703 miles of track had been laid down in the old northwest (Paxson (1912)). Speculation in land is noted by Van Vleck (1943, pp. 28-34), Gates (1934, Ch. 6), and Stampp (1990), among many others.

8 Consistently intense competition existed among the great connector roads, the New York & Erie, New York Central, Penn Central, and the Baltimore & Ohio (see, e.g., Nevins (1947, p.235). During the 1850s a number of new local lines were introduced in states such as Ohio, Michigan and Illinois that competed with existing lines.

certain other railroads.[9] Compounding the risks, Ludlow caused OLITC to itself borrow on call for the loans he made to himself to finance his railroad investments.

As a result of extensive litigation that followed OLITC's suspension and subsequent failure, a detailed list of assets held in receivership was made available approximately two years after the failure. The listed assets are reprinted in Table 1. There are $263,485 in bonds issued by the Cleveland & Pittsburgh railroad, where the former OLITC cashier, Rockwell, then served as President; $219,000 of bonds issued by the Marietta & Cincinnati railroad, where S.B. Keys, an OLITC director, was a director, and where it is worth emphasizing that the Marietta & Cincinnati was crucial to the success of the Ohio & Mississippi (for which Ludlow was a director) as part of the "Great Central Railroad" connecting to the Baltimore & Ohio[10]; and $192,000 of bonds issued by the Hillsborough & Cincinnati railroad, which had gone bankrupt and been acquired by the Marietta & Cincinnati railroad in March of 1854. There is another $100,000 of high-risk "dividend" bonds issued by the recently troubled Cincinnati, Hamilton & Dayton that had had a long relationship with OLITC, where Ludlow served as *de Facto* Treasurer. Of the smaller positions, it is relevant to note that Rockwell was listed was "projector" of the Norwich & Worcester railroad.[11]

Thus close to $800,000 out of the $1,000,000 in listed railroad bonds were issued by the three closely connected railroads, with most of the debt being subordinated secured mortgage bonds or something of lower priority. The State of Ohio Department Report of March 8, 1859 indicates that, although Ludlow had dabbled in railroad stocks for a longer period of time, much of this purchase activity occurred in the 12 months leading up to the failure.[12] This timing is further supported by 1856 financial statements of Cleveland & Pittsburgh and Marietta & Cincinatti that do not list 3rd or 4th mortgage bonds, nor the dividend bonds, as well as documents that quote the President of OLITC as stating that "amongst the causes of the failure: '*First.* In his (the cashier's) dealings with, and large advances to the Cleveland and Pittsburgh railroad company, to aid in the completion of said road.'"[13]

Summing up, numerous authors and commentators have suggested that OLITC's failure was idiosyncratic, described simply as "fraud and embezzlement" caused by OLITC's New York City-based cashier, Mr. Ludlow. Based on this characterization in the literature, one gets the impression that Mr. Ludlow was a mid-level manager that, although cunning, was operating in isolation and in it

[9] See William G. Sumner, *A History of American Currency,* New York, 1874, p. 181 and section VII of the State of Ohio Executive Report.

[10] See Nevins (1947, p.206).

[11] See Lanman (1876, p.362).

[12] According to the State of Ohio report, "Ludlow seems to have adopted with alacrity every railroad proposal…he is never so much in his element as when he labors, steeped to his chin in kiting operations, and loaded down with all kinds of debt.

[13] Based on Cleveland & Pittsburgh's annual report from 1861, we do know that, besides the fact that the accounts between OLITC and C&P were "voluminous, complicated and disputed," the dividend bonds were issued in January 1857 and the other bonds were issued sometime prior to 1857 but after the issuance of the 1856 annual report.

exclusively for his own gain.[14] This kind of characterization naturally leads one to believe that the failure was unrelated to deeper structural problems that correlated with OLITC's business practices and asset holdings.[15] Emphasis on the idiosyncratic nature of triggering events conforms to what Gary Gorton (1988) terms as the "random events" hypothesis of banking panics, which are "self-confirming equilibria in settings with multiple equilibria, caused by shifts in beliefs which are unrelated to the real economy."[16]

We have presented evidence that contradicts the random events/self-fulfilling equilibrium view of OLITC as triggering the panic of 1857. Instead, we find that the failure of OLITC was a direct consequence of its self-interested gamble for resurrection. More importantly, the failure was a highly significant information event that created a focal point within the business and investment community, triggering a convergence of opinion with respect to structural flaws in banking, weakness in the agricultural sector, and the true financial condition of railroads. OLITC, by virtue of its history, scale and reputation as a well-managed financial intermediary with high quality assets, stood prominently at the nexus between eastern finance and western economic development. Its failure neatly encapsulated and confirmed all the worst fears of investors and the public at large; optimism and hope in a highly uncertain economic environment suddenly morphed into mistrust, pessimism, bankruptcy and general suffering as a result of the OLITC failure.[17]

A critical part of our argument is linked to the motives and actions of Mr. Ludlow. This raises the issue of why so much misinformation has been generated about Ludlow and his actions. Evidence points to the fact that the fraud and ultimate failure of OLITC was a big legal problem for senior management of the New York Agency who wanted to cover up and escape liability.[18] It was much easier to label the cashier as an embezzler—cunning to be sure—but something of a mid-level bumbler working in isolation, than to explain the real reason, which was largely a systematic gamble for resurrection

[14] Some additional specific quotes by prominent authors that describe Mr. Ludlow's actions will make the point clearer. Van Vleck (1943) simply asserts that "the entire assets of the institution had been virtually embezzled by its cashier under what were supposed to have been watchful eyes of its officers and trustees"; Paxson (1912) briefly states that the cashier embezzled funds to "sustain stock market operations"; Huston (1983) observes only that Ludlow "embezzled funds and loaned credit too freely"; and even Stampp (1990), who concludes that there were multiple interrelated causes of the panic, simply refers to OLITC failure as due to a "large embezzlement" without any further elaboration.

[15] The State of Ohio Executive Department Report placed the blame for OLITC's excesses strictly on a lack of management control. One of the authors of the Report, Charles Reemelin, was on record as early as 1854 in calling attention to the issue of control. In a letter to the state auditor he stated , "we have…in corporations, too much of the all-prevailing control of one man: the board of directors are generally mere ciphers…The presidents pay too little attention to business…and exercise too little control over the cashiers…Too great an anxiety for large profits among them." See H.F.B. "History of Banking in the United States; II. Ohio." *The Bankers' Magazine and Statistical Register*, September 1856, p. 161. See also Spiegelman (1948, pp.257-258).

[16] A predisposition among many to equate a panic with a self-confirming outcome with no basis in the real economy likely derives from the word "panic" itself. Panic has been defined as "terror inspired by a trifling cause or misapprehension of danger." (*Office of the Mercantile Agency* (January 1858, New York), as reported in Lagniappe, (1963). Perhaps a better definition of a panic or idiosyncratic shock is that it is a statement of ignorance of the true fundamental causes of the problem.

[17] See also Stampp (1990, p.231).

[18] Shortly after the suspension, OLITC's board of trustees made the unusual assignment of the assets of the company to themselves. The President, Mr. Stetson, was then in charge of winding down the business of the company and distributing the assets to the claimants. Once the assignees took over they decided to take no action against Ludlow, although they specifically laid the blame on him. See Affidavit of Charles Stetson, *New York Herald*, November 2, 1858.

made possible by improper internal controls and monitoring.[19,20] And, to date, much of the literature has accepted the explanation at face value. This has, in turn, helped create the mistaken impression of an idiosyncratic self-fulfilling equilibrium.

3. Known Unknowns and Unknown Unknowns: Railroad Accounting and Leverage Leading up to the Crisis

3.1 Preliminaries

Analysis in this section provides support for our hypothesis that the panic of 1857 was caused by specific conditions that existed in the real economy prior to the onset of the panic. As a starting point for this analysis, Table 2 shows stock price changes for 17 representative railroads, grouped by region, for the week prior to the announcement date of the suspension of OLITC as well as for the one full day and the week after the announcement date. Stock prices are obtained from two sources. First, price data for all 17 railroads are obtained on a weekly basis from the *American Railway Times* (*ART*). These data were published on the Thursday of the week, but we believe that prices were as of the prior Saturday. Published prices in *ART* were based on information gathered from "the best authorities in the principal markets," rather than actual closing prices, since thin trading volume and exchange prices at that time were such that realized transactions were not always considered representative. To complement this information, we also obtained stock price information on available companies as printed in the *New York Times* (*NYT*) and *Boston Advertiser* (*BA*). OLITC announced suspension on the morning of Monday, August 24. Consequently, we gathered *NYT-BA* price data from August 15 to 22 (the week prior to the announcement), as well as from Tuesday, August 25 to 29 (the week after the announcement).[21]

Note that there are two groupings of Western railroads. The latter grouping contains two companies for which OLITC had particularly large exposures (Cleveland & Pittsburgh and Marietta & Cincinnati), and two of the largest companies located in Wisconsin (La Crosse & Milwaukee and Milwaukee & Mississippi) which was at the frontier of railroad construction in the months leading up to the panic. In our analysis we will address both the time series and the cross-section of stock price reactions.

---

[19] There is another element to the Mr. Ludlow's fraud other than his unauthorized investment and financing transactions. Just prior to the announced suspension of operations, Mr. Ludlow, at the "request" of two Ohio-based board members, but without authority of the full board, authorized channeling available liqudity to Ohio bank depositors. Thus priority was given to western depositors over eastern depositors (Janey (1885)). This action left the eastern depositors high and dry, something which must have infuriated and deeply embarrassed the eastern financial establishment. Why Mr. Ludlow would take this action has previously never really been explained. Mr. Ludlow, through his business connections with western railroads and apparently close relations with Ohio-based directors, apparently wanted to retain their good graces by staking his claim with the western branch of the operation until the bitter end.

[20] Much of the conventional wisdom apparently follows from an original report issued by OLITC's President, Mr. Charles Stetson, reprinted in *The Banker's Magazine and Statistical Register* in January 1858, p. 581, where Mr. Stetson states that, "In addition to the foregoing, is the almost endless litigation, caused by numerous attachments and other legal proceedings…The causes which have brought the company to insolvency, are wholly owing to the unauthorized and disastrous transactions of the cashier in New York."

[21] Stock price data availability problems in the antebellum period are well known. See Schwert (1990) for data sources associated with the construction of stock price indices before, during and after the 1857 panic.

As noted earlier, railroad stock prices leading up to the crisis had been in general decline for several years, particularly for companies located further west (Smith and Cole (1935, Ch.13)). With this in mind, first observe the *lack* of a price reaction for the New England railroads, which were generally more mature, regionally-based companies that were relatively isolated from the activities further west. They had been, for the most part, constructed to serve the local textile industry. Price changes at railroad locations further west, which tended to be much larger companies designed to service western agriculture, become increasing negative, both before and after the OLITC closure announcement date.

Stock price changes in the week after the OLITC suspension are strongly negative, particularly in the second western regional grouping, which contains the OLITC-linked and Wisconsin-based railroad companies. As seen in the *NYT-BA* stock price data, there were particularly strong price declines on Friday and Saturday of that week in response to additional increases in money rates and the news of the failure of a prominent broker whose business activities were primarily associated with Ohio- and Wisconsin-based railroad companies.[22]

Prior to conducting a detailed analysis of railroad accounting and financing policies leading up to the panic, it is worthwhile to briefly review the economics of the railroad business in the 1850s. This review will explain the promotional nature of the business as related to the railroads' necessarily high demand for financial capital.

Much of the real investment activity in railroads in the 1850s was occurring at the frontier of the northern half of the country (primarily Ohio, Michigan, Indiana, Illinois and Wisconsin).[23] Although some have argued to the contrary, it is clear that railroads being built after 1852 were generally "ahead of demand", and that building ahead of demand was speculative in nature.[24,25] In addition, the

[22] OLITC announced its failure on Monday, August 24. From the *New York Herald* on August 27, "The panic still continues. It is rather on the increase. The brokers topple down like so many loose bricks."; *New York Times* on August 29, "The severity of the Money pressure increases, and has extended outside Wall-street and the Stock Exchange."; *New York Times* on August 31, "The week past was one of unusual concern and depreciation in Money values. It opened with the bankruptcy of the Ohio Trust Company and closed with the suspension of Messrs. ATWOOD and Co., Domestic Exchange Brokers, chiefly connected with Ohio and Wisconsin."

[23] According to Fishlow (1966), from 1849-58, railroads accounted for 15 percent of total investment in the U.S. In the middle 1850s it was approximately 25 percent. Dunbar and Sprague (1904, p. 272) notes that in 1850 there were 7,355 miles of railroad in the U.S., where by 1857 there were 24,476 miles, half of which was constructed in sparsely populated areas in the Old West. Another 6,000 miles were under construction when the panic hit in 1857, and were finished by the end of 1859 (Nevins (1947, p.194)).

[24] Fishlow (1966) makes tortured, ultimately unconvincing arguments that railroad construction did not occur ahead of demand in the 1850s. There is general consensus today that construction did occur ahead of demand during the middle 1850s. Dunbar and Sprague (1904, p.272) were very clear on this point; also see Nevins (1947, p.239) and more recently Atack et al. (2009). Huston (1983) and Paxson (1912) separately comment on the fortuitous aspects of this overcapacity as it aided the North in its civil war efforts.

[25] 1852 marked the turning point at which capital began to flow aggressively to speculative railroad ventures. The panic of 1837 devastated foreign speculation in the U.S., as European investors said, "never again." Finally by the early 1850s, Europe began to reconsider the U.S. as a destination for speculative investment. Chandler (1956) notes that, "During the year [1852] a large number of banking, brokerage and import houses had begun to take part in the marketing of railroad securities…prosperity, a low interest rate, and rapidly rising prices of British securities combined to break down the British investors' prejudices against American securities." Medbery (1870, p.306) observed that, "From '51 to '53 twenty-seven new banks had been organized in the [New York] city. Hence competition, a relaxation of the scrutiny of securities, and an eagerness for call loans…England, therefore, forgot its old fears, and had become a buyer again. It absorbed our governments, and such stable State securities as those of New York and Massachusetts. Then it began to purchase

business of building and running a railroad involved high fixed costs. With such high fixed costs, and given the speculative nature of Western railroads, one might expect to observe relatively low debt levels in railroad capital structures. Yet this was not the case, as most railroads at or near the frontier had leverage ratios in excess of 50 percent. Why the liberal use debt by these speculative ventures?

The basic intuition follows from Townsend's (1979) analysis of state verification costs and debt as an optimal contract. Railroad construction required vast quantities of capital. The middle and western parts of the U.S. in the 1850s had significant economic potential, but were capital poor. This meant that most of the capital to fund investment had to come from elsewhere. Outside equity capital providers were rightly nervous about funding speculative ventures when there was an inability to monitor activities firsthand. This was especially true when financial reporting and governance were suspect. Without a trusted local presence or some other way to reduce monitoring expenses, the cost of outside equity capital was high as a consequence. This caused railroad financial management to consider debt finance. Debt in this case, especially if backed by tangible collateral, tended to be more cost effective, since debt is a priority claim that requires paying state verification costs only in the (hopefully rare) cases of bad state outcomes. Hence the incentive for railroads, particularly the riskier ventures located further west, was to finance construction with debt.

Yet, at the time it was well known that too much debt was problematic in the high growth, high fixed cost railroad business.[26] The difficulty in selling shares and the necessity of financing with both debt and equity placed the promoter at the forefront of western railroad development. Moreover, equity issuance often required the payment of high dividends, even if it meant paying dividends from borrowed funds. Complementary to a promotional sales approach was presenting information in its most favorable light and suppressing information that might not reflect well on management or the business model. In addition to providing incentives for management to water stock and otherwise underreport leverage, this meant avoiding reporting the sources and uses of funds as well as expenses associated with a depreciating capital stock.[27]

3.2 Analysis

The purpose of this section is to show how, in the months leading up to the failure of OLITC, stagnant earnings growth, significant debt obligations and unrecognized expenses associated with a depreciated capital stock combined to create significant problems for many railroads. Although the

railroad bonds." Van Vleck (1943, p.36) estimates $250mm of foreign investment existed in the U.S. in 1857, of which $160mm went into railroad securities.

[26] Henry Varnum Poor was perhaps the best known advocate of this principle. According to Chandler (1956, p.134), Poor advocated a 50% limit of total debt to total assets. He made three further qualifications: 1) a sinking fund provision was necessary for repayment of the debt, 2) bona fide stock subscriptions were required, and 3) short-term debt should be minimized, since the rollover risk was significant and potentially quite disruptive.

[27] As Brief (1965) observed in his aptly titled article *19th Century Accounting Error*: "That the accounting profession had little authority in this period meant that the presentation of financial data rested solely on the judgment of management." Indeed, railroad mogul and master promoter Henry Hudson bluntly stated, "I will have no statistics on my railroad." For a more recent perspective on Hudson and accounting shenanigans in England in the 1840s, see Odlyzko (2010).

existence of excess leverage has been recognized generally in the literature, the negative consequences of unrecognized deferred maintenance and depreciation costs have received much less attention. Neither issue has, to our knowledge, been studied in detail, separately or together, so this analysis constitutes an original contribution to the literature on this topic.

We will focus on the years 1854 through 1857, and continue to explore details associated with the sample of 17 firms presented in Table 2.[28] Table 3 lists the names and regions of the railroads selected for our sample, as well as provides some key facts about the company in terms of its history, track mileage, assets and revenues. There is no centralized source of accounting and financial information for railroads during the 1850s; consequently, we utilized a number of different data sources to construct our database of accounting and financial information.[29]

Table 4 reports interest coverage and total leverage measures for the first three groupings on the eve of the panic of 1857. Net earnings are reported before interest, taxes, depreciation and amortization (EBITDA). Note the conservative coverage ratios and debt levels of the three older New England railroads—Boston & Lowell, Boston & Providence and Boston & Worcester—which were established and well-managed companies. The other two New England railroads, Eastern and Western of Massachusetts, were burdened with much more debt.[30] This appears to be because construction of the latter two roads was finished after the panic of 1837, when equity capital had become scarce and long-term debt was issued that had yet to mature.[31]

The Trans-Eastern and Western railroads are seen to carry significant debt obligations. However, with the exception of New York & Erie and Illinois Central, the levels do not at first blush appear to be alarming. The New York & Erie, a very important railroad in the history of the U.S., often incurred the wrath of Poor and other analysts for its aggressive and shady management practices (see, e.g., Chandler (1956, Ch. 6)). The Illinois Central Railroad, with its extremely high leverage and low coverage ratio, was the first railroad to receive a land grant from the federal government with the express purpose of assisting in the financing of railroad construction. The land grant generated much land speculation, but relatively little in the way of actual railroad construction. With both the railroad

[28] The railroads included in the New England and Western groups are those used by Smith and Cole (1935) to construct the indices reported in *Fluctuations in American Business*. The Trans-Eastern group includes the Baltimore & Ohio and New York Central from Smith and Cole, and adds the New York & Erie and the Pennsylvania Central to account for the roads which served to connect the western roads to the east coast.

[29] The main sources of balance sheet and income statement data for the sample are from the annual reports of the railroads. In some cases the annual reports themselves were unavailable. Various sources were used to fill in missing observations, including: Massachusetts General Court; Committee of Railways and Canals; *Annual Reports of The Railroad Corporations in The State of Massachusetts,* various years; New York State Engineer, *Report on the Rail Roads of the State of New York*, (also titled *Annual Report of the Railroad Commission of the State of New-York*), various years. Financial data for the Marietta & Cincinnati Railroad were obtained from Pixton (1966).

[30] Boston & Lowell's debt combined with its small capitalization allowed the stock to be closely held. Consequently, no prices appear in the "United States Railway Share and Bond List" published by the *American Railway Times*. Eastern of Massachusetts, which had substantial debt, had no debt prices reported in the "List" during 1857.

[31] See Henry Varnam Poor (1860, pp. 115,160).

and the saleable lands available as security, Illinois Central financed itself almost exclusively with debt.[32]

As discussed earlier, four other Western railroads are of particular interest in exploring the railroads' role in the panic. They include the Cleveland & Pittsburgh and Marietta & Cincinnati, both of which played a central role in the failure of OLITC, and the La Crosse & Milwaukee and Milwaukee & Mississippi. The latter two railroads accounted for most of the railroad construction in Wisconsin from 1955-57. Wisconsin was at the time a thinly populated but rapidly growing state with 81% of total railroad construction occurring during that three-year window.[33] These two railroads were clearly speculative ventures that laid most of their track well ahead of demand.[34] Table 5 displays the leverage measure results for this fourth grouping.

This group of railroads displays a great deal of financial risk and leverage. Cleveland & Pittsburgh leverage measures are understated, as they are based on 1856 rather than 1857 financial data (no annual report for 1857 appears to exist), where previous analysis showed that debt levels increased significantly in 1857 for this firm. Moreover, based on available reporting correspondence, it is likely that debt levels for this railroad are also underreported in 1856. We further believe that leverage of the La Crosse & Milwaukee railroad is significantly underreported, as the firm was known to engage in stock watering schemes and appears to have ignored debt obligations in its financial reporting (we will take up this issue in detail in the next section). Furthermore, at the end of 1857 La Crosse & Milwaukee had over $100,000 in unpaid bond coupons.

Thus, from Tables 4 and 5, we have found that three of 17 railroads had reported earnings insufficient to cover the interest obligations; four of 17 had reported earnings between 1.0 and 2.0 times the interest requirements; five of 17 had coverage between 2.0 and 3.0; and five of 17 had coverage of more than 3.0 times. By modern day standards, coverage of less than 2.0 is considered to be a risky investment. Given this measure, seven of 17, or 41 percent of our sample of railroads, fall into the risky category. This estimate is conservative, in that net earnings are generally inflated because most railroads underreported operating and routine maintenance expenses, oftentimes treating those expenses as capitalized items that were placed into the construction account and subsequently "forgotten about".

If we focus on the book debt-to-book asset capitalization ratio, there are three railroads with this debt ratio less than 20 percent; four between 20 and 50 percent; seven between 50 and 60 percent; and

[32] See Paul W. Gates (1934), particularly chapters VI and VII.

[33] By the end of 1857, Wisconsin had 686 miles of completed railroads with 554 miles built between the beginning of 1855 and the end of 1857. See Paxson (1912).

[34] The La Crosse & Milwaukee was a recipient of a federal land grant in 1856, which generated some of the same issues as associated with Illinois Central. The Milwaukee & Mississippi and the La Crosse & Milwaukee both had their origins in a desire to see the city of Milwaukee grow as a lake port. Both eventually suffered as Chicago became the primary port on the western shore of Lake Michigan.

three above 60 percent. Thus, 59 percent of railroads in our sample have leverage ratios in excess of 50 percent. We have good reason to believe these numbers underreport true leverage levels for at least some of the railroads in the sample, particularly those located further west.

We now consider the incremental effects of deferred maintenance, depreciation and amortization on railroad profitability, as reflected in the construction account. The construction account for railroads in the 1850s was a catchall capitalization account. Capitalized investments were, however, not depreciated. Only when the item was sold, worthless and subsequently replaced, or otherwise disposed of was it removed from the capital account and expensed. With the newer western railroads replacement was not an immediate issue, so the distortion in accounting was more severe. As already noted, many railroads also appear to have directed routine operating expenses items into the account, subsequently "forgetting" to expense them so as to inflate earnings and justify the payment of high dividends.[35] Discounts associated with newly issued debt securities were also dumped into the construction account, which allowed firms to report issuance proceeds at par on their balance sheet. Shares were sometimes issued to pay wages, at discounts on the dollar, and subsequently capitalized at par value. All of this had the effect of inflating reported earnings and assets, and decreasing measures of leverage.[36] It also disguised the precarious state of railroads in terms of their ability to generate sufficient cash flow to meet their fixed obligations.[37]

Henry Varnum Poor and others wrote about distortions created by construction accounting, focusing primarily on the issues of deferred maintenance expense and capital expenditures required to keep the assets in place in working order. Poor suggested that depreciation should be charged at a 6.0 percent rate based on assets included in the construction account, and a writer to the *American Railway Times* suggested 8.0 percent.[38] A contemporary observer, "H", broke down elements in the typical construction account and assigned a depreciation percentage to each, finally computing a weighted average depreciation rate that could be applied to the construction account. His estimate was 5.22 percent of construction account assets.[39] These estimates seemed to ignore technological obsolescence, which was extremely high during this era of shabby construction methods and the development of new track, engine and rolling stock technologies that, in a highly competitive environment with much new construction, reduced the lifespan and productivity of assets in place.[40]

---

35 See Chandler (1956, p138).

36 See appendix A for additional detail on bond discounts and issued stock as they were treated in the construction account.

37 See Evans (1859, pp.101-102) for a detailed discussion of the construction account in the years leading up to 1857 panic.

38 See the *American Railroad Journal,* September 15, 1849 and "The Railway Interest of the United States,' *American Railway Times,* December 6, 1855. Also see *Colburn's Railroad Advocate*, December 15, 1855, which argues for an 8.33% rate of depreciation.

39 "H", "Annual Railway Depreciation," a letter published in the *American Railway Times,* January 3, 1856.

40 See, for example, Boorstin (1965, p.103) and Grant (1856, pp.114-129). Grant and others writing around that time commented on the switch of engines from wood burning to coal burning, which offered significant operating cost savings.

In Table 6, paid interest and estimated depreciation are subtracted from 1857 net reported earnings for our sample of railroads. Paid interest is taken as reported by the railroads, and depreciation is calculated "straight-line" at 5.22 percent per year as estimated by "H". Based on these comparisons, and the caveats regarding incurred but unreported maintenance expenses and technological obsolescence, we consider our depreciation estimate to be conservative.

Reported net earnings to book asset capitalization are seen in column (1). With the exception of Illinois Central, these returns might be termed as poor but not disastrous. They are generally positive, but do not represent a good return on investment capital given the associated risks. For example, promised yields on bonds to the firms generally exceed the reported return on assets.

As seen in column (2), after subtracting estimated depreciation from reported net earnings, we obtain net earnings after depreciation but before paid interest. The ratio of this number to total book capitalization is a useful ratio by which to analyze overall profitability of the railroad. The return on assets is seen to decline considerably when adjusted for depreciation. The third column is useful in judging the benefits from an investment in shares of stock. After subtracting both paid interest and estimated depreciation from net reported earnings, as seen in column (3), more than half of the firms in the sample generate negative returns to equity, and all generate a return that is less than 4.3%. Not surprisingly, the "Other Western Railroad" group generated the lowest returns to assets and equity, and none of the railroads in the sample generated returns that would have appeared attractive to investors in 1857.

The Panic of 1857 did not descend upon financially sound railroads and cause them sudden financial distress—they were generally unprofitable as they approached the Panic. Of the 17 railroads analyzed, we were able to obtain at least partial data on 16 for at least one year during the 1854-1856 period. Of the 15 railroads for which we have earnings data, we find that seven generate negative earnings measures in each year where data are available, and five additional railroads generate negative net earnings after depreciation and interest for more than half of the years. The only railroads with no annual negative net reported earnings are New York Central and Chicago, Burlington & Quincy. At the same time, these mostly unprofitable or marginally profitable railroads generally paid dividends at a rate of 6.0 percent or more, with 8.0 percent as the modal dividend payment rate. In reviewing the balance sheet reporting of the railroads during this time period, only token amounts of cash were reported by some of the railroads while others reported no cash on hand at all, implying that dividends were almost exclusively being paid out of recent financing transactions.

In summary, these data show that financial results from 1854 to 1857 were poor, which can explain the downward drift in railroad share prices over this time period. To explain the sudden drop in prices coinciding with the failure of OLITC in late August 1857, we would now like to provide a forward-looking view from an investor's perspective sitting on the eve of the August 1857 panic. We will take two approaches to doing this. For the first approach, we will ask the question: Given the railroad's current earnings and financial structure, what kind of earnings growth would have been required to

pay down current debt obligations when they fell due. The second approach is complementary to the first. In this case we ask: Given the railroad's current earnings and reasonable rates of earnings growth, what is the maximum debt obligation that could be supported by the stated earnings and earnings growth.

As a first step in the analysis, we examine realized earnings growth during the 1854 to 1857 time period. Results are reported in Table 7. We note that earnings growth generally came from two sources: assets in place and new assets added during the measured time period. Earnings growth attributable to assets in place at the start of the measurement period is in modern times often referred to as "same-store" growth. We are most interested in same-store earnings growth rates, as these are the salient measures in assessing the viability of a railroad's current business model. That is, one wants to strip away the new asset growth component in order to get an accurate picture of the productivity of assets in place relative to their cost of capital. Under the assumption that new assets generate the same rate of earnings growth as assets in place, terminal earnings are adjusted downward by an asset growth rate factor (seen in column (2)) in order to obtain same-store earnings growth as reported in column (3).

Although same-store earnings growth is seen to vary across companies over the 1854 to 1857 time period, the picture is rather bleak in general. A number of railroads generated negative same-store growth in earnings, where the unweighted sample average over the three-year period was -0.1%. Looking forward, standing in late August 1857, expected earnings growth would likely not be exceedingly high, giving credibility to Schumpeter's (1939) dry observation that, "Middle western and western projects could not be expected to pay for themselves within a period such as most investors care to envisage."

Conditional on current earnings and financial structure, we will now calculate a same-store earnings growth rate necessary to generate sufficient cash reserves to satisfy current debt obligations when they come due. This reserve is accumulated net cash earnings after accounting for: i) costs necessary to keep the existing stock of assets in their current condition (i.e., annual depreciation/reinvestment costs are subtracted from earnings), ii) paying interest on the bonds in place, and iii) paying a dividend to shareholders.

Let g denote the earnings growth rate to be determined; r, the rate of return earned on the reserve over the accumulation period; E_0, the railroad's reported net earnings in the base year; i, the rate of interest on the bonded debt outstanding (book debt), D, in the base year; d the dividend rate on base year equity capital stock (book equity), S; δ, the assumed rate of reinvestment required on the construction account assets-in-place, A, to maintain asset productivity over time; m, the maturity of bonds in years; and $\gamma \in [0,1]$, which scales the salvage value of the assets-in-place (relative to D) at the time of maturity that can be applied to help fund the debt balance due. Assuming that flows are realized and compounded as necessary in continuous time, the amount needed to pay off the bonded debt, D, can be written as,

$$\gamma D = \int_0^m \left[\left(E_0 e^{gt}\right) - iD - dS - \delta A\right] e^{r(m-t)}\, dt \tag{1}$$

Equation (1) accounts for growth in current earnings, which are compounded at a rate of *g*. From these earnings bond interest and share dividends are paid, and reinvestment is made as required to maintain asset productivity.

From this equation it follows that,

$$\frac{e^{gm} - e^{rm}}{g - r} = \frac{\gamma D - \left[\frac{1 - e^{rm}}{r}\right]\left[iD + dS + \delta A\right]}{E_0} \tag{2}$$

which must be solved numerically for the minimum required earnings growth rate, g^*. To generate specific solutions, base year E_0, D, and S are obtained from the firm's 1857 financial statements. With reference to the available market data, in order to enhance comparability we will choose representative values of debt maturity, m=10; bond interest rate, i=0.08; and dividend yield, d=0.08.[41] We assume this dividend yield rate is required for the railroad to be able to continue to attract capital for other investment, and that other resources are available to fund the dividend payment and related cash outlays if current earnings are insufficient. We assume reinvestment is into a "safe" investment, where data from Homer and Sylla (2005) indicates a 4.2% yield rate on high-grade long-term bonds in 1857.

The most difficult parameters to estimate with accuracy are the required asset reinvestment rate, δ, and the asset salvage parameter, γ. As discussed earlier, contemporary estimates of the rate of depreciation on assets in the construction account varied between 5.22 and 8.33 percent. As also noted earlier, we believe these estimates do not fully account for unreported maintenance expenses and the effects of technological obsolescence as related to keeping the assets-in-place fully productive in a highly competitive and rapidly evolving industry.

To account for uncertainty associated with these two parameters, we will consider three alternative scenarios: 1) δ=0, γ=1, which coincides with the case of a firm making no maintenance or other reinvestment in the assets-in-place (but somehow retaining full productivity over time), which as a result renders them worthless at that time of debt maturity, implying the establishment of a sinking fund that equals the loan balance at maturity; 2) δ=.0522, γ=.50, which coincides with the case of a firm reinvesting in the assets-in-place at a rate of 5.22% as determined by "H", but where technical obsolescence and other factors result in having to fund 50 percent of the debt face value at the debt

[41] We have analyzed available data on debt maturities of bonds of railroads in our sample, and have found an average maturity of 10 years. Coupon bond rates and dividend yields are respectively found to average 8 percent.

maturity date; and δ=.10, γ=0, which coincides with the case of a firm undertaking reinvestment at a rate sufficient to maintain full asset redeployability, thus requiring no sinking fund at debt maturity.[42]

The resulting minimum growth rates in net current earnings required to satisfy current debt obligations under the three scenarios are displayed in Table 8. Reported (and unreported) results indicate particular sensitivity in the minimum growth rate (*g*) to the required rate of reinvestment into the assets in place (δ). This sensitivity may explain the focus of prominent analysts in the 1850s on the construction account and proper recognition and estimation of maintenance expenses and depreciation.

If investors at the time believed that a reinvestment rate of between 5 and 10 percent was required to maintain asset productivity, with a respective sinking fund requirement of between 50 and zero percent of debt face value, in order to meet existing debt repayment requirements in those two scenarios 10-year net revenue growth rates of 9.0 percent or higher are required for all of the railroads in the sample. Required minimum same-store earnings growth rates exceed 18 percent for the Other Western Railroad group. Achieving these kinds of growth rates would have seemed highly unlikely given recent economic conditions, particularly given revised expectations formed after the failure of OLITC.

We will now calculate a maximum debt level that can support the firm's current earnings and assumed same-store earnings growth rate. That is, we now specify an expected earnings growth rate, *g*, and ask how much debt the railroad could have in the base year and still accumulate a sinking fund of sufficient size to satisfy debtholders. Equation (2) can be algebraically manipulated to find the maximum quantity of debt, D^*, that can support current earnings and assumed earnings growth, where we find that

$$D^* = \frac{\dfrac{E_0\left[e^{gm} - e^{rm}\right]}{g - r} + \left(ds + \delta A\right)\left[\dfrac{1 - e^{rm}}{r}\right]}{\gamma - i\left[\dfrac{1 - e^{rm}}{r}\right]} \tag{3}$$

With D^*, the maximum leverage ratio can be stated as $\dfrac{D^*}{D+S}$, where *D*+*S* is defined as book assets in the base year.

Results are displayed in Table 9, where four alternative scenarios are considered. In all four scenarios, a required reinvestment rate of γ=.0522 is assumed. We then consider sinking fund requirements such that γ=.50 and γ=0.0. In the latter case we conservatively assume that no sinking fund is required

[42] That is, in this latter case with "full" reinvestment in the assets-in-place, the expectation would be that new collateralizable finance is available at the debt maturity date to fully pay down the loan balance.

to satisfy bonded debtholders. Two alternative same-store earnings growth rates of 5.0% and 10.0% are also considered. All other parameter values are as stated previously. Actual reported book leverage ratios are shown for comparison purposes. The table clearly illustrates that most of the railroads in the sample were seriously overextended, particularly those in the Western railroad groupings, with no hope of supporting current debt levels. This was in fact the case, where five railroads in our sample went into receivership by 1860 and an additional nine experienced varying degrees of financial distress after the onset of the panic.[43,44]

In summary, this section provides detailed analysis supporting the notion that, by August 1857, many railroads had an unsustainable business model. Softening fundamentals, caused in part by a decline in demand for western agricultural products, combined with high leverage and shady business practices to significantly weaken a number of railroads. In the process of our analysis we have filled in missing links related to Fishlow's (1966) contention that railroads were at the center of the panic, which Calomiris and Schweikart (1991) criticize when they state Fishlow "has not explained the timing of the decline in 1857 or the links between railroad securities and banks."

This analysis also explains why there was a banking panic but relatively few bank failures. OLITC was large and inter-connected enough to present a systemic banking risk, where its failure raised many questions and caused many to ask, "do you go next?" (Janey (1885)). But not many other banks had the kind of financial exposure that OLITC had to western railroads, where instead much of that risk was distributed in smaller packages to foreign and eastern investors as well as to smaller isolated western banks. The distribution of risk outside of normal banking channels was in part the result of Wall Street investment banking, which began to make inroads into the traditional credit markets in the 1850s, and the fact that the railroads marketed securities directly to the public with the assistance of eastern brokers. There was also the fact, noted previously, that OLITC used available liquidity to pay off Ohio banks ahead of other eastern depositors prior to closing their doors on August 24. And, finally, bank depositors did not initially panic at all by withdrawing their deposits; rather, it was the banks that choked off new lending, which fed back to spook depositors as the economy contracted sharply (see Gibbons (1859, Ch. XIX), as well as Ó Gráda and White (2003)).

Although most investors likely did not make the calculations exactly as we have shown, the issue was undoubtedly on their minds. Yet we argue, somewhat implausibly it might seem, particularly given warnings issued by credible sources such as Henry Varnum Poor, that the unsustainability of the

[43] Receivership is the equivalent of bankruptcy with the transfer of assets to new management, resulting from payment default on debt in place at the time of the OLITC failure. Serious financial distress is the elimination of dividend payments and a debt restructuring, usually along with significant restructuring of operations. Mild financial distress is typically a reduction in dividend payments combined with the issuance of new equity that results in a less levered capital structure, along with a noticeable change in operating policy. No financial distress corresponds to finding no evidence of any significant change in financial or operating policy in the period August 1857 to 1860. Sources for our classification are: Johnson and Supple, pp.143-179; Pearson, p.62; *Merchants Magazine and Commercial Review*, October 1865, pp.287-291; *Ibid.,* November 1865, p.353; Ackerman, pp.101-105; Brownson, pp.411-413; Mayer, pp.261-270; Vernon, p.471; Poor, p.99, p.104, p.106, p.117, p.163, p.278, p.287, p.474, p.584; Various Annual Reports 1858, 1859, 1860, 1861.

[44] See Giesecke et al. (2010) for an analysis of corporate bond defaults spanning the 1866 to 2008 time period.

railroad business model was not fully internalized prior to the OLITC failure. But, in fact, a slow response to worsening conditions happened *because* financial reporting from many of the most systemically important firms in the economy was at best not very informative and at worst fraudulent.

In the face of a still-optimistic but increasingly wary investment market, incentives for opaqueness seem clear on the part of railroad management and other agents in the economy who stood to gain from such policies. But why would investors allow for such poor financial reporting conditions to persist in the face of so much uncertainty? Doing so would seem to lend at least some support to the "random events" hypothesis of banking panics. One plausible explanation comes from Gennaioli, Shleifer and Vishny (2010), who argue that investors systematically "neglect" or underestimate the magnitude of certain risks during boom times. Neglect may be particularly relevant in economies with many new and different dynamics and interconnections. Firms and financial intermediaries can be interested in furthering neglect in order to oversupply securities that are in high demand. This in turn leads to financial fragility problems that can cause markets to collapse, and only when neglected risks become realized outcomes do investors fully update their beliefs.

4. Anatomy of Financial Innovation and Accounting Shenanigans

A primary thesis of this paper is that, prior to the suspension and failure of OLITC, a speculative investment environment, which fed the western railroad construction boom, combined with general uncertainty about underlying dynamics in the economy to lay the groundwork for the panic of 1857. In this section, to further support our thesis, we conduct a detailed analysis of three Wisconsin-based railroads' actions leading up the OLITC suspension date. We specifically analyze the Milwaukee & Mississippi (M&M), La Crosse & Milwaukee (L&M), and Racine & Mississippi (R&M) railroads. Most of our analysis will be focused on two financial innovations—the *railroad farm mortgage* and the *farm mortgage-backed security*.

As way of background, prior to the panic of 1837 a number of states had committed to fund the local development of "internal improvements," including railroads. That panic and subsequent economic carnage left those states with significant liabilities, but no internal improvements to show for their troubles.[45] As a result of the debacle, many affected and unaffected states put restrictions on the public funding of railroads (or, more generally, on any internal improvements).[46] State-level funding restrictions were largely why land-rich but cash-poor states such as Illinois and Wisconsin provided land grants to the politically well connected and "important" railroads. But the land grants were not sufficient to fund railroad development, as the majority of the land had no value unless economic

[45] Medbery (1870) notes that nine states—Pennsylvania, Maryland, Florida, Louisiana, Mississippi, Illinois, Indiana, Michigan, Arkansas—defaulted on their bonds as a result of the consequences of the panic of 1837.

[46] For example, Article VII, Section 10 of the Constitution of the State of Wisconsin, adopted in 1848, prohibited funding for internal improvements. At the beginning of the decade of the 1850s, Indiana, Illinois, Ohio, and Michigan had changed their constitutions to forbid internal improvements. By 1860 more than a dozen and a half states had provisions prohibiting such investments.

activity on or near the land was realized—or at least foreseeable. Being built ahead of demand, the first step to demonstrating value was to secure financing for the laying of the track.

Thus, in the frontier states, a difficult chicken-or-egg problem presented itself to railroads in terms of securing funding. Making the problem even more difficult was that financiers from outside the immediate area liked to see local capital, particularly local equity capital, invested in order to demonstrate commitment and quality so as to decrease the risks of investment. But, as a local historian put it, "Wisconsin [outside the City of Milwaukee] was as poor as poverty's grandmother at that time, and had no financial standing in the East. Neither had her euphonious name ever been heard by the rich men across the sea."[47] What to do?

This combination of factors caused a new financial innovation called the "railroad farm mortgage (RRFM) bond." Although the initial idea may have first sprung up in Ohio or Indiana, it was Byron Kilbourn who successfully implemented the idea on a meaningful scale. Kilbourn, who helped launch the M&M railroad in 1848, and who moved over to start the L&M railroad in 1852, apparently came up with the idea along with Moses Strong (M&M's chief council) prior to an M&M board meeting that occurred in late February 1850. At the February 27, 1850 board meeting of M&M, the speaker was Joseph Goodrich, a displaced New Yorker who was now Mayor of Milton, Wisconsin (and a future board member at M&M). He stood up and announced:

> See here; I can mortgage my farm for $3,000 and go to the east, where I came from, and get money for it. Now, are there not one hundred men between Milwaukee and Rock River that can do the same? If so, here is your [M&M's] money. I will be one of them." [Holton (1903, p. 277)]

The compelling selling point to the farmer was, not surprisingly, self-interest. Quoting from Mr. Kilbourn in his "Circular to Capitalists" (1850), he argues that development of a railroad near the farmer's location:

> would more than double the amount of the farmer's profits, producing a higher general prosperity of the community, and a consequent enhancement of the value of real estate in all that part of the country falling within the range of its influence.

The idea of course was full of promise for the Western farmer. Besides an opportunity to improve the local economy and speculate on farmland value, among other things it would:

> Make the farmer a stakeholder to rebut the "corporate" view of the railroad. The idea as for the railroad to become almost a farm machine, owned collectively by the farmers, instead of being a sinister device for capitalists for exploiting the agricultural class…The railroad

[47] A.J. Longworthy, "Early Railway History," in *The Milwaukee Sentinel* July 23, 1893.

> company would give the real estate mortgages as collateral security for its own bonds, which would be sold in the eastern capital markets or given in payment to contractors…Eastern capitalists posed no threat. They did not own the road [the farmer would as an equity shareholder], they merely advanced the immediate liquid capital. [Schilling (1964, pp.33,41-42)]

In almost no time the farmers responded. However, like many experiments, success did not come immediately. After the farm mortgages were given to the railroad in return for an equity stake in the company, the next step was to transform the RRFMs into the liquidity required to construct the road. As Holton (1859, p. 277) notes, there was,

> an attempt [was]… made to negotiate them [in New York City]. But this was found, at first, impossible. It was a class of security entirely unknown, and no market could be found for them.

Hence, in the year 1850, the first known attempt to securitize a pool of mortgages on Wall Street had occurred.[48] Although this particular pooling-securitization effort failed, there is evidence that a subsequent attempt succeeded with a pool of residential and farm mortgages from Indiana.[49] The year of that pooled mortgage asset securitization was 1852, coincidentally the time in which capital began to flow in again into the U.S. from England and then the Continent.

After failing to sell the initial structure in New York, Kilbourn ditched the asset pooling approach, which posed problems in terms of generating an attractive sales price without a credible third-party guarantee, in favor of a single asset security.[50] The single asset security implied a one-to-one match between the RRFM and the RRFM bond. The security interest was nonetheless legally transformed into something other than the original RRFM, since repayment was promised by the firm in addition to promises made vis-à-vis the loan contract itself. They were, in other words, what is known in modern terms as covered bonds. The bonds were issued at approximately 80 percent of par.[51]

---

[48] Evidence of the earliest securitizations that we are aware of can be found in Goetzmann and Rowenhorst (2005, Ch. 15), where in 1753 Gideon Deutz, Mayor of Amsterdam, led an effort to pool and sell plantation mortgages on properties located in the West Indies.

[49] From William Gephart (1909, p. 163) on a securitized deal executed in Indiana in 1852: "When individuals subscribed to the stock, mortgages on their property were frequently given, as is shown by the report of the Bellefontaine and Indiana Railroad in 1852, which exhibits a list of town lots and farms conveyed to the road. These properties were offered as security for a loan of $200,000 and comprised 213 lots in different towns in several counties and 57 farms, almost all of which contained less the one hundred acres."

[50] It is likely that an additional problem was selling the entire asset pool to a single investor unit. The idea of tranching the pool apparently did not occur to the issuers at the time, and there were likely coordination as well as distributional concerns about how to address default and foreclosure problems in the presence of multiple investors. Consequently, L&M and other issuers settled on the single asset security approach as the most feasible structure.

[51] On January 10, 1856, $5,000 in La Crosse and Milwaukee RRFM bonds were sold, at auction, by A.H. Nicolay, for 80.5 as reported in the *New York Times* on January 11, 1856. See also Cary (1892, p.32).

The striking feature of the deal structure is that no cash changed hands between the farmers and the railroad. The standard railroad-farmer loan transaction was for the farmer to offer a first mortgage on his property with a promise to pay 8 percent interest only for a term of 10 or 20 years, at which time principal was due and payable. In return, the railroad offered shares of restricted stock equal to the face value of the mortgage amount, carried on the railroad's balance sheet as equity, with a promise of a 10 percent dividend yield on the stock's face value. The 10 percent rate more than covered the interest payment, so there was no need for money to change hands. Moreover, the 2 percent dividend in excess of the interest requirement was to be used to pay down the balance of the farm mortgage over time.[52] In the fever of the speculative times of the middle 1850s, to the farmer this deal must have been difficult to pass up.

Comparing the 1850s with the recent past, from a mortgage design perspective these loans would likely seem even more attractive to borrowers than the hybrid and option ARMs offered prior to the financial crisis of 2007-08. In both cases, the bet was on increasing property prices that would be capitalized into investment value—farmland values and railroad stock prices in the 1850s and house prices in the 2000s. The hybrid and option ARMs of the 2000s at least required the borrower to fund a mortgage payment, making them less attractive than the RRFM from that perspective. Furthermore, like some of the sub-prime loans of the 2000s, farm mortgages were essentially "no documentation" loans, in the sense that the only documentation provided to the bond investors was a stated warranty in an investment circular that an appraisal had been done on the property and that it conformed to standards.

The appraisal issue warrants additional discussion, as it relates directly to the question of how pyramiding leverage and uncertainty contributed to the panic. Prior to 1852, evidence from a number of sources suggests that the maximum loan-to-value (LTV) ratio available for a standard farm mortgage was 50 percent. Ó Gráda and White (2003) document that, even during the go-go years of the middle 1850s, Emigrant Bank of New York permitted LTV ratios of no more that 50 percent. Gibbons (1859) further notes the 50 percent LTV ratios being in place for many banks all the way through to the 1857 panic. We believe the 50 percent LTV ratio cutoff, which might seem low by today's standards, to be the result of significant volatility in agricultural commodity and farmland prices during the first half of the 19th century, together with the fact that farmers often borrowed additional money on an unsecured or less secured basis in order to survive financially from one harvest to the next.

In contrast, securitized RRFMs originating from properties located in Wisconsin and northern Illinois had an advertised loan-to-value ratio upper bound of 66.7 percent. The appraisals were made by individuals "appointed by the company [the railroad]," leading to an obvious conflict of interest problem, particularly related to the fact that these frontier railroads were capital-starved and the farmers giving the mortgages had no out-of-pocket costs that would vary as a function of the loan amount.

[52] There are several sources that confirm this general structure. See, for example, Merck (1914, p.241) and Cary (1892, p.17).

We have been unable to locate complete RRFM bond offering circulars from the Milwaukee &Mississippi or La Crosse &Milwaukee that would provide detail on the marketing of these bonds to investors. However, Appendix B contains a reprint of a full circular from the Racine & Mississippi Railroad. This 1856 offering, which required semi-annual interest payments of 10 percent on the bonds, is made with the backing of farm mortgages located in northern Illinois. We have no reason to believe this circular to be unrepresentative of similar offerings made by similarly located railroads, and wish to highlight several parts of the circular.

There are three layers of security offered to investors as stated in the circular: 1) The mortgage note, which provides for interest paid by the borrower to the company; 2) The mortgage itself, which provides a collateral back-stop in the case of default; and 3) The bond of the company. As to the quality of the first layer of protection, a copy of a representative note included in the circular indicates interest to be paid by the borrower annually to the company.[53] Nowhere in the circular is it indicated that the interest payment is offset by the stock dividend, with no cash paid in from the borrower to fund the interest payment. The company does separately state that it has issued equity secured by farm mortgages, but does not mention any connection between these mortgages and the listed stock, the dividend obligation, nor the cashless swap agreement with the borrower. On the first page of the circular it is also stated that, “Nine out of ten of the notes would be good without any other security.” Subsequent events would prove this claim to be inflated. Therefore, we conclude that the note portion of the credit protection package is illusory and, in essence, deceptive.

As to the quality of the second layer of protection—the mortgage that establishes a collateral back-stop—it depends critically on the value of the collateral at the time the note is signed. In the circular it is stated that the appraisal is completed by “two persons appointed by the company” and that “None of them [the mortgages] is for more than two-thirds of the appraised value of the lands at their present worth.” Although the circular states that “Great caution has been used in getting low appraisals,” there is no further information provided to back up their claim. Thus, an aggressive appraisal LTV cutoff of 66.7 percent together with a questionable governance structure suggests the real possibility of a lower quality collateral backstop than advertised.

To address the appraisal quality issue in greater detail, we have obtained RRFM loan data from the failed L&M railroad. Because the L&M railroad had received a land grant from the State of Wisconsin to aid in the construction of railroads, and because those lands had reverted back to the State as a result of the bankruptcy of the company and transfer of the railroad to a new company in 1861, the state formed the Wisconsin Railroad Farm Mortgage Land Company with the intent of compensating affected farm mortgagors for their incurred losses. Funding was to be generated by the sale of land that had been part of the L&M land grant. Because of the public nature of this initiative, we have been able to identify and obtain usable data on approximately 1,000 securitized farm mortgages that were eligible for compensation from the Wisconsin Railroad Farm Mortgage Company.

[53] Note made by Oren Johnson to the La Crosse and Milwaukee Rail Road Company, dated January 29, 1853, located in the Archives of the Wisconsin State Historical Society Library.

Besides providing the name of the individual eligible for compensation, as well as his post office address, there are data on the originated mortgage amount. We match the listed name and location with 1850 census data. When a listed name and location is matched to the census, we can obtain an estimate of the property value (which was made by the property owner himself). We use 1850 census data rather than 1860 census data to obtain property value estimates, as we believe that the 1850 estimates will be more accurate (they were made prior to the boom and bust that occurred in the middle and late 1850s, which was likely to lead to significantly overstated farmland property values in the 1860 census). This matching process leaves us with 246 farms that were owned in 1850 by the mortgagor, where the critical measure of interest is the ratio of the mortgage amount to the estimated property value at the time of loan issuance.

Our express concern regarding the use of the railroad's "in-house" appraisals to certify property value is the incentive of the railroad to increase stated RRFM loan amounts in order to increase proceeds from a subsequent securitized loan sale. Did the incentive problem produce the predicted result? As a first step in analyzing this question, available evidence indicates that relevant Illinois and Wisconsin farmland values likely more than doubled, but probably had not tripled, between 1850 and 1855-57, which is the period in which most of the RRFMs were issued.[54] With these appreciation factors, we can now calculate a LTV ratio based on the reported mortgage amount and the estimated appreciated farmland value. Table 10 shows that, based on an analysis of the 246 RRFMs for which 1850 ownership data exists, an estimated 42 to 67 RRFM loans had LTV ratios in excess of the stated 66.7 percent LTV cutoff. A similar exercise shows that between 55 and 86 of the loans had LTV ratios in excess of 50 percent. The latter statistic implies that 86 of the 246 RRFMs had a stated loan amount in excess of the reported 1850 property value.

Thus, given the available data (which are admittedly noisy) and assuming that this restricted set of loans is representative of the total pool of RRFMs underwritten and appraised (which we have no way of verifying), we estimate that between 17 and 27 percent of the analyzed loans exceeded the stated maximum LTV ratio of 66.7%. An estimated 22 to 35 percent of the loans were originated with an LTV ratio in excess of the previous LTV ratio standard of 50.0%. These results suggest a persistent tendency of the railroad to originate mortgage loans in excess of the stated LTV cutoff value. Certainly, given the benefit of hindsight that incorporates knowledge of declining property values as a result of the panic and subsequent bust, our estimated LTV ratios are lower than "true" LTV ratios and hence conservative.[55] Therefore, with previous caveats firmly in mind, our conclusion from this particular exercise is that significant appraisal bias existed and was a contributing factor to pyramiding leverage

[54] Bogue and Bogue (1957, p.13) show the average sale price of land of two speculators in Illinois. In 1850 the average price was $2.97/ acre and in 1856 it was $4.09/acre, less than doubling in value during those years. Hibbard (1905, p. 195) shows a table of land sales in Dane County, Wisconsin in which the average price of land was $2.85/acre in 1845 and $9.68/acre in 1855 which shows a growth of over 3 times starting from the 1845 date.

[55] A *Chicago Tribune* article from December 17, 1861 summarized the common attitude after the fact. In reference to farm mortgages given to the Racine & Milwaukee and La Crosse & Milwaukee railroads, the article notes, "In almost every case the property is of less value than the amount of the note which it was given to secure. The property was appraised at a time when all real estate was extravagantly high, and in many, in fact in most cases, the agents to procure the subscription were the appraisers of the property mortgaged."

that existed across the entire economy, and which came to light as a result of the fallout from the OLITC failure.

As to the quality of the third layer of protection, the "bond of the company," it depends on the true financial condition of the railroad itself. Clearly the railroad's leverage is important to the security of the RRFM bondholder. R&M railroad stated in the circular that $2 million out of $3 million in equity on its balance sheet had its origin in railroad farm mortgages. But does the "bond of the company" offer true security to the bondholder and therefore insurance against financial distress risk at the firm level, or is this too an illusory thing?

Figure 1 provides a series of stylized balance sheets for a hypothetical railroad that finances itself with a RRFMs. Panel A shows the railroad's position prior to a RRFM financing, where the $100 of assets of the firm are financed with 50 percent equity and 50 percent debt. Panel B shows the accounting entries associated with a $100 RRFM financing, in which the assets are booked prior to a bond sale of RRFMs. The $100 of RRFMs is accounted for as being financed all by equity, leading to a significantly lower leverage ratio. But, as a going concern, and recalling that no cash changes hands between the farmer and the railroad, the firm is effectively no less levered than before the financing, as it has the same interest payment obligation on the $50 of debt as supported by the same $100 in railroad assets.

Panel C shows how the railroad's repackaging of the mortgage and the note accounts for the sale of the $100 in RRFM as bonds, where we assume that the bonds are sold at 80 percent of par with the difference carried as an asset on the balance sheet as an unamortized bond discount (see Appendix A for additional background on how the railroads accounted for the unamortized bond discount). The $100 in RRFMs is removed from the balance sheet as an asset, and is replaced by investment in $80 worth of railroad assets and $20 of unamortized bond discount placed in the construction account. The reported leverage ratio remains at 25 percent, which is still inaccurate, but there is now more cash flow from productive assets to support interest and principal payments required on the $50 of preexisting debt.

But this accounting treatment completely misses the $100 principal and interest payment obligation that goes with the issuance of the RRFM bonds. Certainly, effective debt levels exceed the reported 25 percent level. Panels D and E provide a more accurate financial picture given a more appropriate accounting treatment. In Panel D, the RRFMs remain on the balance sheet, and the sale of the bonds is recognized as a debt obligation. This treatment, which in modern terms would be referred to as a covered bond, reflects the fact that interest payments are an obligation of the firm, while also recognizing that the RRFMs remain as collateral to secure principal repayment of the bonds. A 50 percent leverage ratio is indicated, which is significantly higher than the reported 25 percent leverage ratio. Perhaps the most accurate treatment is seen in Panel E, where the interest payment obligation is emphasized and the veiled RRFM bond transaction is "looked through" by removing the $100

RRFMs as an asset as well as the $100 in associated equity. The RRFM bond debt obligation remains, and the firm now reports a 75 percent leverage ratio.[56]

The misleading accounting treatments stated in Panels B and C are not some fairy tale: A detailed review of M&M's and L&M's annual financial statements from 1853 to 1857 confirms that their accounting treatment of their RRFMs and RRFM bonds coincides with that reported in Panels B and C of Figure 1. Moreover, we can find no evidence in the annual reports of reported interest expenses paid on the RRFM bonds. Since non-payment of interest would have constituted a default on the bonds, and none of the bonds were declared to be in default prior to August 24, 1857, we infer that the interest costs were buried somewhere in the firm's books in order not to reveal the fact that the RRFM bond interest obligation was the company's, not the farm mortgagor's. This analysis leads us to believe that leverage was understated for some if not all of the western railroads in our sample, and therefore that the leverage analysis presented in the previous section was conservative in the sense that many railroads' true financial condition was significantly worse than reported.[57]

In summary, the Racine and Mississippi offering circular seems to promise more than it could deliver. More to the point, it is deceptive, failing to accurately inform the potential investor of the true risks embedded in the investment. There is less cash available to fund the bond payments than stated, very likely more leverage on the farm asset than stated (our analysis of L&M farm mortgages supports this contention), and almost certainly more leverage at the company level than stated. We believe this deal structure to be symptomatic and representative of the economic and financial environment prior to the OLITC failure, in which accounting errors and omissions contributed mightily to general economic uncertainty, and where resolution of uncertainty was an instrumental reason why the OLITC failure resulted in the panic of 1857.

Lastly, like many new financial products, the RRFM and RRFM bond were designed in the context of market distortions. In particular, land grants, though well intentioned, led to increased land speculation, which went unchecked. And restrictions on state funding of railroad construction, also well intentioned, caused some of the poorest and its least sophisticated citizens to get into the business of trying to supply a public good. As Thompson (1907, p. 19) observed: "The farming class thus made the mistake of trying to be interested in both farming and transportation, instead of seeing to it that there was effective control by the state."

---

56 We thank Jerry Weygandt for assisting us in identifying a proper accounting treatment.

57 This stylized example illustrates another accounting quirk that we previously pointed out in our analysis of the 17 railroads in section 3. The unamortized bond discount we have shown in Figure 1 effectively increases the interest cost on the debt of the railroad. But since there is no provision for amortization or depreciation in the reporting of profits, the increased interest costs never take their rightful place in the net earnings of the railroad. The added costs of the discounts are also addressed in Pixton (1966).

5. Conclusion

This paper revisits the panic of 1857 with benefit of hindsight associated with the panic of 2007-08. A number of similarities between the two crises are documented and discussed, including the prominence of agency, uncertainty and leverage as instrumental causative factors underlying the panics. New evidence is presented regarding OLITC's gamble for resurrection, on financial reporting and accounting practices that distorted reported earnings and leverage of important railroads, and on the development of financial innovations that had similarities to the sub-prime mortgages and MBS which played a key role in triggering the more recent panic.

Consistent with Gorton (1988), we find support for banking panics having their roots with problems in the real economy and financial system, as opposed to being "random events, perhaps self-confirming equilibria in settings with multiple equilibria, caused by shifts in the beliefs of agents which are unrelated to the real economy." (p.751) The shifts in beliefs related to the real economy appear to be the result of neglected risks and Knightian uncertainty that follow from new economic dynamics combined with self-interested disclosure policies of those who are in a better position to understand the implications of such information and risk to the public at large (Gennaioli, Shleifer and Vishny (2010)).

What does the panic of 1857 teach us about the panic of 2007-08, and vice versa? As suggested by Gorton (1988) and Reinhart and Rogoff (2009), it tells us that broad themes are similar across panics and that leading indicators exist to signal potentially serious economic consequences in the not-too-distant future. But it also tells us that the details differ across time and events, thus creating a "fog of war" that makes identification difficult. Complexity and uncertainty thus challenge our ability to take credible policy action prior to crisis events, as well as make sorting out cause and effect difficult after the fact. As a result, given the complexities associated with contemporary financial systems and competitive dynamics that exist in a global economy, in which coordination across sovereign states is difficult, our analysis suggests to us that significant challenges remain in identifying and addressing financial crisis and panics as we go forward.

References

Ackerman, William K. (1900), *History of the Illinois Central Railroad and Representative Employees,* Chicago.

Allen, Franklin and Gary Gorton (1993), "Churning Bubbles," *Review of Economic Studies,* 60(4): 813-36.

Atack, Jeremy, Fred Bateman, Michael Haines and Robert A. Margo (2009), "Did Railroads Induce or Follow? Urbanization and Population Growth in the American Midwest, 1850-1860," NBER Working Paper No.14640, Cambridge, MA: National Bureau of Economic Research.

Bogue, Allan G. and Margaret B. Bogue (1957), ""Profits" and the Frontier Land Speculator," *Journal of Economic History,* XVII(1).

Boorstin, Daniel J. (1965), *The Americans: The National Experience*, New York: Vintage Books.

Brief, Richard P. (1965), "Nineteenth Century Accounting Error," *Journal of Accounting Research*, 3(1): 12-31.

Brownson, Howard G. (1915), "The History of the Illinois Central Railroad to 1870," Ph. D. Dissertation, University of Illinois, 1909, published in *University of Illinois Studies in Social Science*, 1(3&4), September to December 1915.

Calomiris, Charles W. and Gary Gorton (1991), "The Origins of Banking Panics: Models, Facts, and Bank Regulation," in *Financial Markets and Financial Crises,* NBER http://www.nber.org/books/glen91-1.

Calomiris, Charles W. and Larry Schweikart (1991), "The Panic of 1857: Origins, Transmission, and Containment," *The Journal of Economic History*, 51(4): 807-34.

Cary, John W. (1892), *The Organization and History of the Chicago, Milwaukee & St. Paul Railway Company,* Milwaukee: Press of Cramer, Aikens, & Cramer.

Chandler, Alfred D. (1956), *Henry Varnum Poor, Business Editor, Analyst, and Reformer,* Cambridge: Harvard University Press.

Dunbar, Charles F. and O. M. W. Sprague (1904), *Economic Essays,* New York; London: The Macmillan Company; Macmillan & Co., ltd.

Fishlow, Albert (1966), *American Railroads and the Transformation of the Antebellum Economy,* Vol. 127, Cambridge: Harvard University Press.

Gates, Paul W. (1934), *The Illinois Central Railroad and its Colonization Work*, Vol. 42, Cambridge: Harvard University Press.

Gennaioli, Nicola, Andrei Schleifer and Robert W. Vishny (2010), "Financial Innovations and Financial Fragility," CREi Working Paper.

Gephart, William F. (1909), *Transportation and Industrial Development in the Middle West,* Vol. XXXIV, no.1. New York: Columbia University, Longmans, Green & co.

Gibbons, J. S. (1859), *The Banks of New-York, their Dealers, the Clearing-House, and the Panic of 1857,* New-York: D. Appleton & Co.

Giesecke, Kay, Francis A. Longstaff, Stephen Schaefer and Ilya Strebulaev (2010), "Corporate Bond Default Risk: A 150-Year Perspective," Working Paper, Stanford University.

Goetzmann, William N. and K. Geert Rowenhorst (2005), *The Origin of Value,* Oxford University Press, New York, New York.

Gorton, Gary. (1988), "Banking Panics and Business Cycles," *Oxford Economic Papers*, 40(4): 751-81.

Grant, E. B. (1856), "Coal Burning Locomotives," *Boston Railways: Their Condition and Prospect.*

Hibbard, Benjamin H. (1905), "The History of Agriculture in Dane County, Wisconsin," Ph.D. Thesis University of Wisconsin. Reprinted from the Bulletin of the University of Wisconsin, Economics and Political Science Series, Vol. 1, No. 2.

Holton, Edward D. (1859), "Commercial History of Milwaukee," in *Report pf the Collections of the State Historical Society of Wisconsin for the years 1857 and 1858.* Madison

Homer, Sidney and Richard Sylla (2005), *A History of Interest Rates,* 4th Ed. New York: John Wiley & Sons.

Huston, James L. (1983), "Western Grains and the Panic of 1857," *Agricultural History*, 57(1): 14-32.

Huston, James L. (1987), *The Panic of 1857 and the Coming of the Civil War,* Baton Rouge: Louisiana State University Press.

Jalil, Andrew (2010), “A New History of Banking Panics in the United States: 1825-1929,” University of California, Berkeley, November 1, Working Paper.

Janey, J. J. (1885), “State Bank of Ohio,” *Magazine of Western History,* II: 156-75.

Johnson, Arthur M. and Barry E. Supple (1967), *Boston Capitalists and Western Railroads,* Boston.

Kilbourn, Byron (1850), *Circular to Capitalists, Relative to the Milwaukee City Loan, for the Benefit of Milwaukee and Mississippi Railroad Company, Together with the Acts and Ordinances Authorizing Said Loan,* July. Wisconsin Historical Society Archives.

Krishnamrthy, Arvind (2010), “How Debt Markets Have Malfunctioned,” *Journal of Economic Perspectives,* 24(1): 3-28.

Lagniappe, (1963), “Business Failures in the Panic of 1857,” *The Business History Review,* 37(4): 437-43.

Lanman, Charles (1976) (1876), *Biographical Annals of the Civil Government of the United States, during its First Century : From Original and Official Sources,* Detroit: Gale Research Co.

Mayer, Brantz (1871), *Baltimore: Past and Present*, Baltimore: Richardson & Bennet.

Medbery, James K. (1870), *Men and Mysteries of Wall Street,* Boston: Fields, Osgood, & Co.

Merk, Frederick (1971), *Economic History of Wisconsin during the Civil War Decade*, 2d ed. Madison: State Historical Society of Wisconsin.

Moss, David A. and Sarah Brennan (2004), *Regulation and Reaction: The Other Side of Free Banking in Ante-Bellum New York,* Boston: Harvard Business School.

Nevins, Allan (1947), *Ordeal of the Union: A House Dividing, 1852-1857,* New York.

Odlyzko, Andrew (2010), “The Collapse of the Railway Mania, the Development of Capital Markets, And Robert Lucas Nash, A Forgotten Pioneer in Accounting and Financial Analysis,” unpublished working paper, School of Mathematics, University of Minnesota.

Ó Gráda, Cormac, and Eugene N. White (2003), "The Panics of 1854 and 1857: A View from the Emigrant Industrial Savings Bank," *The Journal of Economic History*, 63(1): 213-40.

Paxson, Frederic L. (1912), *The Railroads of the "Old Northwest" before the Civil War*. Madison, Wis.

Pearson, Henry G. (1911), *An American Railroad Builder, John Murray Forbes,* Boston,

Pixton, John. (1966), *The Marietta and Cincinnati Railroad, 1845-1883; a Case Study in American Railroad Economics,* University Park: Pennsylvania State University Press.

Poor, Henry V. (1860), *History of the Railroads and Canals of the United States,* New York: J.H. Schultz & co.

Racine and Mississippi Railroad Company (1856), *Farm Mortgage Bonds of the Racine and Mississippi Railroad Company : With an Appendix*. Racine, Wis.: Printed at the job office of Hulett & Harrison.

Reinhardt, Carmen M. And Kenneth S. Rogoff (2009), *This Time is Different: Eight Centuries of Financial Folly,* Princeton: Princeton University Press.

Schilling, Philip A. (1964), *Farmers and Railroads : A Case Study of Farmer Attitudes in the Promotion of the Milwaukee and Mississippi Railroad Company*. MS Thesis, University of Wisconsin.

Schumpeter, Joseph A. (1939), *Business Cycles,* New York: McGraw-Hill.

Schwert, G. W. (1990), "Indexes of U.S. Stock Prices from 1802 to 1987," *The Journal of Business*, 63(3): 399-426.

Smith, Walter B. and Arthur H. Cole (1935), *Fluctuations in American Business, 1790-1860,* Vol.50. Cambridge: Harvard university press.

Sobel, Robert (1968), *Panic on Wall Street,* Washington D.C.: Beard Books.

Spiegelman, Mortimer (1948), "The Failure of Ohio Life Insurance and Trust Company, 1857," *Ohio State Archaeological and Historical Quarterly,* 57: 247-65.

Stampp, Kenneth M. (1990), *America in 1857: A Nation on the Brink,* New York: Oxford University Press.

State of Ohio Executive Department (1859), "Report of the Commissioners to Examine the Treasury of the State, the Causes of the Defalcation therein, and Other Matters,…" March 7, in the *Ohio Statesman Extra*, March 8, 1859.

Sumner, William G. (1874), *A History of American Currency,* New York: Henry Holt: 391.

Thompson, John G. (1972) (1909), *The Rise and Decline of the Wheat Growing Industry in Wisconsin,* New York: Arno Press.

Townsend, Robert M. (1979), "Optimal Contracts and Competitive Markets with Costly State Verification," *Journal of Economic Theory,* 12: 202-17.

Van Vleck, George W. (1967) (1943), *The Panic of 1857, an Analytical Study,* New York: AMS Press.

Vernon, Edward (1873), *American Railroad Manual,* New York.

Table 1. Detailed Schedule of OLITC Assets in Receivership as Reported in 1858

Railroad Bonds		
Cleveland & Pittsburgh		
3rd Mortgage Bonds	$ 17,500	
4th Mortgage Bonds	200,000	
Income Bonds	20,000	
Dividend Bonds	20,000	
Coupons	5,985	$263,485
Marietta & Cincinnati		
3rd Mortgage Bonds	$153,000	
Income Bonds	66,000	
Hillsborough & Cincinnati Bonds	192,000	411,000
Other		
Cincinnati, Hamilton & Dayton		100,000
Great Western		10,000
Norwich &Worcester		10,000
Indianapolis & Cincinnati		2,000
Ohio & Mississippi		8,000
Hempfield		6,000
Toledo & Illinois		5,000
Florida Freeland		8,000
Fort Wayne & Southern		15,000
Tiffin & Fort Wayne		31,000
Junction R.R.		51,000
Henderson & Nashville		30,000
Railroad Shares		
Cincinnati, Hamilton & Dayton		200
Cincinnati, Cleveland & Delhi Park		10,000
Madison, Peru & Indianapolis		700
Madison River & Lake Erie		38,550
Individual Notes: Good, Bad and Doubtful		318,431
Cash		14,000
Other Bonds		43,500
Other Shares		3,000
Total		$1,378,866

Source: Spiegelman, 1948.

Table 2. Stock Price Changes of Railroads Grouped by Region, Immediately Prior and Immediately After the OLITC Announced Failure Date

Railroad	% Δ Stock Price ART Data Week Prior	% Δ Stock Price ART Data Week Of	% Δ Stock Price NYT-BA Data Week Prior	% Δ Stock Price NYT-BA Data Day After	% Δ Stock Price NYT-BA Data Week Of
New England RRs					
Boston & Lowell	0.00	0.00	N/A	N/A	N/A
Boston & Prov	2.70	-1.32	N/A	N/A	N/A
Boston & Worcester	0.00	0.00	N/A	N/A	N/A
Eastern of Mass.	0.00	0.00	N/A	N/A	N/A
Western of Mass.	0.00	0.00	N/A	N/A	N/A
Regional Average	*0.56*	*-0.28*	*N/A*	*N/A*	*N/A*
Middle States RRs					
Baltimore & Ohio	0.00	5.26	N/A	N/A	N/A
New York Central	-2.50	2.56	-2.54	-3.58	-3.58
New York & Erie	-9.68	-28.57	-8.80	-17.25	-21.05
Penn Central	0.00	-8.60	N/A	N/A	N/A
Regional Average	*-1.92*	*-4.30*	*N/A*	*N/A*	*N/A*
Western RRs					
Chicago Burl. & Quincy	0.00	-33.33	N/A	N/A	N/A
Cleveland & Toledo	-2.13	-13.04	-10.57	-7.78	-8.36
Illinois Central	-6.67	-28.57	-2.82	-7.14	-20.54
Michigan Central	-7.23	-22.08	-6.97	-2.28	-12.38
Regional Average	*-4.41*	*-26.15*	*N/A*	*N/A*	*N/A*
Other Western RRs					
Cleveland & Pittsburgh	-16.67	-60.00	N/A	N/A	N/A
Marietta & Cincinnati	0.00	-60.00	N/A	N/A	N/A
La Crosse & Milwaukee	-21.21	-80.77	-31.20	-6.98	-51.16
Milwaukee & Mississippi	-11.11	-58.33	-2.04	-12.50	-25.00
Regional Average	*-13.29*	*-63.71*	*N/A*	*N/A*	*N/A*

Source: "United States Railway Share and Bond List," *American Railway Times*, *New York Times,* and *Boston Advertizer.*

Table 3. Railroad Sample Characteristics

Railroad	Year Incorporated	Miles of Track In 1857[a]	Book Assets In 1857[b]	Gross Revenues In 1857
New England RRs				
Boston & Lowell	1830	26	$2,486,773	$435,863
Boston & Providence	1831	53	$3,853,238	$584,176
Boston & Worcester	1831	61	$4,843,779	$1,019,149
Eastern of Mass.	1836	56	$5,403,046	$653,841
Western of Mass.	1833	155	$12,864,188	$1,910.343
Middle States RRs				
Baltimore & Ohio	1827	381	$28,725,269	$4,116,998
New York Central	1853	298	$41,461,654	$8,027,251
New York & Erie	1832	464	$34,033,680	$5,827,976
Pennsylvania Central	1846	250	$23,114,774	$4,339.828
Western RRs				
Chicago Burl. & Q.	1848	210	$8,123,896	$1,389,360
Cleveland & Toledo	1846	221	$6,876,927	$1,055,963
Illinois Central	1851	704	$24,043,074	$2,357,203
Michigan Central	1832	284	$13,910,985	$3,104,604
Other Western RRs				
Cleveland & Pittsburgh	1836	196	$6,100,000*	NA
Marietta & Cincinnati	1845	180	$8,220,673*	$386,276
La Crosse & Milwaukee	1852	95	$2,300,000	$649,352
Milwaukee & Mississippi	1847	195	$8,364,933	$882,818

* Total assets not available; construction account reported
[a] From "United States Railway Share and Bond List," *American Railway Times*, July 2, 1857.
[b] From annual reports for 1857, with the exception of Cleveland & Pittsburgh which is from 1856

Table 4. Leverage Measures for Selected Railroads in 1857

Railroad	Reported Net Earnings to Interest Charge	Book Debt to Book Capitalization	Book Debt to Market Debt Plus Market Equity
New England Railroads			
Boston & Lowell	6.82	18.41%	30.36%
Boston & Providence	17.05	6.22%	9.70%
Boston & Worcester	12.95	10.87%	13.50%
Eastern of Massachusetts	1.98	45.63%	72.61%
Western of Massachusetts	2.64	54.13%	58.46%
Middle States Railroads			
Baltimore & Ohio	2.87	38.89%	65.97%
New York Central	2.56	37.38%	44.77%
New York & Erie	1.99	70.96%	94.31%
Pennsylvania Central	3.09	53.61%	57.44%
Western Railroads			
Chicago Burlington & Quincy	3.72	41.10%	45.38%
Cleveland & Toledo	2.23	52.38%	72.01%
Illinois Central	0.42	84.50%	71.01%
Michigan Central	2.10	52.39%	58.08%

Sources: Railroad annual reports and *Returns of the Railroad Corporations in Massachusetts, 1857.*

Table 5. Leverage Measures for Other Western Railroads in 1857

Railroad	Reported Net Earnings to Interest Charge	Book Debt to Book Capitalization	Book Debt to Market Debt Plus Market Equity
Cleveland & Pittsburgh[a]	1.89	51.32%	66.01%
Marietta & Cincinnati	0.00	63.58%	114.00%
La Crosse & Milwaukee	0.45	51.77%	81.00%
Milwaukee & Mississippi	1.11	57.69%	83.07%

[a] Cleveland & Pittsburgh numbers are for 1856, as we were unable to locate financial statements for 1857.
Sources: Railroad Annual Reports.

Table 6. Net Earnings Measures, 1857

Railroad	Reported Net Earnings to Book Capitalization (1)	Reported Net Earnings After Depreciation to Book Capitalization (2)	Reported Net Earnings After Depreciation and Interest to Market Equity (3)
New England RRs			
Boston & Lowell	8.42%	3.14%	4.28%
Boston & Providence	6.36%	1.58%	2.07%
Boston & Worcester	7.04%	2.46%	2.74%
Eastern of Massachussets	5.25%	0.81%	-8.18%
Western of Massachussets	7.36%	2.35%	-1.00%
Middle States RRs			
Baltimore & Ohio	6.46%	2.03%	-0.87%
New York Central	6.00%	2.16%	-0.35%
New York & Erie	9.88%	5.19%	1.62%
Pennsylvania Central	6.34%	2.71%	1.53%
Western RRs			
Chicago Burl. & Quincy	8.26%	3.50%	2.55%
Cleveland & Toledo	7.17%	2.26%	-3.15%
Illinois Central	2.35%	-2.74%	-23.57%
Michigan Central	8.85%	4.41%	0.48%
Other Western RRs			
Cleveland & Pittsburgh[a]	4.06%	-0.95%	-9.64%
Marietta & Cincinnati	0.04%	-4.50%	-323.26%
La Crosse & Milwaukee	2.18%	-0.49	-16.70%
Milwaukee & Mississippi	5.66%	0.75%	-19.78%

[a] Based on 1856 financial reports.
Sources: Railroad Annual Reports.

Table 7. Earnings Growth, Book Asset Growth, and Estimated Same-Store Earnings Growth For Selected Railroads, 1854-1857

Railroad	Annualized Earnings Growth Rate (1)	Annualized Book Asset Growth Rate (2)	Annualized Estimated Same-Store Earnings Growth Rate (3)
New England RRs			
Boston & Lowell	37.0%	3.8%	32.1%
Boston & Providence	5.5%	-0.7%	6.2%
Boston & Worcester	4.3%	-0.1%	4.4%
Eastern of Mass.	-6.5%	46.9%	-36.3%
Western of Mass.	4.8%	2.7%	2.0%
Group Average	*9.0%*	*10.5%*	*1.7%*
Middle States RRs			
Baltimore & Ohio	4.7%	3.2%	1.4%
New York Central	-2.9%	5.6%	-8.1%
New York & Erie	11.2%	0.6%	10.5%
Pennsylvania Central	8.3%	5.8%	2.3%
Group Average	*5.3%*	*3.8%*	*1.54%*
Western RRs			
Chicago Burl. & Q.	N/A	N/A	N/A
Cleveland & Toledo	23.5%	10.5%	11.8%
Illinois Central	64.6%	9.8%	49.9%
Michigan Central	22.2%	9.1%	12.0%
Group Average	*36.7%*	*9.8%*	*24.5%*
Other Western RRs			
Cleveland & Pittsburgh[a]	13.8%	27.52%	-10.8%
Marietta & Cincinnati	N/A	33.2%	N/A
La Crosse & Milwaukee	N/A	N/A	N/A
Milwaukee & Mississippi	15.2%	42.1%	-18.9%
Group Average	*14.5%*	*34.3%*	*-14.9%*
Grand Average	***16.4%***	***14.6%***	***-0.1%***

[a] Cleveland & Pittsburgh data are from 1854-56, as 1857 financial data are not available. Earnings and asset growth rates in columns (1) and (2) are compounded over three years starting from 1854. Same-store growth is calculated by multiplying 1857 earnings by the ratio of 1854 construction account to 1857 construction account, and then calculating compounded earnings growth from 1854 to 1857 using adjusted 1857 earnings. The grand averages are the means of the group averages.
Sources: Railroad annual reports 1854-1857.

Table 8. Minimum Same-Store Growth Rate in Net Current (1857) Earnings Necessary to Pay Debt at Maturity

Railroad	Minimum Earnings Growth Rate, g δ=0.0, γ=1.0	Minimum Earnings Growth Rate, g δ=.0522, γ=.50	Minimum Earnings Growth Rate, g δ=.10, γ=0
New England Railroads			
Boston & Lowell	1.6%	9.5%	14.2%
Boston & Providence	3.6%	12.4%	17.4%
Boston & Worcester	3.4%	11.1%	15.7%
Eastern of Massachusetts	15.0%	18.3%	20.7%
Western of Massachusetts	10.2%	13.9%	16.4%
Middle States Railroads			
Baltimore & Ohio	8.5%	13.1%	16.2%
New York Central	11.2%	14.7%	17.1%
New York & Erie	6.7%	9.0%	10.6%
Pennsylvania Central	12.7%	14.6%	16.0%
Western Railroads			
Chicago, Burlington & Quincy	6.1%	10.7%	13.7%
Cleveland & Toledo	10.2%	13.9%	16.5%
Illinois Central	32.1%	33.5%	34.5%
Michigan Central	6.0%	9.4%	11.8%
Other Western Railroads			
Cleveland & Pittsburgh	20.0%	23.4%	25.8%
Marietta & Cincinnati	81.2%	82.8%	84.0%
Lacrosse & Milwaukee	29.5%	30.2%	30.6%
Milwaukee & Mississippi	15.1%	18.2%	20.4%

Parameter values used to generate solutions are as follows. E_0, D, and S are obtained from the firm's 1857 financial statements (1856 in the case of Cleveland & Pittsburgh); m=10, i=0.08, d=0.08, r=.04.

Table 9. Maximum Leverage Ratios Necessary to Support Repayment Given Alternative Growth and Sinking Fund Requirements

Railroad	Current Book Leverage Ratio	Max Leverage Ratio g=.05, γ=.50	Max Leverage Ratio g=.10, γ=.50	Max Leverage Ratio g=.05, γ=0.0	Max Leverage Ratio g=.10, γ=0.0	Post-OLITC Degree of Financial Distress
New England Railroads						
Boston & Lowell	18.4%	0.0%	21.3%	0.0%	31.9%	Mild
Boston & Providence	6.2%	0.0%	0.0%	0.0%	0.0%	None
Boston & Worcester	10.9%	0.0%	4.8%	0.0%	7.2%	None
Eastern of Massachusetts	45.6%	0.0%	0.0%	0.0%	0.6%	Serious
Western of Massachusetts	54.1%	5.9%	29.4%	8.8%	44.2%	None
Middle States Railroads						
Baltimore & Ohio	38.9%	1.2%	21.9%	1.9%	32.9%	Serious
New York Central	37.4%	0.0%	12.2%	0.0%	18.3%	Mild
New York & Erie	71.0%	46.4%	78.0%	69.8%	117.3%	Receivership
Pennsylvania Central	53.6%	7.0%	27.3%	10.5%	41.0%	Mild
Western Railroads						
Chicago, Burl'ton & Quincy	41.1%	10.4%	36.8%	15.6%	55.3%	Mild
Cleveland & Toledo	52.4%	4.7%	27.7%	7.1%	41.6%	Mild
Illinois Central	84.5%	0.0%	0.0%	0.0%	0.0%	Serious
Michigan Central	52.4%	27.9%	56.3%	42.0%	84.6%	Serious
Other Western Railroads						
Cleveland & Pittsburgh	51.3%	0.0%	0.0%	0.0%	0.0%	Receivership
Marietta & Cincinnati	63.6%	0.0%	0.0%	0.0%	0.0%	Receivership
Lacrosse & Milwaukee	51.8%	0.0%	0.0%	0.0%	0.0%	Receivership
Milwaukee & Mississippi	57.7%	0.0%	9.7%	0.0%	14.6%	Receivership

Parameter values used to generate solutions are as follows. E_0, and S are obtained from the firm's 1857 financial statements (1856 in the case of Cleveland & Pittsburgh); m=10, i=0.08, d=0.08, r=.04, δ=.0522.

Sources: Johnson and Supple, pp.143-179; Pearson, p.62; *Merchants Magazine and Commercial Review*, October 1865, pp.287-291; *Ibid.,* November 1865, p.353; Ackerman, pp.101-105; Brownson, pp.411-413; Mayer, pp.261-270; Vernon, p.471; Poor, p.99, p.104, p.106, p.117, p.163, p.278, p.287, p.474, p.584; Various Annual Reports 1858, 1859, 1860, 1861.

Table 10. Estimated Number of Loans Exceeding Stated Loan-to-Value Ratios

	LTV > .667	LTV > .50
1850 Farm Value Times 2.0	67 (27.1%)	86 (34.8%)
1850 Farm Value Times 3.0	42 (17.0%)	55 (22.3%)

Data Sources: U. S. Census 1850, Bogue and Bogue, Hibbard, Wisconsin Railroad Farm Mortgage Land Company Papers, 1869-1888, Wisconsin Historical Society Archives.

Figure 1. Stylized Balance Sheet Statements of Railroad Farm Mortgage and Bond Financings

Panel A: Prior to RRFM Financing

Assets		Liabilities	
RR Assets	100	Debt	50
		Equity	50

Reported Leverage Ratio: 50 percent

Panel B: After RRFM Financing, Prior to Bond Issuance

Assets		Liabilities	
RR Assets	100	Debt	50
RRFM	100	Equity	150

Reported Leverage Ratio: 25 percent

Panel C: After RRFM Financing and Bond Issuance

Assets		Liabilities	
RR Assets	180	Debt	50
Unam Disc	20	Equity	150

Reported Leverage Ratio: 25 percent

Panel D: Covered Bond Accounting

Assets		Liabilities	
RR Assets	180	Debt	150
RRFM	100	Equity	150
Unam. Disc.	20		

Reported Leverage Ratio: 50 percent

Panel E: Look-Through Accounting

Assets		Liabilities	
RR Assets	180	Debt	150
Unam. Disc.	20	Equity	50

Reported Leverage Ratio: 75 percent

Appendix A. Additional Detail on Bond and Stock Discounts in the Construction Account

The construction account, which provides a base to estimate depreciation that is used in calculating adjusted returns, merits further discussion as related to the treatment of bond and stock sales discounts. Railroad bond issues at the time were usually at even coupon rates ranging from 6% to 10%. In many cases first mortgage bonds were issued at the same stated coupon rate as second mortgage bonds. During the 1850s, railroad bonds of any coupon rate were generally issued at a discount to par. As noted in the body of the paper, the bond discount amount was added to the construction account rather than subtracted from the face value of the bond when recorded on the books of the company.[58] The logic of this approach was that the face value of the bonds had to be repaid, so the discount was a cost of construction. When the bond discount was included in the construction account, but that account was never "depreciated" (or, more appropriately, amortized) and subtracted from net income, it follows that bond discounts were not reflected in the current net income reported to stockholders.

To better understand the role of bond discounts in the overstatement of stated earnings of railroads in the 1850s, it is helpful to examine the magnitude of these discounts. Railroad annual reports of the ante-bellum period seldom reported the discount or even many of the terms of the various bond issues other than their issue date. The inability to identify discounts or bond terms and conditions made it difficult to assess the true cost of capital the railroad was paying on its debt. However, an exception to the non-reporting rule was the New York & Erie railroad, which reported details associated with both the discounts and the maturity date on individual bonds. From these data we can make reasonable estimates of both the effective yield being paid on the debt and amount of discounts included in the construction account. The 1856 annual report of the New York & Erie Railroad illustrates the bond discounts, which we report in Table A1.

The discounts included in the 1856 annual report amount to 6.17% of the construction account, inclusive of the discount taken on an income bond issuance that was not included in New York & Erie's 1856 statement of funded debt.

[58] There were exceptions to the accounting for discounts. Illinois Central during the entire period of our study subtracted the discount from the face value of the bond in a separate bond account rather than adding the discounts to the cost of construction.

Table A1. Funded Debt of New York & Erie Railroad

September 30, 1856

Issue	Face Value	Issue Date	Due Date	Term (Years)	Proceeds at Issuance	Discount	Issue Price	Effective Interest Rate
7% Mortgage	$3,000,000	1847	1867	20	$2,721,465	$278,534	90.72	7.94%
7% Mortgage	$4,000,000	1849	1859	10	$3,538,925	$461,075	88.47	8.78%
7% Convertible	$4,351,000	1851	1871	20	$3,999,107	$351,893	91.91	7.81%
7% Convertible	$3,500,000	1852	1862	10	$3,118,434	$381,566	89.10	8.67%
7% Mortgage	$4,000,000	1853	1883	30	$3,635,435	$364,565	90.89	7.79%

Like recordings were made when equity shares were issued to early promoters or contractors in lieu of payment in cash. One vivid example comes from the *Report of the Special Committee of the Wisconsin Legislature* in early 1858. The Special Committee had been set up to investigate bribes paid to the legislature, governor, and other prominent people in Wisconsin by the La Crosse & Milwaukee railroad in an effort to obtain a federal land grant. In that report the committee makes note of other practices of the company. For example, it notes a contract with Selah Chamberlain and Stephen H. Alden for the completion of the road from Beaver Dam to Portage that was executed on March 29, 1856 in which "…they were to receive among other classes of securities, an indefinite amount of capital stock of the Company, at *fifty cents on the dollar."*[59] Thus the accounting transaction with the Chamberlain-Alden contract would have increased the construction account $100 for each share issued under the contract, but the work which Chamberlain-Alden performed would have been worth just $50. This was common practice for many railroads at the time, and obviously reduced the reported measures of financial leverage. But, in contrast to the bond account, the share account did not have a "day of reckoning" at which time the shares would be paid off.

In calculating his estimated depreciation rate of 5.22% "H" does not itemize bond or stock discounts such as those paid to Chamberlain-Alden in the La Crosse & Milwaukee 1856 construction contract. These fictitious costs are actually imbedded in other line items in the construction account he analyzes. Discounts on bonds could be treated separately from such things as the cost of iron by amortizing the discount over the life of the bond. But the "discount" that arises from recording stock at $100 per share on the books when it was used as payment to the contractor at 50 cents on the dollar is another matter. The cost of this "discount" does not have to be recovered; however, if it is not recovered, it is the existing stockholders whose share values are diluted by the transaction.

The amortization of bond discounts could have been dealt with by charging a pro-rata portion as an offset to earnings each year of the bond's term to maturity. The adjustments we have made to reported net earnings by subtracting 5.22% of the construction account balance implies a straight-line amortization period of bond discounts of over slightly more than 19 years. For New York & Erie, as

[59] Printed in the *New York Times,* May 25, 1858. Emphasis added.

shown in Table 5 the weighted average maturity of the bonds is slightly in excess of 18 years. This is equivalent to 5.51% applied to the discounts in the construction account, implying that the appropriate rate to apply to the total construction account for New York & Erie should be only slightly higher than the 5.22% used in making the calculations shown in Table 3. Other railroads have shown shorter maturities, 10 years on average, implying an amortized bond discount rate of 10 percent.

Appendix B. Reprint of Offering Circular for Farm Mortgage Bonds Offered by The Racine and Mississippi Railroad in 1856

(Note: Page Numbering in Circular is Incorrect, But No Pages Appear to be Missing)

FARM MORTGAGE BONDS

OF THE

RACINE AND MISSISSIPPI

Railroad Company.

WITH AN APPENDIX.

RACINE, WIS:

PRINTED AT THE JOB OFFICE OF BULLETT & HARRISON.

1856.

FARM MORTGAGE BONDS.

OFFICE OF THE RACINE AND MISSISSIPPI R. R. Co., }
RACINE, Wis., April 1st, 1856. }

This company have for sale $500,000 of Farm Mortgage Bonds, guaranteed by the Company. These Mortgages are for various amounts, from $500 to $5,000 each. They run for five years from the tenth day of May, 1856 upon interest at ten per cent. per annum, payable by the Bond of the Company, semi-annually, at their office in New York City. They constitute a three-fold security:

1. The Note of the Mortgagor. Our farmers are now in a very independent condition. Nine out of ten of the notes would be good without any other security. Indeed, in a majority of the cases, the makers could pay the notes at once, from the proceeds of their personal property alone.

2. The Mortgage. The mortgages are taken to secure the notes, and are mostly upon valuable and improved farms situate in Winnebago, Stephenson and Carroll Counties, in the State of Illinois. These counties are upon the northern line of Illinois —have been settled about twenty years—are very populous, and contain the best lands in the State. The lands mortgaged are all situate near the line of the road, and the mortgages have been given by the inhabitants from an enlightened self-interest to secure its construction. It was better for them, and for the Company, to give these mortgages, than it would have been to have had them made cash subscriptions. Better for them, because in this new country, where improvements are being made rapidly, each farmer can use his cash means more profitably otherwise. Better for the Company, because thereby they get their whole cash means at once, and they can complete the road immediately. The lands being near the line of

the road, its construction will enhance their value in most cases more than the amount of the mortgage.

The mortgages are a first lien upon the premises, and the official certificate from the proper county officer accompanies each one, showing that the land is free from all other incumbrances whatever.

None of them are for more than two-thirds of the appraised value of the lands at their present worth. The appraisal is made by two persons appointed by the Company, and their certificate of appraisal accompanies each mortgage. Great caution has been used in getting low appraisals, and there has been no inducement for the Company to have any other, as they had more mortgages offered than they wanted to take.

The lands in this part of the west all have a market price, which can be realized at any time upon short notice. They are continually increasing in value, owing to the rapid improvements made in the country, and the great immigration; and cash sales are frequent in every neighborhood.

By the laws of Illinois, the process of foreclosure is simple and speedy, and the lands are sold at auction to the highest bidder, absolutely, allowing the mortgagor one year's redemption by paying the amount the land sold for with interest at 10 per cent.

3. The Bond of the Company. This is made the principal debt, and the note and mortgage are placed as collateral. The Company agree to pay the principal and interest at their office in New York City—the interest semi-annually. The Bonds are made with Coupons. The value of this bond must depend upon the value of the project of the road in itself, the amount and character of the capital stock which the Company has in proportion to the cost of the road, the amount already done by the Company, and the management of the affairs of the Company.

THE PROJECT OF THE ROAD.

This is a legitimate Railroad, and one which ought to be built. It has, from the first, had the unqualified endorsement of the best railroad men in the country. It runs east and west,

according to the natural channels of business. It forms one of the shortest routes between Lake Michigan and the Mississippi River, and passes through a better tract of country, and a more populous, than any other running in that direction. Its way business alone will make the stock remunerative.

COST OF THE ROAD.

The distance from Racine to Savanna on the Mississippi is 136 miles; and, at $25,000 per mile, the cost of the road would be $3,400,000. This estimate is a high one, and will cover all discounts, the interest accruing during construction, and large equipments.

CAPITAL STOCK.

There is now over $3,000,000 of subscribed Capital Stock.—This is of three kinds.

1. Individual cash subscriptions to the amount of $425,000. There has been already paid upon these over $200,000, and nearly the whole subscription may be considered as secured thereby.

2. $540,000 of subscriptions by Town and City Bonds, $490,000 of which have been negotiated, netting the Company 87½ cents on the dollar.

$2,035,000 secured by farm Mortgages, as above stated; of which $600,000 have been already negotiated at par.

No Railroad Company in the west ever had a subscription to compare with this, either in amount or availability.

In addition to this, the Company has issued its First Mortgage Bonds on the Road from Racine to Beloit, 68 miles, for $680,000—all of which have been lately negotiated on favorable terms.

WHAT THE COMPANY HAS DONE.

The road is completed and in operation 47 miles, from Racine to Delavan.

The iron, chairs and spikes, for the whole road to the Mississippi, are purchased.

The right of way to Beloit is paid for, and the road between Delavan and Beloit is more than two-thirds graded.

The Depot grounds at Racine and Beloit were purchased at about $60,000, and are worth now over $250,000. The Depot grounds at the intermediate stations have been donated to the Company.

All the depot buildings and station houses at Racine, Delavan, and the towns between, are completed.

There has been 35 miles of road fenced, and 28 ballasted.

The road will be completed 101 miles, to Freeport, this season and to the Mississippi as soon after as men and money can do it.

THE MANAGEMENT OF THE ROAD.

The Stockholders and the Directors all reside upon the line of the road. There are over 2,500 Stockholders. The Company has met with no losses. It has paid out none of its stock for work or materials, except a little for track-laying, safes and scales, at par value. It has done its work thus far, and purchased its iron and other materials, at the lowest cash prices. The Company stands well in New York City, and has received great credit there from the most respectable parties.

The forms of the Note, Mortgage and Bond are given in the appendix. The Company invite the closest scrutiny as to the character of these securities. Considering the project of the road itself—the amount and character of the subscribed stock—the work already done, and the materials bought—the management of the road—all as affecting the Company's Bond, and adding to the farm mortgage and note, and the security is unquestionable.

HENRY S. DURAND, *President.*

APPENDIX.

FORM OF NOTE.

KNOW ALL MEN BY THESE PRESENTS, That of County of and State of Illinois, being justly indebted to the RACINE AND MISSISSIPPI RAILROAD COMPANY, in the sum of Dollars, lawful money of the United States of America, for full value received, does, in consideration thereof, hereby promise to pay the said Racine & Mississippi Railroad Company, or Order, the sum of Dollars at the expiration of five years from the tenth day of May, A. D. 1856, together with interest thereon at the rate of ten per cent. per annum, payable annually on the 10th day of May in each year after the date hereof, principal and interest payable at the office of said Company in the City of Racine, in the State of Wisconsin.

IN WITNESS WHEREOF, I have hereunto set my hand this day of in the year of our Lord one thousand eight hundred and fifty

FORM OF MORTGAGE.

THIS INDENTURE, Made the day of in the year of our Lord, one thousand eight hundred and fifty between of the in the county of state of Illinois, part of the first part, and the RACINE AND MISSISSIPPI RAILROAD COMPANY, party of the second part, Witnesseth, that the said part of the first part, for and in consideration of the sum of Dollars, to in hand paid, the receipt whereof is hereby acknowledged, ha granted, bargained and sold, and by these presents do grant, bargain and sell unto the said party of the second part, and to their assigns forever, all that

certain real estate situated in the said state of Illinois, and known and described as follows, to wit :

To Have and to Hold, the above bargained premises, with the appurtenances unto the said party of the second part, and their assigns forever. Provided always, and these presents are upon this express condition, that if the said part of the first part heirs, executors administrators or assigns, shall well and truly pay, or cause to be paid, to the party of the second part, or their assigns, the sum of Dollars, in five years from the tenth day of May, in the year of our Lord one thousand eight hundred and fifty-six, and interest thereon from and after said tenth day of May, A. D. 1856, annually, at the rate of *Ten per Centum per Annum*, at the Office of said Rail Road Company, in the City of Racine, in the state of Wisconsin according to the tenor and effect of a certain promissory note, bearing even date herewith, executed by the said of the part of the first part, to the said party of the second part, and shall pay all taxes and assessments upon said premises, and every part thereof, at the time when the same shall become due, then these presents and the said note shall be null and void.

And the said part of the first part do further covenant and agree that will pay all taxes and assessments of every nature that may be assessed on said premises previous to the day appointed by any law of the state for the sale of lands for taxes. And in case of the non-payment of the said sum and interest mentioned in said note, or any part thereof, at the time or times above limited for the payment thereof, or in case of the non-payment of any taxes that may be assessed on said premises in manner aforesaid ; then and in either case, it shall or may be lawful for the said party of the second part, or their assigns, and the said part of the first part do hereby further covenant and agree, and by these presents empower and authorize the said party of the second part, or their assigns, to grant, bargain, sell, release and convey the said premises, with the appurtenances thereunto belonging, at pub-

lic auction or vendue, and on such sale to make and execute to the purchaser or purchasers, his or their heirs and assigns forever, good, ample and sufficient Deeds of Conveyance in the law, pursuant to the statute in such cases made and provided, and out of the monies arising from such sale to retain the principal and interest which shall then be due on the said note, together with the costs and charges, and all taxes, assessments and charges on said premises, which may be paid by the said part of the second part, or their assigns, rendering the surplus monies, if any there be, to the said part of the first part heirs, executors, administrators or assigns, after deducting the cost of such vendue as aforesaid.

And the said for and heirs, executors and administrators, do covenant, grant, bargain and agree to and with the said part of the second part and their assigns, that at the time of the ensealing and delivery of these presents well seized of the premises above conveyed, as of a good, sure, perfect, absolute and indefeasible estate of inheritance in the law in fee simple, and ha good right, full power and lawful authority to grant, bargain, sell and convey the same in manner and form as aforesaid, and that the same are free and clear from all incumbrances of whatever kind or nature soever ; and against all and every person or persons lawfully claiming or to claimthe whole or any part thereof, will forever Warrant and Defend.

In Witness Whereof, the said part of the first part ha hereunto set hand and seal the day and year first above written.

[L. S.]

[L. S.]

Signed, Sealed and Delivered in Presence of

FORM OF ACKNOWLEDGMENT.

STATE OF ILLINOIS, }
COUNTY OF }

I, in and for said county, do hereby certify that personally known to me to be the person whose name subscribed to the foregoing Mortgage, as having executed the same, appeared before me this day in person, and acknowledged that he signed, sealed and delivered the same, as free and voluntary act and deed, for the uses and purposes therein set forth.

And the said personally known to me to be the wife of the said and as the person who subscribed said Mortgage as such, having been by me acquainted with the contents and meaning of said instrument of writing, and examined separate and apart from her husband, acknowledged that she had executed the same, and relinquished her dower and all rights whatever, whether of dower or otherwise, in and to the lands and tenements therein mentioned, voluntarily, freely, and without compulsion of her said husband, and that she does not wish to retract.

Given under my hand and seal at this day of A. D., 1856.

FORM OF ABSTRACT

OF TITLE TO THE LANDS DESCRIBED IN THE MORTGAGE.

Patent from the United States to
Recorded Vol. Page
Deed from to
dated Recorded Vol. Page

Mortgage from to
Dated Recorded Vol. Page

OFFICE OF 185 }
STATE OF }
COUNTY, } ss.

THIS IS TO CERTIFY, That we, the undersigned, at the request of the RACINE AND MISSISSIPPI RAILROAD COMPANY, have examined the premises described in the foregoing Mortgage, and find the same to be worth Dollars, at a fair and reasonable valuation, exclusive of the value of all buildings, barns and out houses situated thereon.

Dated this day }
of 185 }

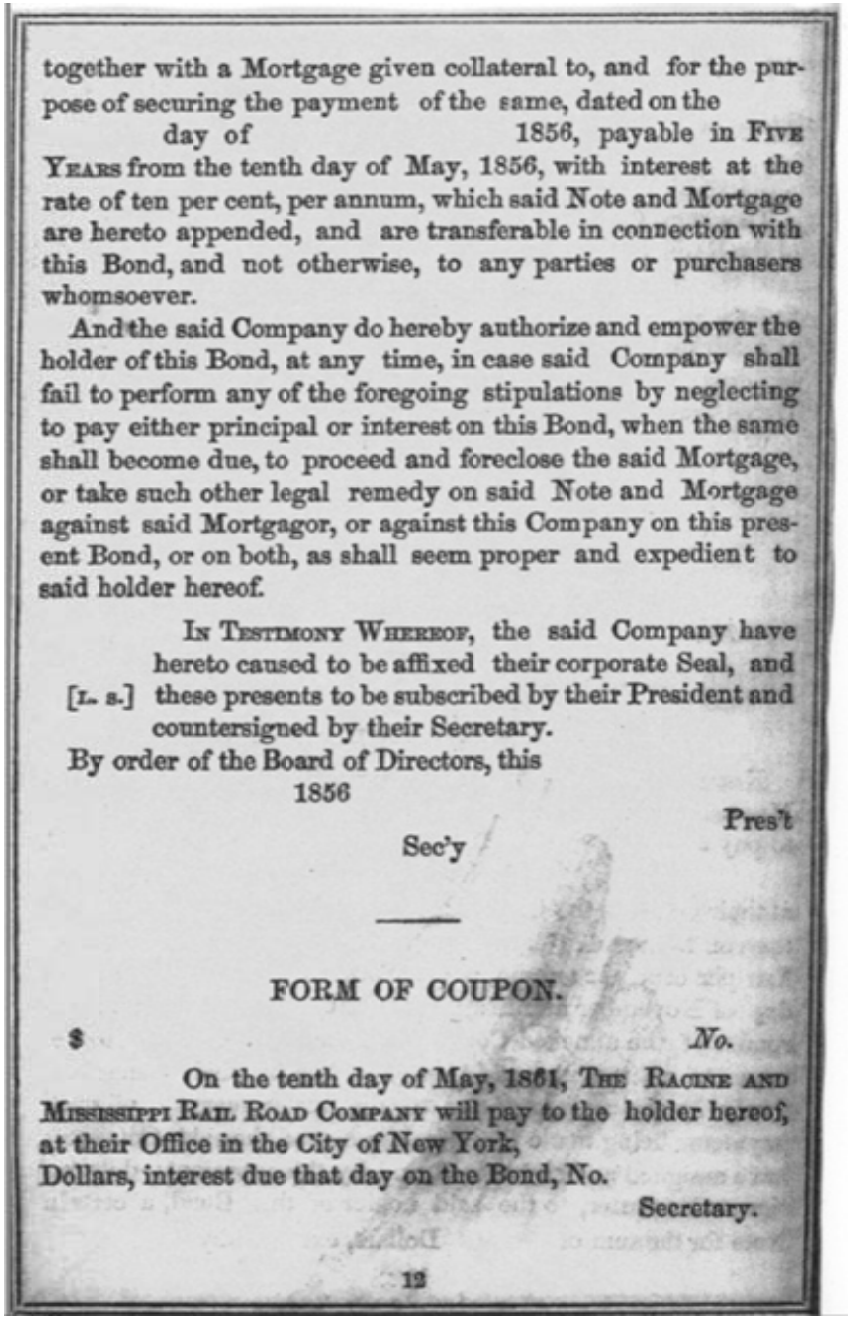
FORM OF BOND.

No. $

UNITED STATES OF AMERICA, }
State of }

RACINE AND MISSISSIPPI RAIL ROAD COMPANY.

KNOW ALL MEN BY THESE PRESENTS, That the RACINE AND MISSISSIPPI RAIL ROAD COMPANY is justly indebted, and promise to pay to or bearer, Dollars on the tenth day of May, 1861, at their Office in the City of New York, together with interest thereon from and after the tenth day of May, at the rate of TEN per cent, per annum, payable semi-annually on each tenth day of November and May, upon the presentation and surrender of the annexed Coupons, at the said office. To the payment whereof the said Company hereby bind themselves firmly by these presents and for the better security of such payments being made to the holder hereof, the said Company have assigned and transferred, and by these presents does assign and transfer, to the said holder of this Bond, a certain Note for the sum of Dollars, executed by



together with a Mortgage given collateral to, and for the purpose of securing the payment of the same, dated on the day of 1856, payable in FIVE YEARS from the tenth day of May, 1856, with interest at the rate of ten per cent, per annum, which said Note and Mortgage are hereto appended, and are transferable in connection with this Bond, and not otherwise, to any parties or purchasers whomsoever.

And the said Company do hereby authorize and empower the holder of this Bond, at any time, in case said Company shall fail to perform any of the foregoing stipulations by neglecting to pay either principal or interest on this Bond, when the same shall become due, to proceed and foreclose the said Mortgage, or take such other legal remedy on said Note and Mortgage against said Mortgagor, or against this Company on this present Bond, or on both, as shall seem proper and expedient to said holder hereof.

IN TESTIMONY WHEREOF, the said Company have hereto caused to be affixed their corporate Seal, and [L. S.] these presents to be subscribed by their President and countersigned by their Secretary.

By order of the Board of Directors, this
1856

Pres't

Sec'y

FORM OF COUPON.

$ *No.*

On the tenth day of May, 1861, THE RACINE AND MISSISSIPPI RAIL ROAD COMPANY will pay to the holder hereof, at their Office in the City of New York,
Dollars, interest due that day on the Bond, No.

Secretary.

12