

**Liquidity Creation without a Lender of Last Resort:
Clearing House Loan Certificates in the Banking Panic of 1907**

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ABSTRACT

We employ a new data set comprised of disaggregate figures on clearing house loan certificate issues in New York City to document how the dominant national banks were crucial providers of temporary liquidity during the Panic of 1907. Clearing house loan certificates were essentially “bridge loans” arranged between clearing house members that enabled, and were issued in anticipation of, monetary gold imports, which took a few weeks to arrive. The large, New York City national banks acted as private liquidity providers by requesting (and the New York Clearing House issuing) a volume of clearing house loan certificates beyond their own immediate liquidity needs. While loan certificates were a temporary solution at best to the liquidity crisis in 1907, their issuance allowed the New York banks to serve their role as central reserve city banks in the national banking system.

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I. INTRODUCTION

Modern monetary economics associates lender of last resort activities with central banking. The United States during the National Banking era (1863-1913) had no central bank and lacked a reliable way to increase the stock of high-powered money quickly. Yet during the Panic of 1907 the six largest national banks in New York City collectively and intentionally engaged in lender of last resort activities, without a statutory mandate or formal institutional arrangements to enable them to do so. Through the New York Clearing House, the big six national banks borrowed clearing house loan certificates assets used for settling clearing balances among Clearing House member banks, to provide liquidity for the entire New York money market in amounts that clearly exceeded their own private needs. The New York Clearing House by approving the loan requests and the big six banks by borrowing the loan certificates acted as a private lender of last resort during a financial crisis.

We focus on the liquidity providing behavior of the big six private nationally chartered banks-- National City, National Bank of Commerce, First National, National Park, Hanover, and Chase National.¹ The six biggest banks in New York City account for the majority (over 70 percent) of the clearing house loan certificates issued by member national banks in 1907, whereas they provided just over half the loan volume of New York City national banks. The big six banks were crucial for clearing inter-regional

¹ These banks comprised nearly 60 percent of the total assets of New York City national banks in 1907. See Table 1 for additional evidence on the extent of the big six bank dominance of New York City financial activity.

payments; they were storehouses for interior bank deposits and accounted for nearly 80 percent of the net liabilities to banks (banker deposits in New York City banks) held by New York City national banks.² In 1907, it was essential that the largest New York City national banks requested clearing house loan certificates from the Clearing House because the aggregate resources of the other, smaller banks were likely insufficient to provide the credit necessary to generate the liquidity to alleviate a crisis.³ The large, national banks in New York City were the only participants with the resources sufficient to affect aggregate liquidity conditions.

We examine clearing house loan certificates issued during the Panic of 1907 among New York Clearing House member banks by exploiting underutilized data that list the borrowing bank identity, the loan amount, the issue date, and the retirement date of loan certificates. Current research, to our knowledge, has not examined such high frequency data for clearing house loan certificate issues at the borrower level. We emphasize the high frequency time series behavior of the data because the rapid issue of a large quantity of clearing house loan certificates was an important and necessary response to quell the panic.

² We have not determined the proportion of banker balances held by New York City national banks that were deposits by smaller, non-New York City banks. The deposits placed in New York City national banks by other, usually smaller national banks in the interior of the country qualified as legal reserves for the smaller national banks. Some of the New York City national bank deposits were those of New York City trust companies, which qualified as reserves for trusts.

³ Clearing house loan certificate issues were also in the best interest of the large banks, in order to avoid liquidating extensive amounts of loans, especially those in call loans on the New York Stock Exchange. The dominance of the large national banks in New York City in 1907 offers a contrast to an observation from the issuance of clearing house loan certificates in 1873 in New York City. In 1873, banking assets in New York City were not as highly concentrated and the big national banks required cooperation from a large number of smaller banking organizations to ensure sufficient loan certificate issuance.

The severe crisis in 1907 required a rapid liquidity infusion to quell the turbulence in the financial market. The issuance of clearing house loan certificates was the only mechanism available to increase quickly the supply of a substitute for specie and legal tender in final payment transactions among clearing house members. That substitution would allow the release of cash and specie (in small amounts) to the general public. The loan certificates helped prevent the need for costly liquidation of bank assets, like call loans – short-term demandable loans backed by stock or bond collateral -- in order to satisfy cash withdrawal demands or unfavorable clearing balances.

Clearing house loan certificates were, however, only a temporary provision of credit. For a more durable solution, the financial system required gold inflows to restore bank reserves to the legal requirements, but there was a time lag between the arrangement for gold import and the arrival of the gold. It was not until late in December of 1907 before monetary gold arrived in New York City at a dollar volume comparable to the volume of clearing house loan certificates outstanding. The clearing house loan certificate issues were effectively “bridge loans” that enabled the borrowing banks to finance the importation of monetary gold.

The Panic of 1907 precipitated an extreme financial stringency that altered the typical movements of notable high-frequency data, like short-term interest rates and currency premiums, spikes in which are interpreted as indicators of financial market distress. We find that the first issues of clearing house loan certificates coincide with spikes in such indicators of financial market distress. Within several weeks of the clearing house loan certificate issues, the only notable moderation among these indicators was in the interest rate on call money loans, stock market loans backed by the collateral

of the purchased stock. A return to pre-panic conditions among other indicators of financial distress took place only after the dollar volume of gold inflows surpassed \$100 million, the restrictions or partial suspension of cash payments was lifted, and the vast majority of clearing house loan certificate issues were paid off and cancelled.⁴

II. BACKGROUND ON CLEARING HOUSE LOAN CERTIFICATES

a) Clearing house credit extensions to borrowing banks

During financial panics, New York City banks and other financial intermediaries faced a widespread increase in demand for cash from individual depositors and from interior banks that held deposits with New York City banks. To adapt to the absence of a formal lender of last resort the New York Clearing House banks, as early as 1860, used an artificial settlement device – the clearing house loan certificate – as a mechanism to provide settlement media for use among Clearing House member banks as an alternative to cash and specie. Cannon (1910), Myers (1931), as well as modern authors describe the institutional development of clearing house loan certificates during the National Banking Era.^{5 6}

The process for issuing clearing house loan certificates relied upon the New York Clearing House and began with its decision to issue them. First, the Executive Committee of the New York Clearing House would agree that financial conditions warranted the issuance of clearing house loan certificates, which were perceived as an aggregate response to limited cash liquidity. Clearing house loan certificates were issues

⁴ Goodhart (1969) makes a similar observation about the crucial role of gold inflows to end the crisis.

⁵ Cannon (1910) describes the use of Clearing House loan certificates in 1860 and throughout the panics of the National Banking Era (see pages 75-115). Myers (1931, pages 98-100) notes also that a similar temporary liquidity enhancing technique was used in 1857.

⁶ Specie refers to precious metal (silver and gold) coinage.

of credit – paper notes that were tradable among clearing house members, but non-negotiable in the private economy -- extended by the New York Clearing House to member banks who requested them. The borrowing bank placed collateral (commercial paper, bills receivable, as well as stocks and bonds) with the New York Clearing House in order to borrow clearing house loan certificates up to 75 percent of the market value of the collateral.⁷ Following the decision to issue clearing house loan certificates, the Executive Committee would form a loan committee comprised of representative members who had the obligation to monitor the quality of collateral that was offered by member bank borrowers of clearing house loan certificates.

Clearing house loan certificates were costly to issue; in 1907, the borrowers of clearing house loan certificates paid a 6 percent annual rate of interest to the holder of the certificate. The payment of interest made the certificates desirable for banks to hold, and the certificates traded at par with gold and legal tender among Clearing House banks. Clearing house loan certificates were issued in 1907 as an intentionally temporary supplement to liquidity, which had a limited time to maturity ranging from one month to three months. However, after maturity the borrower faced progressively rising penalty interest rates that were designed to hasten loan repayment (expiration or cancellation). In terms of volume, the New York Clearing House issued over \$80 million in clearing house loan certificates, which was substantial when compared to New York Clearing House

⁷ The collateral assets that backed the clearing house loan certificate issues were heavily discounted in order to minimize the potential losses from clearing house loan certificates that could not be terminated by the borrowing bank. Cannon (1910 page 119) suggests that in 1907, about 73 percent of the collateral was commercial paper and the other 27 percent was stock, bonds and short-maturity railroad notes. We have verified this finding in a primary source from the reports of the New York Clearing House Loan Committee; Cannon was the chairperson of the committee.

member bank reserve holdings that hovered around \$250 million around the time of the panic.

The New York Clearing House played the role of intermediary for the credit extension and ensured that the borrower paid the interest charge to the holder of the clearing house loan certificate. Among other unique characteristics, the clearing house loan certificates were explicitly liabilities of the New York Clearing House, that is, the loans were backed by the collective assets of the Clearing House member banks, rather than backed by the specific assets pledged as collateral from the borrowing bank.⁸

Clearing House loan certificates were then used by the borrowing banks as substitutes for cash and specie in settling clearing balances among members at the Clearing House. Clearing house loan certificates allowed cash used for settlement to be freed up to satisfy other banking needs, such as meeting depositor withdrawals and financing additional loans without additional reserve assets. Given the interest payment, it was possible that a receiving bank may have held a clearing house loan certificate in its vault to accrue interest. Similarly to clearing balances, vault cash could also be freed up and used to satisfy demands from depositors.

While the certificates were a close but imperfect substitute for reserve assets, they were not a close substitute for legal tender. It was illegal to use the Clearing House loan certificates as hand-to-hand currency or a cash substitute in any other transaction. The big six banks, nevertheless, engaged in liquidity-enhancing actions despite binding restrictions on the powers of the New York Clearing House. For example, the New York

⁸ Gorton and Huang (2001, 2002) infer that the Clearing House loan certificates, as general liabilities of the Clearing House, were a form of deposit insurance because the depositor who accepts these loan certificates in exchange for his or her deposits is exchanging a claim on a single bank for a claim on general assets of the Clearing House (the coalition of banks in general). See also Gorton and Mullineaux (1987).

Clearing House was legally prohibited from printing currency, and it was unable to sell or buy bonds in quantities comparable to modern open market or discount window operations. There was no legal mandate for the issuance of clearing house loan certificates during crises, and therefore, they could not serve as legal reserves. Unlike the discount window, which is always available, the Clearing House Committee had to convene and then decide if conditions warranted the authorization of loan certificates. These restrictions distinguish the New York Clearing House from modern central banking institutions. Still, the New York City national banks and their use of clearing house loan certificates resembled central bank injections of temporary liquidity as observed today in periods of extreme liquidity demands.⁹

b) Literature on clearing house loan certificates

Research on liquidity provision during National Banking Era (1863-1913) financial crises highlights the aggregate issuance of clearing house loan certificates by the New York Clearing House. Specifically, these works focus on the aggregate issuance, the amount used in private transactions, and the duration of their existence as well as their use as a device to increase liquidity temporarily (see Andrew 1908, Cannon 1910, Timberlake 1978, 1990, Gorton 1985, and Gorton and Mullineaux 1987).

As early as Andrew (1908) and Cannon (1910), economic analysis of clearing house loan certificates centered on their use as a substitute for cash and for reserves, and Cannon noted that the currency available was essentially increased by the full amount of the clearing house loan issue. Other astute contemporary economists, most clearly

⁹ See McAndrew and Potter (2002) for a detailed description of activities of the Federal Reserve discount window function during the week of 9/11.

Maurice Muhleman (1908) and O.M.W. Sprague (1910), viewed the decision to issue clearing house loan certificates by the New York Clearing House as a crucial action necessary to avert a more serious consequence: the costly premature liquidation of illiquid assets, and the potential collapse of economic activity from an inability to complete financial transactions. Sprague (1910, page 271) notes “Clearing house loan certificates were at length authorized, enabling the banks to meet the local situation, and to an even greater extent than in the past, they served this purpose effectively.”

Muhleman (1908) provides a contemporary view of clearing house loan certificates:

By means of the clearing-house certificates they (New York clearing house banks) were enabled to increase the loans, instead of demanding payment; such demands would inevitably have aggravated the evil and precipitated serious disasters. The loans were expanded for three distinct purposes: to finance the importation of gold, to enable the furnishing of cash to interior banks; to relieve interior banks of loans (probably speculative), in the center, which they were anxious to get rid of; and to enable the security market to have some means to check the ruinous fall in prices, particularly of bonds, which had set in. By supplying loans at reasonable rates, the fall was restricted. (Muhleman 1908, page 191)

Timberlake (1984), Gorton (1985), and Gorton and Mullineaux (1987) describe and analyze the actions taken by the New York Clearing House (as well as other important Clearing House associations) to alleviate financial stress during the National Banking Era (1863-1913) crises, highlighting the temporary infusion of liquidity provided by the issues of clearing house loan certificates.

Gorton and Mullineaux (1987) emphasize that the liquidation of call loans, or any other illiquid asset, would be costly for banks, and the Clearing House loan certificates were a mechanism to liquefy, temporarily, a discounted amount of illiquid assets.

Timberlake (1984) provides a detailed description of the process that the Clearing Houses used to issue the certificates. Timberlake (1984, 1990) as well as Gorton (1985) emphasize the central banking role of private Clearing Houses during the crises of the national banking era.¹⁰ In these works, the arguments support a central banking-like interpretation of the Clearing House actions and emphasize the widespread demand for cash withdrawals as the main determinant for requests for clearing house loan certificates.

III. CLEARING HOUSE LOAN CERTIFICATES DURING THE PANIC

We use newly available data on clearing house loan certificates issued to member banks in New York City following the onset of the Banking Panic of 1907 to demonstrate the crucial role that the big six national bank actions played in generating liquidity for the call loan market and bank payment clearing (see APPENDIX I). The data are extracted from the daily minutes of the New York Clearing House Sub-Committee on Clearing House loan certificates. They list the amount of the loan, the value of securities pledged as collateral for the loan, the date issued, and the bank to which the loan is issued. We match the clearing house loan certificate data with balance sheet measures for the set of national bank members of the New York Clearing House taken from the August 1907 call reports of the United States Office of the Comptroller of the Currency. In addition, we collect call report data for the big six New York City national banks for the call reports on December 3, 1907 and February 14, 1908 available from the records of the New York Clearing House. Further, we use weekly aggregate numbers for New York City national

¹⁰ Separately, Taus (1943) and Timberlake (1990) describe how the United States Treasury engaged in central banking functions.

banks from the National Monetary Commission (Table 4, page 258 in Andrew 1910) to assess the balance sheet conditions of the New York City financial market between call dates. The call reports contain the standard balance sheet information for each of the big six banks, while the weekly National Monetary Commission data have aggregate numbers for national banks operating in New York City for loans, net deposits (net liabilities to banks plus individual deposits), bank note circulation, and reserves (the sum of specie and legal tender).¹¹ Finally, we compare the weekly clearing house loan certificate issues with the net gold inflow figures taken from Andrew (1910) page .

Chart 1 displays net liabilities to banks of individual Clearing House member national banks in New York City relative to the total net liabilities of banks of Clearing House member national banks in New York City. We plot this data series along with clearing house loan certificate issues per bank relative to total clearing house loan issuance of Clearing House member national banks in New York City. The distributions for both data transformations are skewed, which reflects the enormous influence of the big six banks in both these activities. The big six New York City national banks account for more than 2/3 (\$53M of \$74M) of the aggregate amount of clearing house loan certificates issued to national bank members of the New York Clearing House in 1907.¹² These banks were also the most important providers of deposit services for interior banks, holding nearly 80 percent of net deposits from banks (net liabilities to banks) at New York City national banks calculated from the August 1907 call report and listed in Table

¹¹ The weekly numbers are totals for New York Clearing House member banks so they do not correspond exactly to the call report data for New York City national banks.

¹² We examine only the national bank members of the New York Clearing House at this time because we do not possess the balance sheet data for the Clearing House member state banks in New York City. The inclusion of state bank information would contribute only \$10 million more of the clearing house loan certificate issues, and should not affect inferences about the influence of the big six national banks.

1. The funds from bank deposits were used to extend call loans at the stock market. As mentioned above, the onset of panic made the rapid issuance of clearing house loan certificates important to prevent the undesirable premature sale of illiquid collateral.

Chart 2 presents the accumulation of clearing house loan certificate issues to Clearing House members in New York City for the first week after the New York Clearing House agreed to issue them on October 26, 1907. The total bar includes state chartered intermediaries as well as the national bank members.¹³ The big six national banks account for more than half of the initial issues of clearing house loan certificates.¹⁴ The large-scale clearing house loan subscription taken by National City Bank is also noteworthy because the bank intended to enter the autumn of 1907 in a significantly liquid position. Clearing house loan certificates added to National City Banks' ability to increase its loans during the panic.

Contemporary observers knew that New York City national banks went far below their required reserve ratio of 25 percent during the Panic of 1907. Muhleman (1908, pages 191-192) shows that New York Clearing House member banks had \$267 million in reserves on October 19, 1907, and the level of reserves fell to \$216 million on November 23, 1907. The timing of the reserve loss, however, is important to note. By October 26, 1907, New York Clearing House member bank reserves had only fallen to \$254.7 million, a modest loss of slightly over \$12 million. By the week of November 2, 1907, the reserves fell to \$224 million, a notable \$30 million loss of cash reserves that pushed

¹³ We do not include the state bank member Clearing House loan certificates for the remainder of the analysis because we lack the balance sheet data for the state bank members.

¹⁴ One of the big six, Hanover Bank, took out no Clearing House loan certificates. The Hanover Bank President, James Woodward, became the chairman of the executive committee of the New York Clearing House as of October 1, 1907, and it was this committee that decided to issue Clearing House loan certificates and determined the collateral requirements for each issue. Hence, the incentives and the potential perception of a conflict of interest provide an institutional explanation for the lack of Clearing House loan certificate requests from Hanover Bank. See Wicker (2000, page 98).

New York Clearing House banks below their required reserve levels. Chart 3 displays reserves of New York Clearing House member banks along with clearing house loan certificate issues. The timing of the reserve decline lines up with the increase in clearing house loan certificate issues. Chart 4 displays weekly estimates of the amount that reserve levels were below reserves required to support net deposit levels, and compares them with the level of clearing house loan certificate issues. In addition, we display the sum of clearing house loan certificate issues and the reserve deficiency as a proxy for net reserve supply to New York City national banks. When we add the level of clearing house loan certificates to the reserve deficiency at national banks, we in effect apply the volume of clearing house loan certificates as reserve substitutes. Interpreted in that way, the volume of clearing house loan certificate issue helps explain why the national banks were less concerned with cash drains throughout the panic.

Financial market indicators of distress spiked upward immediately as the panic conditions struck New York City. The high-frequency (daily) observations let us assess the effect of the timing of clearing house loan certificate issues on the financial market stress indicators and relevant measures of bank liquidity. Table 2 displays indicators of financial distress observed during the weeks following the onset of the panic, such as the ranges for exchange rates on deposits in New York City offered at Chicago and St. Louis, the “currency premium” (the premium value of cash over deposit balances) observed in New York City, the call loan interest rate, and the effective reserve deficiency among New York City national banks.¹⁵ The peak distress in the stock market, measured by the interest rate on call loans, took place in the week of October 26, 1907 prior to the issue of

¹⁵ Data on the cash premium in New York City and on the range of call loan interest rates were taken from Table 29, page 136 in Andrew (1910). Domestic exchange rates were from Table 15, page 217, Andrew (1910). The reserve deficiency is taken calculated from the weekly aggregate numbers described below.

clearing house loan certificates. However, the peak premium for currency in New York City on a weekly frequency was November 16, 1907, and ranged from 2.5 to 4 percent. Exchange premiums on balances in New York traded in Chicago and St. Louis at near their peaks for the weeks November 16 and 23, 1907. The relation between these financial market distress signals and the issue of clearing house loan certificates was notable, but it is also clear that the issue of clearing house loan certificates was not an immediate palliative to the market unease. The additional injection of liquidity from clearing house loan certificates helped to maintain transactions activity (stock trading volume) in the stock market, and likely reduced the call loan interest rate directly. These outcomes were clearly important for the large, New York City national banks. Nearly 1/3 of the loans by the big six national banks were allocated to call loans on the stock market.

a) Timing of Clearing House Loan Certificate Issues

The largest net outflow of cash reserves from New York City Clearing House banks took place in the week immediately following the New York Clearing House decision to issue clearing house loan certificates and to restrict the convertibility of deposits into cash. The timing of these events is important because the clearing house loan certificates provided a substantial volume of a near-substitute clearing balance medium. The use of clearing house loan certificates in the clearing process and the acceptance of them by other Clearing House member banks in lieu of legal reserve assets allowed the Clearing House members to release cash from New York City. These cash outflows were thereby less threatening to the liquidity of the financial markets and the payments system. Hence, clearing house loan certificates, as pseudo-reserves,

imperfectly substituted for cash (as settlement balances) and thereby partially alleviated the liquidity deficiency.

New York City national banks increased their levels of deposits and loans during the panic at the same time that their reserve balances were run down. These banks were required to hold reserves at the level of 25 percent of their net deposit levels, but they violated this requirement throughout the Panic of 1907. Chart 5 displays the changes from week to week in specie and legal tender, in clearing house loan certificates, and in loans at New York Clearing House member banks for the weeks of October 19, 1907 through November 30, 1907. The chart illustrates how the decline in reserve assets (specie and legal tender) coincides with the increase in clearing house loan certificates and in loans. By the end of November, sizable inflows of gold were arriving and adding to bank reserves, which leads to the next section.

b) The Big Six New York City National Banks

The call report balance sheet data indicates a net contraction of cash reserves at the big six banks from August 22, 1907 to December 3, 1907 of nearly \$27 million (\$16.7 million in specie, \$9.9 million in legal tender). Despite a contraction in cash reserves among the big six banks, these banks borrowed nearly twice that amount (\$53 million) in clearing house loan certificates.¹⁶ The big six banks also increased their loans over this period by over \$40 million, some of which funded an increase in loans on call (see Muhleman 1908, page 193).

Chart 6 presents the changes in the specie component of reserves at the big six banks individually using call report dates (there were five call dates per year) from

¹⁶ The total reserve loss for New York City over the period may have exceeded \$50 million See the weekly statements on the aggregates for New York City national banks Table 4, page 258 in Andrew (1910).

December 3, 1907 to February 14, 1908. Over this period, total net increase in specie held at the big six banks increased by \$48.2 million, whereas the maximum clearing house loan certificate issue outstanding for these same banks was \$53.2 million. The chart displays changes in specie to the volume of clearing house loan certificates that the big six banks took out from the Clearing House. First, the specie reserves increased across all six banks from December 1907 to February 1908, even at Hanover Bank, which took no clearing house loan certificates.¹⁷ Aside from Hanover Bank, the specie reserve increases display positive co-movement with the level of clearing house loan certificates taken by each bank. In two cases, First National Bank and Chase National Bank, the totals of clearing house loan certificates and net specie increase is almost the same dollar amount. The observable co-movement between clearing house loan certificate issues and the change in specie reserves observed between the call report dates is consistent with the interpretation that clearing house loan certificates were like “bridge loans” in anticipation of subsequent gold inflows.¹⁸

Goodhart (1969) emphasizes the role of gold inflows to alleviate the cash shortage during the Panic of 1907. Essentially, the stock of high powered money in the United States hinged on the domestic stock of monetary gold. Following Goodhart’s lead, we describe the relationship between net gold inflows and clearing house loan certificates using data listed in Table 3 and displayed in Chart 7. Table 3 shows the accumulation of net gold imports into New York City starting from October 12, 1907. The accumulation of net gold inflows had reached just over \$39 million by November 23, 1907, which was also the week in which the New York City national banks faced their largest reserve

¹⁷ As the President of Hanover was also the president of the Clearing House Association that year, we suspect that he felt compelled to refrain from issuing loan certificates owing to conflict of interest concerns.

¹⁸ Muhleman (1908) quoted above suggest that clearing house loan certificates enabled the gold imports.

deficit in this period -- \$54.15 million. At the same time, clearing house loan certificates were at their maximum weekly level outstanding at \$84.9 million. Clearing house loan certificates and accumulated gold inflows crossed on December 28, 1907, when net gold inflows exceeded clearing house loan certificates outstanding. For New York City national banks, the reserve deficit became a surplus in the week of January 11, 1908, when the accumulation of net gold inflows exceeded \$100 million, and clearing house loan certificates outstanding were just under \$70 million. By the end of the sample, the gold inflows approach their maximum and the reserve positions of the big six banks are likely approaching the conditions that are reflected in the February 14, 1908 call report.

Chart 8 displays a time series of weekly net gold inflows to New York from January 1902 to December 1908. The shaded area indicates the Panic of 1907. Net gold inflows during three months of the panic (November and December of 1907 and January 1908) were the largest observations of net gold inflows observed over that period.¹⁹

Muhleman (1908) page 110 describes the amount of gold and cash that flowed into the New York City national banks, and infers the gross amount of cash that flowed out of New York City. Paraphrasing Muhleman, between October 19 and December 31, the US Treasury contributed about \$46 million, gold imports added about \$85 million, and New York national banks added about \$20 million of their own notes, adding to a total of about \$151 million, yet reserves were \$24 million lower at the end than at the beginning of the period.²⁰ Muhleman's analysis suggests that cash hoarding by interior country banks from New York City banks approached \$200 million. Hoarding behavior

¹⁹ Using the weekly series on legal reserves in New York City national banks to normalize the level of gold flows does not alter this inference significantly.

²⁰ See Muhleman (1908) page 110.

imposed costs on banks, and likely suggested another reason for the New York City national banks to reconsider the viability of a status quo response to banking crises.²¹

c) The concentration of payments in New York City

Focusing on the behavior of the Big Six banks is important, for by 1907 they had become the nation's clearinghouse for interregional payments. Under the National Banking System, New York City national banks, as central reserve city banks, were the key depositories for the reserves of reserve city and country national banks. Deposits, or bankers' balances, held in New York City national banks were counted by the Office of the Comptroller of the Currency as official reserves for the interior national banks. As a result, the New York City national banks faced an increase in demand for its cash and liquid assets whenever the financial markets faced a widespread contraction. Clearing house loan certificate issuance was the only mechanism available to the New York banks to create a temporary increase in liquidity that could enhance reserves and thereby provided a temporary expansion of liquidity. Clearing House loan certificates allowed standard flows of payments to take place despite a crisis.

By 1907, there was increased concentration of banker balances at the biggest six national banks in New York City. Sprague (1910, page 232) notes that in 1873, the biggest seven New York City national banks held about 30 percent of New York City banker balances; by 1907, the biggest six national banks held over 75 percent of banker balances held in New York City. The increased concentration of banker deposits in New

²¹ See Wicker (2005) and Moen and Tallman (1999) for a further examination of the banking reform movement that followed the panic.

York City national banks signaled the rising influence of the big six banks in the inter-regional payments system at that time.²²

During the National Banking Era, the New York City banking and financial markets were the most important centers for intermediation activity. In terms of transactions and payments, the large New York City banks were essential in coordinating payments between domestic businesses as well as international payments. As the post-bellum US financial market evolved, James and Weiman (2005) describe how interregional payments centralized in New York City. Banks and firms throughout the entire United States exchanged claims on New York City national bank balances, thereby making New York City almost the national clearing house for payments. The New York City financial markets, most notably the equity markets, were central for allocating liquid capital throughout the United States.²³ These observations, the latter one shared by both contemporary and present day economists, highlight how the decisions of the New York City national banks, mainly the big six New York Clearing House member banks, were central for the development and growth of the US economy at the turn of the 20th century.

IV. DISCUSSION

²² In periods when Clearing House loan certificates were issued, Cannon (1910, page 79) describes how banks took out Clearing House loan certificates “as a patriotic movement” that all member banks should embrace “for the welfare of the community as a whole” as opposed to other motives. The notable contrast in 1907, noted by Cannon (1910), was that only 60 percent of New York Clearing House member banks took out Clearing House loans, compared to nearly complete participation in previous episodes. The concentration of regional deposits in the big six banks by 1907 likely contributed to the lack of full participation by smaller (national) banks in Clearing House loan certificates. Smaller banks relied on the larger banks that had more resources as well as more incentives to preserve the system. See Sprague (1910, pages 233-34) for further detail.

²³ Muhleman (1908, pages 117-18) also highlights the central role of New York City national banks in the payments system.

The New York Clearing House decision to issue Clearing House loan certificates was a public announcement, one that ensured that banks were aware that a temporary liquidity infusion was imminent. Also, the payment of 6 percent interest to the holder of the clearing house loan certificate made it a desirable asset to hold by Clearing House member banks. In contrast, it was a costly liability to take on for the borrowing bank because of that 6 percent interest cost. As a result, the marginal value of the clearing house loan certificates in use clearly exceeded the 6 percent interest cost.²⁴

During the Panic of 1907, the issues of clearing house loan certificates demonstrate how coalitions of private banks turned illiquid loan portfolios into liquid claims as discussed in Gorton and Huang (2002). Clearing house loan certificate issuance was an intentional (and temporary) increase in base money liquidity. It was intentional because the Clearing House Committee chose to form a clearing house loan committee, whose sole purpose was to evaluate collateral and issue clearing house loan certificates to member borrowers.

The credit expansion in the form of clearing house loan certificates maintained and supported the intermediation activities of the big six New York City banks, those banks that were crucial for the operation of the payments system. Those same banks were also crucial for the operation of the stock market, because they were key providers of liquidity for the call loan market. During the Panic of 1907, the big six banks faced two crucial risks. The first risk was asset value risk – the big six bank loan portfolios were over 30 percent comprised of call loans, and thereby faced the risk that the stock market values backing the loans would fall. Given the sharp decline in stock market

²⁴ Interest rates on commercial paper, a market less liquid at that time than the call loan market, were over 7 percent throughout the panic months. The maturity of commercial paper was between 3 to 6 months.

values, it was possible that the collateral values fell below the outstanding loan value. The second risk was withdrawal risk, the largest component arising from their substantial holdings of banker balances. Combining these two risks arising for each side of the balance sheet, the big six banks faced immense challenges during banking panics to maintain adequate liquidity to support both a functioning capital market and an effective payments system. As a result, the same big six banks had the highest likelihood of borrowing clearing house loan certificates from the Clearing House.

As the largest banking institutions in the country, the preservation of a functioning payment system was in their best interest. Clearing house loan certificate issues were the only readily available tool to address the volume of final payment media during the crisis. The New York City national banks requested a volume of clearing house loan certificates in excess of their net banker balance contractions. Here, the requests by the big banks for large issues of clearing house loan certificates ensured an adequate reserve supply for the entire payment system, not just their own balance sheet needs. The excess provision of clearing house loan certificates as reserve substitutes reflected the credit enhancement and liquidity creation activity of the private, New York Clearing House coalition, actions that resemble functions normally associated with central banking activity.

Clearing house loan certificates can be interpreted as “bridge” or emergency loan provisions in anticipation of gold inflows, and this interpretation is consistent with earlier research (Muhleman 1908, Goodhart 1969). In addition, the distress signals from the financial market conveyed through the premium on cash in New York City, the premium on New York City balances within cities in the interior US, and the reserve deficit among

New York City national banks suggest that the crisis was not quelled by clearing house loan certificate issues alone. Gold shipments to New York City from overseas were an essential ingredient to fostering a return to calmer financial conditions.

Foreign creditors shipped gold to the United States because of their strongly held perception of the credit-worthiness of the New York City banks and of the US financial system more generally. These certificate issues were credible to the public only because there was ample credit available from overseas markets from which gold could be imported. International bankers overseas shipped gold to the United States because market participants overseas believed that the US would remain on the gold standard. Participants in overseas markets also perceived that the financial system in the United States was in disarray, but essentially solvent (as was the New York City financial market).

V. CONCLUSIONS

The National Banking System suffered recurrent financial crises because of constraints on the system's ability to increase liquidity quickly. The system endured these crises, though, despite the absence of an explicit central bank having lender of last resort powers that could transform illiquid debt issues, such as bank loans and debt securities, into more liquid media like currency and specie. During financial panics, Clearing House associations frequently voted to issue clearing house loan certificates as a temporary mechanism to increase the availability of cash (currency, legal tender and specie), to disburse additional cash to satisfy depositor withdrawal demands (both individual and bank) and to allow the additional cash to enter into the non-financial

sectors of the economy. Large-scale reserve outflows from New York City national banks increased in October 1907 and the issuance of clearing house loan certificates may have been the only means to increase the effective supply of high powered money quickly that was under the explicit control of the New York Clearing House.

As holders of nearly 80 percent of banker balances held in New York City national banks, the big six banks faced the risk of large-scale withdrawal of cash reserves from the depositor banks. The big six national banks in New York City borrowed the predominant amount of clearing house loan certificates that enabled them to send cash to the interior and prevent call loan contractions during the panic. However, the volume of clearing house loans certificates issued to the large, New York City national banks exceeded the net contraction in banker balances that they faced, which we interpret as an intentional increase of liquidity to the financial system well beyond the needs of the Big Six banks. In this way, the New York Clearing House acted as a private lender of last resort to increase aggregate base money temporarily during the panic.

Clearing house loan certificates were only partially responsible for the moderation in financial market signals of distress and in fact may have only been a vestigial solution. The importance of net gold inflows to quell the panic has been emphasized by Muhleman (1908) and Goodhart (1969). Our findings indicate that the main contribution of clearing house loan certificates was to make credit available temporarily on the New York Stock Exchange at levels sufficient to maintain transactions on the capital market. A return to normal financial conditions relied upon the complete removal of restriction on the convertibility of deposits into cash and the cancellation of outstanding clearing house loan certificates among New York City banks. These decisions were made only after an

accumulated net inflow of gold was sufficient to return the New York City national banks to reserve levels above their legal requirements.

APPENDIX I: DATA

Data for Clearing House Loan Certificate Issues taken from the Minutes of the Clearing House Loan Committee of the New York Clearing House from October 26, 1907 through March 21, 1908. These data were initially compiled by Elmus Wicker. Verification and additional data on cancellations compiled by Ellis Tallman during a visit to The Clearing House, 100 Broad Street, NYC, New York, January 30 and 31, 2007.

Weekly frequency data on New York Clearing House member bank loans, net deposits, and specie and legal tender balances taken from 'Weekly Statements of New York City Clearing House (member) Banks', pages 258-259, Table 4, from Edwin W. Kemmerer, *Seasonal Variations in Demands for Currency and Capital*, Government Printing Office, Washington, D.C. 1911.

Data on weekly call loan interest rates, premiums on currency in New York City. Table 29, pages 136-137, Abraham Piatt Andrew, *Statistics for the United States*, Government Printing Office, Washington, D.C. 1911.

Weekly frequency data on gold imports and exports, Table 10, pages 173-176, Part III, *Statistics on Money, Gold Supply, Foreign and Domestic Cash Money, and Rates on Foreign and Domestic Exchange*, Andrew, *Statistics for the United States*.

Data on domestic exchange rates for balances held in New York City, Table 15, pages 217-218, Part III, *Statistics on Money, Gold Supply, Foreign and Domestic Cash Money, and Rates on Foreign and Domestic Exchange*, Andrew, *Statistics for the United States*.

Data in appendix on industrial production is from Jeffrey Miron and Christina Romer (1991) "A New Monthly Index of Industrial Production, 1884-1940." *Journal of Economic History*, 50, 321-38.

Data for the stock market index and call and commercial paper rates are from Frederick Macaulay, *Some Theoretical Problems Suggested by the Movements of Interest Rates, Bond Yields and Stock Prices in the United States since 1856*, New York: National Bureau of Economic Research, 1938.

APPENDIX II: THE STORY OF THE PANIC OF 1907

The Panic of 1907 was precipitated by an unusual sequence of events including unwritten but effective restrictions placed as barriers to the free flow of capital to the United States (by the Bank of England). The Bank of England restricted the issue of American finance bills issued in London typically done in anticipation of the arrival of U.S. agricultural shipments. The restrictions were apparently in response to gold outflows from England to the U.S. in 1906, in part caused by the actions of Treasury Secretary Leslie Shaw in his attempt to stem an impending domestic U.S. crisis. Secretary Shaw subsidized the cost of importing gold into the U.S. from abroad by agreeing to pay the shipping costs, thereby lowering the effective gold shipping point. The gold outflows from England exacerbated an already significant gold drain from England to the US as a result of insurance payments to San Francisco policy holders by Lloyds of London (see Odell and Weidenmier 2004). The 1906 drain of gold from England nearly caused a panic in London. Tallman and Moen (1998) emphasize the irregular gold flows in 1907 arising from the Bank of England's policy, and emphasize that there was no quick substitute for gold with another form of base money stock. Without an adequate increase of base money, bank credit in New York City was constrained and this was especially problematic heading into the autumn harvest and shipping season.

Various culprits have been offered as the underlying causes of the Panic of 1907. The financial crisis was largely a result of the combination of the existing financial rigidities, the external constraints on base money growth, and hence, restricted growth in

credit and deposits along with the decline of stock market asset values throughout 1907 and flattening or stagnating growth in real activity. The more flamboyant, proximate cause was the failed attempt to corner the stock of United Copper by Augustus M. Heinze and Charles W. Morse.²⁵ The Heinze-Morse affair involved several banks owned by Heinze, some of which were members of the Clearing House, which then bankrolled the stock corner gambit. Promptly following the notorious failure, the New York Clearing House removed Heinze and his accomplices from the banking industry; Heinze and Morse resigned from all their banking interests. The New York Clearing House promised to support member banks and the banks were either liquidated at par or more commonly the management was entirely replaced. These actions took place during the week of October 14, 1907, and there were no notable or widespread disruptions to banking activities in New York City in that week. The lack of activity was not surprising because the Heinze Morse banking interests totaled only \$71 million in assets, relative to the aggregate of \$1.4 billion in New York City national banks.

THE PANIC OF 1907 IN DATA

The Panic of 1907 reached a crisis stage on October 21, 1907 following the announcement by the National Bank of Commerce (one of the big six national banks) that it would no longer act as clearing agent for the Knickerbocker Trust company, the third largest trust companies in New York City. Depositors lined up to withdraw their deposits from Knickerbocker Trust, forcing it to suspend operations on the following day, October 22, after it paid out more than \$8 million in cash to depositors. The total assets of

²⁵ See Strouse (1999), Tallman and Moen (1991), or Woods (2004, Chapter 9). Of the Heinze-Morse banks, the Mercantile National Bank was likely the most important, and its management was replaced by the New York Clearing House.

Knickerbocker Trust were not so large to precipitate a panic. However, the closure came about without assurances from the New York Clearing House, which indicated a distinction between Clearing House member banks and non-member trust companies.²⁶ On the following day, Trust Company of America was stricken with a sharp increase in depositor withdrawals, and an ad hoc committee of J.P. Morgan, James Stillman, and George Baker coordinated efforts to stave off a further spread of financial panic. On October 24, the call loan money interest rate spiked to over 100 percent, an indication of the lack of liquidity in the New York City financial markets. By Saturday, October 26, 1907, the New York Clearing House committee agreed to issue clearing house loan certificates in response to the panic conditions.

Several general features of the economy and the financial market distinguished the 1907 panic from the previous boom years. Studentski and Kroos (1963, page 252) refer to the Banking Panic of 1907 as an “exclusively banking” panic, because the source of the crisis arose from financial market activities, and hence differed from the previous financial panics during the national banking era.²⁷

We use several monthly data series to emphasize one main conclusion: that there was an increase in the demand for liquidity for which the financial system at the time had no simple mechanism to satisfy.

Chart A1 displays the monthly stock market index value of the Cowles Commission along with the monthly Industrial Production Index (Miron and Romer 1991) from January 1900 to December 1909. The stock market index peaked prior to 1907, whereas the IP index peaks closer to the time of the panic and the two series reach

²⁶ For discussion of the isolation of trust companies in New York City, see Moen and Tallman (2000).

²⁷ See Moen and Tallman (1992, 2000) and Wicker (2000).

local nadirs in late 1907. The stock market index declined by over 45 percent from November 1906 to November 1907, and the IP index contracted over 30 percent from December 1906 to December 1907.

The decline in stock market values likely limited the use of stock market equity as collateral for loan and may have affected interest rates. Chart A2 displays the 6 month commercial paper interest rate along with the call money loan interest rate, monthly averages from January 1900 to December 1909. The call money rate was the interest rate charged by banks on demandable loans to brokers on the stock market. These loans were collateralized by stock equity at a discount, usually 80 percent of the equity value. On October 24, 1907, during the most intense period of the panic, the call money interest rate hit 125 percent at an annual rate. The October monthly average call money interest rate was over 20 percent, whereas the peak commercial paper rate was 7.83 percent in December 1907, up from 5.44 in June. These sharp spikes in interest rates coincide roughly with the steep declines in the stock index and the industrial production indexes.

The sharp spike in interest rates and the sharp fall in stock market values indicate a liquidity shortage and one might expect to see a coincident shortage in cash reserves in New York City. Chart A3 displays the weekly aggregate net deposits and reserves of New York City national banks from January 5, 1907 to December 28, 1907. This chart illustrates the sharp decline in reserve assets and a rise in net deposits from October 19 to November 2, 1907 at the onset of the panic. These charts show a sharp decline in stock values, industrial activity, and New York City national bank reserves at the same time there is a sharp increase in interest rates.

Chart A1: Stock Market Index versus Industrial Production Index

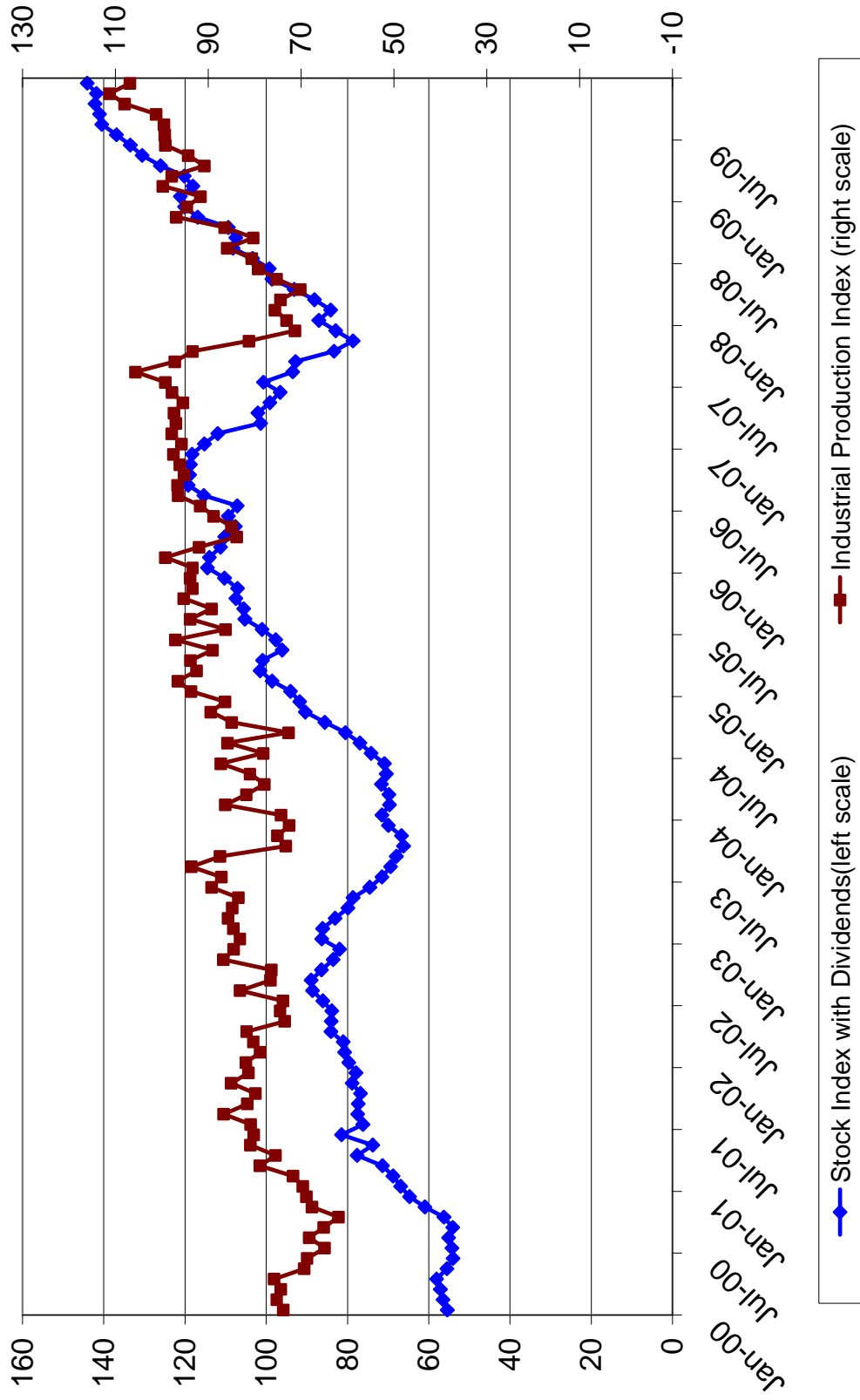


Chart A2: Short-term Nominal Interest Rates

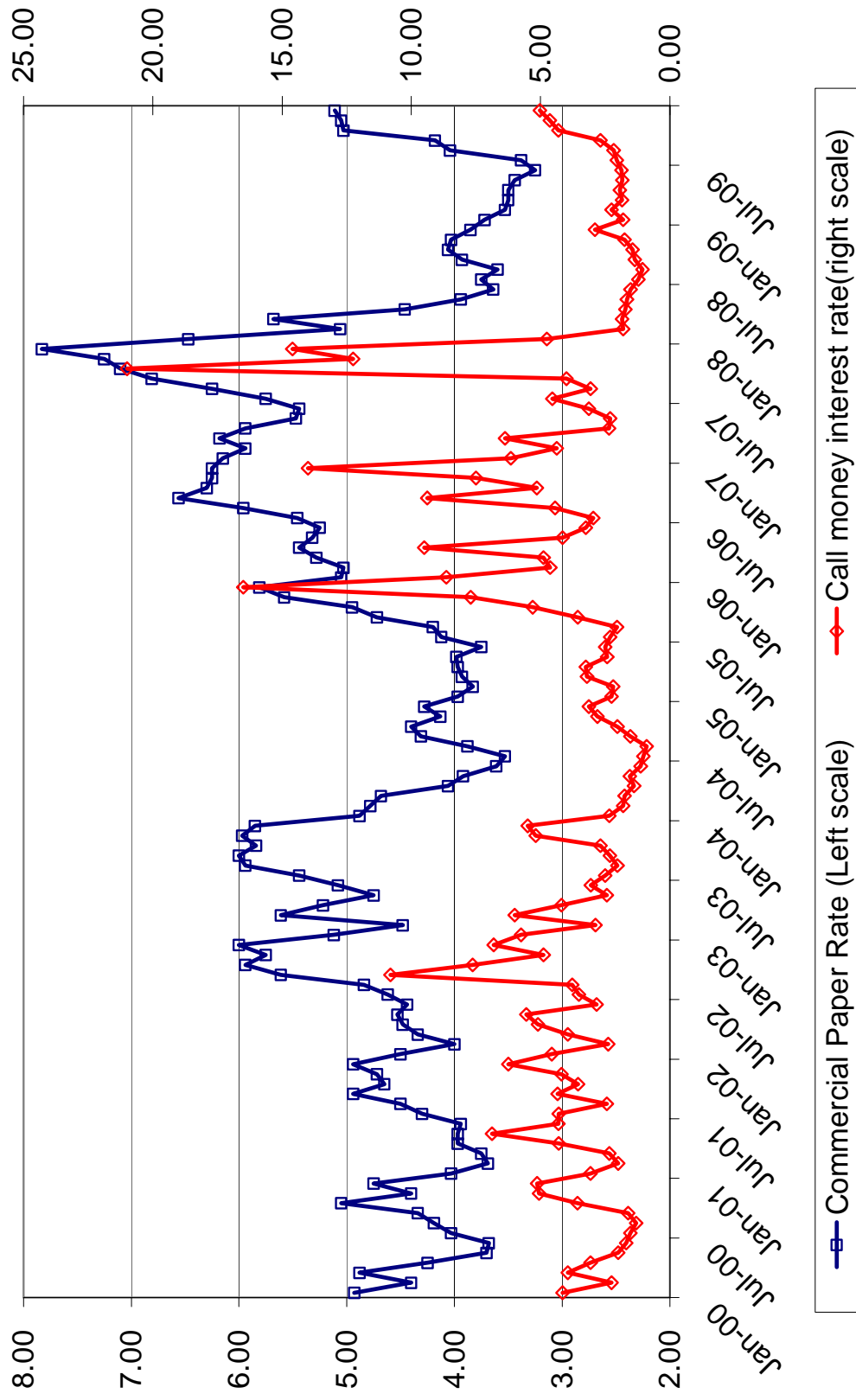
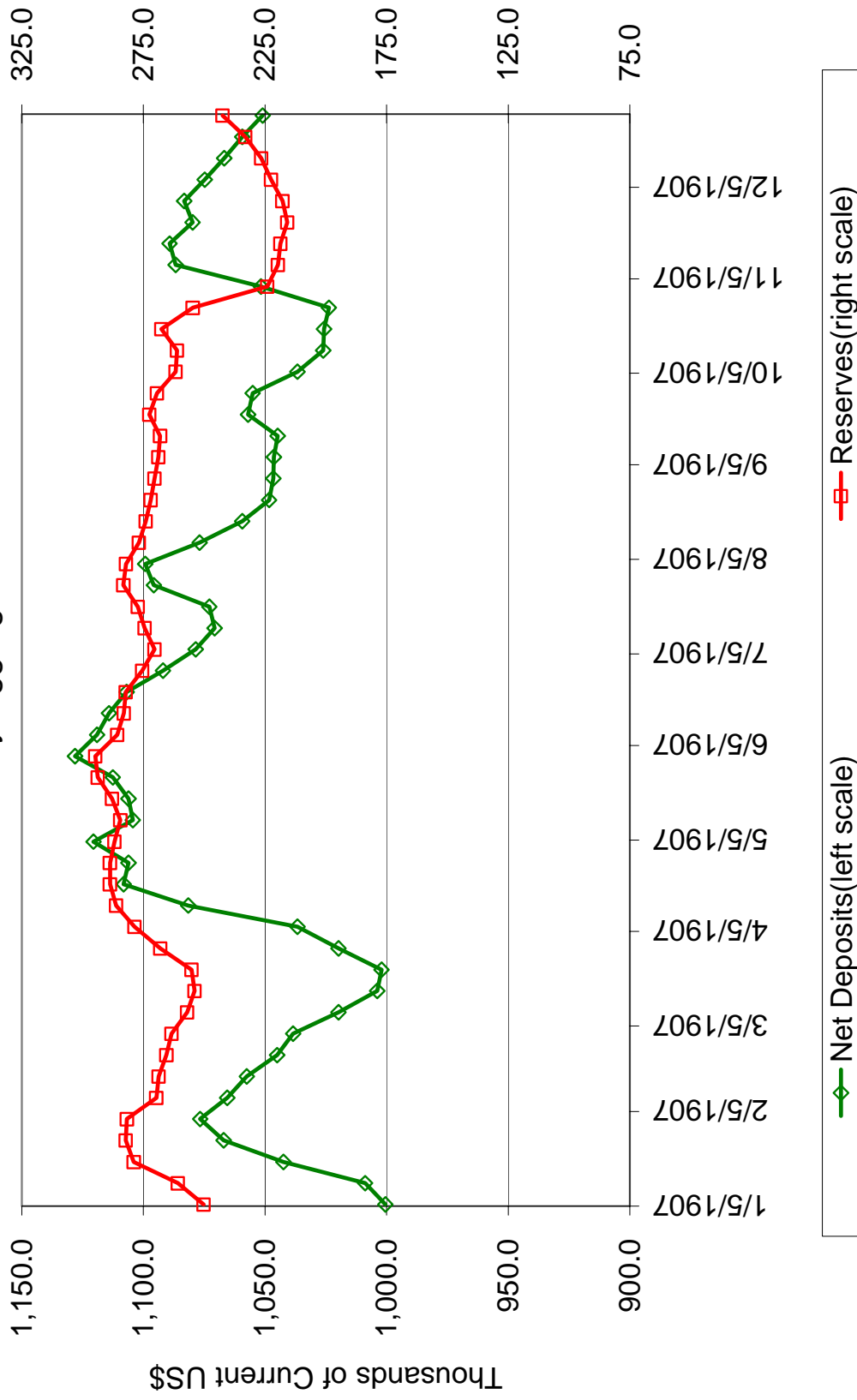


Chart A3: New York City National Banks in 1907
Weekly Aggregates



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Table 1: Aggregates from National Bank Balance Sheets – Report of the Comptroller of the Currency
As of August 22, 1907 (In Millions)

Balance Sheet Item	Aggregate New York City National Banks	Big Six New York City National Banks	Big Six as Percentage of all New York City National Banks	Aggregate of National Banks in United States
Loans	771.042	417.384	54.13	4678.584
Loans to (Due from) banks (deposits by these national banks held at other banks)	188.894	102.954	54.5	614.496 (reserve agents) 334.571 (other NBs) 123.020 (state and other) 1072.087 TOTAL
Lawful money	218.786	139.916	63.95	531.108 (specie) 170.516 (legal tender) 801.624 TOTAL
Reserve Ratio	26.0	26.3		16.52
Individual deposits	532.709	285.408	53.58	4319.035
Due to banks (deposits by other banks held at these National banks)	498.031	349.485	70.17	823.680 (national bank) 38.139 (reserve agent) 337.927 (trust and saving) 395.745 (state bank) 1595.491 TOTAL
Net liabilities to banks	309.137	246.531	79.75	523.404
Total Resources	1425.704	836.696 (10% US total)	58.7	8390.328

Table 2: Financial Market Indicators of Distress

Week ending:	Cash balances in New York City						Currency Premium		Call Money Rate			Reserve Deficit
	Chicago		St. Louis		New York City		low	high	low	high	In millions US \$	
	low	high	low	high	low	high						
1907-42	-0.2	0.15	-0.6	0.35	0	0	2.25	10			11.175	
1907-43	-0.25	0.1	-2	0.15	0	0	5	125			-1.225	
1907-44	-0.25	0	-0.3	3.25	1	3	3	75			-38.825	
1907-45	0	2.5	2.5	6.5	1	4	4	25			-52	
1907-46	0.25	2.5	4	8	2.5	4	5	15			-53.725	
1907-47	1	2.5	6	7.5	1.5	3.5	3.5	15			-54.15	
1907-48	1	2	2	7	0.75	1.75	3	12			-53	
1907-49	0	1.5	2	5.5	0.5	2	3	13			-46.2	
1907-50	0	0	4	6	0.5	1.5	2	25			-40.1	
1907-51	-0.5	-0.1	3	5.25	0.5	1.25	6	17			-31.75	
1907-52	-0.5	0.5	2	3.5	0.25	1.25	6	25			-20.225	
1908-1	-0.4	0.6	1	1	0.125	0.375	5	20			-11.6	
1908-2	-0.5	0.3	-0.75	0.75	0	0	2	9			6	
1908-3	0.25	0.5	-0.75	0.75	0	0	2.5	6			22.6	
1908-4	0.15	0.5	-0.25	0.75	0	0	1.5	3			37.1	
1908-5	0.25	0.3	-1	0.4	0	0	1.5	2			40.5	

Emboldened numbers denote observations indicating substantial financial distress.

Table 3: New York Financial Market Indicators of Distress and Monetary Quantities

Week	Currency Premium		Call Money Rate		Net Gold Imports	Accumulated	Net Outstanding	Includes Gold	Reserve Deficit
	low	high	low	high					
	New York City								
42	0	0	2.25	10	0.018	1.3	11.175		
43	0	0	5	125	-1.285	16.61	-1.225		
44	1	3	3	75	-1.765	57.235	-38.825		
45	1	4	4	25	5.508	72.095	-52		
46	2.5	4	5	15	26.619	80.185	-53.725		
47	1.5	3.5	3.5	15	39.032	84.885	-54.15		
48	0.75	1.75	3	12	55.578	84.595	-53		
49	0.5	2	3	13	69.389	86.97	-46.2		
50	0.5	1.5	2	25	78.856	87.32	-40.1		
51	0.5	1.25	6	17	84.560	87.865	-31.75		
52	0.25	1.25	6	25	88.675	86.495	-20.225		
1	0.125	0.375	5	20	97.763	80.815	-11.6		
2	0	0	2	9	101.390	68.345	6		
3	0	0	2.5	6	101.938	24.12	22.6		
4	0	0	1.5	3	102.313	6.65	37.1		
5	0	0	1.5	2	103.095	5.555	40.5		
Emboldened numbers denote observations indicating substantial financial distress.									
Net Gold Imports, New York Clearing House Loan Certificates, and Reserve Deficit are calculated in millions of US dollars.									

Chart 1: Net Liabilities to Banks and Clearing House Loan Certificates:
Relative to their Aggregate Totals for New York City National Banks

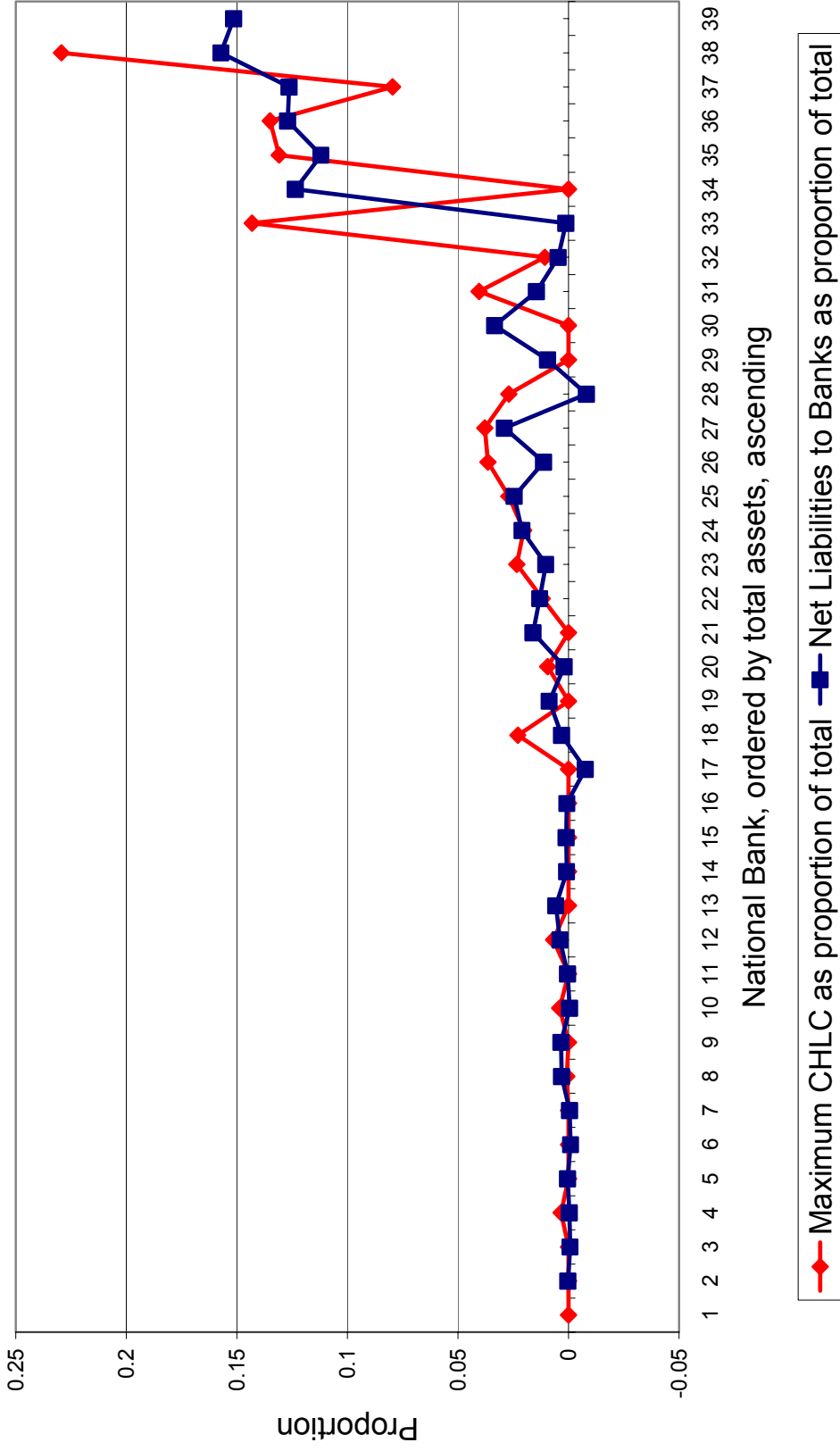
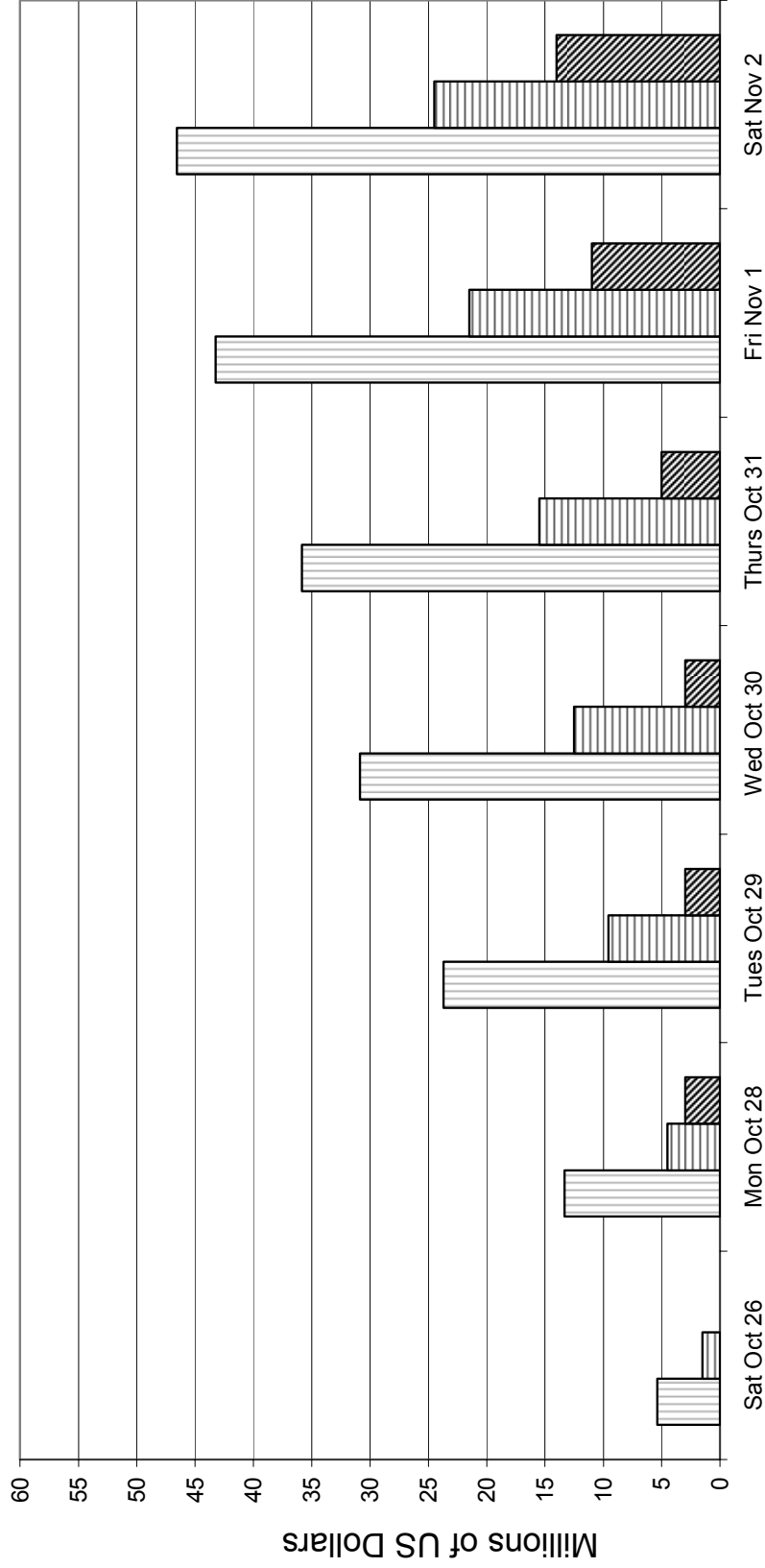


Chart 2: First Week of Issuance: New York City
Clearinghouse Loan Certificates



October 26, 1907 to November 2, 1907

□ Amount Outstanding ▨ Big Six ▩ National City Bank CLCs

Chart 3: New York City Clearing House Member Reserves versus Clearing House Loan Certificate Issues

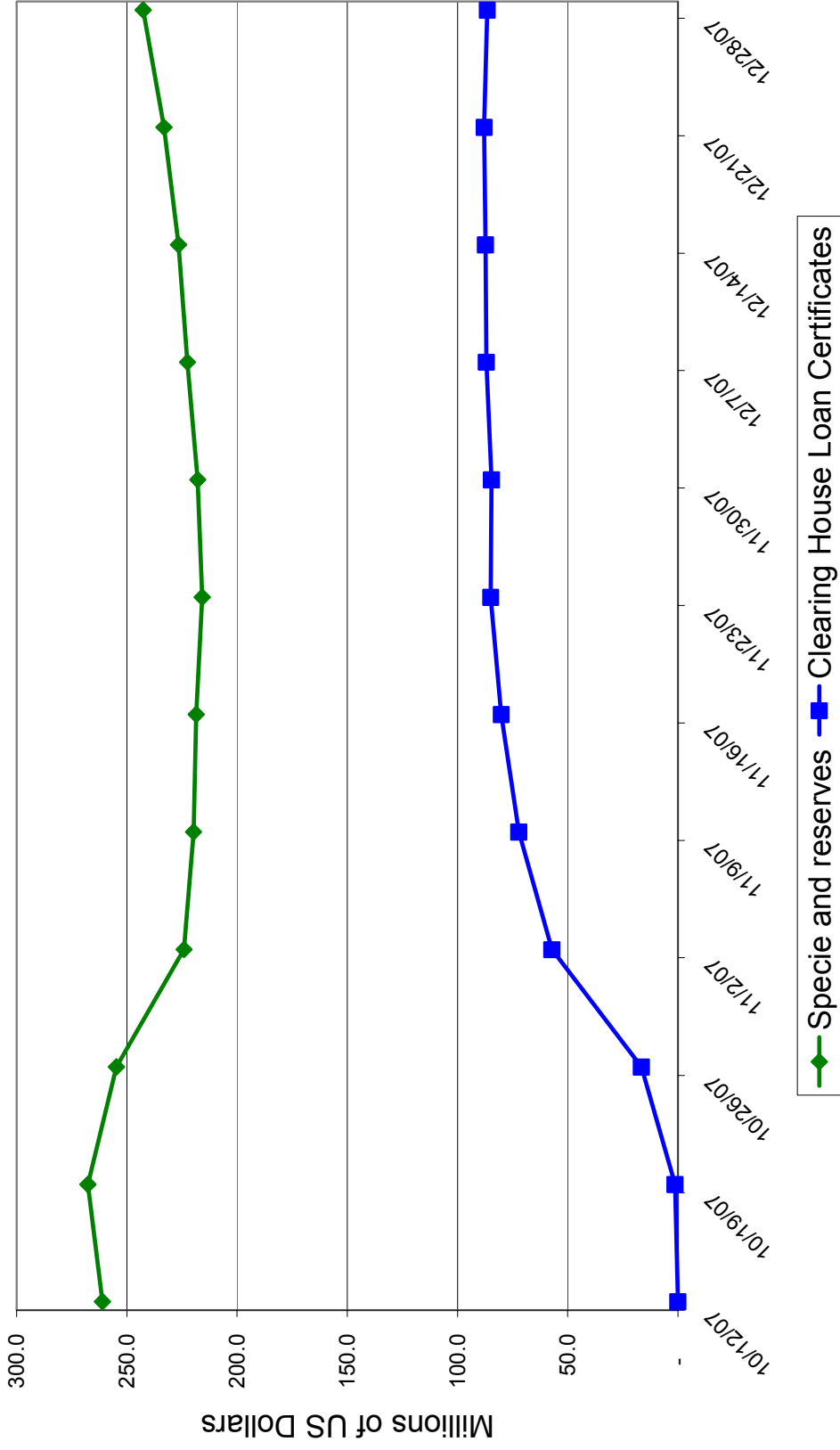


Chart 4: Reserve Deficiency and Clearinghouse Loan Certificate Issues

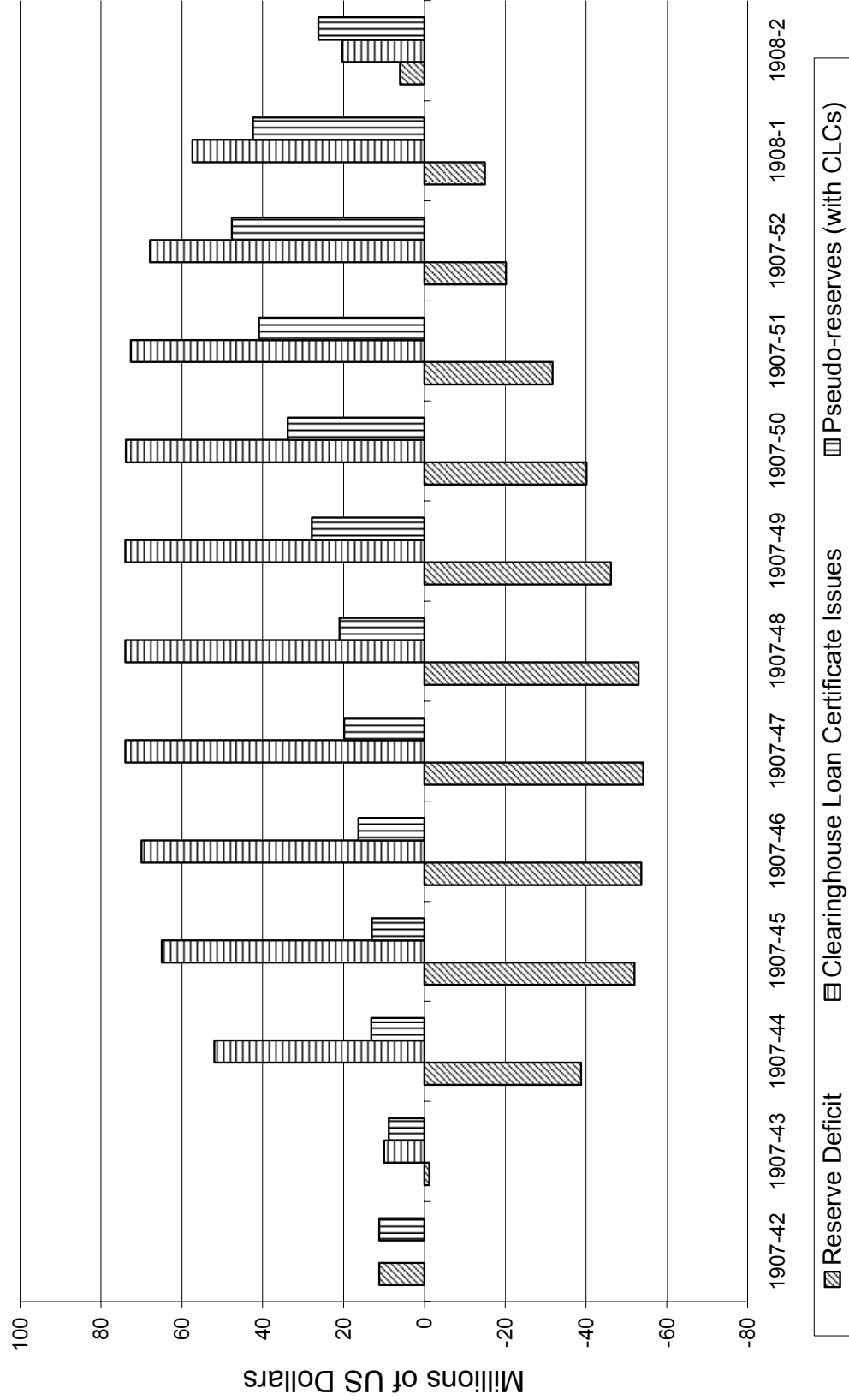


Chart 5: New York Clearing House Member Bank Balance Sheet Items

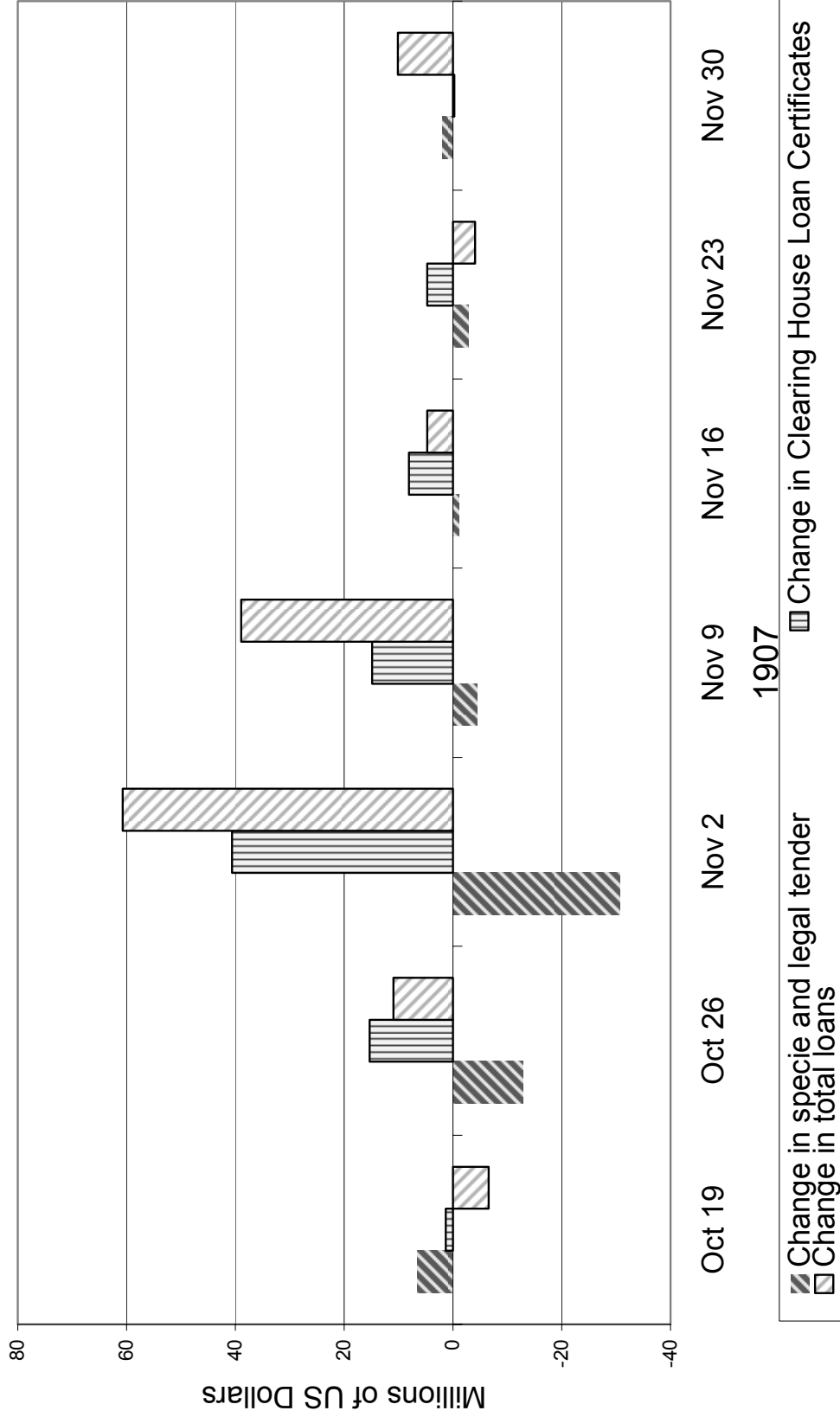


Chart 6: Clearinghouse Loan Issues and Subsequent Change in Specie-based Reserve Assets

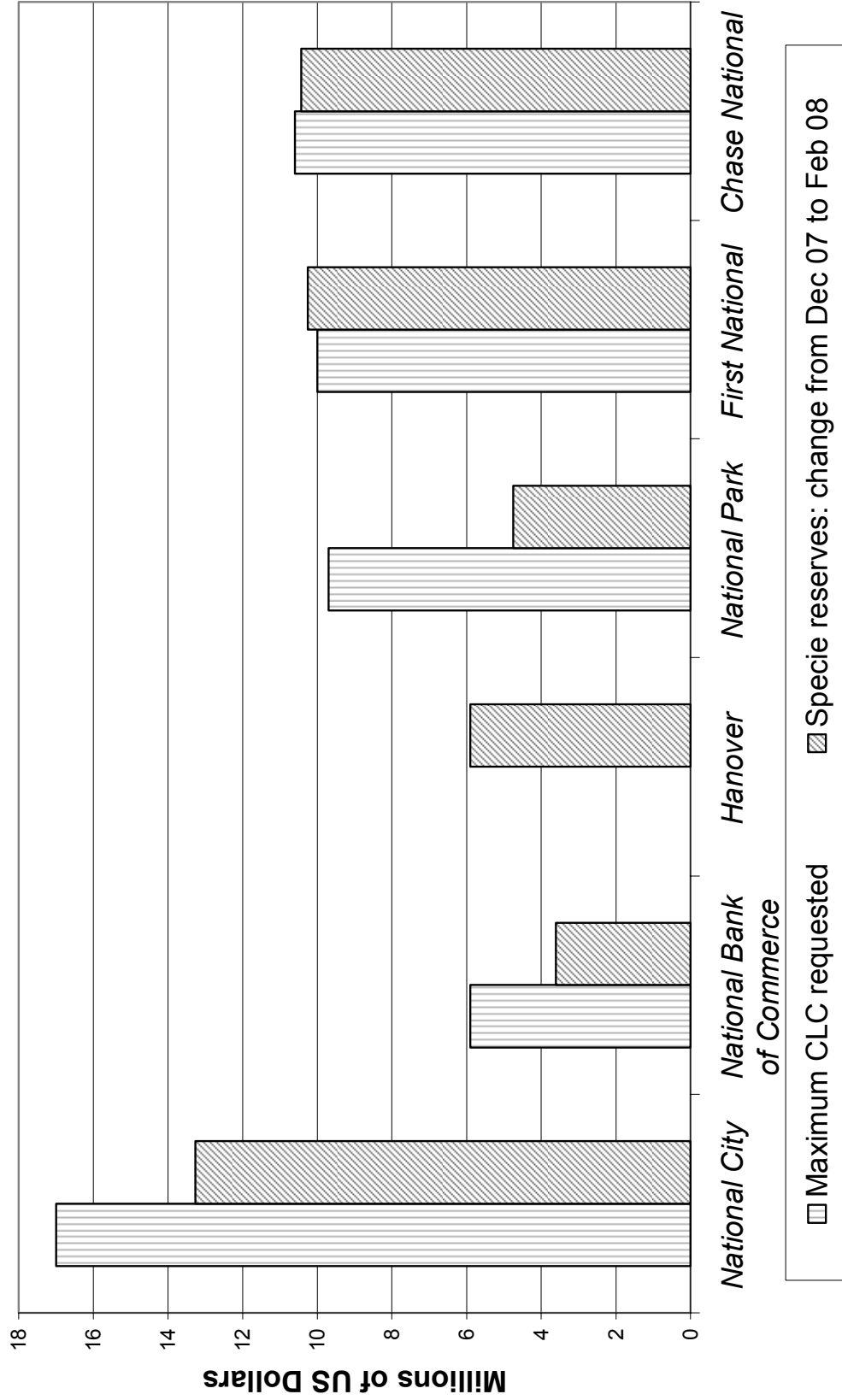


Chart 7: New York Clearing House Loan Certificates and Accumulated Gold Net Imports

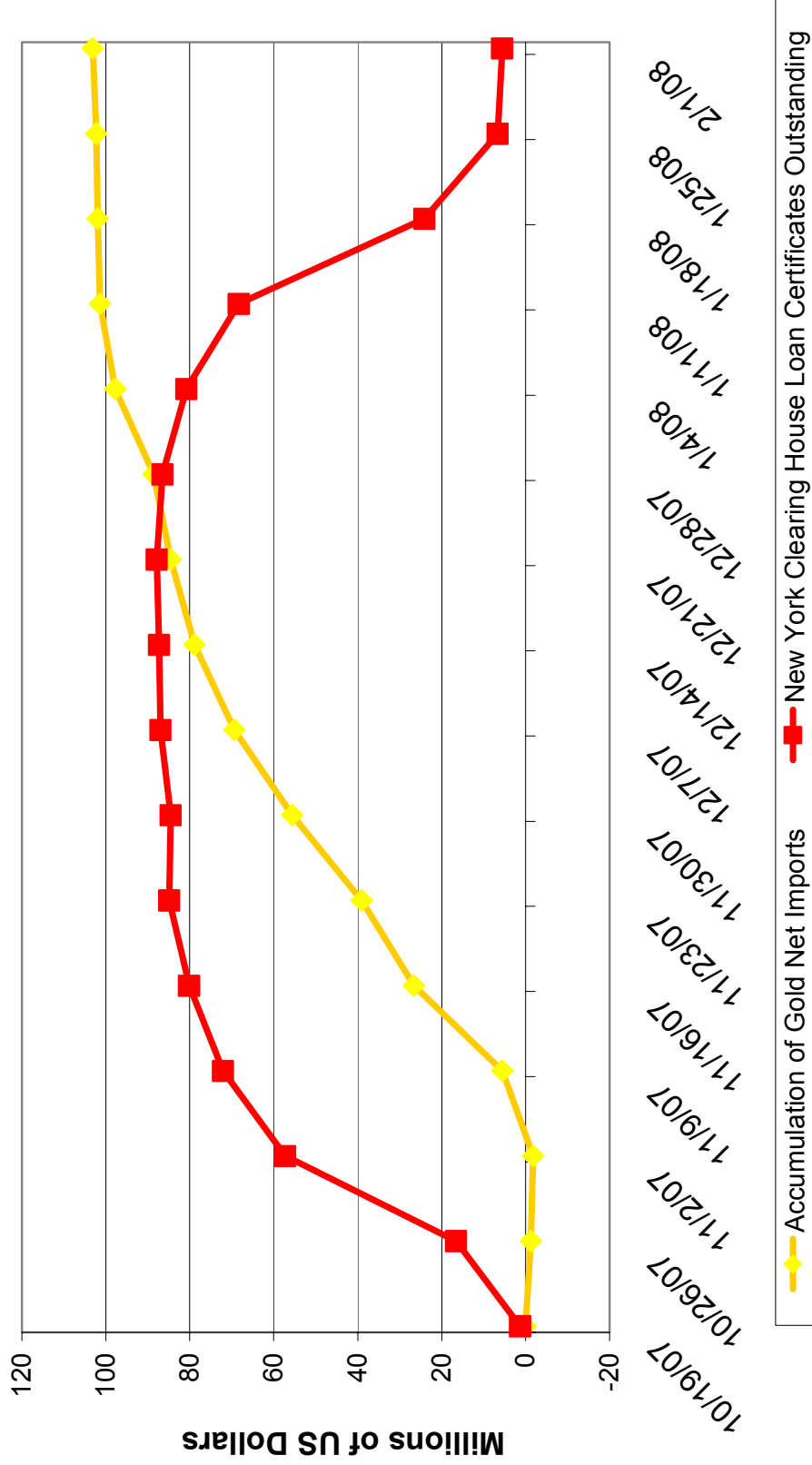


Chart 8: Net Gold Imports to New York

