Liquidity Crises in Opaque Markets: The NYSE in the Panic of 1907

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Abstract

We study the Panic of 1907 to understand how opaque corporate governance and loose market regulation can render financial systems susceptible to financial crises. Using a new daily dataset for all stocks traded on the New York Stock Exchange between 1905 and 1910, we study the impact of information asymmetry during the Panic of 1907- one of the most severe financial crises of the 20th century. We estimate that the acute liquidity freeze drove up the median spread from 0.8% to 3% during the peak of the crisis in October of that year. Spreads rose most among mining companies-the industry with the worst track record of corporate governance and the epicenter of the rumors that triggered runs on several financial institutions with links to a notorious firm in the sector. Stocks of the highly-regulated railroad firms and companies with close ties to Wall Street's "Money Trust" weathered the crisis with the greatest trading liquidity. We find other hallmarks of information-based illiquidity: trading volume dropped and price impact rose. Despite short-term cash infusions into the market, the market remained relatively illiquid for several months following the peak of the panic. Thus, our findings demonstrate how opaque systems allow idiosyncratic rumors to spread and amplify into a long-lasting, market-wide crisis. Asset pricing tests suggest that sophisticated traders recognized and incorporated liquidity considerations in their pricing of market risk.

Keywords: Market microstructure, panic, shadow banking, information asym- metry, funding illiquidity, market illiquidity

JEL Classifications: E65, G00, G14, N00, N21

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We study the Panic of 1907 to understand how opaque corporate governance and loose market regulation can render financial systems susceptible to financial crises. Using a new daily dataset for all stocks traded on the New York Stock Exchange between 1905 and 1910, we study the impact of information asymmetry during the Panic of 1907- one of the most severe financial crises of the 20th century. We estimate that the acute liquidity freeze drove up the median spread from 0.8% to 3% during the peak of the crisis in October of that year. Spreads rose most among mining companies-the industry with the worst track record of corporate governance and the epicenter of the rumors that triggered runs on several financial institutions with links to a notorious firm in the sector. Stocks of the highly-regulated railroad firms and companies with close ties to Wall Street's "Money Trust" weathered the crisis with the greatest trading liquidity. We find other hallmarks of information-based illiquidity: trading volume dropped and price impact rose. Despite short-term cash infusions into the market, the market remained relatively illiquid for several months following the peak of the panic. Thus, our findings demonstrate how opaque systems allow idiosyncratic rumors to spread and amplify into a long-lasting, market-wide crisis. Asset pricing tests suggest that sophisticated traders recognized and incorporated liquidity considerations in their pricing of market risk.

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1 Introduction

The Panic of 1907 provides a unique laboratory for understanding how information opacity amplifies financial crises. The episode marked the beginning of the end of unregulated capital markets and weak central monetary authority in the United States. Much like the global financial crisis of 2008, the panic set off an immediate outcry from the public followed by reactions from federal and state governments. While private initiatives, notably, the concerted effort organized by J. P. Morgan, contributed to resolving the crisis, its depth and duration provided central banking advocates the ammunition they needed to push through the Federal Reserve Act, and in the meantime the provision of emergency currency via the Aldrich-Vreeland Act.[1] The crisis prompted the famous Money Trust hearings in Congress that led to the Clayton Antitrust Act, as well as a state level investigation in New York that ultimately led to tighter control over access to trading at the NYSE. These regulatory steps laid the foundation for the more far-reaching regulatory interventions, such as the U.S. Securities and Exchange Commission (SEC), that emerged during the Great Depression.[2]

The Panic of 1907 is particularly valuable for studying information problems in financial markets because it took place in an era of weak corporate governance law, highly variable accounting practices, and essentially no regulation of stock markets, all compounded by rudimentary information technology. Traders faced a continual threat of informational contagion (Bernstein et al., 2014) and difficulties in assessing counterparty risk (Frydman et al., 2015).[3] In the environment of October 1907, market participants could observe only general declines in market prices, plummeting United Copper stock prices, and the failure of a major brokerage house. Soon there was news of illiquidity and then runs on several associated banks and trust companies and spikes in short term borrowing (call money) rates. This series of events stirred panic across the board, because both institutions and markets were opaque and information was difficult to verify.

We make three principal contributions to understanding how information asymmetry drives liquidity crises. First, using daily microstructure data unavailable to prior researchers, we document that market illiquidity persisted for months after emergency interventions stabilized funding markets, revealing fundamental limits to liquidity provision when information problems remain unresolved. Specifically, we show that bid-ask spreads rose from 0.5% to 3% during the peak of the crisis in October 1907 and remained elevated through March 1908–well after the acute phase ended–despite short-term cash infusions into the market. Second, we demonstrate that information opacity determines cross-

[1]Which would come into play in the summer of 1914 (Fohlin, 2016).

[2]This paper builds on earlier studies by Fohlin et al. (2008) and Gehrig and Fohlin (2006).

[3]See also Gorton (1988), Calomiris and Gorton (1991), and Moen and Tallman (1992) for earlier work.

sectional variation in crisis impact: opaque mining firms experienced spread increases more than six times larger than transparent, heavily-regulated railroad companies. Stocks of companies connected to Wall Street's "Money Trust" and those subject to stringent regulatory oversight weathered the crisis with the greatest trading liquidity. Third, we show that feedback loops between funding and market liquidity operated most powerfully for the least transparent securities, consistent with adverse selection amplifying funding constraints during periods of heightened uncertainty.

Existing studies of the 1907 Panic (Sprague, 1910; Gorton, 1988; Moen and Tallman, 1992) examine aggregate dynamics at weekly or monthly frequencies, obscuring the microstructure channels through which information asymmetry and funding constraints interact. Studies using modern crisis data (Brunnermeier and Pedersen, 2009; Acharya and Pedersen, 2005) document funding-liquidity feedback loops but cannot observe markets operating without regulatory safeguards or central bank backstops. Our setting isolates the role of information opacity in an unregulated environment, providing insights into how transparency requirements and lender-of-last-resort facilities address crisis vulnerabilities. Moreover, the severity and regulatory aftermath of the 1907 Panic make it a critical episode for understanding the historical origins of modern financial regulation.

Most previous studies examine the panic at the aggregate level and at lower frequency and therefore cannot analyze microstructure effects, where the problem (and presumably, the solution) really lies. In contrast, we reveal a much more nuanced picture of the unfolding crisis by exploiting a comprehensive database of daily transaction, quotation, and volume data for all stocks traded on the NYSE from 1905 to 1910.[4] This granularity allows us to trace the evolution of liquidity in real time, examine cross-sectional heterogeneity in crisis impact, and identify the specific channels through which opacity transformed an idiosyncratic shock into a systemic crisis. Based on this novel data set, we uncover a range of new results on funding and market liquidity and their interaction with asset pricing.

Our empirical strategy proceeds in several steps. We first document the time-series evolution of market liquidity measures during the crisis period, showing that spreads rose and trading volume fell beginning in September 1907–before the most acute crisis phase–and remained depressed through March 1908. We then explore the impact of funding illiquidity on market illiquidity, demonstrating that call money rates (our measure of funding liquidity) drove stock market spreads during the peak of the crisis, with effects concentrated among the least liquid stocks. Next, we investigate cross-sectional heterogeneity, showing that crisis impact varied systematically with firm transparency characteristics. Finally, we examine whether traders separately priced stock illiquidity risk in a four-factor asset pricing framework, finding that despite severe short-term liq-

[4]See Fohlin (2015) for more detail on the larger data collection project.

uidity disruptions, illiquidity risk was not priced as an independent factor in monthly returns.

Our findings demonstrate how opaque systems allow idiosyncratic rumors to spread and amplify into long-lasting, market-wide crises. When institutions lack transparency, rumors propagate through adverse selection mechanisms, creating persistent market-wide illiquidity that emergency liquidity provision alone cannot immediately resolve. Asset pricing tests suggest that sophisticated traders recognized that liquidity crises were temporary disturbances rather than signals of fundamental value changes, pricing securities based on long-run fundamentals. This distinction between crisis impact on trading costs and returns has important implications for understanding the value of regulatory interventions.

From a policy standpoint, our results are particularly relevant for ongoing debates about financial regulation and crisis management. The 1907 experience demonstrates that *liquidity provision* and *information provision* are complements, not substitutes, in crisis resolution. Treasury and Morgan interventions prevented institutional collapse but did not immediately restore market liquidity because traders still faced uncertainty about asset values and counterparty risks. Full recovery required credible information from clearing house examinations, public announcements of institutional soundness, and ultimately, regulatory reforms mandating disclosure. Modern crises echo these patterns: in 2008, emergency liquidity facilities stabilized funding markets but could not immediately restore securitized debt trading because investors could not value complex securities or assess which institutions held toxic assets. Our analysis suggests that crisis-prevention policy should prioritize transparency requirements alongside liquidity backstops.

The remainder of the paper proceeds as follows. Section 2 provides historical background on the NYSE's institutional structure, the information environment of the early twentieth century, and the timeline of the 1907 crisis. Section 3 describes our data construction and provides summary statistics. Section 4 presents our main empirical results on the drivers of stock market illiquidity, examining time-series patterns, funding liquidity transmission, and cross-sectional heterogeneity related to information opacity. Section 5 investigates whether illiquidity risk was priced through asset pricing tests. Section 6 concludes with a discussion of policy implications and connections to modern financial crises.

2 The Panic in Context

This section provides the institutional and historical context necessary for understanding our empirical analysis. We first describe the NYSE's structure and operations in 1907, emphasizing features that make it an ideal setting for studying market forces absent government intervention. We then characterize the information environment, highlighting the opacity that made markets vulnerable to rumor-driven panics. Next, we trace the crisis timeline from pre-crisis conditions through contagion and resolution. Finally, we develop testable hypotheses about how information asymmetry should manifest in cross-sectional liquidity patterns.

2.1 NYSE Institutional Structure

From its inception through 1907, the NYSE operated as a self-regulated members' cooperative, making it an ideal setting for examining market forces absent government intervention. In basic terms, the NYSE operated much as it does today: a continuous auction mechanism in which transactions occur throughout the trading day, with no guarantee of a single price. Brokers traded on behalf of their customers and received set commissions as payment, while specialists bought and sold shares to make markets in securities, receiving the bid-ask spread as compensation. Specialists managed their trades at circular trading posts equipped with telephones. The photograph in Figure 1, from Pearson's Magazine, depicts the trading floor in November 1907, apparently shot covertly due to restrictions preventing photography of the trading floor at the time.[5]

Figure 1: Historical Trading Floor

[5]See "Historical trading floor" or Figure 1.

The Governing Committee held ultimate responsibility for exchange operations, but regulatory reach remained limited. A key set of internal rules dealt with membership. Joining the exchange was costly: a new member had to pay a membership fee and then buy the seat of an existing member. The exchange had fixed the number of seats at 1,100 in 1879, thus creating a cartel on trading. Seat prices therefore varied considerably but grew fairly steadily and reached a local peak of $95,000 in the year before the crisis. Seats sold for as little as $51,000 in the panic year and the year following.[6] The governing committee held the power to fine or even expel members for infractions against exchange rules. The value of a member's seat served as collateral in these cases or in the event of bankruptcy (Mulherin et al., 1991). The courts upheld these powers as well as the exchange's right to restrict trading solely to its members and to set other rules (Mulherin et al., 1991).

The NYSE's listing standards created variation in information transparency that we exploit in our cross-sectional analysis. The exchange implemented relatively stringent listing requirements, including registration of all shares (to prevent stock watering), minimum shareholder numbers, and a qualitative assessment of risk. Oil stocks, for example, could not be listed in their early years because they were deemed too risky. Listed firms faced greater disclosure requirements than unlisted securities, though enforcement remained weak and variable across sectors.

The NYSE also maintained an "Unlisted" department to trade stocks that either could not meet listing requirements or chose not to disclose the information required for an official listing. The exchange created this segment in response to growing competition from the Consolidated Exchange and, to some extent, the curb market, an informal collection of brokers that traded stocks on the curbstone outside the NYSE. This two-tier structure creates a natural experiment in transparency: unlisted securities provided minimal public information while listed securities faced at least nominal disclosure requirements. However, one important distinction affects interpretation: listed securities qualified as acceptable margin collateral while unlisted securities did not, potentially attracting different investor clienteles to each market segment.

2.2 Information Environment and Corporate Opacity

Three features of the 1907 information environment made markets particularly vulnerable to rumor-driven panics. First, corporate governance law remained weak and accounting practices highly variable, creating persistent information opaqueness throughout the initial phases of development of the corporate economy and capital markets. Second, information technology limited price discovery to physical presence at the exchange or

[6] Davis and Gallman (2001), page 320.

telephone contact with brokers, who themselves relied on ticker tape transmitted via telegraph. Third, no regulatory body verified or standardized corporate disclosures, making information difficult to assess even when firms chose to publish accounts.

Corporate reporting law remained loose and vague in the United States until the Great Depression and the creation of the Securities and Exchange Commission and the related spate of disclosure regulations that followed. For some companies, internal incentives –particularly the desire to access outside funds from investors – led them to publish balance sheets and income statements, but the practice was far from widespread. The NYSE issued a recommendation in 1895 that listed companies should provide both a balance sheet and an income statement in annual reports to investors. Such reporting became mandatory in 1899. However, adherence to and enforcement of the rule remained weak for many years, and the extent and accuracy of these reports varied significantly (Archambault and Archambault, 2005; Sivakumar and Waymire, 1993).

Disclosure practices varied systematically across sectors. Companies in sectors subject to rate regulation –particularly railroads – faced the greatest incentive to publish their accounts, although their regulation also created incentives to manipulate earnings statements (Archambault and Archambault, 2011). New laws and exchange rules requiring audited accounts developed only after the Panic of 1907 (Sivakumar and Waymire, 1993, 2003). Mining companies, by contrast, had notoriously poor governance and provided minimal financial information to investors. Manufacturing firms fell somewhere in between these extremes.

Thus, notably, the rapid financial development that funneled large amounts of capital into New York had taken place in spite of poor legal protection for investors and sparse, erratic, and often non-existent or erroneous information on corporate performance. This opaque information environment exacerbated the growing uncertainty over stock valuations in the months before the crisis, most particularly in the mining sector. These cross-sectoral differences in transparency allow us to test whether opacity amplified crisis impact, as theory predicts.

The role of opaqueness in propagating panics has been modeled particularly in the context of banks, which are notorious for their opaque balance sheets. As delegated monitors, banks screen and originate loans (Diamond, 1984), but precisely because of this delegation, their assets are difficult for depositors and outside investors to monitor. In an opaque environment it is more costly for investors to acquire informative signals about underlying asset values. Therefore, incentives increase to herd on the behavior of others or even run on an institution (Bernardo and Welch, 2004; He and Manela, 2016; Izumi, 2018). Consequently, there is a role for regulation to increase transparency and thus reduce opacity (Dietrich and Gehrig, 2025b).

Empirical evidence supports the importance of opacity in banking crises. Morgan (2002) finds increased disagreement between rating agencies for more opaque banks relative to financial intermediaries with easier-to-value assets such as asset-backed securities or highly capitalized banks. He concludes that "[t]he relative opacity of banks provides some justification for government intervention in the banking markets, since runs, contagion, and other strains of systemic risk stem ultimately from the opacity of banks' assets" (p.888). Flannery et al. (2013) find that adverse selection costs in trading bank stocks increased substantially relative to non-banks during the 2007–2008 financial crisis. This theory applies directly to the run triggered in the opaque trust company sector in 1907, and we extend the logic to examine opacity effects in equity markets.

2.3 Pre-Crisis Conditions and Market Patterns

The basic facts of the Panic of 1907 are fairly clear. Stocks had been on a bull run for nearly two years, starting in late 1903, but weakness began to emerge in 1906. After considerable declines in the market in March and August 1907, poor sentiment turned to panic in October. The bear market targeted mining stocks most heavily. Mining stocks had risen in excess of the broader bull market in 1905 and early 1906, then dropped more dramatically during the crisis and recovered least after the crisis ended in 1908 (Figure 2). Note that United Copper Company traded on the curb market, so it is not incorporated into the mining index of the NYSE.[7]

These patterns of market indicators over the 1907 crisis and recovery resemble modern boom-bust cycles. U.S. financial markets had achieved a significant level of development and integration, both national and international. Stock exchanges and banks operated in all corners of the country (and the world), and the New York Stock Exchange had risen to dominance among U.S. exchanges. Excess funds flowed into New York, by then the clear financial center of the United States, from all over the country and from England, France, Germany, and elsewhere around the world.

While general conditions boded poorly for the broader equity market in 1907, certain sectors faced heightened idiosyncratic risks. The mining sector, particularly copper, became the epicenter of the crisis due to a combination of fundamental weakness, poor governance, and a history of manipulation. These conditions set the stage for the events of October 1907.

[7]The contemporary usage of "panic" is nowadays referred to as financial crisis.

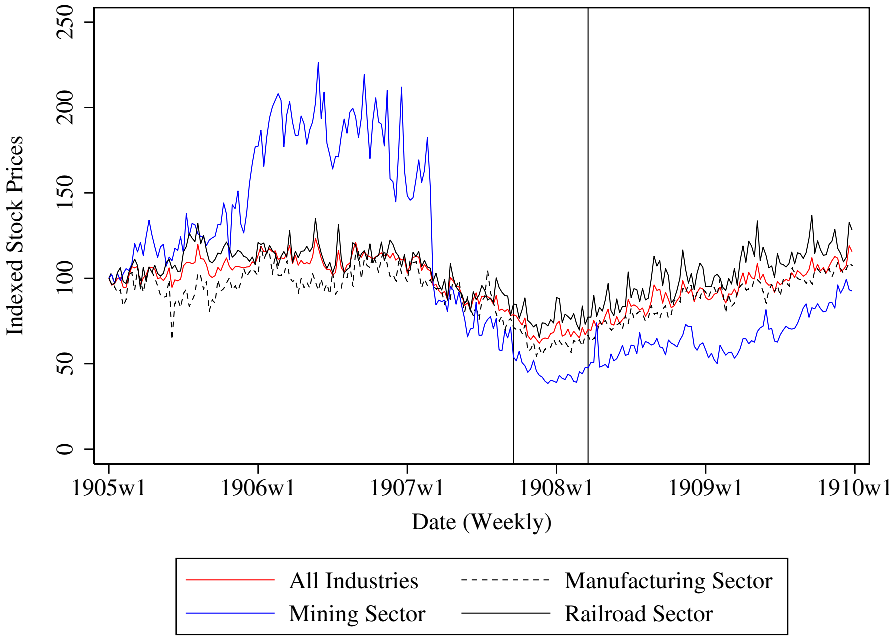


Figure 2: Daily Stock Prices Relative to January 1905

2.4 Crisis Timeline

The United Copper Company faced heightened, largely self-induced, idiosyncratic risks dating back much earlier than 1907. The "Copper War" between Augustus Heinze and the Rockefeller-owned Anaconda Copper raged for decades, as Heinze's upstart United Copper exploited legal loopholes, political connections, and even bribery of judges to wrangle control over key copper veins in the Butte, Montana area (Fohlin and Lu, 2021). In 1906, however, Heinze sold off his Montana copper properties to Rockefeller and associates, and soon after, United Copper Company share prices began to slide (Figure 3). Outside investors began to suspect that Heinze was falsifying accounts. As the decline accelerated in 1907, Augustus's brother Otto, a broker in New York, suspected a bear attack on the company and attempted to shore up the United Copper stock price by accumulating shares.

2.4.1 The Failed Corner: October 14–16, 1907

On October 16, 1907, Otto Heinze failed in his attempt to corner United Copper shares and squeeze suspected short sellers. The manipulations caused swings in the stock's price, but the price ultimately plummeted and left Otto in financial ruin. Heinze's failure was only the beginning of the story.[8] The Otto Heinze failure set off rumors that certain

[8]For extensive details, see the Smithsonian Magazine article from September 2012 and Chapter 6 of Parker and Whaples (2013).

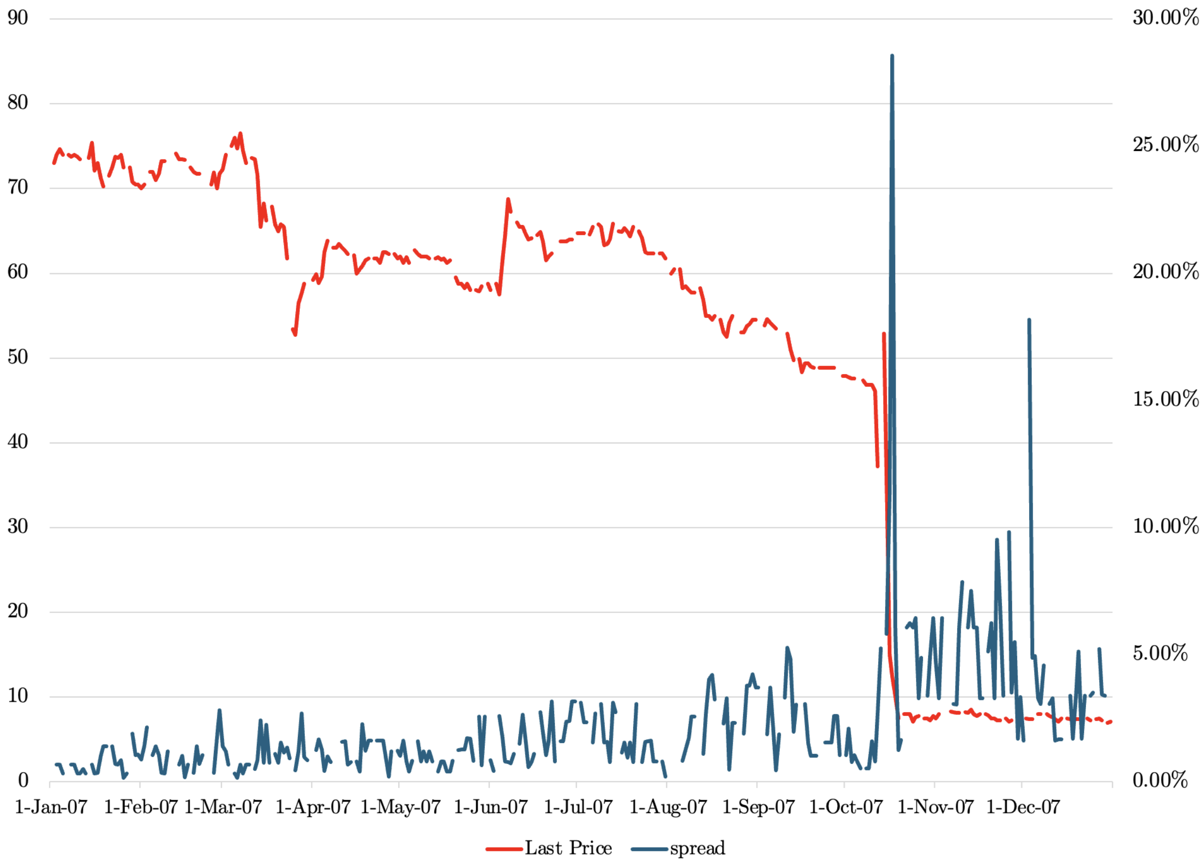


Figure 3: Share Price and Relative Spreads of United Copper Company

financial institutions had financed the failed short squeeze and therefore held unpayable debts. Augustus Heinze was the key link in the rumor chain, as he had just a few months prior moved to Manhattan and taken an active interest in banking and finance, including Presidency of the Mercantile Bank and directorships at several other banks and trust companies.[9]

2.4.2 Contagion: October 17–22, 1907

With the failure of Otto Heinze, the establishment bankers–in the words of veteran Wall Street observer Edwin Lefèvre–"thought they perceived a heaven-sent opportunity to eliminate Heinze and his associates from the banking situation of New York City." Lefèvre also quipped that "the seed of fear had been implanted in the breast of the New York City mob." As rumors spread about counterparties to Otto's brokerage firm, depositors ran on

[9]See the detailed reporting in the *Commercial and Financial Chronicle* in the weeks during and following the panic. Fohlin and Lu (2021) demonstrate that the runs on affected trust companies remained well contained, viewed from the performance of all New York City trust companies with shares quoted at the time. In fact, trust companies with ties to the Money Trust performed better after the panic than before.

Mercantile National and on trust companies with known ties to Heinze; first and foremost, the Knickerbocker Trust Company with $69 million in assets (Tallman and Moen, 1990). After the closure of Knickerbocker Trust Company on Tuesday, October 22nd, depositors rapidly began withdrawals from other trust companies.[10] As banks faced withdrawals, money became scarce, and rates on short-term loans spiked, thereby causing difficulties in financing stock market transactions. Falling stock prices set off margin calls and further sell-offs in stocks to cover.

The crisis narrative of O.M.W. Sprague (Sprague, 1910), page 246, an eminent economist of the time, clearly indicates that contemporaries well understood the importance of information and uncertainty, and how those problems led to a crisis of confidence, panic, and runs on banks and the stock market. Here, a brief excerpt from his extensive coverage:

> "After the August decline on the stock exchange a number of unfavorable events served to weaken confidence. The most important of these were the disclosures regarding the affairs of the New York street railway companies, which culminated in the appointment of receivers toward the end of September. There is, however, no evidence that distrust of the solvency of the banks either in New York or elsewhere had been excited. During the crisis distrust rapidly developed, but this was owing to causes similar to those which had produced the same effect in other crises and can be naturally accounted for by the events which marked its beginning.
>
> The initial episode of the crisis was, as has often happened in previous instances, insignificant enough. Copper was, as we have seen, the one branch of industry in which a positive decline had taken place. No time could possibly have been chosen so unfavorable for venturesome attempts at manipulation either of copper itself or of the shares of copper companies. It happened that the particular disaster which precipitated the crisis was a copper gamble, the outcome of which would ordinarily have had no public importance."

When investors could observe runs on Heinze-linked institutions but could not verify which other institutions held exposure, uncertainty propagated systemically.

In an era when smaller investors lacked telephones, the only way to learn news in real time was to appear in person. The now-famous photograph in Harper's Weekly during the panic gives an impression of what that "price discovery" process looked like (Figure 4).

The extensive reporting in the *Commercial and Financial Chronicle* of the time as well as contemporary economists and numerous subsequent researchers point out that

[10] Again, see the extensive details reported in the *Commercial and Financial Chronicle* as well as other contemporary financial press.

Figure 4: Price discovery process during the Panic of 1907

rumors and the inability of investors to access and assess information led to escalation into panic.[11] Market participants could observe the runs on trusts and banks that had close ties to the Heinze brothers, and they could learn with some lag about stock price declines, but they had no way of accurately evaluating in real time the fundamental values of either the financial institutions or the corporations whose stocks served as collateral on millions of dollars' worth of loans.

Sprague also emphasized the lack of lender-of-last-resort facility for the trust companies, the "shadow banks" of the day, and the antagonistic relationship between these unchartered and loosely regulated institutions and the more tightly regulated commercial banks. In particular, the required reserve ratios of national banks exceeded the reserves typically held by trusts, and that gap led to a competitive advantage for the trusts and an arguably self-defeating unwillingness to assist trusts in the face of the 1907 liquidity freeze. In this pre-Fed era, the Clearing House Association of New York, a private clearing house, acted as an emergency lender to its members in crisis times. The trusts were not part of this club (Tallman and Moen, 2014). Moen and Tallman (1992) point out that loans at trust companies contracted by 37% between August 22 and December 19, 1907. Loans at banks contracted by 19% during that same period.

[11]See Sprague (1908, 1910) as well as the modern analyses of Gorton (1988), Calomiris and Gorton (1991), and Moen and Tallman (1992).

2.5 Interventions and Crisis Resolution

The panic might have deepened if not for rescue measures implemented in short order. The Treasury Department deposited $25 million in New York banks, followed on October 24th by J.P. Morgan's now-famous bailout plan involving large sums of his own money and that of the city's top bankers. On October 26th, the New York Clearing House Association issued Clearing House loan certificates for its member banks (Tallman and Moen, 1990, 2012). To further calm the markets, the Treasury issued its own certificates on November 19th and 20th.

Notably, as Rodgers and Payne (2012) find and as described in Kindleberger and Aliber (2011), the announcement by the Bank of France that it would discount American commercial paper for gold Eagles held in the Bank's reserves ultimately seemed to have stopped the downward spiral of equity prices. The Bank of France repeated its announcement between November 22 and December 7, 1907. Rodgers and Payne (2012) conclude that the Bank of France actions signaled an ongoing ability to provide liquidity, and thereby a more enduring resolution of the crisis, in contrast to Courtelyou's and Morgan's temporary injections of funds.

Wilson and Rodgers (2011) point out that, in addition to various policy responses, the structure of U.S. capital markets proved beneficial during the Panic of 1907. For example, the payment system for bond transactions was not necessarily tied to banks. Hence, investors could continue to receive payments even with banks in trouble. Additionally, most bond indentures stipulated that coupon and principal payments had to be made in gold, which further explains why the Bank of France announcements proved so helpful in stabilizing the market.

To the extent that the interventions of J.P. Morgan, Secretary Courtelyou, and the Clearing House reflected positive information about the solvency of underlying firms (and the removal of Heinze interests at the Mercantile further signaled a complete severing of ties to the failed Heinze brokerage house), these actions reduced the need for market participants to produce costly information of their own. As we describe in Section **??**, successful interventions should be reflected in declining spreads, increasing trading volume, and a reduction in overall informational risk as well as valuation uncertainty.

This downturn displayed characteristics also observed in earlier financial crises (Moen and Tallman, 1992): interest rates increased, stock prices decreased sharply, output in the real economy fell significantly, and financial institutions suffered from deposit withdrawals (Gorton, 1988; Kindleberger and Aliber, 2011). The resulting contraction of loans yielded significant negative consequences for the real sector (Moen and Tallman, 1992; Bruner and Carr, 2008).

2.6 Testable Hypotheses: Information Opacity and Liquidity

2.6.1 Conceptual Framework: How Opacity Amplifies Crisis Impact

To formalize how information opacity amplifies crisis impact on market liquidity, consider a simple market-making model building on Kyle (1985). A risk-neutral market maker sets bid and ask prices for a stock with true value v. Trade flow comes from liquidity traders (volume u) and informed traders (volume x) who observe a signal s about v. The market maker observes total order flow $q = x + u$ but cannot distinguish informed from uninformed trades.

In equilibrium, the bid-ask spread compensates the market maker for adverse selection risk. We extend the standard Kyle framework to incorporate firm-level information opacity. The spread is given by:

$$\text{Spread} = \lambda \cdot \sigma_v \cdot \phi(\theta) \tag{1}$$

where $\lambda > 0$ is the price impact parameter (Kyle's lambda), σ_v measures uncertainty about the fundamental value v, and $\phi(\theta)$ is an increasing function of information opacity $\theta \in [0, 1]$, with $\phi'(\theta) > 0$ and $\phi(0) = 1$ (normalization for full transparency).

Interpretation of opacity θ: The parameter θ captures the quality and availability of public information about firm fundamentals. High θ means fewer disclosure requirements, less frequent reporting, lower accounting quality, and weaker governance. In our setting, mining companies have high θ (sparse, unreliable disclosure), railroads have low θ (rate regulation mandates detailed reporting), and firms connected to the Money Trust have effectively lower θ through certification and monitoring by reputable financiers.

Two channels through which opacity affects spreads:

Direct effect: For any level of fundamental uncertainty σ_v, higher opacity θ increases spreads because market makers face greater adverse selection risk. With fewer public signals, informed traders possess more valuable private information, forcing market makers to widen spreads:

$$\frac{\partial \text{Spread}}{\partial \theta} = \lambda \sigma_v \phi'(\theta) > 0 \tag{2}$$

Crisis amplification effect: A crisis shock increases fundamental uncertainty from σ_v^0 to $\sigma_v^1 > \sigma_v^0$. The key interaction effect is:

$$\frac{\partial^2 \text{Spread}}{\partial \sigma_v \partial \theta} = \lambda \phi'(\theta) > 0 \tag{3}$$

This cross-partial captures the central mechanism: *opacity amplifies the impact of uncertainty shocks.* When a crisis increases σ_v, the rise in spreads is larger for opaque firms because market makers cannot rely on public information to assess values.

Linking to funding liquidity: We can extend equation (1) to incorporate funding constraints, as in Brunnermeier and Pedersen (2009). Market makers face margin requirements $m(\theta, \sigma_v)$ on their inventory positions, where margins increase with both opacity and volatility: $\frac{\partial m}{\partial \theta} > 0$, $\frac{\partial m}{\partial \sigma_v} > 0$. Crucially, $\frac{\partial^2 m}{\partial \theta \partial \sigma_v} > 0$ because lenders demand higher margins when they cannot verify collateral values. The total spread becomes:

$$\text{Spread} = \underbrace{\lambda \sigma_v \phi(\theta)}_{\text{adverse selection}} + \underbrace{\gamma \cdot m(\theta, \sigma_v)}_{\text{funding cost}} \tag{4}$$

where $\gamma > 0$ is the shadow cost of the funding constraint. This formulation predicts that funding stress (captured by call money rates in our data) affects spreads more for opaque stocks, as tighter funding constraints bind more severely when collateral is difficult to value.

Testable predictions: The framework generates four predictions we test empirically:

1. *Crisis effect:* Spreads increase for all stocks during the crisis as σ_v rises: $\frac{\partial \text{Spread}}{\partial \sigma_v} > 0$

2. *Opacity amplification:* The crisis effect is larger for opaque firms (equation 3). Empirically: mining stocks > manufacturing > railroads; unlisted > listed

3. *Certification:* Firms with Money Trust connections experience smaller spread increases because connections effectively lower θ through monitoring and implicit guarantees

4. *Funding-opacity interaction:* Funding stress (call money rates) affects spreads more for opaque stocks (equation 4), particularly for the most illiquid securities

This framework is intentionally stylized but captures the core economic mechanism. While we cannot directly observe θ or σ_v, we exploit cross-sectional variation in ex-ante opacity (sector, listing status, financial connections) and time-series variation from the crisis shock to test whether opacity amplifies illiquidity as the framework predicts. The predictions map cleanly to the empirical patterns we document in the following sections.

2.6.2 Mapping to empirical specifications

The theory and historical narrative suggest several testable hypotheses about how information asymmetry should manifest in market liquidity patterns during the crisis.

Hypothesis 1 (Sector Transparency): Stocks with the most opaque financial reporting practices and those most prone to manipulations–such as naked short sales, corners, and short squeezes–should suffer the most severe adverse selection effects. Given the differing extent and thoroughness with which different industries published their accounting information (Archambault and Archambault, 2005), we conjecture that stocks in more transparent sectors (especially railroads, which provided accounting information to the public in great detail) should exhibit lower informational risk than other sectors, such as manufacturing and mining, that published meager information on a sporadic basis.

Hypothesis 2 (Listing Status): Listing on the NYSE brought certification of quality based on the exchange's listing requirements, which involved some level of disclosure and examination of financial statements. Since the NYSE did not impose disclosure rules on stocks trading in the Unlisted department, less public information was available about these stocks. Episodes of heightened uncertainty may exacerbate such information problems. Thus, ceteris paribus, we should expect that unlisted stocks would be particularly vulnerable in a panic.

However, there is one important caveat to the ceteris paribus assumption. Non-listed stocks did not qualify as acceptable collateral, while listed stocks were widely used as collateral by the Clearinghouse in the period under study. This property induces a prima facie preference of investors for listed stocks because of their additional liquidity benefits on top of their risk-return profiles. Thus, the overall pool of investors active in the listed market should exceed the pool of investors active in non-listed segments, and the composition of the respective pools of investors might differ significantly.

Hypothesis 3 (Financial Connections): One means of offsetting some of the opaqueness is vetting by a trusted organization or connection to well-capitalized financial institutions. Firms connected to the so-called Wall Street "Money Trust," the network of powerful banks and financiers led by J.P. Morgan, should benefit from implicit guarantees and superior information. During the crisis, when Morgan organized rescue efforts and the Clearing House examined troubled institutions, connected firms should have experienced smaller increases in spreads than unconnected firms.

Hypothesis 4 (Funding-Market Liquidity Interaction): Following Brunnermeier and Pedersen (2009), we expect positive feedback between funding and market liquidity in crises: funding constraints force asset sales, widening spreads; wider spreads increase margin requirements, tightening funding constraints. This spiral should be most pronounced when information asymmetry is greatest, as margins and haircuts respond to valuation uncertainty. We therefore predict that call money rates (funding liquidity) should drive bid-ask spreads (market liquidity), with the strongest effects for the most opaque securities.

3 Data

Testing how information asymmetry drives market illiquidity requires daily microstructure data that has been, until now, unavailable to researchers studying the 1907 Panic. We constructed a comprehensive dataset covering all NYSE stocks from 1905 through 1910, including transaction prices, bid-ask quotations, and trading volume for every trading day. This granularity allows us to trace the evolution of liquidity in real time and examine cross-sectional heterogeneity in crisis impact.

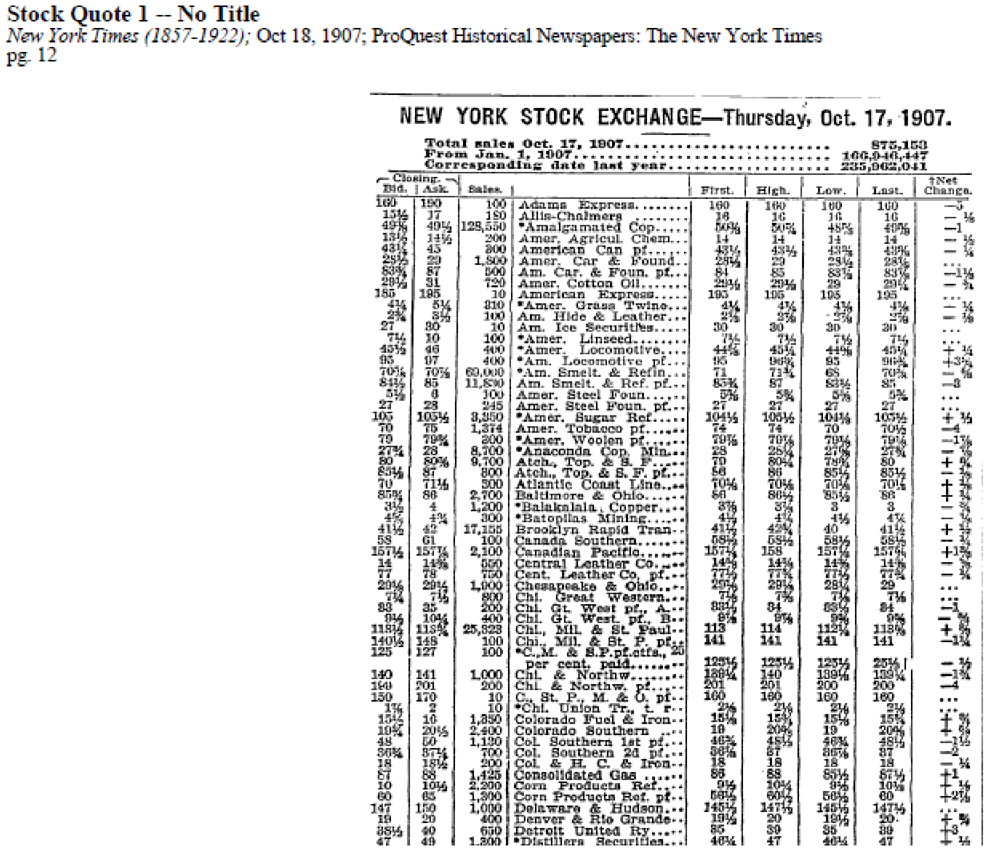
3.1 Stock Market Data: Construction and Sources

Our primary data source consists of daily transaction prices (first, last, high, and low), closing bid and ask quotations, and volumes (number of shares traded) for all stocks trading on the NYSE on every trading day from 1905 through 1910.[12] An example of a stock quote from the New York Times can be found in Figure **??**. Markets were open Monday through Saturday during this period, making for roughly 300 trading days per year.

The raw data come from the NYSE daily transactions table, printed the following day in the New York Times business pages. We used manual data entry with double entry and cross checking. We then ran all data through logical error checking to spot any potential typographical errors in the source or inserted during data entry: for example, flagging negative spreads and cases where 'high' and 'low' were not the highest and lowest prices, respectively. We also checked any entries with relative bid-ask spread or daily return exceeding ten percent. The newspaper images (Figure 5) are difficult to read by machine and optical character recognition (OCR) proved infeasible at the time. The database covers all stocks, common and preferred, as well as rights, warrants and other related equity securities. In the current analysis, we concentrate on common stock, since it is the most prevalent and actively traded class.

For every stock trading on the NYSE during the period, we gathered data on book value of common equity and par values of total capital in order to reweight portfolios and construct book-to-market ratios. These data come from the New York Times weekly financial supplement and Moody's Manual of Investments. We excluded preferred stock data following Fama and French (1993).

[12]The data constitute a portion of the new NYSE database for 1900–1925 created by and discussed in greater detail in Fohlin (2015), funded by grants from the U.S. National Science Foundation.



Stock Quote 1 -- No Title
New York Times (1857-1922); Oct 18, 1907; ProQuest Historical Newspapers: The New York Times
pg. 12

NEW YORK STOCK EXCHANGE—Thursday, Oct. 17, 1907.

Total sales Oct. 17, 1907 875,153
From Jan. 1, 1907 166,946,447
Corresponding date last year 235,962,041

Closing. Bid.	Ask.	Sales.		First.	High.	Low.	Last.	†Net Change.
160	190	100	Adams Express	160	160	160	160	−5
15½	17	180	Allis-Chalmers	16	16	16	16	−½
49⅝	49¾	128,550	*Amalgamated Cop.	50⅛	50⅝	48⅝	49⅝	−1
13½	14½	200	Amer. Agricul. Chem.	14	14	14	14	−½
43½	45	300	American Can pf.	43½	43¾	43⅜	43⅝	−¼
28½	29	1,800	Amer. Car & Found.	28⅝	29	28½	28⅝	...
83⅝	87	500	Am. Car. & Foun. pf.	84	85	83½	83⅝	−1⅛
29½	31	720	Amer. Cotton Oil	29½	29¾	29	29¼	−¾
185	195	10	American Express	195	195	195	195	...
4½	5¼	810	*Amer. Grass Twine	4¼	4½	4⅛	4⅛	−⅛
2⅝	3½	100	Am. Hide & Leather	2⅞	2⅞	2⅞	2⅞	−⅛
27	30	10	Am. Ice Securities	30	30	30	30	...
7½	10	100	*Amer. Linseed	7½	7½	7½	7½	...
45½	46	400	*Amer. Locomotive	44⅝	45¼	44⅝	45¼	+¼
95	97	400	*Am. Locomotive pf.	95	96⅝	95	96⅝	+3⅝
70⅝	70⅞	69,000	*Am. Smelt. & Refin.	71	71¾	68	70⅝	−⅝
84½	85	11,830	Am. Smelt. & Ref. pf.	85¾	87	83½	85	−3
5½	6	100	Amer. Steel Foun.	5⅝	5⅝	5⅝	5⅝	...
27	28	245	Amer. Steel Foun. pf.	27	27	27	27	...
105	105½	3,350	*Amer. Sugar Ref.	104½	105½	104⅛	105½	+½
70	75	1,374	Amer. Tobacco pf.	74	74	70	70½	−4
79	79⅝	200	*Amer. Woolen pf.	79⅝	79⅝	79⅝	79⅝	−1⅞
27⅞	28	8,700	*Anaconda Cop. Min.	28	28¼	27⅝	27⅞	−⅜
80	80⅛	9,700	Atch., Top. & S. F.	79	80¼	78⅝	80	+⅝
85½	87	800	Atch., Top. & S. F. pf.	86	86	85½	85½	−½
70	71½	500	Atlantic Coast Line	70½	70½	70½	70½	+½
85⅝	86	2,700	Baltimore & Ohio	86	86½	85½	86	+¼
3½	4	1,200	*Balakalala Copper	3⅞	3⅞	3	3	−⅞
4⅝	4¾	300	*Batopilas Mining	4½	4¾	4½	4¾	−⅛
41½	42	17,155	Brooklyn Rapid Tran.	41½	42¾	40	41½	+½
58	61	100	Canada Southern	58½	58½	58½	58½	−½
157½	157⅞	2,100	Canadian Pacific	157¼	158	157¼	157⅝	+1⅝
14	14⅜	550	Central Leather Co.	14⅜	14⅜	14⅜	14⅜	−⅜
77	78	750	Cent. Leather Co. pf.	77½	77⅞	77½	77⅞	−⅛
28⅝	29¼	1,000	Chesapeake & Ohio	29⅞	29¼	28¼	29	...
7⅛	7½	800	Chi. Great Western	7½	7⅝	7⅛	7⅛	...
33	35	200	Chi. Gt. West pf., A.	33½	34	33½	34	−1
9¼	10¼	400	Chi. Gt. West. pf., B.	9⅝	9⅝	9⅝	9⅝	−⅜
113¼	113⅝	25,323	Chi., Mil. & St. Paul	113	114	112¼	113⅝	+⅝
140½	148	100	Chi., Mil. & St. P. pf.	141	141	141	141	−1¼
125	127	100	*C., M. & S.P. pf. ctfs., 20 per cent. paid	125½	125½	125½	25½	−½
140	141	1,000	Chi. & Northw.	139¾	140	139¾	139¾	−1⅜
199	201	200	Chi. & Northw. pf.	201	201	200	200	−4
150	170	10	C., St. P., M. & O. pf.	160	160	160	160	...
1⅞	2	10	*Chi. Union Tr., t. r.	2⅛	2⅛	2⅛	2⅛	...
15½	16	1,350	Colorado Fuel & Iron	15⅜	15⅞	15⅜	15⅝	+⅜
19⅝	20½	2,400	Colorado Southern	19	20⅝	19	20⅝	+⅝
48	50	1,130	Col. Southern 1st pf.	46⅜	48½	46⅜	48½	−1½
36⅝	37¼	700	Col. Southern 2d pf.	36⅝	37	36⅝	37	−2
18	18½	200	Col. & H. C. & Iron	18	18	18	18	−¼
87	88	1,425	Consolidated Gas	88	88	85½	87½	+1
10	10½	2,200	Corn Products Ref.	9⅝	10⅛	9⅝	10⅛	+⅛
60	65	1,300	Corn Products Ref. pf.	58⅝	60½	58⅝	60	+2½
147	150	1,000	Delaware & Hudson	145½	147½	145½	147½	...
19	20	400	Denver & Rio Grande	19½	20	19½	20	+⅝
38½	40	650	Detroit United Ry.	35	39	35	39	+3
47	49	1,300	*Distillers Securities	46¾	47	46¾	47	+¼

Figure 5: **Example of Stock Quote from the New York Times (October 1907)**

3.2 Funding Liquidity and Risk-Free Rate Measures

In order to control for funding liquidity and riskless rates, we used daily call money rates and monthly prime commercial paper rates, respectively. The latter proxies for the risk-free rate, since Treasury bills did not exist yet. Call money represents overnight lending among financial institutions (banks and trust companies) and brokers secured by securities. In the period we analyze, the call money rate represents the marginal cost of financing for stock purchases.[13] The daily high, low, and ruling call money rates come from Fohlin (2025).

Call money rates are particularly important for our analysis because they provide a high-frequency measure of funding stress. During normal periods, these rates averaged around 3%, but they spiked dramatically during the crisis, reaching as high as 125% on some days in October 1907. This variation allows us to test whether funding illiquidity drove market illiquidity during the panic.

[13]Prime commercial paper rates come from Federal Reserve Board, Banking And Monetary Statistics; Federal Reserve Bulletins.

3.3 Key Variables and Measurement

We construct several key variables for our analysis:

Relative Bid-Ask Spread: Our primary measure of market liquidity is the relative bid-ask spread, defined as:

$$\text{Relative Spread}_{i,t} = \frac{\text{Ask}_{i,t} - \text{Bid}_{i,t}}{(\text{Ask}_{i,t} + \text{Bid}_{i,t})/2} \tag{5}$$

where i indexes stocks and t indexes trading days. This measure captures the percentage cost of a round-trip transaction and is standard in market microstructure research.

Quasi-Volatility: Since we have daily data rather than intraday prices, we proxy for volatility using a "quasi-volatility" measure:

$$\text{Quasi-Volatility}_{i,t} = \frac{\text{High}_{i,t} - \text{Low}_{i,t}}{\text{Last}_{i,t}} \tag{6}$$

This captures the range of price variation within the trading day. We exclude observations for which quasi-volatility equals zero, as these likely indicate that the stock traded only once that day, suggesting low liquidity and therefore higher spreads.

Trading Volume: We measure trading activity using the number of shares traded each day for each stock. Volume serves as an alternative liquidity measure and helps us understand whether the crisis affected trading activity as well as transaction costs.

Book-to-Market Ratio: For asset pricing tests, we construct the book-to-market ratio as:

$$\text{Book-to-Market}_i = \frac{\text{Total book value of common stock}_i}{\text{Number of common shares outstanding}_i \times \text{Stock Price}_i} \tag{7}$$

Market Equity: Market equity (common stock) is defined as:

$$\text{Market value of common equity}_i = \frac{\text{Total common equity stock}_i}{\text{Par value of common}_i} \times \text{Stock Price}_i \tag{8}$$

3.4 Firm Classification Variables

To test our hypotheses about information opacity, we construct several indicator variables based on firm characteristics:

Connected Firms: We identify firms with connections to Wall Street's "Money Trust"– the network of powerful banks and financiers led by J.P. Morgan. We classify a firm as connected if it had interlocking directorates with major Money Trust institutions or received explicit support during the crisis interventions. This classification is based on contemporary accounts in the *Commercial and Financial Chronicle* and the subsequent

Money Trust hearings.

Railroad Firms: We identify all firms in the railroad sector, which faced stringent rate regulation and published detailed financial statements. This sector serves as our benchmark for transparency.

Unlisted Firms: We classify stocks trading in the NYSE's Unlisted department separately from officially listed securities. As discussed in Section **??**, unlisted stocks faced minimal disclosure requirements but also did not qualify as margin collateral.

Mining Firms: We separately identify mining and metals companies, which had notoriously poor governance and sparse financial reporting. This sector serves as our benchmark for opacity and was the epicenter of the crisis.

3.5 Summary Statistics

Table 1 provides descriptive statistics on the key variables for the full sample period (1905–1910). Several patterns emerge from this cross-sectional variation that motivate our empirical analysis.

The median percentage bid-ask spread over the period was 0.8 percent, though a number of high-spread stocks pulled the average up to two percent. This substantial cross-sectional heterogeneity allows us to examine how firm characteristics mediate crisis impact. Likewise, the median stock traded only 800 shares in a given day, but the handful of large firms traded orders of magnitude more, with an average of around 7,521 shares traded per company on an average trading day.

The highest price and the lowest price were on average \$75.48 and \$74.64 with median values of \$55.00 and \$54.00, respectively. The similarity between high and low prices, combined with the quasi-volatility measure averaging 1.5%, suggests that most stocks did not experience extreme intraday price swings during normal periods, though this changed dramatically during the crisis.

Call money rates averaged nine percent during the crisis period, from August 1907 to June 1908, but the rate usually held steady at much lower levels, with a median rate of three percent over the full sample. This dramatic increase during the crisis provides variation we exploit to test the funding-market liquidity transmission mechanism.

Table 1 also reports descriptive statistics of capital stock data and the book-to-market ratio. Companies were generally trading below par, with book-to-market ratios averaging 3.71 (median of 1.73). This suggests that the market valued many companies below their stated book values, perhaps reflecting skepticism about accounting quality or concerns about future profitability.

3.6 Data Quality and Limitations

Several features of our data merit discussion. First, the "last" price of the day could have taken place at any time during the trading session, not necessarily at the market close. This means our closing prices may not perfectly reflect end-of-day valuations. However, this limitation affects all stocks equally and should not bias our cross-sectional comparisons.

Second, we lack information on ex-dividend dates for all stocks, which means our return calculations exclude dividend adjustments. For our spread and volume analysis, this omission is not problematic. For asset pricing tests in Section **??**, we drop the small number of observations (0.6 percent of the sample) on known ex-dividend dates to avoid spurious return spikes.

Third, our classification of connected firms relies on contemporary accounts and subsequent historical research rather than a comprehensive database of all interlocking directorates. While our classification captures the most prominent Money Trust connections, we may miss some smaller institutions with Wall Street ties. This measurement error would bias our results toward finding no effect of connections, making our positive findings for connected firms conservative estimates.

3.7 Sample Composition and Cross-Sectional Variation

Tables A1–A6 in the Online Appendix present summary statistics separately for connected versus unconnected firms, listed versus unlisted firms, and railroad versus non-railroad firms. These comparisons reveal important cross-sectional patterns that foreshadow our main results.

Connected firms trade at higher average prices ($92.58 versus $61.28 for unconnected firms) and exhibit lower relative spreads (1.0% versus 3.0%). They also trade in higher volumes, suggesting greater market liquidity. These patterns are consistent with connected firms being larger, more established companies with better information environments.

Railroad firms similarly show higher prices and lower spreads than non-railroad firms, consistent with their greater transparency due to rate regulation. Mining and manufacturing firms, by contrast, exhibit the highest spreads and greatest volatility, supporting our hypothesis that opacity increases trading costs.

Unlisted firms show surprisingly lower spreads than listed firms in normal periods (2.9% versus 2.1%), a pattern we discuss in detail when presenting our main results. As previewed in Section 2, this may reflect differences in investor composition due to collateral rules rather than transparency per se.

Kolmogorov-Smirnov tests (Table 7 in the Online Appendix) confirm that the distributions of key variables differ significantly across these firm categories, justifying our cross-sectional analysis. Correlation matrices (Tables A7–A8 in the Online Appendix) show that relative spreads correlate negatively with stock prices and positively with quasi-volatility, as expected from standard microstructure theory.

This rich cross-sectional variation, combined with the time-series shock of the 1907 crisis, provides the identifying variation we exploit in the following sections.

4 Drivers of Stock Market Illiquidity During the Crisis

Stock market liquidity measures, such as relative spreads and trading volume, highlight the progression of the crisis, transition to outright panic, and long duration of the recovery in the market. Relative spreads started rising around March 1907, while trading volume dropped significantly (Figure 7). These trends accelerated in October 1907. While prices rebounded before the end of the year, spreads remained elevated and trading volume remained depressed and more variable until the following spring.

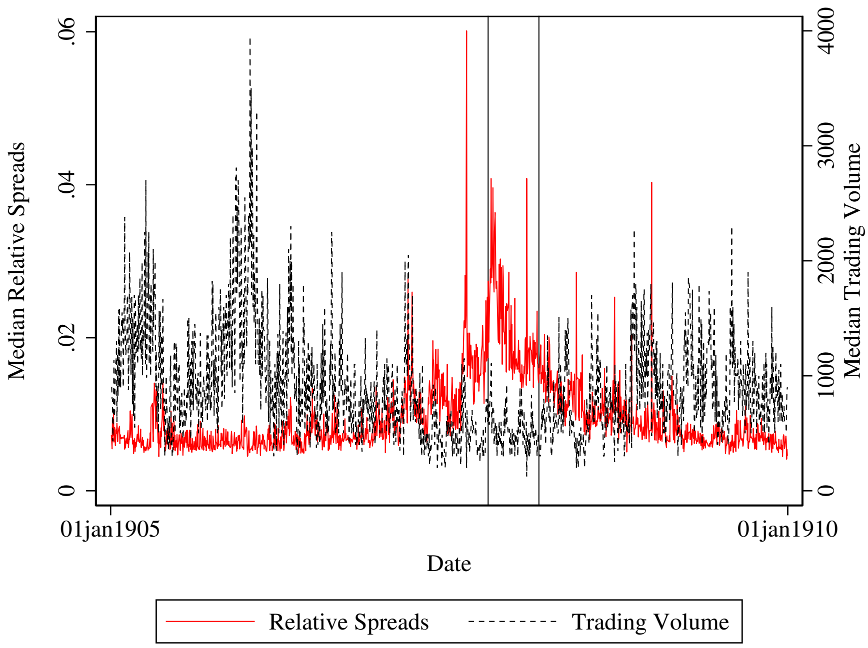


Figure 6: Median of Relative Spreads & Trading Volume: 1905-1910

To more explicitly evaluate the changes in stock market illiquidity during the crisis, we estimate quantile regressions of daily relative bid-ask spreads for all common stocks trading on the NYSE from 1905 through 1909. We control for the price level and contemporaneous volatility, in line with the theoretical implications of studies such as Copeland

and Galai (1983), and then add binary indicator variables for the height of the panic (October 22nd–November 9th) and the rest of the financial crisis period outside of the peak (September 30–October 21 and November 10 to January 31, 1908), as follows:[14]

$$\begin{aligned}\text{Relative Spreads}_{i,t} = {}& \beta_{0,\tau} + \beta_{1,\tau}\text{Panic Height}_t + \beta_{2,\tau}\text{Crisis}_t + \beta_{3,\tau}\text{Stock Price}_{i,t} \\ & + \beta_{4,\tau}\text{Quasi Volatility}_{i,t} + \varepsilon_{i,t} \quad \forall\ i = 1, ..., N, t = 1, ..., T, \tau = 1, ..., 99\end{aligned} \tag{9}$$

The analysis confirms and expands on the graphical evidence that relative spreads increase significantly, in both economic and statistical terms, during the crisis and especially so during the height of the Panic (Table 2). Indeed, the height of the panic effect is more than twice the effect of the crisis days just before and after the peak. The pattern holds across all three quartile estimations, with substantially increasing impact for higher spread quartiles. For both the height of the panic and for the surrounding crisis days, the median effect is more than two and a half times that for the lowest (most liquid) quartile, while the third quartile (least liquid) effect is well over six times that of the lowest quartile.

Volatility and stock prices follow the expected positive and negative patterns, respectively, and those estimated effects increase with each quartile of relative spreads. Notably, since the regression analysis controls for stock price and asset valuation uncertainty (quasi-volatility), the crisis and panic indicators measure an additional effect, above and beyond the standard microstructure effects. In other words, these results indicate that additional panic-specific factors exacerbated the rising market illiquidity in the stock market. In the following sections, we dig deeper to identify the role of funding illiquidity and then of incomplete information in driving up spreads.

4.1 Market Liquidity and Funding Liquidity During the Panic

The narrative of the Panic of 1907 points out the already fragile state of financial markets in the several months prior to the crisis, and general economic conditions had also weakened over the previous year. Odell and Weidenmier (2004) argue that the financial repercussions of the San Francisco earthquake in April of 1906 led to monetary stringency and made financial markets susceptible to a crisis. In the absence of a central bank, the setting of short-term borrowing rates was performed by the overnight call money market throughout our period of study. Funding liquidity issues therefore appear in the form of elevated call loan rates.

[14]Since we have daily data, we proxy volatility with a "quasi-volatility" measure: each day's high minus low transaction price, divided by the last price of the day. We exclude observations for which quasi-volatility is equal to zero, since these observations likely indicate that the stock traded only once in that day, suggesting low liquidity and therefore higher spreads.

As Brunnermeier and Pedersen (2009) argue, in periods of crisis positive feedback between funding illiquidity and market illiquidity will typically amplify each other in frictional markets. In such situations, decreasing availability of funds increases margin requirements and haircuts on collateral, inducing fire-sales of the underlying assets and causing a widening of bid-ask spreads, reflecting higher inventory holding costs for market makers. As market liquidity dries up, margin calls and haircuts increase and reduce funding liquidity even further.

This mutually enhancing feedback between funding illiquidity and market illiquidity is particularly important in opaque markets with asymmetric information about assets' true valuations, when frictions matter more. In this case margins and haircuts typically are larger, generating increased correlation between funding illiquidity and market illiquidity, as well as an increase in commonality between asset returns, volatility and effective spreads-likely compounded by investors' flight to quality.

In periods of crises, market illiquidity will typically amplify funding illiquidity for banks and financial intermediaries relative to non-financials by triggering runs on the intermediaries (Dietrich and Gehrig, 2025a). Hence runs are an extra escalation channel in the case of banks or trusts that enhance illiquidity on both dimensions, funding and trading. On the other hand, Li and Ma (2022) provide an explicit model of the feedback effect from funding illiquidity to market illiquidity for the case of banks. Both models together provide a theoretical foundation for the 1907 Panic, which was triggered by a run on Knickerbocker Trust and subsequently on other trusts and banks as well.[15]

Since we cannot observe the margins and haircuts set by the exchanges during the period of interest, we can only indirectly test this relationship between funding illiquidity and market illiquidity. Taking daily maximum call money rates as our measure of funding illiquidity and spreads as the measure of market illiquidity, Figure 7 suggests that the co-movement between daily maximum call money rates and relative spreads increased dramatically at the peak of the Panic in October 1907. In other words, our measure of funding illiquidity seems to be highly correlated with market illiquidity during these hectic two weeks. Afterwards, we see a decoupling of funding liquidity and market liquidity and a convergence of market illiquidity to more normal levels despite the fact that funding illiquidity spikes toward the end of 1907.

To confirm this hypothesis and the graphical evidence, we analyze the relationship between call money rates and relative spreads in a multivariate model of spreads. We re-estimate the model from the previous section, augmented by daily maximum call loan rates. As before, the independent variables include daily stock prices, daily quasi-

[15]The trusts in the early twentieth century played a role similar to shadow banks about a hundred years later.

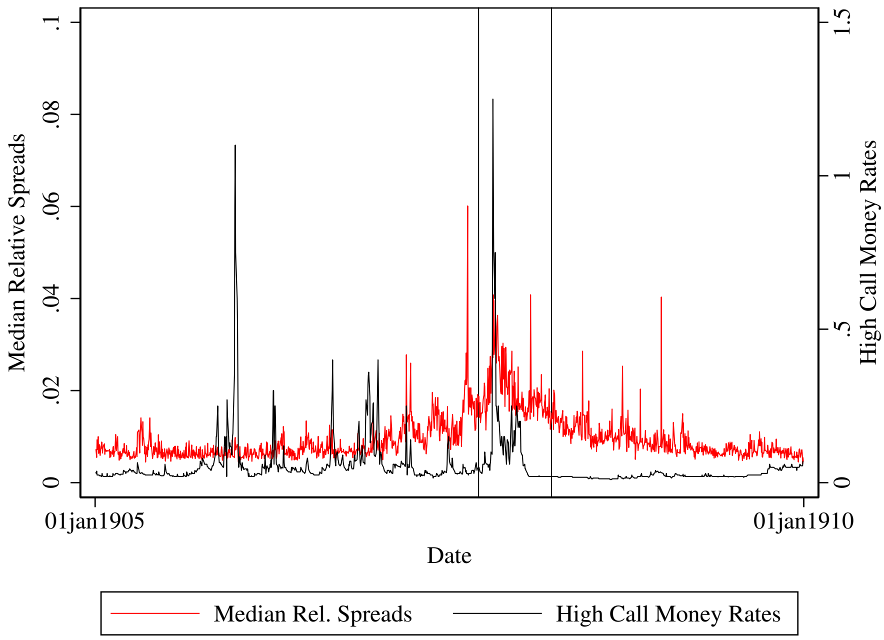


Figure 7: Market and Funding Illiquidity during the Panic of 1907: High Call Money Rates vs. Relative Spreads

volatility, and the same crisis/panic indicator variables.[16]

$$\begin{aligned}\text{Relative Spreads}_{i,t} = {} & \beta_{0,\tau} + \beta_{1,\tau}\text{Height of the Panic}_t + \beta_{2,\tau}\text{Crisis}_t + \beta_{3,\tau}\text{High Call Money Rates}_{i,t} \\ & + \beta_{4,\tau}\text{Stock Price}_{i,t} + \beta_{4,\tau}\text{Quasi Volatility}_{i,t} + \varepsilon_{i,t} \\ & \forall t = 1, ..., T, i = 1, ..., N, \tau = 1, ..., 99\end{aligned} \tag{10}$$

Note that despite the time subscript t on all variables, the call money rates actually precede the closing relative spread. The quotation of call money rates took place throughout the trading day, but banks typically set rates before noon, particularly for renewals (many of these loans were rolled over for several days, but the borrower had to pay each new day's renewal rate and therefore had to take the risk of a higher rate as the market fluctuated). So, the bid and ask quotes at the close of the market would have taken into account the call money rates that had prevailed that day. In the quantile regressions we therefore use intra-day maximum call money rates to capture the leading role of funding liquidity.

In line with the prior results, call money rates lead relative spreads for the most

[16]Note that, as before, we exclude observations for which quasi-volatility is equal to zero, due to the likelihood that such instances indicate a single trade for that day. The height of the panic is October 22–November 9, 1907 and the rest of the crisis, outside the peak, is September 30–October 21 and November 10 to January 31, 1908.

illiquid stocks only, those in the 75th percentile of relative spreads (Table 3). We find that the correlation between funding liquidity (as measured by call money rates) and market liquidity (as measured by spreads) increases as stocks become more illiquid; there is no significant effect for the most liquid or median liquid stocks. The Panic itself had strongly positive effects on relative spreads, both during the height of the panic as well as during the remainder of the panic. Spreads are significantly higher for all quartiles of stocks. The most liquid stocks see an increase in relative spreads of about 0.3 percent, whereas the most illiquid stocks experience an increase in spreads of about 0.9 percent during the height of the crisis. This effect reflects strong simultaneous feedback effects between market and funding illiquidity across the illiquidity spectrum. There is an extra effect from 0 (lowest quartile) of up to 0.4 percent (in the highest quartile) for the remainder of the crisis. It is also important to highlight that, as theory predicts, asset valuation uncertainty (quasi-volatility) is consistently strong and positively related to relative spreads, and stock prices relate negatively and statistically significantly. The panic indicator variables and the maximum call money rates are therefore providing additional explanatory power, over and above the generally higher volatility and lower prices of the time.[17]

4.2 Information Opaqueness and Market Illiquidity

Thus far, we have assembled some of the key pieces of the 1907 picture: (1) stock market illiquidity (relative bid-ask spreads) rose dramatically during the crisis, especially during the height of the panic, and did so above and beyond the effects of rising volatility and falling prices; and (2) funding illiquidity exacerbated market illiquidity during the peak weeks of the crisis.

To establish that the core of the illiquidity problem lay in the opaqueness of information in the market, we next compare the impacts on different firms, depending on their (hypothesized) a priori information opaqueness. Based on historical narratives and past research, firms connected to the Money Trust and those in the railroad sector would benefit from greater market liquidity. In contrast, firms trading in the NYSE's unlisted department would tend to experience lower liquidity, which would worsen in a financial crisis.

Firms not listed on the exchange exhibit both a negative direct effect and a negative interaction with the Height of Panic variable. This finding needs explanation, since basic microstructure considerations would tend to support the opposite sign. At this stage one important institutional feature seems to play a key role. Unlisted companies did not qualify for collateral, while listed companies did, providing extra (funding) liquidity

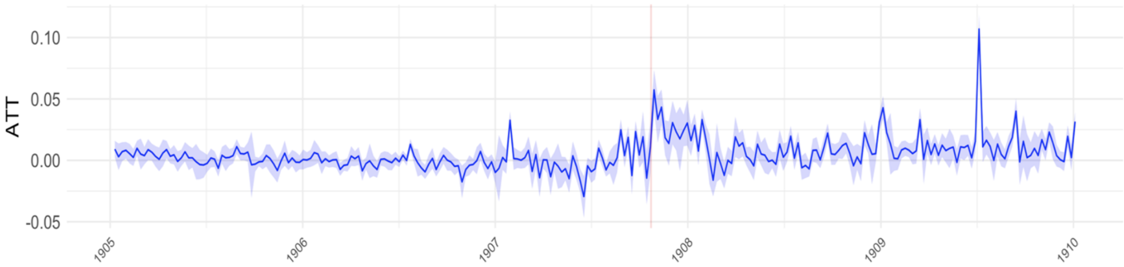
[17] These results are robust across different specifications of call money rates. As depicted by Table **??**, the results also hold when the daily minimum call money rates are used instead of the maximum rates.

benefits. So in addition to the standard investment considerations, the added liquidity service apparently did attract extra traders to listed securities, who presumably were less informed about the underlying securities fundamentals except for qualifying for a listing. Therefore, our finding suggests that in unlisted stocks traders typically had to acquire more fundamental information on their own, such that informational heterogeneity across a presumably smaller number of active traders was actually lower than in listed securities, implying lower adverse selection, and, hence, spreads.

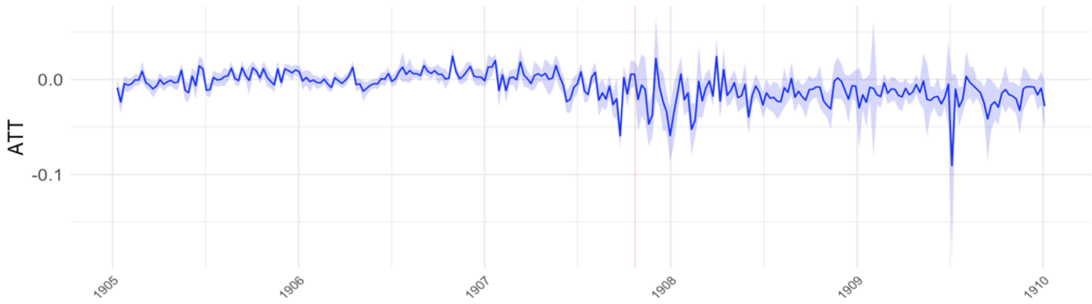
The results from both approaches indicate that during financial stress, such as the 1907 Panic, firms with financial connections or those listed on the stock exchange managed to maintain lower liquidity costs. Connected firms experienced smaller increases in bid-ask spreads due to their financial ties, while unlisted firms faced higher liquidity costs during the panic. This underscores the importance of financial connections and listing status in mitigating adverse liquidity impacts during financial crises. Being connected to financial institutions and the transparency associated with being listed on a stock exchange provide significant advantages in maintaining lower transaction costs in turbulent times.

Generalized synthetic control estimates the Average Treatment Effect on the Treated (ATT) for unlisted, connected, and railroad firms to comprehensively assess how different types of institutions fared during the panic. The results (Figure 8) reveal distinct patterns across these three categories. For unlisted firms, the effects remained largely insignificant throughout most of the period, hovering near zero with occasional positive spikes, suggesting these firms experienced minimal systematic impact from the panic. In contrast, connected institutions show essentially no difference from their synthetic controls before the panic, but during and after the panic period, they experienced significantly negative effects on their relative spreads, with the impact persisting for months afterward. Railroad firms display a similar but even more pronounced pattern, with pre-panic effects near zero followed by sharp and severely negative effects during the panic that reached magnitudes of -0.2 or greater, indicating these firms suffered the most substantial adverse impacts. The blue shaded areas represent confidence intervals, and the fact that these effects are sustained and statistically significant for both connected and railroad firms suggests that institutional characteristics played a crucial role in determining the outcomes during the crisis, with connected institutions receiving lasting financial advantages while railroad firms faced persistent disadvantages, likely reflecting differences in market access, borrowing costs, and investor confidence across these different types of firms.

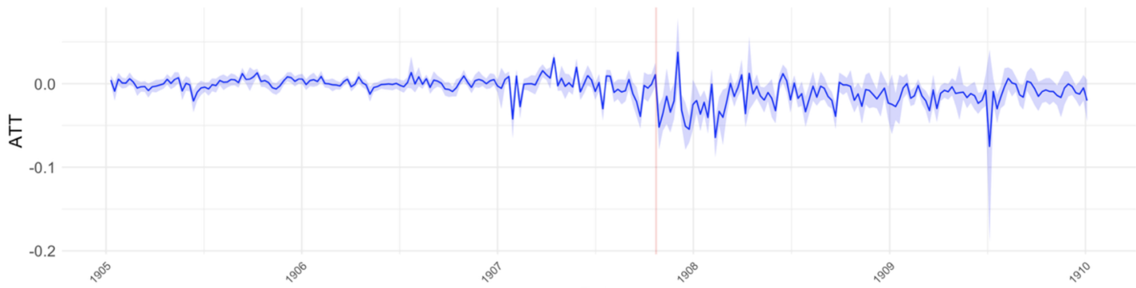
In Table 2, we see that the indicator for the Height of the Panic is positive and statistically significant at all quantiles, implying higher relative bid-ask spreads–and hence higher liquidity costs–during the panic. The Connected dummy is negative (significant at the median and upper quantiles), consistent with the notion that ties to money trust



Unlisted



Connected



Railroad

Figure 8: Average Treatment Effect on the Treated for Unlisted, Connected, and Railroad Firms

companies were associated with lower spreads in normal times. Crucially, the interaction Height of the Panic × Connected is negative and significant across the distribution, indicating that connected firms experienced a smaller run-up in spreads at the height of the panic than otherwise similar, non-connected firms. As controls, higher stock prices are associated with narrower spreads (negative and significant), while quasi-volatility is strongly positively related to spreads, as expected in microstructure settings. Despite modest R-squared values, the effects are precisely estimated.

For firms not listed on the exchange, the Height of Panic coefficient is again positive and highly significant across quantiles, reinforcing that market-wide stress raised trading frictions. The main effect of Unlisted Firms is small and statistically indistinguishable from zero, suggesting no systematic spread difference in tranquil periods purely from listing status. However, the interaction Height of Panic × Unlisted is positive (significant at the lower and upper quantiles and imprecise at the median), indicating that unlisted firms bore larger increases in spreads at the height of the panic relative to listed firms. As in Panel A, stock prices load negatively and quasi-volatility loads positively and strongly, mirroring the expected directional relationships.

5 Illiquidity as a Factor in Asset Pricing

As demonstrated above, varying levels of stock illiquidity and the provision of market funding liquidity played a crucial role during the Panic of 1907 and in its resolution. Hence, the question arises whether illiquidity risk had been a regular feature of early unregulated markets, and whether illiquidity risk has been priced in the market. To provide an answer we conduct an asset pricing analysis in order to analyze various measures of illiquidity risk and check whether they were priced factors in our data.

In order to address this question, we focus on market illiquidity and investigate whether market illiquidity risk was priced by the market. We follow suggestions of Holmström and Tirole (2001), Pástor and Stambaugh (2003), or Acharya and Pedersen (2005) for modern age markets. In this tradition we augment a standard Fama-French three factor model with a factor proxying for market illiquidity such as relative bid-ask spreads.[18]

In order to test this model, we first construct size and book-to-market factors using the procedure in Fama and French (1992).[19] We define Book-to-market as:

$$\text{Book-to-Market (B/M)} = \frac{\text{Total book value of common stock}}{\text{Number of common shares outstanding} * \text{Stock Price}} \tag{11}$$

[18]We also run regressions with alternative measures of market illiquidity such as the Amihud illiquidity measure and trading volume generating similar results.

[19]Kenneth French's online database starts much later.

We then break our entire sample of stocks into three book-to-market equity groups based on the breakpoints for the bottom 30% (Growth), middle 40% (Neutral), and top 30% (Value) of the ranked values of the book-to-market ratio.[20] We furthermore sort our sample of stocks into size portfolios based on market equity. Market equity (common stock) in our case is defined as:

$$\text{Market value of common equity} = \left(\frac{\text{Total common equity stock}}{\text{Par value of common}}\right) * \text{Stock Price} \tag{12}$$

We split the sample into two equal groups, small and big, based on the median value of market capitalization. These sorts follow Fama and French (1992) as well as Fama and French (1993). The Fama/French factors are constructed using the six value-weighted portfolios formed on size and book-to-market. SMB (Small minus Big) is the average return on the three small portfolios minus the average return on the three big portfolios:

$$\text{SMB} = \frac{1}{3}(\text{Small Value}+\text{Small Neutral}+\text{Small Growth})-\frac{1}{3}(\text{Big Value}+\text{Big Neutral}+\text{Big Growth}) \tag{13}$$

HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios:

$$\text{HML} = \frac{1}{2}(\text{Small Value} + \text{Big Value}) - \frac{1}{2}(\text{Small Growth} + \text{Big Growth}) \tag{14}$$

Since short T-bills did not yet exist during the period of our study, we define the excess return $R^m - R^0$ relative to a zero-beta portfolio, using the gold flow rate (i.e., growth rate in the gold stock of the U.S. government). We choose to use gold flow rates for two reasons. First of all, this rate represents the zero-beta portfolio as it correlates with the market return at only -0.01.[21] Secondly, it seems that gold reserves were viewed as a safe haven by investors: As described by Rodgers and Payne (2012), the Panic lost some of its steam once the level of gold stock reserves rose towards 1908.

Once we have our size and market-to-book factors, we follow the traditional two-step OLS methodology of Fama and MacBeth (1973) extended by Pástor and Stambaugh (2003) to incorporate liquidity risk in order to estimate portfolio betas and factor prices.[22] In the first stage we estimate firm-specific in-sample regression coefficients ("Betas") for the three Fama-French factors plus the illiquidity measure. In this regression, $R_{i,t}$ is the

[20] Note that for this section stocks trading in the Unlisted department of the NYSE had to be excluded due to the lack of capital stock data for this type of stocks.

[21] The market return is defined as the equally-weighted return of all stocks in our sample.

[22] See chapter 12 of Cochrane (2005) for example.

firm-specific time-varying monthly return, where i denotes the companies and t is a time-index (monthly).[23] $R_t^m - R_t^0$ denotes the excess market return and "Spread" denotes our measure for illiquidity, which is relative bid-ask spreads. We estimate the first stage as follows:

$$R_{i,t} - R_t^0 = \beta_{1,i} * (R_t^m - R_t^0) + \beta_{2,i} * \text{Liquidity}_{i,t} + \beta_{3,i}\text{SMB}_{i,t} + \beta_{4,i}\text{HML}_{i,t} + \epsilon_{i,t} \quad (15)$$

where "liquidity" captures market liquidity variously defined as relative spread, trading volume (sales), Amihud illiquidity measure, and Kyle's lambda.

In the second stage, we regress the cross-section of average monthly expected returns on the estimated factor sensitivities of the first stage. The estimated parameters of the second stage can be interpreted as the associated market prices of the corresponding risk factors. If the model is well specified, γ_0 should not be statistically significant.

$$E[R_i - R^0] = \gamma_0 + \gamma_1\widehat{\beta_{1,i}} + \gamma_2\widehat{\beta_{2,i}} + \gamma_3\widehat{\beta_{3,i}} + \gamma_4\widehat{\beta_{4,i}} + \eta_i \quad (16)$$

The results of our asset pricing analysis (Table 5) reveal that the crucial factor for asset pricing in the early 20th century follows standard asset pricing theory-excess market returns-though there is some indication of a value effect. Apparently, and despite significant variation in liquidity in crisis periods, liquidity risk was not priced in the market as an independent risk factor in the medium run. None of the liquidity measures (bid-ask spread, Amihud, and Kyle's lambda) contributes significantly to the asset pricing equation. This was true whether at the median or at other quantiles as well as in a simple OLS model. The marginal contribution of the SMB factor appears small across different model specifications, while the HML factor is consistently positive and significant. Thus, regardless of the model specification, the HML factor reliably contributes to explaining the excess returns, and its impact is both positive (indicating that value stocks outperform growth stocks) and statistically significant.

The asset pricing analysis does not reveal any significant illiquidity risk premium, separate from market risk and size and value factors, at the level of monthly observations. While in earlier sections we report significant effects of daily liquidity variations on daily returns, apparently those effects smooth out in the longer horizon with monthly returns, or get captured in the standard three factors, so that no significant additional contribution to liquidity risk can be measured in the long term.

[23]Note that returns are calculated excluding ex-dividend dates as detailed information on firm-specific dividends is missing. We drop 0.6 percent of the entire dataset by excluding ex-dividend dates.

6 Conclusion

Our analysis offers several new insights into the role of information in financial markets, and in particular, how critical a role information transparency plays in mitigating adverse selection problems that destabilize markets. The period of our study, 1905–1910, surrounds one of the worst financial crises in over 100 years and provides a unique window on the performance of self-regulated asset markets operating under constrained information in the face of uncertainty shocks from unverifiable rumors.

We link stock market illiquidity to a severe funding freeze during the peak of the crisis and more broadly demonstrate the liquidity premium demanded in the market. All of our measures of liquidity evidence severe deterioration of market quality, and we find that this risk contributes significantly to the wedge between bid and ask prices in the very short term. Short-term cash infusions did not permanently increase trading volume, although risk indicators eventually recovered.

Our results demonstrate that a sudden short-term liquidity freeze in an opaque market setting can severely damage confidence in financial markets over extended periods, constraining liquidity far beyond the most acute phase of the panic. We show further that asymmetric information problems play out - as the theory suggests - in predictable cross-sectional variation in stock illiquidity. In particular, the liquidity crisis hit the mining sector most severely, because it lay at the heart of the crisis - both in terms of illiquidity and in terms of heightened informational risk. The mining sector also ranked among the least transparent sectors of the economy and, along with many manufacturing enterprises, provided sparse information to investors. Moreover, both extremely illiquid stocks as well as stocks traded in the NYSE's more opaque "Unlisted" department also suffered significantly more during the Panic than well-certified (listed) and liquid stocks. On the flip side, the stocks of companies linked to the famed "Money Trust" benefited throughout the panic from improved liquidity.

Finally, our analysis generates important insights for asset pricing. Outside specific crisis periods, markets worked reasonably well and did not even price illiquidity risk as an independent risk factor, suggesting that market participation in early markets was concentrated on knowledgeable and financially literate investors. In this era before cheap access to trading in NYSE stocks, participation in the main financial market presumably confined itself to relatively more knowledgeable and literate investors than in modern regulated markets.

From a policy standpoint, our results are particularly interesting, because the Panic of 1907 marks a turning point in the history of the U.S. financial system and the rise of the regulated era. The severity of the Panic of 1907 brought calls for reform of the financial system, with a particular focus on curbing potentially destabilizing activities in the stock markets and the need for a lender of last resort in order to maintain confidence and enhance funding liquidity: themes that echo in today's debates over financial regulation. Most of the first phase of regulatory activity focused on bank funding liquidity backstops. Consequently, on May 28, 1908, Congress passed the Aldrich-Vreeland Act that provided for emergency currency to infuse funding liquidity into the system when widespread insolvency threatened. Additionally, the law introduced the National Monetary Commission and charged it with investigating the Panic of 1907 and recommending measures to regulate capital markets and the banking system (Calomiris and Gorton, 1991). The Commission submitted its final report in 1912 and on December 23, 1913, Congress passed the Federal Reserve Act. Thus, the 1907 crisis stands as the last major crisis without an official institution to coordinate funding liquidity support in periods of financial distress, and ultimately the stimulus for the foundation of the Federal Reserve System.[24]

Politicians also held up the Panic of 1907 as an example of Wall Street excess and dishonesty and used it to motivate the famous Money Trust hearings in Congress. That investigation produced volumes of testimony by Wall Street insiders and led to the Clayton Antitrust Act. In New York, the Governor appointed a committee to study the crisis and recommend reforms to the financial markets, which led to tighter control over access to trading at the NYSE. These early regulatory steps made little inroad into the problem of information opaqueness that had exacerbated (if not outright caused) the crisis, but the new regulations did lay the foundation for more far-reaching government oversight of markets and corporate governance, such as the Securities and Exchange Commission (SEC), created a few decades later. In this sense, the Panic of 1907 ultimately put an end to unregulated securities markets and opaque corporate accounting in the United States.

References

Acharya, V. V. and Pedersen, L. H. (2005). Asset Pricing with Liquidity Risk. *Journal of Financial Economics*, 77(2):375–410.

Archambault, J. J. and Archambault, M. (2005). The Effect of Regulation on Statement Disclosures in the 1915 Moody's Manuals. *The Accounting Historians Journal*, pages 1–22.

[24] We consider the situation in the summer of 1914, as an impending crisis, but one that was staved off in part due to the lessons of 1907 and the creation of a liquidity backstop in Aldrich-Vreeland. Fohlin (2016) provides an in-depth study of market liquidity during the lead-up to the war and global stock market closures, as well as during the month following the reopening of the NYSE in December 1914. Fohlin (2016) analyzes the overnight lending market (call money) and underscores the key role of Aldrich-Vreeland in stabilizing rates in that market. Dietrich and Gehrig (2021) provides a theoretical argument about the instability of private provision of funding liquidity.

Archambault, J. J. and Archambault, M. E. (2011). Earnings Management among Firms during the Pre-sec Era: A Benford's Law Analysis. *The Accounting Historians Journal*, pages 145–170.

Bernardo, A. E. and Welch, I. (2004). Liquidity and Financial Market Runs. *The Quarterly Journal of Economics*, pages 135–158.

Bernstein, A., Hughson, E., and Weidenmier, M. D. (2014). Counterparty Risk and the Establishment of the New York Stock Exchange Clearinghouse. Technical report, National Bureau of Economic Research.

Bruner, R. F. and Carr, S. D. (2008). *The Panic of 1907: Lessons learned from the market's perfect storm*. John Wiley & Sons.

Brunnermeier, M. K. and Pedersen, L. H. (2009). Market liquidity and funding liquidity. *Review of Financial studies*, 22(6):2201–2238.

Calomiris, C. W. and Gorton, G. (1991). The Origins of Banking Panics: Models, Facts, and Bank Regulation. In *Financial Markets and Financial Crises*, pages 109–174. University of Chicago Press.

Cochrane, J. (2005). *Asset Pricing*. Princeton University Press.

Copeland, T. E. and Galai, D. (1983). Information effects on the bid-ask spread. *the Journal of Finance*, 38(5):1457–1469.

Davis, L. E. and Gallman, R. E. (2001). *Evolving Financial Markets and International Capital Flows: Britain, the Americas, and Australia, 1865–1914*. Cambridge University Press.

Diamond, D. (1984). Financial intermediation and delegated monitoring. *Review of Eocnomic Studies*, 51(3):393–414.

Dietrich, D. and Gehrig, T. (2021). On the instability of private liquidity provision. *Economic Letters*, 209:110117.

Dietrich, D. and Gehrig, T. (2025a). Scope and limits of bank liquidity provision. *Journal of Financial Intermediation*, 61:101123.

Dietrich, D. and Gehrig, T. (2025b). Talk and the city: How dar to trust bankers for (not) calling for bailout? *CEPR-DP*, 20532.

Fama, E. F. and French, K. R. (1992). The cross-section of expected stock returns. *the Journal of Finance*, 47(2):427–465.

Fama, E. F. and French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of financial economics*, 33(1):3–56.

Fama, E. F. and MacBeth, J. D. (1973). Risk, Return, and Equilibrium: Empirical Tests. *The Journal of Political Economy*, pages 607–636.

Flannery, M., Kwan, S., and Nimalendran, M. (2013). Information Acquisition in Rumor-Based Bank Runs. *Journal of Financial Intermediation*, 22.

Fohlin, C. (2015). A New Database of Transactions and Quotes in the NYSE, 1900-25 with Linkage to CRSP. In *Johns Hopkins Mimeo*.

Fohlin, C. (2016). Complex news and investor uncertainty: The NYSE during the European Crisis of 1914. *Working Paper*.

Fohlin, C. (2025). Rethinking the Lender of Last Resort: New Evidence on the Stabilization of Money Markets Before the Federal Reserve. In *Emory University Mimeo*.

Fohlin, C., Gehrig, T., and Brünner, T. (2008). Liquidity and Competition in Unregulated Markets: The New York Stock Exchange Before the SEC. *DP 101, Collegio Carlo Alberto*.

Fohlin, C. and Lu, Z. (2021). How contagious was the panic of 1907? new evidence from trust company stocks. *AEA - Papers and Proceedings*, 13(3):514–519.

Frydman, C., Hilt, E., and Zhou, L. Y. (2015). Economic Effects of Runs on Early 'Shadow Banks': Trust Companies and the Impact of the Panic of 1907. *Journal of Political Economy*, 123(4):902–940.

Gehrig, T. and Fohlin, C. (2006). Trading Costs in Early Securities Markets: the Case of the Berlin Stock Exchange 1880–1910. *Review of Finance*, 10(4):587–612.

Gorton, G. (1988). Banking Panics and Business Cycles. *Oxford economic papers*, pages 751–781.

He, Z. and Manela, A. (2016). Information Acquisition in Rumor-Based Bank Runs. *The Journal of Finance*, 71.

Holmström, B. and Tirole, J. (2001). An analysis of changes in specialist inventories and quotations.

Izumi, R. (2018). Opacity: Insurance and fragility. In *Rutters Mimeo*.

Kindleberger, C. P. and Aliber, R. Z. (2011). *Manias, Panics and Crashes: A History of Financial Crises*. Palgrave Macmillan.

Kyle, A. (1985). Continuous Auctions and Insider Trading. *Econometrica*, 53(6):1315–1335.

Li, Z. and Ma, K. (2022). Contagious bank runs and committed liquidity support. *Management Science*, 68(12):9152–9174.

Moen, J. and Tallman, E. (1992). The Bank Panic of 1907: The Role of Trust Companies. *Journal of Economic History*, 52(3):611–30.

Morgan, D. (2002). Rating Banks: Risk and Uncertainty in an Opaque industry. *American Economic Reveiw*, 92:874–888.

Mulherin, J., Netter, J., and Overdahl, J. (1991). Prices are Property: the Organization of Financial Exchanges from a Transaction Cost Perspective. *JL & Econ.*, 34:591.

Odell, K. A. and Weidenmier, M. D. (2004). Real shock, monetary aftershock: The 1906 san francisco earthquake and the panic of 1907. *The Journal of Economic History*, 64(04):1002–1027.

Parker, R. E. and Whaples, R. M. (2013). *Routledge Handbook of Major Events in Economic History*. Routledge.

Pástor, L. and Stambaugh, R. F. (2003). Liquidity Risk and Expected Stock Returns. *Journal of Political Economy*, 111(3):642–685.

Rodgers, M. T. and Payne, J. E. (2012). An Overlooked Central Bank Rescue: How the Bank of France Ended the American Financial Crisis of 1907. *Journal of Economic History*.

Sivakumar, K. and Waymire, G. (2003). Enforceable Accounting Rules and Income Measurement by Early 20$^{\text{th}}$ Century Railroads. *Journal of Accounting Research*, 41(2):397–432.

Sivakumar, K. N. and Waymire, G. (1993). The Information Content of Earnings in a Discretionary Reporting Environment: Evidence from NYSE Industrials, 1905-10. *Journal of Accounting Research*, pages 62–91.

Sprague, O. M. (1908). The american crisis of 1907. *The Economic Journal*, 18(71):353–372.

Sprague, O. M. W. (1910). *History of crises under the national banking system*, volume 538. US Government Printing Office.

Tallman, E. W. and Moen, J. R. (1990). Lessons from the Panic of 1907. *Economic Review*.

Tallman, E. W. and Moen, J. R. (2012). Liquidity Creation without a Central Bank: Clearing House Loan Certificates in the Banking Panic of 1907. *Journal of Financial Stability*, 8(4):277–291.

Tallman, E. W. and Moen, J. R. (2014). The Transmission of the Financial Crisis in 1907: An Empirical Investigation.

Wilson, B. K. and Rodgers, M. T. (2011). Systemic Risk, Missing Gold Flows and the Panic of 1907. *The Quarterly Journal of Austrian Economics*.

7 Tables

Table 1: Descriptive Statistics

This table reports the summary statistics of the data this paper is using. All variables are daily except Capital Stock that is annual and Prime commercial paper that is weekly.

Variables	Mean	Median	Std	Q25	Q75	Observations
Relative Bid-Ask Spread (1905-1910)	0.020	0.008	0.058	0.003	0.020	161,810
Number of Shares Traded (1905-1910)	7521	800	24819	200	3400	161,810
High Price (1905-1909)	75.48	55.00	61.99	28.25	113.00	132,646
Low Price (1905-1909)	74.64	54.00	61.63	27.00	111.75	132,646
Last Price (1905-1910)	78.62	56.75	78.53	29.75	110.00	161,810
Quasi Volatility (1905-1909)	0.015	0.009	0.036	0.00	0.020	132,590
High Call Money Rates	0.054	0.030	0.094	0.020	0.050	113,058
Capital Stock	6.01e+07	3.00e+07	1.01e+08	1.50e+07	6.52e+07	7,527
Book-to-Market Ratio	3.71	1.73	7.57	0.90	3.74	7,527
Prime commercial paper	5.563	5.63	0.887	4.75	6.30	10,131

Table 2: Stock Market Illiquidity During the Panic of 1907

This table reports the results of quantile regression of relative bid-ask spreads on time indicator variables for the Panic period and controls for volatility and share prices. The sample includes the panel of all traded NYSE stocks at daily frequency from 1905 to 1909, and the table reports results for the 1st, 2nd, and 3rd quartiles. Relative bid-ask spread is the difference between ask and bid prices divided by the average of ask and bid prices. Quasi-volatility is defined as the highest transaction price on a given day minus the lowest transaction price on that same day, divided by the last transaction price (note that we exclude observations for which quasi-volatility equals zero). The "Height of Panic" indicator variable takes the value of one during the height of the 1907 Panic, namely from October 22, 1907, to November 9, 1907, and zero otherwise. "Crisis" denotes the remainder of the Panic of 1907, namely the period of September 30, 1907, to October21, 1907, and November 10, 1907, to January 31, 1908. T-statistics the standard errors are computed allowing for intra-cluster correlation as in Parente and Santos Silva (2016); are robust under heteroskedasticity and are computed allowing for intra-cluster correlation and are reported in parentheses below the coefficient estimates. The symbols ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) Rel. Spread 1st Quartile	(2) Rel. Spread Median	(3) Rel. Spread 3rd Quartile
Height of Panic	0.0042***	0.011***	0.027***
	(5.37)	(5.09)	(9.97)
Crisis	0.0019***	0.0049***	0.013***
	(4.02)	(4.65)	(5.44)
Stock Price	-0.000026***	-0.000034***	-0.000045***
	(-5.45)	(-3.12)	(-5.00)
Quasi Volatility	0.022**	0.093***	0.26***
	(2.39)	(4.65)	(4.80)
Constant	0.0050***	0.0076***	0.013***
	(9.29)	(6.99)	(8.92)
Observations	99,090	99,090	99,090
R-squared	0.049	0.042	0.035

Table 3: Funding Illiquidity and Market Illiquidity During the Panic of 1907

This table reports the results of quantile regression of relative bid-ask spreads on high call money rates and controls for volatility, share price, and panic indicator variables. The sample includes the panel of all traded NYSE stocks at daily frequency from January 3, 1905 to December 31, 1909, and the table reports results for the 1st, 2nd, and 3rd quartiles. Relative bid-ask spread is the difference between ask and bid prices divided by the average of ask and bid prices. Quasi-volatility is defined as the highest transaction price on a given day minus the lowest transaction price on that same day, divided by the last transaction price (note that we exclude observations for which quasi-volatility is zero). The "Height of Panic" indicator variable takes the value of one during the height of the 1907 Panic, namely from October 22, 1907, to November 9, 1907, and zero otherwise. "Crisis" denotes the remainder of the Panic of 1907, namely the period of September 30, 1907, to October 21, 1907, and November 10, 1907, to January 31, 1908. Variable evaluating the relevance of the Call Money Rate during the "Crisis" period is introduced as an interaction term called "High Call Rates * Crisis Period" . T-statistics the standard errors are computed allowing for intra-cluster correlation as in Parente and Santos Silva (2016); are robust under heteroskedasticity and are computed allowing for intra-cluster correlation and are reported in parentheses below the coefficient estimates. The symbols ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) Rel. Spread 1st Quartile	(2) Rel. Spread Median	(3) Rel. Spread 3rd Quartile
Height of Panic & Crisis	0.0016***	0.0043***	0.011***
	(2.95)	(3.98)	(4.78)
High Call Money Rates	-0.00015	-0.00094	-0.0016
	(-0.47)	(-1.13)	(-0.90)
High Call Rates * Crisis Period	0.0031***	0.0095***	0.028***
	(3.31)	(6.58)	(7.26)
Stock Price	-0.000026***	-0.000035***	-0.000047***
	(-5.47)	(-3.20)	(-5.03)
Quasi Volatility	0.021**	0.090***	0.25***
	(2.20)	(4.08)	(5.82)
Constant	0.0050***	0.0078***	0.013***
	(9.27)	(7.24)	(9.34)
Observations	85,068	85,068	85,068
R-squared	0.052	0.045	0.037

Table 4: Liquidity under Information Opaqueness: Connected, Unlisted, and Railroad Heterogeneity

VARIABLES	(1) Rel. Spread 1st quartile	(2) Rel. Spread Median	(3) Rel. Spread 3rd Quartile
Railroad	-0.0004***	-0.0010***	-0.0016***
	(-15050.44)	(-9993.99)	(-3282.55)
Height of Panic	0.0087***	0.0259***	0.0569***
	(71528.19)	(64901.94)	(25581.89)
Height × Railroad	-0.0050***	-0.0119***	-0.0298***
	(-46155.68)	(-30343.36)	(-14371.03)
Height × Connected	-0.0019***	-0.0108***	-0.0227***
	(-18587.82)	(-30739.64)	(-12821.74)
Connected	-0.0007***	-0.0026***	-0.0067***
	(-29591.27)	(-31513.79)	(-15222.20)
Height × Unlisted	-0.0026***	-0.0133***	-0.0173***
	(-14177.80)	(-19573.74)	(-5012.57)
Unlisted Firms	-0.0006***	-0.0016***	-0.0029***
	(-11580.33)	(-8072.32)	(-3031.63)
Sales	-3.67111e-05***	-5.91831e-05***	-6.72825e-05***
	(-200969.57)	(-41804.42)	(-6795.78)
Stock Price	-2.13689e-03***	-2.07173e-03***	-1.54175e-03***
	(-124420.69)	(-19852.29)	(-1816.79)
Quasi Volatility	0.0467***	0.1230***	0.2984***
	(62689.48)	(41136.61)	(15342.60)
Constant	0.0054***	0.0086***	0.0148***
	(171407.79)	(61488.40)	(16711.72)
Observations	99,090	99,090	99,090
R-squared	0.070	0.089	0.120

Notes: Dependent variable is relative spread. t-statistics in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. Dependent variable is the relative bid–ask spread (at the 1st quartile, median, and 3rd quartile). Standard errors are robust (clustered on firms).

Table 5: Asset Pricing with Liquidity Factor (Relative Spread)

This table reports the results from the second stage regression estimation of the two-stage estimation procedure described in Section 5.

VARIABLES	(1) Median	(2) Median	(3) Median	(4) Median	(5) Median
Excess Market Return	0.015***	0.015***	0.024***	0.024***	0.024***
	(3.42)	(3.89)	(3.49)	(3.36)	(2.27)
SMB	0.000062	0.00012	-0.00047*	-0.00056*	-0.00012
	(0.052)	(0.098)	(-1.68)	(-1.75)	(-0.35)
HML	0.0083*	0.0087**	0.0069***	0.0064***	0.0079***
	(1.90)	(2.01)	(3.96)	(3.28)	(5.93)
Spread			-0.00022		
			(-0.33)		
Amihud				-8.1e-08	
				(-1.56)	
Kyle's λ					1.76
					(0.057)
Constant	-0.0040	-0.0040	-0.013*	-0.013*	-0.013
	(-1.23)	(-1.48)	(-1.89)	(-1.78)	(-0.84)
Observations	190	190	190	190	190

8 Online Appendix

Table 6: Summary Statistics for Different Categories of Firms

Category	Variable	Obs	Mean	Std. dev	Min	Max
	Relative Bid-Ask Spread	47,502	0.010	0.020	0.000	1.076
	High Price	47,469	92.583	69.721	0.75	770
	Low Price	47,477	91.531	69.341	0.50	680
Connected Firms	Last Price	47,502	106.011	109.672	0.50	1360
	Quasi Volatility	47,450	0.015	0.029	0.000	3.529
	Relative Bid-Ask Spread	85,207	0.030	0.067	0.000	8.375
	High Price	85,177	61.281	50.725	0.17	670
	Low Price	85,168	60.557	50.378	0.17	670
Unconnected Firms	Last Price	85,207	62.029	51.040	0.17	760
	Quasi Volatility	85,140	0.016	0.050	0.000	9.251
	Relative Bid-Ask Spread	23,017	0.029	0.066	0.000	1.638
	High Price	23,007	58.296	48.210	1.5	302.75
	Low Price	23,008	57.364	47.565	1.5	298.5
Unlisted Firms	Last Price	23,017	58.137	47.634	1.5	299.5
	Quasi Volatility	22,999	0.019	0.026	0.000	1.447
	Relative Bid-Ask Spread	109,692	0.021	0.053	0.000	8.375
	High Price	109,639	75.459	61.945	0.17	770
	Low Price	109,637	74.640	61.594	0.17	680
Listed Firms	Last Price	109,692	81.892	84.830	0.17	1360
	Quasi Volatility	109,591	0.015	0.047	0.000	9.251

Variable	Comparison	K-S Statistic	p-value
Quasi Volatility	Unlisted vs Listed	0.112796	0.000
	Connected vs Unconnected	0.18214	0.000
High Price	Unlisted vs Listed	0.158183	0.000
	Connected vs Unconnected	0.23304	0.000
Low Price	Unlisted vs Listed	0.16095	0.000
	Connected vs Unconnected	0.232383	0.000
Last Price	Unlisted vs Listed	0.170034	0.000
	Connected vs Unconnected	0.240871	0.000
Relative Spread	Unlisted vs Listed	0.049581	0.000
	Connected vs Unconnected	0.315227	0.000

Table 7: Kolmogorov-Smirnov (KS) Tests Comparing Distributions

The results from the different Kolmogorov-Smirnov tests conducted suggest that the distributions of the variables vary substantially across unlisted vis-a-vis listed firms as well as connected vis-a-vis unconnected firms. The difference appears greater for connected and unconnected firms than for unlisted and listed firms.

Table A1: Correlation Matrix — Connected Firms

	Relative Bid-Ask Spread	High Price	Low Price	Last Price	Quasi Volatility
Relative Bid-Ask Spread	1.000	-0.073	-0.072	0.023	0.079
High Price	-0.073	1.000	0.999	0.900	-0.189
Low Price	-0.072	0.999	1.000	0.900	-0.227
Last Price	0.023	0.900	0.900	1.000	-0.182
Quasi Volatility	0.079	-0.189	-0.227	-0.182	1.000

Table A2: Correlation Matrix — Listed Firms

	Relative Bid-Ask Spread	High Price	Low Price	Last Price	Quasi Volatility
Relative Bid-Ask Spread	1.000	-0.171	-0.170	-0.112	0.013
High Price	-0.171	1.000	0.999	0.912	-0.090
Low Price	-0.170	0.999	1.000	0.912	-0.127
Last Price	-0.112	0.912	0.912	1.000	-0.101
Quasi Volatility	0.013	-0.090	-0.127	-0.101	1.000

Table A3: Correlation Matrix — Non-Railroad Firms

	Relative Bid-Ask Spread	High Price	Low Price	Last Price	Quasi Volatility
Relative Bid-Ask Spread	1.000	-0.206	-0.204	-0.173	0.005
High Price	-0.206	1.000	0.998	0.963	-0.061
Low Price	-0.204	0.998	1.000	0.964	-0.107
Last Price	-0.173	0.963	0.964	1.000	-0.097
Quasi Volatility	0.005	-0.061	-0.107	-0.097	1.000

Table A4: Correlation Matrix — Railroad Firms

	Relative Bid-Ask Spread	High Price	Low Price	Last Price	Quasi Volatility
Relative Bid-Ask Spread	1.000	-0.166	-0.164	-0.095	0.013
High Price	-0.166	1.000	0.999	0.908	-0.151
Low Price	-0.164	0.999	1.000	0.908	-0.175
Last Price	-0.095	0.908	0.908	1.000	-0.136
Quasi Volatility	0.013	-0.151	-0.175	-0.136	1.000

Table A5: Correlation Matrix — Unconnected Firms

	Relative Bid-Ask Spread	High Price	Low Price	Last Price	Quasi Volatility
Relative Bid-Ask Spread	1.000	-0.212	-0.211	-0.184	0.002
High Price	-0.212	1.000	0.999	0.986	-0.067
Low Price	-0.211	0.999	1.000	0.986	-0.107
Last Price	-0.184	0.986	0.986	1.000	-0.096
Quasi Volatility	0.002	-0.067	-0.107	-0.096	1.000

Table A6: Correlation Matrix — Unlisted Firms

	Relative Bid-Ask Spread	High Price	Low Price	Last Price	Quasi Volatility
Relative Bid-Ask Spread	1.000	-0.282	-0.281	-0.262	-0.031
High Price	-0.282	1.000	1.000	0.999	-0.103
Low Price	-0.281	1.000	1.000	0.999	-0.122
Last Price	-0.262	0.999	0.999	1.000	-0.116
Quasi Volatility	-0.031	-0.103	-0.122	-0.116	1.000

Table A7: Correlation Matrix — Three Dummies

	Connected	Unlisted	Railroad
Connected	1.000	-0.179	0.252
Unlisted	-0.179	1.000	-0.372
Railroad	0.252	-0.372	1.000

Table A8: Variance–Covariance — Three Dummies

	Connected	Unlisted	Railroad
Connected	0.230	-0.032	0.060
Unlisted	-0.032	0.143	-0.070
Railroad	0.060	-0.070	0.247

Table A9: Multicollinearity diagnostics (VIF and Tolerance)

	Variable	VIF	Tolerance
0	Height of the Panic	3.169	0.316
1	Height of the Panic × Railroad	2.322	0.431
2	Last	2.134	0.469
3	Rail Road	1.917	0.522
4	Height of the Panic × Connected	1.889	0.529
5	Connected	1.885	0.530
6	Height of the Panic × Unlisted	1.530	0.653
7	Sales	1.222	0.818
8	Unlisted	1.154	0.867
9	Quasi Volatility	1.137	0.880

Condition number (Belsley): 3.44. Heuristics: VIF $>$ 10 or condition number $>$ 30 can indicate problematic collinearity.

Table A10: Specification tests: Ramsey RESET

	Test	Statistic	df1	df2	p-value	N	Clusters
0	RESET F (OLS, built-in)	890.583	1	99078	0.000	99090	274
1	RESET Wald χ^2 (cluster-robust)	21.889	2		0.000	99090	274

Built-in RESET reports an F test using conventional errors. The cluster-robust RESET augments the model with $\hat{y}^2$ and $\hat{y}^3$ and reports a Wald test on those terms.

Table A11: Nonlinearity (quadratic) enrichment test

	Added terms	Statistic	df	p-value	N	Clusters
0	Sales^2, Last^2, Quasi Volatility^2	53.446	3	0.000	99090	274

Joint Wald test of all added quadratic terms equals zero (cluster-robust covariance).

Table A12: Robustness for Liquidity under Information Opaqueness: Connected, Unlisted, and Railroad Heterogeneity

		(1) 1st quartile	(2) Median	(3) 3rd quartile
Panel A: Connected	Height of the Panic	0.0069***	0.018***	0.041***
		(3.91)	(3.69)	(5.48)
	Connected	-0.00081*	-0.0025**	-0.0067***
		(-1.81)	(-2.34)	(-3.24)
	Height of the Panic × Connected	-0.0041**	-0.012**	-0.027***
		(-2.13)	(-2.21)	(-3.14)
	Stock Price	-0.000026***	-0.000030***	-0.000027***
		(-5.75)	(-2.66)	(-3.00)
	Quasi Volatility	0.028***	0.10***	0.28***
		(2.73)	(4.38)	(7.42)
	Constant	0.0053***	0.0083***	0.014***
		(9.98)	(8.40)	(9.50)
	Observations	99,090	99,090	99,090
	R-squared	0.050	0.044	0.035
Panel B: Unlisted	Height of Panic	0.0040***	0.0099***	0.025***
		(3.71)	(7.36)	(7.10)
	Unlisted Firms	-0.00024	-0.00069	-0.00039
		(-0.49)	(-0.53)	(-0.19)
	Height of Panic × Unlisted	0.0028*	0.0027	0.015*
		(1.80)	(0.62)	(1.79)
	Stock Price	-0.000026***	-0.000035***	-0.000047***
		(-5.54)	(-3.01)	(-5.19)
	Quasi Volatility	0.025***	0.098***	0.28***
		(4.48)	(3.86)	(7.77)
	Constant	0.0050***	0.0078***	0.013***
		(9.50)	(6.62)	(9.19)
	Observations	99,090	99,090	99,090
	R-squared	0.043	0.035	0.029
Panel C: Railroad Heterogeneity	Railroad	-0.00022	-0.00082	-0.0021
		(-0.64)	(-0.85)	(-0.95)
	Height of Panic	0.0082***	0.018***	0.043***
		(5.85)	(4.93)	(3.28)
	Height of Panic × Railroad	-0.0057***	-0.013***	-0.027*
		(-3.56)	(-3.49)	(-1.87)
	Stock Price	-0.000026***	-0.000033***	-0.000042***
		(-5.32)	(-2.92)	(-3.17)
	Quasi Volatility	0.024**	0.098***	0.28***
		(2.29)	(4.02)	(7.47)
	Constant	0.0051***	0.0079***	0.013***
		(8.61)	(7.10)	(9.42)
	Observations	99,090	99,090	99,090
	R-squared	0.045	0.038	0.030

Notes: Dependent variable is relative spread. t-statistics in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. Dependent variable is the relative bid–ask spread (at the 1st quartile, median, and 3rd quartile). Standard errors are robust (clustered on firms).

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