

An Overlooked Central Bank Rescue:

How the Bank of France Ended the American Financial Crisis of 1907

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ABSTRACT

Recent American and European financial crises prompt the questions: under what conditions do crises end, when does a rescue plan crystallize, and how does a rescue happen? We examine a successful rescue operation in the worst pre-Federal Reserve financial crisis, the Panic of 1907, with these questions in mind. Received tradition ascribes the resolution of the crisis to a series of efforts to expand domestic liquidity, coordinated by J. Pierpont Morgan. In this study, however, we find it was a direct intervention by the French in American money markets that ultimately relieved the stringency by providing a new source of international liquidity. We challenge the notion that Morgan saved the American markets by devising a series of ad hoc domestic liquidity measures during the crisis. While Morgan's actions may have averted a settlement crisis on the floor of the New York Stock Exchange and provided temporary relief for equity prices, we find that it was the announcement by the Bank of France to accelerate its gold payments directly for American crops that ultimately reversed the downtrend in equity prices.

We find evidence that signs of spillover to the French banking and financial systems accompanied the French decision to rescue the United States. Furthermore, discussions among French bank regents reveal how the rescue operation met their competing mandates to provide liquidity while not forsaking rigorous credit quality standards for assets the Bank purchased in exchange for its liquidity provision. Implications are that rescues occur when a surplus-reserve central bank experiences signs of domestic stress, that central banks cooperate when their self-interests are served, and that a collateralized rescue operation can provide systemic liquidity and still maintain central bank portfolio quality.

KEY WORDS: Financial crisis, rescue, bailout, spill over, international linkages, Panic of 1907, Bank of France, gold points, J. Pierpont Morgan, central bank cooperation, bills of exchange

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1. Introduction

Recent American and European financial crises prompt the questions: under what conditions do crises end, when does a rescue plan crystallize, and how does a rescue happen? We examine a successful rescue¹ operation in the worst American pre-Federal Reserve financial crisis, the Panic of 1907, with these questions in mind. Received tradition ascribes the resolution of the crisis to a series of efforts to expand domestic liquidity. In this study, however, we find it was a direct intervention by the French in the American money market that ultimately relieved the crisis by providing an ongoing, exogenous source of international liquidity to the American system.

We test the American equity market response to information flows about both domestic and foreign monetary events. Equity prices are selected as indicators of which event is associated with an end to the crisis because as long as equity prices were declining, threats of loan default in the American banking system were still growing since equities collateralized loans at banks. Indeed, in the period leading up to the 1907 crisis, about half of all bank loans in the US were secured by stocks in the call loan market (Bordo, Rappoport, Schwartz, 1992). During the 1907 crisis, Sprague notes the sensitivity of the New York Clearing House banks to

¹ Adopting the perspective of Bordo and Schwartz (1999), the Panic of 1907 can be understood as a pre-Bretton Woods liquidity crisis, not a solvency crisis typifying the post-Bretton Woods experience. In this crisis, the shock was the insolvency of a financial institution, the Heinze brokerage house, brought on by an unsuccessful, highly-leveraged transaction that erupted into a banking or trust company panic. The run on trust companies sparked an internal drain of reserves and precipitated a suspension of convertibility of bank deposits into specie. The premium on currency, which emerged in American markets after suspension, as was custom after previous suspension episodes in 1873 and 1893 (Wickus, 1990), disrupted the foreign exchange markets, threatening a full-blown global currency crisis. Following Bordo and Schwartz, we define a rescue plan as an action taken to relieve a liquidity crisis before a currency devaluation is necessary to address a capital account deficit. Contrastingly, a bailout plan is put into place to repay lenders post-devaluation after a loan defaults. Since the action devised by the Bank of France was associated with the demise of the disruptive gold premium, preserving the fixed exchange rate of the gold standard, the action is defined as a rescue, not a bailout.

call loans by noting that 85% of the \$63 million loan increase among those banks were call loans or time loans with collateral originated on the stock exchange.² Falling equity prices could spread bankruptcy (Kindleberger, 1993). Threats to the banking system would finally abate when equity prices started to rise. Additional indicators of banking and financial stress are examined as well.

We challenge the notion that J.P. Morgan saved the American markets by coordinating a series of ad hoc domestic measures during the crisis to relieve strained liquidity conditions. Morgan's actions may have averted a settlement crisis on the floor of the New York Stock Exchange and provided temporary relief for equity prices. However, we find that it was the announcement by the Bank of France to accelerate its gold payments directly for American crops, a truncation of the typical "bill-of-exchange" process of trade settlement, that ultimately reversed the downward trend in equity prices. We find evidence that signs of spill over to the French banking and financial systems accompanied the French decision to rescue the United States. Furthermore, an analysis of the discussion among the Regents of the Bank of France reveals how the rescue operation met their dual charge to support domestic business while not forsaking the credit quality of the Bank's asset portfolio. We conclude that domestic measures to increase liquidity could not permanently increase the reserves of domestic banks, nor could they reverse falling equity prices. It took commodity exports with offsetting capital account inflows, specifically shipping American cotton in return for French gold, to provide the exogenous source of liquidity to the system that ultimately improved investors' expectations and rallied stock prices. Implications from our study may be that rescues occur when a surplus-reserve central bank, in this case France, experiences signs of domestic stress from a foreign crisis, that central

² O. M. W. Sprague, 1910, p. 301.

banks cooperate across borders when their self-interest is served, and that a collateralized rescue operation can be selected to provide systemic liquidity relief and still maintain rigorous systemic credit quality. Further implications are that crises end when trade imbalances reverse.

We define monetary news as an announcement in the press about central bank policy, gold flows, or other measures of liquidity provision that market agents might understand as factors impacting general liquidity conditions. After a comprehensive reading of the daily *New York Times* and other business journals and newspapers, we identify dates of announcements regarding monetary phenomena that should have significant information content. Then we identify windows of return measurement around those dates. Assigning dummy variables to the event windows allows me to measure the sensitivity of the market return to a particular announcement. We expect to find that the market's return was most dependent on the announcements that prompted the most significant reassessments of equity returns. Importantly, allowances in the window construction are made for lead and lag effects. Windows of at least two days are defined as noted below. Window overlap is avoided. In Events One and Seven, news stories only gradually released details about the event. In those cases, longer windows are constructed to accommodate longer lag effects.

1. Bank of France opens facility to pay interest on gold payments during trans-Atlantic shipping time in order to drain gold from United States to replenish French reserve. Announcements repeat from July 24 to July 31.
2. Bank of England raises its discount rate to defend its gold reserve from export. August 15, October 28, November 1, November 4, November 7. The November 7 announcement coincides with the announcement that the Bank of France purchased up to 80 million francs in sterling bills and forwarded 80 million francs in gold eagles to London.
3. Crash of United Copper Company stock and trust company runs. October 17- October 23.
4. Formation of Money Pool by J. P. Morgan & Co. October 24 and 25.

5. Issuance of Clearing House Loans and Suspension of Deposit Convertibility by Banks. October 29 and 30.
6. Issuance of Treasury certificates and Panama Canal Bonds. November 19 and 20.
7. Bank of France operation to discount American commercial paper for gold Eagles held in Bank of France reserve. Announcements repeats from November 22 to December 7.

Many of the domestic events from the Panic of 1907 have been thoroughly documented by several researchers, but the international events, less so. In the next sections, we discuss the significance of each of the events, spending more time on the international events than on the domestic events.

The next several sections provide background to understand the significance of the events under consideration followed by a section that discusses the data set, model, and results. Conclusions and implications are presented in the last section.

2. Announcements by International Banks to Defend their Reserves: Events One and Two

France and England were actively seeking gold from the United States in 1907 to shore up their central bank reserves. The French action of July 1907, is examined as Event One in this study and the English actions are Event Two. Each event should have alerted investors of increasing risks of constrained liquidity and higher interest rates. Consequently, investors should have revised their expectations for corporate profits downward and sold equities. We provide a detailed context here about these two events, first, the facility opened by the Bank of France to draw gold from the U.S. in July of 1907 and second, the decisions taken by the Bank of England to draw gold from all markets by raising its bank rate.

To understand how market participants might have attached meaning to the actions of the Bank of France, we pursue a detailed review of newspapers and private archives following the

methodology of other financial historians (Ferguson, 2006). First, of all the central European banks, market participants knew that the Bank of France had the largest gold reserves. Newspapers informed them,

FRANCE A GOLD MINE: ENORMOUS HOLDINGS IN HER INSTITUTIONS: France still has more of the precious metal than she knows what to do with. This reserve showed a constant increase last year. The Bank of France held in running accounts \$541,000,000 at the end of August 1907; its reserve was 561,000,000. This means that France alone holds about a third of all the coined money in the world.³

Indeed, the National Monetary Commission reported there was on average \$520,900,000 in French gold reserves compared to only \$165,600,000 in English gold reserves in 1907.⁴ The Commission also reported that the proportion of specie to liabilities on deposits and notes in circulation for the five major banks of Europe was France, 75.3%; Holland, 58%; England, 38.4%; Germany, 37.1%; and Belgium, 17.4% during the weeks of the crisis.⁵

Market contemporaries knew that while the Bank of France's charter authorized five policy instruments to maintain its gold reserve, among them the discretion to set the discount rate, that rate was almost rigid,⁶ rarely used as a tool to manage the reserve.⁷

The Daily Mail argues against England being a free gold center, and calls for the adoption of some such system as prevails in France where the state bank authorities have power to *protect the gold reserves without resorting to fluctuations of the discount rate which disturbs trade*. It was unfair that because confidence has been destroyed in the US that English business has to pay the penalty from a high bank discount rate.⁸

³ *Washington Post*, Nov 17, 1907, p. 15.

⁴ Statistics, NMC, 1910, p. 282.

⁵ *The English Banking System*, NMC, 1910.

⁶ The tradition of maintaining a steady bank rate can be traced back to the vision of the Bank's founder, Napoleon Bonaparte. Politically perceiving the role of the Bank to be a source of reliable, low-cost credit to French banks to maintain commerce, he wrote the French Minister of Finance, M. Mollien on May 15, 1810, "You should tell the governor of the Bank and the regents that they should write in letters of gold in their board room these words, "What is the Object of the Bank of France: To Discount the Credits of all Commercial Concerns in France at Four Per Cent" (Bopp 1952, p. 229).

⁷ See Bopp (1952, pp. 229-244 for a comprehensive summary of the monetary policy tools of the Bank of France.

⁸ *Los Angeles Times*, November 8, 1907, p. 1

When the Bank did elect to use the discount rate tool to defend its reserve, market participants knew that increases were small, in an effort to maintain an accommodative business climate in France.⁹ Furthermore, retaliatory rate increases in which European central banks each sought to defend their respective gold reserves, were perceived to be harmful.¹⁰

With its relatively thin veneer of gold to back its deposits compared to the Bank of France, the Bank of England primarily relied on the Bank Rate as its tool of monetary policy to attract reserves from abroad. Of the central banking powers--England, France, and Germany--England's bank rate was the most volatile. Indeed the degree to which Bank Rate volatility was sanctioned in England almost set them apart as the odd man out of contemporary central bank practices.

[Insert Table 1 here]

London credit markets began to feel stress long before the American Panic began in October 1907. Table 1 portrays the net gold movements in the United Kingdom for the period from 1903 through 1910. Despite receiving more gold from her gold producing colonies in both 1906 and 1907 compared to 1905, London still found it necessary to draw gold in from the European continent to supply the unusual demands for gold from the U.S. in 1906 and from Egypt and India in 1906 and 1907. The American demand for London gold to satisfy claims on British insurance companies arising from the San Francisco earthquake in 1906 is thoroughly

⁹ Awareness of the Bank's primary concern for French commerce is documented in the press. "If the Bank of France were forced to raise its own rates in self-defense, money would grow dear at home and French commerce and industry would suffer" (Stoddard 1908, p. 232). Additionally, from the November 29, 1907 issue of the European edition of the *Economist*: "One cannot forget, after all, that the central function of the Bank de France is to come to the aid of French commerce; it can only logically extend its actions to foreign markets in which case it is clearly demonstrated that its intervention contributes to the protection of our national interests" [translation by author].

¹⁰ Flandreau cites the practice of retaliatory discount rate increases to protect gold reserves at least as far back as 1873 when England increased her rate to 10% to thwart the drain of gold to Germany as Germany attempted to adopt the gold standard and sell her Thalens by raising her rate to attract gold. That episode ended by using policy tools other than the discount rate to equilibrate the quantities of reserve metals held by competing central banks (Flandreau 1996, p. 887).

documented by Odell and Weidenmier (2004). However, the unusual Egyptian and Indian demands upon London for gold in 1906 and 1907 are less well understood phenomena.

In Egypt, the movement of two larger than normal cotton crops, the construction of large port and rail projects, and an associated boom in land and stock prices were factors which may have drained the £13,600,000 gold from London to Alexandria beginning in 1906.¹¹ Following the burst in the Egyptian real estate bubble, the failure of a prominent mortgage lending bank prompted a liquidity infusion from London.¹² The Bank of England enlisted the aid of the Bank of France for this purpose.¹³ In India, the failure of the 1906-1907 monsoon rains caused the failure of two major export crops, wheat and rice (Keynes 1909). With its seasonal sources of gold inflows thus interrupted, the Council of India drew down its reserves and then sought credit in the London money markets by selling Council bills to shore up its shrunken reserve. Not until the harvest began in November of 1907 and grain exports began to earn gold for India, did the Council's borrowings in London end. The shortage of gold in India, while significant enough to warrant intervention by the Council, did not rise to the same level as that of Egypt. No banking crisis erupted in India as had in Egypt.

The Bank of England had actually begun taking measures as early as the fall of 1906 to defend its gold reserves, including raising its discount rate, borrowing directly from the Bank of France, and, while not a formal policy tool of the British, calling of American finance bills.

¹¹ Onyeiwu, 2000

¹² Muhleman, 1907

¹³ "The failure of a financial institution in Alexandria led to prompt negotiations in London for shipments of gold to Egypt and the outgo may well be heavy owing to the admittedly precarious condition of Egypt's financial affairs. If the unsettled Russian situation leads Paris to continue its withdrawals of gold from this city (New York) the combined drain will undoubtedly have its effect upon the local money market. The whole foreign position at the moment is such as to make caution a virtue." *New York Times*, July 24, 1907.

Indeed, Sprague (1910) cites the unwillingness of the British to roll over American finance bills as one of the most important contributory factors to the American crisis.

While the Bank of England was thus primarily occupied with supporting the trade of her colonies, India and Egypt, France was primarily preoccupied with maintaining a good domestic business climate. The Bank of France had experienced a significant reduction in its gold reserve from January through June 1907, partly to alleviate the Bank of England's efforts to support Egypt. The Bank of France was also planning to make a loan to the Imperial Bank of Russia for capital expenditures to modernize its agricultural infrastructure to facilitate the export of wheat to France and other parts of Europe. Additionally, the French Rothschild's were structuring a loan to Brazil to support the coffee trade and needed the Bank of France to amass the gold that would be required for that transaction.¹⁴ Accordingly, in July the Bank began to restore its depleted gold reserve.

Rather than raising its bank rate to attract gold, the French implemented a strategy to draw gold inflows from America to France by initiating a special facility on July 24 of paying interest on gold in transit from America, a cost normally absorbed by bullion merchants.¹⁵ The largest gold outflow from the U.S. in three years happened in July 1907. It matched the year's largest monthly gold inflow to France.

¹⁴ *Commercial and Financial Chronicle*, July 23, 1907, p. 1365.

¹⁵ Wall Street has been attempting for some time to discover the reasons for the heavy withdrawals of gold from this market by the Bank of France. The smaller cash holding of the Bank of France as compared with a year ago and the unsettled position of affairs in Russia have been advanced in turn to explain *the offer of interest on gold in transit by the great French bank*. It was learned indirectly from Paris sources yesterday that a \$50,000,000 loan was made by the Bank of France to Russia to provide money for both agricultural and industrial enterprises in the Russian interior mainly through the agency of the land banks. *New York Times*, July 24, 1907, p. 9.

For purposes of this study, market participants read stories in the *New York Times* from July 24 through July 31, which reported how the Bank of France was attempting to restore its reserves by drawing gold from the United States. On August 15, October 28, and November 1, 4, and 7, market participants also read announcements in the *New York Times* about increases in the London bank rate that were meant to protect the British gold reserves. Because they were aware of how the two largest central banks worked, investors should have been sensitive to the meaning of those actions taken by foreign central banks and incorporated the information in their valuation of securities prices.

3. Announcements of Domestic Measures to Increase Liquidity: Events Three through Six

In one important way, the 1907 episode parallels the recent American and European financial crises. Declining asset prices eventually reveal which financial institutions are over-leveraged. Bear Stearns and Lehman Brothers were too leveraged to mortgage collateral to survive price declines in that asset class in 2008; European banks may have been too leveraged to Greek sovereign debt in 2011. In 1907, the Heinze brokerage and its related trust affiliates were too leveraged to United Copper shares to survive the price decline in that collateral.¹⁶ The crash of United Copper stock and the ensuing runs on the trust companies, Event Three in our study, are the hallmark events studied by numerous previous scholars of the Panic, including Sprague (1910), Friedman and Schwartz (1963), Moen and Tallman (1990), and Wicker (2000). We consider the runs on the trust companies as a domestic monetary event since such runs represented a significant withdrawal of liquidity from the banking system. Bruner and Carr (2007) provide the most comprehensive rendering of the intricacies of the crash in the stock of

¹⁶ Indeed, Calomiris (1991) summarizes the Tallman and Moen (1990) study by saying those researchers explain the 1907 crisis as the discovery by investors of the overexposure of a subset of financial intermediaries, the trust companies, to collateral assets which had severely declined in value.

United Copper Company, its relationship to the Knickerbocker Trust company, and the subsequent depositor runs on the Knickerbocker Trust Company, the Trust Company of America, and Lincoln Trust Company.

We contribute only one additional perspective about the runs on trust companies. Repetitive stories about the conflicts of interest inherent in interlocking board directorates from the coverage of the Armstrong investigation in 1905 and 1906 were fresh in the minds of 1907 investors. The hearings, named after New York Senator William Armstrong, uncovered for the first time the linkages between the largest three life insurers and the investment banking community. Hearing in October 1907 that directors of the Heinze/Morse were linked to the Knickerbocker Trust Company would send a clear signal to investors that deposits at the trust companies had likely been used in the Heinze Morse schemes. Market participants were exposed to news stories from October 17 to October 23 about the runs; those dates mark the boundaries of our Event Three. The announcements should have heightened uncertainty about the reliability of the banking system. Faced with such announcements, it would be logical for market agents to incorporate increasing uncertainty into their evaluation of equity prices.

The formation of the so-called Morgan money pools on October 24 and 25, is the next domestic liquidity action, around which we construct our Event Four window. This is the marquee event of the crisis, from which springs the received tradition of attributing the resolution of the crisis to J. Pierpont Morgan. Apparently frustrated with the lack of will at the Clearing House Association to form a collective response to the liquidity crisis by issuing clearing house notes, Morgan convened twenty of the fifty eight Clearing House Association member banks, and convinced them to take coordinated action to lend a “pool” of money to floor brokers at the New York Stock Exchange. This access to credit temporarily alleviated a

settlement crisis on the floor of the New York Stock Exchange when bank loans to brokers were called, permitting the Exchange to avoid a threatened closure. An archival examination of Morgan's transactions, profits, risk management and conversations with government leaders about expediting crop shipments to Europe during the crisis awaits further research.

The Event Five window is constructed around the announcement by the New York Clearing House Association on October 28 to issue Clearing House loan certificates to member banks. New York banks began to experience differential levels of difficulty in meeting customer withdrawal requests. Banks whose customer base was concentrated in trust companies and interior correspondent banks had the most trouble for those were the two primary sources of withdrawing intermediaries. For example, the reserves at the First National Bank had dropped below the 25% minimum to 22.5% in the week ending October 26 because it had more trust company deposits and more correspondent banks in the West and the South than other New York City banks. The decision of the New York Clearing House Association to issue clearing house loan certificates to its members was the way in which imbalances of interbank balances would be settled. Sprague explains the instrument: "The issues of loan certificates for payments between the banks did not represent any addition to the circulating medium. They simply obviated the customary shifting of money between the banks in the settlement of daily balances, with the result that the money held by the banks remained just where it was at the time they were authorized."¹⁷ With the issuance of clearing house loan certificates on October 28, the First National could settle its obligations to other member banks with the loan certificates, rather than

¹⁷ O. M. W. Sprague, National Monetary Commission, p. 315.

settling with reserves. “During the last five days of October 84% of clearinghouse balances were settled in certificates and in November, 96% were settled this way.”¹⁸

The decision to issue clearing house loan certificates was accompanied by the decision to suspend the convertibility of bank deposits into coin or gold. The purpose of the decision to suspend payment was to defend the reserves of the banking system. The restriction in New York inevitably precipitated more or less complete suspension throughout the entire country. Sprague describes the determination of the banks to maintain their 25% reserve requirement even though suspension of cash, coin, and gold withdrawals was the cost of doing so: “Without exaggeration, this arithmetical ratio of reserve can only be adequately characterized as a sort of fetish to which every maxim of sound banking policy is blindly sacrificed.”¹⁹ Accompanying the announcement of clearing house note issuance was the announcement to suspend the convertibility of bank deposits into gold and currency. As had been the case in the crises of 1873 and again in 1893, a premium on gold then appeared in the market. Acknowledging the thorough research previously done on this event by Sprague (1910), Friedman and Schwartz (1963), Moen and Tallman (1990) and Wicker (2000), this study simply notes the pivotal announcement date of Sunday, October 28 as a point about which market participants might have altered their expectations of securities prices.

The announcement by Treasury Secretary Cortelyou on Sunday, November 18 of the Panama Canal bond issuance marks our Event Six. The announcement represents yet another domestic attempt to expand liquidity to meet the needs of the banking system. Some scholars point to it as the event that ended the Panic of 1907. (Carosso, 1970; Burner & Carr, 2007) In an effort to expand the collateral against which banks could issue their bank notes, Cortelyou

¹⁸ Ibid., p. 272.

¹⁹ Sprague, National Monetary Commission, 1910, p. 280.

approved the issuance of \$150,000,000 in Panama Canal bonds and U.S. Treasury certificates. The bonds were issued even though the federal government did not really have a pressing need for funds, the cause for much criticism of Cortelyou in months to come. At first, on Monday, November 19, the market responded favorably to the news with equity prices rallying. However, it soon became clear to bankers that the bonds would have to be purchased with gold or reserves, albeit on accommodative terms. In post-1913 Federal Reserve Open Market Committee parlance, this transaction resembled a contractionary open market sale of federal securities, a drain of high-powered reserves from the banking system. Initial optimism faded and investors quickly became pessimistic again when the confusion over the net effect of the bond issuance set in. Indeed, the issue went significantly undersubscribed with only about 30% of the issues purchased,²⁰ as banks were apparently were loath to part with their gold and other reserves.

4. The Announcement by the Bank of France to Release Gold Eagles directly to New York: Event Seven

The announcement by the Bank of France on November 22, carried in the November 23rd *New York Times*, to release American gold eagle coins for discounted French commercial paper drawn against American imports informed market participants of a new foreign source of gold to the banking system. Rather than her November 6th gesture to only temporarily loan gold to the Bank of England, France now indicated a willingness to open her vaults to outright purchases of gold. French merchants, vouched for by their banks, would remit the gold eagles to the U.S. against their purchases of American imports.²¹ Event Seven of our study is constructed around this announcement. It extends from November 22 to December 7, the first and last dates

²⁰ Ibid., p. 316.

²¹ How the American eagle coins came to be stored in the cellars of the Banque of France is an interesting question. Readings of the J. P. Morgan & Co. Syndicate Books reveal that as part of Morgan's role in the transaction in which the United States purchased the Panama Canal Zone from the French in 1902, Pierpont personally accompanied a gold shipment worth \$18,000,000 to France. Whether those were gold eagles awaits further research.

on which details about the transaction appear in the *New York Times*. Since little has been published in the literature about this event, considerable detail is presented here.

The *New York Times* (November 23, 1907) headlines shouted, “Paris Sends Gold to American Bank,” followed by the opening line, “The Bank of France today took action with a view to relief for American banks and the prevention of a further advance of the Bank of England rate. Lazard Frères of New York were able to obtain \$500,000 in American eagles at the Bank of France today upon commercial paper with a French acceptance.” (See the Appendix to this study for excerpts from numerous other newspapers for how the announcement was reported.) The announcement was first carried in the November 22 issue of the Parisian newspaper *Le Temps*.

The various reports which have been current during the last few days on the subject of the intervention of the bank of France in the American money crisis today found their answer in a simple commercial discount operation carried out in accordance with the provisions of the bank’s charter. The Bank of France is in fact prepared to discount small successive parcels of commercial securities, signed by French firms of the highest repute for the purchase at a premium of American eagles, which do not circulate in France. This operation was effected in order to keep down the rate of exchange in London and consequently to prevent the drainage of the gold in circulation. This operation will also contribute, by preventing the increase of bills in circulation, to keeping the discount rate within comparatively reasonable limits in the interest of French commerce. All the numerous other arrangements proposed to the bank had no chance of success as they did not come within the provisions of the charter.²²

Newspaper accounts beg the scholarly questions: why France, why November 22 and why such terms? In answer to these three questions, we find first that France may have begun to register early signs of stress in her financial markets. Second, French bankers proffered an idea to the Regents of the Bank of France on November 21 to alleviate the crisis, eliciting the

²²Reported verbatim from *Le Temps* in quotations in the *Times* of London on Nov 23, 1907, p. 10. The *Manchester Guardian* printed the story verbatim from *Le Temps* as well on Nov 23, 1907, p. 9.

Regents' response on the next day. Third, the terms of the French transaction addressed the primary concerns of the Regents, an alarming deterioration in foreign exchange rates and another potential round of retaliatory bank rate increases. We elaborate these findings below.

If not spilling over to the French banking system and financial system, the American crisis was certainly seeping into France. Three indicators of liquidity stress in the French banking and financial systems attended the emergence of the American premium on gold. The franc sterling exchange rate began to deteriorate, the spread between British and French central bank discount rates widened, and interestingly, the spread between the stock prices of the Bank of France and French commercial bank stocks widened. Concerns about two of these indicators, the exchange rate and the discount rate spread, are explicitly addressed in the Bank's November 22 announcement.

The American premium on gold was bound to influence the foreign exchange market. Margaret Myers, in her 1931 seminal work on the New York Money Market describes how New York banks met withdrawal requests by interior correspondent banks by the purchase of gold in New York and the charging of the premium to the account of the drawee bank.²³ New York banks were afraid to pay out cash to the interior banks. As depicted in Figure 1, the shortage of currency was reflected in the premium of up to four percentage points on gold from October 31 to November 25.

[Insert Figure 1 here]

The premium on gold made it profitable for banks and others to import gold to the U.S. from Europe even when the currency exchange rate was at the point that normally prompted gold

²³ Myers, Margaret G., *The New York Money Market*, Columbia University Press, New York, 1931, p. 418.

to be exported from the U.S. to Europe.²⁴ The dollar was being oversold to buy pounds in order to pay for gold purchased in London. Sterling was being bid higher. Importantly, with sterling high, the franc/sterling rate was approaching the French gold export point in late November (see Figure 2). It was becoming cheaper to ship gold to London to settle French purchases of English goods than it was to sell francs and buy expensive sterling bills, the more typical mode of trade settlement. If that trend continued, gold would reach the export point in France. Even though France did not have a “free gold” market with large quantities available for export, further depreciation of the franc/sterling rate would have prompted the export of at least the quantity of gold in French circulation to England.²⁵

[Insert Figure 2 here]

Secondly, the spread between short-term English and French bank rates, standing at its widest point after November 7, as portrayed in Figure 3, likely contributed to the depreciating French currency. To protect their dangerously low reserves the English had increased their bank rate three times since the American premium on gold emerged, reaching 7% on November 7. Raising the discount rate attracted gold because with expensive sterling, investors would be incited to ship gold to London, rather than buying expensive sterling bills, to take advantage of a high bank rate. However, after briefly rebounding following the increase to 7%, reserves at the Bank of England resumed their decline during the week of November 21st (see Figure 4). Further rate increases would be expected in the face of declining reserves. France could be expected to resist further rate increases after already reluctantly raising its own bank rate to 4%

²⁴ For two discussions on the mechanics of the impact of the gold premium, see Sprague, p. 283, and Friedman and Schwartz, p. 162. Even if faced with paying \$4.90 for sterling to use in settlement of a gold purchase in London, about a one percent premium over parity, as long as the gold commanded a 3 percent to 4 percent premium if sold in New York, the American purchase of expensive sterling rendered a profitable trade.

²⁵ *The Economist* quotes weekly prices of gold at the London wharf as well as quantities sold, but only quotes prices in Paris as “nominal,” with no quantity quoted.

on November 7th. Thus, the Regents of the Bank of France identified both the discount rate and the foreign exchange rate as causes of concern.

[Insert Figure 3 here]

[Insert Figure 4 here]

Albeit not specifically mentioned by the regents, another variable familiar to market agents also reveals creeping systemic stress in France. Confidence in French national banks may have begun to deteriorate in the aftermath of the run on American trust companies. Mistrust of the French banks by French citizens had emerged in the wake of three domestic banking failures in 1882, 1889 and 1891. In 1882, the “terrible crash of the Union Generale was so powerful that the French market as a whole was considerably influenced by the disaster. The financial institutions, heavily engaged with the Union had serious fears for their own credit. But the Bank of France came to the rescue of the compromised institutions by rediscounting a part of their commercial paper. It contributed greatly to the restoration of confidence.” (Patron, 1909) In April 1889, the Comptoir d’Escompte’s “calamity nearly compromised the conditions of the banks of deposit which were engaged with the Comptoir. A heavy speculation in the copper market gave way, producing serious losses. The Bank placed at the disposal of the Comptoir a sum of 140 million francs thus permitting the repayment of all its deposits and a liquidation which for want of that help might have proved disastrous.” (Patron, 1909) More recently, of the 1889 episode, Hautcoeur and White (2011) find the Comptoir d’Escompte’s insolvency nearly induced a system-wide crisis in France. The most recent near-panic in France happened in 1891 with the failure of the Societe des Depots et Comptes Courants. “By rediscounting 50 million francs worth of the bank’s loans, all deposits were paid off and the dreaded effects of a panic were once more averted. The Banque still had yet to recover 7.5 million francs by 1895 and it

was only in the following year that this account disappeared entirely from the balance sheet of the Banque.” (Patron, 1909)

Additionally, we have evidence from the letters in the Morgan Grenfell archives that information asymmetries among counterparties may have been increasing in November 1907, slowing interbank lending.²⁶ Conant (1909) also notes that while pressure upon the banks was at its maximum, the market for foreign exchange was temporarily blocked. In the absence of a variable to measure bank counterparty risk such as a spread between an interbank rate and a central bank discount rate,²⁷ we construct an equity spread as a proxy for confidence in the French banking system.²⁸ The spread between an index of the share price of the Bank of France and an index of the share prices of three prominent French commercial banks (Credit Lyonnais, Comptoir d’Escompte and Banque de Paris) reveals striking results. The price of the Bank of France’s stock rallied sharply during the American panic, perhaps capturing the flight to quality trade, while the share prices of the commercial banks declined. The spread reached its widest point, 13.25 percentage points, on November 21st, the day Parisian bankers sought help from the Regents at the Bank of France (see Figure 5). Importantly, after the announcement by the Regents to release gold directly to the United States, the spread begins to narrow. It declines to six percentage points by January 1908 as the Bank of France shares decline and the French commercial bank stocks rally.

[Insert Figure 5 here]

²⁶ On Friday November 8th, Brown and Shipley was unable to sell any 60-day sight bills in New York, while Baring Brothers was still able to sell their own bills. It was suggested that to overcome this counterparty obstacle that “Brown Shipley and JPM & Co. could each exchange £50,000 60 day sight drafts with Baring Brothers and then remit to JSM & Co. the Baring bills and we will discount them in the London market. If it were known that JPM & Co would buy Baring bills and that Baring would buy JPM & Co. bill and so on eventually with Baring and Lazard, that it might do something to restore confidence in the bill market in New York.” Morgan Grenfell & Co. Letter Book, letter from Vivian to Jack Morgan in Paris dated Nov 12, 1907, p. 186.

²⁷ The so-called TED spread, the difference between the London Interbank Offer Rate (LIBOR) and the discount rate at the U.S. Federal Reserve, was used daily as a proxy for counterparty risk among banks.

²⁸ The difference between the official discount rate and the open market rate as quoted weekly in the Economist magazine shows little variation.

Archival evidence confirms that worry of contagion to the French markets was in the mind of French policy makers. Minutes from the November 21 meeting of the Council of Regents record the comments of central bank Governor Pallain, “The *contagion* of the crisis will spread to Europe, and Paris will have to raise its discount rate.”²⁹ The Rothschilds,³⁰ represented among the Regents, also worried separately about contagion. Faced with a request for short-term loans to aid a struggling project of their American agent, August Belmont, Jr., the Rothschilds agreed to extend the loan, likening the situation to the 1890 Baring Crisis during which a financial crisis in London had spilled over to France. Lord N. M. Rothschild in London wrote to the Paris Rothschild partners on November 19, that it would be wise to “avoid the many anxious months everyone passed through (during the Barings crisis) and the time it took to restore confidence. If anything should happen to Belmont, it would be one of those untoward incidents which if it did not precipitate a fresh crisis in New York, it would materially affect the present one from passing away.”(Wilkins, 1989)

Turning now to the question of why November 22nd, we know that American cotton began to arrive in France on Wednesday, November 20, as reported by the New York Times.^{31 32} Purchases of the cotton by French merchants would soon require settlement. We also know that

²⁹ Minutes from the Banque de France archives.

³⁰ With investment houses in London, Paris, Frankfurt Venice and Vienna as well as an agent in New York, August Belmont, Jr., the Rothschilds may have functioned as an information conduit among central banks in a period of underdeveloped formal communication channels. (Flandreau, 1997; Ferguson, 1999) The personal papers of August Belmont, Jr. reveal that in August, the London and Paris Rothschild houses had lent £250,000 to the IRT at Belmont’s request, establishing if not extending, their investment in the urban transportation system. (Papers archived at Columbia University, New York, p. 225, dated August 25, 1907.) From Wilkins’ (1989) review of the Rothschild archives, we know that three days prior to the regents’ meeting, November 19, Lord N. M. Rothschild wrote to Alphonse, his cousin and one of the Banque’s regents, of Belmont’s request for personal aid to weather the crisis. “we can hardly avoid doing it and no doubt our action will be very beneficial to him and to ourselves... if Belmont were to default on his obligations it might have a most prejudicial effect on the rehabilitation of the Interborough Railway.” Both the London and Paris Rothschilds were of “the same mind that something must be done to help Belmont.”

³¹ Two leading issuers of cotton bills of lading at French ports identified by the Master Cotton Spinners and Manufacturers Associations were the *Compagnie Generale Transatlantique* operating between New York and Le Havre and the *Pensacola-Havre Line*. International Congress of Delegated Representatives of Master Cotton Spinners' and Manufacturers' Associations held in the Palais des Academies Rue Ducale, Brussels, June 6, 7, 8, 1910, Printed in Manchester, England, October, 1910. Appendix IWStatistics, Consumption of Cotton for year ending August 31, 1908 (Spinners' Returns). p. 358.

³² *New York Times*, p.1.

the three signs of French systemic stress, discussed above, were increasing that week, despite the announcement by Cortelyou on Monday the 18th of the issue of Treasury bills and Panama Canal bonds to be used as collateral for the issuance of bank notes. What happened next is revealed in the minutes of the Board of Regents of the Banque de France from Thursday, November 21st.³³

An appeal from “a diverse group of Parisian bankers” was made directly to Governor Pallain that day for the Banque to release gold from its reserves, the payment for which would be discounted commercial paper on American exports endorsed by the French bankers. This suggestion departs from the normal custom of paying for cotton with bills of exchange. Thus, by requesting permission for merchant bankers themselves to buy the gold eagles from the Bank, the rescue plan was suggested not by bureaucrats or politicians, but by the French business community directly. We summarize the deliberations of the Regents in detail below.

First, Governor Pallain presents the bankers’ request to the Books and Portfolio Committee of the Board of Regents. Hottinguer, the Dean of the Regents, voices a preference for repeating an operation in which the Bank lent gold to the Bank of England, with a guarantee of repayment of gold in kind in about three months. Hottinguer believes, however, that the Regents can satisfy the bankers’ request by selling them a small portion of gold if the central bank charges a premium for it. Pallain says that the Regents should avoid denying requests from their business community. He worries aloud that if they deny the request and the English raise rates again, French businessmen will not understand the Regents’ attitude. Balsam also regrets they cannot do another transaction with the Bank of England, but Pallain says the Bank of England is abstaining from asking for another gold loan for the moment. Hottinguer and Neuflyze note that all possible operations should be studied to try to avoid raising the official Bank rate to 5%.

³³ Comité des Livres & Portefeuilles Séance du Jeudi, 21 Novembre 1907. Present were nine men: Pallain, Guernant, Chomereau, Lamotte, Hottinguer, Balson, Gouin, Neuflyze, Delaunay-Belleville. File #560, Banque de France Archives, Paris.

Balsan notes that French commerce has a big interest in ending the crisis. After this exchange of ideas, the committee recommends Pallain bring the question to the full Board of Regents.³⁴

In many ways the discussion in front of the full Board resembles the discussions of central banks in the 2008-2011 financial crises; bankers try to balance competing desires to provide liquidity to the system while not forsaking the credit quality of assets the Bank purchases in exchange for its liquidity provision. The conversation of the full board of Regents in 1907 is more tactical in tone than the more strategic nature of the discussion in the Books and Portfolio Committee. Richemond opens by immediately asking what the Committee decided earlier in the day. Hottinguer replies that the Bank must affirm its goodwill to the French bankers and research a new genre of operations that let the Regents help the New York market. He estimates that following Pallain's suggestion, the Regents can deliver some eagles to the bankers of Paris against discounted commercial paper. Ideally, the gold ought to be sold to the bankers at a premium. Pallain argues that the exit of gold from a country cannot be abandoned to purely private interests; the Bank must play a role. Balsan worries that the operation will have evil moral effects in the country (*facheux effet moral*). Aynard observes that this operation would be a good way to conform to the Bank's statutes to aid French commerce. He says it is simply a question of examining the paper and the signatures.

Then Pallain recommends that any sale should be small so that gold reserves can be maintained for use by other European countries that may request it in coming weeks. He notes that the premium on gold is still 2.5 to 3% in New York on November 21st even after the announcement by Cortelyou to sell Treasury bills and Panama Canal bonds. He notes how

³⁴ La Séance de Jeudi, 21 Novembre 1907. Present were sixteen men: Pallain, Aynard, Balsan, Richemond, Seydoux, Guoin, Loreay, Bargeton, Neuflyze, Davillier, Mallet, Rothschild, Mirabaud, de Gretry, Guernant and Delaunay-Belleville. File #49, Banque de France Archives, Paris.

“authorized people at the outset of the crisis” estimated that it would take about \$20 million from Europe to solve, and already \$70 or \$80 million have been sent. He says now it is impossible to estimate how much more gold will be needed because the crisis has evolved into one of confidence. He reiterates that his major concern is to avoid another interest rate increase. He notes that the English have been clear that if their reserve drops further they will raise their rate to 8 or 9%. “What will the other Europeans do? The contagion will spread and we will have to raise our rate to 5%. Is it realistic to think this operation will make a difference? Isn’t it wise to limit the operation to commercial paper and save the reserves for more unforeseen contingencies?”

Mirabaud, Neuflyze and Aynard discuss now it may be fortuitous there is not much American commercial paper in Paris; if there is little paper, then there is little gold they have to deliver. Seydoux does not think it will be a successful rescue; the Americans are hoarding much more than the Regents are thinking of sending. Aynard responds that all the Regents should consider is the commercial case of French bankers, not whether this operation will solve the whole crisis: “We should do what we can to prevent the rise in the bank rate.” Rothschild³⁵ notes that unlike the Bank of England transaction, if gold is sold outright in this operation, there is a low probability of it coming back to the Bank, so the Regents need to be extra careful in this decision. He thinks the Regents should do what they can to bring down the exchange rate. (See Figure 2 for the portrayal of how the franc/sterling rate was approaching the French gold export point that day.) Belleville wonders how much gold the Bank can part with without inconvenience. Hottinguer replies that when the Regents think they have sold enough, the Bank can simply raise the premium if the bankers want to buy more. Pallain perceives the Bank as

³⁵ Regent Alphonse Rothschild’s personal interest in resolving the American crisis was recounted earlier in fn 28 as in saving his firm’s investment in the Interborough Rapid Transit project.

having a larger role as the international lender of last resort when he states: “Our reserves should be regarded as reserves for all of Europe. We cannot touch them without circumspection.”

Finally, Pallain calls the question. He asks the Regents for permission to sell gold against commercial paper and suggests the following response to Parisian bankers: “The Banque does not refuse assistance to a certain extent but cannot set any numbers and it retains full freedom of action. The Banque will do whatever possible while taking into account the interests of French commerce. Its intervention into the crisis can only be justified when it has the intent and result of preventing the rise in the discount rate in France by defending the exchange.” With unanimous approval, the Regents gave the requested authorization. The rescue plan crystallized.

To understand the specific terms of the rescue operation, it is useful to review the process of originating a bill of exchange. The bill of exchange was the key to settling international trade transactions.³⁶ Succinctly described by Margaret Myers (1931), international transfers consisted merely of the shifting of book credits by the banks from the accounts of nationals of one country to the accounts of nationals of another. “When funds were being sent from London to New York, for example, sterling bills were being sold in New York by English agents and purchased with American bank deposits. No gold would be shipped until the demand for dollars had driven the price up to a point where it was less expensive to ship the metal than to use sterling bills.”³⁷

To understand how the Regents circumvented this typical method of trade settlement and introduced an opportunity for gold to be used to settle the transaction instead, we examine the details laid out by the Regents in their discussions. Suppose an American cotton exporter sells

³⁶ Ray Burt Westerfield PhD, Yale University Assistant Professor of Political Economy, provides an exhaustive discussion of the details of the implementation of foreign exchange transactions in *Banking Principles and Practice*, The Ronald Press Company, 1921. Chapters 54 and 55 in Volume V focus on The Elements of Foreign Exchange (pp. 1096-1173) with separate discussions on practices prevailing before WWI and after WWI. The pre-WWI discussion is drawn upon heavily for this paper.

³⁷ Myers, p. 338.

goods to a French importer and wishes to be paid. He would write out a bill of exchange ordering the French importer to pay to the order of an American bank. The American exporter would then sell this bill to his American bank with documents attached consisting of the bill of lading and insurance certificates that, in case of non-acceptance by the French importer, gave the American bank title to the goods represented. The American bank now holds a newly created financial instrument known as a single name bill of exchange with collateral security (a bill drawn in connection with a foreign trade transaction on another individual or commercial house is called a commercial bill and its selling value takes into account the credit ratings of exporter and the importer. A single name bill can be converted into a double name bill by securing the endorsement thereon (guaranty) of a bank of high standing.) Having bought this bill and paid the grower, the American bank will send it to its correspondent French bank who will present it to the French importer for payment. If paid by the importer immediately, the importer fulfills his debt to the American exporter.

Usually however, the American bank orders the French bank to sell the bill in the London discount market, thereby increasing his balance with the French or English bank, against which he can sell bills in America. The price of a bill is simply the rate of exchange. As soon as it is sold to a European discount house the American banker puts himself in funds and the discounter becomes the creditor to the French importer. Since the great majority of export bills drawn were acceptance bills and sold in the discount market, it is evident that the ultimate creditors of foreign trade were the large discounters. N. M. Rothschild wrote at the height of the 1907 crisis that “the whole trade of the world is carried on by bills on London (denominated in sterling).

There were always running on London between 300 and 400 million pounds (\$1.5 billion to \$2 billion) of drafts of which probably more than half are for foreign account.”³⁸

The larger the volume of American exports, the larger the supply of exchange for sale to American bank intermediaries in New York on London or Paris. The bankers having bought the bills and thus procured the credit balances in London or Paris are in a position to sell exchange.³⁹ The supply of bills for sale therefore was determined by the amount funds owing to Americans. The supply is seasonal varying with the times of merchandise exportation. Therefore, in early autumn, when American agricultural exports to England and France increase, bills of exchange in New York on London and Paris will be plentiful relative to the demand. The price of sterling and French bills would fall until it reached the gold import point from the American point of view. At this point, Americans who had not yet found a buyer for their bills would find it more profitable to request an importation of gold rather than to sell their bills at \$4.82 or \$4.83. This was how gold eventually found its way into the American markets every Spring; when too many bills were for sale, American exporters asked European importers to pay in gold rather than accept “nothing” for their bills. The process happened over time with March usually being the month in which sterling reached its low point prompting a new importation of gold into New York.⁴⁰

By accelerating the settlement process and allowing the claims among banks to be settled directly in gold rather than by selling bills of exchange and further weakening the franc/sterling exchange rate, the Bank of France short-circuited any contagion before significant economic impact to the France could occur. The Regents interrupted a transmission channel for the

³⁸ Ferguson, Niall, *House of Rothschild*, 1999, p. 400

³⁹ Exchange may theoretically be offered for sale by any party who has money in England or Paris due to him. Westerfield.

⁴⁰ Margaret Myers, *The New York Money Market*, p. 341 Vol. 1

liquidity crisis, the sale of French bills of exchange for sterling. Spillover was arrested. See Figure 5 for a comparison of the trade settlement ex-ante and ex-post the intervention by the Regents. The intention of the Regents to continue the facility for an extended period likely indicated to the banking community and to hoarders that the new supply of gold could be significant. Indeed, the size of the French operation was estimated at \$16,000,000, a meaningful supply of gold to the American markets.⁴¹

[Insert Figure 5 here]

Importantly, the decision by the Bank of France precedes by one day the diminution of the currency premium. American banks that offered gold for sale at a 2.5% to 4% premium would be undercut by Lazard Freres selling French gold offered at a 0.6% premium. “A prominent money brokerage house announced that it would discontinue paying premiums on currency beginning Monday, November 26.”⁴² The premium on gold was dissolving as the eagle-freighted steamer left Cherbourg. “One of the largest of the houses which have been dealing in money, in accordance with its promise of last week, discontinued trading in currency yesterday and the feeling was general that hoarded money would come out in increasing quantities *as the chance of selling it at a premium diminished*. The return of such funds to normal channels, together with *the constant influx of foreign gold*, is the basis of the prediction general among those who are closest to the banking situation that the premium on currency will have entirely disappeared by the end of the week.”⁴³ While contemporaries discussed⁴⁴ many factors likely contributed to the waning of the premium on gold, the source of new French supply

⁴¹ Conant (1909), p. 716, quotes Yves Guyot’s study *la Crise Americaine* in *Revue de commerce de l’industrie et de la Banque*, December 31, 1907.

⁴² *New York Times*, November 24, 1907.

⁴³ *New York Times*, November 26, 1907, p 2.

⁴⁴ *Commercial and Financial Chronicle*, Vol. 85, November 30, 1907, pp. 1360-1361.

certainly would likely have figured prominently in its disappearance. With the disappearance of the premium on gold, a prime incentive for hoarding gold was removed from the American system, and coins and gold began returning to the banks. The reserves at the New York Clearing House banks began to recover the week after the announcement by the Bank of France (see Table 2).

[Insert Table 2 here]

As the commodity backing the bills of exchange, cotton figured prominently in the rescue plan for two reasons. Its receipt at French wharves qualified as an approved collateral under the Statutes of the Bank of France (Discounting) and the size of the crop was not so big as to cause serious depletion of French reserves.⁴⁵ Conversations among the regents documented above reveal their concern for maintaining the quality of the Bank's assets. The Statutes of the Bank reveal the evolution of both the credit and collateral standards exacted by the bank in its discount operations beginning in 1800.⁴⁶ Credit quality is addressed with the requirement of three signatures endorsements accepting responsibility to pay a bill were required from entities well-known to be solvent. Perhaps three signatures indicated repeated interactions among bankers and tradesmen sufficient to convince the Bank of the instrument's quality. In place of one of the credit evidences, collateral could be substituted for one of the endorsements provided that the bill represented transactions in merchandise.

The French banking community was likely familiar with the annual size of the imported American cotton crop. A French Chamber of Commerce of New York with offices on William Street, existed to connect French businesses to opportunities in the U.S., counting among its

⁴⁵We study cotton rather than wheat or other staples because cotton was mentioned most frequently in the press.

⁴⁶ Statutes of the Banque de France. Law 24, 1800, and amendments, File OV 48, Overseas File, Bank of England Archives, London.

membership prominent French bankers.⁴⁷ In their monthly bulletin for December, 1907, they noted that the cotton export crop from the States to France for the ten month period from December 1, 1906 through September 30, 1907 had amounted to 541,000 bales with a dollar value of \$31,792,000, dwarfing all other categories of exports. The largest category of French imports to the U.S. was Silk Material, \$15,562,000 for the same time period, followed closely by Cotton Lace and Embroideries of \$10,273,000. The International Congress of Master Cotton Spinners was often held on the European continent attended by French representatives and weekly notes about the cotton crop were carried in leading journals read by French bankers. Of approximately 11,000,000 bales of cotton produced in the U.S. that season, about 700,000 bales or 6% of the American crop, were exported to France.⁴⁸ Interestingly, the market value of the cotton bound for France would have been about \$35,000,000 (700,000 bales x 500 pounds per bale x ten cents per pound), falling within the \$20,000,000 to \$40,000,000 range rumored to be available for shipment by the Bank of France. The \$16,000,000 estimate of the size of the operation previously mentioned falls within the estimated size of American cotton shipments to France.

In summary, by permitting Lazard Freres, the Bank of Paris and other French houses to purchase eagles at a mere premium of 0.6% and pay for it with bills of exchange written by American exporters, the Regents accomplished several goals. Most importantly, they opened a new source of gold supply to the American system, liquefying their sterilized balances. By assuring the American markets of a new source for gold offered at a premium of less than the

⁴⁷ Jacquier et Cie, banquiers de Lyon, Morgan Harjes of Paris, and Schroeder et Schyler et Cie., each of Paris, p. 11, December 1907 edition, Vol 3, 12th Annee, archives of the Banque de France.

⁴⁸ The greatest proportion of the American crop, 42%, was kept for domestic spinners, followed by 23% exported to the United Kingdom, and 10% was shipped to Germany. The other 17% of American cotton was committed across the remaining European countries. The Seventh International Congress of Delegated Representatives of Master Cotton Spinners' and Manufacturers' Associations held in the Palais des Academies Rue Ducale, Brussels, June 6-8, 1910, p;rinted in Manchester, England, October, 1910. Appendix IWE Statistics, Consumption of cotton for year ending August 31, 1908 (Spinners' Returns). P. 358.

gold premium existing in New York, competition drove the premium down, reducing the incentive to hoard.

Secondly, they reduced the amount of bills outstanding by providing a gold-based rather than franc-deposit-based way to satisfy outstanding trade payment obligations. This relieved the selling pressure on the franc. A strengthening franc moved the franc away from the gold export point vis a vis London. With exchange moving away from the export point, pressure to raise the French bank rate diminished as France was no longer put on the defensive to defend its reserve. The semi-official explanation of the bank's action was given out in Paris: 'These operations are intended to restrain the increase of the check exchange rate on London which has now reached a point where it is profitable to ship coin taken from circulation. It is also expected to contribute to keeping the discount rate of the Banque of France at a moderate figure.'⁴⁹ Because the operation was limited to releasing gold for sale in a relatively small amount, the Regents kept the largest part of the great French banking reserves intact, dry ammunition for further anticipated defense tactics against the voracious American demand for gold. The large reserves maintained the credibility and reputation of the Bank of France.

The Regents skirted the problem of the absence of reliable certifiers of debt in the American market. Without a central bank, trustworthy investment bankers in New York, or independent rating agencies, the French relied instead on cotton as the collateral, and the certification by reputable French banks of their importer customers. They made a profit for the shareholders of the Bank of France by selling gold at a premium. We estimate this at 0.6% times the estimated size of the operation, \$16,000,000 to yield \$96,000. Indeed, the Bank had a very

⁴⁹ *New York Times*, November 23, 1907, p. 2.

good year witnessed by an increased dividend to its highest level ever, amounting to an 11% rate.⁵⁰

They stayed within the constraints of their charter, putting the interests of French commerce first, before the need to be lender of last resort to the rest of the world. They did not cooperate until it was in their best interest to do so, until the pressure on their markets was emerging. Finally, the regents acted before the crisis reached fully infected French markets, thus avoiding the harsh adjustments of the American market where the interruption to the payment mechanism and losses from liquidation in the financial markets resulted in significant contractions in output.

That the French arrangement proved to be the deterrent to further increases in the Bank of England's rate is found in a cable from William Campbell later to the Rothschild Frères in Paris, "your assistance had prevented my taking even more stringent means to protect our Gold Reserves."⁵¹ We expect Event Seven to be associated with an upward revision in investors' expectations conditioned on an expectation to the end of interest rate increases.

Imagine Seydoux's surprise, he having been the most skeptical of the Regents, when the relief and return of confidence at the announcement was recounted in several publications. "While a new low record for the year was made on Friday, on the last day of the week the market rose in a violent way. The engagements of gold made by our bankers yesterday in Paris constituted a helpful influence. That the attitude of the Bank of France has changed serves as a basis for improvement of sentiment here."⁵² "The academic bull argument was the apparently

⁵⁰ Archives of the Banque de France.

⁵¹ Ferguson, p. 928, Rothschild archive, London, December 6, 1907.

⁵² *Washington Post*, November 23, 1907, p. 1.

authoritative announcement about the willingness of the Bank of France to release gold to this market if necessary. This is a decided factor in restoring confidence.”⁵³

5. Data Set, Model and Results

Daily data on the Dow Jones Industrial Average and Dow Jones Railroad Average indices from *The Dow Jones Averages 1885-1985* (Dow Jones-Irwin, Ed. P. Pierce, Homewood, IL) for the period July 1, 1907 to December 31, 1907 obtained from quotations in the *Wall Street Journal*. We begin the analysis by first taking the natural logs of the respective indices and examine whether the indices exhibit unit roots. The results of the Augmented Dickey-Fuller (ADF, 1979) and Phillips-Perron (PP, 1988) unit root tests fail to reject the null hypothesis of a unit root for the natural log of the indices. However, the null hypothesis of the first difference of the logs for each index is rejected indicating each index is difference stationary at the 1% significance level as shown in Table 3.

[Insert Table 3 here]

Given our focus on the seven events outlined previously, we employ a GARCH model to account for the presence of autoregressive conditional heteroscedasticity associated with the residuals (Engle, 1982, 1983; Bollerslev, 1986). In particular, the GARCH model allows for the impact of the news announcements and the potential for volatility clusters that may emerge as a result of such announcements. Taking into account the dynamic variance of returns predicated

⁵³ *Wall Street Journal*, November 27, 1907, p. 4.

on the prior day's information set with a GARCH model may capture a possible cascading effect of such announcements on investors' expectations for the future.⁵⁴

The mean equation is specified as the respective returns (first-difference of the log of the indices) as a function of seven dummy variables representing the seven events outlined previously in regards to the 1907 financial panic.

$$r_t^j = \mu + \delta_1 D1_t + \delta_2 D2_t + \delta_3 D3_t + \delta_4 D4_t + \delta_5 D5_t + \delta_6 D6_t + \delta_7 D7_t + \varepsilon_t \quad (1)$$

where r_t^j represents the respective returns for the Dow Jones Industrial Average and the Dow Jones Railroad Average indices; μ is the constant term; and ε_t the random error term. The dummy variables correspond to the seven events discussed as follows:

$D1_t$ is a dummy variable equal to 1.0 for the period July 24, 1907 to July 31, 1907 and 0.0 otherwise representing Bank of France opens facility to pay interest on gold payments during trans-Atlantic shipping time in order to drain gold from U.S. to replenish French reserve. Announcements repeat from July 24, 1907 to July 31, 1907.

$D2_t$ is a dummy variable equal to 1.0 for August 15, 1907; October 28, 1907; November 1, 1907; November 4, 1907; and November 7, 1907 and 0.0 otherwise for Bank of England increasing its discount rate to defend its gold reserve from export. The November 7 announcement coincides with the announcement that the Bank of France purchased up to 80 million francs in sterling bills and forwarded 80 million francs in gold eagles to London.

$D3_t$ is a dummy variable equal to 1.0 for the period October 17, 1907 to October 23, 1907 and 0.0 otherwise representing the crash of United Copper Company due to stock and trust company runs, October 17, 1907 to October 23, 1907.

$D4_t$ is a dummy variable equal to 1.0 for the period October 24, 1907 and October 25, 1907 and 0.0 otherwise representing the formation of money pool by J.P. Morgan & Company on October 24, 1907 and October 25, 1907.

⁵⁴ An alternative approach may be to identify where the turning point in the data is and then ask, "What event happened that day?" With such a reframing of the research question, the structural break methodology used by Willard, Guinnane, and Rosen (1996) to identify turning points in the Civil War as reflected in changing asset prices. We formulate hypotheses about which news announcements should have resulted in market reactions and then test whether the market indeed reacted.

$D5_t$ is a dummy variable equal to 1.0 for the period October 29, 1907 and October 30, 1907 and 0.0 otherwise representing the issuance of clearing house loans and suspension of deposit convertibility by banks on October 29, 1907 and October 30, 1907.

$D6_t$ is a dummy variable equal to 1.0 for the period November 19, 1907 and November 20, 1907 and 0.0 otherwise representing the issuance of Treasury certificates and Panama Canal bonds on November 19, 1907 and November 20, 1907.

$D7_t$ is a dummy variable equal to 1.0 for the period November 22, 1907 to December 7, 1907 and 0.0 otherwise representing the Bank of France's operation to discount American commercial paper for gold eagles held in the Bank of France reserves. Announcements repeat from November 22, 1907 to December 7, 1907.

As pointed out by Cosimano and Jensen (1988), the absence of serial correlation is important in the mean equation in order to adequately test for the presence of autoregressive conditional heteroscedasticity in the residuals. Table 4 displays the results for the mean equation for the respective returns. With respect to the returns for the Dow Jones Industrial Average, only the coefficient on the dummy variable, $D7_t$, is statistically significant and positive. Likewise, the returns for the Dow Jones Railroad Average yields the coefficient on the dummy variable, $D7_t$, as statistically significant and positive as well along with the coefficient on $D3_t$ as a negative and statistically significant. Further evaluation of the model diagnostics reveals that both models exhibit predictive power with the statistical significance of the overall F-statistics at the 1% level. The residuals from each model are free of serial correlation up to fifteen lags based on the statistical insignificance of the Ljung-Box Q-statistic, $Q(15)$. Though the residuals from the respective models are free of serial correlation, the residuals do exhibit time-varying variance (i.e. autoregressive conditional heteroscedasticity) given the statistical significance of the chi-square test statistics ARCH(1).⁵⁵

⁵⁵ Though the ARCH(1) test statistic is marginally insignificant in the case of the returns for the Dow Jones Industrial Average (p-value = 0.11) recognizing the presence of ARCH effects is taken into account.

[Insert Table 4 here]

With the presence of autoregressive conditional heteroscedasticity, the mean equation is augmented to incorporate the presence of the time-varying variance in the residuals using the GARCH(1,1) specification.

$$r_t^j = \mu + \delta_1 D1_t + \delta_2 D2_t + \delta_3 D3_t + \delta_4 D4_t + \delta_5 D5_t + \delta_6 D6_t + \delta_7 D7_t + \varepsilon_t \quad (2)$$

where $\varepsilon_t \sim N(0, h_t^2)$

$$h_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1}^2 \quad (3)$$

where equation (2) represents the mean equation for the respective returns and equation (3) the conditional variance equation where $V(\varepsilon_t | \Omega_{t-1}) = h_t^2$ is the condition variance of ε_t with respect to the information set Ω_{t-1} . The moving average component (ARCH term) is ε_{t-1}^2 and represents volatility in returns from the previous period. The autoregressive component (GARCH term) is h_{t-1}^2 and represents the forecast variance of returns from previous period. The sum of the coefficients of the ARCH (α) and GARCH (β) terms in the conditional variance equation determine the persistence in volatility due to shocks. The closer the sum of α and β is to one, the more persistent the shock.

[Insert Table 5 here]

The results of the GARCH(1,1) specifications are shown in Table 5. As in Table 4, the coefficient for the dummy variable, $D7_t$, is positive and statistically significant in the mean equation for the returns from the Dow Jones Industrial Average. Again, the coefficient for $D3_t$,

is negative and statistically significant while $D7_t$ is positive and statistically significant in the mean equation for the returns from the Dow Jones Railroad Average. In the conditional variance equations, the coefficients for the ARCH and GARCH terms differ somewhat between the two returns. The coefficient for the ARCH term in the conditional variance equation for the returns from the Dow Jones Industrial Average is positive and statistically significant at the 10% level while the ARCH term in the conditional variance equation for the returns from the Dow Jones Railroad Average is positive but statistically insignificant. As for the GARCH terms, both coefficients are positive and statistically significant at the 1% level for the respective returns. Furthermore, the residuals are free of both serial correlation and autoregressive conditional heteroscedasticity. In regards to the events surrounding the 1907 financial crisis, it appears the Bank of France intervention to discount American commercial paper for gold eagles held in the Bank of France reserves provided a positive market reaction to both the Dow Jones Industrials and Railroads. In addition, the results indicate that the crash of United Copper Company and the corresponding runs on stock and trust companies yielded a greater impact on the Dow Jones Railroads than Industrials.

Further evaluation shows that the sum of the coefficients for the ARCH and GARCH terms in the conditional variance equations for the Dow Jones Industrial Average (0.9545) and the Dow Jones Railroad Average (0.8631) exhibit a high degree of volatility persistence.⁵⁶ The difference in volatility persistence between the two returns may be attributed to the difference in company composition between the Dow Jones Industrial Average and the Dow Jones Railroad Average. Specifically, the twelve companies comprising the Dow Jones Industrial Average

⁵⁶ The GARCH-M model was also estimated however the conditional variance in the mean equation was statistically insignificant. Also, an augmented GARCH model in which the respective dummy variables were included in the conditional variance equation revealed their statistical insignificance.

were generally younger companies with shorter trading histories than the twenty companies comprising the Dow Jones Railroad Average, implying perhaps more information asymmetries in the Industrials than in the Railroad stocks, and therefore more volatility.

Figure 6 plots the course of the Industrial and Railroad equity index from July 1, 1907, through December 31, 1907. The market bottom is apparent in the figure, occurring on November 21. Then an enduring market bottom formed, returns turned positive, and stocks sustained their advance. With the low being registered, increasing stock prices reduced the risk of loan default in the banking system, thus ending the crisis.

6. Conclusions and Implications

The capacity for the Bank of France's announcement to change expectations of market participants for equity prices seems to have been underappreciated by financial historians. The premium on gold melted on November 24th as the *Provence* left Le Havre. Within days, the decline in American bank reserves reversed as the premium came off gold. Perhaps because it signaled a continuing new source of gold to relieve the shortage rather than the temporary solutions crafted by Cortelyou, Morgan, or the directors of the Clearing House banks, market participants responded more favorably to the French announcement than to the announcements about domestic efforts to expand liquidity.

The analysis of the discussions of the Regents of the Bank of France reveals the pressure they felt to meet their competing missions of providing liquidity to forestall full-blown contagion of the American crisis with their need to maintain the credit quality of the Bank's portfolio. The cotton collateral and the credit assurances from French banks of high repute provided the Regents of with satisfactory certification to proceed in the absence of rating agencies or

independent analysis of American creditworthiness. Analysis also revealed that the Regents put France's commercial interests above those of the rest of the world, and cooperated with England or America when it was in their self-interest, supporting Flandreau (1997). Finally, the Regents openly discussed what the likely result of their inaction on the issue, or of a decision to deny the request of the Parisian bankers for help. If France did not take action, and the English bank rate increased again, the Regents worried they could lose the confidence of the Parisian bankers.

The timing of the transaction was important. To the extent that the French transaction hastened the stabilization of the payment mechanism in America, it shortened the period of economic contraction.⁵⁷ If the Bank of France's rescue operation resulted in a four to six-week acceleration of the seasonal gold receipts, then the country experienced only a ten-week disruption to deposit convertibility instead of a possible fourteen to sixteen-week disruption. Furthermore, the discussion among the Regents reveals how close they thought they were to a full-blown global liquidity crisis.

The received tradition of ascribing the role of savior to the markets to J. P. Morgan seems somewhat overemphasized. The equity market did not begin its sustained rally until the French rescue was announced. The money pools coordinated by Morgan might have averted a settlement crisis at the New York Stock Exchange, however, allowing that institution to remain open until the New York Clearinghouse Association found a way to relieve bank reserve imbalances. Once bank reserve imbalances were addressed, banks resumed lending to floor brokers at least on a limited basis, thus keeping the Exchange open without the assistance of a money pool.

⁵⁷ See recent work by James, McAndrews and Weiman on the macroeconomic consequences of New York bank suspensions, 1866- 1914.

Finally, if the 1907 French rescue is generalizable to other crises, implications are that rescues occur when a surplus-reserve central bank experiences signs of domestic stress, that central banks cooperate when it serves their self-interest, and that a collateralized rescue operation can provide systemic liquidity yet still maintain rigorous central bank portfolio quality.

Appendix

Excerpts from newspapers about the Bank of France announcement are provided here for reference.

From the *Manchester Guardian* (November 23, 1907),

The intervention of the bank of France in the American money crisis today found its answer in a simple commercial discount operation carried out in accordance with the provision of the bank's charter. The Bank of France is in fact prepared to discount small successive parcels of commercial securities endorsed by French firms of the highest repute for the purchase at a premium of American eagles which do not circulate in France.

From the *New York Times* (November 24, 1907):

The first shipment of gold by the Bank of France directly to America, \$2,500,000 in eagles, left Le Havre this afternoon on the French Line steamer *Provence*. The shipment was made through local bullion merchants on rediscount exclusively of French commercial paper. It is probable that a similar consignment will be sent on Wednesday by way of Cherbourg. American eagles have been chosen as they can pass immediately into circulation.

From the *New York Tribune's*, correspondent in Paris, reported in the November 24 issue: The Bank of France's operation in discounting American commercial paper with French signatures and giving gold therefore upon the payment of a premium to the Bank of 3/5 of 1%, will be continued. The operations will be limited to the discount of commercial bills drawn against shipments of cotton and other staples which are now coming in the market, the gold will be obtainable only as such bills become available. The shipments therefore may extend over a considerable period. The Associated Press is informed that the amount of gold to be released in this way will not exceed twenty million dollars and may be less.

From the *Philadelphia Inquirer*, November 24, 1907:

The most important development in the improvement of the situation was that the Bank of France is permitting the withdrawal of gold for shipment to this country. The gold obtained through the French bank was not secured through the intervention of negotiations by a syndicate of bankers, but in a purely commercial way. The bank of France is giving up gold on commercial bills of exchange and it is understood that the operation is being facilitated by the deposit of securities pending the arrival of the commercial bills. The importance of this movement can hardly be overestimated. It means the extension of facilities to our export trade. For it is through foreign aid that the real relief must come.

From the *Commercial and Financial Chronicle* dated November 30, 1907, p. 1360:

The transaction was in the ordinary course of business between the Banque and French houses and that this and future operations would be continued to the discount of commercial bills drawn against shipments hence to France of cotton and other staples now being received at the French markets. The \$2.5 million consignment of American eagles to New York was made through French bullion houses as re-discount exclusively by the Bank of France of French commercial exchange, which gold had been bought at a premium of 6 per mille (60 basis points in modern parlance) from the Bank of France.

The Paris correspondent of the *New York Times* (November 26, 1907) reported, When the North German Lloyd steamer *Kronprinzessin Cecelie* leaves Cherbourg tomorrow for New York, her special strong room will be almost filled with barrels of American eagles taken from the cellars of the Bank of France. An official of the Bank told me this afternoon that the amount of the eagles sent direct from France in the German boat would be at least \$2,000,000, perhaps twice that sum. Lazard Frères, the French bank, alone are sending \$1,000,000 and the Banque Francaise, the Banque de Paris and Hirsch & Co. also are negotiating for large amounts. From another source, WElearn that the Banque of France possesses \$60,000,000 in American eagles and if conditions in the United States require it, the entire amount will be sent to New York. The Bank has formally promised however to release eagles at the rate of \$4,000,000 weekly as long as America shall need assistance.

Table 1. U. K. net gold movement (£million)^a

<u>Year</u>	<u>Total</u>	<u>Europe^b</u>	<u>USA</u>	<u>S. America^c</u>	<u>Egypt and India</u>	<u>Residual^d</u>	<u>Gold producers^e</u>
1903	0.9	-9.9	-3.8	-2.6	-2.9	0.2	19.8
1904	0.8	-15.8	-0.7	-5.5	1	-4.1	16.1
1905	7.7	-12.3	-1.8	-6.5	2.9	0.3	25.1
1906	3.4	0.2	-14.1	-6.2	-7.1	-1.5	32.1
1907	6.2	2.4	-17.7	-7.7	-6.5	1.6	34.1
1908	-3.8	-31	-0.6	-6.3	0.1	-1.1	35.1
1909	7.4	-16.1	2.9	-10.5	-3.6	-1.6	36.3
1910	6.4	-9.9	3.9	-2.5	-17.1	-4.8	36.8

^a Source: Board of Trade Annual Abstracts of Statistics from Bank Rate and the Burdens of Adjustment 1870-1914

^b Europe comprises France, Holland, Germany and Austro-Hungary

^c South America comprises Brazil, Argentina, and Uruguay

^d Residual = (Total) less (Europe + USA + S. America + Egypt and India + Gold Producers)

^e Gold Producers comprises South Africa, Rhodesia, Australia and New Zealand(Ford 1964.)

Table 2. Weekly Reserve Deficit at New York Clearing House Banks, Call Loan Range, Net Gold Imports, Specie Level and Gold Premium, October 26, 1907 through January 11, 1908

Before the Bank of France Announcement

<u>Date</u>	<u>Surplus</u> <u>Resev</u>	<u>Call Loan</u> <u>range</u>	<u>Net gold</u> <u>impt</u>	<u>Specie Level</u>	<u>Gold</u> <u>Premium</u>
Week of: 10/26/1907	(\$1,233,300)	5 to 125%	(\$1,303,245)	\$196,426,000	none
11/2/1907	(\$38,838,825)	3 to 75%	(\$479,622)	\$175,913,900	2 to 3.5%
11/9/1907	(\$51,924,625)	3 to 25%	\$7,272,752	\$170,712,000	3 to 4%
11/16/1907	(\$53,666,950)	5 to 15%	\$21,110,672	\$170,347,900	2 to 4%
11/23/1907	(\$54,103,600)	3.5 to 15%	\$12,413,679	\$168,799,100	1.25 to 3.5%

After the Bank of France Announcement

11/30/1907	(\$52,989,425)	3 to 12%	\$16,546,078	\$170,554,600	0 to 1.75%
12/7/1907	(\$46,210,350)	3 to 13%	\$13,810,794	\$173,888,700	.625 to 1.5%
12/14/1907	(\$40,101,175)	2 to 25%	\$9,467,275	\$177,165,300	0 to 1.5%
12/21/1907	(\$31,751,000)	6 to 17%	\$5,703,241	\$181,503,100	0 to 1.25%
12/28/1907	(\$20,170,350)	12 to 15%	\$4,115,667	\$187,874,300	0 to .25%
1/4/1908	(\$11,509,550)	5 to 20%	\$5,297,871	\$192,120,900	none
1/11/1908	\$6,084,050	2 to 9%	\$3,627,460	\$206,732,500	none

Table 3
Unit Root Tests

Variable	ADF	PP
P_t^{DJIA}	-1.13	-1.58
ΔP_t^{DJIA}	-12.69 ^a	-12.86 ^a
P_t^{DJRA}	-1.41	-1.59
ΔP_t^{DJRA}	-13.36 ^a	-13.32 ^a

Notes: Unit root tests included constant and trend terms. Critical values for ADF (C+T) and PP (C+T) are a(1%) -4.02, b(5%) -3.43, and c(10%) -3.14.

Table 4
Mean Equation Results

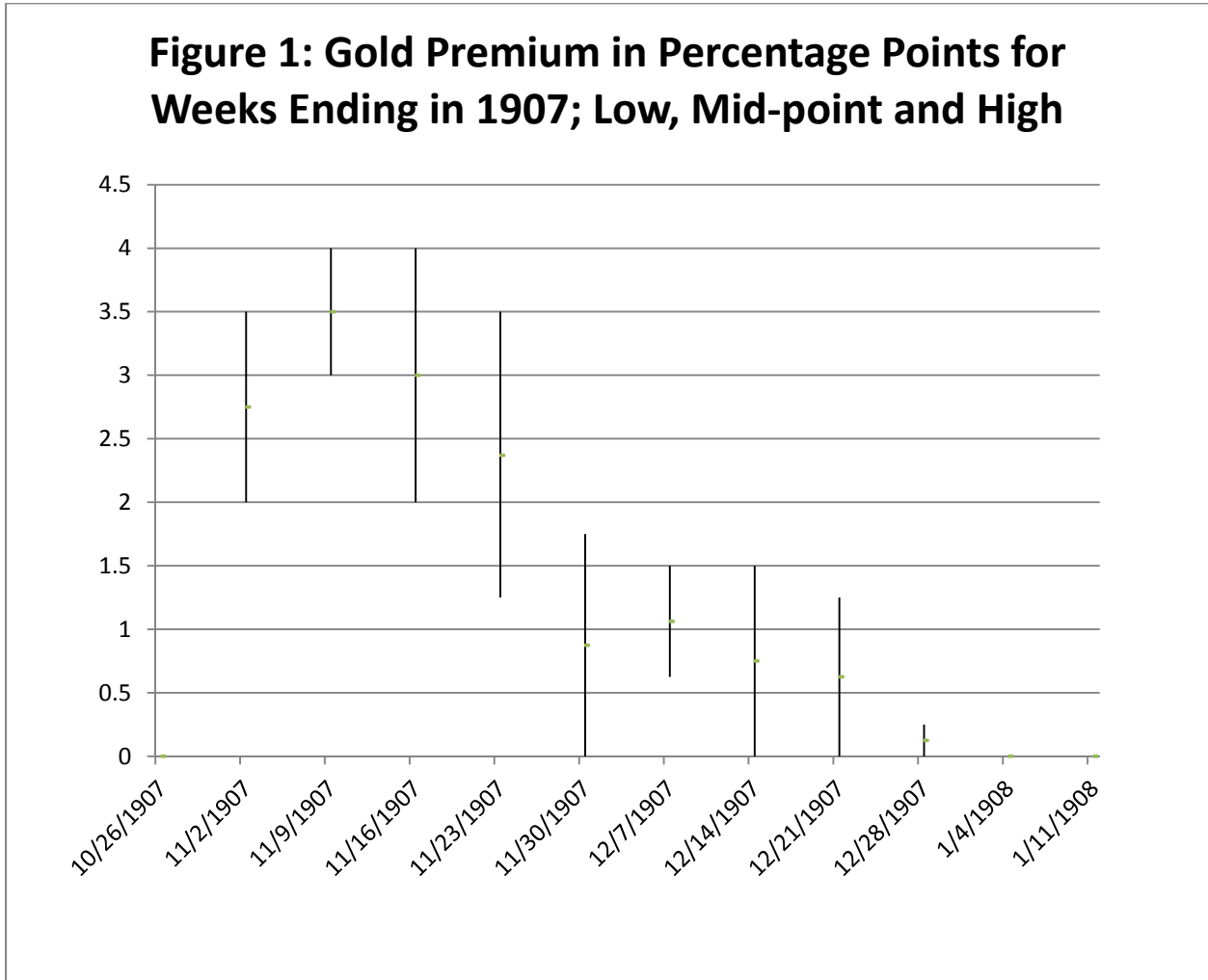
Variables	r_t^{DJIA}	r_t^{DJRA}
μ	-0.0030 (0.001) ^b	-0.0015 (0.001)
$D1_t$	-0.0007 (0.005)	-0.0004 (0.004)
$D2_t$	0.0018 (0.005)	0.0038 (0.004)
$D3_t$	-0.0039 (0.004)	-0.0074 (0.004) ^b
$D4_t$	0.0061 (0.010)	0.0114 (0.008)
$D5_t$	0.0037 (0.011)	-0.0097 (0.009)
$D6_t$	-0.0142 (0.009)	-0.0118 (0.008)
$D7_t$	0.0146 (0.004) ^a	0.0100 (0.003) ^a
<i>Model Diagnostics:</i>		
F-statistic	2.531 [0.017] ^b	2.693 [0.012] ^b
Q(15)	20.293 [0.161]	19.335 [0.199]
ARCH(1)	2.477 [0.115]	13.151 [0.000] ^a

Notes: Standard errors are in parentheses and probability values in brackets. Significance levels are denoted as follows: a(1%), b(5%), and c(10%). F-statistic is the overall F-statistic for the model. Q(15) is the Ljung-Box Q-statistic for serial correlation up to 15 lags distributed as chi-square. ARCH(1) is the chi-square tests for autoregressive conditional heteroscedasticity.

Table 5
GARCH Model Results

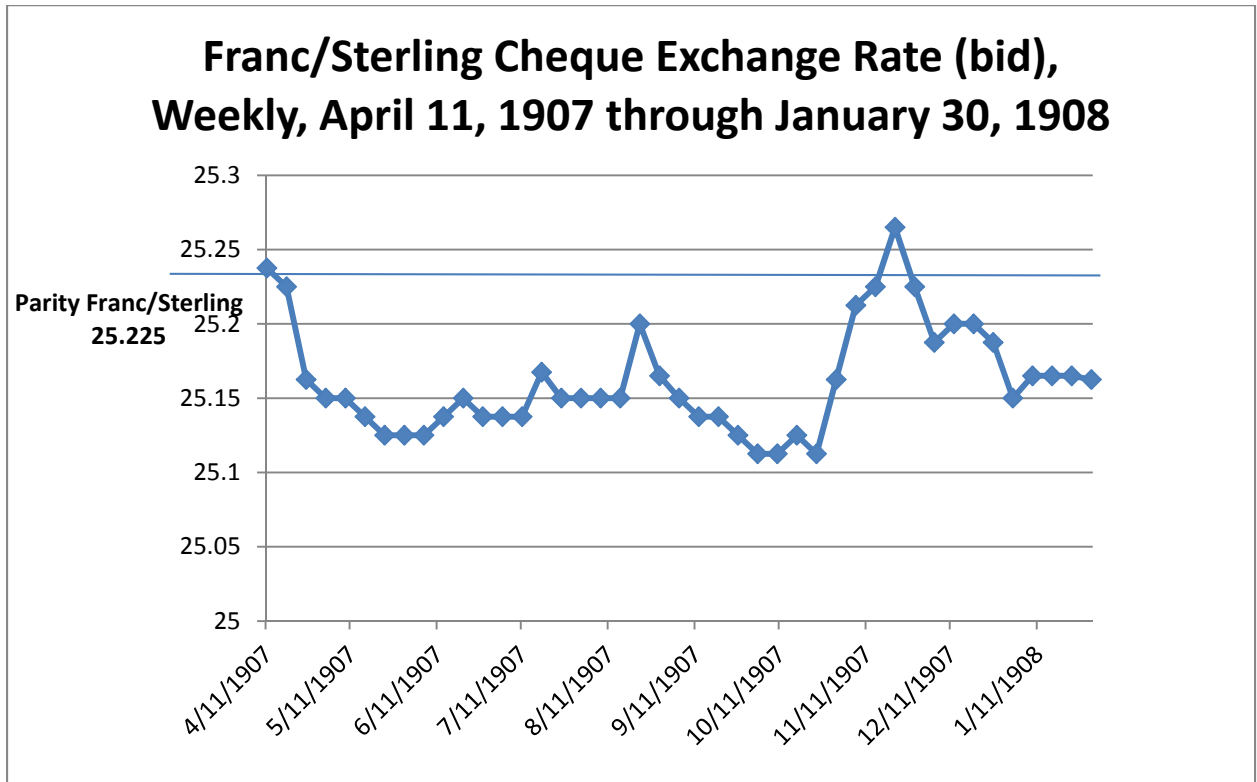
Variables	r_t^{DJIA}	r_t^{DJRA}
μ	-0.0023 (0.001) ^c	-0.0011 (0.001)
$D1_t$	-0.0012 (0.005)	-0.0007 (0.004)
$D2_t$	0.0018 (0.007)	0.0038 (0.009)
$D3_t$	-0.0016 (0.003)	-0.0047 (0.003) ^c
$D4_t$	0.0042 (0.118)	0.0096 (0.020)
$D5_t$	0.0030 (0.010)	-0.0105 (0.010)
$D6_t$	-0.0153 (0.015)	-0.0124 (0.016)
$D7_t$	0.0121 (0.004) ^a	0.0077 (0.003) ^a
<i>Variance Equation:</i>		
ω	9.16E-06 (9.96E-06)	1.59E-05 (1.83E-05)
ε_{t-1}^2	0.1182 (0.071) ^c	0.1505 (0.109)
h_{t-1}^2	0.8363 (0.102) ^a	0.7126 (0.223) ^a
<i>Model Diagnostics:</i>		
Q(15)	17.090 [0.314]	14.067 [0.520]
ARCH(1)	0.038 [0.845]	1.997 [0.158]

Notes: Standard errors are in parentheses and probability values in brackets. Significance levels are denoted as follows: a(1%), b(5%), and c(10%). Q(15) is the Ljung-Box Q-statistic for serial correlation up to 15 lags distributed as chi-square. ARCH(1) is the chi-square tests for autoregressive conditional heteroscedasticity.



Source: A. Piatt Andrew, National Monetary Commission, Statistics, 1910.

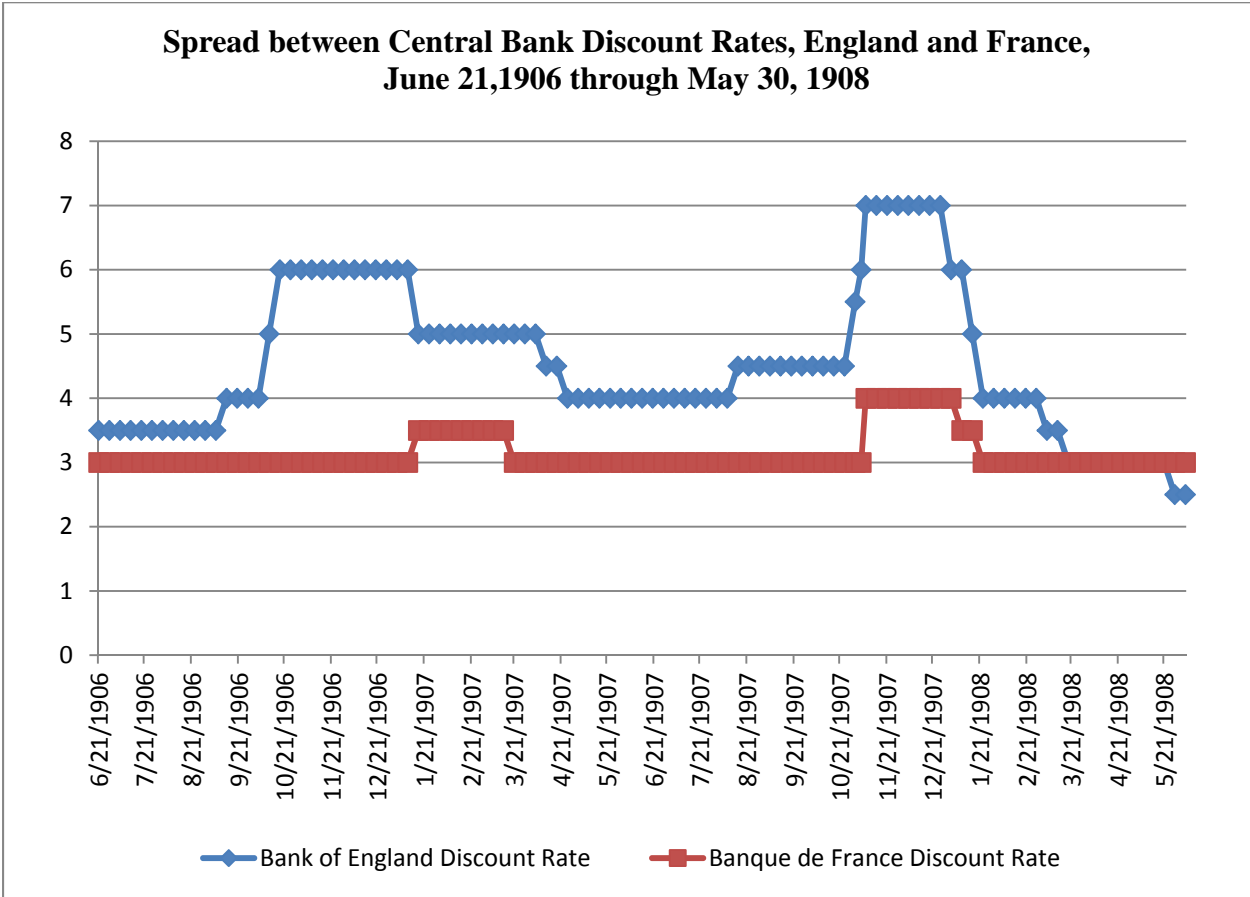
Figure 2: Franc/Sterling Exchange Rate, Weekly, April 11, 1907 to January 30, 1908



This figure portrays the parity of franc/sterling exchange at 25.225 francs per pound. The gold import point from the French point of view was estimated at 25.125 and prevailed when there was relatively little demand for sterling in France. The gold export point from the French point of view was estimated at 25.325 and prevailed when there was relatively more demand for sterling in France. At high exchange rates for sterling, a Frenchman purchasing goods from England might rather pay in gold rather than buy expensive bills of exchange on London. (See Westerfield, 1921, for a thorough discussion of bills of exchange and gold points.) As the American Panic unfolded after October 24, the exchange moved away from the French import point toward the French export point, signalling increasing market pressure to export gold to London.

Source: The Banker's Gazette section of the weekly editions of the *Economist* magazine, published in London. Par parity quoted each Saturday.

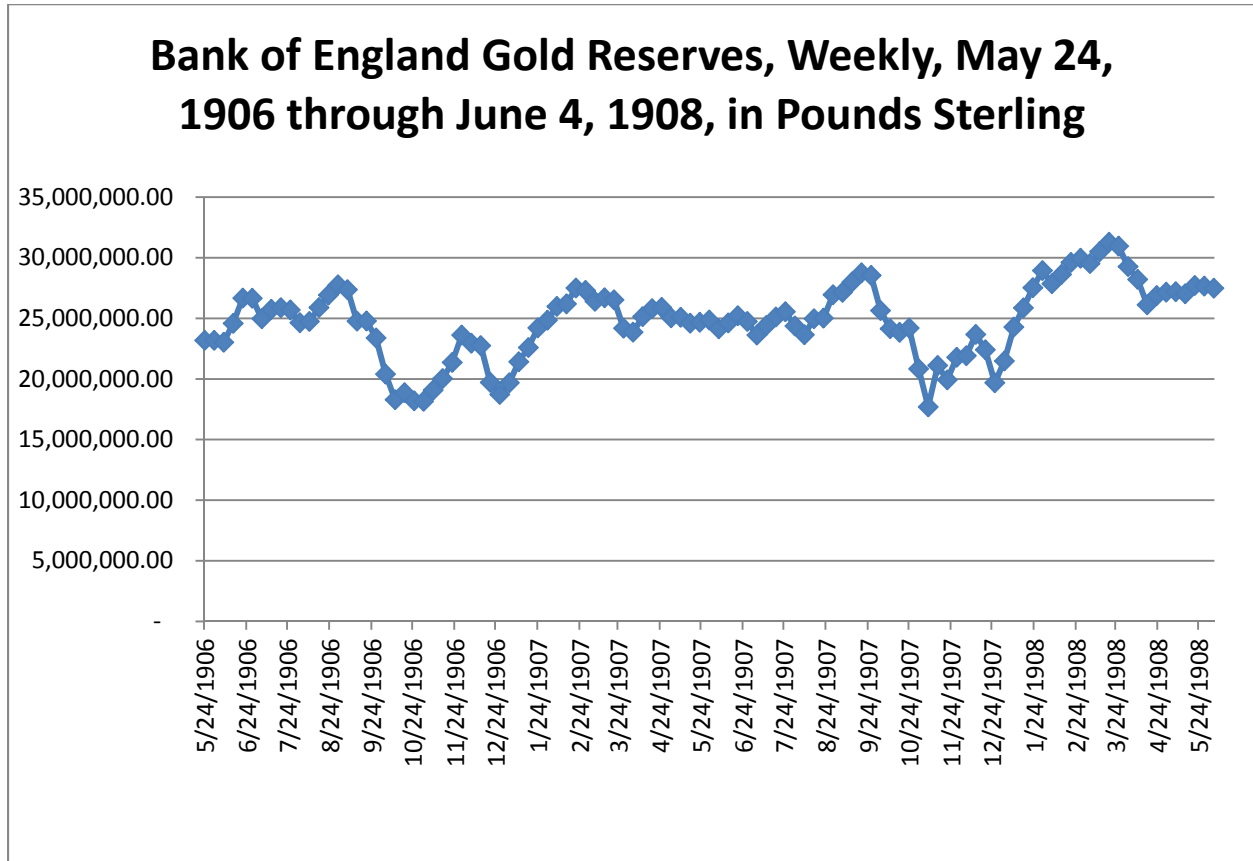
Figure 3: Spread between Official Discount Rates of the Bank of England and the Bank of France, June 21, 1906 through May 30, 1908



The French discount rate experiences much less volatility during the two years portrayed in this figure compared to the English discount rate. The spread between the two rates had been 300 basis points for several weeks in 1906 as well as it was in 1907, but in 1907, the absolute level of rates was higher in 1906, making it more expensive to transact international trade in 1907.

Source: The Banker’s Gazette section of the weekly editions of the *Economist* magazine.

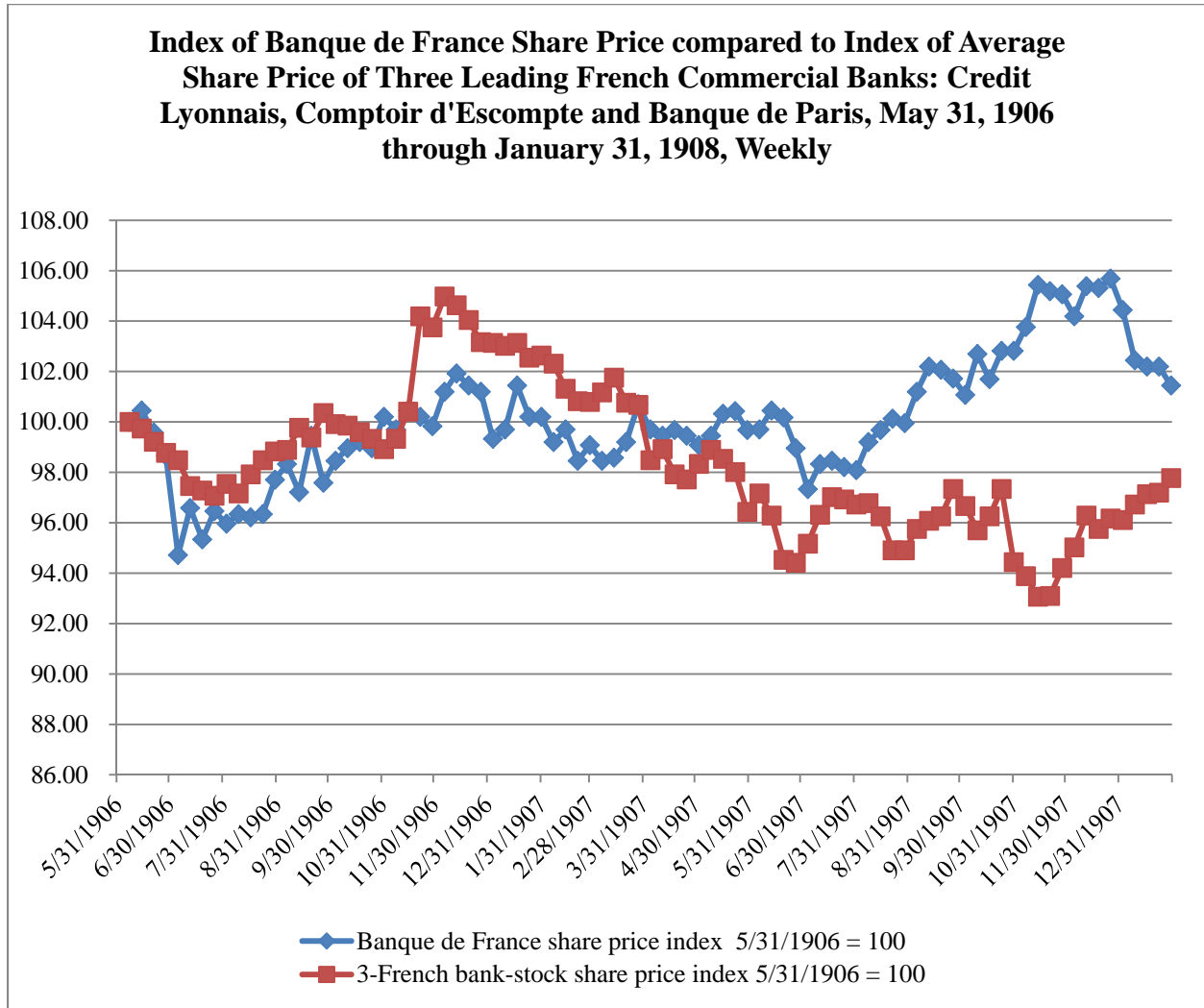
Figure 4: Reserves at the Bank of England, Weekly, May 24, 1906 through June 4, 1908



This figure portrays how the lowest point for the reserves of the Bank of England was reached on November 7, 1907. That day, the Bank raised its discount rate to 7% and borrowed about £3,000,000 from France in gold, and the reserves jumped during the following week of November 14. The graph shows, however, how the reserves started to decline again during the week ending November 21st. After the announcement by the Bank of France to ship eagles to the States, pressure seems to finally come of the Bank of England's reserves.

Source: The Banker's Gazette section of the weekly editions of the *Economist* magazine.

Figure 5: Spread between Index of Bank of France share price and Index of Commercial Banks share prices, Weekly, May 31, 1906 through January 31, 1908



An index of three major French commercial banks' stock prices is constructed and compared to an index of the stock price of the Bank of France. A spread opens up between the indexes, perhaps reflecting a "flight to quality" trade during the American financial crisis. Increasing uncertainty about whether the crisis might disrupt French banking might have prompted the widening of the spread. After incentives to export gold to the States and to London abate, (gold currency premium diminishes in New York and franc/sterling rate subsidies), the spread narrows, perhaps indicating improving confidence of market agents.

Source: The Banker's Gazette section of weekly editions of the *Economist* magazine

Figure 6. Anatomy of a Rescue Operation: Comparison of American Commodity Sale to France Before and After the Intervention of the Regents of the Bank of France

Typical Transaction:

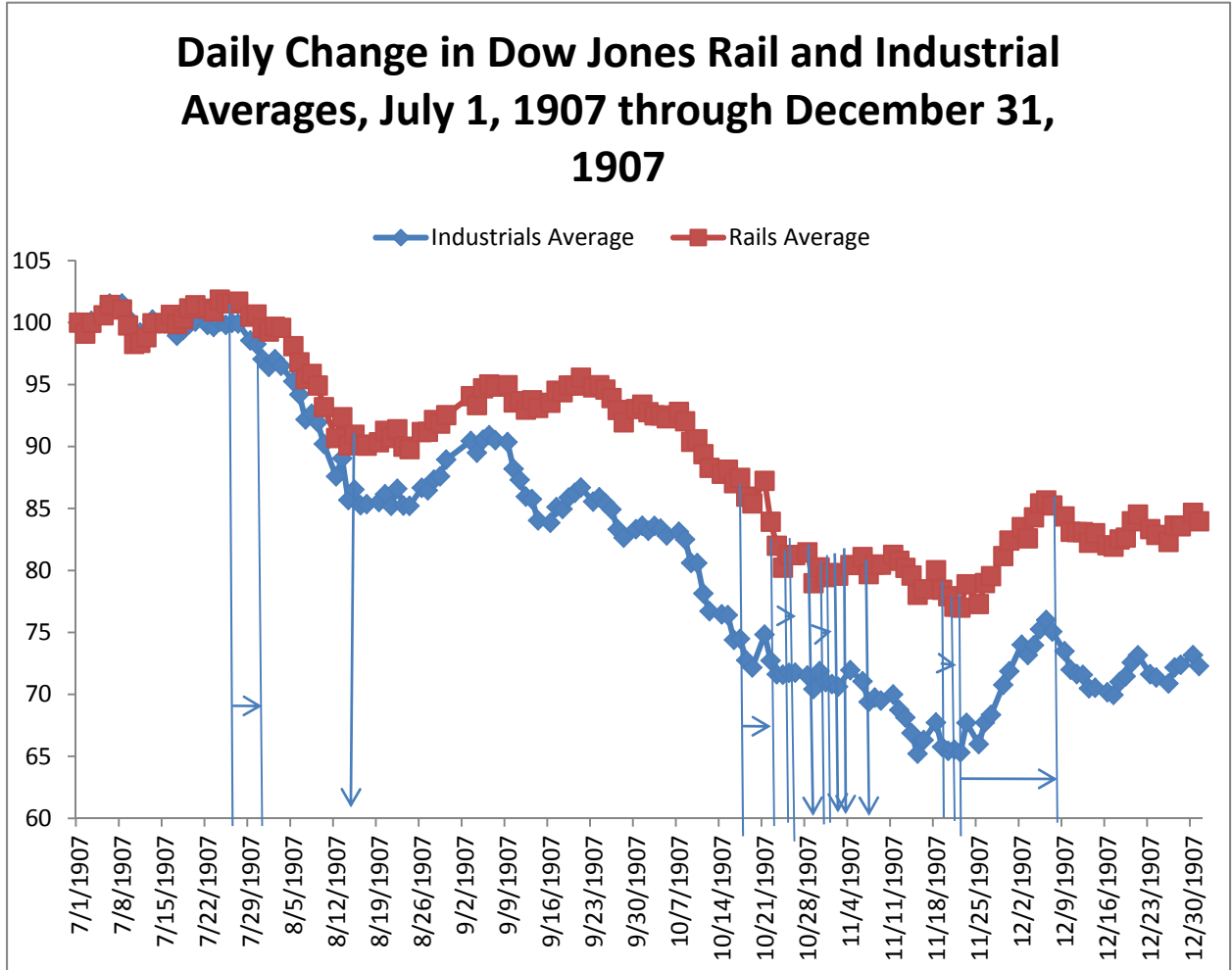
- American cotton grower draws draft on French buyer of American cotton and sells the bill to his bank for dollars.
- American banker sells the bill denominated in francs on the London bill market for sterling, adding downward pressure on franc/sterling exchange rate.
- American banker holds sterling balances at his correspondent English bank. He then can sell sterling exchange to anyone wanting to buy sterling.

Restructured Transaction by the Bank of France:

- American cotton grower draws draft on French buyer of American cotton and sells the bill to his bank for dollars.
- American banker sells bill to French merchant bank such as Lazard Freres
- Lazard takes bill to Bank of France and uses it to pay for gold eagle coins, purchased at a premium over parity of 0.6%
- Lazard ships gold eagles back to New York and deposits them into New York banks or sells them to interior banks.
- Supply of bills of exchange is reduced and downward pressure on franc/sterling exchange rate is reduced.

Source: Explanation of pre-WWI foreign exchange transactions (Westerfield, 1921).

Figure 7. Daily Change in Dow Jones Averages with Tested Events Superimposed



Seven events are superimposed on a graph of Dow Jones averages. Six events are depicted with horizontal arrows and one event is a grouping of the vertical arrows. Refer to either Section 2 or Section 8 of the article for event identification.

Source: Dow Jones Averages, Irwin Publishers, Homewood, IL 1986, ed. Phyllis S. Pierce

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