



Credit Supply Disruptions: From Credit Crunches to Financial Crisis*

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ABSTRACT

It is useful to reflect on how the financial environment changed between the credit crunch episode of the early 1990s and the recent financial crisis. What did we learn from the earlier crisis, and how did the credit crunch literature help guide policy in the more recent crisis? Two important changes were the consolidation of the banking sector and the dramatic growth in nonbank financial intermediaries, which are much more susceptible than banks to liquidity risks because of a lack of deposit insurance. This article highlights that, although security broker-dealers, money market mutual funds, and issuers of asset-backed securities were not particularly important in the early 1990s, when the bank credit crunch occurred, they grew dramatically to become both major sources of financing and key elements in exacerbating the problems experienced during the recent financial crisis.

Keywords

financial crisis (/search?option1=pub_keyword&value1="financial crisis"), **credit availability** (/search?option1=pub_keyword&value1="credit availability"), **financial intermediaries** (/search?option1=pub_keyword&value1="financial intermediaries"), **liquidity** (/search?

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option1=pub_keyword&value1="shadow banking"), financial innovations (/search?

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1. INTRODUCTION

The events of the financial crisis highlight the important role that financial intermediaries play in the economy, especially during economic downturns. The breadth and severity of the financial crisis took most observers by surprise, renewing academic interest in understanding the effects of financial shocks and of the changing nature of financial intermediation on the real economy. This interest in the real effects of financial shocks recalls the literature associated with the bank credit crunch of the early 1990s. It is useful to reflect on what we thought we knew on the basis of that research, and on how that research has helped to guide policy in the recent financial crisis.

The original research examined how, at financial institutions, problems that adversely affected bank loan supply could have a broader impact on the real economy. As in the recent financial crisis, the trigger for banking problems in the late 1980s and early 1990s was a decline in real estate prices. Although real estate prices did decline during that period in particular regions of the United States, particularly New England, the fall in real estate prices did not occur nationwide, unlike in the recent crisis. However, because banking markets at that time were more fragmented and localized, the most severe effects of the localized shocks that impacted construction and commercial real estate loans were limited primarily to banks operating in a given region; regions that experienced declines in real estate values also experienced increases in bank loan losses and widespread failures of local banks.

The observations that loss of bank capital could cause capital-constrained banks to shrink lending and that this loss of credit availability could have deleterious effects on the real economy were made in a variety of empirical and theoretical papers. **Bernanke & Lown (1991)**, **Hancock & Wilcox (1994)**, **Kashyap & Stein (1995, 2000)**, and **Peek & Rosengren (1995a, b; 1997)**, for example, all highlight the decrease in loan supply engendered by capital-constrained banks. Although it is difficult to unambiguously separate declines in loan supply from declines in loan demand and to directly tie any decline in bank loan supply to real activity, **Peek & Rosengren (2000)** subsequently provided a more direct link to the real economy: They showed that an adverse bank capital shock to

Japanese banks that was unrelated to US loan demand shrank Japanese bank lending in the United States and, importantly, had a significant impact on real activity in the US economy. Although it was noted that the real effects depended on bank behavior (described by, for example, substitutability across elements of banks' balance sheets and substitutability between bank finance and other types of financing for borrowers), the evidence became increasingly compelling that credit availability could be highly relevant to the performance of the real economy when economic downturns were accompanied by problems with depository institutions. Initially there was skepticism within policy circles, but eventually Chairman of the Federal Reserve Alan **Greenspan (1991)** began to regularly discuss headwinds to monetary policy, an indirect reference to the accumulated problems with credit availability.

Although in the early 1990s the importance of credit crunches, also referred to as bank capital crunches, was controversial (**Berger & Udell 1994, Oliner & Rudebush 1996, Sharpe 1995**), during the 2008 financial crisis it was widely assumed that credit availability was indeed a problem. Therefore, many of the policy remedies proposed for alleviating credit crunches were, in fact, used during the early stages of the 2008 financial crisis to mitigate potential credit availability problems. These remedies included capital infusions into troubled banks, provision of liquidity facilities by the Federal Reserve, and a primary focus of the initial stress test on raising bank capital rather than allowing banks to shrink assets to maintain, or reattain, required capital ratios. These policies helped banks remain viable, and they also helped bank borrowers, including a wide variety of households and firms. Granted, these policies did not completely offset the credit availability problems at the time, but they did provide needed support for the recovery of the real economy. Although the recovery has been anemic by historical standards, this support has nonetheless helped to situate the US economy, seven years after the crisis, in a much better place than most developed economies.

This article reflects on the recent crisis through the lens of earlier research. Section 2 discusses some of the ways in which the economic environment in the recent financial crisis differed from that in the earlier credit crunch. We focus on two particularly striking differences. First, although both total loans and commercial and industrial (C&I) loans declined significantly beginning in 2008, the decline, particularly in C&I loans, was sharper than during the earlier credit crunch, as was the subsequent recovery of C&I loans. Although depository institutions were important during the recent financial crisis, the real story is the role in amplifying the effects of the crisis played by

financial intermediaries other than traditional commercial banks. Second, although the move toward even greater market-centric financing in the United States between the early 1990s and 2008 had been assumed by some to reduce the risk of credit crunches, instead the growth of the shadow banking sector, the increased reliance on market financing, and the greater interconnectedness of the banking and the nondepository financial sectors contributed to the impact of the recent crisis. This is reflected in the different labeling of the two events: the earlier one was referred to as a bank credit (capital) crunch, and the later one as a much more widespread financial crisis.

The bank credit crunch literature provided useful insights during the financial crisis, but the financial environment had changed substantially by 2008, with nondepository financial intermediaries having assumed a more important role and, indeed, playing a central role in the crisis. Although the differences between depository and nondepository financial intermediaries were not a focus of attention when the credit crunch literature began, it has become increasingly important to understand these differences. This highlights the need for economists to better understand the constraints faced by nondepository financial intermediaries during financial crises and to learn how to safeguard against the significant disruptions transmitted through these institutions. In particular, this article highlights that, although security broker-dealers, money market mutual funds (MMMFs), and issuers of asset-backed securities (ABS) were not particularly important in the early 1990s, when the bank credit crunch occurred, they had grown dramatically over the subsequent two decades to become both a major source of financing and a central element in exacerbating the problems experienced during the recent financial crisis.

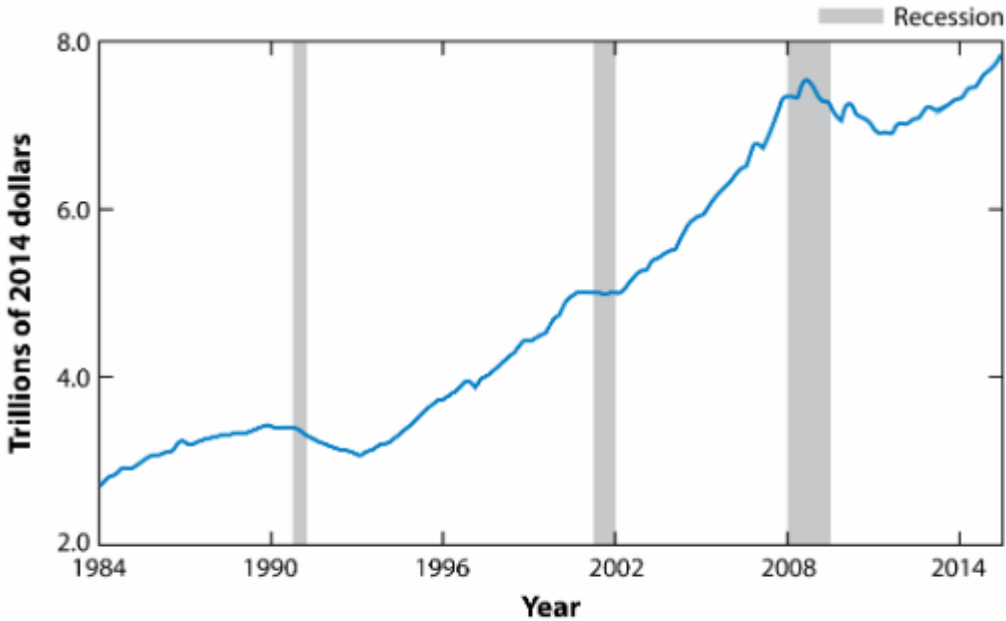
2. CREDIT CRUNCHES THEN AND NOW


Figure 1 shows total loans outstanding from 1984 to 2015 in constant 2014 dollars. The decline in lending in the early 1990s, commonly referred to as the bank credit crunch, motivated a series of articles on the potential spillover effects of banking problems on the real economy. Lending peaked in 1989:Q4 and did not return to that peak until 1994:Q4. It is striking that this decline in lending occurred despite that the real estate and bank capital problems were not a nationwide phenomenon. The 1990 recession was relatively mild, with a peak unemployment rate of only 7.8% in June 1992, and many parts of the country did not experience significant declines in real estate prices or widespread bank failures. **Figure 2** shows that whereas New England and the Middle Atlantic region were particularly impacted in the late 1980s and early 1990s, all regions of the United

States experienced notable declines in real estate prices during the 2008 financial crisis. The associated literature found that, despite the more localized set of problems in the credit crunch, reductions in credit availability were significant and acted as a headwind as monetary policy attempted to spur the national economic recovery.

Figure 1

Total loans outstanding at commercial banks, 1984:Q1–2015:Q2. Shaded areas represent recessions. Dollar values are adjusted for inflation using the GDP Deflator. Figure data are from Commercial Bank Call Reports, BEA, NBER, and Haver Analytics.



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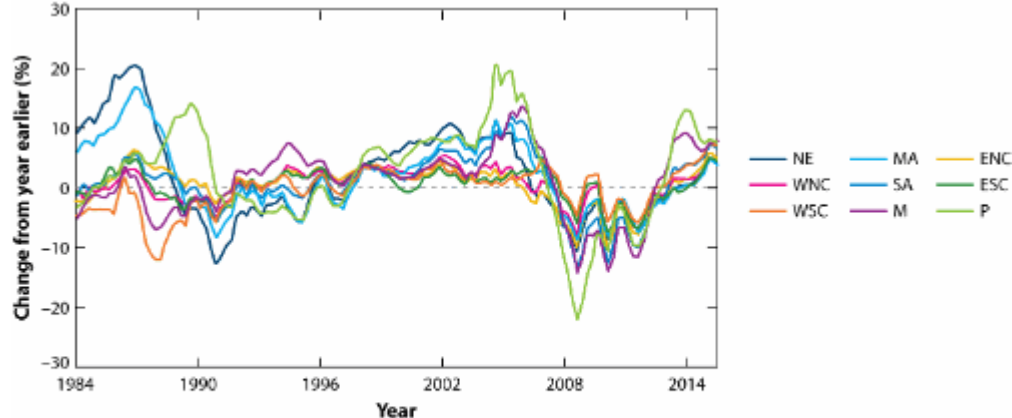
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Figure 2

Growth in real house prices by census region, 1984:Q1–2015:Q2. The nine census regions are: ENC, East North Central; ESC, East South Central; M, Mountain; MA, Middle Atlantic; NE, New England; P, Pacific; SA, South Atlantic; WNC, West North Central; WSC, West South Central. Figure data are from the Federal Housing Finance Agency, BLS, and Haver Analytics.



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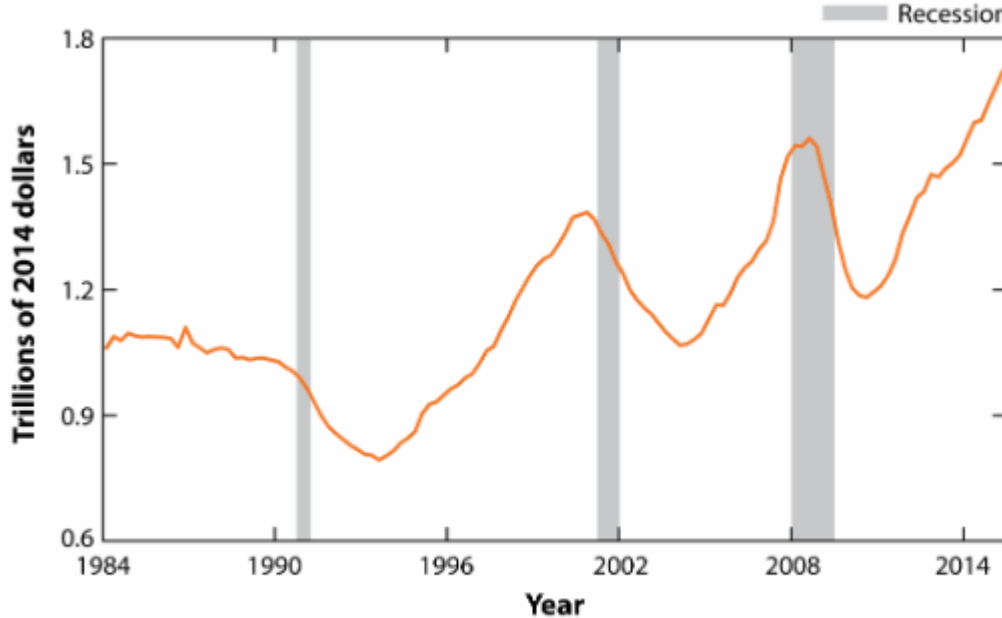
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Figure 3 is the analog of **Figure 1** for C&I loans, which also played an important role in stimulating the credit crunch literature, as much of this literature focused on constrained lending to firms rather than to households. **Figure 3** shows a more substantial decline in C&I lending relative to overall lending (see **Figure 1**), with loans peaking in 1986:Q4 and not regaining that peak until 1998:Q1. During the recent financial crisis, however, C&I loans declined much more steeply and also recovered more quickly than in the 1990s.

Figure 3

Commercial and industrial (C&I) loans outstanding at commercial banks, 1984:Q1–2015:Q2. Shaded areas represent recessions. Dollar values are adjusted for inflation using the GDP Deflator. Figure data are from Commercial Bank Call Reports, BEA, NBER, and Haver Analytics.



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The credit crunch literature played an important role in the policy discussions associated with the Great Recession. Whereas the earlier literature was controversial in the immediate aftermath of the 1990 recession, the finding that banking problems could have real effects was not generally disputed during the early stages of the Great Recession. Awareness of such effects informed and helped to tailor some of the earliest responses to the recent financial crisis.

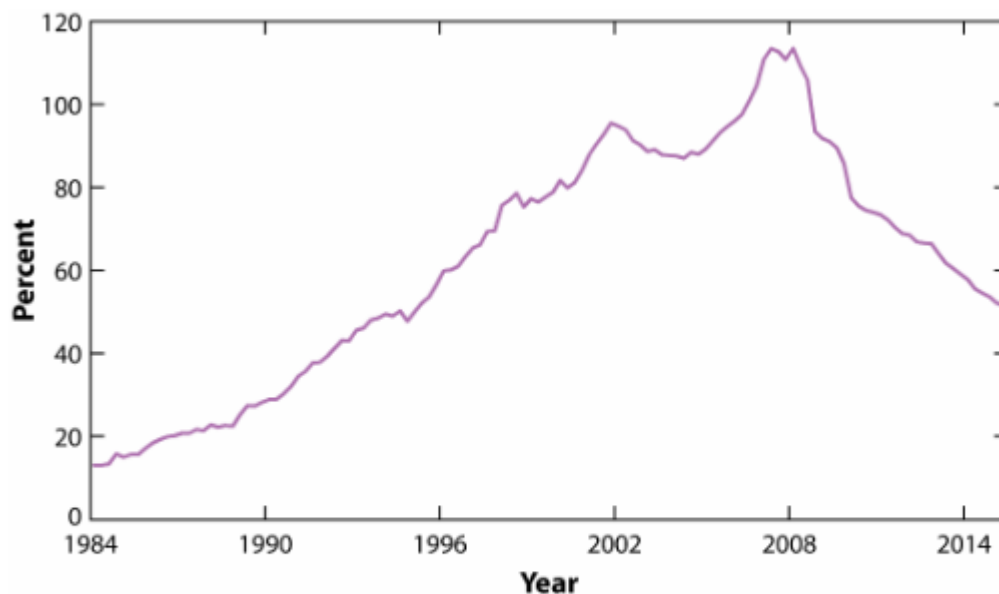
It was well understood by 2008 that capital-constrained banks might choose to shrink assets to maintain their capital ratios above required minimums. Consequently, the decision to infuse banks with capital under the 2008 Troubled Asset Relief Program was made in part to encourage banks to continue lending and to refrain from dramatically reducing their lending capacity. Similarly, the initial stress testing under the 2009 Supervisory Capital Assessment Program required any capital deficiency (shortfall in capital-to-assets ratio) to be met through increased capital. This forced banks to recapitalize rather than allowing them to raise their capital-to-assets ratio by shrinking their assets. Although shrinking bank assets initially might have been less painful for shareholders, it


would likely have been much more painful for potential borrowers. Thus, despite the severity of the Great Recession, with an unemployment rate that reached 10%, C&I lending experienced a surprisingly strong recovery beginning in 2010:Q4.

One of the issues raised in the early credit crunch literature was that banks substituting among elements of their balance sheets and firms substituting between intermediated bank loans and direct market financing would reduce the impact of problems emanating from the banking sector (for example, **Kashyap & Stein 1994**). **Figure 4** shows that in 1989, when this early literature began to be written, the assets of nonbank competitors were small relative to the assets of depository institutions. In fact, the combined assets of MMMFs, broker-dealers, and ABS issuers were only about 25% of depository assets in 1989:Q1. Over the subsequent years leading up to the financial crisis, however, these nonbank (shadow bank) alternatives grew significantly. By the beginning of the financial crisis, the assets of these same competitors had grown to more than match the total assets of depository institutions.

Figure 4

Assets of security brokers and dealers, money market mutual funds, and asset-backed securities issuers relative to assets of US-chartered depository institutions, 1984:Q1–2015:Q2. Figure data are from the Federal Reserve Board, the Financial Accounts of the United States, and Haver Analytics.



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It was often assumed that these nonbank alternative sources of financing would likely be more resilient than banks to economic cycles and to downturns in the value of collateral. This, however, turned out not to be the case during the Great Recession. Rather than absorbing shocks, in some cases these nonbank alternatives turned out to be much less resilient than banks.¹ In contrast to the sharp recovery in C&I lending after the financial crisis, the recovery of lending by these nonbank lenders has yet to occur. **Figure 4** shows the decline in the combined assets of broker-dealers, MMMFs, and ABS issuers relative to the assets of depository institutions following the onset of the financial crisis.

The differences between banks and nonbanks were underappreciated prior to the financial crisis. One reason why the credit crunch literature could focus on binding capital ratios at banks is that, with deposit insurance, the liabilities of banks are less reactive than those of other financial intermediaries facing financial difficulties. Banking problems appear primarily as loan losses that impact bank capital and cause pressure on capital relative to assets. For financial intermediaries without deposit insurance, reactions to financial crises are often experienced as a rapid loss of liabilities that can lead to a fire sale of assets, with the degree of shrinkage determined by the run risk faced by the institution. For these institutions, initial illiquidity can result in a rapid downward spiral into insolvency. Although both depository and nondepository institutions suffered in the recent crisis, depository institutions had better backstops, in part because of regulatory structure. Consequently, nondepository financial institutions suffered more severely from the financial crisis than did banks, and financial markets dependent on these financial intermediaries were less resilient once the crisis had subsided. In addition, the amplitude of the problems at these nonbank financial intermediaries during the crisis led to increased and continuing regulatory scrutiny of their activities. Section 3 explores the impacts of these developments, which were not experienced during the credit crunch of the early 1990s, focusing on three types of intermediaries central to the crisis: broker-dealers, MMMFs, and ABS issuers.

3. SENSITIVITY OF NONDEPOSITORY FINANCIAL INTERMEDIARIES TO FINANCIAL CRISES

Despite that shadow banking institutions had been widely assumed to be shock absorbers relative to commercial banks, the exact opposite was true during the financial crisis. Market-based financing that depended on financing at short maturities from MMMFs and on ABS was severely impaired during the financial crisis, as were some longer-run financing mechanisms, which were harmed by the inability of broker-dealers to make markets; this, in turn, severely impacted other types of financing.

3.1. Security Broker-Dealers

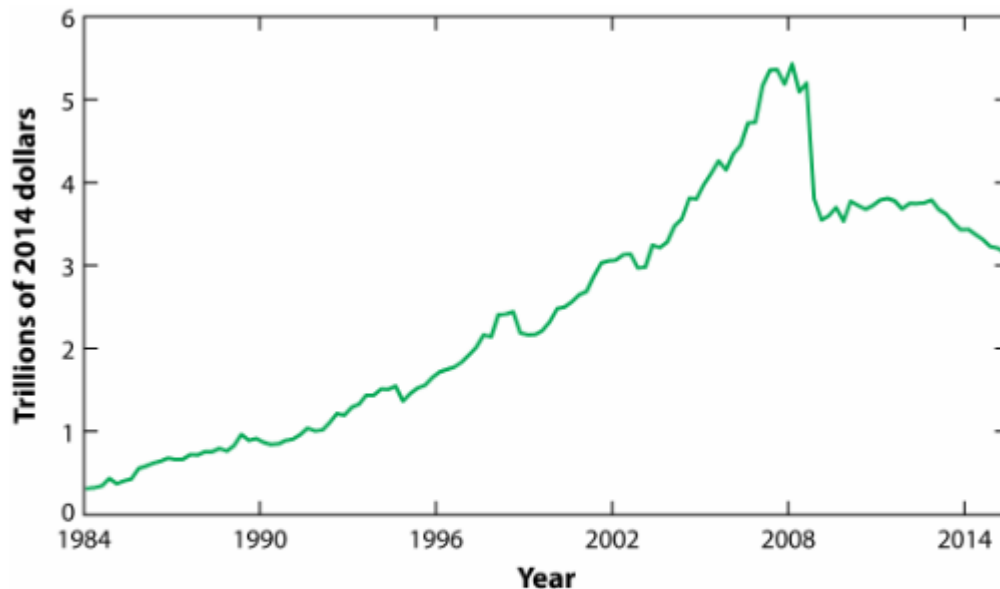
Broker-dealers and, in particular, large investment banks played a much more significant role in the financial crisis than during the earlier credit crunch episode. Problems became severe with the failure of investment bank Bear Stearns, and then critical with the failure of investment bank Lehman Brothers. Both firms had relied heavily on short-term wholesale funding, were unable to issue insured deposits, and, prior to the crisis, had not been part of a bank holding company and therefore had no direct access to normal discount window operations. In addition, both were regulated by the Securities and Exchange Commission (SEC) and operated within a regulatory framework different from (and less focused on prudential regulation than) that of banks.² By the time the recovery was underway, all large domestic broker-dealers were incorporated into large bank holding companies. Incorporating broker-dealers into bank holding companies, however, does not fully mitigate the potential risks that emerge when broker-dealers encounter financial difficulties, as **Rosengren (2014)** has emphasized.

Figure 5 illustrates that the assets of broker-dealers in 1990 amounted to less than a trillion dollars, even measured in 2014 dollars. The activities of broker-dealers expanded dramatically over the ensuing two decades, however, with their collective assets growing approximately fivefold. This rapid growth was facilitated both by their liability structure and by the lenient regulatory oversight of broker-dealers. **Figure 6** shows that this growth was also facilitated by the use of repurchase agreements, which enabled broker-dealers to finance long-term securities with relatively inexpensive short-term collateralized financing. Because most repurchase agreements were of very short duration, with many lasting only overnight, a significant spread could exist between the return on the underlying security and the cost of the repurchase agreement. Furthermore, this spread was enhanced over time, as repurchase agreements were increasingly used to finance securities that had

credit risk rather than Treasury securities, which did not have credit risk. In analyzing the financial crisis, **Gorton & Metrick (2012)** highlight the important role of the run on repurchase agreements, and **Adrian & Shin (2009, 2010)** focus on the role of broker-dealer balance-sheet financing.

Figure 5

Assets of security brokers and dealers, 1984:Q1–2015:Q2. Dollar values are adjusted for inflation using the GDP Deflator. Figure data are from the Federal Reserve Board, the Financial Accounts of the United States, BEA, and Haver Analytics.



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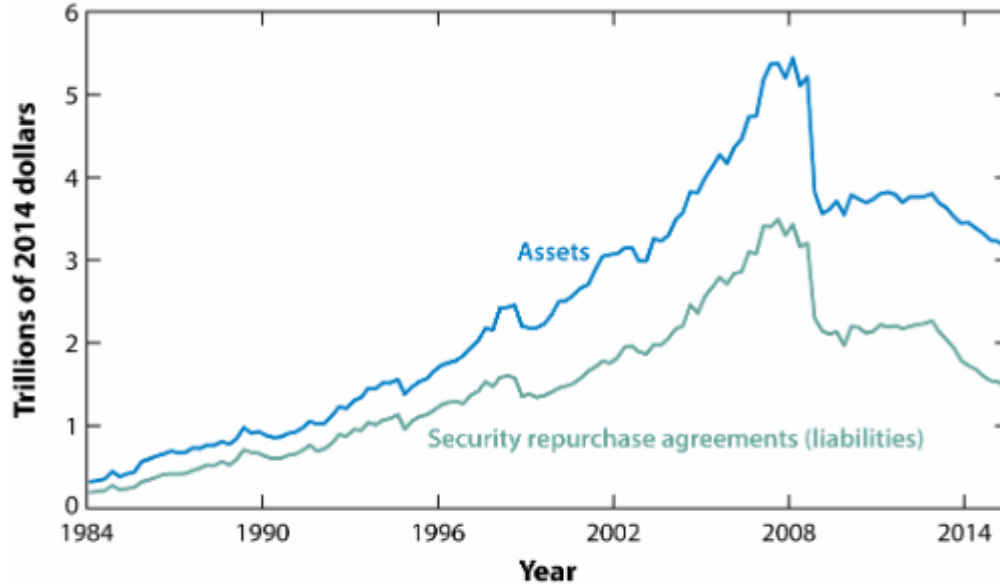
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Figure 6

Selected balance-sheet items of security brokers and dealers, 1984:Q1–2015:Q2. Dollar values are adjusted for inflation using the GDP Deflator. Figure data are from the Federal Reserve Board, the Financial Accounts of the United States, BEA, and Haver Analytics.



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It had generally been assumed that repurchase agreement financing would be stable during a financial downturn because the securities were fully collateralized with significant haircuts designed to offset price fluctuations. Should a broker-dealer be unable to repay according to the repurchase agreement, the underlying security could then be sold. However, the liquidity risk embedded in this financing was underappreciated prior to the crisis. This occurred in part because of limited transparency in the market. Even now, broker-dealers provide few details of the collateral they are financing with repurchase agreements or of the maturity structure of their borrowing, as the publicly filed SEC FOCUS Report provides only minimal information (**Rosengren 2014**). This has increasingly enabled large broker-dealers to finance risky securities with little or no public scrutiny.

As a result of this financing structure, financial disruptions caused significant differences between broker-dealer activity and the activity of more traditional depository institutions during the financial crisis. Broker-dealers' problems began as a silent run on their ability to finance their securities portfolios. As these financing difficulties became more apparent, they were forced to sell securities. Whereas Treasury securities could generally be sold in very liquid markets and tended to appreciate with the flight-to-quality response to financial problems, less liquid and more credit-risky securities became illiquid and could be sold only with significant reductions in price. Unlike banks, which have

deposit insurance and can therefore dispose of assets over time, broker-dealers are much more susceptible to runs and fire-sale pricing because of the very real run risk they face resulting from their heavy reliance on repurchase agreements.

This type of problem was not present during the credit crunch analyzed in the earlier literature. Several facts may explain this difference. In the early 1990s, broker-dealers were small relative to commercial banks, and the use of repurchase agreements to finance riskier debt had not yet become widespread. In addition, real estate price declines were more localized, so diversified portfolios of real estate assets were not as severely impacted. Furthermore, the securitization of assets was much less important. As a result, the potential for financial market disruption as broker-dealers faced runs and fire sales did not receive significant attention from economists before the financial crisis. Even after the crisis and despite some changes, the risk to financial stability arising from broker-dealers' financing structure is still receiving less attention than is warranted.

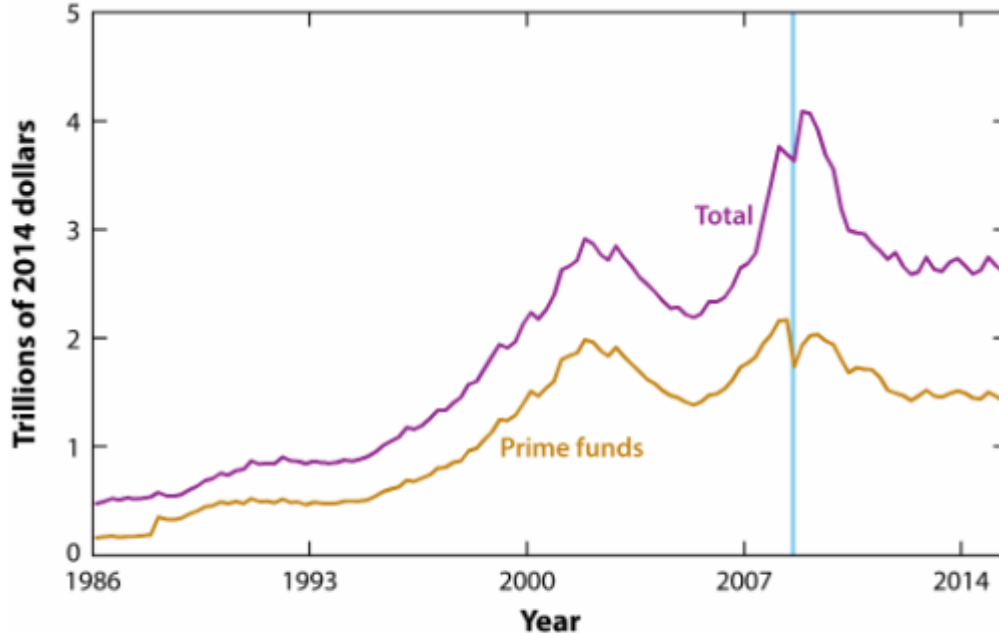
The regulatory response to this problem has been muted. Regulations for broker-dealers have not changed since the crisis. With most large domestic broker-dealers now embedded in bank holding companies, however, these broker-dealers are subject to bank holding company capital requirements and liquidity requirements. Nonetheless, as **Rosengren (2014)** has noted, the ability to finance a broker-dealer within a bank holding company structure is limited, and these limitations have increased with the passage of the Dodd–Frank Act. This is an area where more transparency and renewed attention to broker-dealer regulations would be helpful in the interest of avoiding future financial problems.


3.2. Money Market Mutual Funds

As with broker-dealers, relatively little academic attention was focused on MMMFs in the credit crunch literature. At the time of the credit crunch, as **Figure 7** shows, MMMF assets were below one trillion dollars, even in 2014 dollars. MMMF assets had grown, however, to about four trillion dollars by the onset of the financial crisis.

Figure 7

Money market mutual fund assets under management, 1986:Q1–2015:Q2. The vertical blue line represents the two consecutive dates when Lehman Brothers failed (September 15, 2008) and the Reserve Primary Fund broke the buck (September 16, 2008). Dollar values are adjusted for inflation using the GDP Deflator. Figure data are from iMoneyNet and BEA.



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One reason for the lack of attention to MMMFs was that they were perceived as being relatively low-risk. Under the SEC's 2A-7 rules, the riskiness of assets that MMMFs could hold was constrained; MMMFs were limited to assets with relatively short maturities and mostly to assets having credit ratings of A1/P1, indicating a relatively low probability of default, at least as viewed by rating agencies. Although MMMFs, like other mutual funds, hold no capital and do not have the deposit insurance available to bank deposits, the relatively low risk associated with these SEC requirements caused many investors to view MMMFs as similar to bank deposits. Individuals and institutional investors treated MMMF accounts as sufficiently safe to be used as transactions accounts.

Over time, however, MMMFs had begun to compete on yield. Some funds reached for yield by holding longer average maturities and/or taking on more credit risk in their investment portfolios. Among the assets purchased by some funds were structured investment vehicle paper and the commercial paper of troubled financial intermediaries that had not yet been downgraded, such as Lehman Brothers, and of foreign banks, such as Dexia, a large European financial intermediary that eventually became a casualty of the 2011 European sovereign debt crisis. With the failure of Lehman Brothers and the unraveling of many structured investment vehicles, many MMMFs experienced

losses (for a description of the losses, see **Brady, Anadu & Cooper 2012**). Although most MMMFs had sponsors that were able to provide the support needed to make investors whole, the Reserve Primary Fund did not. When it became clear that the Reserve Primary Fund would break the buck, resulting in investors' inability to withdraw the full value of their accounts dollar for dollar, many institutional investors began a run on MMMFs. The run was focused on prime funds that were allowed to hold paper other than government securities and that therefore generally offered a slightly higher return.

This run was precipitous, causing a dramatic decline in the assets of prime MMMFs in particular (see **Figure 7**). Although some investors moved their funds to insured bank accounts, others moved funds to MMMFs that invested only in government securities. To avert failure, the Treasury provided a guarantee for MMMF investors, and the Federal Reserve established a lending facility to support the ability of MMMFs to liquidate their asset-backed commercial paper. However, the run by MMMF investors and the need of MMMFs to dramatically increase liquidity severely tightened the availability of short-term credit. MMMFs became less willing to hold commercial paper with credit risk and less willing to hold repurchase agreements on securities not issued or guaranteed by the federal government. This created problems for broker-dealers that were dependent on MMMFs to fund their securities holdings, as well as for companies that had counted on the commercial paper market to finance a wide variety of assets.

Because MMMFs hold no capital, the mechanism that caused their credit availability to shrink was very different than that for capital-constrained banks. Again, the absence of deposit insurance made these intermediaries particularly susceptible to runs and fire-sale prices. Because of MMMFs' relatively small collective size at the time of the credit crunch in the early 1990s and their very different regulatory structure, the early credit crunch literature devoted little attention to these organizations. Yet it was these organizations that were responsible for the seizing up of short-term credit markets in the fall of 2008.

The SEC has altered the regulation of MMMFs as a result of the problems during the crisis. In 2010, MMMFs became subject to enhanced liquidity requirements, and in 2014, the SEC adopted rules that required institutional prime MMMFs to adopt floating net asset values (NAVs). Both approaches should help to mitigate any seizing up of short-term credit in the future. The problems with MMMFs have not been fully resolved, however. The new floating NAV requirement, for example, does not

apply to retail prime MMMFs. In addition, the SEC allowed individual MMMFs to impose gates and fees on investors in funds experiencing a run. Although this would stop a run on an individual fund by preventing investors from immediately accessing their funds, which they might have thought were being held in transactions-like accounts, such actions could cause a much more widespread run, with investors fleeing nongovernment MMMFs to avoid the potential imposition of gates and fees. Such omissions and provisions could cause severe problems in a future financial crisis.

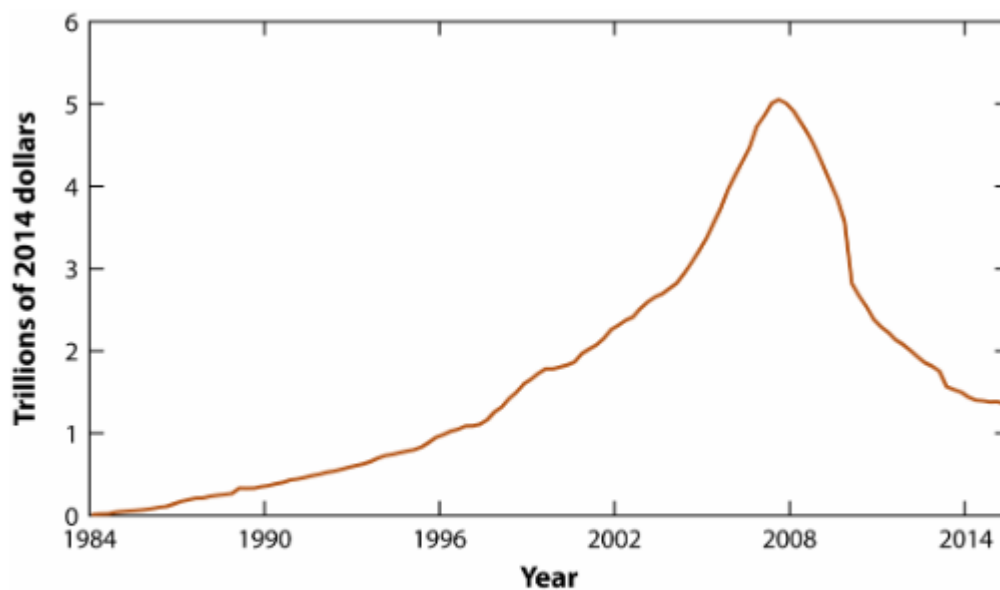
3.3. Asset-Backed Securities Issuers

Figure 8 shows the assets of ABS issuers over time. ABS issuers use a particular legal structure called special purpose vehicles (SPVs) to hold assets financed by issuing debt, such as mortgages, consumer loans, automobile loans, and student loans. Prior to the crisis, these structures were used to remove assets from the balance sheets of banks and finance companies. By securitizing these assets, financial institutions could collect fees but no longer needed to hold capital against the assets. This form of shadow banking was viewed as a way to move toward an even more market-centric financing structure. Moreover, as **Shin (2009)** notes, prior to the crisis many authors had assumed that the primary impact of securitization would be to enhance financial stability.

Figure 8

Assets of asset-backed securities issuers, 1984:Q1–2015:Q2. Dollar values are adjusted for inflation using the GDP Deflator.

Figure data are from the Federal Reserve Board, the Financial Accounts of the United States, BEA, and Haver Analytics.



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As mentioned above, ABS issuers received relatively little attention in the earlier credit crunch literature. In part, this is because they were collectively quite small, with much less than one trillion dollars in assets at the time of the credit crunch. As **Figure 8** shows, the assets of ABS issuers increased dramatically between then and the recent financial crisis, with an acceleration just prior to the crisis. Since the financial crisis, however, the creation of securitized assets has decreased significantly. Like other types of intermediation, this type became susceptible to investor runs. During the financial crisis, many of the assets that were being securitized had become riskier, resulting in lessened willingness on the part of investors to hold debt issued by an SPV. Moreover, regulatory changes implemented since the crisis have made securitizing assets less attractive to banks and finance companies. In particular, a series of rules and regulations have increased required risk retention, strengthened reporting requirements (SEC actions on disclosure), and required representations and warranties that substantially increase the risk of litigation (Section 943 of the Dodd–Frank Act). Thus, the regulatory reaction to problems experienced with securitizations during the crisis have substantially increased the costs to ABS issuers, and in some areas there remains significant uncertainty surrounding the eventual evolution of securitization.

Although securitization did not play a significant role in the earlier credit crunch episode, it did create problems during the financial crisis. As structures tied to securitization unraveled, more financing had to be provided by financial intermediaries that were already capital-constrained by the losses they were experiencing. This increased the cost of financing to many households and individuals. The eventual status of securitization will depend on rules and regulations not yet finalized. The experience from the financial crisis highlights the importance of undertaking more academic work aimed at understanding how these complicated financial structures work and how they can encounter problems.

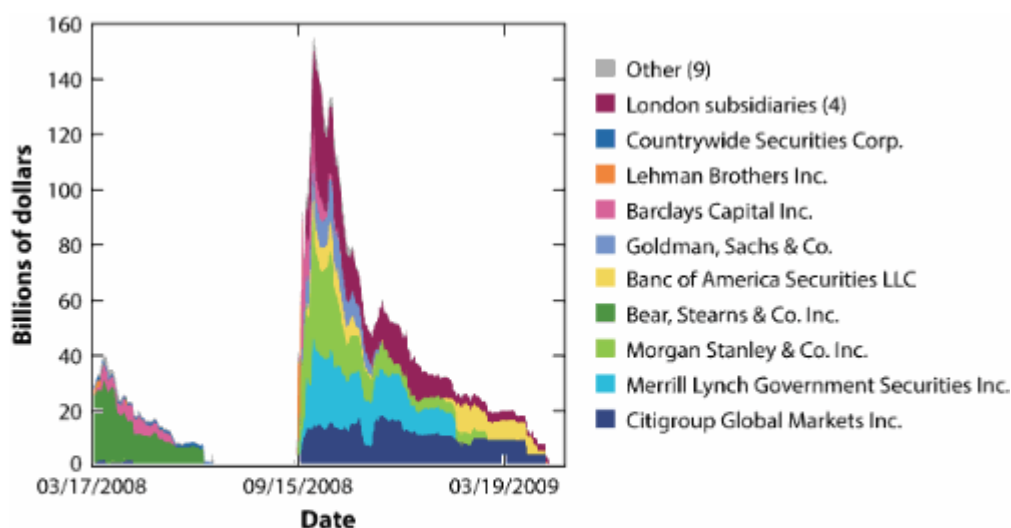
4. RESPONSES TO POTENTIAL CREDIT CRUNCHES

Although the credit crunch of the 1990s did engender a regulatory response, the scale of the response was nowhere near the scale of the response to the financial crisis, which included the comprehensive Dodd–Frank Act, among other actions. In the response to the financial crisis, not only were actions taken to quickly recapitalize financial institutions, but lending facilities were created to ameliorate the problems created by runs on, and fire sales by, nondepository financial institutions (see, for example, **Adrian, Burke & McAndrews 2009; Fleming, Hrung & Keane 2009; Adrian & Shin 2010; Fleming 2012**). This was particularly striking because attention had previously been focused on financing through depository, rather than nondepository, institutions.

A good indicator of the response can be seen in two of the facilities designed to ameliorate the difficulties created by the liquidity and solvency problems of large broker-dealers. **Figure 9** shows the composition of borrowers from the Primary Dealer Credit Facility. Borrowing spiked immediately with the failure of Bear Stearns and then subsided until the dramatic spike at the time of the Lehman Brothers failure. This second spike occurred despite Goldman Sachs and Morgan Stanley becoming bank holding companies and several other broker-dealers being acquired by bank holding companies, indicating that despite the exemptions granted for lending to nonbank affiliates, substantial demand remained among these institutions for accessing the liquidity available from the Primary Dealer Credit Facility.

Figure 9

Primary Dealer Credit Facility loans outstanding, March 17, 2008–May 12, 2009. The four London subsidiaries (*dark purple*) are securities subsidiaries of Citigroup, Goldman Sachs, Merrill Lynch, and Morgan Stanley. Figure data are from the Federal Reserve Board.



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Table 1 shows similar information for the Term Securities Lending Facility. This facility was designed to address the problem of broker-dealers obtaining financing for lower-credit-quality assets. Through this program, broker-dealers were able to swap lower-quality securities for Treasury securities that could then be financed. The extensive borrowing from this facility indicates how difficult it was for broker-dealers to finance non-Treasury securities. By providing liquid financing, the program enabled broker-dealers to avoid selling their lower-quality securities at what would likely have been fire-sale prices during the height of the financial crisis, which would have further impaired securities financing, even for relatively healthy broker-dealers.

Table 1

Term Securities Lending Facility, March 28, 2008–August 14, 2009

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The extensive borrowing from the Federal Reserve facilities illustrates just how impaired financing was at many nondepository financial institutions. Although these institutions had received relatively little academic scrutiny, they had become critical infrastructure for the continuing movement to more market-centric financing. However, unlike banks, for which financial regulation had been designed to mitigate the impact of liquidity and capital shocks, broker-dealers were not well positioned by regulations for either type of shock. The realization that credit shocks could be devastating and that restoring credit availability was critical to recovery was nonetheless a valuable lesson learned from previous periods when shocks had been more bank-centric. This lesson informed the policies that were hastily improvised as the financial crisis accelerated.

In terms of regulatory response, the reaction to the financial crisis has resulted in significant changes to both bank supervision and bank regulation. Perhaps the most salutary effect has been to increase focus on stress tests. Stress tests, which evaluate bank capital distributions in the context of hypothetical stressful situations, have become a standard supervisory tool. To increase dividends or stock repurchases, the largest banks are now required to show that such actions would not prevent them from exceeding capital thresholds even under a stress scenario provided by bank regulators. The combination of regular stress tests and higher capital requirements included in the Dodd–Frank Act has resulted in a significant recapitalization of the banking system. Particularly striking has been the increase in capital at the largest, most systemically important financial institutions.

Had stricter capital rules and stress tests been in place prior to the financial crisis, banks would have had far larger capital cushions to protect them from emerging problems. An additional innovation has been the substantial attention given to liquidity at large financial institutions. Liquidity issues emerged as a major problem at a number of the largest banks that experienced funding problems during the crisis.

Although there have been significant improvements in bank regulation, less success has been achieved in addressing problems in the nondepository financial sector. As **Gorton & Metrick (2010)** have highlighted, the regulatory response in this area has been much less aggressive, despite the significant role played in the crisis by MMMFs and securitization. **Gorton & Metrick (2012)** also highlight the significant gaps in liquidity regulation of nondepository financial institutions.

5. CONCLUSION

The earlier literature on credit crunches contributed importantly to economists' understanding of how financial shocks can impact the real economy. The real estate shock that caused capital-constrained banks to reduce credit availability to households and firms provided an important lesson in the 1990 recession, as discussed in the academic work that followed. That literature provided a helpful guide as to how to respond to adverse credit shocks.

Many of the financial innovations that occurred after the 1990 recession, however, moved the issuance of credit to nondepository financial intermediaries. Whereas the main problem facing banks was how to satisfy capital constraints when experiencing large declines in capital, these nonbank intermediaries were much more susceptible than banks to liquidity shocks, runs on liabilities, and fire sales of assets.³ Although the earlier literature provided important context, the nature of the problems was quite different for nondepository entities. Because these potential problems of nonbank intermediaries had not arisen in the earlier credit crunch, they were largely ignored in the subsequent credit crunch literature.

Significant regulatory improvements are being implemented for banks. For nondepository institutions, however, much remains to be done (see, for example, **Adrian & Ashcraft 2012**). Both policymakers and academics need to better understand the complex interaction of depository institutions and financial markets with shadow banks if we are to be confident that the economy would be resilient to a future adverse financial shock of a similar magnitude.

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The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

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