

The Federal Reserve and Panic Prevention: The Roles of Financial Regulation and Lender of Last Resort[†]

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Any market economy is susceptible to a fundamental mismatch that can lead to the negative externalities of liquidity demand, which include credit cycles, bank runs, and financial crises. Assets with liquidity are “safe” assets. More specifically, “liquidity” refers to the ease with which an asset can be sold quickly and without a loss of value, in the sense that substantial sales do not depress the price of this asset nor give rise to an adverse selection problem in which buyers fear that the asset being sold is of diminished quality. However, liquidity is hard to produce. Long-term investment is required for growth, but such investment is by its nature uncertain and costly to evaluate. On the other side, the ultimate suppliers of investment capital are subject to liquidity shocks: in particular, at times they will perceive higher risks and desire greater liquidity, which means holding short-term and very low-risk financial assets that can easily be sold, like US Treasury bills. In normal times, the maturity and information mismatch between the long-term investments and short-term liquidity needs are intermediated by the financial system through the creation of liquid “money-like” assets. In a simple example, a bank uses bank deposits to make long-term loans, while promising that the deposits will be available in the short run. However, a wide array of other short-term financial instruments are

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also backed by long-term assets, while allowing investors who desire liquidity to withdraw their funds, or more generally not renew their short-term investment, in a much shorter time horizon. During a financial crisis, the negative externalities of liquidity demand are manifested when investors race to withdraw their liquid assets; in “normal times,” negative externalities occur when each additional liquid claim does not incorporate in its price its contribution to the risk of such a crisis.

To mitigate the risk of a liquidity-driven crisis, the United States has a financial sector safety net with two key pillars: the Federal Reserve as a lender-of-last-resort and the Federal Deposit Insurance Corporation (FDIC) as a guarantor of bank deposits. The existence of this safety net then alters the incentives of regulated financial institutions: in particular, they can take greater risks when their depositors and investors know that this safety net is in place. Thus, the existence of the safety net provides the rationale for close supervision and regulations that limit the scope, risk-taking, and leverage of these institutions. If the safety net is too large, then banks lack incentives to manage risks in a socially optimal way; if the safety net is too small, then failure of a large institution could have major spillovers to the whole financial system; and if only the largest institutions are thus given the most protection, then the private incentives will be for every institution to grow “too big to fail.” This dynamic presents a complex problem for the Fed as the lender of last resort and regulator of the largest institutions.

This paper traces the Fed’s attempts to address this problem from its founding. We will discuss how the effectiveness of the lender-of-last-resort function was eroded in the 1920s, which in turn contributed to the banking panics of the Great Depression and indeed has hampered its lender-of-last-resort efforts to the present day. We consider the regulatory changes of the New Deal, including deposit insurance and the centralization of Fed decision-making power in the Board of Governors, which by some combination of luck and design contributed to a quiet period of nearly 50 years in the US financial system. Indeed, during this time bank supervision was only peripheral to the Fed’s priorities, which moved steadily towards a focus on price stability using interest-rate policy as its main instrument, and the Fed rarely needed to even think about the lender-of-last-resort function. The late 1970s saw the beginning of a transformation of the banking sector, with a rise of nonbank financial intermediaries and then regulatory adjustments so that banks could compete with these nonbank firms, which has continued to the present day. The financial crisis of 2007–2009 shook bank supervision efforts out of their slumber, made the lender-of-last-resort function central again, and led to a significant shift for the Fed back to its financial-stability roots. Indeed, the Fed’s efforts in the recent financial crisis can largely be viewed as attempts to expand the lender-of-last-resort function beyond its traditional institutions and markets. We conclude by bringing the story to the present day with a discussion of the evolving role of the Federal Reserve in the context of the changes under the Dodd–Frank Wall Street Reform and Consumer Protection Act of 2010.

The Establishment of the Federal Reserve System

Market economies will sometimes face a banking panic or financial crisis, which can be defined as an event in which the holders of short-term debt issued by intermediaries seek to withdraw cash en masse or refuse to renew their loans. A crisis is a *systemic* event; it involves the banking system, not this or that bank. Such a crisis is an information event (in the sense of Dang, Gorton, and Holmström 2013). That is, many holders of short-term debt previously viewed it as so safe that it was unnecessary to gather or process information about the debt, but these debt-holders then come to fear that the debt is not so safe and that they cannot distinguish good and bad collateral. In such a crisis situation, when what had seemed safe is no longer viewed that way, all banks are insolvent in the sense that they cannot honor their debt contracts without trying to sell assets—and if they try to sell assets, they will receive only a low fire-sale price, because the value of collateral has become so uncertain.

In a bank run, holders of banks' short-term debt come to doubt the collateral backing the debt. These doubts are not irrational. When no central bank is present, banking panics occur around the peak of the business cycle when holders of short-term bank debt receive news that indicates a recession is likely coming (Gorton 1988).¹ An unexpected deterioration in macroeconomic fundamentals causes a shift in expectations. In the ensuing recession, some banks will fail, but it is not known which banks. Depositors respond by withdrawing their cash from all banks. In the United States, such panics were common in the century before the start of the Federal Reserve.

The underlying dilemma in a bank run is that the depositors' doubts about the backing collateral can only be removed by showing them cash. But since the banks have lent the cash out, and the assets of the banking system cannot be sold (except possibly at low "fire sale" prices), there is no way for the banks to obtain cash except through a lender of last resort—an institution that lends against the impaired bank collateral. However, a lender of last resort can only prevent panics if it is sufficiently credible such that depositors believe it can essentially purchase the assets of the banking system. The Federal Reserve System was established for exactly this purpose.

At the time the Fed was established, the main perceived defect of the banking system was that currency was not "elastic"—that is, there was no way to obtain more currency to meet demands from depositors in times of bank runs, nor to meet seasonal demands. At that time, the main mechanism for responding to panic was the private bank clearing houses. Since being established in New York City in 1854, clearing houses had spread across the country and had become increasingly sophisticated in their responses to crises (for discussion of clearing houses, see Timberlake

¹ In the modern era with the presence of central banks, the links between financial crises and recessions are similar. For example, Demirgüç-Kunt and Detragiache (1998, p. 83) examine the period 1980–1994 and "find that low GDP growth, excessively high real interest rates, and high inflation significantly increase the likelihood of systemic problems in our sample."

1984; Gorton 1984, 1985; Gorton and Mullineaux 1987; Gorton and Huang 2006). Clearing houses, with one in each large city, were coalitions of member banks. Ostensibly set up to efficiently clear checks, they assumed a central bank-like role in crises, even though they were private associations.

A panic would trigger clearing house members to act as one large bank, issuing special liabilities—clearing house loan certificates—for which they were jointly responsible. At the outset of the crisis, the clearing house would prohibit the publication of bank-specific information, which was required during noncrisis times. Also, the amounts of clearing house loan certificates issued to individual member banks were kept secret, preventing those banks from being targeted for bank runs. Following the Panic of 1907, Congress passed the Aldrich–Vreeland Act, which among other provisions created a system for national banks to issue emergency “elastic” currency in a panic.

However, these responses of the clearing house member banks were only triggered by the panic itself. The ability of the clearing houses to issue loan certificates and Aldrich–Vreeland emergency currency did not prevent panics and their associated real effects. William Ridgely (1908, p. 173), the US Comptroller of the Currency from 1901 to 1908, put the issue this way: “The real need is for something that will prevent panics, not for something that will relieve them; and the only way to attain this is through the agency of a Governmental bank.”

Thus, the idea behind the establishment of the Federal Reserve System was that it could do something that the clearing houses and the Aldrich–Vreeland Act could not do. It could establish a credible emergency mechanism *in advance*. When the Federal Reserve System was founded, the main focus was on the potential benefits of a “bills market”—that is, a market for bankers’ acceptances, which are a documented promise by a bank to make a payment at a future time. The Federal Reserve would participate in this market by purchasing bankers’ acceptances. In addition, banks would be able to use their holdings of commercial paper and other marketable securities as collateral to borrow at the discount window—thus in effect exchanging private debt for currency.

Moreover, being a (quasi-)government entity, the Federal Reserve System could be expected to be solvent and would always be able to lend to banks. By contrast, the coalitions of clearing house banks might not be solvent, so expectations that the clearing house would act did not fully deter panics. Indeed, currency premia on the certified checks, which were joint clearing house liabilities, were positive during crisis periods (in other words, it took more than \$1 of certified checks to buy \$1 of currency), reflecting uncertainty about clearing house solvency. The Aldrich–Vreeland emergency currency was issued with bank loans as collateral, not US Treasury bonds. Again, there was uncertainty about the outcomes.

There is an important difference between providing the reassurance that can prevent bank runs and responding to a crisis once it has happened. Once a financial event is seen to be systemic and the lender of last resort begins lending, these actions take time and the process of exchanging private bank assets for government assets (whether money or Treasury debt) can be costly and painful.

It was widely believed that the discounting authority of the Federal Reserve would *prevent* banking panics. Banks needing cash could take bankers' acceptances (that is, their promise to pay at a near-term date) which were discounted from par to the Fed's discount window, where the Fed would buy it at a further discount—"rediscounting" it. Representative Carter Glass (1927, p. 387), who sponsored the Federal Reserve Act in the House of Representatives, wrote that the most important accomplishments of the legislation were to remove "seasonals" in interest rates and to prevent panics. Senator Robert Owen (1919, p. 99), sponsor of the bill in the Senate, said that the Federal Reserve Act "gives assurance to the business men of the country that they never need fear a currency famine. It assures them absolutely against the danger of financial panic . . ." Congressman Michael Phelan of Massachusetts, Chairman of the House Committee on Banking and Currency, argued (as quoted in Hackley 1973, p. 10): "In times of stress, when a bank needs cash, it can obtain it by a simple process of rediscounting paper with the Federal reserve [sic] banks. Many a bank will thus be enabled to get relief in time of serious need." Businessmen and regulators agreed. Magnus Alexander, the president of the National Industrial Conference Board announced (quoted in Angly 1931, p. 12) that "there is no reason why there should be any more panics." The Comptroller of the Currency (1915, p. 10) announced that, with the new Federal Reserve Act, "financial and commercial crises, or 'panics,' . . . with their attendant misfortunes and prostrations, seem to be mathematically impossible." The Federal Reserve System's (1914, p. 17) first Annual Report states that "its duty is not to await emergencies but by anticipation to do what it can to prevent them."

The 1920s

The establishment of the Federal Reserve System did change the expectations of depositors about systemic banking crises.² Gorton (1988) creates a leading indicator of recessions for the earlier US "National Banking Era" from the Civil War up to 1913, and finds that panics arose when the unexpected component of this leading indicator of recession exceeded a threshold. During the National Banking Era, no panic occurred without this threshold being exceeded, and there are no cases where it was exceeded without a panic. This model predicts that there should have been a panic in June 1920 (and another panic in December 1929). Thus, the 1920–21 recession can be viewed as the first test of the ability of the Federal Reserve to prevent bank runs.

As dated by the National Bureau of Economic Research, there was a business cycle peak in January 1920 and a trough in July 1921. Banks started to fail in 1920;

² There is some evidence that seasonal swings in short-term interest rates were eliminated, although the point is controversial. For a sampling of the evidence that the Fed did eliminate seasonal swings, see Miron (1986) and Mankiw, Miron, and Weil (1987). For the alternative view, see Shiller (1980), Clark (1986), Fische and Wohar (1990), and Fische (1991).

505 banks failed in 1921, and the number of failures continued to rise, averaging 680 per year from 1923 to 1929. The peak was 950 in 1926 (Alston, Grove, and Wheelock 1994). Hamilton (1985, p. 585) observes that the failed banks were overwhelmingly small banks in small rural communities: “National banks were only 13 percent of the failures and only 17 percent were members of the Federal Reserve System.” In other words, for the most part the banks that failed did not have access to the Federal Reserve discount window.

Though many small banks failed, there was no panic. As many contemporary commentators noted, depositors did not run on banks. For example, Henry Parker Willis (1923, p. 1406, emphasis added), who received a PhD in economics from the University of Chicago and was later the first Secretary of the Federal Reserve System, wrote:

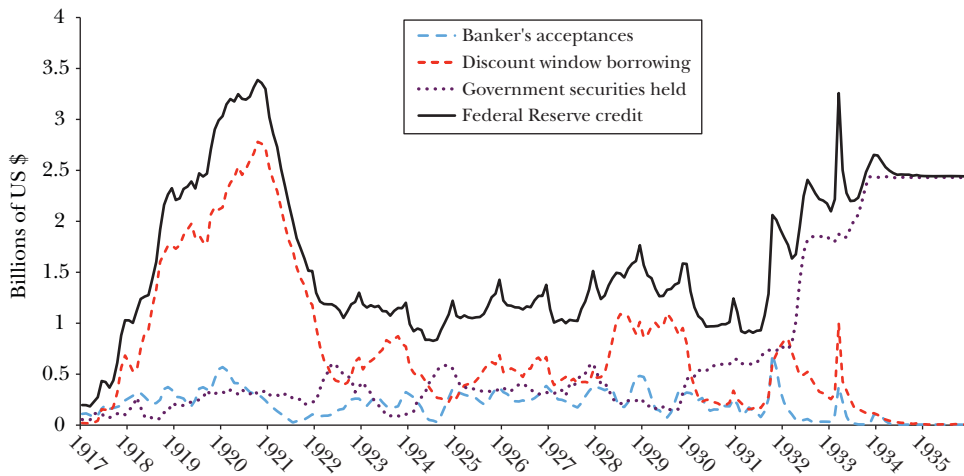
In previous panics or periods of stringency, difficulty had grown out of the fact that doubts arose concerning the ability of given institutions to meet their obligations, owing to the fact that their loans were frozen or that public confidence had resulted in withdrawing an undue amount of cash from them. On such occasions relief was obtained by the banks banding together for the purpose of supporting any of their number which had sound assets. In the depression of 1920–1921, the federal reserve system [sic] was in the position of a clearing house association, *already organized in advance* and able to assist the community . . .

Perhaps predictably, the Federal Reserve Annual Report (1921, p. 99) took a similar view that the creation of the Federal Reserve had prevented a panic:

Other nations, such as Great Britain and France, with their great central banking institutions, have always had their years of prosperity and their periods of depression, although they have been free from the money panics which we formerly had in this country as a result of our inadequate banking system and which we would, no doubt, have had in the most aggravated degree a year or so ago but for the efficiency and stabilizing influence of the Federal Reserve System.

If bank depositors did not run because they expected banks to have access to the discount window, then it might not be necessary for banks to have actually borrowed from the discount window. But in fact, national banks did use the discount window, as shown in Figure 1. Tallman (2010, p. 104) also notes this use of the discount window over the years 1914–27. In 1921, discounts and advances as a proportion of Federal Reserve credit was at its peak of 82 percent with about 60 percent of member banks borrowing. “It was not uncommon, evidently, for hundreds of banks to be continuously borrowing amounts in excess of their capital and surplus” (Shull 1971, p. 37). Notably, there was no evidence that borrowers from the discount window experienced any particular stigma in credit markets.

Figure 1

Federal Reserve Credit Extended, 1917–1935

Source: Tallman (2010); used with permission.

One reason that banks borrowed so much from the discount window was that the discount rate was below the market interest rate. During World War I, the Fed felt that low discount rates were important. “The Board did not believe, during the war period, that marked advances in rates would be advisable in view of the obvious necessity of avoiding any policy likely to disturb the financial operations of the Treasury” (Harding 1925, p. 147). During the steep 1920–21 recession, the low discount rate may have been fortuitous. As an Assistant Secretary of the Treasury wrote (Leffingwell 1921, p. 35), “by permitting rates to remain below the open market rates and credit to be expanded during the period of deflation of prices, it has prevented the present business depression from degenerating into an old-fashioned panic.” But over time, of course, freely available discount lending at below-market interest rates was bound to bring tensions.

Indeed, unbeknownst to the wider world, Fed policy on discount window lending was fundamentally altered in the mid-1920s. As Shull (1993, p. 20, with quotations from Keynes, 1930, pp. 239–40) explains: “A set of non-price rationing rules, limiting use of the discount window to short-term borrowing for unanticipated outflows of funds, were developed; banks were encouraged to be ‘reluctant to borrow;’ i.e., the Fed “turned to ‘gadgets’ and conventions . . . without any overt alteration of the law.” Creating a reluctance to borrow can informally come about through possible implicit threats to examine the borrowing bank more frequently and intensively, ostensibly to determine whether such borrowing is warranted.

Why was the policy on discount lending changed? There seem to be several reasons. First, it became clear that hundreds of banks were borrowing from the Fed for extended periods of time. Shull (1971, p. 35) reports that as of August 31, 1925,

588 banks had been borrowing continuously for at least a year; 239 had been borrowing since the start of the recession in 1920; and 122 had been borrowing continuously since before 1920. In addition, “259 national member banks had failed since 1920, and a guess was made that at least 80 per cent had been habitual borrowers prior to their failure.” Thus, the Federal Reserve Annual Report of 1926 (p. 4) stated that “the funds of the Federal Reserve banks are ordinarily intended to be used in meeting temporary requirements of members, and continuous borrowing by a member bank as a general practice would not be consistent with the intent of the Federal Reserve Act.”

In addition, by the latter part of the 1920s, the Fed became concerned with trying to distinguish between “speculative security loans” and loans for “legitimate business.” In other words, was discount window credit being used to pump up stock market values (Anderson 1966)? Was it leading to high growth in real estate prices, labeled a “bubble” by some (White 2009)? The Fed sought to restrain credit growth through moral suasion that would deter member banks from borrowing for speculative purposes, while at the same time trying to maintain a preferential discount rate for “legitimate” borrowing (Friedman and Schwartz 1963, p. 225–26). But the Fed decided that attempting to influence the economy via the discount window was not going to work. In short, the purpose of the discount window changed. It would no longer serve to provide an “elastic currency.” While contemporary observers noted that there had been no banking panics in the 1920s, there appears to have been no understanding of the details of how freely available lending through the discount window had avoided the panic. The Fed’s new policy of creating a “reluctance to borrow” based on nonpecuniary measures, and an emphasis that such lending should be only temporary, meant that a bank that did borrow from the discount window must be in trouble. This was the creation of “stigma,” which has complicated lender-of-last-resort policy ever since.

The Great Depression

Explaining the timing and causes of the banking panics of the Great Depression has been difficult and many researchers have offered explanations.³ There is a reason that researchers have found this confusing: at the time, bank depositors were also confused. They had been told repeatedly that banking panics would not occur under the Federal Reserve System—and in fact, no panics had occurred in the 1920s. Depositors, however, were unaware of the shift in Fed policy with regard to the discount window, so depositors reasonably assumed that banks would again avail themselves of the discount window as needed. But by the late 1920s, banks had been repeatedly told not to use the discount window, and when the 1930s arrived,

³This literature is very large and we do not survey it here. As a starting point, see Friedman and Schwartz (1963), Wicker (1996), and Meltzer (2003). Richardson (2007) relates this literature to new archival data on bank failures and suspensions (which are not the same thing).

they were quite hesitant to do so. As shown in Figure 1, discount window borrowing from 1929 to 1931 was much lower than in the 1920s, and after peaking in 1932, it declines slightly. Apparently, banks feared the stigma the Fed policies had created in the mid-1920s on discount lending.

When the Great Depression started in 1929, there were no bank runs. As mentioned earlier, Gorton's (1988) calculations looking at how unexpected movements in leading indicators had predicted financial crises in the pre-Fed era suggested that, in the Great Depression, there should have been bank runs starting in December 1929. Similarly, Wicker (1980, p. 573) noted: "Historically, banking panics in the United States usually developed shortly after a downturn in economic activity. The banking crisis in November–December 1930, however, was unlike previous banking collapses: there was little or no discernible impact on the central money market, and the panic lagged the downturn by eighteen months."

Bank runs did not happen in the Great Depression until late in 1930. As Richardson (2007, p. 40) notes: "Before October 1930, the pattern of [bank] failures resembled the pattern that prevailed during the 1920s. Small, rural banks with large loan losses failed at a steady rate. In November 1930, the collapse of correspondent networks triggered banking panics. Runs rose in number and severity after prominent financial conglomerates in New York and Los Angeles closed amid scandals covered prominently in the national press." There is some dispute over which bank collapse loomed largest. Friedman and Schwartz (1963) argue that the failure of the Bank of United States on December 11, 1930, was especially important—in part because of the bank's name. Wicker (1980, p. 581; 1996) disputes the importance of that bank failure, and instead cites the collapse of Caldwell and Company in mid-November as the trigger of the panic. Caldwell was large; it controlled a large chain of banks in the South.

A second wave of bank runs began in March 1931. There were runs, for example, on Chicago-area banks that were followed by a 40 percent increase in postal savings deposits (Wicker 1996, p. 85; for additional discussion, see Calomiris and Mason 1997). Finally, there was the Panic of 1933, actually in the last quarter of 1932 and early 1933, which led to President Roosevelt declaring a four-day "bank holiday" in March 1933, during which banks and the stock exchange were closed and forbidden to do any business without special government permission.

During this time, although the Federal Reserve was not engaging in much discount lending, the Reconstruction Finance Corporation, established in January 1932 under President Hoover, had started lending to banks in February 1932. The Reconstruction Finance Corporation action was needed because the Fed took no "positive action to intervene directly to keep open troubled banks. No direct assistance was offered other than to discount eligible paper of the [Federal Reserve] member banks" (Wicker 1996, p. 85). There were 17,000 banks in existence just prior to Roosevelt's March 1933 banking holiday. Only 12,000 survived, and half of those were borrowing some or as much as all of their capital from the Reconstruction Finance Corporation (Todd 1992). Ironically, the chairman of the Reconstruction Finance Corporation was Eugene Mayer, who was also chairman of the Fed.

At first, there was apparently no stigma attached to borrowing from the Reconstruction Finance Corporation until the clerk of the House of Representatives revealed the names of borrowers in July 1932 (Butkiewicz 1995, 1999; see also Friedman and Schwartz 1963, p. 331). Figure 2 illustrates the scale of loans from the Reconstruction Finance Corporation to banks as well as to other institutions like state and local governments, railroads, and mortgage institutions. Prior to the revelation of borrower names beginning in July 1932, total Reconstruction Finance Corporation borrowing had reached approximately \$1 billion, with about half of this total going to banks. Following the name revelation, net bank borrowing flattened out and was below \$500 million four years later, even though nonbank borrowing—where stigma is far less of an issue—rose to more than \$2 billion of the total.

The bank runs of the Great Depression were haphazard, chaotic, and spread out in time, unlike those of the pre-Fed period. Given that there was no bank run in 1929 at the onset of the Depression, the timing suggests that when depositors eventually saw the failures of large banks in the 1930s, they realized that the discount window mechanism was not working and the bank runs started. What happened? Friedman and Schwartz (1963, pp. 318–19) write: “The aversion to borrowing by banks, which the Reserve System had tried to strengthen during the twenties, was still greater at a time when depositors were fearful for the safety of every bank and were scrutinizing balance sheets with great care to see which banks were likely to be the next to go . . .” Wheelock (1990, p. 424) provides some evidence for this:

This study also finds evidence of a downward shift in borrowed reserve demand during the Depression. Financial crises made banks cautious and less willing to borrow reserves. The Fed’s failure to recognize this change in bank willingness to borrow contributed to its failure to interpret monetary conditions accurately. Fed officials continued to believe that low levels of bank borrowing signaled easy money.

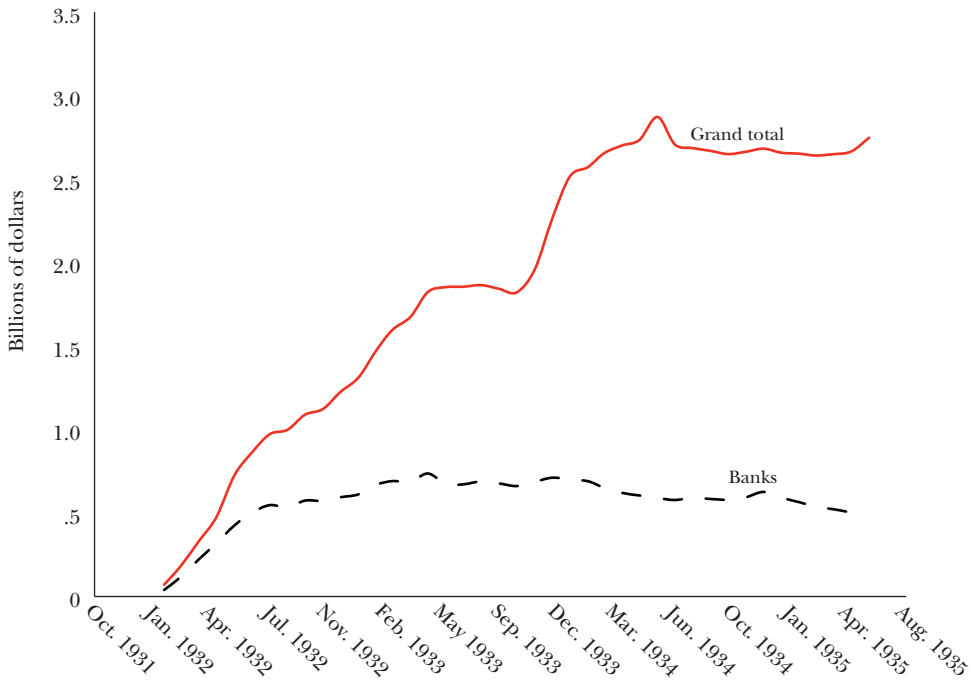
The problem was that the expectations of depositors that banks could and would avail themselves of the discount window when in trouble were not (widely) realized. Large banks failed and depositors then ran on the banks.⁴

New Deal Legislation and the Quiet Period: 1933–1978

The financial legislation of the New Deal period transformed the financial regulatory system and the role of the Federal Reserve within it; in addition, it

⁴ We are not making any claims here about the effectiveness of the Fed as a lender of last resort when banks *actually did borrow*. For example, Richardson and Troost (2009) contrast the policies of two regional Federal Reserve Banks (St. Louis and Atlanta) with regard to their responses to bank troubles in Mississippi during the Great Depression. Atlanta aggressively assisted banks and the bank failure rate was lower than in the part of Mississippi in the St. Louis district. The interesting question here is how Atlanta managed to overcome (or avoid) the stigma that depressed borrowing in other districts.

Figure 2

Reconstruction Finance Corporation Loans Outstanding

Source: Federal Reserve, Flow of Funds.

Note: Figure 2 illustrates the scale of loans from the Reconstruction Finance Corporation to banks as well as to other institutions like state and local governments, railroads, and mortgage institutions.

represented the last major set of changes in financial regulation until the 1970s.⁵ The Banking Acts of 1933 and 1935 amended the Federal Reserve Act to establish the Federal Deposit Insurance Corporation. The advent of deposit insurance rendered moot—for a time—the mistake of developing the policy of “reluctance to borrow,” and there was no discussion or realization of the problem that had been created by the discount–rate policies of the 1920s. Over the subsequent 75 years, the original insurance cap of \$2,500 per bank account would be raised many times, finally reaching \$250,000 in the aftermath of the recent financial crisis.

The Banking Acts also had a profound influence on the power and structure of the Fed. The balance of power between the Board and the regional Reserve Banks was tipped in favor of the center, with a Board-dominated Federal Open Market Committee established in 1935. Far more obscure at the time was a small

⁵ We do not attempt anything close to a review of all financial regulation during this time period. For a comprehensive treatment of regulatory and competitive changes in the key 1979–1994 period, see Berger, Kashyap, and Scalise (1995). For a discussion of changes since the 1990s leading to the rising share of nonbank financial intermediaries, see Gorton and Metrick (2010).

amendment to Section 13 of the Federal Reserve Act, granting the Fed the power to greatly expand its lending programs under “unusual and exigent circumstances.” These powers were invoked often in the recent crisis, as discussed later in this paper.⁶

The Banking Act of 1933 is often known by the last names of its sponsors, Glass and Steagall, and by the provision of the law that enforced the separation of deposit-taking and securities underwriting. This separation of banking and securities was coincident with significant new financial regulation, beginning with the Securities Act of 1933, which focused on the primary sale of securities, and the Exchange Act of 1934, which created the Securities and Exchange Commission and focused on the secondary trading markets. The SEC was granted further powers to regulate market intermediaries in the Investment Company Act of 1940 (for mutual funds and other investment companies) and in the Investment Adviser Act of 1940 (which today covers hedge funds and private equity funds, in addition to traditional advisers).

After the New Deal legislation, the most important piece of financial regulation to affect the Fed during this time period was the Bank Holding Company Act of 1956, in which the Fed was given oversight responsibility over holding companies that included commercial banks in their structure, with rules codified about the separation of banking and nonbanking activities. Importantly, this responsibility gave the Fed insight and access to the largest commercial banks, all of which (over time) became part of bank holding companies. The role of bank holding companies in the overall financial system has increased steadily, so that today they cover the vast majority of assets in the US banking system.

The Transformation of Banking: 1979–2006

Into the 1970s, banking in the United States was still a relatively simple business, at least compared with today, with this simplicity supported by ceilings on the interest rates that could be paid on time deposits (“Regulation Q”), a prohibition of paying interest on demand deposits, and by restrictions on both inter- and intrastate branching of banks. The story of banking since the 1970s is largely about attempts to work around regulations and the resulting growth in nonbank alternatives in the far more complex financial system of today. Liquid safe assets—assets that can safely store value for a short period of time with almost no risk such as money market mutual funds, and sale and repurchase agreements—began to be produced in large volumes. In Gorton, Lewellen, and Metrick (2012), we show that the net effect of these changes is that bank deposits’ share of the “safe” financial assets in the United States fell from 80 percent in 1952 to less than 30 percent by 2007.

⁶ The Fed’s emergency-lending power in Section 13(3) was first granted by the Emergency Relief and Construction Act of 1932, which later received amendments in the Banking Act of 1935 and in Federal Deposit Insurance Corporation Improvement Act of 1991. As discussed later, these amendments proved crucial for the lending powers used in the recent crisis (Mehra 2011).

One controversial element of bank regulation and supervision has played a large role in recent Federal Reserve history: the setting of capital standards. “Capital” in this context is defined in its narrowest sense as the common-equity component on the right-hand-side of the balance sheet, with various broader definitions including other forms of equity and the present-value of different kinds of safe revenue claims. For our purposes here, we will just refer to all of these definitions as “capital,” unless there is an important reason to be more specific.⁷

The benefit of banks having higher capital should be that each individual bank has a lower probability of distress. Given the access to the government safety net of deposit insurance and the lender of last resort, banks may not fully internalize the social cost of failure. In addition, even in the absence of such access, banks would not internalize the spillover effects of their own failure on other financial institutions. For these reasons, the government has an interest in lowering the probability of bank failure by requiring higher levels of capital than may seem privately optimal to banks.

An international consortium of regulators began work on a set of standards that could be applied across the major economies; this process culminated in the “Basel I” accords of 1988, implemented in 1990 in the United States. In the 1990s, the Basel requirements were revised and updated for riskiness of bank assets, resulting ultimately in the Basel II accords of 1997. As of 2006, most of the developed world had fairly complex implementations of capital standards for banks, with the Fed as the primary regulator for the largest financial holding companies in the United States. Nevertheless, regulatory capital proved to be a slow-moving measure of bank health, and in no country did it provide clear warnings of the coming crisis. In the aftermath of the crisis, the Fed was a main driver of the next round of “Basel III” accords, although the Basel III standards have not yet been implemented in the United States. Whether raising bank capital requirements is desirable has been the subject of great debate.⁸

⁷ Our discussion of capital rules and the Basel process focuses on the role played by the Federal Reserve and the implications for the growth of the shadow banking system. For a more comprehensive treatment, Goodhart (2011) is a definitive history of the Basel process up through 1997, and Hanson, Kashyap, and Stein (2011) is an accessible survey of the intellectual debate about capital standards in the post-crisis world.

⁸ DeAngelo and Stulz (2013) point out that if banks’ liabilities, short-term liquid debt, are useful because of their liquidity, they have a “convenience yield” (part of the return the holder gets is the benefits of liquidity) and then banks optimally have high leverage. Kashyap, Stein, and Hanson (2010) point out that even small increases in the cost of the capital could be sufficient to drive significant flows from banks into nonbank financial institutions. For the most forceful argument in favor of the Modigliani–Miller interpretation that raising additional capital would not be costly for banks, see Admati and Hellwig (2013). Other recent perspectives on this debate include Baker and Wurgler (2013) and Gorton and Winton (2002).

The Financial Crisis of 2007–2009

When the financial crisis began in 2007, the Federal Reserve faced two major challenges in its function as lender of last resort. First, the stigma of the discount window, originally created by the policies of the 1920s, was still causing a reluctance to borrow by member banks. Second, the sharp growth of a financial sector outside of member banks—in the so-called “shadow banking” sector where institutions like money market mutual funds take deposits and funds are invested in bonds and other financial assets—left a large portion of the financial system without access to the discount window. Most of the Fed’s actions during the crisis can be viewed as attempts to deal with these challenges.

Policies both formal (raising the discount rate) and informal (implicit threats to conduct more extensive and frequent bank examinations) continued to discourage borrowing from the discount window from the 1920s through the rest of the twentieth century. Despite an additional change in August 2007 that decreased the discount-window premium by 50 basis points and increased the eligible term for discount window loans, banks were still reluctant to borrow throughout 2007. In an interesting parallel to the role of the Reconstruction Finance Corporation during the Great Depression, many banks found an alternative source of back-up liquidity to escape the stigma of the discount window—in this case the Federal Home Loan Banks. Ashcraft, Beck, and Frame (2010) describe how the FHLB system became a “lender of next-to-last resort” with over \$1 trillion in loans at the peak of the crisis.

In December 2007, the Fed created the Term Auction Facility in a major attempt to overcome the reluctance of banks to borrow at the discount window. In the Term Auction Facility (TAF), the Fed created regular auctions of pre-set total quantities of loans for set terms (either 28 or 84 days), and the same institutions eligible to use the discount window were able to submit bids for what they would pay to borrow these funds. The rules for these loans were similar (although not identical) to those for the discount window. The institutions that received the loans were not publicly revealed, and the market apparently believed that some combination of the stigma and risk of possible disclosure of these loans was significantly lower than those from the discount window. According to Almantier, Ghysels, Sarkar, and Shrader (2011), TAF credit outstanding peaked at over \$300 billion, nearly three times the peak for discount window credit. This occurred although interest rates for borrowing through the Term Auction Facility were higher on average than rates at the discount window, by an average of 37 basis points overall and more than 150 basis points after the Lehman bankruptcy in September 2008. Banks were apparently willing to pay a premium to avoid the stigma of borrowing at the discount window.

Continued pressure in short-term funding markets led to the near-bankruptcy and fire sale of Bear Stearns to JPMorgan in March 2008. As Bear Stearns was not a depository institution and thus did not have access to the discount window, the eventual Fed guarantee that enabled the JPMorgan sale required use of the 13(3) authority granted in the 1930s, its first invocation during the crisis. The

Fed also responded by expanding the discount window—historically reserved for depository institutions—to include a broader group of primary dealers including Lehman Brothers, Merrill Lynch, and Goldman Sachs. A further expansion of the lender-of-last-resort function, which also required the use of Section 13(3), authority came through the Term-Securities Lending Facility (TSLF), which allowed primary dealers to effectively exchange illiquid securities for government bonds. The Term Securities Lending Facility was successful in reducing stress in the sale and repurchase or “repo” markets (Fleming et al. 2010; Hrung and Seligman 2011), in which one firm sells securities to another firm and then agrees to repurchase them at a slightly higher price in the near future—thus in effect receiving a short-term loan (Gorton and Metrick 2012).

However, the Federal Reserve was only getting started in expanding its role as lender of last resort for other parts of the shadow banking system. In fall 2008, 13(3) authority was used to create an alphabet soup of facilities, each targeted to extend the lender-of-last-resort function to another part of the shadow banking system. The Term Asset-Backed Securities Loan Facility (TALF) allowed borrowers to post various asset-backed securities as collateral for term loans; the Commercial Paper Funding Facility (CPFF) created facilities to buy commercial paper directly from issuers; the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) purchased asset-backed commercial paper from money-market mutual funds; and the Money-Market Investor Funding Facility (MMIFF) lent to money-market mutual funds on a broad range of collateral, effectively acting as a discount window for these funds. The Fed also used its 13(3) authority to create special-purpose vehicles to support lending programs to the insurance company AIG in September 2008.

Overall, the Fed made significant use of its 13(3) powers during the crisis, expanding its role as a lender of last resort well beyond the depository institutions typically served by the discount window. To go with the lender-of-last-resort function, the Fed marked the end of the panic phase of the financial crisis with the Supervisory Capital Assessment Program (SCAP), also known as the “stress tests,” carried out in spring 2009. The stress tests expanded the standard supervisory reviews to include considering the stresses that might arise in specific look-ahead scenarios, an element of what is now called “macroprudential” regulation (that is, policies aimed at protection of the entire financial system) in which potential reactions across financial firms and markets are considered, not just whether individual companies seem to be holding sufficient capital.

The Dodd–Frank Act and the Fed’s Role Today

The Dodd–Frank Act of 2010 targeted several of the most glaring holes in the pre-existing financial regulatory structure, with significant implications for the Federal Reserve’s role as supervisor and as lender of last resort. As of mid-2013, many important components of the legislation are still in the rule-writing stage, and thus any assessment of the law’s effect is necessarily preliminary. The Dodd–Frank Act unambiguously

expanded the Fed's role as a supervisor of financial institutions. However, the legislation was drafted and passed during a time when the Fed was under tremendous political and media pressure for its actions during the financial crisis, and this pressure led to some restrictions on the Fed's discretionary power as a lender of last resort.

From a supervisory viewpoint, the 2010 legislation created the Financial Stability Oversight Council, a new coordinating body that has the power to designate some financial institutions (including nonbanks) as being systemically important, with these institutions then subject to oversight and (additional) regulation by the Fed. Such designations effectively make the Fed a primary regulator for all large financial institutions, no matter what their main function. Furthermore, the Fed now has an explicit mandate to set higher capital standards and to give extra scrutiny to these largest firms.

One motivation of the Dodd–Frank Act was to end public bailouts of the largest institutions. Such a promise is complex and somewhat at odds with the lender-of-last-resort function. Specifically, the 13(3) powers that the Federal Reserve used during the crisis have been restricted by requiring more cooperation with the Treasury, more disclosure to Congress, and less flexibility to design programs to aid specific borrowers. In addition to the restrictions on the Fed's 13(3) powers, other restrictions were made on Treasury's emergency use of rescue powers such as those used for money-market funds, and the ability of the Federal Deposit Insurance Corporation to broadly guarantee bank assets without an act of Congress. Taken together, Dodd–Frank significantly reduced the flexibility of the executive branch and the Federal Reserve to act quickly during a financial crisis, while expanding their ability to act pre-emptively before one.

The Dodd–Frank Act did little to address the vulnerabilities in the shadow banking system at the heart of the panic during the crisis. For instance, repurchase agreements serve as a market for short-term loans and can be a source of troubles in a crisis when such loans are not rolled over as expected; yet reform of repurchase agreements was left entirely out of the legislation, with no clear jurisdiction for any agency to act. Reform of money market mutual funds was left to the existing statutory powers of the Securities and Exchange Commission, and it has proved difficult (so far) to make significant changes to the status quo. Financial securitization received some new rules under which those who originally make loans need to retain some of the risk, rather than completely passing it on to others, but larger-scale reforms were not included. The Financial Stability Oversight Council has some flexibility to address all of these shadow-banking issues in the future, but the necessary powers are still untested. Overall, the Fed and other regulators still have significant limitations for liquidity provision and oversight for many of the shadow banking markets in which financial runs occurred in 2007–2008.

Conclusion

The Federal Reserve plays a central role in financial regulation, with responsibility as both a lender of last resort and as a supervisor for the largest institutions.

The discount window was originally intended to provide this lender-of-last-resort function through the provision of contingent liquidity to banks; that is, there would always be a credible supplier of liquidity should the state of the world be one in which depositors would otherwise run on the banks. If this institution was credible, then depositors would never run. But, in the 1920s the main concern of the Fed was to discourage discount window borrowing. The intellectual and policy history of the discount window following the Great Depression is one of discouraging its use with virtually no thought about its role in preventing crises. In an ideal world, all depositors (wholesale and retail) would be confident that the Fed would lend freely in a systemic crisis, while letting all institutions fail outside of a crisis. In the less-than-ideal real world, there are many challenges to this balance. The Fed is now in the position of having to try to reestablish its credibility to meet bank runs. We conclude with a statement of three of these challenges.

First, in the recent financial crisis, the Fed extended its lender-of-last-resort function beyond traditional banks, recognizing the broad expansion of the financial system. These programs have been discontinued. To prevent market panics, do these programs need to be in existence all the time, just like the discount window for traditional banks?

Second, given the continued reluctance to borrow from the discount window, and the new informational requirements for other emergency lending programs, what are the Fed's best options to reduce the stigma for its lender-of-last-resort function so that it has the tools to prevent liquidity runs before they start? How can the expectations of market participants be changed to believe that these programs are sufficient to prevent runs?

Third, following the passage of the Dodd–Frank Act, the Fed has a greatly expanded responsibility for supervision of the largest financial institutions and for the monitoring of financial stability. What is the optimal way to perform these functions to prevent future liquidity crises?

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References

Admati, Anat, and Martin Hellwig. 2013. *The Bankers' New Clothes: What's Wrong with Banking and What to Do about It*. Princeton University Press.

Almantier, Olivier, Eric Ghysels, Asani Sarkar, and Jeffrey Shrader, Jr. 2011. "Stigma in Financial Markets: Evidence from Liquidity Auctions and

- Discount Window Borrowing during the Crisis." Federal Reserve Bank of New York Staff Report, no. 483. Available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1754558.
- Alston, Lee J., Wayne A. Grove, and David C. Wheelock.** 1994. "Why Do Banks Fail? Evidence from the 1920s." *Explorations in Economic History* 31(4): 409–431.
- Anderson, Clay J.** 1966. "Evolution of the Role and Functioning of the Discount Mechanism." Study in the series "Fundamental Reappraisal of the Discount Mechanism." Federal Reserve Bank of Philadelphia. Available at FRASER, Federal Reserve Archive: <http://fraser.stlouisfed.org/publication/?pid=706>.
- Angly, Edward.** 1931. *Oh, Yeah?* New York: Viking.
- Ashcraft, Adam B., Morten L. Bech, and W. Scott Frame.** 2010. "The Federal Home Loan Bank System: The Lender of Next-to-Last Resort?" *Journal of Money, Credit and Banking* 42(4): 551–83.
- Baker, Malcom, and Jeffrey Wurgler.** 2013. "Do Strict Capital Requirements Raise the Cost of Capital? Bank Regulation and the Low Risk Anomaly." NYU Working Paper no. FIN-13-003.
- Bordo, Michael, and David Wheelock.** 2011. "The Promise and Performance of the Federal Reserve as Lender of Last Resort, 1914–1933." NBER Working Paper 16763.
- Butkiewicz, James.** 1995. "The Impact of a Lender of Last Resort during the Great Depression: The Case of the Reconstruction Finance Corporation." *Explorations in Economic History* 32(2): 197–216.
- Butkiewicz, James.** 1999. "The Reconstruction Finance Corporation, the Gold Standard, and the Banking Panic of 1933." *Southern Economic Journal* 66(2): 271–293.
- Calomiris, Charles W.** 1994. "Is the Discount Window Necessary? A Penn–Central Perspective." *Federal Reserve Bank of St. Louis Review* 76(3): 31–56.
- Calomiris, Charles W., and Joseph R. Mason.** 1997. "Contagion and Bank Failures during the Great Depression: The June 1932 Chicago Banking Panic." *American Economic Review* 87(5): 863–83.
- Chandler, Lester.** 1967. "Selective Credit Control." Study in the series "Fundamental Reappraisal of the Discount Mechanism." Board of Governors of the Federal Reserve System. Available at FRASER, Federal Reserve Archive: <http://fraser.stlouisfed.org/publication/?pid=706>.
- Clark, Truman A.** 1986. "Interest Rate Seasonals and the Federal Reserve." *Journal of Political Economy* 94(1): 76–125.
- Comptroller of the Currency.** 1915. *Annual Report, 1914.*
- Dang, Tri Vi, Gary Gorton, and Bengt Holmström.** 2013. "Ignorance, Debt and Financial Crises." Unpublished paper.
- DeAngelo, Harry, and Rene M. Stulz.** 2013. "Why High Leverage is Optimal for Banks." ECGI Finance Working Paper no. 356/2013, European Corporate Governance Institute.
- Demirgüç-Kunt, Asli, and Enrica Detragiache.** 1998. "The Determinants of Banking Crises in Developing and Developed Countries." *IMF Staff Papers* 45(1): 81–109.
- Federal Reserve System.** 1921, 1923, 1926. Annual Reports.
- Fishe, Raymond P. H.** 1991. "The Federal Reserve Amendments of 1917: The Beginning of a Seasonal Note Issue Policy." *Journal of Money, Credit and Banking* 23(3): 308–326.
- Fishe, Raymond P. H., and Mark Wohar.** 1990. "The Adjustment of Expectations to a Change in Regime: Comment." *American Economic Review* 80(4): 968–76.
- Fleming, Michael J., Warren B. Hrungrung, and Frank M. Keane.** 2010. "Repo Market Effects of the Term Securities Lending Facility." Federal Reserve Bank of New York Staff Reports 426.
- Friedman, Milton, and Anna Jacobson Schwartz.** 1963. *A Monetary History of the United States.* Princeton University Press.
- Glass, Carter.** 1927. *An Adventure in Constructive Finance.* New York: Doubleday, Page and Company.
- Goodhart, Charles.** 2011. *The Basel Committee on Banking Supervision: A History of the Early Years 1974–1997.* Cambridge University Press.
- Gorton, Gary.** 1984. "Private Bank Clearinghouses and the Origins of Central Banking." Federal Reserve Bank of Philadelphia *Business Review*, January/February, 3–12.
- Gorton, Gary.** 1985. "Clearinghouses and the Origin of Central Banking in the United States." *Journal of Economic History* 45(2): 277–83.
- Gorton, Gary.** 1988. "Banking Panics and Business Cycles." *Oxford Economic Papers* 40(4): 751–81.
- Gorton, Gary, and Lixin Huang.** 2006. "Bank Panics and the Endogeneity of Central Banking." *Journal of Monetary Economics* 53(7): 1613–29.
- Gorton, Gary, Stefan Lewellen, and Andrew Metrick.** 2012. "The Safe-Asset Share." *American Economic Review* 102(3): 101–106.
- Gorton, Gary, and Andrew Metrick.** 2010. "Regulating the Shadow Banking System." *Brookings Papers on Economic Activity*, Fall, 41(2): 261–97.
- Gorton, Gary, and Andrew Metrick.** 2012. "Securitized Banking and the Run on Repo." *Journal of Financial Economics* 104(3): 425–51.
- Gorton, Gary, and Don Mullineaux.** 1987. "The Joint Production of Confidence: Endogenous Regulation and Nineteenth Century

- Commercial-Bank Clearinghouses." *Journal of Money, Credit and Banking* 19(4): 458–68.
- Gorton, Gary B., and Andrew Winton.** 2000. "Liquidity Provision, Bank Capital, and the Macroeconomy." Available at SSRN: <http://ssrn.com/abstract=253849> or <http://dx.doi.org/10.2139/ssrn.253849>.
- Hackley, Howard H.** 1973. *Lending Functions of the Federal Reserve Banks: A History*. Board of Governors of the Federal Reserve System.
- Hamilton, David.** 1985. "The Causes of the Banking Panic of 1930: Another View." *Journal of Southern History* 51(4): 581–608.
- Hamlin, Charles.** 1914. "The Federal Reserve System as Established and in Operation." An Address delivered before the New York Chamber of Commerce, December 3.
- Hanson, Samuel, Anil Kashyap, and Jeremy Stein.** 2011. "A Macroprudential Approach to Financial Regulation." *Journal of Economic Perspectives* 25(1): 3–28.
- Harding, Warren P. G.** 1921. "Working Back to Normal." An Address delivered at the Annual Dinner of Group VIII of the New York State Bankers' Association, New York City, January 17.
- Harding, Warren P. G.** 1925. *The Formative Period of the Federal Reserve System*. Boston and New York: Houghton Mifflin Company.
- Hrung, Warren B., and Jason S. Seligman.** 2011. "Responses to the Financial Crisis, Treasury Debt, and the Impact on Short-Term Money Markets." Federal Reserve Bank of New York Staff Report 481.
- Kashyap, Anil, Jeremy C. Stein, and Samuel G. Hanson.** 2010. "An Analysis of the Impact of 'Substantially Heightened' Capital Requirements on Large Financial Institutions." Unpublished paper.
- Keynes, John Maynard.** 1930 [1960]. *A Treatise on Money*, Vol. 2. London: Macmillan and Co.
- Laughlin, J. Laurence.** 1933. *The Federal Reserve Act: Its Origin and Prospects*. New York: Macmillan and Co.
- Leffingwell, Russell C.** 1921. "The Discount Policy of the Federal Reserve Banks: Discussion." *American Economic Review* 11(1): 30–36.
- Mankiw, N. Gregory, Jeffrey A. Miron, and David N. Weil.** 1987. "The Adjustment of Expectations to a Change in Regime: A Study of the Founding of the Federal Reserve." *American Economic Review* 77(3): 358–74.
- Mehra, Alexander.** 2010/2011. "Legal Authority in Unusual and Exigent Circumstances: The Federal Reserve and the Financial Crisis." *University of Pennsylvania Journal of Business Law* 13(1): 221–72. (Published in 2010 and updated in 2011 after publication.)
- Meltzer, Allan H.** 2003. *A History of the Federal Reserve*, Vol. 1: 1913–1951. University of Chicago Press.
- Miron, Jeffrey A.** 1986. "Financial Panics, the Seasonality of the Nominal Interest Rate, and the Founding of the Fed." *American Economic Review* 76(1): 125–40.
- Mitchell, Wesley C.** 1922. "The Crisis of 1920 and the Problem of Controlling Business Cycles." *American Economic Review* 12(1): 20–32.
- Owen, Robert L.** 1919. *The Federal Reserve Act*. New York: Century Co.
- Richardson, Gary.** 2007. "The Collapse of the United States Banking System during the Great Depression, 1929 to 1933: New Archival Evidence." *Australasian Accounting Business and Finance Journal* 1(1): 39–50.
- Richardson, Gary, and William Troost.** 2009. "Monetary Intervention Mitigated Banking Panics during the Great Depression: Quasi-Experimental Evidence from a Federal Reserve District Border, 1929–1933." *Journal of Political Economy* 117(6): 1031–73.
- Ridgely, William B.** 1908. "The Nation's Currency and Banking System." *North American Review* 627(February): 166–75.
- Shiller, Robert J.** 1980. "Can the Federal Reserve Control Real Interest Rates?" Chap. 4 in *Rational Expectations and Economic Policy*, edited by Stanley Fischer. National Bureau of Economic Research and University of Chicago Press.
- Shull, Bernard.** 1971. "Report on Research Undertaken in Connection with a System Study." In *Reappraisal of the Federal Reserve Discount Mechanism*, Vol. 1, p. 249–70. Board of Governors of the Federal Reserve System.
- Shull, Bernard.** 1993. "The Limits of Prudential Supervision: Economic Problems, Institutional Failure and Competence." Levy Economics Institute Working Paper no. 88.
- Silber, William.** 2007. *When Washington Shut Down Wall Street: The Great Financial Crisis of 1914 and the Origins of America's Monetary Supremacy*. Princeton University Press.
- Tallman, Ellis W.** 2010. Comment on 'The Promise and Performance of the Federal Reserve as Lender of Last Resort, 1914–1933,' by Michael D. Bordo and David C. Wheelock, presented at the conference "A Return to Jekyll Island: The Origins, History, and Future of the Federal Reserve," Federal Reserve Bank of Atlanta and Rutgers University, November 5–6, 2010, Jekyll Island Club Hotel, Jekyll Island, Georgia.
- Timberlake, Richard H.** 1984. "The Central Banking Role of Clearinghouse Associations." *Journal of Money, Credit and Banking* 16(1): 1–15.
- Todd, Walker.** 1992. "History of and Rationales for the Reconstruction Finance Corporation."

Federal Reserve Bank of Cleveland *Economic Review* QIV, 22–35.

West, Robert Craig. 1974. *Banking Reform and the Federal Reserve, 1863–1923*. Ithaca and London: Cornell University Press.

Wheelock, David. 1990. “Member Bank Borrowing and the Fed’s Contractionary Monetary Policy during the Great Depression.” *Journal of Money, Credit and Banking* 22(4): 409–26.

White, Eugene. 2009. “Lessons from the Great

American Real Estate Boom and Bust of the 1920s.” NBER Working Paper 15573.

Wicker, Elmus. 1980. “A Reconsideration of the Causes of the Banking Panic of 1930.” *Journal of Economic History* 40(3): 571–83.

Wicker, Elmus. 1996. *The Banking Panics of the Great Depression*. Cambridge University Press.

Willis, Henry Parker. 1923. *The Federal Reserve System: Legislation, Organization and Operation*. New York: The Roald Press Company.

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4. Kilian Rieder. The Lender of Last Resort Under the Microscope, c. 1840–1930 1661–1696. [[Crossref](#)]
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8. Kilian Rieder, Michael Anson, David Bholat, Ryland Thomas. 2023. Dating the Lender of Last Resort. *The Economic Journal* **133**:652, 1657–1676. [[Crossref](#)]
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20. Andrew Metrick, Paul Schmelzing. 2021. Banking–Crisis Interventions, 1257 - 2019. *SSRN Electronic Journal* **134**. . [[Crossref](#)]
21. Alice Abboud, Elizabeth Duncan, Akos Horvath, Diana A. Iercosan, Bert Loudis, Francis Martinez, Timothy Mooney, Benjamin Ranish, Ke Wang, Missaka Warusawitharana, Carlo Wix. 2021.

- COVID-19 as a Stress Test: Assessing the Bank Regulatory Framework. *SSRN Electronic Journal* **123**. . [\[Crossref\]](#)
22. Zhengyang Bao, Kenan Kalaycı, Andreas Leibbrandt, Carlos Oyarzun. 2020. Do regulations work? A comprehensive analysis of price limits and trading restrictions in experimental asset markets with deterministic and stochastic fundamental values. *Journal of Economic Behavior & Organization* **178**, 59-84. [\[Crossref\]](#)
23. Haelim Anderson, Jin-Wook Chang, Adam Copeland. 2020. The Effect of the Central Bank Liquidity Support during Pandemics: Evidence from the 1918 Spanish Influenza Pandemic. *Finance and Economics Discussion Series* **2020.0:50**. . [\[Crossref\]](#)
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28. Andrew Metrick, June Rhee. 2018. Regulatory Reform. *Annual Review of Financial Economics* **10:1**, 153-172. [\[Crossref\]](#)
29. Sriya Anbil. 2018. Managing stigma during a financial crisis. *Journal of Financial Economics* **130:1**, 166-181. [\[Crossref\]](#)
30. Matthew Jaremski, Gabriel Mathy. 2018. How was the quantitative easing program of the 1930s Unwound?. *Explorations in Economic History* **69**, 27-49. [\[Crossref\]](#)
31. Christos Gortsos. 2018. Legal Aspects of the European Central Bank (ECB) - The ECB within the European System of Central Banks (ESCB) and the European System of Financial Supervision (ESFS). *SSRN Electronic Journal* **3**. . [\[Crossref\]](#)
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35. Sriya Anbil. 2017. Managing Stigma during a Financial Crisis. *Finance and Economics Discussion Series* **2017.0:7**. . [\[Crossref\]](#)
36. Natacha Postel-Vinay. 2016. What Caused Chicago Bank Failures in the Great Depression? A Look at the 1920s. *The Journal of Economic History* **76:2**, 478-519. [\[Crossref\]](#)
37. Filippo Occhino. 2016. Central Bank Lending in a Liquidity Crisis. *Economic Commentary (Federal Reserve Bank of Cleveland)* **1-4**. [\[Crossref\]](#)
38. Donato Masciandaro, Davide Romelli. 2015. Ups and downs of central bank independence from the Great Inflation to the Great Recession: theory, institutions and empirics. *Financial History Review* **22:3**, 259-289. [\[Crossref\]](#)
39. Margaret M. Jacobson, Ellis W. Tallman. 2015. Liquidity provision during the crisis of 1914: Private and public sources. *Journal of Financial Stability* **17**, 22-34. [\[Crossref\]](#)

40. Charles W. Calomiris, Matthew Jaremski, Haelim Park, Gary Richardson. 2015. Liquidity Risk, Bank Networks, and the Value of Joining the Fed. *SSRN Electronic Journal* 46. . [[Crossref](#)]
41. Mark A. Carlson, Burcu Duygan-Bump, William R. Nelson. 2015. Why Do We Need Both Liquidity Regulations and a Lender of Last Resort? A Perspective from Federal Reserve Lending During the 2007-09 U.S. Financial Crisis. *SSRN Electronic Journal* 4. . [[Crossref](#)]
42. Donato Masciandaro, Davide Romelli. 2015. Ups and Downs. Central Bank Independence from the Great Inflation to the Great Recession: Theory, Institutions and Empirics. *SSRN Electronic Journal* 4. . [[Crossref](#)]
43. Sriya Anbil. 2015. Managing Stigma During a Financial Crisis. *SSRN Electronic Journal* 2. . [[Crossref](#)]
44. J. Santiago E. Barraza, Andrea Civelli, Nicola Zaniboni. 2015. Loans and the Transmission of Monetary Policy Shocks: A VAR Analysis of the Role of Commitments. *SSRN Electronic Journal* 27. . [[Crossref](#)]
45. François Koulischer, Daan Struyven. 2014. Central bank liquidity provision and collateral quality. *Journal of Banking & Finance* 49, 113-130. [[Crossref](#)]
46. Francois Koulischer, Daan Struyven. 2013. Central Bank Liquidity Provision and Collateral Quality. *SSRN Electronic Journal* 4. . [[Crossref](#)]
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