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United States to Promote Bank Liquidity**

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Lessons from the Historical Use of Reserve Requirements in the United States to Promote Bank Liquidity

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Efforts in the United States to promote bank liquidity through reserve requirements, a minimum ratio of liquid assets relative to liabilities, extend at least as far back as the aftermath of the Panic of 1837. These requirements were quite important during the National Banking Era. Nevertheless, suspensions of deposit convertibility and liquidity shortfalls continued to occur during banking panics. Eventually, efforts to ensure that banks remained liquid resulted in a shift away from reserve requirements in favor of a central bank able to add liquidity to the financial system. This paper reviews the issues raised in the historical debates about reserve requirements along with some empirical evidence on banks' holdings of reserves, to provide some insights and lessons that are relevant today. A key lesson is that individual bank liquidity during stress periods is inherently and intricately tied to the liquidity policies of the central bank.

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Shortly after the Panic of 1837, states began instituting reserve requirements which mandated that banks had to hold liquid assets representing at least some minimum fraction of their liabilities. When Congress passed the National Bank Acts in the 1860s, banks receiving National Bank charters also faced a minimum reserve requirement. These rules were part of an effort to promote liquidity and soundness by ensuring that each individual bank had a pool of liquid assets that it could draw on during times of stress.

Despite these efforts, as well as some efforts from within the banking sector to provide liquidity support, the banking system remained vulnerable to banking panics and suspensions of convertibility in which banks temporarily stopped or restricted withdrawals of funds (Calomiris and Gorton 1991, Sprague 1910, Wicker 2000). These panics were quite disruptive to economic activity and demonstrated that the reserve requirements were not sufficient to ensure that the financial system remained liquid during periods of stress (Grossman 1993, James, Weiman, and McAndrews 2012). In part to address these concerns, Congress established the Federal Reserve to create an “elastic” currency that could add liquidity to the banking system and serve as a lender of last resort.¹

This paper reviews the historical experience of the United States with reserve requirements to provide insights for policymakers today regarding efforts to promote individual bank liquidity and the relation of those efforts with a lender of last resort. (Some proposals, such as the, liquidity coverage ratio proposed by the Basel Committee on Banking Supervision, are quite similar to these historical reserve requirements.²) The insights discussed here draw importantly on the active discussions among academics, policymakers, and bankers during the 1800s and early 1900s about the value of reserve requirements. Other lessons are based on contemporary discussions and some data

¹ The reserve requirements were “microprudential” in nature as they applied to individual financial institutions. One could think of the creation of the lender of last resort as macroprudential policy as it provides a liquidity backstop for the whole system.

² For a description of the liquidity coverage ratio see the Basel Committee on Banking Supervision (2010).

analysis regarding the dynamics within the banking system during panics and the impact of reserve requirements.

While this paper reviews the historical experience of the United States with reserve requirements starting in the 1830s, there is a bit more emphasis on material from the National Banking Era (1863-1913).³ The empirical parts of the paper also draw on data from this period. The focus on the National Banking Era reflects the fact that it was in this period that use of reserve requirements was most prominent and that the experiences during this period ultimately resulted in the creation of the Federal Reserve and a shift away from the use of reserve requirements to regulate liquidity.

One key lesson that can be drawn from historical experience is that central banks are important during panics for multiple reasons. One description of a panic is a situation where extraordinary demand for liquid assets exceeds the available supply of those liquid assets (as evidenced by the suspensions of convertibility that occurred during panics and by the spikes in short-term interest rates). A central bank can help ease a panic by rapidly expanding the supply of liquid assets. Relatedly, banks often depend on other banks for liquidity. During a panic, the ability of other banks to furnish that liquidity support is likely to become impaired. Without access to this usual source of liquidity, and in the absence of a lender of last resort, banks may face increased incentives to hoard liquidity during stress events. This dynamic may exacerbate the severity of the stress episode. Thus, during a crisis, the liquidity of an individual bank is intricately connected to central bank liquidity policy and optimal liquidity regulation should consider these jointly.

There are other pertinent lessons as well. The liquidity reserves mandated by reserve requirements are generally intended to be used when liquidity demand spikes. Nevertheless, banks are often reluctant to draw down their stores of liquid assets during panics. Historical experience suggests that if the rules regarding the instances when the reserve should be used are unclear, the lack of clarity may exacerbate banks' reluctance. On a related note, the regulations and penalties associated with monitoring and enforcing

³ See also Miller (1927) for a discussion of arguments regarding reserve requirements in the antebellum period.

the reserve requirement during normal times that were in place during the late 1800s and early 1900s do not appear to have been particularly effective which indicates the importance of considering these aspects of liquidity requirements as well. Additionally, historical experience suggests that when certain assets are designated as stores of liquidity, institutions will seek to accumulate those assets during a crisis to demonstrate their strength; unless the pool of liquid assets can be expanded at those times, there is some risk that the functioning of the market for those assets expected to provide liquidity can deteriorate.⁴

This paper is organized as follows. Section 2 describes the introduction of reserve requirements, reviews the arguments for and against such requirements during the 19th and early 20th centuries, and provides some stylized facts on reserves held by banks. Section 3 reviews mechanisms within the system designed to address the stresses associated with banking panics and presents some evidence on how holdings of reserves changed shortly after a panic. Section 4 briefly recounts events from the Panic of 1907 and discusses some reasons why the reserve requirements alone were not sufficient to stop banking panics. This section also reports on the subsequent debate about the need for a central bank to provide liquidity support to the banking system. Section 5 describes reserve requirements in the presence of a central bank and the decline in the use of reserve requirements as a tool for regulating liquidity following the establishment of the Federal Reserve. A general review of the lessons from the historical experience and concluding thoughts are provided in Section 6.

Section 2. Reserve requirements prior to the Federal Reserve

This section briefly reviews the history of the laws regarding reserve requirements. It also describes some of the reasons given by policymakers for having reserve requirements, the differences in requirements across states, and the enforcement

⁴ Finally, as was evident from the panic of 1907, if non-regulated institutions also use the designated assets as a source of liquidity, then problems at those institutions have the potential to spill over and affect the liquidity of the banking sector (or vice versa).

of the reserve requirements. Additionally, this section provides some basic empirical information on the levels of reserves held by individual national banks.

Section 2.1 Introduction of reserve requirements

The first reserve requirements were introduced in the United States shortly following the Panic of 1837 by the states of Virginia, Georgia, and New York (Rodkey 1934).⁵ These requirements were generally intended to ensure that banks had ready access to resources that would enable them to meet their liability obligations. The adoption of reserve requirements by other states occurred slowly; only 10 states had such laws by 1860.⁶ Although after the Panic of 1857 there were a number of journal articles and pamphlets advocating in favor of reserve requirements.

When reserve requirements were first enacted the main bank liability was bank notes, which were privately issued currency that the bank promised to redeem for specie (gold or silver coin), and state laws referred to those liabilities as the base for determining the appropriate reserve. As the liability base of banks shifted toward deposits, the reference point for the reserve requirements shifted as well. In 1842, Louisiana passed a law requiring banks to maintain a reserve in specie equal to one-third of its liabilities to the public, which included both notes and deposits (White 1893). By 1895, 21 states had reserve requirements for commercial banks; at this time, all such laws included deposits in liability base (Comptroller 1895). For states that enacted reserve requirements, the laws regarding the ratio of reserves that had to be held relative to the liability base ranged from between 10 percent and 33 percent.

State laws also differed with respect to what could be included in the reserve. Some states allowed deposits in other banks to count as part of the reserve. This feature likely owed to the fact that many banks in smaller communities maintained balances at banks in larger cities to clear payments. As many bank notes, and later checks, were

⁵ There were some similar requirements included in the charters and bylaws of some of the early banks, such as the Massachusetts Bank, but these appear to be the first state laws applying the reserve requirements more broadly.

⁶ When reserve requirements were introduced, banks were chartered exclusively by the states so it was state laws that mattered.

redeemed at these clearing banks, interbank deposits played an important part in a bank's liquidity profile (James 1978, White 1983). Other states required that the entire reserve be carried as specie in the bank's vault. A few states allowed short-term loans to count as part of the reserve.

There were some further debates about the type of deposits should be included in the base for the reserve. Some policymakers argued that banks ought to maintain a greater reserve against more volatile deposits. As a result, some states only required a reserve against demand deposits (Comptroller 1895, Welldon 1910). A handful of states mandated reserves against both demand and time deposits, but specified that the amount of liquid resources that needed to be held against each dollar of time deposits was smaller than that required for demand deposits. Nevertheless, a majority of states required the reserve to be calculated against all deposits.⁷

When the U.S. Congress passed the National Banking Acts in the early 1860s and provided for National Bank charters, the legislation included reserve requirements for National Banks. These reserve requirements were tiered depending on the location of the banks. For much of the National Banking Era, banks located outside major cities—referred to as “country banks”—were required to hold reserves equal to 15 percent of deposits, three-fifths of which could be held as deposits in banks of reserve cities while

⁷ One potential reason for not distinguishing types of deposits is that doing so can result in behavior designed to get around the rules. In the 1920s, a distinction was made between demand and time deposits for the purpose of calculating reserves. Federal Reserve staff found that banks responded by adjusting the characteristics of their liabilities. One innovation by banks was to make savings deposits more liquid. At the time, depositors were required to present a savings passbook when making a deposit to, or withdrawal from, their savings account. Some banks introduced “duplicate” passbooks that would be kept at the bank. A depositor could then write a check against their savings account, the check would then be recorded in the duplicate passbook when cashed, and the two passbooks would be reconciled the next time the depositor came to the bank. More generally, Federal Reserve staff noted that banks persistently attempted to “classify as time deposits, accounts which are essentially of an active character (Federal Reserve 1931)” and that the variations in types of deposits made it so that “there is no practicable way of defining time deposits and demand deposits without opening the doors to evasions of the intent of the law (Federal Reserve 1931).” Federal Reserve staff also noted that turnover rates of demand deposits increased in the 1920s; the reasons for this development were not clear but they did make reserve requirements less effective in supporting liquidity. Such shifts led the Federal Reserve to encourage use of simple rules that would apply a uniform rule to all banks and treat all deposits the same. Staff also proposed a reserve requirement against average daily debits to respond to changes in the turnover rate for deposits.

the rest was required to be held as vault cash.⁸ Banks in reserve cities—generally larger cities—were required to hold reserves equal to 25 percent of deposits, half of which could be carried as balances in central reserve cities. Banks in central reserve cities—at first just New York but later also Chicago and St. Louis—held significant amounts of interbank deposits. These banks were required to maintain a reserve equal to 25 percent of deposits which needed to be held in gold or in Treasury notes.⁹ One reason that banks in reserve and central reserve cities were expected to hold a higher portion of their assets as reserves was that they held more interbank deposits; these deposits were seen as more volatile and, in particular, more likely to be withdrawn during banking panics (Federal Reserve 1927).

Section 2.2 The purpose of the reserve

As noted above, reserve requirements were a prudential requirement meant to ensure that banks maintained the resources to meet their obligations. This goal is quite broad and has aspects of both solvency and liquidity. Indeed proponents of reserve requirements often blended the two or spoke of the benefits both in terms of the safety of the banks and the promptness with which banks could meet withdrawals, though there was perhaps a bit more frequent mention of the liquidity benefits.

An example of arguments framing the reserve as a tool for supplying liquidity comes from the 1873 report of the Comptroller of the Currency (Comptroller)—the chief regulator of the National Banks—who noted that “the question is not whether a reserve shall be held which shall insure the *payment*, merely, of the note, for that is unnecessary, but what amount of reserve shall be held by the banks to insure the *prompt* payment of all their liabilities? (p.19)” Among the arguments pointing to solvency benefits, Tucker (1858) suggested that bank failures, such as during the Panic of 1857, were the result of “imprudence” as banks overextended themselves and did not maintain a reserve of at

⁸ In earlier years of the National Banking Era reserves had to be held against both notes and deposits.

⁹ A number of states also adopted a tiered system in which state-chartered banks in larger cities faced more stringent reserve requirements.

least one-third of their liabilities.¹⁰ Most advocates tended to blend these extremes. Hooper (1860) provided one of the most interesting blends. He maintained that a bank could reduce its riskiness by adjusting either its capital or its reserve and that for a given level of capital, a bank could extend more loans if it held greater reserve.¹¹ Having a strong reserve meant that the bank would be able to avoid being forced to access emergency funds from other banks or rapidly call in their loans (or presumably be forced to sell assets in firesales) and thus be stronger overall.

While much of the discussion focused on the microprudential benefits to the individual banks of requiring a minimum level of reserves, some commentators did suggest that there were systemic benefits of ensuring banks retained sufficient liquid resources on hand. Opdyke (1858) argued that excessive credit growth led to a boom and bust cycle and that a reserve requirement could be useful in restraining credit growth.¹²

More concrete systemic benefits were described by Hooper (1860) and Coe (1873) who suggested that there were collective action reasons to mandate minimum reserves, especially for banks in the main money center of New York City. Hooper noted that the reserve of banks in New York was a common good benefitting all the banks in the city as well as the rest of the country and that the management of those banks might not internalize the social benefit they provided. As a consequence, he argued that the law

¹⁰ Capital also played an important role in prudential regulation and it was well understood that an adequate capital base was necessary to establish the safety of the bank. Tucker (1839) maintained that “to secure the requisite solidity, two things seem essential. One is that the bank should have a sufficient amount of capital; and the other is, that such capital should be real, not nominal or borrowed [i.e paid in installments or with borrowed funds] (p.192).” Interestingly, and in contrast to the reserve requirements, capital requirements were often expressed in terms of a fixed dollar amount rather than as a ratio. Nevertheless, a few states in the early 1800s did limit the amount of loans that could be extended to some multiple of capital.

¹¹ While he does not use these terms, Hooper appears to argue that banks should target a particular overall level of risk and can hit that risk target by adjusting either their capital to asset ratio (leverage) or adjusting the balance between riskless cash and risky loans.

¹² Opdyke argued for a limit on loans equal to one and a half times capital and specie, which again suggest that reserves offered a blend of solvency and liquidity benefits. Opdyke also suggested that the importance of restraining credit growth, and hence of a reserve requirement, had more than an economic motivation. “Whenever our currency is thrown into one of its paroxysms of extreme expansion, by the undue enlargement of bank loans, it literally intoxicates commerce, and drives it into all kinds of excesses. The desire of gain is stimulated to an unwonted degree, and manifests itself in over-trading, imprudent credits, reckless speculations, and numerous enterprises of questionable utility and still more questionable morality (p.8).”

needed to require them to hold a larger reserve than the banks would otherwise have chosen.

It is out of the question for the banks of the city of New York to hold that relation of the entire confidence through the country, so long as the action of each bank, in regard to the amount of its reserve of specie, is dependent upon the peculiar views or character of its board of managers. The *law* must secure the uniform ability of the banks to meet their engagements by making it imperative upon each one of them to hold the requisite amount of specie as a condition of their power to discount (p.44).

Coe noted that banks in New York City were linked both through their general dependence on the call loan market for liquidity (described in detail below) and that interior banks tended to react to troubles at one bank as a signal of troubles at all the banks. Thus, during a panic the strong banks needed to support the weak to contain liquidity drains and prevent problems from cascading. This linkage, Coe argued, was a reason that all banks needed to hold a strong reserve and was a motivation for the New York Clearinghouse to establish a reserve requirement in 1857.

Section 2.3 Enforcing the reserve requirement

The debate about how to ensure that banks met the reserve requirement started soon after the requirements were introduced. Tucker (1839) advocated enforcing the requirement using a moderate penalty proportional to any deficiency of the reserve. He maintained that the penalty should be high enough to dissuade banks from running below the reserve in good times but not so high that banks were unwilling to use the reserve during a crisis. Opdyke (1858) argued for requiring a minimum reserve somewhat below what was desired as he maintained that banks would hold a buffer stock above the requirement and that the buffer could then be used: “A legal minimum of 20 per cent. will, it is believed, give a practical minimum of not less than 25 to 30 per cent., for no prudent bank will voluntarily occupy a position on the verge of legal death (p.15-16).”

In the National Banking Era, the law provided that in the event the Comptroller found that a National bank was deficient in its reserve, the bank could be required to

cease making loans and stop paying dividends until the amount of the reserve was restored. The Comptroller (1893) stated that in the event that the bank had loaned out too great a portion of its funds or depositors had withdrawn a significant amount of funds, the only “safe and prudent course for the bank to pursue is to cease paying out money in any direction except to depositors until either through the collection of demand or maturing loans on the one hand, or the receipt of deposits on the other, the required portion has been restored (p.18).”

If the reserve was not restored within 30 days, the Comptroller could, with the concurrence of the Secretary of the Treasury, appoint a receiver for the bank. It was well noted that both the finding by the Comptroller that the bank was deficient and the decision to seek a receiver were discretionary on the part of the Comptroller. Moreover, the Comptroller stated that he only had the opportunity to learn about the bank’s balance sheet from one of the biannual bank examinations or the report of condition filed five times a year (1893). The actual ability to monitor was slightly more complicated. In their examination reports, examiners were asked to look through the bank’s books and calculate and comment on the adequacy of bank’s reserve for the past 30 days (or more if deemed appropriate). Thus the examination reports allowed the Comptroller more just than a single day’s observation.

Carter Glass (1913) asserted that this particular penalty regime was reportedly not very successful. In the debates related to Federal Reserve Act, he maintained that the penalties for holding inadequate reserves for an extended period were so severe that they had the never been applied and that in some cases banks had been allowed by regulators to have deficient reserves for periods of several years. Looking at examination reports for a sample of banks indicates that the examiners took note of the condition of the bank’s reserves and used this information, along with other aspects of the bank’s condition, to make recommendations about whether the bank should be allowed to pay dividends or make other changes to its capital account.¹³ This indicates that the condition

¹³ The sample here is described in detail in section 2.5

of the reserve did matter to the examiners. There were no suggestions in this sample of examination reports that a bank ought not make new loans due to a deficit reserve.

Information from Welldon (1910) suggests that, as of 1909, many states had similar, though perhaps slightly less severe, penalties for banks falling short of their reserve. Out of the 39 states that had reserve requirements at that time, Welldon mentions a penalty for failing to meet that reserve for 25 states. In every case, that penalty involved a prohibition on extending new loans. In 15 cases, there was also a prohibition on issuing dividends. For only one state, Arizona, does Welldon mention an explicit provision that failure to restore the reserve could result in a bank being declared insolvent. For one other state, Welldon notes that it had removed a previous provision allowing a bank to be declared insolvent if the bank failed to restore the reserve.

Section 2.3 Use of interbank deposits in the reserve

Whether or not to allow interbank deposits to count as part of the reserve was a subject of considerable debate. The National Bank Act allowed country and reserve city banks to count interbank deposits for up to two-fifths and one-half of their reserve respectively. Most states allowed interbank deposits to count as well; only 3 out of the 21 states that had reserve requirements in 1895 required that all reserves be held at the bank.

Interbank deposits were allowed partly as recognition of the way banks operated. As noted earlier, smaller banks had historically maintained deposits at correspondent banks in larger cities to clear payments or facilitate the redemption of their bank notes. As liability holders would seek to redeem the notes in the larger cities, it made some sense to include part of the balance held there to meet those obligations as part of the bank's liquidity reserve.

However, during a panic these interbank deposits were generally not an effective source of liquidity. Noyes (1894) notes that when demand during a panic was for physical currency, reserves held elsewhere were not particularly useful. More fundamentally, it was also noted that allowing interbank deposits to count as reserves

created a pyramid structure. A bank could deposit cash in another bank and count that deposit in its reserve while the second bank counted the cash in its reserve. The second bank could then deposit the cash in a third bank and compound the process. A withdrawal of reserves by the bottom of the pyramid during a panic could thus result in a rapid depletion of reserves within the banking system (Bankers' Magazine 1907, July). The Comptroller noted in 1900 that reserves held in other banks had been ineffective in protecting depositors during the panics of 1873 and 1893 and encouraged Congress to increase the portion of the reserve that banks had to carry as money in their vaults (see pages 25-27).

Section 2.4 Some empirical observations on reserve holdings

Looking at the status of reserves for a sample of 208 banks in both reserve cities (82 banks) and larger country towns (126 banks) using data from the September 1892 Call Report provides some further information about the level of bank reserves.¹⁴ Most banks appear to have held reserve in excess of the required reserve; the average reserve ratio was around 29 percent and quite similar for both country banks and those in reserve cities (Table 1). (These ratios are similar to those found by the Comptroller in 1887.) Moreover, the ratio of reserves to deposits exceeded the legal requirement (15 percent for country banks 25 percent for reserve city banks) by 10 or more percentage points for three-fifths of country banks and almost one-fourth of reserve city banks. Banks may have preferred to hold reserve ratios in excess of what was required simply because they preferred being more liquid, as is suggested by the Bankers' Magazine (1908,

¹⁴ The sample used here consists of 208 banks from the cities of Birmingham and Mobile, Alabama; Los Angeles and San Diego, California; Denver and Pueblo, Colorado; Indianapolis, Indiana; Des Moines and Dubuque, Iowa; Lexington and Louisville, Kentucky; New Orleans, Louisiana; Minneapolis, Rochester, St. Paul, and Stillwater, Minnesota; Kansas City and St. Joseph, Missouri; Helena, Montana; Lincoln and Omaha, Nebraska; Fargo, North Dakota; Cincinnati, Ohio; Portland, Oregon; Knoxville, Memphis, and Nashville, Tennessee; Dallas, El Paso, and San Antonio, Texas; Salt Lake City, Utah; Spokane and Tacoma, Washington; Milwaukee and Racine, Wisconsin; and Cheyenne, Wyoming. The sample is skewed toward the west and south; these parts of the country were most affected by the panic of 1893, a fact that will become useful below.

November), or because they viewed the required reserve ratio as a minimum they did not want to breach and desired to maintain a buffer.

Reserves held in the bank (as opposed to with reserve agents) accounted for about half the total reserve. Relative to deposits, reserves at the bank averaged about 14 percent for both groups; also well above the legal requirements of 6 percent for country banks and 12.5 percent for reserve city banks. The finding that about half the reserve was held in cash matches similar findings by the Comptroller a decade or so later (Comptroller 1907).

While many banks appear to have preferred to hold reserve well in excess of what was legally required, some banks had deficiencies in their reserve ratios. Of the banks in the sample, 10 percent of the country banks had a deficient reserve and 25 percent of reserve city banks did. That banks had deficient reserves suggests that they did not see the reserve ratio as something that had to be met at all times (perhaps especially as they had 30 days to restore it upon notice by the Comptroller). Nevertheless, most of these banks did not sink too far below the legal limit—many of them being within 3 percentage points of the limit—perhaps indicating the rule did have some influence on their behavior.¹⁵

Section 3. Reserve requirements and liquidity during panics

It was understood that banking panics were stressful periods in which the liquidity of the banking system would be tested. In the absence of a central bank, there were two primary mechanisms for provide liquidity during the panics: using the reserve and issuance of Clearinghouse loan certificates.¹⁶ This section considers these two mechanisms.

¹⁵ Comparing reserve delinquencies over time suggests only modest persistence. Looking at banks with Call Report data for both 1892 and 1894, of the ten banks with the lowest reserve ratios in 1892, only one was still in the ten with the lowest reserve ratios in 1894 and only three were in the bottom thirty banks.

¹⁶ The high interest rates that occurred during panics resulted in gold inflows which boosted liquidity, but this took a bit longer than the mechanisms described here.

Section 3.1 Usability of the reserve during a panic

There are two aspects of the debate about the usability of the bank reserve. One is whether the law allowed banks to use their reserve, and the other is whether banks would use their reserve to support other institutions. The concern that legally required reserves held by banks would not be helpful if the banks had to maintain these reserve at all times and could not use them was stated clearly early on. In 1848, Kettell argued that “This *keeping* of 15 per cent. of specie on *hand* has been tried in New York, in Alabama, and elsewhere, and its gross absurdity always made manifest. Of what use is it that a bank has the gold and silver, if the law forbids it to part with it?”

The debate about whether banks could legally use their reserves continued during the National Banking Era. In his annual report for 1894, the Secretary of the Treasury argued against the reserve requirement for National Banks as then written saying that, as the law was silent on when the National banks could use their reserves, the law created a situation in which they were unusable: “Among these are the requirements...that a fixed reserve, which cannot be lawfully diminished, shall be held on account of deposits. The consequence of this last requirement is that when a bank stands most in need of all its resources it cannot use them without violating the law (reprinted in Rodkey 1934).”

Proponents of reserve requirements responded that the reserve was established with the intent that it be used during stress periods. As noted above, the decision to find a bank deficient in its reserve was discretionary on the part of the Comptroller. This discretion allowed the Comptroller to effectively waive the requirement during a panic and allow banks time to rebuild their reserves subsequently (Comptroller 1893).

Others viewed the vagueness of the law regarding the use of the reserve to be a notable impediment to banks’ willingness to use the reserve. The Bankers’ Magazine (1907, August) argued that the vagueness of the law regarding when the reserve could be drawn meant that many bankers felt that the reserve could not be used during a crisis. The President of the American Bankers Association expressed similar sentiments in 1908 (see Bankers’ Magazine 1908, November). Providing certainty about when the reserve could be used was seen as inherently difficult. Coe (1873) argued that it is very

challenging to prescribe rules regarding the circumstances or timing in which the reserve should be allowed to be used or rebuilt.

Concerns that the rules were preventing banks from running down their reserve were sufficiently great that in at least one instance, Congress introduced legislation in which one goal to make the reserve more clearly usable. In 1897, Representative Walker, Chair of the House Committee on Banking and Currency, argued that the currency legislation “forbids, under severe penalties, the banks under any circumstances to use their reserves for the very purpose for which the banks are required to keep such reserves” and proposed legislation to allow the “banks to use their reserves in any legitimate way for the purpose for which they are required to keep a reserve (Committee on Banking and Currency, 1897 p. 28).” This claim was strenuously denied by the Comptroller (Eckels 1897, pp. 320 and 324).

The reserve and its potential use also created tension between banks subject to the reserve requirements and those not subject to them. The Bankers’ Magazine (1894, April) indicated that there was some expectation that the National Banks would use their reserves to provide liquidity and support to state and trust companies not subject to the reserve requirements, even if this support was only provided by the National Banks to protect themselves. The article indicated that this expectation was the source of some tension among bankers and resulted in some lack of cooperation during the panic. One might also speculate that some state banks or trust companies may have held lower reserves than they would have if they had not expected the National Banks to provide support.

Hooper (1860) suggested that confidence about the reserve also likely affected banks’ willingness to use it. In particular, he argued that banks in New Orleans were required by law to maintain a higher reserve than those in Boston and that the populace of New Orleans, knowing the strength of the reserve, had greater confidence in their banks

and thus the New Orleans banks were more able to use their reserve times of financial trouble.¹⁷

Section 3.2 Evidence on Use of the Reserve During a Panic

Evidence on use of the reserve during panics situations provides a mixed picture of whether banks were willing to use their reserve. As their reserves were depleted during banking panics, banks in the central reserve city of New York would suspend or curtail shipments of currency to other parts of the country.¹⁸ Sprague (1913) argued that the New York banks tended to do so well before they had exhausted their reserve. In 1907, the Wall Street Journal noted that reserves were around 21 percent of deposits around the time of suspension, below the legal requirement but still fairly high. It was noted in the Journal that use of the reserve during the panic was appropriate:

[T]here is a deficit of the bank reserve of \$38,838,825. It should be remembered, however, that a reserve is for use. There is no wisdom in locking up immense sums of money in bank vaults unless they can be employed in times of emergency...although the deficit is very large, yet there is still left in the banks a reserve amounting to over 21 percent of deposits (Wall Street Journal, Nov. 4, 1907).

Detailed information on bank balance sheets and reserves are available at a time shortly after the panic from the October 3, 1893 call report. Comparing reserves in 1893 for banks in the same cities as in 1892 suggests that reserve rates declined slightly for country banks and increased a bit for reserve city banks (Table 2). There also appears to be a shift toward holding the reserves in cash at the bank rather than as deposits with reserve agents.

Shifts in the size of the total reserve ratio appear to due largely to shifts in which banks are reporting. When the sample is restricted to banks reporting in both 1892 and 1893, for the median bank the total reserve ratios is higher in 1893 by less than one

¹⁷ Westerfield (1921) summarizes this debate regarding a minimum reserve requirement succinctly. “The psychological effect of the known large reserve is undoubtedly good, allaying the depositor’s fears as to the bank’s ability to pay on demand; but if the depositor also realized that this reserve could not be actually used when required, his faith would be less strong (p.146).”

¹⁸ Banks in reserve cities would then in turn suspend payments to country banks. A lack of available currency gave rise to the use of scrip and other currency substitutes (see Warner 1895 and Andrew 1908).

percentage point higher. By contrast, the shift toward cash is evident even when looking at the same banks. Again looking at the median bank for banks reporting in both 1892 and 1893, the ratio of cash to liabilities subject to the reserve requirement rose by over 5 percentage points, while the ratio of deposits at reserve agents to liabilities subject to reserve requirements decreased by over 5 percentage points. This shift was observable at both county and reserve city banks. Moreover, the number (and share) of banks reporting a reserve ratio below the legal requirement decreased relative to what was observed in 1892. Overall, these figures give the impression that banks not under such pressure tended not use their reserves to support the general liquidity of the financial system. Given the pyramiding of reserves that occurred through interbank deposits, the shift toward use of cash in reserves likely had a detrimental impact on overall system liquidity.

Looking at how the reserves in 1894 compare to those in 1892 provides some information about longer-term changes to reserve holdings following a panic (Table 3).¹⁹ Reserve ratios at country banks continued to average 29 percent, but the average reserve ratio for reserve city banks increased to 33 percent. Considering only banks that reported in both years, reserve ratios increased 1 percentage point for banks in country towns and 2 percentage points for banks in reserve cities. (The changes are strongly statistically significant for reserve city banks and moderately so for country banks.) These changes took place entirely from increases in cash holdings at the banks as ratios of reserves held with agents relative to deposits were little changed. These changes suggest that some of the increased preference for cash evident in 1893 persisted for some time.

Section 3.3 Private sector mechanisms for promoting liquidity during banking panics

Commercial banks did have some mechanisms for responding to panics and trying to expand the supply of liquid assets. Banks in New York, and other large cities, formed clearinghouses to facilitate the settlement of payments between members. The clearinghouses also provided a way to supply liquidity to their members during a panic. In particular, the clearinghouses established procedures to allow banks to deposit

¹⁹ The 1894 call report data is for October 2, 1894.

securities with the clearinghouse and receive clearinghouse loan certificates that could be used to make payments to other members of the clearinghouse. Using clearinghouse notes allowed specie or other forms of cash to be used to satisfy the heightened demand from others for liquid assets (Comptroller 1873 and 1890, Nash 1908).

The clearinghouse notes worked for interbank and sometimes local transactions, but not well for interregional payments. Clearinghouse notes were issued extensively in the Panic of 1907. In New York these notes continued to be large denomination notes, but in many smaller cities small denomination notes were issued and circulated with other currency in the general public market.

Banks appear to have been fairly willing to use these loan certificates when the need arose. Tallman and Moen (2012) report that the majority of the loan certificates issued by the New York Clearinghouse Association during the Panic of 1907 went to the six largest banks. Nevertheless, there appears to have been some concern about the possibility of a negative reaction to the issuance of clearinghouse certificates. Coincident with the issuance of clearinghouse loan certificates, the New York Clearinghouse Association halted its normal practice of issuing a weekly statement that provided information on the balance sheet of each individual bank and instead reported only aggregate figures for all clearinghouse members. This shift was reportedly done in part to protect members receiving the loan certificates and whose reserves might otherwise appear to be depleted (Bankers' Magazine 1907, November).

Media reaction to the issuance of loan certificates was also mixed. Shortly after the issuance of the loan certificates in 1907, the Wall Street Journal noted:

Although the issue of these certificates is a confession of weakness nevertheless it is also an assurance of strength, and the situation at the end of the week is all the better for the action taken by the Clearing House Association (Oct. 28, 1907, p.1).

Section 3.4 Discussion

The two mechanisms did provide some additional liquidity during a banking panic. Nevertheless, as evidenced by the widespread suspension of convertibility during

the major banking panics that occurred between 1865 and 1910, these mechanisms were clearly insufficient to provide the necessary liquidity during times of stress. The reserve does not appear to have been used to the degree that proponents might have hoped, perhaps because the degree of regulator discretion and rules for its use and restoration were unclear. Clearinghouse certificates also helped, but, as they could not facilitate distance transactions, also proved insufficient.

Section 4. The Panic of 1907

This section very briefly describes the events of the Panic of 1907, which provides a useful illustration of the dynamics of bank liquidity during a crisis. The section also discusses the lessons of the crisis and the resulting impetus for a central bank.

Section 4.1 Brief history of the Panic of 1907

Two pieces of background information are useful for understanding the panic. First, in the years prior to the panic, there had been considerable growth in the size of the trust companies of New York City. These institutions took deposits and were similar to banks but the state laws allowed them to operate with smaller reserve requirements and without some other restrictions faced by banks. Indeed, these institutions established themselves as trust companies partly to avoid capital and reserve requirements. Trust companies were not members of the New York Clearinghouse Association, but relied on members of the association as clearing agents for payment processing. A second piece of background information is that, at both banks and trust companies, a significant portion of liquid assets consisted of call loans. Both banks and trusts depended on the call loan market as a secondary source of reserves, and most of the funding for the call loan market came from the banks and trusts. (Call loans were short-term loans to stock brokers to finance stock purchases and were collateralized by the purchased stocks. These loans could be called by the bank when funds were needed and it was assumed the stock brokers would be easily able to sell the stock to repay the loan.)

The Panic of 1907 started when an attempt to corner the copper market collapsed.²⁰ A number of banks were implicated, but runs on these institutions were quelled following a statement of support from the Clearinghouse Association. Shortly thereafter, a National Bank announced that it would no longer provide clearing services for the Knickerbocker Trust company. When it became clear that the Clearinghouse Association would not support the trust companies, a number of trusts experienced runs. The call loan market quickly came under immense pressure and borrowers in that market that were unable to find alternative funding and faced the prospect of selling their stocks in a firesale and possibly defaulting. Consequently, banks were not able to tap the call loan market as a secondary source of liquidity as they might normally do and the functioning of that market deteriorated significantly.²¹ Although the banks had held reserves in excess of what was required by law prior to the crisis, such reserves were not sufficient to prevent the New York banks from being forced to restrict payments to out-of-town banks. Since they held large quantities of interbank deposits, these restrictions affected bank liquidity throughout the country. The interbank market for reserves—on a national level and at the city level for many regional financial centers—broke down as many banks feared deposit withdrawals and “hoarded” cash and maintained reserves well in excess of what was required (Yates 1908). The panic ended when J.P. Morgan and a consortium of bankers agreed to serve as a *de facto* lender of last resort to the financial sector.

²⁰ See Odell and Weidenmier (2004) for a broader background on factors leading up to the panic. Sprague (1910) and Wicker (2000) provide detailed histories of the panic.

²¹ This dynamic was well known. In discussion the use of call loans as store of short-term liquidity, Dwight (1858) noted that “The causes which alarm one bank alarm the whol. Upon any shock to confidence, they all call in at once. The stock collaterals are forced upon the market at the same moment that its ability to take them is almost destroyed by the total cessation of new loans (p.159).” The argument was repeated following the panic of 1893 where it was noted that when all institutions used the same market as a course of liquidity, that market would be unable to provide liquidity during a panic (Bankers’ Magazine 1894, April). This dynamic is also the one warned against by Coe (1873) when he indicated that the size of banks’ reserves had systemic implications and warned that strong banks would need to support weaker institutions.

Section 4.2 Impetus from the Panic of 1907 for establishing a central bank

There were several lessons that policymakers took from the Panic of 1907 that prompted them to work toward establishing a central bank. One lesson was that when the instrument used as a reserve and primary source of supply liquidity—in this case the supply of gold and Treasury notes—was fairly inelastic in the short run, demand for that instrument would exceed the available supply during a panic. The subsequent scramble for liquidity would cause short-term funding markets to freeze. (Gold could, and did, flow into the US from abroad in response to rising interest rates. These inflows boosted liquidity, but did take some time to arrive in quantities sufficient to meet demand.)

As a result, many policy makers concluded that an “elastic” currency that could increase in quantity was required (Vanderlip 1908). The notion that an elastic currency was needed was not new; as early as 1868, the Comptroller argued in favor of providing some elasticity to the currency for use during times of stress. In particular, the Comptroller argued that

The treasury of the United States could hold in reserve a certain amount of legal tender notes in excess of the amount of money in regular circulation, to be advanced to banking institutions at a specified rate of interest upon the deposit of United States bonds as collateral security, a source of relief would be established which would effectually prevent a monetary pressure from being carried to any ruinous extent (1868, p.27).

Similar arguments in favor of making available additional currency backed by bonds to add elasticity to the currency and relieve seasonal and other financial pressures were made by the Comptroller in his Annual Report in 1899 (pp. 11-17) and 1902 (pp. 61-63). Various bankers also argued for an elastic currency (See for instance Pugsley (1902) and Hamilton (1906). White (1983) describes various other initiatives.)

Nevertheless, following the Panic of 1907, legislative action seemed considerably more likely. Some proposals provided for an emergency currency that could be issued by a central authority only during a crisis; as a temporary palliative such a currency was included in the Aldrich-Vreeland Act of 1908. Under this Act the Secretary of the Treasury could, during a crisis, authorize the issuance of currency backed by any securities held by banks instead of the usual requirement that the currency be backed by

U.S. government bonds.²² Ultimately, policymakers chose instead to create the Federal Reserve as a permanent solution where the discount window could be used to turn bank assets into central bank reserves and would thus provide an elastic currency that could be used to respond to changing stringencies in money markets more flexibly and continuously than could the issuance of emergency currency.²³

A closely related argument made by advocates of a central bank was that only central bank notes or reserves are certain to be liquid during a financial crisis (Sprague 1911).²⁴ Other assets were argued to be liquid only to the extent that they could be converted into central bank reserves:

In countries where these notes of the central banks are generally accepted in settlement of debts by business men and banks, the 'banking reserves' of the stock banks may safely consist of the central bank currency, or of a balance kept with the central bank, convertible into such currency. These form the first line of banking reserves. The second line consists of those assets which, with certainty and promptness, may be converted into credit balances with the central bank (Warburg 1916, p. 9).

Central bank reserves also have the advantage of being able to be expanded by the central bank during a stress episode. Moulton (1918) notes that the expansion of liquidity is essential during a crisis as banks are expected to be the source of liquidity for their non-financial customers during a crisis and if banks are required to bolster their own liquidity to support their reserve by demanding repayment of, or even refusing to renew, loans during a crisis then financial strains can be significantly exacerbated. (Moulton also cautions that, at least at that time, securities holdings were unlikely to be effective as a secondary reserve during a crisis as banks could only sell their securities to other banks.

²² Some, such as Silber (2007), have argued that the issuance of Aldrich-Vreeland currency in 1914 helped prevent a panic in U.S. financial markets associated with the onset of World War I.

²³ Open market operations could accomplish something similar to the extent that they involved purchasing securities that were less liquid, but this was not discussed much at the time.

²⁴ In particular, advocates of a central bank, such as Sprague (1911) and Warburg (1916), argued against thinking of interbank deposits as reserves even though these assets had traditionally been a part of banking reserves. They argued that interbank deposits tended to concentrate risk in a few large institutions, so that the entire system was affected if issues arose at those institutions and that there was no guarantee that those institutions in which the interbank deposits were vested would themselves remain liquid. Vanderlip (1908) noted that the interbank deposits created interdependence among financial centers and that once New York closed, other centers were compelled to suspend payments to out-of-town banks.

If all banks were seeking to sell their securities holdings at the same time, those securities would be not function as a source of liquidity. This implies that to function as a source of liquidity during a crisis, a security must have ready purchasers from outside the banking system.²⁵⁾

Another lesson was that behavioral dynamics could be affected by the absence or presence of a central bank. During a panic, individual banks would pull their funds out of the banks in the reserve cities and bolster their liquid resources (Bankers' Magazine 1908, November); several observers, such as the Comptroller (1907) and Herrick (1908), reported that declines in interbank deposits contributed at least as much to the panic as the actions of individual depositors.²⁶ Banks were argued to have acted out of self-preservation because there was no guarantee that their regular source of liquidity, the reserve city banks, would be able to furnish liquidity should the crisis intensity (Roberts 1908, Sprague 1913). Indeed, the banks in New York had suspended payments to out-of-town banks during several prior banking panics. As a central bank would be able to provide a guaranteed liquidity backstop, individual banks would not need to hoard liquidity at the first sign of stress because they would know that the backstop would still be available in a crisis; Warburg (1914) goes a bit further and argues that to prevent hoarding the backstop and ability to turn supply cash must have absolute credibility which only a central bank could provide. It was expected that the existence of the central bank would prompt a change in behavior during a panic and would stop minor stresses from escalating into full blown crises (Warburg 1916).

A third lesson was that the liquidity requirements that tried to strike a balance between ensuring that the liquidity of the banking system was maintained yet not hampering banks in providing credit were likely to be overwhelmed during a panic. Even

²⁵ Around this time there was a broader debate about what it meant for assets and for banks to be liquid. Traditionally the self-liquidating nature of short-term loans had been emphasized as a source of liquidity and banks were more liquid when they had more of these loans. This view was in the process of being challenged. See Suviranta (1933) for a more in-depth discussion.

²⁶ Stickney (1901) makes a similar point comparing the U.S. experience during panics to that of England. He argues that during times of stress, the US system resulted in banks having to compete for reserves increasing their scarcity, while in England the Bank of England faced no competition and could thus act to make reserves more readily available.

critics of central banks sought ways to allow private market participants to expand the supply of liquid assets during a panic.

One other aspect of the panic that was not lost on policymakers was that institutions outside the normal banking system, in this case the Trust companies, could precipitate a run on the banking system. The realization that these outside institutions could threaten the stability of the system may have prompted some large influential Clearinghouse Association members to support a central bank (see White 1983, Moen and Tallman 1999).

Section 5. Reserve requirements after the founding of the Federal Reserve

With the establishment of the Federal Reserve, required reserves were reduced as it was expected that the liquidity backstop from the central bank provided individual commercial banks with a ready means of meeting extraordinary liquidity demands.²⁷ As noted by Rodkey (1934):

With the advent of the Federal Reserve System in 1914, we entered upon an era of central banking...The central bank is thus placed in position to make advances, either directly or indirectly, to the individual member banks as the replenishment of their reserves becomes necessary...It is clear that the presence of a central bank, prepared to make advances on eligible assets, places the individual bank in a less vulnerable position with respect to demands of its depositors. It tends to lessen the need for primary reserves. The Federal Reserve Act recognized this fact by reducing materially the percentage of required reserves (p.64).

Westerfield (1921) noted that the reduction in reserves was appropriate for several reasons including that the reserve because they were concentrated (as opposed to dispersed across banks throughout the system), because the reserves were “located in a central bank which feels its responsibility” and because their “availability is now unquestioned.”²⁸ Lunt (1922), who provided instructions to insurers on how to assess the quality of a bank from its balance sheet, noted that prior to the founding of the

²⁷ See also Feinman (1993) who provides more detail on reserve requirements from the founding of the Federal Reserve until the 1990s.

²⁸ White (1983) suggests that further lowering the reserve requirements also enhanced the attractiveness of joining the Federal Reserve system.

Federal Reserve the statement of cash and cash items “was regarded as extremely important, and banks that habitually carried larger reserves than those required by law were thought to be exceptionally safe (p.217).” However, with the Federal Reserve, the “point seems far less important now, since any bank that has a proper loan account can replenish its reserve at will by the simple process of rediscounting .”

While reserve requirements continued to be viewed as a tool to promote bank liquidity for some time, there was a gradual shift away from this view. Indeed, by the late 1930s, reserve requirements were no longer seen as playing an important role in providing liquidity.

The committee [Federal Reserve System Committee on Bank Reserves] takes the position that it is no longer the case that the primary function of legal reserve requirements is to assure or preserve the liquidity of the individual member bank. The maintenance of liquidity is necessarily the responsibility of bank management and is achieved by the individual bank when an adequate proportion of its portfolio consists of assets that can be readily converted into cash. Since the establishment of the Federal Reserve System, the liquidity of an individual bank is more adequately safeguarded by the presence of the Federal Reserve banks, which were organized for the purpose, among others, of increasing the liquidity of member banks by providing for the rediscount of their eligible paper, than by the possession of legal reserves (Federal Reserve 1938).

It is useful to note that during this period, the Federal Reserve was important as a lender to the banking system. Burgess (1936) notes that in a typical month during the mid-1920s about one-third of member banks obtained at least one loan or advance from their Reserve Bank. As a regular lender to the system, it would be fairly easy for the Federal Reserve to provide additional liquidity to individual banks. The discount window was seen by Federal Reserve staff as the primary source of emergency liquidity for the banking system, especially after the range of eligible collateral was significantly expanded in 1932.²⁹

²⁹ Indeed, the Federal Reserve staff noted in 1931 that “since 1914 [banks] have remained liquid through periods of unprecedented banking strain, they have been able to do so not because of the legal reserves that they have carried, but largely because they have been able to borrow at the reserve banks to convert their eligible assets into cash (Federal Reserve 1931).” While the veracity of this statement is debatable, it did reflect the staff view at the time.

As they shifted away from being seen as promoting individual bank liquidity, reserve requirements were increasingly seen as a tool to manage credit growth and facilitate the use of monetary policy. This development occurred as the Federal Reserve began to use open market operations to adjust available reserves in the banking system as its primary monetary policy tool; it was seen as impractical to have reserves both serve as a source of liquidity and be manipulated for monetary policy purposes.

The two main functions of legal requirements for member bank reserves under our present banking structure are, first, to operate in the direction of sound credit conditions by exerting an influence on changes in the volume of bank credit, and secondly, to provide the Federal Reserve banks with sufficient resources to enable them to pursue an effective banking and credit policy (Federal Reserve 1938).

Section 6. Lessons and concluding remarks

From the late 1830s until 1913, regulatory efforts aimed at promoting bank liquidity consisted primarily of reserve requirements that mandated that individual institutions hold liquid assets. However, these reserves were not sufficient to provide liquidity and prevent banks from suspending deposit withdrawals during banking panics. To provide for an elastic currency that could be expanded to meet the extraordinary liquidity demands experienced during a crisis, the Federal Reserve was established.

Several lessons from the historical reserve requirement experience are apparent. One of the most important lessons is that individual bank liquidity is intricately connected to central bank liquidity policy. For instance, in the absence of a lender-of-last-resort backstop, banks have more incentive to hoard liquidity which could exacerbate stress episodes. Second, the historical debates point out that a known and understood regulatory response to shortfalls in the reserve is an important factor for whether the reserve will be used in times of stress (and for how binding the reserve requirement will be during ordinary times). Third, historical experience indicates that when certain assets are designated as stores of liquidity, institutions will seek to accumulate those during a crisis. Unless the pool of designated assets is large or can be expanded at those times, there is some risk that the functioning of the market for those assets can deteriorate.

Further, if non-regulated institutions also use the designated assets as a source of liquidity, then problems at those institutions can spill over and affect the liquidity of the banking sector.

Policymakers today are considering various liquidity requirements for banks. For instance, under the Basel III requirements, banks will be subject to a liquidity coverage ratio (LCR). Under this requirement, banks will be required to maintain a stock of high quality and liquid assets as a buffer that is sufficient to cover potential net cumulative cash outflows at all times during a 30-day period. To a large degree, the LCR is similar to a reserve requirement in that it effectively requires liquid assets to be held against certain classes of liabilities (and lines of credit). The historical experience with reserve requirements offers valuable lessons for policymakers as they implement the LCR and other liquidity regulations.

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Table 1. Reserve Ratios in 1892
(Actual reserves as a percent of reservable liabilities)

	Country Banks			Reserve City Banks		
	Reserve in Bank	Held at Reserve Agents	Total Reserve Ratio	Reserve in Bank	Held at Reserve Agents	Total Reserve Ratio
Mean	14.1	15.3	29.4	14.8	14.7	29.5
75 th percentile	17.8	19.7	34.3	19.7	17.9	33.9
Median	13.3	13.6	27.7	14.1	14.1	27.6
25 th percentile	89.0	8.3	19.6	11.5	9.7	24.6
Standard deviation	6.9	10.4	9.2	4.8	7.3	7.6
<i>Observations</i>		126			82	

Source. Call Report for September 30, 1892.

Table 2. Reserve Ratios in 1893
(Actual reserves as a percent of reservable liabilities)

	Country Banks			Reserve City Banks		
	Reserve in Bank	Held at Reserve Agents	Total Reserve Ratio	Reserve in Bank	Held at Reserve Agents	Total Reserve Ratio
Mean	16.7	8.9	23.5	21.1	11.2	32.2
75 th percentile	24.7	12.1	35.8	25.8	14.8	37.8
Median	16.1	7.2	24.8	19.8	10.4	32.7
25 th percentile	8.1	3.6	13.2	16.2	6.7	25.7
Standard deviation	12.6	8.0	17.2	6.8	6.4	8.8
<i>Observations</i>		103			77	

Source. Call Report for October 3, 1893.

Table 3. Reserve Ratios in 1894
 (Actual reserves as a percent of reservable liabilities)

	Country Banks			Reserve City Banks		
	Reserve in Bank	Held at Reserve Agents	Total Reserve Ratio	Reserve in Bank	Held at Reserve Agents	Total Reserve Ratio
Mean	15.5	13.8	29.4	16.6	16.2	32.7
75 th percentile	18.6	18.9	36.3	19.1	20.4	37.3
Median	14.6	11.8	28.1	16.4	14.4	29.6
25 th percentile	10.6	7.5	21.8	12.9	10.8	26.5
Standard deviation	6.0	9.6	10.9	4.9	9.3	9.0
<i>Observations</i>		100			76	

Source. Call Report for October 2, 1894.