Financial Crises and Bank Liquidity Creation

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Financial crises and bank liquidity creation are often connected. We examine this connection from two perspectives. First, we examine the aggregate liquidity creation of banks before, during, and after five major financial crises in the U.S. from 1984:Q1 to 2008:Q1. We uncover numerous interesting patterns, such as a significant build-up or drop-off of "abnormal" liquidity creation before each crisis, where "abnormal" is defined relative to a time trend and seasonal factors. Banking and market-related crises differ in that banking crises were preceded by abnormal positive liquidity creation, while market-related crises were generally preceded by abnormal negative liquidity creation. Bank liquidity creation has both decreased and increased during crises, likely both exacerbating and ameliorating the effects of crises. Off-balance sheet guarantees such as loan commitments moved more than on-balance sheet assets such as mortgages and business lending during banking crises.

Second, we examine the effect of pre-crisis bank capital ratios on the competitive positions and profitability of individual banks during and after each crisis. The evidence suggests that high capital served large banks well around banking crises – they improved their liquidity creation market share and profitability during these crises and were able to hold on to their improved performance afterwards. In addition, high-capital listed banks enjoyed significantly higher abnormal stock returns than low-capital listed banks during banking crises. These benefits did not hold or held to a lesser degree around market-related crises and in normal times. In contrast, high capital ratios appear to have helped small banks improve their liquidity creation market share during banking crises, market-related crises, and normal times alike, and the gains in market share were sustained afterwards. Their profitability improved during two crises and subsequent to virtually every crisis. Similar results were observed during normal times for small banks.

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1. Introduction

Over the past quarter century, the U.S. has experienced a number of financial crises. At the heart of these crises are often issues surrounding liquidity provision by the banking sector and financial markets (e.g., Acharya, Shin, and Yorulmazer 2007). For example, in the current subprime lending crisis, liquidity seems to have dried up as banks seem less willing to lend to individuals, firms, other banks, and capital market participants, and loan securitization appears to be significantly depressed. This behavior of banks is summarized by the Economist: "Although bankers are always stingier in a downturn, […] lots of banks said they had also cut back lending because of a slide in their current or expected capital and liquidity."[1]

The practical importance of liquidity during crises is buttressed by financial intermediation theory, which indicates that the creation of liquidity is an important reason why banks exist.[2] Early contributions argue that banks create liquidity by financing relatively illiquid assets such as business loans with relatively liquid liabilities such as transactions deposits (e.g., Bryant 1980, Diamond and Dybvig 1983). More recent contributions suggest that banks also create liquidity off the balance sheet through loan commitments and similar claims to liquid funds (e.g., Holmstrom and Tirole 1998, Kashyap, Rajan, and Stein 2002).[3] The creation of liquidity makes banks fragile and susceptible to runs (e.g., Diamond and Dybvig 1983, Chari and Jagannathan 1988), and such runs can lead to crises via contagion effects. Bank liquidity creation can also have real effects, in particular if a financial crisis ruptures the creation of liquidity (e.g., Dell'Ariccia, Detragiache, and Rajan 2008).[4] Exploring the relationship between financial crises and bank liquidity creation can thus yield potentially interesting economic insights and may have important policy implications.

The goals of this paper are twofold. The first is to examine the aggregate liquidity creation of

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[1] "The credit crisis: Financial engine failure" – The Economist, February 7, 2008.

[2] According to the theory, another central role of banks in the economy is to transform credit risk (e.g., Diamond 1984, Ramakrishnan and Thakor 1984, Boyd and Prescott 1986). Recently, Coval and Thakor (2005) theorize that banks may also arise in response to the behavior of irrational agents in financial markets.

[3] James (1981) and Boot, Thakor, and Udell (1991) endogenize the loan commitment contract due to informational frictions. The loan commitment contract is subsequently used in Holmstrom and Tirole (1998) and Kashyap, Rajan, and Stein (2002) to show how banks can provide liquidity to borrowers.

[4] Acharya and Pedersen (2005) show that liquidity risk also affects the expected returns on stocks.

banks around five financial crises in the U.S. over the past quarter century.[5] The crises include two banking crises (the credit crunch of the early 1990s and the subprime lending crisis of 2007 – ?) and three crises that can be viewed as primarily market-related (the 1987 stock market crash, the Russian debt crisis plus the Long-Term Capital Management meltdown in 1998, and the bursting of the dot.com bubble plus the September 11 terrorist attack of the early 2000s). This examination is intended to shed light on whether there are any connections between financial crises and aggregate liquidity creation, and whether these vary based on the nature of the crisis (i.e., banking versus market-related crisis). A good understanding of the behavior of bank liquidity creation around financial crises is also important to shed light on whether banks create "too little" or "too much" liquidity, and whether bank behavior exacerbates or ameliorates the effects of crises. We document the empirical regularities related to these issues, so as to raise additional interesting questions for further empirical and theoretical examinations.

The second goal is to study the effect of pre-crisis equity capital ratios on the competitive positions and profitability of individual banks around each crisis. Since bank capital affects liquidity creation (e.g., Diamond and Rajan 2000, 2001, Berger and Bouwman forthcoming), it is likely that banks with different capital ratios behave differently during crises in terms of their liquidity creation responses. Specifically, we ask: are high-capital banks able to gain market share in terms of liquidity creation at the expense of low-capital banks during a crisis, and does such enhanced market share translate into higher profitability? If so, are the high-capital banks able to sustain their improved competitive positions after the financial crisis is over? The recent acquisitions of Countrywide, Bear Stearns, and Washington Mutual provide interesting case studies in this regard. All three firms ran low on capital and had to be bailed out by banks with stronger capital positions. Bank of America (Countrywide's acquirer) and J.P. Morgan Chase (acquirer of Bear-Stearns and Washington Mutual's banking operations) had capital ratios high enough to enable them to buy their rivals at a small fraction of what they were worth a year before, thereby gaining a potential competitive advantage.[6] The recent experience of IndyMac Bank provides

[5] Studies on the behavior of banks around financial crises have typically focused on commercial and real estate lending (e.g., Berger and Udell 1994, Hancock, Laing, and Wilcox 1995, Dell'Ariccia, Igan, and Laeven 2008). We focus on the more comprehensive notion of bank liquidity creation.

[6] On Sunday, March 16, 2008, J.P. Morgan Chase agreed to pay $2 a share to buy all of Bear Stearns, less than one-tenth of the firm's share price on Friday and a small fraction of the $170 share price a year before. On March 24, 2008, it increased its bid to $10, and completed the transaction on May 30, 2008. On January 11, Bank of America announced it would pay $4 billion for Countrywide, after Countrywide's market capitalization had plummeted 85% during the preceding 12 months. The transaction was completed on July 1, 2008. After a $16.4 billion ten-day bank

another interesting example. The FDIC seized IndyMac Bank after it suffered substantive losses and depositors had started to run on the bank. The FDIC intends to sell the bank, preferably as a single entity but if that does not work, the bank will be sold off in pieces. Given the way the regulatory approval process for bank acquisitions works, it is likely that the acquirer(s) will have a strong capital base.[7] Funds from the $700-billion bailout package (TARP program) are being used by some strong banks to acquire lesser-capitalized peers. E.g., PNC Bank is using TARP funds to acquire National City Bank.

A financial crisis is a natural event to examine how capital affects the competitive positions of banks. During "normal" times, capital has many effects on the bank, some of which counteract each other, making it difficult to learn much. For example, capital helps the bank cope more effectively with risk,[8] but it also reduces the value of the deposit insurance put option (Merton 1977). During a crisis, risks become elevated and the risk-absorption capacity of capital becomes paramount. Banks with high capital, which are better buffered against the shocks of the crisis, may thus gain a potential advantage.

To examine the behavior of bank liquidity creation around financial crises, we calculate the amount of liquidity created by the banking sector using Berger and Bouwman's (forthcoming) preferred liquidity creation measure. This measure takes into account the fact that banks create liquidity both on and off the balance sheet and is constructed using a three-step procedure. In the first step, all bank assets, liabilities, equity, and off-balance sheet activities are classified as liquid, semi-liquid, or illiquid. This is done based on the ease, cost, and time for customers to obtain liquid funds from the bank, and the ease, cost, and time for banks to dispose of their obligations in order to meet these liquidity demands. This classification process uses information on both product category and maturity for all activities other than loans; due to data limitations, loans are classified based solely on category ("cat"). Thus, residential mortgages are classified as more liquid than business loans regardless of maturity because it is generally easier to securitize and sell such mortgages than business loans. In the second step, weights are assigned to these activities. The weights are consistent with the theory in that maximum liquidity is created when

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"walk", Washington Mutual was placed into the receivership of the FDIC on September 25, 2008. J.P. Morgan Chase purchased the banking business for $1.9 billion and re-opened the bank the next day. On September 26, 2008, the holding company and its remaining subsidiary filed for bankruptcy. Washington Mutual, the sixth-largest bank in the U.S. before its collapse, is the largest bank failure in the U.S. financial history.

[7] After peaking at $50.11 on May 8, 2006, IndyMac's shares lost 87% of their value in 2007 and another 95% in 2008. Its share price closed at $0.28 on July 11, 2008, the day before it was seized by the FDIC.

[8] There are numerous papers that argue that capital enhances the risk-absorption capacity of banks (e.g., Bhattacharya and Thakor 1993, Repullo 2004, Von Thadden 2004).

illiquid assets (e.g., business loans) are transformed into liquid liabilities (e.g., transactions deposits) and maximum liquidity is destroyed when liquid assets (e.g., treasuries) are transformed into illiquid liabilities (e.g., subordinated debt) or equity. In the third step, a "cat fat" liquidity creation measure is constructed, where "fat" refers to the inclusion of off-balance sheet activities. Although Berger and Bouwman construct four different liquidity creation measures, they indicate that "cat fat" is the preferred measure. They argue that to assess the amount of liquidity creation, the ability to securitize or sell a particular loan category is more important than the maturity of those loans, and the inclusion of off-balance sheet activities is critical.[9] We apply the "cat fat" liquidity creation measure to quarterly data on virtually all U.S. commercial and credit card banks from 1984:Q1 to 2008:Q1.

Our measurement of aggregate liquidity creation by banks allows us to examine the behavior of liquidity created prior to, during, and after each crisis. The popular press has provided anecdotal accounts of liquidity drying up during some financial crises as well as excessive liquidity provision at other times that led to credit expansion bubbles (e.g., the subprime lending crisis). We attempt to give empirical content to these notions of "too little" and "too much" liquidity created by banks. Liquidity creation has quadrupled in real terms over the sample period and appears to have seasonal components (as documented below). Since no theories exist that explain the intertemporal behavior of liquidity creation, we take an essentially empirical approach to the problem and focus on how far liquidity creation lies above or below a time trend and seasonal factors.[10] That is, we focus on "abnormal" liquidity creation. The use of this measure rests on the supposition that some "normal" amount of liquidity creation exists, acknowledging that at any point in time, liquidity creation may be "too much" or "too little" in dollar terms.

Our main results regarding the behavior of liquidity creation around financial crises are as follows. First, prior to financial crises, there seems to have been a significant build-up or drop-off of "abnormal" liquidity creation. Second, banking and market-related crises differ in two respects. The banking crises (the credit crunch of 1990-1992 and the current subprime lending crisis) were preceded by abnormal positive liquidity creation by banks, whereas the market-related crises were generally preceded

[9] Their alternative measures include "cat nonfat," "mat fat," and "mat nonfat." The "nonfat" measures exclude off-balance sheet activities, and the "mat" measures classify loans by maturity rather than by product category.
[10] As alternative approaches, we use the dollar amount of liquidity creation per capita and liquidity creation divided by GDP and obtain similar results (see Section 4.2).

by abnormal negative liquidity creation. In addition, the banking crises themselves seemed to change the trajectory of aggregate liquidity creation, while the market-related crises did not appear to do so. Third, liquidity creation has both decreased during crises (e.g., the 1990-1992 credit crunch) and increased during crises (e.g., the 1998 Russian debt crisis / LTCM bailout). Thus, liquidity creation likely both exacerbated and ameliorated the effects of crises. Fourth, off-balance sheet illiquid guarantees (primarily loan commitments) moved more than semi-liquid assets (primarily mortgages) and illiquid assets (primarily business loans) during banking crises. Fifth, the current subprime lending crisis was preceded by an unusually high positive abnormal amount of aggregate liquidity creation, possibly caused by lax lending standards that led banks to extend increasing amounts of credit and off-balance sheet guarantees. This suggests a possible dark side of bank liquidity creation. While financial fragility may be needed to induce banks to create liquidity (e.g., Diamond and Rajan 2000, 2001), our analysis raises the intriguing possibility that the causality may also be reversed in the sense that too much liquidity creation may lead to financial fragility.

We then turn to the second goal of the paper – examining whether banks' pre-crisis capital ratios affect their competitive positions and profitability around financial crises. To examine the effect on a bank's competitive position, we regress the change in its market share of liquidity creation – measured as the average market share of aggregate liquidity creation during the crisis (or over the eight quarters after the crisis) minus the average market share over the eight quarters before the crisis, expressed as a proportion of the bank's average pre-crisis market share – on its average pre-crisis capital ratio and a set of control variables.[11] Since the analyses in the first half of the paper reveal a great deal of heterogeneity in crises, we run these regressions on a per-crisis basis, rather than pooling the data across crises. The control variables include bank size, bank risk, bank holding company membership, local market competition,[12] and proxies for the economic circumstances in the local markets in which the bank operates. Moreover, we examine large and small banks as two separate groups since the results in Berger and Bouwman (forthcoming) indicate that the effect of capital on liquidity creation differs across large

[11] Defining market share this way is a departure from previous research (e.g., Laeven and Levine 2007), in which market share relates to the bank's weighted-average local market share of total deposits.

[12] While our focus is on the change in banks' competitive positions measured in terms of their aggregate liquidity creation market shares, we control for "local market competition" measured as the bank-level Herfindahl index based on local market deposit market shares.

and small banks.[13]

One potential concern is that differences in bank capital ratios may simply reflect differences in bank risk. Banks that hold higher capital ratios because their investment portfolios are riskier may not improve their competitive positions around financial crises. Our empirical design takes this into account. The inclusion of bank risk as a control variable is critical and ensures that the measured effect of capital on a bank's market share is net of the effect of risk.

We find evidence that high-capital large banks improved their market share of liquidity creation during the two banking crises, but not during the market-related crises. After the credit crunch of the early 1990s, high-capital large banks held on to their improved competitive positions. Since the current subprime lending crisis was not over at the end of the sample period, we cannot yet tell whether high-capital large banks will also hold on to their improved competitive positions after this crisis. In contrast to the large banks, high-capital small banks seemed to enhance their competitive positions during *all* crises and held on to their improved competitive positions after the crises as well.

Next, we focus on the effect of pre-crisis bank capital on the profitability of the bank around each crisis. We run regressions that are similar to the ones described above with the change in return on equity (ROE) as the dependent variable. We find that high-capital large banks improved their ROE in those cases in which they enhanced their liquidity creation market share – the two banking crises – and were able to hold on to their improved profitability after the credit crunch. They also increased their profitability after the market-related crises. In contrast, for high-capital small banks, profitability improved during two crises, and subsequent to virtually every crisis.

As an additional analysis, we examine whether the improved competitive positions and profitability of high-capital banks translated into better stock return performance. To perform this analysis, we focus on listed banks and bank holding companies (BHCs). If multiple banks are part of the same listed BHC, their financial statements are added together to create pro-forma financial statements of the BHC. The results confirm the earlier change in performance findings of large banks: listed banks with high capital ratios enjoyed significantly larger abnormal returns than banks with low capital ratios during banking crises, but not during market-related crises. Our results are based on a five-factor asset pricing

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[13] Berger and Bouwman use three size categories: large, medium, and small banks. We combine the large and medium bank categories into one "large bank" category.

model that includes the three Fama-French (1993) factors, momentum, and a proxy for the slope of the yield curve.

We also check whether high capital provided similar advantages *outside* crisis periods, i.e., during "normal" times. We find that large banks with high capital ratios did not enjoy either market share or profitability gains over the other large banks, whereas for small banks, results are similar to the small-bank findings discussed above. Moreover, outside banking crises, high capital was *not* associated with high stock returns.

Combined, the results suggest that high capital ratios serve large banks well, particularly around banking crises. In contrast, high capital ratios appear to help small banks around banking crises, market-related crises, and normal times alike.

The remainder of this paper is organized as follows. Section 2 discusses the related literature. Section 3 explains the liquidity creation measures and our sample based on data of U.S. banks from 1984:Q1 to 2008:Q1. Section 4 describes the behavior of aggregate bank liquidity creation around five financial crises and draws some general conclusions. Section 5 discusses the tests of the effects of pre-crisis capital ratios on banks' competitive positions and profitability around financial crises and "normal" times. This section also examines the stock returns of high- and low-capital listed banking organizations during each crisis and during "normal" times. Section 6 concludes.

2. Related literature

This paper is related to two literatures. The first is the literature on financial crises.[14] One strand in this literature has focused on financial crises and fragility. Some papers have analyzed contagion. Contributions in this area suggest that a small liquidity shock in one area may have a contagious effect throughout the economy (e.g., Allen and Gale 1998, 2000). Other papers have focused on the determinants of financial crises and the policy implications (e.g., Bordo, Eichengreen, Klingebiel, and Martinez-Peria 2001, Demirguc-Kunt, Detragiache, and Gupta 2006, Lorenzoni 2008, Claessens, Klingebiel, and Laeven forthcoming). A second strand examines the effect of financial crises on the real sector (e.g., Friedman and Schwarz 1963, Bernanke 1983, Bernanke and Gertler 1989, Dell'Ariccia,

[14] Allen and Gale (2007) provide a detailed overview of the causes and consequences of financial crises.

Detragiache, and Rajan 2008, Shin forthcoming). These papers find that financial crises increase the cost of financing and reduce credit, which adversely affects corporate investment and may lead to reduced growth and recessions. That is, financial crises have independent real effects (see Dell'Ariccia, Detragiache, and Rajan 2008). In contrast to these papers, we examine how the amount of liquidity created by the banking sector behaved around financial crises in the U.S., and explore systematic patterns in the data.

The second literature to which this paper is related focuses on the strategic use of leverage in product-market competition for non-financial firms (e.g., Brander and Lewis 1986, Campello 2006, Lyandres 2006). This literature suggests that financial leverage can affect competitive dynamics. While this literature has not focused on banks, we analyze the effects of crises on the competitive positioning and profitability of banks based on their pre-crisis capital ratios. Our hypothesis is that in the case of banks, the competitive implications of capital are likely to be most pronounced during a crisis when a bank's capitalization has a major influence on its ability to survive the crisis, particularly in light of regulatory discretion in closing banks or otherwise resolving problem institutions. Liquidity creation may be a channel through which this competitive advantage is gained or lost.[15]

3. Description of the liquidity creation measure and sample

We calculate the dollar amount of liquidity created by the banking sector using Berger and Bouwman's (forthcoming) preferred "cat fat" liquidity creation measure. In this section, we explain briefly what this acronym stands for and how we construct this measure.[16] We then describe our sample. All financial values are expressed in real 2007:Q4 dollars using the implicit GDP price deflator.

3.1. Liquidity creation measure

To construct a measure of liquidity creation, we follow Berger and Bouwman's three-step procedure (see *Table 1*). Below, we briefly discuss these three steps.

In Step 1, we classify all bank activities (assets, liabilities, equity, and off-balance sheet activities)

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[15] Allen and Gale (2004) analyze how competition affects financial stability. We reverse the causality and examine the effect of financial crises on competition.
[16] For a more detailed discussion, see Berger and Bouwman (forthcoming).

as liquid, semi-liquid, or illiquid. For assets, we do this based on the ease, cost, and time for banks to dispose of their obligations in order to meet these liquidity demands. For liabilities and equity, we do this based on the ease, cost, and time for customers to obtain liquid funds from the bank. We follow a similar approach for off-balance sheet activities, classifying them based on functionally similar on-balance sheet activities. For all activities other than loans, this classification process uses information on both product category and maturity. Due to data restrictions, we classify loans entirely by category ("cat").[17]

In Step 2, we assign weights to all the bank activities classified in Step 1. The weights are consistent with liquidity creation theory, which argues that banks create liquidity on the balance sheet when they transform illiquid assets into liquid liabilities. We therefore apply positive weights to illiquid assets and liquid liabilities. Following similar logic, we apply negative weights to liquid assets and illiquid liabilities and equity, since banks destroy liquidity when they use illiquid liabilities to finance liquid assets. We use weights of ½ and -½, because only half of the total amount of liquidity created is attributable to the source or use of funds alone. For example, when $1 of liquid liabilities is used to finance $1 in illiquid assets, liquidity creation equals ½ * $1 + ½ * $1 = $1. In this case, maximum liquidity is created. However, when $1 of liquid liabilities is used to finance $1 in liquid assets, liquidity creation equals ½ * $1 + -½ * $1 = $0. In this case, no liquidity is created as the bank holds items of approximately the same liquidity as those it gives to the nonbank public. Maximum liquidity is destroyed when $1 of illiquid liabilities or equity is used to finance $1 of liquid assets. In this case, liquidity creation equals -½ * $1 + -½ * $1 = -$1. An intermediate weight of 0 is applied to semi-liquid assets and liabilities. Weights for off-balance sheet activities are assigned using the same principles.

In Step 3, we combine the activities as classified in Step 1 and as weighted in Step 2 to construct Berger and Bouwman's preferred "cat fat" liquidity creation measure. This measure classifies loans by category ("cat"), while all activities other than loans are classified using information on product category and maturity, and includes off-balance sheet activities ("fat"). Berger and Bouwman construct four liquidity creation measures by alternatively classifying loans by category or maturity, and by alternatively including or excluding off-balance sheet activities. However, they argue that "cat fat" is the preferred

[17] Alternatively, we could classify loans by maturity ("mat"). However, Berger and Bouwman argue that it is preferable to classify them by category since for loans, the ability to securitize or sell is more important than their maturity.

measure since for liquidity creation, banks' ability to securitize or sell loans is more important than loan maturity, and banks do create liquidity both on the balance sheet and off the balance sheet.

To obtain the dollar amount of liquidity creation at a particular bank, we multiply the weights of ½, -½, or 0, respectively, times the dollar amounts of the corresponding bank activities and add the weighted dollar amounts.

3.2. Sample description

We include virtually all commercial and credit card banks in the U.S. in our study.[18] For each bank, we obtain quarterly Call Report data from 1984:Q1 to 2008:Q1. We keep a bank if it: 1) has commercial real estate or commercial and industrial loans outstanding; 2) has deposits; 3) has an equity capital ratio of at least 1%; 4) has gross total assets or GTA (total assets plus allowance for loan and lease losses and the allocated transfer risk reserve) exceeding $25 million. We end up with data on 18,134 distinct banks, yielding 907,159 bank-quarter observations over our sample period.

For each bank, we calculate the dollar amount of liquidity creation using the process described in Section 3.1. The amount of liquidity creation and all other financial values are put into real 2007:Q4 dollars using the implicit GDP price deflator. When we explore aggregate bank liquidity creation around financial crises, we focus on the real dollar amount of liquidity creation by the banking sector. To obtain this, we aggregate the liquidity created by all banks in each quarter and end up with a sample that contains 97 inflation-adjusted, quarterly liquidity creation amounts.

In contrast, when we examine how capital affects the competitive positions of banks, we focus on the amount of liquidity created by individual banks around each crisis. Given documented differences between large and small banks in terms of portfolio composition (e.g., Kashyap, Rajan, and Stein 2002, Berger, Miller, Petersen, Rajan, and Stein 2005) and the effect of capital on liquidity creation (Berger and Bouwman forthcoming), we split the sample into large banks (between 330 and 477 observations, depending on the crisis) and small banks (between 5556 and 6343 observations, depending on the crisis), and run all change in market share and profitability regressions separately for these two sets of banks.

[18] Berger and Bouwman (forthcoming) include only commercial banks. We also include credit card banks to avoid an artificial $0.19 trillion drop in bank liquidity creation in the fourth quarter of 2006 when Citibank N.A. moved its credit-card lines to Citibank South Dakota N.A., a credit card bank.

Large banks have gross total assets (GTA) exceeding $1 billion at the end of the quarter before a crisis and small banks have GTA up to $1 billion at the end of that quarter. [19,20]

4. The behavior of aggregate bank liquidity creation around financial crises

This section focuses on the first goal of the paper – examining the aggregate liquidity creation of banks across five financial crises in the U.S. over the past quarter century. The crises include the 1987 stock market crash, the credit crunch of the early 1990s, the Russian debt crisis plus Long-Term Capital Management (LTCM) bailout of 1998, the bursting of the dot.com bubble and the Sept. 11 terrorist attacks of the early 2000s, and the current subprime lending crisis. We first provide summary statistics and explain our empirical approach. We then discuss alternative measures of abnormal liquidity creation. Next, we describe the behavior of bank liquidity creation before, during, and after each crisis. Finally, we draw some general conclusions from these results.

4.1. Summary statistics and empirical approach

Figure 1 Panel A shows the dollar amount of liquidity created by the banking sector, calculated using the "cat fat" liquidity creation measure over our sample period. As shown, liquidity creation has increased substantially over time: it has more than quadrupled from $1.369 trillion in 1984:Q1 to $5.706 trillion in 2008:Q1 (in real 2007:Q4 dollars).

We want to examine whether liquidity creation by the banking sector is "high," "low," or at a "normal" level around financial crises. Since no theories exist that explain the intertemporal behavior of liquidity creation or generate numerical estimates of "normal" liquidity creation, we need a reasonable empirical approach. At first blush, it may seem that we could simply calculate the average amount of bank liquidity creation over the entire sample period and view amounts above this sample average as "high" and amounts below the average as "low." However, *Figure 1 Panel A* clearly shows that this approach would cause us to classify the entire second half of the sample period (1996:Q1 – 2008:Q1) as

[19] As noted before, we combine Berger and Bouwman's large and medium bank categories into one "large bank" category. Recall that all financial values are expressed in real 2007:Q4 dollars.

[20] GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve. Total assets on Call Reports deduct these two reserves, which are held to cover potential credit losses. We add these reserves back to measure the full value of the loans financed and the liquidity created by the bank on the asset side.

"high" and the entire first half of the sample period (1984:Q1 – 1995:Q4) as "low." We therefore do not use this approach.

The approach we take is aimed at calculating the "abnormal" amount of liquidity created by the banking sector based on a time trend. It focuses on whether liquidity creation lies above or below this time trend, and also deseasonalizes the data to ensure that we do not base our conclusions on mere seasonal effects. We detrend and deseasonalize the data by regressing the dollar amount of liquidity creation on a time index and three quarterly dummies. The residuals from this regression measure the "abnormal" dollar amount of liquidity creation in a particular quarter. That is, they measure how far (deseasonalized) liquidity creation lies above or below the trend line. If abnormal liquidity creation is greater than (smaller than) $0, the dollar amount of liquidity created by the banking sector lies above (below) the time trend. If abnormal liquidity creation is high (low) relative to the time trend and seasonal factors, we will interpret this as liquidity creation being "too high" ("too low").

Figure 1 Panel B shows abnormal liquidity creation over time. The amount of liquidity created by the banking sector was high (yet declining) in the mid-1980s, low in the mid-1990s, and high (and mostly rising) in the most recent years.

4.2. Alternative measures of abnormal liquidity creation

We considered several alternative approaches to measuring abnormal liquidity creation. One possibility is to scale the dollar amount of liquidity creation by total population. The idea behind this approach is that a "normal" amount of liquidity creation may exist in per capita terms. The average amount of liquidity creation per capita over our sample period could potentially serve as the "normal" amount and deviations from this average would be viewed as abnormal. To calculate per capita liquidity creation we obtain annual U.S. population estimates from the U.S. Census Bureau.

Figure 2 Panel A shows per capita liquidity creation over time. The picture reveals that per capita liquidity creation more than tripled from $5.8K in 1984:Q1 to $18.8K in 2008:Q1. Interestingly, the picture looks very similar to the one shown in *Panel A*, perhaps because the annual U.S. population growth rate is low. For reasons similar to those in our earlier analysis, we calculate abnormal per capita liquidity creation by detrending and deseasonalizing the data like we did in the previous section. *Figure 2*

Panel B shows abnormal per capita liquidity creation over time.

Another possibility is to scale the dollar amount of liquidity creation by GDP. Since liquidity creation by banks may causally affect GDP, this approach seems less appropriate. Nonetheless, we show the results for completeness.

Figure 2 Panel C shows the dollar amount of liquidity creation divided by GDP. The picture reveals that bank liquidity creation has increased from 19.9% of GDP in 1984:Q1 to 40.4% of GDP in 2008:Q1. While liquidity creation more than quadrupled over the sample period, GDP doubled. Importantly, the picture looks similar to the one shown in Panel A. Again, for reasons similar to those in our earlier analysis, we detrend and deseasonalize the data to obtain abnormal liquidity creation divided by GDP. *Figure 2 Panel D* shows abnormal liquidity creation divided by GDP over time.

Since these alternative approaches yield results that are similar to those shown in Section 4.1, we focus our discussions on the abnormal amount of liquidity creation (rather than the abnormal amount of per capita liquidity creation or the abnormal amount of liquidity creation divided by GDP) around financial crises.

4.3. Abnormal bank liquidity creation before, during, and after five financial crises

We now examine how abnormal bank liquidity creation behaved before, during, and after five financial crises. In all cases, the pre-crisis and post-crisis periods are defined to be eight quarters long.[21] The one exception is that we do not examine abnormal bank liquidity creation after the current subprime lending crisis, since this crisis was still ongoing at the end of the sample period. *Figure 3 Panels A – E* show the graphs of the abnormal amount of liquidity creation for the five crises. This subsection is a fact-finding effort and largely descriptive. In Section 4.5, we will combine the evidence gathered here and interpret it to draw some general conclusions.

Financial crisis #1: Stock market crash (1987:Q4)

On Monday, October 19, 1987, the stock market crashed, with the S&P500 index falling about 20%.

[21] As a result of our choice of two-year pre-crisis and post-crisis periods, the post-Russian debt crisis period overlaps with the bursting of the dot.com bubble, and the pre-dot.com bubble period overlaps with the Russian debt crisis. For these two crises, we redo our analyses using six-quarter pre-crisis and post-crisis periods and obtain results that are qualitatively similar to the ones documented here.

During the years before the crash, the level of the stock market had increased dramatically, causing some concern that the market had become overvalued.[22] A few days before the crash, two events occurred that may have helped precipitate the crash: 1) legislation was enacted to eliminate certain tax benefits associated with financing mergers; and 2) information was released that the trade deficit was above expectations. Both events seemed to have added to the selling pressure and a record trading volume on Oct. 19, in part caused by program trading, overwhelmed many systems.

Figure 3 Panel A shows abnormal bank liquidity creation before, during, and after the stock market crash. Although this financial crisis seems to have originated in the stock market rather than the banking system, it is clear from the graph that abnormal liquidity creation by banks was high ($0.5 trillion above the time trend) two years before the crisis. It had already dropped substantially before the crisis and continued to drop until well after the crisis, but was still above the time trend even a year after the crisis.

Financial crisis #2: Credit crunch (1990:Q1 – 1992:Q4)

During the first three years of the 1990s, bank commercial and industrial lending declined in real terms, particularly for small banks and for small loans (see Berger, Kashyap, and Scalise 1995, Table 8, for details). The ascribed causes of the credit crunch include a fall in bank capital from the loan loss experiences of the late 1980s (e.g., Peek and Rosengren 1995), the increases in bank leverage requirements and implementation of Basel I risk-based capital standards during this time period (e.g., Berger and Udell 1994, Hancock, Laing, and Wilcox 1995, Thakor 1996), an increase in supervisory toughness evidenced in worse examination ratings for a given bank condition (e.g., Berger, Kyle, and Scalise 2001), and reduced loan demand because of macroeconomic and regional recessions (e.g., Bernanke and Lown 1991). To some extent, the research supports virtually all of these hypotheses.

Figure 3 Panel B shows how abnormal liquidity creation behaved before, during, and after the credit crunch. The graph shows that liquidity creation was above the time trend before the crisis, but declining. After a temporary increase, it dropped markedly during the crisis by roughly $0.6 trillion, and the decline even extended a bit beyond the crunch period. After having reached a noticeably low level in

[22] E.g., "Raging bull, stock market's surge is puzzling investors: When will it end?" on page 1 of the Wall Street Journal, Jan. 19, 1987.

the post-crunch period, liquidity creation slowly started to bottom out. This evidence suggests that the banking sector created (slightly) positive abnormal liquidity before the crisis, but created significantly negative abnormal liquidity during and after the crisis, representing behavior by banks that may have further fueled the crisis.

<u>Financial crisis #3: Russian debt crisis / LTCM bailout (1998:Q3 – 1998:Q4)</u>

Since its inception in March 1994, hedge fund Long-Term Capital Management ("LTCM") followed an arbitrage strategy that was avowedly "market neutral," designed to make money regardless of whether prices were rising or falling. When Russia defaulted on its sovereign debt on August 17, 1998, investors fled from other government paper to the safe haven of U.S. treasuries. This flight to liquidity caused an unexpected widening of spreads on supposedly low-risk portfolios. By the end of August 1998, LTCM's capital had dropped to $2.3 billion, less than 50% of its December 1997 value, with assets standing at $126 billion. In the first three weeks of September, LTCM's capital dropped further to $600 million without shrinking the portfolio. Banks began to doubt its ability to meet margin calls. To prevent a potential systemic meltdown triggered by the collapse of the world's largest hedge fund, the Federal Reserve Bank of New York organized a $3.5 billion bail-out by LTCM's major creditors on September 23, 1998. In 1998:Q4, many large banks had to take substantial write-offs as a result of losses on their investments.

Figure 3 Panel C shows abnormal liquidity creation around the Russian debt crisis and LTCM bailout. The pattern shown in the graph is very different from the ones we have seen so far. Liquidity creation was abnormally negative before the crisis, but increasing. Liquidity creation increased further during the crisis, countercyclical behavior by banks that may have alleviated the crisis, and continued to grow after the crisis. This suggests that liquidity creation may have been too low entering the crisis and returned to normal levels a few quarters after the end of the crisis.

<u>Financial crisis #4: Bursting of the dot.com bubble and Sept. 11 terrorist attack (2000:Q2 – 2002:Q3)</u>

The dot.com bubble was a speculative stock price bubble that was built up during the mid to late 1990s. During this period, many internet-based companies, commonly referred to as "dot.coms," were founded.

Rapidly increasing stock prices and widely available venture capital created an environment in which many of these companies seemed to focus largely on increasing market share. At the height of the boom, it seemed possible for dot.com's to go public and raise substantial amounts of money even if they had never earned any profits, and in some cases had not even earned any revenues. On March 10, 2000, the Nasdaq composite index peaked at more than double its value just a year before. After the bursting of the bubble, many dot.com's ran out of capital and were acquired or filed for bankruptcy (examples of the latter include WorldCom and Pets.com). The U.S. economy started to slow down and business investments began falling. The September 11, 2001 terrorist attacks may have exacerbated the stock market downturn by adversely affecting investor sentiment. By 2002:Q3, the Nasdaq index had fallen by 78%, wiping out $5 trillion in market value of mostly technology firms.

Figure 3 Panel D shows how abnormal liquidity creation behaved before, during, and after the bursting of the dot.com bubble and the Sept. 11 terrorist attacks. The graph shows that before the crisis period, liquidity creation moved from displaying a negative abnormal value to displaying a positive abnormal value at the time the bubble burst. During the crisis, liquidity creation declined somewhat and hovered around the time trend by the time the crisis was over. After the crisis, liquidity creation slowly started to pick up again.

Financial crisis #5: Subprime lending crisis (2007:Q3 – ?)

The subprime lending crisis has been characterized by turmoil in financial markets as banks have experienced difficulty in selling loans in the syndicated loan market and in securitizing loans. Banks also seem to be reluctant to provide credit: they appear to have cut back their lending to firms and individuals, and have also been reticent to lend to each other. Risk premia have increased as evidenced by a higher premium over treasuries for mortgages and other bank products. Some banks have experienced massive losses in capital. For example, Citicorp had to raise about $40 billion in equity to cover subprime lending and other losses. Massive losses at Countrywide resulted in a takeover by Bank of America. Bear Stearns suffered a fatal loss in confidence and was sold at a fire-sale price to J.P. Morgan Chase with the Federal Reserve guaranteeing $29 billion in potential losses. Washington Mutual, the sixth-largest bank, became the biggest bank failure in the U.S. financial history. J.P. Morgan Chase purchased the banking business while the rest of the organization filed for bankruptcy. The Federal Reserve intervened in some unprecedented ways in the market, extending its safety-net privileges to investment banks and one insurance company (AIG). In addition to lowering the discount rate sharply, it also began holding mortgage-backed securities and lending directly to investment banks. Subsequently, IndyMac Bank was seized by the FDIC after it suffered substantive losses and depositors had started to run on the bank. This failure is expected to cost the FDIC \$4 billion – \$8 billion. The FDIC intends to sell the bank. Government set aside \$250 billion out of its \$700-billion bailout package (TARP program) to enhance capital ratios of selected banks. Some of these banks are using these funds to acquire lesser-capitalized peers. E.g., PNC Bank is using TARP funds to acquire National City Bank.

Figure 3 Panel E shows abnormal liquidity creation before and during the first part of the subprime lending crisis. The graph suggests that liquidity creation displayed a high positive abnormal value that was increasing before the crisis hit, with abnormal liquidity creation around \$0.70 trillion entering the crisis, decreasing substantially after the crisis hit. A striking fact about this crisis compared to the other crises is the relatively high build-up of positive abnormal liquidity creation prior to the crisis.

4.4. Behavior of some liquidity creation components around the two banking crises

It is of particular interest to examine the behavior of some selected components of liquidity creation around the banking crises. As discussed above (Section 4.3), numerous papers have focused on the credit crunch, examining lending behavior. These studies generally find that mortgage and business lending started to decline significantly during the crisis.

Here we contrast the credit crunch experience with the current subprime lending crisis, and expand the components of liquidity creation that are examined. Rather than focusing on mortgages and business loans, we examine the two liquidity creation components that include these items – semi-liquid assets (primarily mortgages) and illiquid assets (primarily business loans). In addition, we analyze two other components of liquidity creation. We examine the behavior of liquid assets to address whether a decrease (increase) in semi-liquid assets and / or illiquid assets tended to be accompanied by an increase (decrease) in liquid assets. We also analyze the behavior of illiquid off-balance sheet guarantees (primarily loan commitments) to address whether illiquid assets and illiquid off-balance sheet guarantees move in tandem around banking crises and whether changes in one are more pronounced than the other.

Figure 4 Panels A and B show the abnormal amount of four liquidity creation components around the credit crunch and the subprime lending crisis, respectively. For ease of comparison, the components are not weighted by weights of +½ (illiquid assets and illiquid off-balance sheet guarantees), 0 (semi-liquid assets), and –½ (liquid assets). The abnormal amounts are obtained by detrending and deseasonalizing each liquidity creation component.

Figure 4 Panel A shows that abnormal semi-liquid assets decreased slightly during the credit crunch, while abnormal illiquid assets and especially abnormal illiquid guarantees dropped significantly and turned negative. This picture suggests that these components fell increasingly below the trendline. The dramatic drop in abnormal illiquid assets and abnormal illiquid off-balance sheet guarantees (which carry positive weights) helps explain the significant decrease in abnormal liquidity creation during the credit crunch shown in *Figure 3 Panel B.*

Figure 4 Panel B shows that these four components of abnormal liquidity creation were above the trendline before and during the subprime lending crisis. Illiquid assets and especially off-balance sheet guarantees move further and further above the trendline before the crisis, which helps explain the dramatic buildup in abnormal liquidity creation before the subprime lending crisis shown in *Figure 3 Panel E*. All four components of abnormal liquidity creation continued to increase at the beginning of the crisis. After the first quarter of the crisis, illiquid off-balance sheet guarantees showed a significant decrease, which helps explain the decrease in abnormal liquidity creation in *Figure 3 Panel E*. On the balance sheet, during the final quarter of the sample period (the third quarter of the crisis), abnormal semi-liquid and illiquid assets declined, while abnormal liquid assets increased.

4.5. General conclusions from the results

What do we learn from the various graphs in the previous analyses that indicate intertemporal patterns of liquidity creation and selected liquidity creation components around five financial crises?

First, across all the financial crises, there seems to have been a significant build-up or drop-off of abnormal liquidity creation before the crisis. This is consistent with the notion that crises may be preceded by either "too much" or "too little" liquidity creation, although at this stage we offer this as tentative food for thought rather than as a conclusion.

Second, there seem to be two main differences between banking crises and market-related crises. The banking crises, namely the credit crunch and the subprime lending crisis, were both preceded by positive abnormal liquidity creation by banks, while two out of the three market-related crises were preceded by negative abnormal liquidity creation. In addition, during the two banking crises, the crises themselves seem to have exerted a noticeable influence on the pattern of aggregate liquidity creation by banks. Just prior to the credit crunch, abnormal liquidity creation was positive and had started to trend upward, but reversed course and plunged quite substantially to become negative during and after the crisis. Just prior to the subprime lending crisis, aggregate liquidity creation was again abnormally positive and trending up, but began to decline during the crisis, although it remains abnormally high by historical standards. The other crises, which are less directly related to banks, did not seem to exhibit such noticeable impact.

Third, liquidity creation has both decreased during crises (e.g., the 1990-1992 credit crunch) and increased during crises (e.g., the 1998 Russian debt crisis / LTCM bailout). Thus, liquidity creation likely both exacerbated and ameliorated the effects of crises.

Fourth, off-balance sheet illiquid guarantees (primarily loan commitments) moved more than semi-liquid assets (primarily mortgages) and illiquid assets (primarily business loans) during banking crises.

Fifth, while liquidity creation is generally thought of as a financial intermediation service with positive economic value at the level of the individual bank and individual borrower (see Diamond and Rajan 2000, 2001), our analysis hints at the existence of a "dark side" to liquidity creation. Specifically, it may be more than coincidence that the subprime lending crisis was preceded by a very high level of positive abnormal aggregate liquidity creation by banks relative to historical levels. The notion that this may have contributed to the subprime lending crisis is consistent with the findings that banks adopted lax credit standards (see Dell'Ariccia, Igan, and Laeven 2008, Keys, Mukherjee, Seru, and Vig 2008), which in turn could have led to an increase in credit availability and off-balance sheet guarantees. Thus, while Diamond and Rajan (2000, 2001) argue that financial fragility is needed to create liquidity, our analysis offers the intriguing possibility that the causality may be reversed as well: too much liquidity creation may lead to financial fragility.

5. The effect of capital on banks' competitive positions and profitability around financial crises

This section focuses on the second goal of the paper – examining how bank capital affects banks' competitive positions and profitability around financial crises. We first explain our methodology and provide summary statistics. We then present and discuss the empirical results. In an additional check, we examine whether the stock return performance of high- and low-capital listed banks is consistent with the competitive position and profitability results for large banks. In another check, we generate some "fake" crises to analyze whether our findings hold during "normal" times as well.

5.1. Empirical approach

To examine whether banks with high capital ratios improve their competitive positions and profitability during financial crises, and if so, whether they are able to hold on to this improved performance after these crises, we focus on the behavior of individual banks rather than that of the banking sector as a whole. Because our analysis of aggregate liquidity creation by banks shows substantial differences across crises, we do not pool the data from all the crises but instead analyze each crisis separately. Our findings below that the coefficients of interest differ substantially across crises tend to justify this separate treatment of the different crises.

We use the following regression specification for each of the five crises:

$$\Delta PERF_{i,j} = \alpha + \beta_1 * EQRAT_{i,j} + B * Z_{i,j} \quad (1)$$

where $\Delta PERF_{i,j}$ is the change in bank i's performance around crisis j, $EQRAT_{i,j}$ is the bank's average capital ratio before the crisis, and $Z_{i,j}$ includes a set of control variables averaged over the pre-crisis period. All of these variables are discussed in Section 5.2. Since we use a cross-sectional regression model, bank and year fixed effects are not included. In all regressions, t-statistics are based on robust standard errors.

Given documented differences between large and small banks in terms of portfolio composition (e.g., Kashyap, Rajan, and Stein 2002, Berger, Miller, Petersen, Rajan, and Stein 2005) and the effect of capital on liquidity creation (Berger and Bouwman forthcoming), we split the sample into large and small banks, and run all regressions separately for these two sets of banks. Large banks have gross total assets (GTA) exceeding $1 billion at the end of the quarter preceding the crisis and small banks have GTA up to $1 billion at the end of that quarter.

5.2. Variable descriptions and summary statistics

We use two measures of a bank's performance: competitive position and profitability. The bank's competitive position is measured as the bank's market share of overall liquidity creation, i.e., the dollar amount of liquidity created by the bank divided by the dollar amount of liquidity created by the industry. Our focus on the share of liquidity creation is a departure from the traditional focus on a bank's market share of deposits. Liquidity creation is a more comprehensive measure of banking activities since it does not just consider one funding item but instead is based on all the bank's on-balance sheet and off-balance sheet activities. To establish whether banks improve their competitive positions during the crisis, we define the change in liquidity creation market share, ΔLCSHARE, as the bank's average market share during the crisis minus its average market share over the eight quarters before the crisis, normalized by its average pre-crisis market share. To examine whether these banks hold on to their improved performance after the crisis, we also measure each bank's average market share over the eight quarters after the crisis minus its average market share over the eight quarters before the crisis, again normalized by its average market share before the crisis.

The second performance measure is the bank's profitability, measured as the return on equity (ROE), i.e., net income divided by stockholders equity.[23] To examine whether a bank improves its profitability during a crisis, we focus on the change in profitability, ΔROE, measured as the bank's average ROE during the crisis minus the bank's average ROE over the eight quarters before the crisis.[24] To analyze whether the bank is able to hold on to improved profitability, we focus on the bank's average ROE over the eight quarters after the crisis minus its average ROE over the eight quarters before the crisis.

[23] We use ROE, the bank's net income divided by equity, rather than return on assets (ROA), net income divided by assets, since banks may have substantial off-balance sheet portfolios. Banks must allocate capital against every off-balance sheet activity they engage in. Hence, net income and equity both reflect the bank's on-balance sheet and off-balance sheet activities. In contrast, ROA divides net income earned based on on-balance sheet *and* off-balance sheet activities merely by the size of the on-balance sheet activities.

[24] We do not divide by the bank's ROE before the crisis since ROE itself is already a scaled variable.

To mitigate the influence of outliers, ΔLCSHARE and ΔROE are winsorized at the 3% level. Furthermore, to ensure that average values are calculated based on a sufficient number of quarters, we require that at least half of a bank's pre-crisis / crisis / post-crisis observations are available for both performance measures around a crisis. Since the subprime lending crisis was still ongoing at the end of the sample period, we require that at least half of a bank's pre-subprime crisis observations and all three quarters of its subprime crisis observations are available.

The key exogenous variable is EQRAT, the bank's capital ratio averaged over the eight quarters before the crisis. EQRAT is the ratio of equity capital to gross total assets, GTA.[25]

The control variables include: bank size, bank risk, bank holding company membership, local market competition, and proxies for the economic environment. Bank size is controlled for by including lnGTA, the log of GTA, in all regressions. In addition, we run regressions separately for large and small banks.

We include the z-score to control for bank risk.[26] The z-score indicates the bank's distance from default (e.g., Boyd, Graham, and Hewitt 1993), with higher values indicating that a bank is less likely to default. It is measured as a bank's return on assets plus the equity capital/GTA ratio divided by the standard deviation of the return on assets over the eight quarters before the crisis.

To control for bank holding company status, we include D-BHC, a dummy variable that equals 1 if the bank was part of a bank holding company. Bank holding company membership may affect a bank's competitive position because the holding company is required to act as a source of strength to all the banks it owns, and may also inject equity voluntarily when needed. In addition, other banks in the holding company provide cross-guarantees. Furthermore, Houston, James, and Marcus (1997) find that bank loan growth depends on BHC membership.

We control for local market competition by including HERF, the bank-level Herfindahl-Hirschman index of deposit concentration for the markets in which the bank is present. From 1984-2004, we define the local market as the Metropolitan Statistical Area (MSA) or non-MSA county in which the

[25] We use the bank's ratio of equity capital to assets rather than its regulatory capital ratios. The latter are based on risk-weighted assets, which reflect the bank's on- and off-balance sheet portfolio decisions. We want to focus on the bank's capitalization decision, rather than on its portfolio allocation decisions.

[26] Results are qualitatively similar if we use the standard deviation of the bank's return on assets, ROA, instead.

offices are located.[27] After 2004, we use the new local market definitions based on Core Based Statistical Area (CBSA) and non-CBSA county.[28]

We also need to ensure that changes in performance are not driven by local market economic conditions. We therefore include income growth, INC-GROWTH, and the log of population, lnPOP, in the markets in which the bank operates, using the bank's share of deposits in a market as weights.

Table 2 contains summary statistics on all the regression variables.

5.3. Liquidity creation market share and profitability regression results

In this section, we present our regression results. Every table has two panels. Panel A focuses on the crisis period in order to address the first question: are high-capital banks able to improve their competitive positions and profitability during crises? Results are presented separately for large and small banks, and for each of the five crisis periods. This panel thus has two times five columns. Panel B compares post-crisis and pre-crisis performance in order to shed light on the second question: are high-capital banks able to hold on to their improved competitive positions and profitability after crises? Results are again presented separately for large and small banks, and for each crisis period. This panel has two times four columns: the subprime lending crisis is missing from this panel since this crisis was not over at the end of the sample period.

In *Table 3 Panel A*, the change in a bank's market share of liquidity creation from the pre-crisis period to the crisis period, ΔLCSHARE, is regressed on the bank's pre-crisis capital ratio plus control variables. The results indicate that for large banks, capital helps to improve their competitive positions only during the two banking crises: the credit crunch and the subprime lending crisis. The coefficients are not significant for the market-related crises. Thus, during banking crises, high-capital large banks were able to improve their market share of liquidity creation. For small banks, the results indicate that high-capital small banks improved their competitive positions in all crises. It is economically sensible that the results are stronger for small banks since large banks may enjoy too-big-to-fail benefits and may also be

[27] When appropriate, we use New England County Metropolitan Areas (NECMAs) instead of MSAs, but refer to these as MSAs.

[28] The term CBSA collectively refers to Metropolitan Statistical Areas and newly-created Micropolitan Statistical Areas. Areas based on these new standards were announced in June 2003. For recent years, the Summary of Deposits data needed to construct HERF is available on the FDIC's website only based on the new definition. It is not possible to use the new definition for our entire sample period.

offered selective access to liquidity by the Federal Reserve that may not be more broadly made available to all banks.

To judge the economic significance of these results, consider the coefficients on EQRAT for large and small banks during the credit crunch (3.437 and 2.875, respectively). These results suggest that if the pre-crisis capital ratio were one percentage point higher, then the bank's liquidity creation market share is predicted to be around three percentage points higher for both large and small banks during the crisis. In contrast, the predicted effects during the subprime lending crisis (0.554 and 0.605 for large and small banks, respectively) are only about half a percentage point for both large and small banks.

Table 3 Panel B regresses the change in a bank's market share of liquidity creation from the pre-crisis period to the post-crisis period on the bank's pre-crisis capital ratio plus control variables. As indicated above, the subprime lending crisis is not included since this crisis was not yet over at the end of the sample period. The results suggest that high-capital large banks were able to hold on to their improved market share after the credit crunch. As before, the large bank results are not significant for the market-related crises except that high-capital large banks lose market share after the bursting of the dot.com bubble, suggesting that having high capital ratios is not always beneficial in terms of leading to higher market share. High-capital small banks were able to hold on to their improved competitive positions after every crisis, as indicated by a positive and highly significant coefficient on EQRAT in all specifications.

Revisiting the credit crunch example, the coefficients on EQRAT (7.124 and 9.792, respectively) suggest that if the pre-crisis capital ratio were one percentage point higher, then the bank's liquidity creation market share is predicted to be around seven and ten percentage points higher for large and small banks after the credit crunch, respectively. This suggests that high-capital banks not only hold on to their improved market shares, but add to them after the crisis is over.

Table 4 Panel A regresses the change in profitability, ΔROE (average ROE during the crisis period minus average ROE during the pre-crisis period) on the bank's pre-crisis capital ratio plus control variables. For large banks, the coefficients on EQRAT are positive and significant for the credit crunch and the subprime lending crisis, suggesting that high-capital large banks were not just able to improve their market share, but were able to do so profitably as evidenced by a higher ROE. The coefficient on

EQRAT is also significant during the Russian debt crisis. Perhaps surprisingly, the coefficients on EQRAT in the small bank regressions are positive and significant only during the bursting of the dot.com bubble and the current subprime lending crisis. They were not significant for small banks in the other crises, suggesting that small banks were able to improve their market shares, but this did not always go hand-in-hand with improved profitability.

To judge the economic significance of these results, again consider the coefficients on EQRAT during the credit crunch (0.513 for large banks and not significant for small banks). These results suggest that if the pre-crisis capital ratio were one percentage point higher, then the large bank's ROE is predicted to be around half a percentage point higher for large banks during the crisis. In contrast, the predicted effect during the subprime lending crisis (0.132 for large banks and 0.072 for small banks) is only about 0.1 percentage point for both large and small banks.

In *Table 4 Panel B*, the change in profitability from the pre-crisis period to the post-crisis period is regressed on EQRAT plus control variables. Again, the subprime lending crisis is excluded. For large banks, the coefficient on EQRAT is positive and significant for the credit crunch, suggesting again that high-capital large banks were not just able to hold on to their improved market share after the crisis, but that this also translated into sustained higher profitability as measured by a higher ROE. Even though high-capital large banks did not improve their liquidity creation market share around the other crises (it even declined after the bursting of the dot.com bubble), their profitability did improve after those crises. For small banks, the coefficients on EQRAT are positive and significant for three out of four crises (credit crunch, Russian debt crisis, and dot.com bubble), suggesting that even though high-capital small banks were not always able to improve their ROE *during* the crisis, they managed to improve their profitability after emerging from the crisis.

Revisiting the credit crunch example one more time, the coefficients on EQRAT (0.209 for large banks and 0.102 for small banks) suggest that if the pre-crisis capital ratio were one percentage point higher, then the bank's ROE is predicted to be around 0.2 and 0.1 percentage points higher for large and small banks after the credit crunch, respectively. This suggests that large high-capital banks held on to less than half of their improved profitability, whereas small high-capital banks only (statistically) significantly improved their ROE after the crisis was over.

5.4. Robustness check: controlling for monetary policy

Monetary policy changes directly affect a bank's profitability, and could indirectly affect a bank's liquidity creation market share. Thus, the documented effects of pre-crisis capital ratios on a bank's liquidity creation market share and profitability could be driven in part by monetary policy changes. We now look into this possibility. We use the federal funds rate as a monetary policy proxy. We calculate the change in the federal funds rate during (after) the crisis as the average federal funds rate during (after) the crisis minus the average pre-crisis federal funds rate.

Table 5 Panels A and B contain the results regarding the effect of the bank's pre-crisis capital ratio on its liquidity creation market share during and after crises, respectively. *Table 5 Panels C and D* examine how the bank's pre-crisis capital ratio affects its profitability during and after crises, respectively. All panels include all the control variables plus the change in the federal funds rate (not shown for brevity). The coefficients and the t-statistics are similar to those shown in Panels A and B of Tables 3 and 4. Thus, our main results continue to hold even after controlling for changes in monetary policy.

5.5. Additional check: abnormal stock return performance

In this section, we examine whether the improvements in competitive positions and profitability experienced during crises by high-capital banks relative to low-capital banks also translated into higher abnormal stock returns for high-capital banks.[29]

Since all regression analyses have been performed at the individual bank level and not every bank is listed on an exchange, we focus on banks that are individually traded or are part of a traded BHC. We include listed independent banks and listed BHCs in the analysis. In case of a listed BHC, we create a pro-forma balance sheet and income statement by aggregating the items of all the banks in the BHC. We require that at least 90% of the traded entity's assets are banking assets. We then classify listed banks and BHCs (collectively called banks in the remainder of this section) as high-capital (top 50%) and low-capital (bottom 50%) banks based on their average capitalization over the eight quarters before the crisis. Note that these banks are more comparable to the large bank sample than the small bank sample because

[29] We do not examine post-crisis stock returns. Since stock returns are forward-looking, the crisis period returns incorporate investors' expectations about both the crisis and the post-crisis periods.

virtually all of the very largest banks are either listed or in listed BHCs, whereas most small banks are independently-owned and are not listed.

The question we ask is: Does the *pre-crisis* capital ratio of a bank affect its stock returns during a crisis? Specifically, if investors' expectations of returns during a crisis are formed on the basis of pre-crisis data, do banks with high pre-crisis capital ratios enjoy higher abnormal returns during a crisis than banks with low pre-crisis capital ratios?

We use the following approach to establish whether the stock returns of high-capital banks improved more than or decreased less than the stock returns of low-capital banks during each crisis. In the first step, we use a five-factor model to *separately* estimate the pre-crisis factor loadings of high- and low-capital banks. In this step, portfolio excess returns are regressed on the three Fama-French (1993) factors, the Carhart (1997) momentum factor and the slope of the yield curve:

$$R_{p,t} – R_{f,t} = \alpha + \beta_1 * (R_{m,t} – R_{f,t}) + \beta_2 * SMB_t + \beta_3 * HML_t + \beta_4 * MOM_t + \beta_5 * YLDCURVE_t$$

where $R_{p,t}$ is the portfolio return in pre-crisis month $t \in [-24, -1]$, $R_{m,t} – R_{f,t}$ is excess return on the market, SMB (Small Minus Big) is the difference between the average return on portfolios of "small" and "big" stocks, HML (High Minus Low) is the difference between the average return on portfolios of "high" and "low" book-to-market stocks, MOM (the Carhart momentum factor) is the difference between the average return on portfolios of high and low prior stock returns, and YLDCURVE is the slope of the yield curve, proxied by the difference between the ten-year Treasury bond and the federal funds rate. The slope of the yield curve is included because commercial bank performance is strongly related to the interest rate environment (e.g., Flannery and James 1984). This is because banks typically derive a large part of their revenues from net interest income, the difference between what the bank earns on assets and what it pays on deposits, and the slope of the yield curve affects net interest income because a bank's assets are typically of longer duration than its liabilities. The slope of the yield curve has been used in the literature on the predictability of non-bank returns, starting with Fama and French (1989). The pre-crisis factor loadings are assumed to represent the information set of investors prior to the crisis and are hence the best estimates to compute returns investors expected going into the crisis.

In the second step, we use these pre-crisis factor loadings to predict portfolio returns during the crisis. We thus obtain the portfolio returns that were predicted to have been achieved absent the crisis.

We then deduct these predicted returns from the realized returns to obtain the alphas of the high- and low-capital bank portfolios. If the abnormal return, represented by the alpha of a portfolio, is positive (negative) then that portfolio earned more (less) during the crisis than expected.

In the last step, we calculate HminLalpha, the alpha of high-capital listed banks minus the alpha of low-capital listed banks. If HminLalpha is positive during banking crises, the stock return results are consistent with the competitive position and profitability results of large banks: the stock performance of high-capital listed banks improved more (or declined less) than that of low-capital listed banks during these crises.

Table 6 presents the stock return results for the five crises. HminLalpha is positive in all cases but only significant for the two banking crises. During the credit crunch, HminLalpha equals 4.29% per month: while the return on the portfolio of low-capital banks was close to that expected based on the performance of these banks before the crisis (only 0.03% per month higher), the high-capital bank portfolio earned 4.32% per month more than expected based on the pre-crisis stock performance of these banks. During the subprime mortgage crisis, HminLalpha equals 2.78% per month – smaller than that earned during the credit crunch, but still sizeable.[30] These results are consistent with the change in performance results for the large banks presented above.

5.6. Additional check: performance during "normal" times

The results documented in Sections 5.3 through 5.5 beg the question whether there is something special about financial crises or whether the documented effects of capital hold during "normal" times as well. To investigate this, we rerun our regressions for two "fake" crises. The idea is to run our analysis during "normal" times, but do it in a way that mimics our analysis of crises.

To create the "fake" crises, we use the two longest time periods between actual financial crises over our entire 1984:Q1 – 2008:Q1 sample period. These periods are between the credit crunch and the Russian debt crisis, and between the bursting of the dot.com bubble and the subprime lending crisis. In each case, we take the entire period between the crises, designate the first eight quarters as "pre-crisis" and the last eight quarters as "post-crisis" and the remaining quarters in the middle as the "fake" crises.

[30] Stock returns during the subprime lending crisis are based on returns from July 2007 – December 2007 and do not include 2008:Q1 because 2008 stock returns are not yet available in CRSP.

We thus end up with a six-quarter "fake" crisis period between the credit crunch and the Russian debt crisis (from 1995:Q1 to 1996:Q2) and a three-quarter "fake" crisis period between the dot.com bubble and the subprime lending crisis (from 2004:Q4 to 2005:Q2).[31] We calculate the average liquidity creation market share and profitability of all banks over the pre-crisis period, during the "fake" crisis, and over the post-crisis period.[32]

Table 7 shows the results. The results in *Panels A and B* show that high-capital large banks did not improve their liquidity creation market share during or after these "fake" crisis periods. Similar results are obtained for large banks based on ROE, except that the ROE of high-capital banks after the first "fake" crisis was significantly lower than before that crisis. In contrast, the results show that high-capital small banks improved their market share during the "fake" crises and held on to their improved market share; they also improved their ROE during and after the "fake" crises. *Panel C* indicates that high-capital listed banks did not earn higher abnormal returns than low-capital listed banks during these "fake" crises.

In summary, the evidence presented in Section 5 suggests that high capital served large banks well, particularly around the two banking crises, the credit crunch of the early 1990s and the current subprime lending crisis. They improved their liquidity creation market share and profitability during these crises and were able to hold on to their improved performance after the credit crunch was over. In addition, high-capital listed banks enjoyed significantly higher abnormal stock returns than low-capital listed banks during the banking crises. These benefits did not hold or held to a lesser degree around market-related crises and normal times. In contrast, high capital ratios appear to have helped small banks improve their market shares during banking crises, market-related crises, and normal times alike, and the gains in market share were sustained afterwards. Profitability improved during two crises and subsequent to virtually every crisis. Similar results were observed during normal times for small banks.

6. Conclusion

Using a recently-developed comprehensive measure of aggregate liquidity creation by banks, we first

[31] Results are qualitatively similar if we instead use five- or four-quarter crisis periods for the first "fake" crisis, and two- or one-quarter crisis periods for the second "fake" crisis.
[32] As before, we require that data has to be available for at least half of the pre-crisis, crisis, and post-crisis quarters to be included in the sample.

study the behavior of bank liquidity creation around five financial crises in the U.S. from 1984:Q1 to 2008:Q1. We then examine the effect of bank capital on a bank's competitive position, profitability, and stock return performance around these crises. We also create two "fake" crises to explore bank behavior in "normal" times.

We reach five conclusions based on our analysis of the behavior of bank liquidity creation around financial crises. First, there seems to have been a significant build-up or drop-off of "abnormal" liquidity creation before each crisis, where "abnormal" is defined relative to a time trend and seasonal factors. Second, banking and market-related crises differ in two important ways. The banking crises were preceded by positive abnormal liquidity creation by banks, while the market-related crises were generally preceded by negative abnormal liquidity creation. In addition, the crises themselves seemed to alter the trajectory of aggregate liquidity creation during banking crises but not during market-related crises. Third, liquidity creation has both decreased during crises (e.g., the 1990-1992 credit crunch) and increased during crises (e.g., the 1998 Russian debt crisis / LTCM bailout). Thus, liquidity creation likely both exacerbated and ameliorated the effects of crises. Fourth, off-balance sheet illiquid guarantees (primarily loan commitments) moved more than semi-liquid assets (primarily mortgages) and illiquid assets (primarily business loans) during banking crises. Fifth, because the subprime lending crisis was preceded by a dramatic build-up of positive abnormal liquidity creation, our analysis hints at the possibility that while financial fragility may be needed to create liquidity, "too much" liquidity creation may also lead to financial fragility.

Our main findings regarding the effect of capital on the bank's competitive position around financial crises and "fake" crises suggest the following. High-capital large banks were able to improve their competitive positions in terms of their liquidity creation market share and their profitability during the two banking crises (credit crunch and subprime lending crisis), not during the market-related crises or the "fake" crises. They were also able to hold on to their improved positions after the credit crunch. These findings seem consistent with our earlier result that banking and market-related crises are qualitatively different in terms of their effects on aggregate liquidity creation by banks. In contrast, high-capital small banks improved their competitive positions during every banking, market-related, and "fake" crisis. They were able to hold on to their improved liquidity creation market shares after every crisis. Their profitability improved during two crises and subsequent to virtually every crisis. As an additional check on the large bank results, we examine the stock returns of high- and low-capital listed banks using a five-factor asset pricing model. Consistent with the large bank market share and profitability results, we find that high-capital listed banks enjoyed higher abnormal returns than low-capital listed banks only during the banking crises.

The answers to these questions may help to shed new light on why banks hold so much capital – having high capital may be an advantage around banking crises for large banks and around financial crises and non-crisis periods alike for small banks. This advantage may be manifested in an increase in liquidity creation market share, with concomitant gains in profitability and stock returns.

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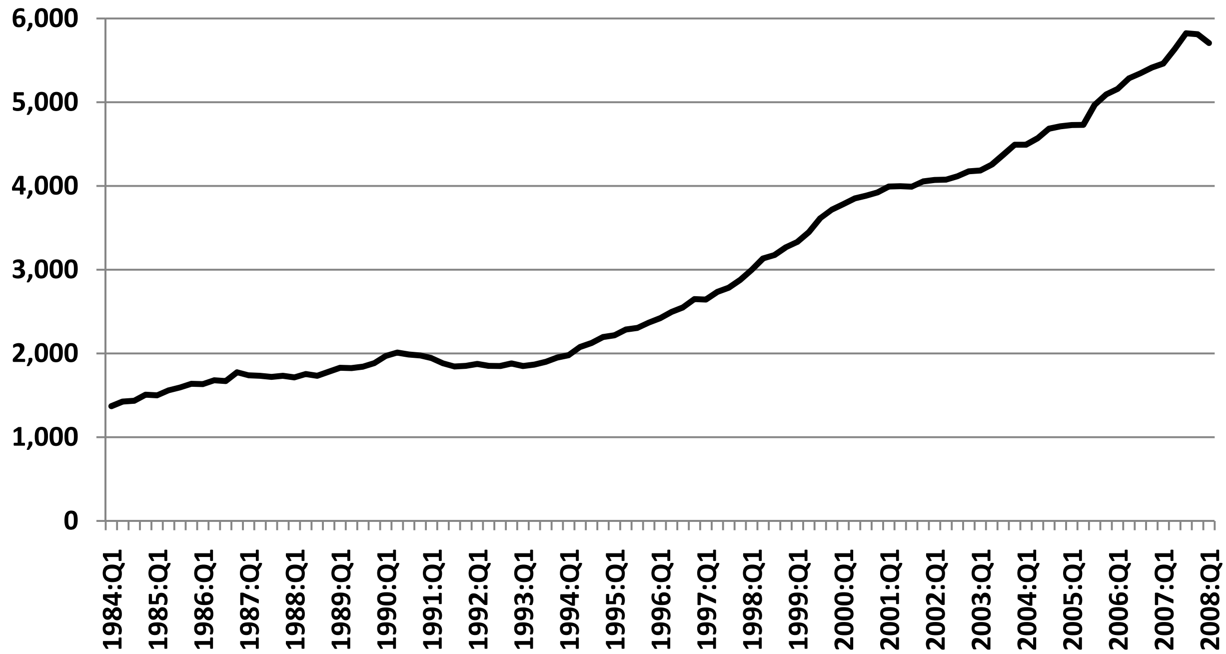
Figure 1: Liquidity creation and abnormal liquidity creation over the sample period
The sample includes virtually all commercial and credit card banks in the U.S. from 1984:Q1 – 2008:Q1. Panel A shows the dollar amount of liquidity created by the banking sector. Panel B shows the abnormal amount of liquidity creation, where "abnormal" is defined as the residuals from a regression of the dollar amount of liquidity creation on a time trend and three seasonal dummies. All dollar values are expressed in real 2007:Q4 dollars.

Panel A: Actual liquidity creation over time (*in $ billion*)



Panel B: Abnormal liquidity creation over time (*in $ billion*)

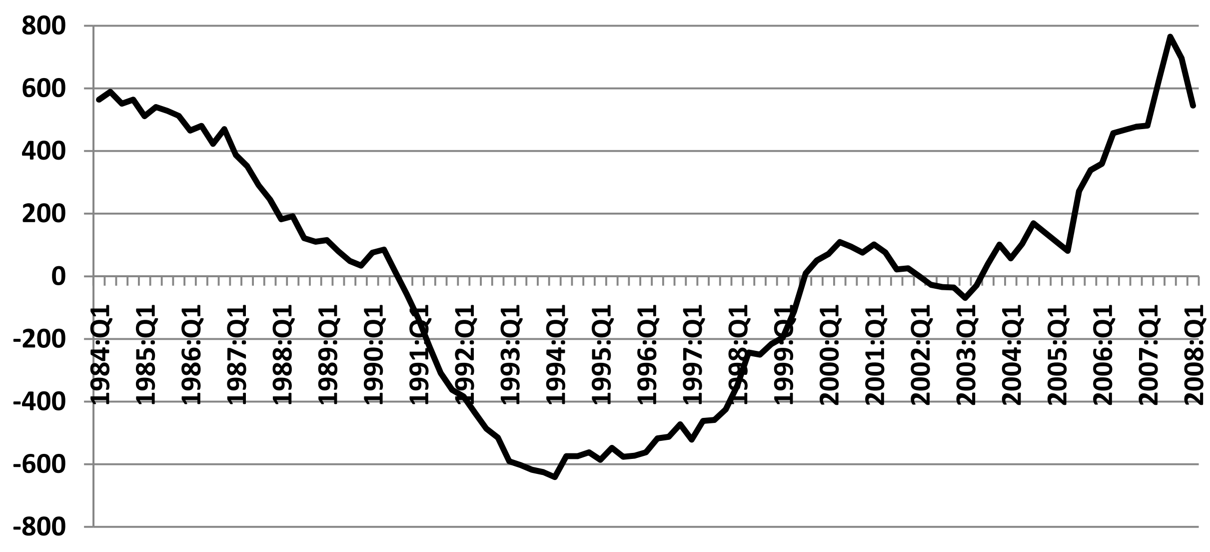
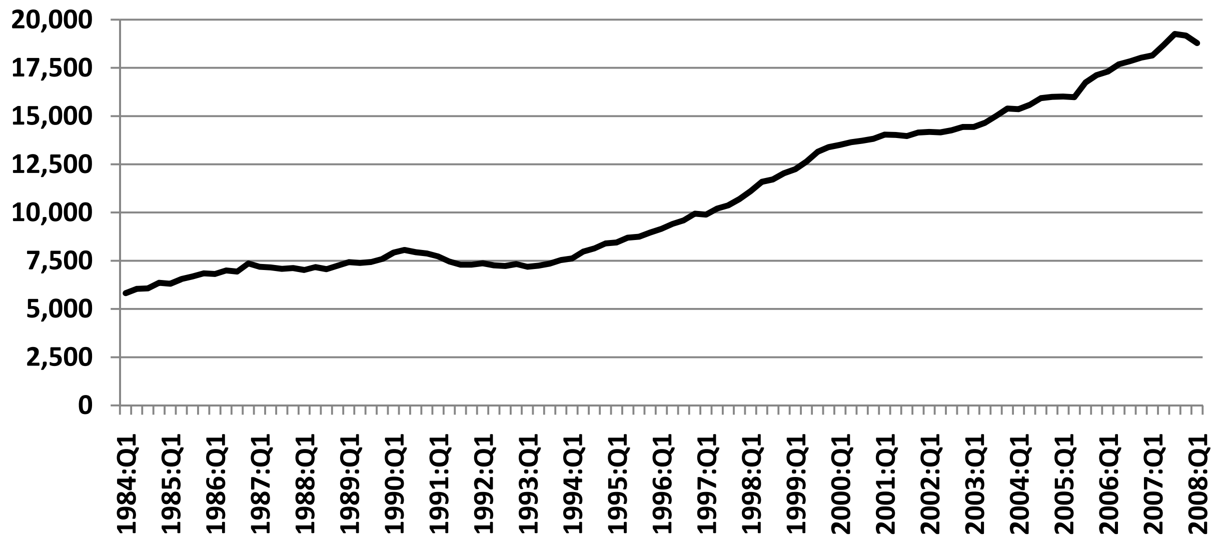


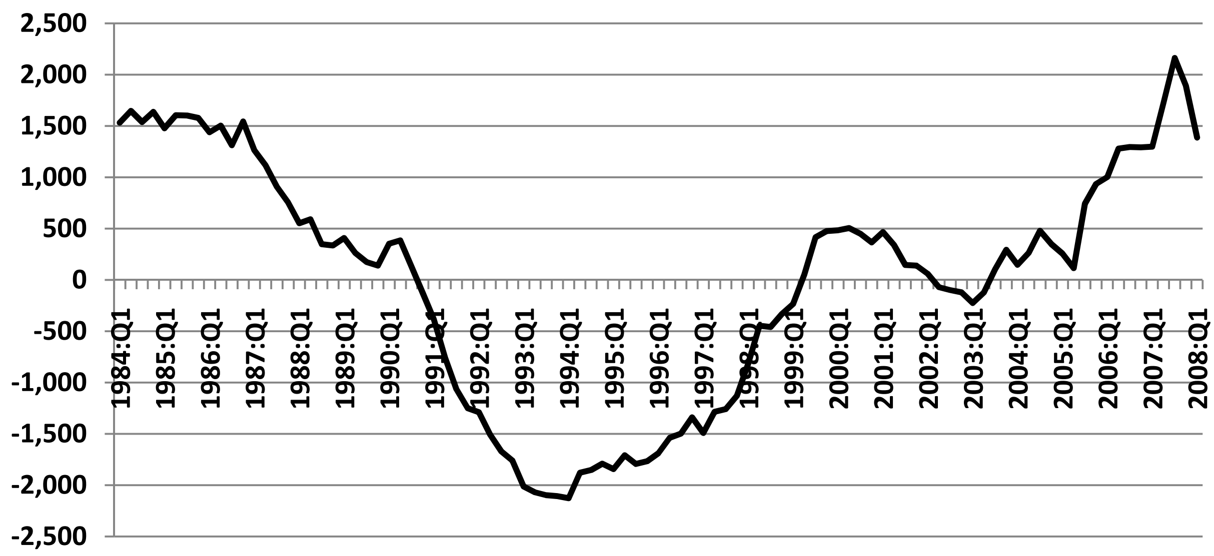
Figure 2: Abnormal liquidity creation calculated using two alternative approaches
This Figure uses two alternative approaches to measuring abnormal liquidity creation based on per capita liquidity creation and liquidity creation divided by GDP.

Panel A shows per capita liquidity creation over time, calculated as the dollar amount of liquidity created by the banking sector divided by the U.S. population (based on annual U.S. Census Bureau estimates). Panel B shows the abnormal amount of per capita liquidity creation, where "abnormal" is defined as the residuals from a regression of the dollar amount of per capita liquidity creation on a time trend and three seasonal dummies. Panel C shows the dollar amount of liquidity creation divided by GDP over time. Panel D shows the abnormal amount of liquidity creation divided by GDP, where "abnormal" is defined as the residuals from a regression of the dollar amount of liquidity creation divided by GDP on a time trend and three seasonal dummies. All dollar values are expressed in real 2007:Q4 dollars.

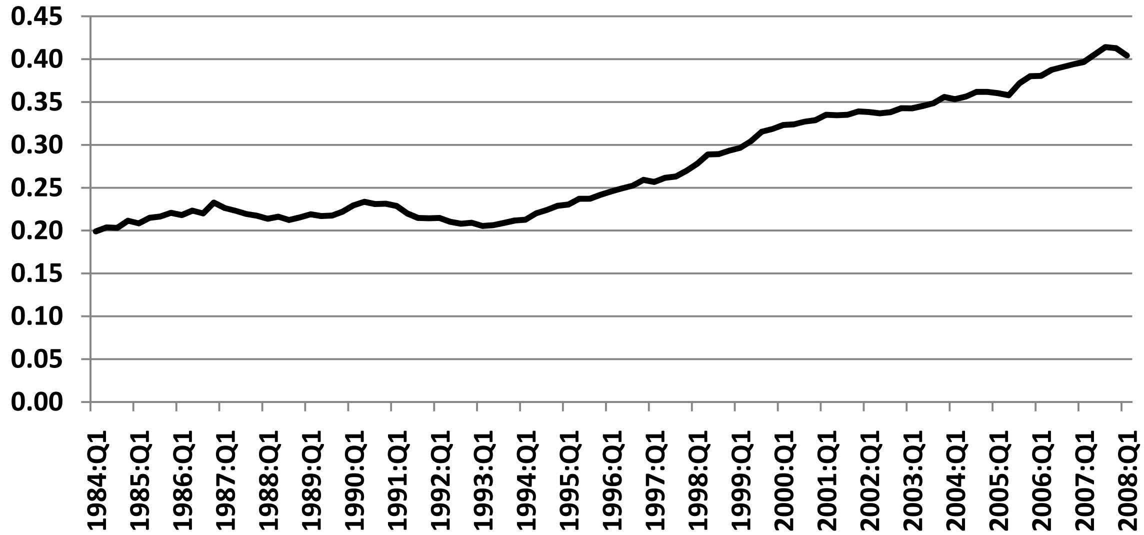
Panel A: Alternative specification: Actual per capita liquidity creation over time (*in $ per capita*)



Panel B: Alternative specification: Abnormal per capita liquidity creation over time (*in $ per capita*)



Panel C: Alternative specification: Actual liquidity creation / GDP over time (*in $ billion*)



Panel D: Alternative specification: Abnormal liquidity creation / GDP over time (*in $ billion*)

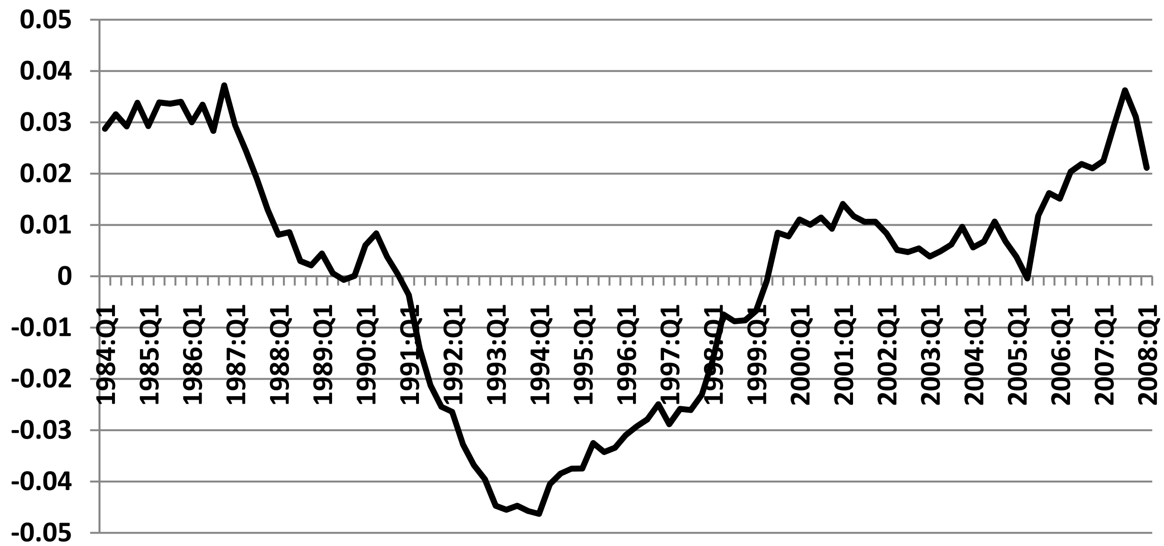
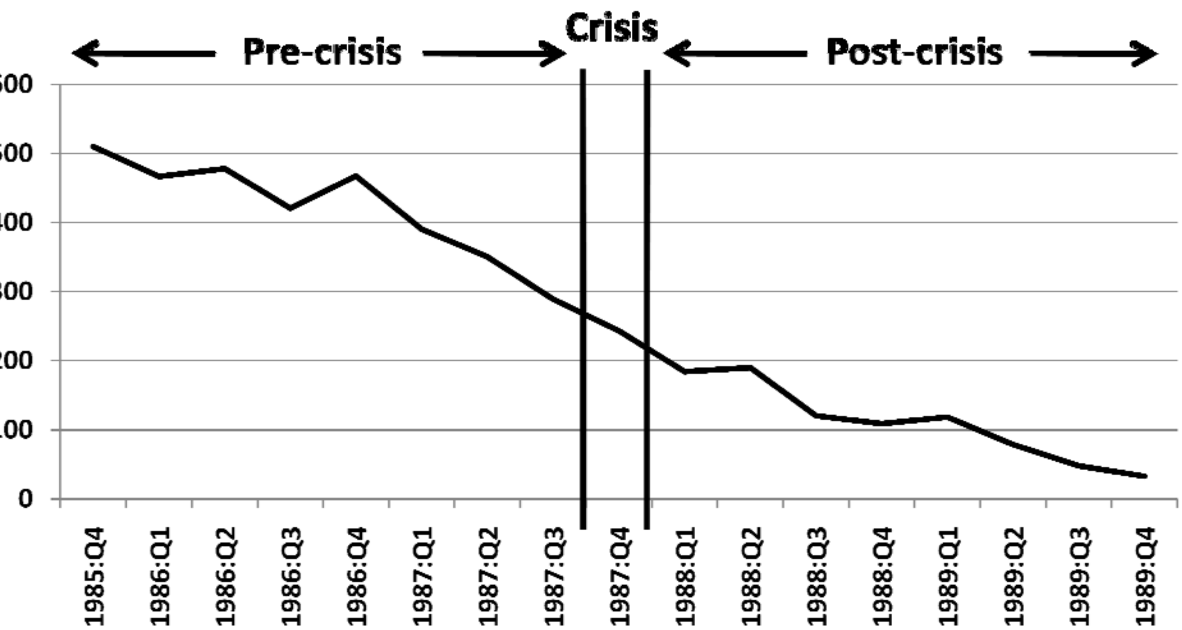


Figure 3: Abnormal liquidity creation around five financial crises

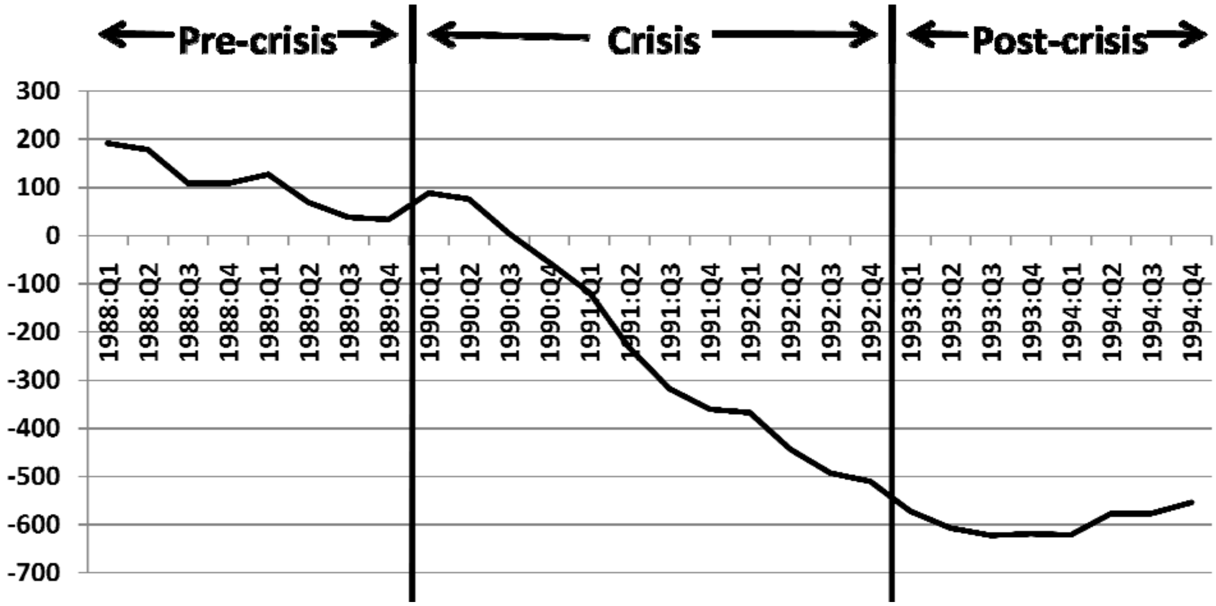
This figure shows abnormal liquidity creation by the U.S. banking sector around the following five financial crises: the 1987 stock market crash (crisis 1 – Panel A), the credit crunch of the early 1990s (crisis 2 – Panel B), the Russian debt crisis plus LTCM bailout in 1998 (crisis 3 – Panel C), the bursting of the dot.com bubble plus Sept. 11 (crisis 4 – Panel D), and the current subprime lending crisis (crisis 5 – Panel E).

Each panel shows the abnormal dollar amount of liquidity created by the banking sector in billions of dollars, where "abnormal" is defined as the residuals from a regression of the dollar amount of liquidity creation on a time trend and three seasonal dummies. The dollar amount of liquidity creation is calculated using Berger and Bouwman's (forthcoming) preferred "cat fat" measure. This measure classifies loans by category ("cat") and all non-loan activities by category and maturity combined, and includes off-balance sheet activities ("fat"). All dollar values are expressed in real 2007:Q4 dollars.

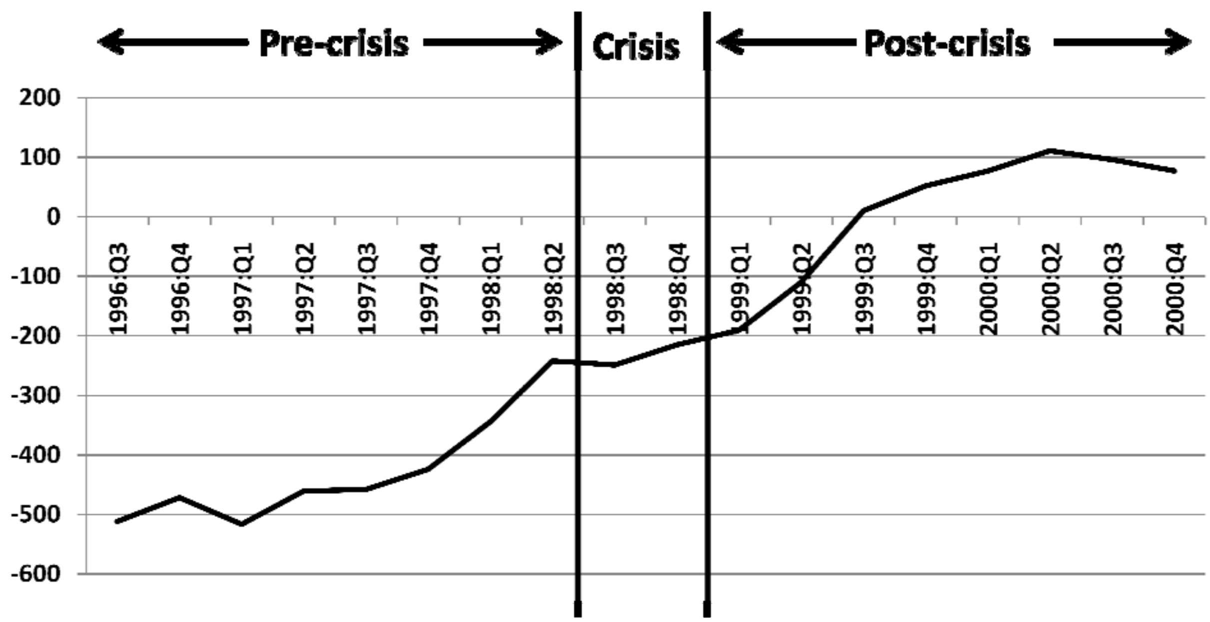
Panel A: Abnormal liquidity creation around crisis 1 – the stock market crash (1987:Q4) ***(in $ billion)***



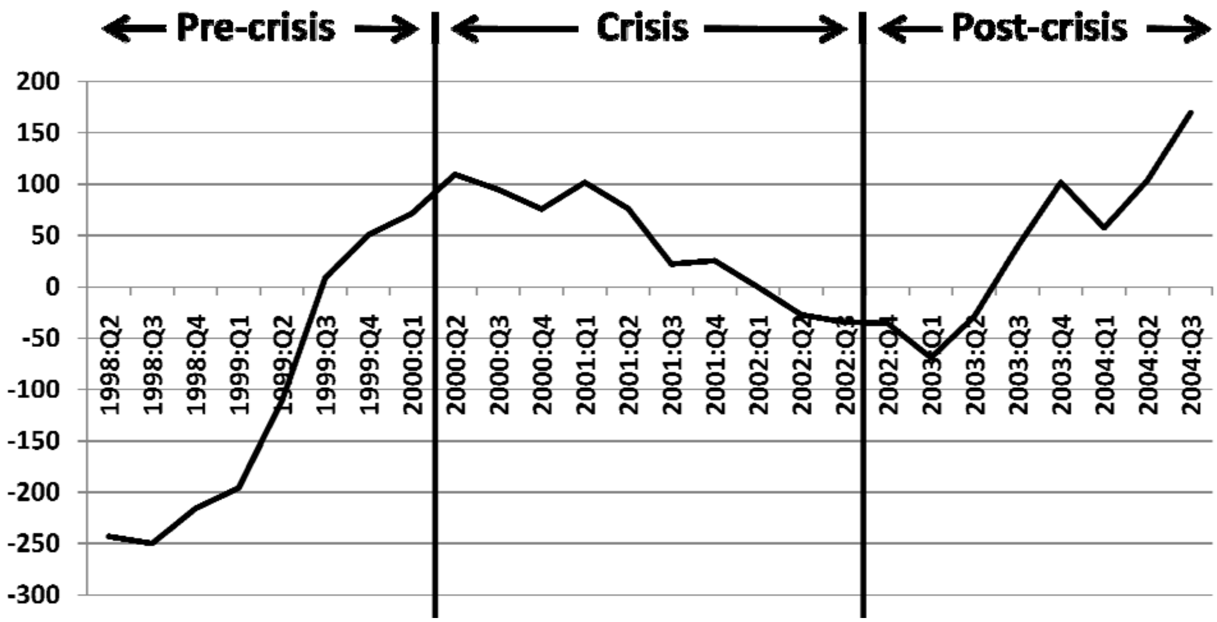
Panel B: Abnormal amount of liquidity creation around crisis 2 – the credit crunch (1990:Q1 – 1992:Q4) ***(in $ billion)***



Panel C: Abnormal amount of liquidity creation around crisis 3 – the Russian debt crisis / LTCM bailout (1998:Q3 – 1998:Q4) ***(in $ billion)***



Panel D: Abnormal amount of liquidity creation around crisis 4 – the bursting of the dot.com bubble and the Sept. 11 terrorist attack (2000:Q2 – 2002:Q3) ***(in $ billion)***



Panel E: Abnormal amount of liquidity creation around crisis 5 – the subprime lending crisis (2007:Q3 – 2008:Q1) ***(in $ billion)***

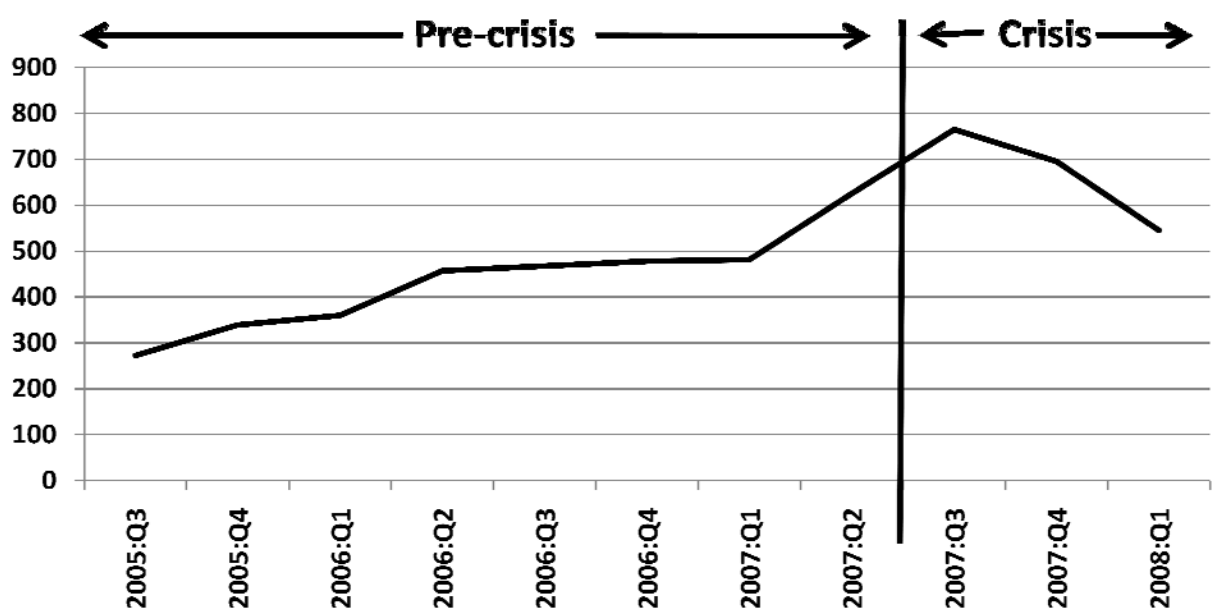
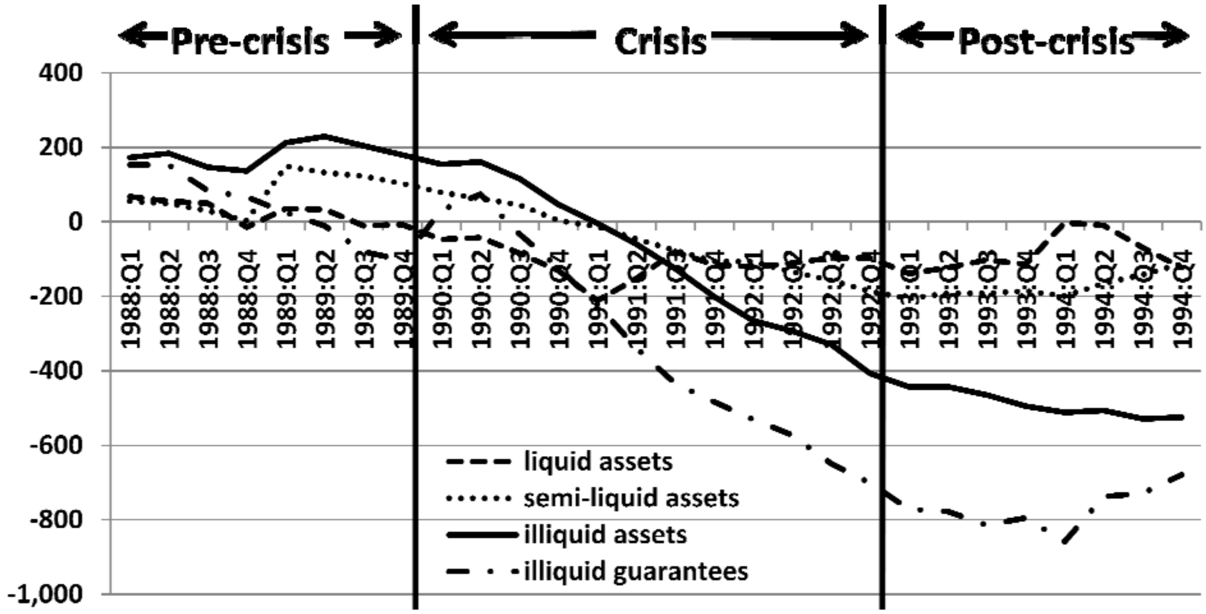


Figure 4: Selected components of abnormal liquidity creation around the two banking crises

This figure shows four components of abnormal liquidity creation by the U.S. banking sector around the two banking crises: the credit crunch of the early 1990s (crisis 2 – Panel A), and the current subprime lending crisis (crisis 5 – Panel B). The four components, defined in Table 1, include: liquid assets, semi-liquid assets, illiquid assets, and illiquid guarantees. Both Panels show the abnormal dollar amounts of these liquidity creation components. "Abnormal" is defined as the residuals from a regression of the dollar amount of these four liquidity creation components on a time trend and three seasonal dummies. All dollar values are expressed in real 2007:Q4 dollars.

Panel A: Four components of abnormal liquidity creation around crisis 2 – the credit crunch (1990:Q1 – 1992:Q4) ***(in $ billion)***



Panel B: Four components of abnormal liquidity creation around crisis 5 – the subprime lending crisis (2007:Q3 – 2008:Q1) ***(in $ billion)***

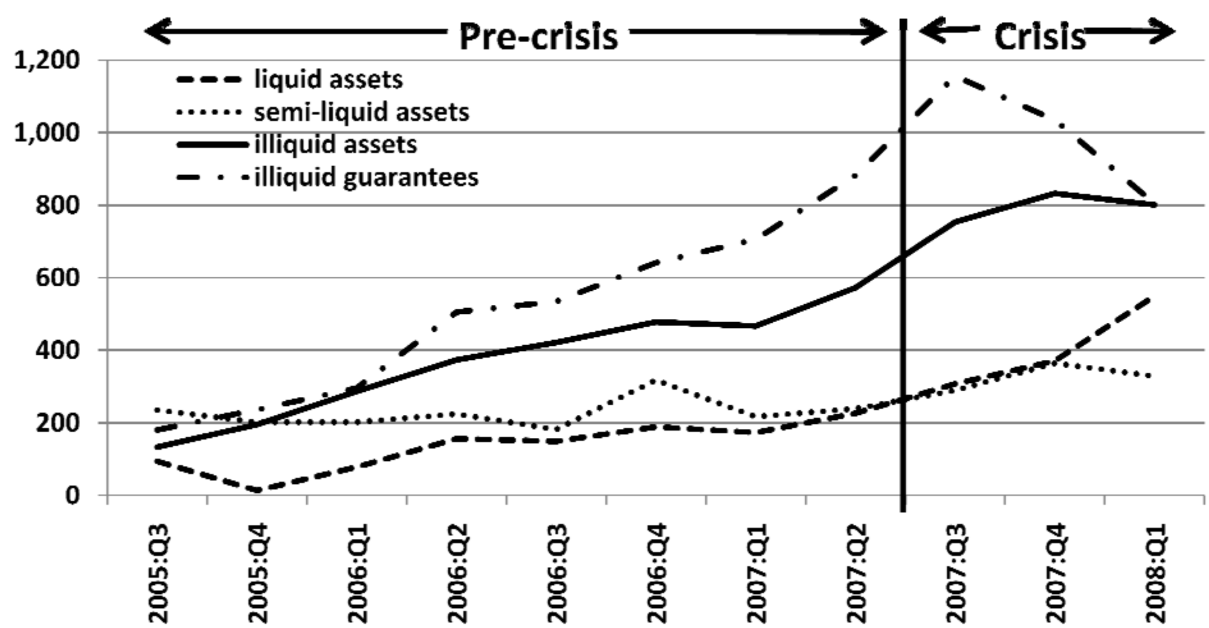


Table 1: Liquidity classification of bank activities and construction of the "cat fat" liquidity creation measure

This table explains the Berger and Bouwman (forthcoming) methodology to construct the "cat fat" liquidity creation measure, that classifies loans by category ("cat") and includes off-balance sheet activities ("fat"), in three steps.

Step 1: Classify all bank activities as liquid, semi-liquid, or illiquid. For activities other than loans, information on product category and maturity are combined. Due to data limitations, loans are classified entirely by product category ("cat").

Step 2: Assign weights to the activities classified in Step 1.

ASSETS:

Illiquid assets (weight = ½)	**Semi-liquid assets (weight = 0)**	**Liquid assets (weight = - ½)**
Commercial real estate loans (CRE)	Residential real estate loans (RRE)	Cash and due from other institutions
Loans to finance agricultural production	Consumer loans	All securities (regardless of maturity)
Commercial and industrial loans (C&I)	Loans to depository institutions	Trading assets
Other loans and lease financing receivables	Loans to state and local governments	Fed funds sold
Other real estate owned (OREO)	Loans to foreign governments	
Investment in unconsolidated subsidiaries		
Intangible assets		
Premises		
Other assets		

LIABILITIES PLUS EQUITY:

Liquid liabilities (weight = ½)	**Semi-liquid liabilities (weight = 0)**	**Illiquid liabilities plus equity (weight = - ½)**
Transactions deposits	Time deposits	Subordinated debt
Savings deposits	Other borrowed money	Other liabilities
Overnight federal funds purchased		Equity
Trading liabilities		

OFF-BALANCE SHEET GUARANTEES (notional values):

Illiquid guarantees (weight = ½)	**Semi-liquid guarantees (weight = 0)**	**Liquid guarantees (weight = - ½)**
Unused commitments	Net credit derivatives	Net participations acquired
Net standby letters of credit	Net securities lent	
Commercial and similar letters of credit		
All other off-balance sheet liabilities		

OFF-BALANCE SHEET DERIVATIVES (gross fair values):

		Liquid derivatives (weight = -½)
		Interest rate derivatives
		Foreign exchange derivatives
		Equity and commodity derivatives

Step 3: Combine bank activities as classified in Step 1 and as weighted in Step 2 to construct a "cat fat" liquidity creation measure.

cat fat =	+ ½ * illiquid assets	+ 0 * semi-liquid assets	– ½ * liquid assets
	+ ½ * liquid liabilities	+ 0 * semi-liquid liabilities	– ½ * illiquid liabilities
			– ½ * equity
	+ ½ * illiquid guarantees	+ 0 * semi-liquid guarantees	– ½ * liquid guarantees
			– ½ * liquid derivatives

Table 2: Summary statistics on the regression variables

This Table contains summary statistics on all the regression variables used to examine the effect of pre-crisis capital ratios on banks' competitive positions and profitability during and after the following five financial crises: the 1987 stock market crash (crisis 1), the credit crunch of the early 1990s (crisis 2), the Russian debt crisis plus LTCM bailout in 1998 (crisis 3), the bursting of the dot.com bubble plus Sept. 11 (crisis 4), and the current subprime lending crisis (crisis 5).

The change in liquidity creation market share during the crisis (after the crisis) is measured as the bank's average market share of liquidity creation during a crisis (after a crisis) minus its average market share of liquidity creation over the eight quarters before the crisis, expressed as a proportion of its pre-crisis market share. The change in profitability during the crisis (after the crisis) is measured as the bank's average profitability over the eight quarters during a crisis (after a crisis) minus its average profitability over the eight quarters before the crisis. Profitability is ROE, net income divided by GTA. GTA equals total assets plus the allowance for loan and the lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

EQRAT is the equity capital ratio, calculated as total equity capital as a proportion of GTA. Ln(GTA) is the log of GTA. ZSCORE is the distance to default, measured as the bank's return on assets plus the equity capital/GTA ratio divided by the standard deviation of the return on assets. D-BHC is a dummy variable that equals 1 if the bank has been part of a Bank Holding Company over the prior three years. HERF is a bank-level Herfindahl index based on bank and thrift deposits (the only variable for which geographic location is publicly available). We first establish the Herfindahl index of the markets in which the bank has deposits and then weight these market indices by the proportion of the bank's deposits in each of these markets. INC-GROWTH is the weighted average income growth in all markets in which a bank has deposits, using the proportion of deposits held by a bank in each market as weights. Ln(POP) is the natural log of weighted average population in all markets in which a bank has deposits, using the proportion of deposits held by a bank in each market as weights. All dollar values are expressed in real 2007:Q4 dollars.

	Large banks					**Small banks**				
	Crisis 1 ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 5** ***Subprime lending crisis***	**Crisis 1** ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 5** ***Subprime lending crisis***
Change in liquidity creation market share:										
During the crisis	0.16	0.24	0.11	0.31	0.08	0.20	0.23	0.06	0.24	-0.01
After the crisis	0.23	0.58	0.25	0.62		0.25	0.99	0.23	0.57	
Change in profitability (ROE)										
During the crisis	-0.02	-0.06	-0.01	-0.02	-0.04	-0.04	-0.01	-0.01	0.00	-0.02
After the crisis	-0.01	0.00	-0.01	-0.03		-0.01	0.01	0.00	-0.01	
Independent variables:										
EQRAT	0.07	0.07	0.09	0.09	0.10	0.08	0.09	0.10	0.10	0.10
lnGTA	14.90	15.01	14.95	15.03	14.92	11.46	11.46	11.54	11.60	11.84
ZSCORE	0.03	0.02	0.03	0.03	0.04	0.01	0.02	0.03	0.03	0.03
D-BHC	0.97	0.90	0.90	0.90	0.91	0.71	0.71	0.77	0.79	0.83
HHI	0.18	0.17	0.16	0.17	0.18	0.22	0.22	0.21	0.21	0.25
INC-GROWTH	0.04	0.04	0.04	0.05	0.06	0.02	0.03	0.04	0.04	0.05
lnPOP	13.41	13.61	13.44	13.51	13.16	11.95	11.84	11.66	11.65	11.66
Obs	378	357	388	330	477	6343	6128	6131	5556	5604

Table 3: The effect of the bank's pre-crisis capital ratio on its liquidity creation market share during and after financial crises

This Table shows how pre-crisis capitalization of a bank affects its liquidity creation market share around the following five financial crises: the 1987 stock market crash (crisis 1), the credit crunch of the early 1990s (crisis 2), the Russian debt crisis plus LTCM bailout in 1998 (crisis 3), the bursting of the dot.com bubble plus Sept. 11 (crisis 4), and the current subprime lending crisis (crisis 5). Results are shown for large banks (GTA exceeding $1 billion), and small banks (GTA up to $1 billion). GTA equals total assets plus the allowance for loan and the lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

In Panel A, the dependent variable is the change in liquidity creation market share during the crisis, measured as the bank's average market share of liquidity creation during a crisis minus its average market share of liquidity creation over the eight quarters before the crisis, expressed as a proportion of its pre-crisis market share. In Panel B, the dependent variable is the change in liquidity creation market share after the crisis, measured as the bank's average market share of liquidity creation over the eight quarters after a crisis minus its average market share of liquidity creation over the eight quarters before the crisis, expressed as a proportion of its pre-crisis market share.

EQRAT is the equity capital ratio, calculated as total equity capital as a proportion of GTA. Ln(GTA) is the log of GTA. ZSCORE is the distance to default, measured as the bank's return on assets plus the equity capital/GTA ratio divided by the standard deviation of the return on assets. D-BHC is a dummy variable that equals 1 if the bank has been part of a Bank Holding Company over the prior three years. HERF is a bank-level Herfindahl index based on bank and thrift deposits (the only variable for which geographic location is publicly available). We first establish the Herfindahl index of the markets in which the bank has deposits and then weight these market indices by the proportion of the bank's deposits in each of these markets. INC-GROWTH is the weighted average income growth in all markets in which a bank has deposits, using the proportion of deposits held by a bank in each market as weights. Ln(POP) is the natural log of weighted average population in all markets in which a bank has deposits, using the proportion of deposits held by a bank in each market as weights.

t-statistics based on robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: The effect of the bank's pre-crisis capital ratio on its liquidity creation market share *during* crises

	Large banks					Small banks				
	Crisis 1 ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 5** ***Subprime lending crisis***	**Crisis 1** ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 5** ***Subprime lending crisis***
EQRAT	0.782	3.437	-0.821	-0.772	0.554	1.008	2.875	0.940	2.113	0.605
	(0.88)	*(3.58)****	*(-0.87)*	*(-1.10)*	*(2.17)***	*(2.26)***	*(4.54)****	*(4.11)****	*(5.89)****	*(4.19)****
lnGTA	-0.045	-0.033	-0.016	-0.038	-0.027	-0.024	-0.068	-0.007	0.003	0.028
	*(-3.47)****	*(-1.16)*	*(-1.09)*	*(-1.62)*	*(-3.62)****	*(-2.44)***	*(-5.03)****	*(-1.05)*	*(0.30)*	*(7.22)****
ZSCORE	0.631	-2.700	-0.384	-0.313	-0.205	4.899	2.915	-0.074	-0.292	-0.731
	(1.06)	*(-1.35)*	*(-0.66)*	*(-0.27)*	*(-0.60)*	*(7.00)****	*(3.37)****	*(-0.32)*	*(-0.76)*	*(-4.43)****
D-BHC	0.029	0.059	0.176	-0.080	0.008	-0.079	0.072	0.009	-0.063	-0.027
	(0.52)	*(0.47)*	*(2.29)***	*(-0.64)*	*(0.20)*	*(-4.25)****	*(2.89)****	*(0.73)*	*(-3.09)****	*(-2.67)****
HHI	0.077	0.251	-0.032	-0.518	0.077	-0.115	0.094	-0.007	0.124	0.002
	(0.39)	*(0.50)*	*(-0.15)*	*(-1.40)*	*(0.74)*	*(-1.75)**	*(0.89)*	*(-0.15)*	*(1.83)**	*(0.10)*
INC-GROWTH	1.713	3.877	0.120	5.106	1.126	1.755	1.231	0.966	1.445	0.517
	*(2.20)***	*(1.78)**	*(0.10)*	*(2.42)***	*(1.50)*	*(6.06)****	*(2.52)***	*(3.47)****	*(4.22)****	*(4.29)****
lnPOP	-0.012	-0.031	0.004	-0.032	0.006	0.005	0.004	0.006	0.029	0.001
	*(-1.74)**	*(-1.60)*	*(0.53)*	*(-1.61)*	*(0.95)*	*(1.20)*	*(0.62)*	*(2.14)***	*(5.73)****	*(0.45)*
Constant	0.809	0.736	0.223	1.329	0.259	0.294	0.563	-0.070	-0.354	-0.405
	*(3.58)****	*(1.40)*	*(0.90)*	*(2.73)****	*(1.87)**	*(2.28)***	*(3.20)****	*(-0.89)*	*(-2.86)****	*(-7.75)****
Obs	378	357	388	330	477	6343	6128	6131	5556	5604
Adj R2	0.05	0.03	0.01	0.01	0.03	0.03	0.01	0.01	0.04	0.02

Panel B: The effect of the bank's pre-crisis capital ratio on its liquidity creation market share *after* crises

	Large banks				Small banks			
	Crisis 1 ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 1** ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***
EQRAT	-1.789	7.124	-1.602	-2.367	1.943	9.792	3.011	4.035
	(-1.62)	*(2.70)****	*(-1.15)*	*(-2.17)***	*(3.00)****	*(6.90)****	*(8.03)****	*(5.57)****
lnGTA	-0.068	-0.102	-0.064	-0.105	-0.045	-0.265	-0.007	-0.003
	*(-3.04)****	*(-1.50)*	*(-2.47)***	*(-2.72)****	*(-3.23)****	*(-8.60)****	*(-0.65)*	*(-0.17)*
ZSCORE	1.167	-6.525	-0.427	-0.836	4.927	6.310	-0.361	-0.022
	(1.21)	*(-1.56)*	*(-0.40)*	*(-0.49)*	*(5.08)****	*(3.04)****	*(-0.81)*	*(-0.03)*
D-BHC	-0.003	0.100	0.022	-0.252	-0.083	0.138	0.012	-0.181
	(-0.05)	*(0.33)*	*(0.16)*	*(-1.19)*	*(-3.05)****	*(2.49)***	*(0.52)*	*(-4.35)****
HHI	-0.187	-0.136	-0.213	-0.587	-0.316	-0.303	0.097	0.458
	(-0.61)	*(-0.14)*	*(-0.52)*	*(-0.85)*	*(-3.30)****	*(-1.36)*	*(1.20)*	*(3.12)****
INC-GROWTH	2.412	6.915	-0.825	6.346	3.665	1.253	2.168	3.149
	*(1.83)**	*(1.42)*	*(-0.32)*	*(1.62)*	*(9.10)****	*(1.12)*	*(4.23)****	*(4.57)****
lnPOP	-0.013	-0.065	0.010	-0.021	0.010	-0.055	0.036	0.071
	(-1.14)	*(-1.69)**	*(0.82)*	*(-0.57)*	*(1.58)*	*(-4.16)****	*(6.98)****	*(6.82)****
Constant	1.451	2.304	1.288	2.771	0.457	3.668	-0.515	-0.679
	*(3.73)****	*(1.97)***	*(2.88)****	*(3.51)****	*(2.41)***	*(9.23)****	*(-3.72)****	*(-2.67)****
Obs	378	357	388	330	6343	6128	6131	5556
Adj R2	0.03	0.02	0.00	0.02	0.03	0.04	0.03	0.05

Table 4: The effect of the bank's pre-crisis capital ratio on its profitability during and after financial crises

This Table shows how the bank's pre-crisis capitalization affects ROE during and after the following five financial crises: the 1987 stock market crash (crisis 1), the credit crunch of the early 1990s (crisis 2), the Russian debt crisis plus LTCM bailout in 1998 (crisis 3), the bursting of the dot.com bubble plus Sept. 11 (crisis 4), and the current subprime lending crisis (crisis 5). Results are shown for large banks (GTA exceeding $1 billion), and small banks (GTA up to $1 billion). GTA equals total assets plus the allowance for loan and the lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

In Panel A, the dependent variable is the change in profitability during the crisis, measured as the bank's average profitability during a crisis minus its average profitability over the eight quarters before the crisis. In Panel B, the dependent variable is the change in profitability after the crisis, measured as the bank's average profitability over the eight quarters after a crisis minus its average profitability over the eight quarters before the crisis. Profitability is ROE, net income divided by GTA.

EQRAT is the equity capital ratio, calculated as total equity capital as a proportion of GTA. Ln(GTA) is the log of GTA. ZSCORE is the distance to default, measured as the bank's return on assets plus the equity capital/GTA ratio divided by the standard deviation of the return on assets. D-BHC is a dummy variable that equals 1 if the bank has been part of a Bank Holding Company over the prior three years. HERF is a bank-level Herfindahl index based on bank and thrift deposits (the only variable for which geographic location is publicly available). We first establish the Herfindahl index of the markets in which the bank has deposits and then weight these market indices by the proportion of the bank's deposits in each of these markets. INC-GROWTH is the weighted average income growth in all markets in which a bank has deposits, using the proportion of deposits held by a bank in each market as weights. Ln(POP) is the natural log of weighted average population in all markets in which a bank has deposits, using the proportion of deposits held by a bank in each market as weights.

t-statistics based on robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: The effect of the bank's pre-crisis capital ratio on its profitability *during* crises

	Large banks					**Small banks**				
	Crisis 1 ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 5** ***Subprime lending crisis***	**Crisis 1** ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 5** ***Subprime lending crisis***
EQRAT	-0.083	0.513	0.316	0.018	0.132	-0.044	-0.014	0.014	0.044	0.072
	(-0.34)	*(2.81)****	*(2.36)***	*(0.25)*	*(2.31)***	*(-0.66)*	*(-0.35)*	*(0.77)*	*(2.55)***	*(3.81)****
lnGTA	-0.016	-0.006	0.001	-0.001	-0.007	0.006	-0.008	0.002	-0.002	-0.005
	*(-2.48)***	*(-0.92)*	*(0.40)*	*(-0.56)*	*(-3.05)****	*(2.99)****	*(-6.67)****	*(3.40)****	*(-2.93)****	*(-6.35)****
ZSCORE	0.120	-0.359	0.099	0.288	0.319	0.943	0.184	0.105	-0.009	0.259
	(0.59)	*(-1.00)*	*(0.97)*	*(3.57)****	*(4.06)****	*(9.61)****	*(3.51)****	*(4.82)****	*(-0.47)*	*(10.04)****
D-BHC	0.005	-0.017	0.002	-0.012	0.007	0.013	0.010	0.004	0.001	-0.001
	(0.22)	*(-0.79)*	*(0.31)*	*(-1.30)*	*(0.70)*	*(4.00)****	*(5.24)****	*(2.97)****	*(0.60)*	*(-0.86)*
HHI	0.061	0.259	-0.011	-0.173	0.021	0.003	-0.031	0.004	-0.008	0.002
	(0.95)	*(2.51)***	*(-0.23)*	*(-3.95)****	*(1.13)*	*(0.25)*	*(-4.39)****	*(0.65)*	*(-1.75)**	*(0.62)*
INC-GROWTH	0.374	-0.663	0.210	0.216	-0.068	0.275	-0.084	0.126	0.037	-0.011
	(1.30)	*(-2.30)***	*(1.01)*	*(1.14)*	*(-0.44)*	*(4.73)****	*(-2.32)***	*(3.88)****	*(1.52)*	*(-0.47)*
lnPOP	-0.005	-0.009	0.000	-0.003	-0.003	-0.003	-0.006	0.001	0.000	-0.003
	*(-2.58)***	*(-2.35)***	*(0.08)*	*(-1.49)*	*(-2.10)***	*(-3.53)****	*(-11.78)****	*(4.07)****	*(0.11)*	*(-8.26)****
Constant	0.263	0.113	-0.060	0.058	0.079	-0.093	0.150	-0.064	0.016	0.061
	*(2.46)***	*(1.09)*	*(-1.50)*	*(1.30)*	*(2.12)***	*(-3.90)****	*(10.72)****	*(-7.49)****	*(1.91)**	*(6.09)****
Obs	378	357	388	330	477	6343	6128	6131	5556	5604
Adj R2	0.03	0.07	0.01	0.09	0.07	0.03	0.07	0.02	0.00	0.05

Panel B: The effect of the bank's pre-crisis capital ratio on its profitability *after* crises

	Large banks				Small banks			
	Crisis 1 *Stock market crash*	**Crisis 2 *Credit crunch***	**Crisis 3 *Russian debt / LTCM***	**Crisis 4 *Bursting dot.com / Sept 11***	**Crisis 1 *Stock market crash***	**Crisis 2 *Credit crunch***	**Crisis 3 *Russian debt / LTCM***	**Crisis 4 *Bursting dot.com / Sept 11***
EQRAT	0.448	0.209	0.399	0.271	0.077	0.102	0.075	0.151
	*(1.67)**	*(2.65)****	*(2.97)****	*(2.20)***	*(1.59)*	*(2.51)***	*(2.75)****	*(6.04)****
lnGTA	0.003	0.002	-0.002	0.005	0.000	-0.004	0.000	-0.003
	(0.53)	*(0.40)*	*(-0.82)*	*(1.59)*	*(0.23)*	*(-3.52)****	*(0.27)*	*(-3.28)****
ZSCORE	0.280	-0.719	0.182	0.419	0.138	-0.300	-0.034	0.013
	(1.30)	*(-3.36)****	*(2.51)***	*(3.48)****	*(1.89)**	*(-5.19)****	*(-1.75)**	*(0.46)*
D-BHC	-0.032	0.029	0.002	-0.022	0.005	0.005	0.005	-0.001
	*(-1.65)**	*(1.86)**	*(0.33)*	*(-1.46)*	*(1.95)**	*(2.67)****	*(3.70)****	*(-0.59)*
HHI	0.261	-0.178	-0.029	-0.180	0.015	-0.067	0.008	-0.012
	*(3.00)****	*(-2.63)****	*(-0.54)*	*(-2.90)****	*(1.67)**	*(-8.27)****	*(1.66)**	*(-1.91)**
INC-GROWTH	-0.136	-0.706	0.091	0.035	0.281	-0.105	0.118	-0.014
	(-0.37)	*(-2.63)****	*(0.46)*	*(0.12)*	*(6.58)****	*(-2.82)****	*(3.89)****	*(-0.45)*
lnPOP	0.002	-0.010	0.002	-0.003	-0.005	-0.005	0.001	0.000
	(0.89)	*(-3.09)****	*(1.05)*	*(-1.05)*	*(-7.51)****	*(-7.96)****	*(2.62)****	*(0.00)*
Constant	-0.142	0.149	-0.047	-0.050	0.025	0.119	-0.030	0.018
	(-1.20)	*(2.03)***	*(-1.17)*	*(-0.83)*	*(1.42)*	*(7.99)****	*(-3.15)****	*(1.56)*
Obs	378	357	388	330	6343	6128	6131	5556
Adj R2	0.04	0.10	0.05	0.08	0.02	0.04	0.01	0.01

Table 5: The effect of the bank's pre-crisis capital ratio on its liquidity creation market share and profitability controlling for changes in monetary policy

This Table shows how the bank's pre-crisis capitalization affects its liquidity creation market share and ROE during and after five financial crises while controlling for changes in monetary policy. The crises include: the 1987 stock market crash (crisis 1), the credit crunch of the early 1990s (crisis 2), the Russian debt crisis plus LTCM bailout in 1998 (crisis 3), the bursting of the dot.com bubble plus Sept. 11 (crisis 4), and the current subprime lending crisis (crisis 5). Results are shown for large banks (GTA exceeding $1 billion), and small banks (GTA up to $1 billion). GTA equals total assets plus the allowance for loan and the lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

In Panels A and B, the dependent variable is the change in liquidity creation market share during (after) the crisis, measured as the bank's average liquidity creation market share during (after) a crisis minus its average liquidity creation market share over the eight quarters before the crisis, expressed as a proportion of its pre-crisis market share. In Panels C and D, the dependent variable is the change in profitability during (after) the crisis, measured as the bank's average profitability during (after) a crisis minus its average profitability over the eight quarters before the crisis. Profitability is ROE, net income divided by GTA.

EQRAT is the equity capital ratio, calculated as total equity capital as a proportion of GTA. All regressions include the full set of control variables, explained in Table 2 (not shown for brevity). The regressions in Panels A and C (B and D) also control for changes in monetary policy during (after) the crisis, measured as the average federal funds rate during (after) a crisis minus the average federal funds rate over the eight quarters before the crisis.

t-statistics based on robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: The effect of the bank's pre-crisis capital ratio on its liquidity creation market share *during* crises controlling for changes in monetary policy

	Large banks					**Small banks**				
	Crisis 1 ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 5** ***Subprime lending crisis***	**Crisis 1** ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 5** ***Subprime lending crisis***
EQRAT	0.780	3.782	-0.697	-0.810	0.607	1.011	2.835	0.934	2.111	0.644
	(0.87)	*(4.04)****	*(-0.73)*	*(-1.13)*	*(2.13)***	*(2.25)***	*(4.47)****	*(4.08)****	*(5.87)****	*(4.01)****
Obs	378	357	388	330	477	6343	6128	6131	5556	5604
Adj R2	0.06	0.04	0.01	0.01	0.06	0.03	0.01	0.01	0.04	0.04

Panel B: The effect of the bank's pre-crisis capital ratio on its liquidity creation market share *after* crises controlling for changes in monetary policy

	Large banks				**Small banks**			
	Crisis 1 ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 1** ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***
EQRAT	-1.631	7.335	-1.679	-2.351	1.865	9.913	3.008	4.022
	(-1.54)	*(2.96)****	*(-1.20)*	*(-2.14)***	*(2.86)****	*(6.96)****	*(8.01)****	*(5.55)****
Obs	378	357	388	330	6343	6128	6131	5556
Adj R2	0.05	0.02	0.00	0.02	0.03	0.04	0.03	0.05

Panel C: The effect of the bank's pre-crisis capital ratio on its profitability *during* crises controlling for changes in monetary policy

	Large banks					Small banks				
	Crisis 1 *Stock market crash*	**Crisis 2 *Credit crunch***	**Crisis 3 *Russian debt / LTCM***	**Crisis 4 *Bursting dot.com / Sept 11***	**Crisis 5 *Subprime lending crisis***	**Crisis 1 *Stock market crash***	**Crisis 2 *Credit crunch***	**Crisis 3 *Russian debt / LTCM***	**Crisis 4 *Bursting dot.com / Sept 11***	**Crisis 5 *Subprime lending crisis***
EQRAT	-0.083	0.487	0.275	0.013	0.162	-0.040	-0.010	0.013	0.044	0.071
	(-0.34)	*(2.95)****	*(2.16)***	*(0.17)*	*(2.31)***	*(-0.59)*	*(-0.25)*	*(0.76)*	*(2.56)***	*(3.41)****
Obs	378	357	388	330	477	6343	6128	6131	5556	5604
Adj R2	0.03	0.07	0.02	0.09	0.06	0.03	0.07	0.02	0.00	0.05

Panel D: The effect of the bank's pre-crisis capital ratio on its profitability *after* crises controlling for changes in monetary policy

	Large banks				Small banks			
	Crisis 1 *Stock market crash*	**Crisis 2 *Credit crunch***	**Crisis 3 *Russian debt / LTCM***	**Crisis 4 *Bursting dot.com / Sept 11***	**Crisis 1 *Stock market crash***	**Crisis 2 *Credit crunch***	**Crisis 3 *Russian debt / LTCM***	**Crisis 4 *Bursting dot.com / Sept 11***
EQRAT	0.451	0.207	0.397	0.271	0.063	0.099	0.073	0.150
	*(1.66)**	*(2.60)****	*(2.97)****	*(2.20)***	*(1.32)*	*(2.46)***	*(2.69)****	*(6.00)****
Obs	378	357	388	330	6343	6128	6131	5556
Adj R2	0.03	0.10	0.05	0.07	0.02	0.04	0.01	0.01

Table 6: The effect of pre-crisis capitalization on abnormal stock returns during financial crises

This Table examines whether the pre-crisis capital ratio of a listed bank affects its stock returns during the following five financial crises: the 1987 stock market crash (crisis 1), the credit crunch of the early 1990s (crisis 2), the Russian debt crisis plus LTCM bailout in 1998 (crisis 3), the bursting of the dot.com bubble plus Sept. 11 (crisis 4), and the current subprime lending crisis (crisis 5).

In the first step, we use a five-factor model to separately estimate the pre-crisis factor loadings of high- and low-capital banks. In this step, portfolio excess returns are regressed on the three Fama-French (1993) factors, the Carhart (1997) momentum factor and the slope of the yield curve:

$$R_{p,t} - R_{f,t} = \alpha + \beta_1 * (R_{m,t} - R_{f,t}) + \beta_2 * SMB_t + \beta_3 * HML_t + \beta_4 * MOM_t + \beta_5 * YLDCURVE_t$$

where $R_{p,t}$ is the portfolio return in pre-crisis month $t \in [-24, -1]$, $R_{m,t} - R_{f,t}$ is excess return on the market, SMB is the difference between a portfolio of "small" and "big" stocks, HML is the difference between a portfolio of "high" and "low" book-to-market stocks, MOM is the Carhart momentum factor, and YLDCURVE is the slope of the yield curve, proxied by the difference between the ten-year Treasury bond and the federal funds rate.

In the second step, we use these pre-crisis factor loadings to predict portfolio returns during the crisis. We thus obtain the portfolio returns that would have been achieved absent the crisis. We then deduct these predicted returns from the realized returns to obtain the alphas of the high- and low-capital bank portfolios.

In the last step, we calculate HminLalpha, the alpha of high-capital banks minus the alpha of low-capital banks. If HminLalpha is positive, the stock return results are consistent with the competitive position and profitability results of large banks: the stock performance of high-capital banks improved more (or declined less) than that of low-capital banks during the crisis.

t-statistics are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Listed banks				
	Crisis 1 ***Stock market crash***	**Crisis 2** ***Credit crunch***	**Crisis 3** ***Russian debt / LTCM***	**Crisis 4** ***Bursting dot.com / Sept 11***	**Crisis 5** ***Subprime lending crisis***
(1) Alpha of high-capital banks	4.132	4.319	1.589	2.385**	0.568
	(0.81)	*(7.49)****	*(0.98)*	*(1.73)*	*(0.56)*
(2) Alpha of low-capital banks	0.127	0.029	0.075	0.545	-2.210
	(0.07)	*(0.04)*	*(0.03)*	*(0.34)*	*(-1.77)**
(1) – (2) HminLalpha	4.005	4.290	1.514	1.839	2.777
	(0.74)	*(4.54)****	*(0.54)*	*(0.87)*	*(1.73)**

Table 7: The effect of the bank's pre-crisis capital ratio on its liquidity creation market share, profitability and stock returns around "fake" crises

This Table shows how pre-crisis capitalization of a bank affects its liquidity creation market share, profitability and stock returns around "fake" crises. Results are shown for large banks (GTA exceeding $1 billion), and small banks (GTA up to $1 billion). GTA equals total assets plus the allowance for loan and the lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

In Panel A (Panel B), ΔLCSHARE is the change in liquidity creation market share *during (after)* the crisis, measured as the bank's average market share of liquidity creation during (after) a crisis minus its average market share of liquidity creation over the eight quarters before the crisis, expressed as a proportion of its pre-crisis market share. In Panel A (Panel B), ΔROE is the change in profitability *during (after)* the crisis, measured as the bank's average profitability during (after) a crisis minus its average profitability over the eight quarters before the crisis. Profitability is ROE, net income divided by GTA. Panel C shows the alphas of portfolios of high- and low-capital listed banks and HminLalpha, the alpha of high-capital listed banks minus the alpha of low-capital listed banks. (For a more detailed explanation, see Table 5.)

EQRAT is the equity capital ratio, calculated as total equity capital as a proportion of GTA. Ln(GTA) is the log of GTA. ZSCORE is the distance to default, measured as the bank's return on assets plus the equity capital/GTA ratio divided by the standard deviation of the return on assets. D-BHC is a dummy variable that equals 1 if the bank has been part of a Bank Holding Company over the prior three years. HERF is a bank-level Herfindahl index based on bank and thrift deposits (the only variable for which geographic location is publicly available). We first establish the Herfindahl index of the markets in which the bank has deposits and then weight these market indices by the proportion of the bank's deposits in each of these markets. INC-GROWTH is the weighted average income growth in all markets in which a bank has deposits, using the proportion of deposits held by a bank in each market as weights. Ln(POP) is the natural log of weighted average population in all markets in which a bank has deposits, using the proportion of deposits held by a bank in each market as weights.

t-statistics based on robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: The effect of the bank's pre-crisis capital ratio on its liquidity creation market share and profitability *during* "fake" crises

	Large banks				**Small banks**			
	ΔLCSHARE		**ΔROE**		**ΔLCSHARE**		**ΔROE**	
	Fake crisis 1	**Fake crisis 2**	**Fake crisis 1**	**Fake crisis 2**	**Fake crisis 1**	**Fake crisis 2**	**Fake crisis 1**	**Fake crisis 2**
EQRAT	-0.335	0.352	-0.015	0.023	1.642	1.335	0.042	0.029
	(-0.29)	*(0.96)*	*(-0.11)*	*(0.65)*	*(5.03)****	*(6.51)****	*(2.20)***	*(1.76)**
lnGTA	-0.013	-0.024	-0.003	-0.001	-0.017	-0.010	-0.003	-0.001
	(-0.76)	*(-2.58)***	*(-1.23)*	*(-0.46)*	*(-2.36)***	*(-1.86)**	*(-4.23)****	*(-1.44)*
ZSCORE	-1.985	0.620	0.146	0.073	-0.667	-0.026	0.076	-0.018
	*(-2.96)****	*(1.63)*	*(1.66)**	*(1.37)*	*(-2.08)***	*(-0.13)*	*(3.17)****	*(-0.93)*
D-BHC	0.165	0.004	0.015	0.006	0.118	-0.047	0.004	0.000
	*(2.14)***	*(0.09)*	*(1.71)**	*(1.05)*	*(8.61)****	*(-3.80)****	*(3.55)****	*(0.38)*
HHI	-0.211	0.150	0.057	-0.009	-0.055	0.013	0.008	0.014
	(-0.66)	*(0.72)*	*(1.09)*	*(-0.31)*	*(-0.97)*	*(0.30)*	*(1.94)**	*(3.16)****
INC-GROWTH	3.708	2.011	-0.202	-0.521	1.279	-0.165	0.018	0.038
	*(3.35)****	*(1.63)*	*(-1.08)*	*(-2.81)****	*(4.55)****	*(-1.56)*	*(0.77)*	*(3.25)****
lnPOP	-0.001	0.009	0.003	-0.003	-0.007	0.014	0.001	0.001
	(-0.12)	*(1.23)*	*(2.15)***	*(-2.63)****	*(-2.03)***	*(5.40)****	*(4.29)****	*(3.72)****
Constant	0.141	0.318	-0.018	0.044	0.068	0.053	0.002	-0.006
	(0.48)	*(1.71)**	*(-0.41)*	*(1.53)*	*(0.72)*	*(0.75)*	*(0.26)*	*(-0.83)*
Obs	337	438	337	438	6377	5681	6377	5681
Adj R2	0.07	0.03	0.01	0.02	0.02	0.03	0.01	0.00

Panel B: The effect of the bank's pre-crisis capital ratio on its liquidity creation market share and profitability *after* "fake" crises

	Large banks				Small banks			
	ΔLCSHARE		ΔROE		ΔLCSHARE		ΔROE	
	Fake crisis 1	**Fake crisis 2**	**Fake crisis 1**	**Fake crisis 2**	**Fake crisis 1**	**Fake crisis 2**	**Fake crisis 1**	**Fake crisis 2**
EQRAT	-0.013	-0.025	-0.283	-0.011	4.112	2.561	0.133	0.119
	(-0.01)	*(-0.03)*	*(-2.06)***	*(-0.15)*	*(6.54)****	*(7.11)****	*(5.36)****	*(5.17)****
lnGTA	0.001	-0.044	-0.003	-0.001	-0.028	0.006	-0.002	-0.001
	(0.02)	*(-2.86)****	*(-1.28)*	*(-0.77)*	*(-2.10)***	*(0.68)*	*(-2.23)***	*(-1.15)*
ZSCORE	-3.309	-0.012	0.129	-0.006	-1.651	-0.620	0.111	-0.061
	*(-3.04)****	*(-0.02)*	*(1.38)*	*(-0.09)*	*(-2.95)****	*(-1.76)**	*(3.47)****	*(-2.33)***
D-BHC	0.195	-0.059	0.016	0.007	0.121	-0.048	0.007	0.002
	(1.33)	*(-0.73)*	*(1.59)*	*(0.89)*	*(4.85)****	*(-2.21)***	*(5.39)****	*(1.17)*
HHI	-0.409	0.189	0.009	0.052	-0.087	0.049	-0.006	0.034
	(-0.74)	*(0.51)*	*(0.14)*	*(1.52)*	*(-0.86)*	*(0.66)*	*(-1.02)*	*(5.92)****
INC-GROWTH	6.822	6.059	-0.632	-0.741	2.336	-0.103	-0.029	0.013
	*(3.21)****	*(3.00)****	*(-3.14)****	*(-3.44)****	*(4.67)****	*(-0.59)*	*(-1.06)*	*(0.81)*
lnPOP	-0.013	0.023	0.002	-0.001	0.005	0.024	0.002	0.001
	(-0.99)	*(1.58)*	*(1.17)*	*(-0.98)*	*(0.74)*	*(5.26)****	*(4.57)****	*(2.57)***
Constant	0.183	0.595	0.044	0.017	-0.017	-0.328	-0.021	-0.019
	(0.33)	*(1.89)**	*(0.90)*	*(0.52)*	*(-0.09)*	*(-2.63)****	*(-2.23)***	*(-1.91)**
Obs	337	438	337	438	6377	5681	6377	5681
Adj R2	0.05	0.03	0.03	0.02	0.02	0.02	0.01	0.01

Panel C: The effect of pre-crisis capitalization on abnormal stock returns *during* "fake" crises

	Listed banks	
	Fake crisis 1	**Fake crisis 2**
(1) Alpha of high-capital banks	0.686	0.011
	(1.63)	*(0.01)*
(2) Alpha of low-capital banks	1.315	-1.941
	*(2.73)****	*(-2.15)***
(1) – (2) HminLalpha	-0.629	1.952
	(-0.98)	*(1.52)*