Crises, Liquidity Shocks, and Fire Sales at Financial Institutions[*]

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ABSTRACT

We investigate the role of shocks to fundamentals and liquidity shocks in financial crises by examining funding sources and asset sales at commercial banks, investment banks, and hedge funds. Counter to the predictions of liquidity shock amplification models, we find that the majority of commercial and investment banks do not experience funding declines during crises and that credit risk appears to play an important role for the minority of banks that do. Our results also suggest that firms avoid costly fire sales by relying on other methods to raise funds, such as relying more on deposits. Similarly, we find that funding-constrained hedge funds often sell more of their stock holdings than would be required to meet redemption requests and use some of the proceeds to make additional purchases. Overall, we conclude that the connection between recession and financial crises, rather than being caused by liquidity shocks and amplified by fire sales, is related to shocks to fundamentals.

Financial crises seem to impact the economy in exceptionally harsh ways, leading to the conclusion that a sound banking system is crucial to avoiding a sharp economic downturn (e.g., Bernanke and Gertler (1989), Bernanke and Lown (1991)).[1] One explanation for the connection between economic downturns and financial crises is that an exogenous liquidity shock causes banks to reduce their lending (Ivashina and Scharfstein (2010)). Such shocks affect all banks, but the resulting shortage of funds is greatest at firms that rely heavily on short-term capital markets funding. As financial institutions face debt shortages, some are forced to sell assets at fire sale prices (Shleifer and Vishny (1992)). Recent theoretical research on amplification models of crises further posits that such fire sales leave banks with even less cash, inducing them to sell more assets. The resulting loss spiral erodes bank capital and ultimately causes a financial crisis.[2] Hence, illiquidity could lead to insolvency and a credit crunch, resulting in a full blown recession (Korinek (2010)).

An alternative explanation for the connection between recessions and financial crises is that shocks to fundamentals and deteriorating prospects drive down the value of risky financial assets, eroding bank capital and reducing banks' competitive position (Kane (2009) and Kashyap and Stein (2004)). Some financial firms lose so much value that they approach insolvency, causing a financial crisis. Thus, what was often described as a liquidity crisis in 2007 and 2008 may actually have owed to a severe decline in the creditworthiness of several large and visible financial institutions (Eisenbeis (2009) and Kane (2009)). Supporting this view, Cohen-Cole, Montorial-Garriga, Suarez, and Wu (2010) find that the cost of issuing commercial paper (CP) at high credit-quality firms was unaffected during the subprime crisis.

[1] Bordo and Haubrich (2009) find that recessions are more severe when accompanied by credit crunches. Berger and Bouwman (2010) show that loose monetary policy does not spur bank lending very well during a crisis.

[2] See Allen and Carletti (2006), Gromb and Vayanos (2002), Adrian and Shin (2008, 2010), Brunnermeier and Pedersen (2009), Diamond and Rajan (2010), Krishnamurthy (2009), Geanakoplos (2010), and Froot (2009).

In this research, we use a sample of commercial banks, investment banks, and hedge funds to evaluate these explanations of financial crises. Using data from 1980-2008, a period spanning several boom and crisis periods, we find that commercial banks do not experience overall declines in funding during crises. We also find that debt funding does not decline uniformly at all financial institutions in crises, and for the small subset of banks that experience a debt funding shortfall, the shortfall is related to the creditworthiness of the institution. We note that banks most reliant on capital markets are able to issue debt during crises, although less so than during booms. Banks rely more heavily on deposits during crisis periods, mitigating the effects of capital market shocks to funding and they also frequently issue equity, cut dividends, and sell off non-core assets at favorable prices. Similar to commercial banks, investment banks issue less debt during crises than booms, but average net debt issuance is still positive. Assets do not typically decline at investment banks or commercial banks during crises, although asset growth is lower during crises than booms for both types of financial institutions. Moreover, assets grow more slowly regardless of the extent to which firms rely on capital market funding. Finally, we find that both sets of banks avoid selling assets at fire sale prices during crises.

Our analysis of hedge funds also shows scant evidence that they are forced into fire sales in crises. On average, they sell similar quantities of stock during booms and crises. While hedge funds with short lock-up periods and large redemption requests ("funding-constrained" hedge funds) do sell significantly more stock during crises than unconstrained hedge funds, these same funds also buy new shares of stock. These purchases indicate that constrained hedge funds do not use all of their sales proceeds to meet redemption requests, as one would expect of firms forced to sell assets at unfavorable prices. Moreover, the stocks they sell in crises have similar liquidity as the stocks they sell in booms, providing further evidence against the existence of fire sales.

Overall, we conclude that liquidity shocks are unlikely triggers of financial crises. Instead our results imply that shocks to fundamentals are an important factor during crises. Firms that have trouble rolling over short-term debt in a crisis are more often those that are closer to insolvency. We do not find evidence that asset prices fall because financial institutions are forced into costly fire sales (Shleifer and Vishny (1992)) that create loss spirals. Rather, we find evidence of asset price declines due to fundamentals changing for the worse.

In the next section we discuss the literature and develop in more detail the implications of the theories for empirical tests. Section 2 summarizes our data, Section 3 presents empirical results, and Section 4 concludes.

1. Literature and Analytical Framework

1.1. Empirical Literature on Liquidity Shock Theories

Existing empirical research on the nature of financial crises reports evidence that is both consistent and inconsistent with liquidity shock theories. For example, Adrian and Shin (2010) document that banks adjust their balance sheets actively by increasing leverage during booms and reducing it during busts, supporting the amplification models' prediction of fire sales in crises. By contrast, Demsetz (1993) shows that commercial banks reduced asset sales during the 1990-1991 credit crunch. Further, in studies of the recent crisis Chari, Christiano, and Kehoe (2008) point out that bank lending did not decline and He, Khang, and Krishnamurthy (2010) find that banks actually increased MBS holdings. Several explanations for asset growth during the recent crisis have been proposed, and none are consistent with the funding shortages that are central to the liquidity shock theories. For example, Acharya and Richardson (2009) argue that asset growth results from banks taking securitized assets back onto their balance sheets, while

Ivashina and Scharfstein (2010) attribute it to borrowers drawing down lines of credit to avoid being shut out of debt markets.

Amplification models posit that liquidity shocks should have a larger impact on firms that borrow in short-term capital markets, but empirical evidence on this prediction is mixed. Brunnermeier (2009) links investment banks' reliance on repurchase agreement (repo) funding to increased liquidity risk, which Gorton and Metrick (2009) support with evidence on repo haircuts in the recent crisis. Acharya, Schafer, and Zhang (2008) conclude that funding pressures facing corporate bond dealers amplified the effects of the Ford and GM downgrades in 2005. However, Kashyap and Stein (1995) show that lending at large banks is less sensitive to monetary shocks, which they attribute to *greater* reliance on capital market funding.

Focusing on hedge funds, Ben-David, Franzoni, and Moussawi (2010) and He, Khang, and Krishnamurthy (2010) document severe asset sales in the subprime crisis. Boyson, Stahel, and Stulz (2010) link contagion in hedge fund returns to liquidity shocks, and Hameed, Kang, and Viswanathan (2010) argue that funding problems lead to decreases in liquidity and stock prices. Billio, Getmansky, and Pellizon (2010) and Sadka (2010) tie aggregate liquidity risk to underperformance during crises. Aragon and Strahan (2010) conclude that Lehman's bankruptcy led to funding problems for its hedge fund clients. However, Ambrose, Cai, and Helwege (2009) argue that selling assets in the absence of information effects does not cause losses.

1.2. Analytical Framework

We test the credit risk and liquidity shock explanations of financial crises by focusing on the following elements of the theories: we investigate the extent to which debt funding declines at financial institutions during crises; we examine the funding models and creditworthiness of firms that suffer declines in debt to determine whether the shortfall in debt financing reflects

liquidity shocks or concerns about solvency; we consider whether liquidity shocks cause financial firms to sell off assets or if they rely on alternative sources of funds; and we investigate whether asset sales involve fire sales that cause loss spirals and amplify the liquidity shocks.

While it is difficult to separate liquidity shocks from fundamental shocks, there are some unique features of the financial institutions in our sample that allow us to shed light on this issue. First, if fundamental shocks rather than liquidity shocks are affecting financial institutions, the impact of the shock should be unrelated to the bank's reliance on capital market funding and more closely tied to the size of its capital cushion before the crisis started. In contrast, amplification theories predict that aggregate liquidity shocks will have a greater impact on firms that rely more heavily on short-term funding. Thus, funding problems from aggregate liquidity shocks should be less severe at commercial banks than investment banks since commercial banks can rely to some extent on insured deposits. Of course, commercial banks with weak deposit networks and more dependence on wholesale funding should suffer more from these shocks. Finally, investment banks and commercial banks have no obligation to refund equity capital to investors on demand, leaving hedge funds even more susceptible to capital market liquidity shocks than either type of bank.

Second, the endogenous choice to borrow with short-term debt reflects an expectation by the firm that it will survive shocks, due to large size, superior credit risk or the availability and use of alternative funding options in downturns. In particular, commercial and investment banks can cut dividends, issue new equity, and/or suspend repurchase programs.[3] Commercial banks can rely more on insured deposits or debt with an implicit government guarantee or just "muddle

[3] Kahle and Stulz (2010) investigate debt funding problems at industrial firms after the Lehman bankruptcy in 2008 and find that they reduce share repurchases to make up for the shortfall.

through" until better times return.[4] Under the shock to fundamentals rationale for financial crises, financial institutions are likely to rely on alternatives to asset sales. However, according to the aggregate liquidity theories, financial institutions will be unable to avoid distressed asset sales.

While some actions, such as dividend cuts, might be considered highly unattractive in a boom, they may be less costly to firms than fire sales. The 10% average drop in market value associated with a commercial bank dividend cut (Slovin, Sushka, and Polonchek (1999)) is clearly an event to avoid in most cases, but not when it would prevent the bank from failing. And while equity issuance is usually considered highly costly, Cornett and Tehranian (1994) and Cornett, Mehran, and Tehranian (1998) show that regulatory pressure on banks to raise equity reduces information problems, lowering its relative cost in a crisis. Because these findings on equity issuance and dividends are affected by regulations, we expect such funding strategies to be more relevant for commercial banks than for investment banks and hedge funds (Berger, DeYoung, Flannery, Lee, and Oxtekin (2008)).

Third, alternative debt funding avenues that are viewed as costly in normal times may be considered less onerous in a crisis when the alternative is insolvency. For example, commercial banks may find it more cost effective to use the discount window despite the associated stigma (Furfine (2001) and Armantier, Ghysels, Sarkar, and Shrader (2010)). Other funding sources may actually become less costly in a crisis: Gatev and Strahan (2006) and Gatev, Schuermann, and Strahan (2009) show that deposits naturally increase in turbulent times as investors seek a safe haven for their funds. In comparison, investment banks have fewer alternative forms of debt financing and hedge funds likely have none. We explore these alternatives to separate the effect

[4] Deposit insurance allows insolvent banks to continue operating if incoming deposits are larger than operating losses, much like a Ponzi scheme. See Kane (1989). It is also possible for a bank with assets that are being repaid at a rapid pace on its amortizing loans to "muddle through" the downturn without doing much of anything, provided interest and returned principal from performing assets are sufficient to cover its immediate cash needs.

of fundamental versus liquidity shocks and propose that liquidity shocks to short-term debt alone would not diminish a firm's ability to access alternative sources of funding. While these sources of funding may be more expensive than short-term debt and could cause a sharp reduction in profitability, the sale of assets at fire sale prices would deplete equity capital and could lead to insolvency. In comparison, shocks to fundamentals make it difficult to raise any form of financing. Some depositors are likely to shun a bank with a perceived imminent risk of bankruptcy, especially institutional investors whose deposits are not insured. In the extreme, even the lender of the last resort will shut down a bank that continues making bad loans.

Finally, an important element of the theoretical models is that liquidity shocks cause asset sales that lead to loss spirals. Fire sales in these models are defined as sales at prices so low that the firm does not receive enough cash to repay its debts, leading to even larger funding problems.[5] Therefore, under the amplification models, we should observe fire sales that deplete firms' equity capital and drive them into insolvency. Shleifer and Vishny (1992) propose that fire sales result from a combination of factors, most important of which is that the entire industry is affected by a shock that causes the most likely buyers to be absent from the market for distressed assets. Further, by assumption, shareholders and creditors of distressed firms will be unable to negotiate new terms, forcing banks to sell assets at discounted prices to industry outsiders.

If such fire sales and loss spirals result from liquidity shocks, the amplification models provide a strong rationale for government intervention in crises as the lender of last resort. That is, if the Federal Reserve intervenes early enough and with sufficiently strong programs, or if it is expected to do so, liquidity shocks will not lead to loss spirals and a full blown financial crisis

[5] When a firm repays its debt, creditors receive face (book) value. Thus, a fire sale in these models occurs when the sale price of an asset is below the book value of the debt used to finance its purchase. Therefore, determining the fundamental value of an asset at the time of its sale is not a requirement of the amplification models; all that is necessary to avoid a loss spiral in the models is for the asset to be sold at or above par value so that creditors may be paid in full. We evaluate this empirically by examining reported gains and losses on the sales of assets.

would be averted. We do not believe that the presence of the lender of last resort affects our results for several reasons. First, in the crises covered by our sample period, the only substantial forms of government-provided liquidity were the discount window and monetary policy. While many new programs were created in the most recent subprime crisis, most took effect after Q4 2008 when our sample ends. Two programs that did start before 2009 are the Capital Purchase Program (CPP) and the Treasury Loan Guarantee Program (TLGP), but these mainly added liquidity in late December 2008 and would not be expected to affect Q4 2008 balance sheets. Thus, government programs likely did not offset the effects of liquidity shocks in our data. Second, He, Khang, and Krishnamurthy (2010) report that commercial banks during the most recent crisis had ample access to liquidity and did not fully tap all sources of debt financing available to them. Third, it is unlikely that the Federal Reserve would step in during every crisis and provide funding to all three types of financial institutions in our sample. Nevertheless, we analyze all crises in pooled regressions as well as separately to assess the differential impact of the Federal Reserve in various crises.

If we observe fire sales in the crises during our sample and find evidence supportive of the amplification models, it indicates that not even government agencies are consistently able to prevent such costly transactions from occurring. However, if we do not observe fire sales in the crises during our sample, the argument in support of the amplification models could rely on the presence of government agencies that supply sufficient liquidity such that they are consistently able to prevent fire sales from being empirically observable. We propose an alternative argument which does not rely on the existence of the lender of last resort: To the extent that firms are affected by liquidity shocks, they may meet funding needs and avoid fire sales by selling assets that are less affected by the crisis, such as noncore assets whose fundamental values have not

declined much, and their most liquid assets. For example, banks that must shrink would choose to sell securities over loans (Kashyap and Stein (2000)) and hedge funds would sell more liquid stocks (Anand, Irvine, Puckett, and Venkataraman (2010)). Commercial banks are especially likely to sell non-core assets instead of loans at distressed prices because they prefer to sell assets that have gained market value since their purchase (cherry picking). Sales of appreciated assets help boost capital ratios by shrinking the denominator without an adverse effect on the numerator. Further, a large fraction of commercial bank financial assets, notably loan portfolios, are not marked to market, which allows banks some discretion in valuation. Avoiding sales of distressed assets allows for greater use of optimistic marks while sales of appreciated assets do not discredit such valuations. Most important, bank accounting rules treat losses and gains asymmetrically on loans – losses are recognized via charge-offs and loan loss reserves, while gains are usually only recognized when assets are sold. Hence, cherry picking serves the additional purpose of raising reported capital (Beatty, Chamberlain, and Magliolo (1995)).[6] In contrast, investment banks, which invest in less opaque assets, carry most, and hedge funds carry all, of their assets at market value and care less about book equity.[7] Thus, under our alternative explanation, we hypothesize that when funding shocks force financial firms to shrink, they do so strategically to minimize fire sales and to ensure that illiquidity problems do not lead to insolvency.

[6] For example, in the recent crisis the following sales led to large gains that helped offset losses:

Bank	Divested Asset	Gain (billions)	Date
JP Morgan	Chase Paymentech Solutions (credit card processor)	$1.0	12/08
Citigroup	German banking operations	$3.9	12/08
Merrill Lynch	Bloomberg, L.P.	$4.3	12/08
Bank of America	Marsico Capital Management	$1.5	12/07
PNC	Hilliard Lyons (asset management)	$0.1	6/07

[7] Investment bank capital regulations motivate these firms to overstate reported equity as well, but SEC supervisory efforts in this arena have been modest compared to those for commercial banks, reducing such regulatory arbitrage.

2. Data

We identify booms and crises over 1980-2008 by examining NBER cycles, bank failures, the TED spread, Moody's Aaa-Baa bond spreads, flights to quality (Collin-Dufresne, Goldstein, and Helwege (2009)), the Long Term Capital Management (LTCM) episode, and credit crunches (Bordo and Haubrich (2009)). We correlate the top quartile of in-sample monthly distributions of bank failures, TED and credit spreads, and bottom quartile of stock market quarterly returns with monthly indicators of NBER recessions, flight to quality, and LTCM. Quartiles with positive outcomes are boom periods and those with negative outcomes are crises.

Table 1 presents our classification, with five crisis and three boom periods.[8] For example, the crisis period from March 2007 through December 2008 (the end of our sample period) is characterized by an NBER contraction, a high number of bank failures, high TED and credit spreads, high incidence of flight to quality, a credit crunch, and low stock market quarterly returns. The boom period from January 2003 through February 2004 is characterized by an NBER expansion, low credit spreads, and high stock market returns. In our tests involving quarterly data, for a particular observation to be classified as occurring during a crisis (boom) period, the crisis must last for the full fiscal quarter in order to observe quarterly changes.

We investigate the responses to liquidity shocks of three distinct groups of financial institutions: large commercial banks, investment banks, and hedge funds. For commercial banks, we use quarterly data from the Compustat Quarterly Bank and Thrift dataset for the period 1980-2008, which covers approximately 1,750 commercial banks. Among these banks we use data on

[8] The remaining time periods are "neutral." In unreported results we shorten the crisis periods by one quarter both the beginning and the end and find that our conclusions are not sensitive to the change, providing further evidence that our results for 2007-2008 are not driven Federal Reserve liquidity programs such as CPP and TLGP.

the largest 10%, as capital market liquidity shocks are unlikely to matter much to smaller banks.[9] To mitigate survivorship bias we use all banks that fall into the top decile of total assets in at least one quarter during our sample period. If a bank fails, we include it up to the quarter immediately preceding its failure. Our final sample contains 168 unique banks, with the number ranging in any given quarter from 56 to 129.[10] CRSP delisting codes show that banks leave our sample due to mergers (95 instances) or being dropped by the exchange (12 cases). If a bank is involved in a merger we drop it from the sample for the quarter of the merger and then add it back into the sample in subsequent quarters.[11] Based on the list of failed banks on the FDIC's website, five banks failed during the sample period.[12] Our sample of large banks is comparable to Kashyap and Stein's (1995) top 1% bank sample based on the Call Report data in Q2 1984. Specifically, their sample of 142 banks is somewhat larger than our 94 banks in 1984 because Compustat covers only banks with publicly traded equity.

Investment banks are identified from several sources: we include those with a Carter and Manaster rating of 8 or higher in each of the sub-periods studied by Loughran and Ritter (2004).[13] We also consult Institutional Investor rankings, Boyson, Stahel, and Stulz's (2010) list of "prime brokers," and SIC codes. Of these 17 investment banks, all but two have quarterly data in Compustat, although not necessarily for all years since 1980.[14]

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[9] Kashyap and Stein (1995) show, using Call Report data, that such large banks account for most of the lending in the economy. The top 10% have over 75% of all banking system assets and the top 1% account for half of such assets.

[10] Compustat includes data on some foreign banks. These account for about 10% of our firm-quarter observations.

[11] We exclude bank-quarter observations involving mergers because we cannot determine which actions are attributable to the original bank in a crisis.

[12] The failed banks are Bank of New England, Downey Financial Corp., MCorp, First Republic Bank Corp., and Washington Mutual. Only Downey and Washington Mutual failed in the subprime crisis.

[13] See Carter and Manaster (1990) and Carter, Dark and Singh (1998). Updated rankings through 2009 provided at http://bear.warrington.ufl.edu/Ritter/ipodata.htm.

[14] These firms are Bear Stearns, CIBC World Markets, Citigroup, Credit Suisse, First Boston, Goldman Sachs, HSBC Securities, JP Morgan, Lazard Freres, Lehman Brothers, Merrill Lynch, Morgan Stanley, Nomura, Salomon Brothers (through 1997), and Thomas Weisel Partners. Dillon Read & Co. and Sandler O'Neill Partners are not in

We supplement these data with commercial bank and investment bank asset sales data reported by Thomson Reuters' Securities Data Corporation (SDC). We also use footnote data from the SEC's EDGAR to investigate asset sales in the 2007-2008 period. Due to data availability, we estimate some cash flow statement variables by relying on their counterparts calculated from balance sheet data after ascertaining that the two are comparable: First, our analysis of periods for which both balance sheet and detailed cash flow data are available confirms that calculating flows with balance sheet information is a reliable method to estimate cash flow items. Second, we also use financial statement data from EDGAR and data on long-term debt issuance from SDC to confirm our results based on estimated cash flow items.

Hedge fund data are obtained from two sources: mandatory 13(f) filings for stock holdings (reported by Thomson-Reuters) for institutions with over $100 million under management and the Lipper TASS individual hedge fund database. While data limitations necessitate that we focus only on long stock positions of hedge funds, common stock holdings comprise 22% of total hedge fund assets reported in Lipper TASS for those fund families with over $100 million in assets under management. Further, using TASS data, Cao, Chen, Liang, and Lo (2010) show that hedge funds have significant exposure to the stock market. We begin with the dataset of Griffin and Xu (2009), which contains hedge funds that have filed 13(f) forms during the period 1980-2004.[15] For 2005-2008, we hand match fund and manager names in TASS and Thomson-Reuters.[16] We then check SEC-required ADV filings for these funds to ensure that they have at least 50% of their assets in hedge funds, or at least 50% of their assets

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the Compustat Quarterly database. Note that Citigroup is a commercial bank through 2Q 2005 and transitions to an investment bank during a neutral period that is not used in our analysis.

[15] We thank John Griffin for providing this list.

[16] Lipper TASS reports data for individual hedge funds while 13(f) filings are at the fund family (management company) level. Note that this data does not suffer from survivorship bias that is frequently discussed when using self-reported data.

owned by high net worth individuals, and they charge incentive fees. This process yields 296 hedge fund families. We restrict the sample years to 1998-2008 due to limited data prior to 1998, yielding a sample of 272 hedge fund families.

We present summary statistics for the three types of financial firms in Table 2. Panel A shows that average (median) assets at commercial banks are $66 billion ($15 billion). Cash and securities account for approximately 27% of total assets, of which securities comprise about two-thirds. Loans represent 59% of assets on average (median of 61%). Most assets are funded by deposits (70% on average), despite the fact that we have eliminated community banks from the sample. In contrast, short-term debt averages only 10% of assets. The cross-sectional variation in short-term debt is substantial – the third quartile value is three times that of the first quartile. The average capital ratio of 7% is larger than the 4.8% in Kashyap and Stein (1995), in line with the recent capital build-up noted by Flannery and Rangan (2008).

Investment banks (Panel B) report median total assets of $192 billion. They hold 18% of their assets in cash and short-term investments and 29% in financial instruments. Trading-related assets (more than 40%) constitute the largest category of assets.[17] Unlike commercial banks, short-term debt funds a large fraction of assets, although as with commercial banks, this variable exhibits significant cross-sectional variation. Compustat does not report investment bank deposits, if any exist. Compared to commercial banks, investment banks use more leverage (average and median equity ratios of 5% and 4%, respectively). Based on the CRSP delisting codes, four investment banks were acquired (First Boston, Bear Stearns, Merrill Lynch, and Salomon Brothers) and one filed bankruptcy (Lehman) during our sample period.

[17] For investment banks, the trading related assets frequently include derivatives and margins on futures contracts for which the investment banks acts in either trading capacity or as end user. See, for example, Lehman Brothers 10-Q for May 31, 2008, p. 13. These assets are marked to market daily.

Panel C shows that hedge funds report mean (median) assets under management of $498 ($183) million. The typical fund reports quarterly average performance of 2.2%. The average lockup period is about 5 months, although most funds have a lockup of exactly one year. Similarly, the typical fund requires 90 days advance notice to redeem one's stake, and that constraint is usually binding. Panel C also reports summary statistics on the types of stocks held by hedge funds, with accounting data from Compustat as of the fiscal year immediately preceding the first appearance of the stock in the 13(f) filing, and stock price data from CRSP as of the prior quarter. The average (median) firm size based on assets is about $5.6 billion ($652 million) and mean (median) market capitalization is about $12 billion ($2 billion), indicating a preference for small to mid-cap stocks. The stocks preferred by hedge funds belong to companies with above average valuations as seen in the mean Tobin's Q of 3.15. These stocks are also fairly liquid: the median Amihud (2002) illiquidity measure (higher values indicate less liquidity) is 0.113, a bit higher than the 0.071 value reported by Hasbrouck (2009) for a sample of NASDAQ and NYSE firms over 1993-2006, but much lower than the value of 0.336 reported by Amihud (2002) for all NYSE stocks from 1963 to 1996. The bid-ask spread of 0.012 is comparable to Hameed, Kang, and Viswanathan's (2010) value of 0.011 for a sample of NYSE stocks.

3. Results

We examine commercial banks, investment banks, and hedge funds separately due to data limitations (differing sample periods and lack of comparability across balance sheets and income statements).

3.1. Commercial banks

We begin by examining the funding availability of commercial banks in Table 3. For the entire sample, reported in the first column, the average net debt issuance is positive during crises,

indicating that banks are typically able to fund their pre-crisis level of lending activity.[18] Net debt issuance grows more slowly in crises than booms, and a substantially higher fraction of banks experience a decline (43% in crises and 36% in booms), which suggests that some banks may suffer from funding shocks during crises. Counter to the view of crises being driven by shocks to short-term capital markets, the decline in long-term debt issuance is comparable.[19] Finally, deposits at commercial banks rise in a crisis, although not significantly more than in a boom.

While funding at large commercial banks does not decline during crises overall, liquidity shock theory suggests that it may decline at banks that rely heavily on the capital markets. We split the sample based on the ratio of deposits to total assets in the preceding quarter, and classify banks in the top (bottom) quartile as high (low) deposit banks. High (low) deposit banks are less (more) reliant on capital market funding. Alternatively, less creditworthy banks may be the least likely to obtain external funding during crises, so we also split the sample based on equity ratios in the quarter immediately preceding a crisis (boom) period, and classify banks in the top (bottom) quartile as high (low) equity banks. While our intent is to separately examine the impact of liquidity risk and credit risk on commercial bank funding, these risks would be difficult to disentangle if the low deposit banks are identical to the weak capitalization banks. Our sample has significant overlap of the two groups but they are not the same.

Table 3 shows positive net debt issuance for the low deposit group in crises, but the figure is well below that seen in boom periods, and well below that of high deposit banks, suggesting that obtaining capital from the markets is not easy in a crisis. Nevertheless, net debt

[18] We also analyze medians of all variables and reach similar conclusions (results omitted).

[19] Long-term debt data in SDC confirms that issuance decreases significantly in crises. Due to Compustat data limitations, we cannot tell whether changes in short-term debt owe to muted effects on repos and CP, or whether shocks in those markets are offset in a crisis with Federal Home Loan Bank advances, federal funds and discount window borrowings. EDGAR filings indicate that some firms report short-term CP as long-term debt because they plan to roll it over, but this would change to short-term debt if such plans were foiled.

issuance is still positive and therefore not strictly a *negative shock* to funding sources as one would expect from the amplification models. These banks are often also weakly capitalized and if the overlap were exact we would see the same slowdown in debt issuance for the bottom quartile by equity ratios. However, net debt issuance actually declines more sharply in crises among weakly capitalized banks, suggesting that solvency concerns are an important factor dampening debt issuance in crises.

Table 3 further shows that low deposit banks suffering from liquidity shocks would find it difficult to replace these funds with deposits, since they are rarely able to improve their weak deposit networks *during* the crisis.[20] Again, we find somewhat stronger evidence that creditworthiness plays a role in their lower balance sheet growth. Weakly capitalized banks experience significantly lower deposit growth during crises – as compared with insignificant changes for banks with low deposits – possibly reflecting concerns about insolvency among large depositors not covered by the FDIC's safety net.

Table 4 shows univariate results on asset sales and some alternatives to selling assets. Overall, total asset growth is sharply lower in a crisis than a boom, but remains positive. As before, we do not actually see *negative* changes in assets for the typical bank. There are pockets of weakness – both low deposit and poorly capitalized banks are more likely to shrink. As the largest asset category, loans also experience slower growth overall. Notably, this decline in growth does not vary based on deposit base or equity ratios, suggesting that the loan slowdown is related to future prospects for the aggregate economy. Unfortunately, we cannot determine from Compustat data whether a change in assets is due to asset sales or a change in the reported values

[20] In approximately 80% of all bank-quarters during a crisis, low deposit banks remain low deposit banks while in 20% of these bank-quarters low deposit banks improve their deposit networks. Only two banks in three quarters during a crisis (or 0.4%) actually became classified as high deposit banks.

of assets (write-downs), but the shrinkage in assets cannot be completely due to sales, as net charge-offs increase in crisis periods for all types of banks.

The positive asset growth in Table 4 is not an artifact of government assistance. We investigate SEC filings of our banks in Q4 2008 and find that these firms received $176 billion through the CPP, including $31 billion received by Citigroup, PNC, and Fifth Third on New Year's Eve 2008 that was unlikely to have increased their Q4 lending. Indeed, lending among the banks receiving these funds fell by $68 billion in the last quarter of 2008 and the correlation between the amount received and the change in loans over the quarter is negative 0.79. The banks received another $82 billion through the TLGP, nearly all of which came in December. Again, lending at commercial banks that received TLGP assistance fell in Q4 2008.

Banks can avoid fire sales in crises by selling off highly valued and/or more liquid assets, issuing equity, and cutting dividends. Table 4 provides evidence that the latter two strategies are alternatives to fire sales: equity issuance is significantly higher and dividends are lower in a crisis.[21] SDC data show that banks divest assets less frequently in crises, which contradicts the prediction of the amplification models that forced sales at depressed prices generate loss spirals. Instead, commercial banks reduce their sales of assets to those that generate reported gains. Rather than revealing massive losses on forced sales of toxic assets, the investment securities gain or loss accounts show only slight decline in crises.

Beginning in 1993 this variable reflects gains and losses from actual security sales as well as some write-downs of "available for sale" securities that are considered "other than temporarily impaired" (OTTI).[22] While Compustat data do not separate out the two routes to asset declines,

[21] Results reported in Table 3 and 4 are not qualitatively affected by relying on asset-based value-weighted averages.
[22] Since 1993 FASB 115 has required that banks adjust their earnings to reflect market value changes in their investment securities that are classified as "available-for-sale." If an unrealized loss in this asset category is considered permanent, it is recorded as if it were a realized loss. By contrast, very few loans are marked to market.

the write-downs and sales are separated in SEC filings. We investigate this important issue in greater detail for 2007 and 2008 by examining each bank's quarterly and annual financial statements to determine the extent to which fire sales affect the investment securities losses. The results are striking: for 2007, our commercial banks report investment securities gains totaling $369 million. Of this, about $1.9 billion reflects actual sales while -$1.6 billion reflects OTTI write-downs. The results for 2008 are even more extreme. The net figure recorded across all banks is -$1.5 billion, which reflects $9.8 billion in gains on sales and -$11.3 billion in OTTI write-downs.[23] Essentially, the strategy of cherry picking drives the main components of the investment gains/losses variable. Interestingly, the majority of the 2008 write-downs (about $7.3 billion) came in the fourth quarter, coinciding with cash injections from the government's CPP and TLGP programs – implying that banks were "using" some of these funds to reduce examiner pressure vis-à-vis loan valuations while "using" the rest to improve their capital ratios. Based on these recent data, we conclude that commercial banks cherry pick financial assets to sell in order to offset write-downs on assets that have suffered from negative valuation shocks.

In addition to investment security sales, we also examine banks' SEC filings for 2007 and 2008 for sales of other assets. Examples of these other sales are bank branch sales and divestitures of subsidiaries. As noted earlier, SDC data suggest fewer sales in crises, but realized gains in SEC filings for these sales are quite large, which indicates that banks are selective about the assets they choose to sell in a downturn. In aggregate, realized gains total $3.0 billion in 2007 and $1.1 billion in 2008 for our sample of commercial banks, again providing strong evidence that in times of crises banks tend to cherry pick assets to boost reported equity. In contrast, loss spiral models predict unusually high sales in the SDC data and large losses on most transactions.

[23] Net realized gains from sales are positive for both annual periods, reflecting realized gains among bank-quarter observations that are nearly 3 times as much as losses during 2007 and 4 times as much as losses in 2008.

Commercial banks have four major alternatives to fire sales when debt funding dries up: increased deposits, equity issuance, decreased dividends, and sales of assets that are unaffected by the crisis. In Figures 1 through 3 we investigate the relative costs of these funding avenues by relying on the banks' revealed preferences. That is, we can infer the cheapest alternatives by investigating banks' funding choices. Figure 1 shows how often each alternative is used, while Figures 2 and 3 focus on the fraction of lost funding that is replaced by deposits and asset sales. Due to data limitations, the category of "asset sales" includes both write-downs and actual sales. Furthermore we are not able to separate sales into instances of fire sales and cherry picking. Therefore, the total asset sales likely overstate the extent of fire sales.

Figure 1 shows that equity issuance and increased deposits are the most popular methods of replacing lost debt funding in a crisis while dividend cuts are used the least often. For the 1,108 banks (out of 2,874) that face such shortfalls, more than 70% issue equity to offset the loss. Even the undercapitalized banks issue equity. Among the banks that do not issue equity, the next most popular method of dealing with debt shortfalls is to increase deposits. Even the low deposit banks increase deposits more often than just resorting to asset sales, suggesting that the costs of these alternatives in a crisis are not onerous. While some banks only reduce assets, the number of banks relying only on asset sales is quite small. Furthermore, as we noted earlier, these "asset sales" include write-downs and cherry picking as well as fire sales. Figure 1 also shows how frequently these alternatives are used in the recent crisis. While equity issuance is not as popular as in past crises, deposits are used to replace debt even more often, and asset sales are no more frequent than they are in other crises.

While Figure 1 shows that equity issuance is the most common tool for dealing with debt shortfalls, the dollars raised via equity are small relative to the shortfall. However, deposits,

which are the second most frequently used replacement, increase substantially in a crisis at these banks. Figure 2 examines the use of deposits to make up the debt shortfall. About 44% (492) of 1,108 banks with debt funding shortages solve this problem entirely with new deposits. Another 243 banks increase their deposits in response to the shortfall but not by enough to offset it fully. Based on untabulated results, this latter group replaces almost half of the lost funds with deposits, using asset sales for most of the remainder. Thus, of the 43% of banks with a debt funding shortfall in a crisis, about two thirds make up at least half of it with new deposits. Further, this reliance on deposits in lieu of lost debt financing holds in the most recent crisis too.

Only about a third of banks that face a debt shortfall (373 banks) also experience a decline in deposits. While high deposit banks and banks with high equity replace more of their debt shortfall with deposits than low deposit and low equity banks, the proportion of banks experiencing funding shortfall *and* deposit declines is comparable across all four types of banks. Given the heavy reliance on cherry picking, it seems unlikely that liquidity shocks at these 373 banks could cause enough fire sales to cause loss spirals and financial crises.

In Figure 3 we analyze how much of the dollar decline in debt is made up by deposits and asset sales for two subsets of banks: (1) all banks with a debt shortfall in a crisis (left panel) and (2) banks with both a debt shortfall and a decline in deposits in a crisis (right panel). Note that the typical decline in debt in a crisis, when it occurs, is small (the median drop is $137 million, and the average is less than 3% of assets). The left panel shows a revealed preference for deposits as the cheapest alternative to debt funding in a crisis, since they make up 72% of the lost funds. The recent crisis is characterized by even higher reliance on deposits to make up the lost debt funding (84%). High deposit and high equity banks almost entirely offset the debt funding decline with increased deposits ($0.99 and $0.98 for each $1 in debt decline, respectively), while

low deposit and equity banks replace from $0.50 to $0.59 of each $1 debt decline with deposits. Among the 373 banks that see outflows in deposits as well as debt declines, the panel on the right shows that asset sales make up about $1.99 of each $1 drop in debt. However, the largest asset sales are at healthier banks (high deposits as well as high equity), suggesting that the decline in assets is part of a retrenchment strategy rather than the result of desperate efforts to raise cash by firms that rely heavily on short-term capital markets.

Thus far our examination of banks' responses to negative shocks has involved only univariate analysis. In Table 5 we combine the various choices facing banks in regressions to determine the dominant factors affecting net debt issuance, changes in equity ratios, and changes in total assets. Our regression results do not necessarily imply causality; rather, we wish to consider the alternative ways banks deal with a liquidity shock in a multivariate setting. The regression models (1), (3), and (5) include only exogenous variables and are unaffected by sorting patterns that mask causality. Holding constant the pre-crisis capital level of the bank, model (1) reveals that net debt issuance does not decline on average in a crisis. Nor does debt issuance fall for firms that rely heavily on the capital markets rather than deposits. The regression coefficient on low equity banks does indicate, however, that funding problems are greater among firms that are perceived by the market to be in danger of failure.

The models specified in columns (2), (4), and (6) include variables from both sides of the balance sheet as well as the relevant exogenous variables. Not only do the coefficients in these models not necessarily imply causality but sometimes they are affected by sorting. For example, model (4) suggests that higher charge-offs are associated with more equity, except in a crisis when the net coefficient is negative. While it may seem counterintuitive that charge-offs could ever lead to higher reported capital, they could if firms with more capital that can afford to report

more losses to regulators do so in normal times. In crises, regulators would not find it credible that there are no losses. In fact, they are so large that all banks end up writing off some loans. The more they write off, the lower the capital, as one would expect in the absence of sorting.

Models (2), (4), and (6) allow for a base effect for each variable and a shift in the coefficient during crisis periods. Like model (1), model (2) indicates that debt issuance does not fall in a crisis, even holding constant other factors. None of our evidence, whether it be based on univariate or multivariate tests, suggests that debt funding declines for the average commercial bank in a crisis, casting doubt on the idea that liquidity shocks trigger financial crises. Nor do the regressions indicate that the subset of banks that rely heavily on the capital markets for funding (low deposit banks) suffer from asset loss spirals because of funding shortfalls. Instead, the regression highlights the fact that commercial banks can substitute deposits for debt issuance. The positive and significant coefficient on the change in loans in model (2) is consistent with the idea that liquidity shocks lead to loan sales and potentially to fire sales, but the fact that the coefficient is less positive in crises contradicts this explanation.[24]

Many amplification models link a lack of liquidity and asset sales to a decline in capital, if not outright insolvency. We examine this prediction in models (3) and (4) of Table 5. We see little evidence that equity ratios are adversely affected by crises, although we note that these are book equity ratios subject to underreported loan loss reserves and charge-offs, as well as the effects of cherry picking. The crisis coefficient is insignificant in model (3) and is actually positive and significant in model (4). Likewise, the low deposit indicator is insignificant, implying that reliance on capital market funding is not a path to insolvency. The coefficients in model (4) that are significant tend to be smaller in magnitude in a crisis. The exceptions are net

[24]In unreported results, we examine the effect of high holdings of Treasuries to determine if their superior value in the repo market helped to avoid funding shortfalls (Gorton and Metrick (2009)), but we see no evidence of this.

equity issuance, which not surprisingly always leads to an increase in the equity ratio, and extraordinary and discontinued items, which generally have a positive effect on capital ratios (perhaps due to cherry picking in all periods). The combined net negative coefficient on charge-offs for crises (0.22 + -0.72 = -0.50) suggests that changes in credit risk are a major contributor to banks' financial distress in crises. The net coefficients also indicate that banks use dividend cuts and reported gains on securities (cherry picking) in crises to meet minimum regulatory capital requirements. We note that debt issuance has a net negative coefficient in crises, suggesting that firms with funding shortfalls end up being *less* leveraged. While this result (more borrowing leads to more leverage) makes sense for boom times, liquidity shock theories suggest that in crises this effect is swamped by borrowing difficulties so that firms that borrow less end up with lower capital. Finally, if fire sales lead to insolvency, a drop in loans in a crisis would reduce capital, but the coefficient of -0.07 in model (4) suggests otherwise.

Models (5) and (6) report regressions for changes in assets and show no unusual decline in assets during crises. Firms that rely heavily on the capital markets for funding do not differ much in crises, nor is there any evidence that deposit changes lead to more fire sales in a crisis (although deposit declines overall lead to asset drops approximately dollar for dollar, the net magnitude has the opposite sign in a crisis in model (6)). In these regressions we allow a separate coefficient on debt issuance for firms that have decreases in debt. If funding constraints lead to fire sales, these firms should have a positive coefficient on debt issuance that is both significant and greater than one (reflecting asset loss spirals). The coefficient is significantly positive but the magnitude implies less than a dollar for dollar decline in assets in a crisis. The small coefficients on the debt declines suggest these firms are able to offset these funding shocks with proceeds from other sources, as shown in Figure 1.

Table 6 presents similar regressions for crisis periods (Table 5 also includes booms). Panel A shows that net debt issuance is no worse for firms with few deposits, except in the 1980-1982 crisis and the most recent subprime crisis. Even if liquidity shocks were more important in the most recent crisis, they are not typically a trigger for a crisis. Moreover, recall that the low deposit variable is set to one for only one-fourth of the sample, implying that only a fraction of the largest commercial banks suffered from liquidity shocks in these episodes. As before, the change in deposits overall may capture funding problems, as firms with deposit outflows do not replace this funding with other borrowing dollar for dollar. The recent crisis is also different in that it is the only period where the coefficient on loans is not positive. In other crises, loans decline with funding, reflecting a decision to lend less or a pattern of fire sales, but in the recent crisis the coefficient is negative. Of course, this coefficient is estimated holding other factors constant, but it still suggests that fire sales of loans were not a major factor in the last crisis. This result is further confirmed by a detailed review of SEC filings for 2007 and 2008 where we find very few sales of loans – at either gains or losses – during this period.

Table 6 Panel B reports the estimates of capital ratio regressions in the individual crisis periods. The low deposit indicator is not significant in any of the models, suggesting that capital market disruptions do not lead to insolvency. Net debt issuance is significantly *negatively* related to the equity ratio in all but two crises, again casting doubt on the idea that funding constraints lead to lower capital, although the variable is not significant during the LTCM episode and the most recent crisis. In these regressions the use of deposits as a substitute for debt is very clear, supporting the conclusion of Gatev, Schuermann, and Strahan (2009) that banks are naturally able to hedge their loan commitment funding in a crisis.

Panel C of Table 6 shows the regression estimates for total asset changes. Again, the banks most reliant on capital market funding do not appear to sell assets in any crisis period. Notably, banks with declines in debt financing have positive coefficients that are close to one in most crises with one major exception: the recent subprime crisis, where the coefficient on net debt financing for firms with declines in debt is relatively small (0.31 in model (6)). A change in loans leads to a high change in assets in the recent crisis, offering some support for the idea that loan fire sales lead to feedback effects on other assets. However, as noted earlier, a review of financial statements during this period indicates little evidence of loan sales. More likely, this positive relationship between loans and assets reflects a strategy of shrinking when loan write-downs push a bank closer to the regulatory minimum as a way to boost a capital ratio.[25]

Overall, we see little evidence to support amplification models in the commercial bank data. Most banks do not experience debt declines and those that do usually replace such shortfalls with deposits. Dividend cuts and equity issuance help banks manage capital ratios in troubled times. Likewise, banks appear to cherry pick assets rather than engage in fire sales. Our results are consistent with bank creditworthiness being an important explanation of financial crises. Further, our results are similar in all the crises, indicating that the lack of support for amplification theories is not driven by variation in the role of the lender of last resort.

3.2. Investment banks

Next we consider investment banks, which liquidity shock models predict will have greater problems than commercial banks because they rely more on short-term capital market funding. We split the sample into those with fractions of short-term borrowing that are above the

[25] A detailed review of SEC filings for the ten largest commercial banks in Q4 2008 supports our conclusions. Specifically, for eight of the ten banks that report loans held for sale ("originate to distribute" loans) separately from "loans held for investment," loan write-downs on loans held for investment on average exceed loan sales of loans held for investment by a factor of 4. Loan sales at the other two banks that aggregate loans held for sale with loans held for investment are comparable to the levels in Q4 2007, and neither bank reported significant losses on sales.

median and those with less short-term funding.[26] Table 7 indicates that investment banks do not experience a drop in overall funding during a crisis. However, similar to commercial banks, growth in debt issuance drops off in a crisis (albeit not significantly for these firms), and the number of banks with a decrease in debt funding is higher in crises as well. Surprisingly, the largest funding shocks occur at investment banks that rely *less* heavily on the short-term capital markets. However, instead of revealing disruptions in the repo market, this result reflects endogeneity of the funding choice. That is, the CP market is typically closed to lesser quality borrowers, crisis or not (see Crabbe and Post (1994)), leading to *fewer* funding problems among the investment banks with greater reliance on short-term debt if they are healthier firms. Consistent with this explanation, data in Compustat on Standard & Poor's short-term credit ratings indicate that those with a higher fraction of short-term capital debt, on average, have higher ratings in crisis periods. Our results are also consistent with those reported by Gao and Yun (2009) who document a decrease in reliance on CP borrowing by less creditworthy borrowers in the wake of Lehman Brothers' bankruptcy.[27]

Asset growth is lower in crises than in booms, but not significantly for firms reliant on short-term capital markets. Indeed, very little differs across crises and booms for these higher-rated firms. The few significant changes in crises exhibited by the firms with high short-term debt are in net equity issuance (repurchases decline), capital ratios (which increase as a result of higher earnings retention), and trading assets (which decrease). Given that funding does not decline, one must interpret the change in trading assets as a strategic move to reduce enterprise

[26] A detailed review of SEC filings from 2006 to 2008 for these banks indicates that "Debt in Current Liabilities" includes unsecured short-term borrowing, payables to customers, brokers, and dealers, other secured financing, and repos, whereas the cash flow item "Change in Current Debt" does not typically include repos. We therefore estimate the change in current liabilities from the balance sheet instead of the cash flow statement. Unreported calculations comparing data in SEC filings to this estimate of the change in current liabilities show they are closely related.

[27] Note that one of the largest CP issuers going into the crisis, GE Capital, suffered enormous losses on residential real estate and its funding pressures may have reflected credit quality concerns more than liquidity risk (see Kacperczyk and Schnabl (2010)).

risk, rather than a forced sale of assets arising from liquidity shocks. Most of the significant differences in Table 7 owe to changes in the situation facing the less creditworthy investment banks – those that rely *less* on short-term capital markets. While we cannot say with certainty whether the declines in assets reflect actual sales or write-downs, the asset declines are likely not driven by declines in funding since net debt issuance for even these investment banks is not actually negative. Similar to commercial banks, investment banks are more likely to engage in divestitures in boom periods, but the difference is not statistically significant. To further analyze cherry picking, as with commercial banks, we review financial statements for sales of other assets during the most recent financial crisis (2007-2008). We find strong evidence of cherry picking: in 2007, gains on sales of other assets totaled $687 million among our investment banks, while total gains in 2008 were an impressive $9.6 billion.

Table 8, Panel A, presents regressions for investment banks similar to the Table 5 regressions for commercial banks. As with commercial banks, the regressions provide little evidence that funding declines significantly in a crisis. Indeed, the crisis indicator is significantly *positive* in the net debt regression. The only two significant interaction variables in model (2) are charge-offs and financial instruments owned, suggesting that declines in funding reflect creditworthiness rather than liquidity shocks. The individual crisis regressions in Panel B are consistent with this conclusion as the short-term debt indicator is insignificant and the intercept is generally positive.[28] Moreover, Panel B suggests that investment banks also rely more heavily on equity issuance (or at least engage less in share repurchases) when debt funding declines.

The change in the equity ratio at investment banks (Panel A, models (3) and (4)) is also not related to a crisis per se, as the crisis indicator coefficient is insignificant and the firms that

[28] Table 8, Panel B only shows two crises separately from the all crisis period regression because of the small number of observations in other periods. This reflects the small number of investment banks on Compustat (because they were private earlier in the sample) and/or the short length of other crisis periods.

rely more on short-term funding do not show a greater risk of insolvency in a crisis. Extraordinary items is one of the few variables that is significantly different in a crisis and it suggests that credit risk, not liquidity risk, is the dominant factor in reducing capital ratios in a crisis. Turning to Panel B, which reports regressions for crisis periods only, the evidence again does not provide support for the liquidity shock channel, since the indicator variables for high short-term debt type are insignificant. A decline in debt issuance does not lead to insolvency as predicted by amplification models and, in fact, has the wrong sign, except in the recent crisis when it is not significant. In both crises, extraordinary items are extremely detrimental to equity capital, indicating that one time charges likely outweigh efforts at cherry picking assets.

Investment banks' assets are not strongly linked to funding shocks in crises. While model (5) in Table 8 Panel A shows a significant negative 3.5% effect of a crisis on asset changes, this result disappears when controlling for other firm characteristics in model (6). Model (6) does provide support for the amplification models in that assets decrease when debt issuance declines, and sharply so for the firms with negative debt issuance. However, the outsized coefficient on extraordinary items raises the question of whether write-downs contribute the most to difficulties in borrowing. The asset changes, as noted before, may reflect revaluations rather than sales of portfolio securities. Interestingly, the point estimate for the coefficient on net debt issuance for firms with lower borrowing is actually lower in the recent crisis (Panel B, Table 8, models (8) and (9)) despite the fact that it was the only one described by the Federal Reserve as "the worst financial crisis since the Great Depression" during which "credit markets froze."[29] Moreover, while the coefficient on net debt issuance for firms with lower borrowing is significant, fewer than half the firms in a crisis have negative debt issuance. Finally, even if assets shrink at

[29] Federal Reserve Chairman Ben Bernanke speech on April 7, 2010 to Dallas Regional Chamber, and Governor Elizabeth A. Duke speech at the annual Consumer Bankers Association in Hollywood, Florida on June 8, 2010.

investment banks because of their inability to borrow in frozen debt markets, none of the coefficients suggest that the decline in borrowing leads to an asset price spiral via fire sales.

While liquidity shock amplification models predict that investment banks will be more sensitive to capital market disruptions than commercial banks, the data do not show strong evidence that liquidity shocks affect them strongly in recent or earlier crises. As with commercial banks, the typical investment bank does not shrink in a crisis. While some pockets of weakness exist, the overall connection between funding and asset growth in a crisis is tenuous. Nor is it obvious that fire sales are a common problem at investment banks in a crisis, and asset shrinkage, to the extent it exists, may instead reflect mark to market adjustments of assets that are impaired because of firm fundamentals.

3.3. Hedge funds

Relative to commercial and investment banks, hedge funds should have the most exposure to liquidity shocks due to their reliance on investor cash flows. Funds that have short lock-up periods are likely to suffer even more from liquidity shocks. Thus, we analyze funds that have negative quarterly net flows and a lockup period under 12 months ("funding constrained" hedge funds) and compare them to the funds that are most insulated from liquidity shocks, those with a lockup period greater than 12 months and positive quarterly net flows ("unconstrained" funds).[30]

Table 9 reports that quarterly hedge fund flows and returns are lower during crises than booms. This mainly reflects problems at funding constrained hedge funds, as unconstrained funds do not have negative returns and their average inflows are not significantly lower in crises.

[30] Many funds have lockup periods of exactly 12 months (it is both the median and the mode), so it is a natural cutoff for short versus long lockup periods. Of the 4,948 fund-quarter observations during the sample period, 1,459 are outflow/short lockup period funds while 210 are inflow/long lockup funds, with 3,279 observations falling in neither category. Our results are similar when we use leading flows to capture the impact of redemption notification periods (which have a median of 90 days in our sample), as in Boyson, Stahel, and Stulz (2010).

The dramatically worse performance of the constrained hedge fund group in both crises and booms is consistent with Aragon (2007) who finds that funds with lockup provisions generally outperform those without. During a financial crisis, the constrained firms earn an average of 16% less than unconstrained funds (annualizing the quarterly returns).

While outflows and losses at constrained funds are consistent with liquidity shocks, Table 9 shows that these funds' problems are also consistent with changes in fundamentals of the firms whose stock they own. Funding-constrained funds hold smaller stocks than unconstrained funds, based on total assets and market capitalization, regardless of the period studied, and they are even smaller during crises. Compared to unconstrained funds, constrained funds hold stocks of firms that are less profitable (based on Tobin's Q and stock returns), regardless of the time period. In unreported results we compare both types of funds' stocks with those of the full sample of hedge funds and we find that both types of funds hold more profitable stocks (relative to funds that are neither constrained nor unconstrained) during both booms and crises, implying that even constrained funds hold stocks with relatively good past performance and growth opportunities. Turning to measures of stock liquidity, there are no economically significant differences in the Amihud (2002) illiquidity measure or bid-ask spreads between the two types of funds in crises or booms. Both types of funds hold more liquid assets during crises than booms. These results suggest that poor stock returns in the constrained funds' portfolios are due more to fundamentals than to price pressure from distressed sales.

Panel B presents data on stock sales by hedge funds. We find no significant differences between sales during crises and booms in the proportion of market capitalization that each sale represents. If selling pressure drives down prices in crises, hedge funds might be expected to hide their trades by splitting them into several smaller transactions, but Panel B shows that all

funds increase their average transaction size during a crisis. The increase is even greater for constrained funds that sell more of their portfolios.

In Table 10, we further investigate the impact of hedge fund quarterly stock sales by classifying each stock in the portfolio as either increased (the hedge fund bought more of an existing position), unchanged, or sold (the hedge fund sold all or a portion of an existing position) relative to the market value of that stock's position in the prior quarter (Coval and Stafford (2007)). By construction, our analysis ignores the initial purchase of stocks each quarter, causing a bias that overstates selling and understates buying. Table 10 shows that constrained hedge funds sell 51% of prior period holdings on average in crises. This is consistent with Ben-David, Franzoni, and Moussawi's (2010) finding that hedge funds sold 30% of their assets in the recent financial crisis. Such extreme declines, coupled with the fact that constrained funds sell 22% more of their assets than unconstrained funds, suggest that fire sales by funds facing redemption requests may be a major problem in crises. However, one fact in Table 10 contradicts the fire sale scenario: both types of hedge funds increase positions in existing stocks during crises. Further, the buying exhibited in this table understates the total purchases of constrained hedge funds, as it ignores initial purchases of stock. Remarkably, the average increase for stocks bought by constrained funds is actually larger during crises than booms. Rather than selling assets at fire sale prices solely to raise cash for redemption requests, the most constrained hedge funds use some sales proceeds to buy more shares. This suggests that for some of their stockholdings, constrained funds' motives for selling during crises may be more closely tied to information (i.e., views on the likelihood of a high return) than to redemption pressures.

Table 11 reports a multivariate analysis of sales by all hedge funds during the sample period. Panels A and B analyze gross and net selling activity, respectively. In both panels, as is

typical in the literature, we control for a number of fund characteristics. We have seven regression specifications for each panel: three that combine observations for crisis and boom periods, one for all crisis periods, and one for each of the three separate crisis periods.

In Panel A the dependent variable is the proportion of shares sold. The crisis indicator has the wrong sign and is insignificant, indicating that hedge funds' overall gross selling is not different between crisis and boom periods (models (1) to (3)). The constrained hedge fund indicator is positive and significant at 1%, confirming the univariate result that constrained funds' gross sales are higher in both crises and booms (model (2)). In model (3), the coefficient on the interaction between the crisis period and the constrained hedge fund indicator is positive and significant, supporting the view that constrained hedge funds engage in more sales during crises but this is not true for unconstrained funds. The model (4) results are also consistent with increased sales: constrained funds' gross sales are significantly greater than zero during all crisis periods, while unconstrained funds sell less than other hedge funds. The results for individual crisis periods suggest that these results are driven by both the most recent financial crisis and the 2001 recession. The result for the 1998-1999 crisis period (model (5)) includes only one quarter (Q4 1998) and there are no unconstrained funds during this period, hence no indicator variable. In unreported tests, when we expand this period to include the quarter ending September 1998 the coefficient on the unconstrained funds indicator is insignificant.

The results from Panel A seem to imply that constrained hedge funds are indeed engaging in fire sales since they sell more assets than unconstrained funds during crises. However, the univariate results of Table 10 indicate that constrained funds are also *buying* stock during financial crises. Hence, in Table 11 Panel B we analyze hedge funds' net sales. The dependent variable is the proportion of shares sold less the proportion of shares purchased (as noted earlier,

shares purchased includes only additions to existing positions). The crisis variable has the wrong sign and is insignificant, indicating that hedge funds' net selling is not different between crisis and boom periods (models (1) to (3)). The model (2) results indicate that constrained funds' net selling is significantly higher during both crisis and boom periods. However, contrary to Panel A, model (3) indicates that the net selling in crisis periods is *not* statistically distinguishable from net selling in boom periods. In contrast to the prior result in Panel A that constrained funds have higher gross sales during crisis periods, Panel B shows that constrained funds do not have higher net sales during crises, providing evidence against fire sales caused by liquidity shocks.

In Table 12, we investigate the types of stocks that hedge funds sell in booms and crises. To appropriately benchmark these results, we compare stocks that are sold to stocks that are "not sold" ("unchanged" and "increased") by the same hedge funds during the same periods, with particular emphasis on the choices made by constrained hedge funds. If constrained hedge funds are driven to sell off assets at bargain basement prices, they should sell the stocks whose prices dropped the least and that are the most liquid in order to minimize losses. Contrariwise, during crises, we find that constrained funds sell *smaller* stocks with slightly *worse* prior year annual returns, and *lower* Tobin's Q than stocks they do not sell. Importantly, these same patterns hold during boom periods. Further, there are no significant differences in either the Amihud (2002) illiquidity measure or bid-ask spreads between stocks sold and not sold. For unconstrained funds, these patterns are similar, although statistical significance for the unconstrained fund results is generally weaker. Hence, it appears that some of the selling by constrained funds is motivated by a desire to sell losers and invest more in winners.

As a final test of whether hedge funds' trading is affected by liquidity shocks or by change in fundamentals of their holdings, we examine cumulative abnormal returns of stocks

sold and not sold during financial crises. Returns of stocks sold due to liquidity should display price reversals after the sale date, indicating that the price decline was temporary, while the performance of stocks sold strategically due to change in fundamentals would not experience the same rebound. We calculate cumulative monthly abnormal returns for the 12 months prior and 18 months following the event date, where the event date is the crisis quarter, and the performance is calculated in excess of the CRSP value-weighted index. Figure 4 plots the returns for all sample crisis periods while Figure 5 plots results for the most recent subprime crisis period. Since our holdings data is quarterly but our returns data is monthly, we are not certain exactly when a stock was sold during the quarter, so the event date for this analysis is denoted T1, T2, or T3, representing the first, second, and third months during the quarter, respectively.

The results in both figures indicate no evidence of fire sales. While the stocks sold by constrained funds underperform those sold by unconstrained funds prior to sale, the graphs do not reveal price declines due to fire sales that subsequently reverse for either type of fund. Further, the stocks not sold by constrained funds behave similarly to the stocks they do sell. For both periods, stocks sold and not sold by constrained hedge funds underperformed the market during crises and then outperformed the market after crises. If this result were due to liquidity-induced sales by constrained funds, it should only hold for stocks sold, not for stocks that were not sold.

Overall, the results of our analysis provide scant evidence that the hedge funds are affected by liquidity shocks during crises. While constrained hedge funds' gross sales are higher during crises than during booms, this result is primarily driven by selling during the most recent crisis period. Contrary to the predictions of the amplification models, funding constrained hedge funds continue to buy stocks during crisis periods, despite the pressures to meet redemption

requests. The stocks that constrained funds sell during crises and boom periods tend to be similar: they are smaller with worse profitability and worse prior year performance than the stocks they do not sell, and these patterns are similar to those exhibited by unconstrained funds. Given that the unconstrained hedge funds are presumably under much less pressure to sell, the similarities likely reflect common strategies for dealing with unprofitable bets.

4. Conclusion

A major research issue in financial economics is how financial crises snowball into major problems for the real economy. Recent theoretical research emphasizes liquidity shocks to financial intermediaries that force them to sell assets at fire sale prices. In many of these amplification models, the asset sales create a loss spiral that can lead to insolvency. The lack of funding and reduced capital at the aggregate level can translate into a shortage of financing for nonfinancial firms and lower business activity overall. An alternative view points to the importance of shocks to fundamentals and highlights the idea that difficulties in rolling over short-term debt reflect concerns about solvency.

We test these two explanations by considering the financing choices, portfolio composition, and equity ratios of commercial banks, investment banks and hedge funds using data that begins in 1980 for commercial and investment banks, and 1998 for hedge funds. We examine the balance sheets of commercial banks and investment banks during crises and booms and find that liquidity shocks, if they exist, are not strong enough to cause a decline in debt issuance at either type of bank. Nor do we see assets fall on average in crises. While the evidence is consistent with pockets of weakness, as banks are more likely to suffer a drop in debt issuance and negative asset growth in a crisis, we find no evidence that their problems owe to liquidity

shocks. For commercial banks, these pockets more often contain banks that are closer to insolvency. But even among these firms, the evidence is not compelling: a dollar decline in funding does not translate into more than a dollar decline in assets, as loss spirals would imply. Most commercial banks find alternative sources of funding, mainly in deposits, and this result holds for the most recent crisis. Likewise, we do not see strong evidence of funding concerns or fire sales among investment banks. Indeed, investment banks that rely more heavily on short-term debt financing are less affected by funding problems as these firms enter the crisis period with more capital and higher bond ratings. Finally, while hedge funds suffer from outflows during crises, particularly those funds with short lockup periods, their stock sales seem as much motivated by a desire to dump losers as by the need for cash to satisfy redemption requests. Even funds suffering the most still manage to make significant stock purchases during crises. Moreover, sales at hedge funds often involve stocks that do not differ significantly from the stocks they do not sell in terms of liquidity, indicating that they are not trying to minimize price pressures by selling their most liquid stocks during crises.

Rather than liquidity shocks driving financial crises, we see greater evidence that problems at these financial institutions emanate from the asset side of the balance sheet in the form of shocks to fundamental value: commercial banks' equity and assets are strongly affected by the level of net charge-offs while investment banks' asset changes seem to reflect market valuation changes more than asset sales. Meanwhile, hedge funds seem to be dumping their worst investments and allocating some of these proceeds to increase positions in stocks they believe will outperform in the future.

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Figure 1: Frequency of Actions Taken by Commercial Banks During Crises

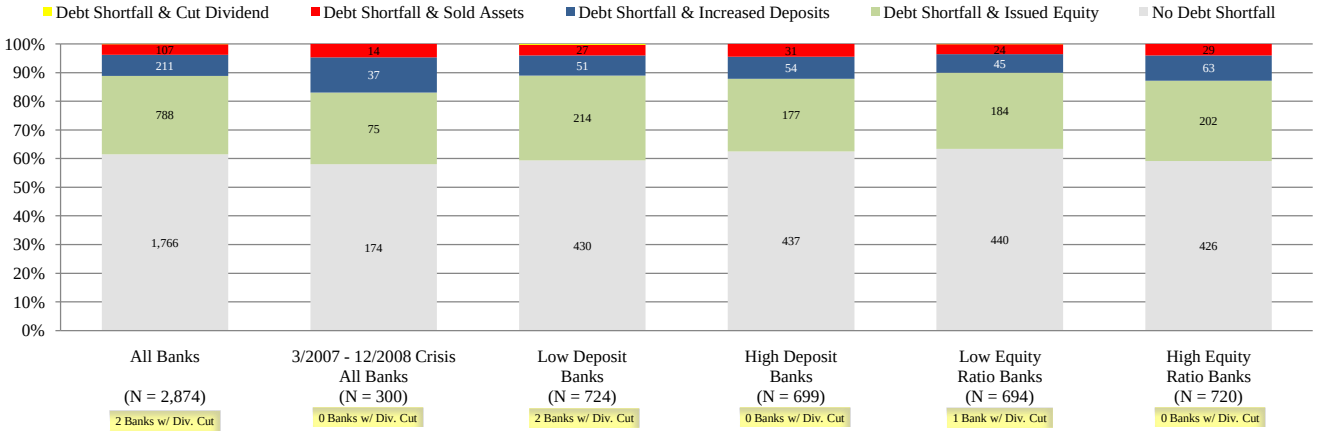

Figure 2: Fraction of Commercial Banks During Crises Partitioned by Debt Shortfall and Change in Deposits

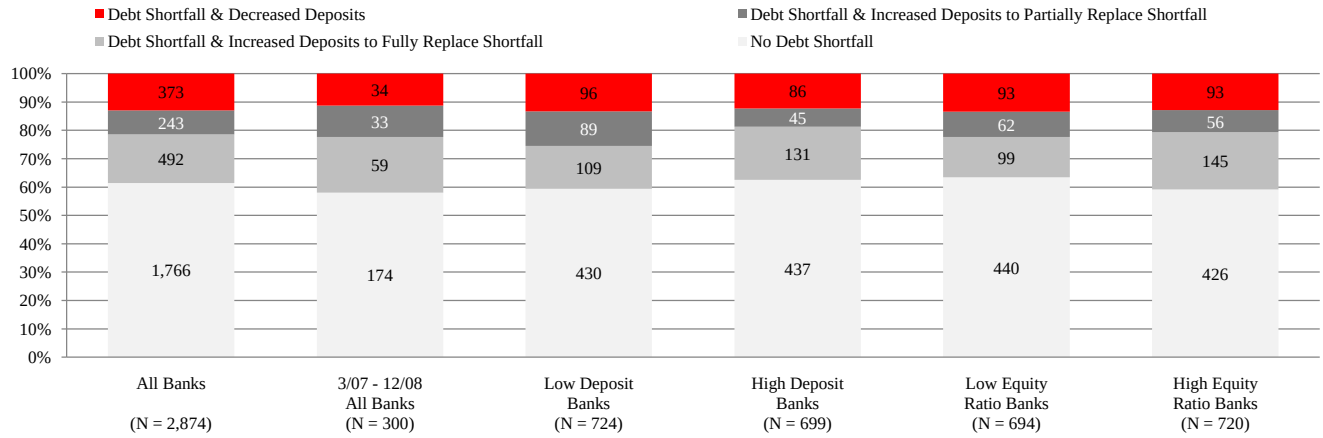

Figure 3: Replacement of Debt Shortfall for Subsamples of Commercial Banks During Crises

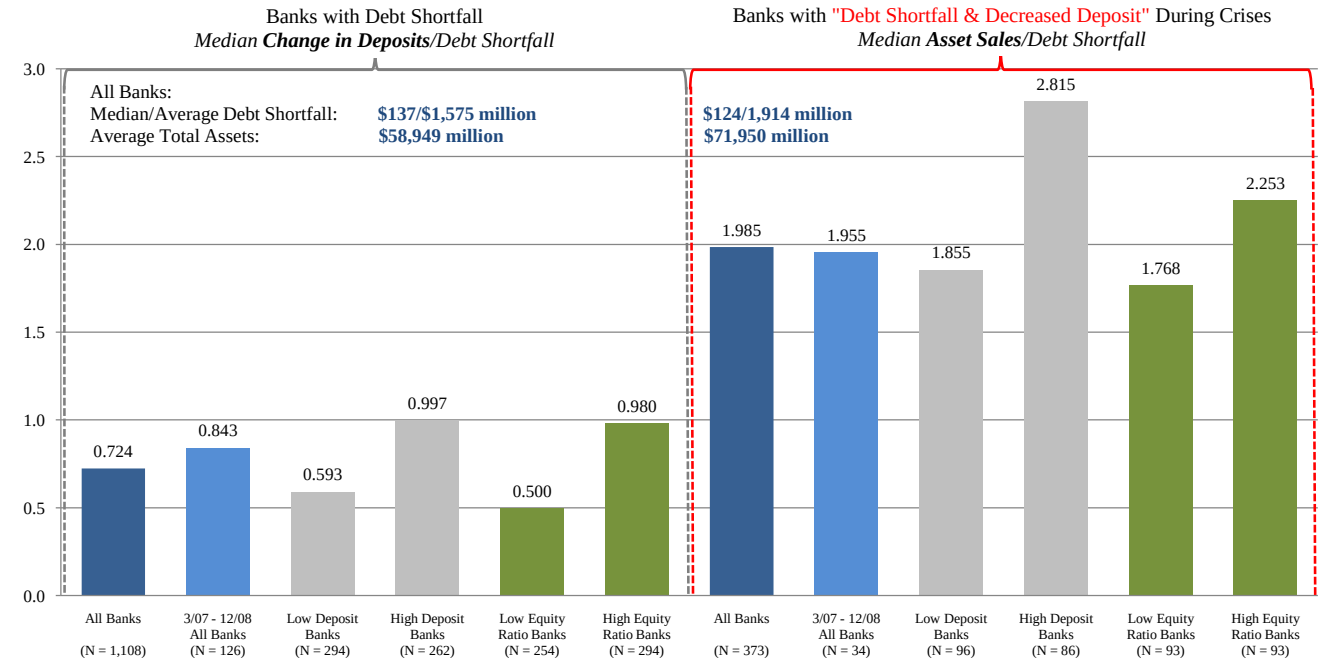

Figure 4: Cumulative Abnormal Return of Stocks Sold and Not Sold by Unconstrained and Constrained Funds During all Crises

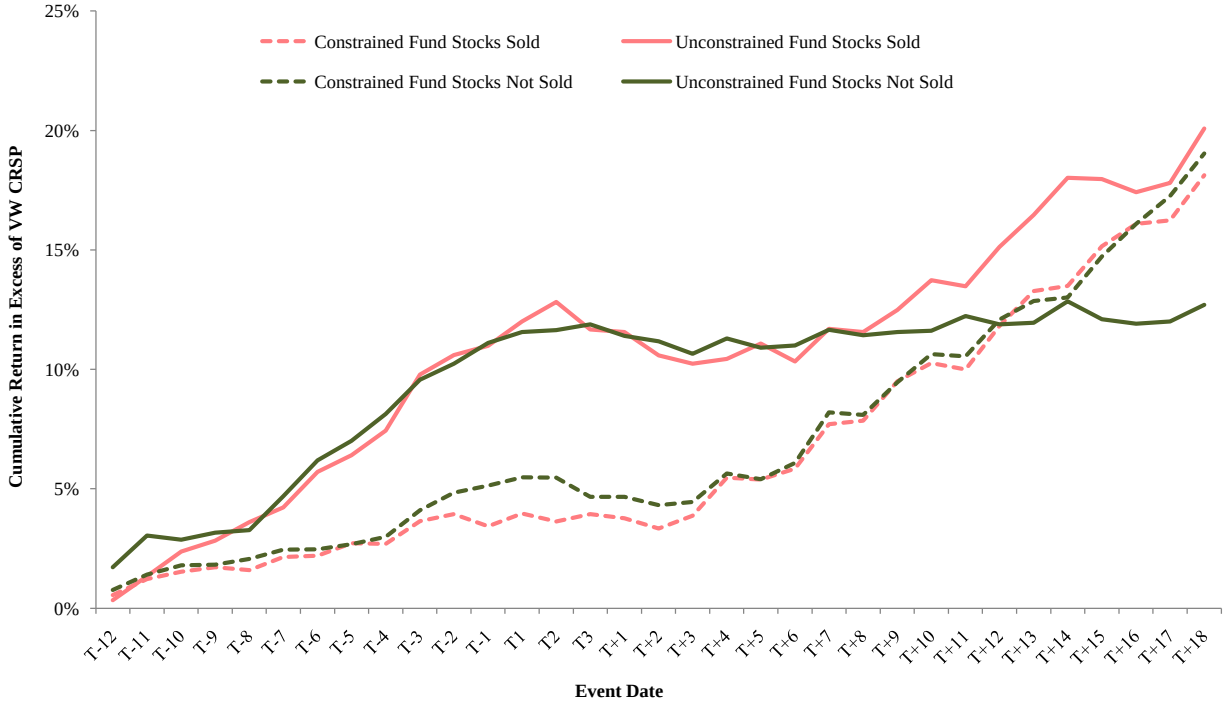

Figure 5: Cumulative Abnormal Return of Stocks Sold and Not Sold by Unconstrained and Constrained Funds During the 2007-2008 Crisis

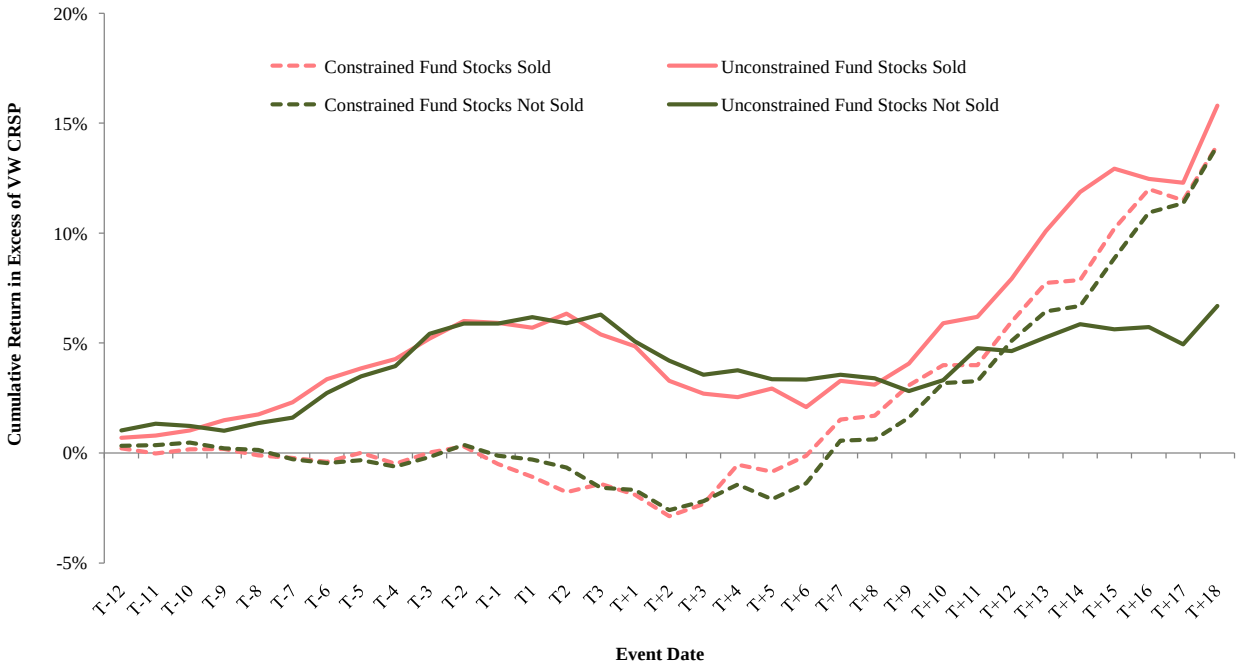

Table 1

This table reports the periods of Booms and Crisis as determined by in-sample distribution of the following indicators: NBER recessions and expansions; bank failures (normalized by the contemporaneous number of banks); TED spread; Moody's AAA-Baa credit spreads; flight to quality indicator (Collin-Dufresne, Goldstein, and Helwege (2003)); the Long Term Capital Management ("LTCM") episode; stock market declines and increases; and credit crunch periods (Bordo and Haubrich (2009)).

Periods	Dates	Notes
Crisis	1/1980 - 11/1982	- NBER contraction (1/1980 - 6/1981) - High TED and credit spreads - Flight to quality in late 1982 - Credit crunch early 1980 - Low stock market returns in 1980 and 1981
	12/1988 - 12/1992	- NBER contraction (7/1990 - 3/1991) - High bank failures (S&L crisis) - Periods of high TED spread - Flight to quality - Credit crunch - Low stock market returns
	8/1998 - 1/1999	- High TED spread - Flight to quality - LTCM episode - Low stock market returns
	3/2001 - 11/2001	- NBER contraction (3/2001 - 11/2001) - Flight to quality - Low stock market returns
	3/2007 - 12/2008	- NBER contraction (12/2007 - Present) - High bank failures - High TED and credit spreads - Flight to quality - Credit crunch - Low stock market returns
Boom	11/1993 - 10/1997	- NBER expansion - Low bank failures - Low TED and credit spreads - High stock market returns
	6/1999 - 5/2000	- NBER expansion - High stock market returns
	1/2003 - 2/2004	- NBER expansion - Low credit spreads - High stock market returns

Table 2 - Sample Characteristics: Commercial Banks, Investment Banks, and Hedge Funds

For large commercial banks and investment banks quarterly accounting data are obtained from Compustat and are scaled by contemporaneous total assets. Loans are loans net of allowance for total loan losses. Failed banks are excluded from the sample after the date of their failure per FDIC website. Quarterly Fund Flow is the average quarterly hedge fund flow, scaled by beginning of quarter assets under management. Quarterly Return of hedge funds is reported in excess of the risk-free rate. Flow, Return, Asset Under Management, Fund Age, Lockup Period, and Redemption Frequency data are from Lipper TASS. Stock characteristic data is from CRSP and Compustat. Prior Year Annual Excess Return is the return for the prior year, net of the risk-free rate. In Panel C, Total Assets and Tobin's Q are calculated using data from the most recent annual report in Compustat. Market Capitalization, Bid/Ask Spread, and Daily Trading Dollar Volume (in millions) are calculated as of the previous quarter, using daily (end-of-day) data. The Amihud illiquidity measure which is the ratio of the absolute daily return to the dollar trading volume on that day. There are 10,828; 833; 4,948; and 199,273 commercial bank-quarter, investment bank-quarter, hedge fund family-quarter, and stock quarter-observations, respectively.

Panel A: Commercial Banks	Ave	Q1	Median	Q3
Total Assets	66,250	6,524	15,181	41,056
Cash and Securities	0.27	0.20	0.26	0.33
Loans	0.59	0.53	0.61	0.67
Deposits	0.70	0.64	0.71	0.79
Short-Term Debt	0.10	0.05	0.09	0.15
Equity	0.07	0.06	0.07	0.08
Panel B: Investment Banks	Ave	Q1	Median	Q3
Total Assets	369,395	59,084	191,894	455,587
Cash and S-T Investments	0.18	0.05	0.18	0.27
Finc'l Instruments Owned	0.28	0.19	0.29	0.38
Trading Related Assets	0.40	0.30	0.40	0.49
Short-Term Debt	0.42	0.19	0.44	0.65
Equity	0.05	0.03	0.04	0.06
Panel C: Hedge Funds	Ave	Q1	Median	Q3
Fund Family Characteristics - Family Level				
Assets Under Management (AUM)	498	55	183	453
Fund Age in Years	6.46	3.89	6.15	8.75
Lockup Period in Months	5	0	0	6
Redemption Frequency in Days	114	60	90	109
Quarterly Fund Flow as % of AUM	-0.07	-0.11	-0.04	-0.01
Quarterly Return	0.04	0.00	0.02	0.06
Number of Stocks per Filing	116	32	68	127
Stocks Owned Characteristics - Stock Level				
Prior Year Annual Excess Return	0.16	-0.21	0.05	0.33
Total Assets	5,569	139	652	2,754
Tobin's Q	3.15	1.16	1.84	3.49
Market Capitalization, Prior Quarter	11,792	540	1,764	6,993
Amihud Illiquidity Measure x 10^6	0.113	0.070	0.107	0.136
Bid/Ask Spread: (Bid-Ask)/Bid	0.012	0.003	0.006	0.018

Table 3 - Funding of Large Commercial Banks

Means of commercial bank characteristics are reported. Low/High Deposit Banks are determined for each quarter as the bottom/top quartile of large commercial banks based on lag(Deposits scaled by Total Assets). Banks with Low/High Equity Ratio are determined in the quarter immediately preceeding a crisis at the bottom/top quartile of large commercial banks based on Equity scaled by Total Assets. All variables are scaled by total assets as reported at the end of prior quarter. Net Debt Issuance(t), if not available on Compustat, equals change in debt (short-term and long-term) in current quarter. Net Long-Term Debt Issuance(t), if not available on Compustat, equals the change in long-term debt as reported in the current quarter. Change in Deposits(t), if not avalable on Compustat, equals the change in net deposits from end of prior quarter. Any observation for which the estimated net issuance or change is below/above 1st/99th percentile is excluded from the sample. Failed banks are excluded from the sample after the date of their failure per FDIC website. Any observation that involves a bank acquiring another bank during the relevant fiscal quarter is eliminated from the analysis. Statistical significance at the 1%, 5%, and 10% level is indicated with ***, **, and *, respectively.

		All	Low Deposits Banks	High Deposits Banks	Low Equity Ratio Banks	High Equity Ratio Banks
Net Debt Issuance	Crisis	0.45%	0.18%	0.58%	0.22%	0.47%
	Boom	0.96%	1.02%	0.88%	1.34%	0.88%
	Diff.	*-0.50%***	*-0.84%***	*-0.30%**	*-1.12%***	*-0.41%***
Net Debt Issuance < 0	Crisis	43.11%	49.03%	39.91%	48.41%	42.36%
	Boom	36.32%	36.20%	33.71%	35.75%	31.91%
	Diff.	*6.79%****	*12.83%****	*6.20%***	*12.66%****	*10.45%****
Net L-T Debt Issuance	Crisis	0.19%	0.21%	0.22%	0.12%	0.20%
	Boom	0.56%	0.73%	0.43%	0.86%	0.47%
	Diff.	-0.38%***	-0.52%**	-0.21%*	-0.74%***	-0.27%*
Change in Deposits	Crisis	1.69%	1.79%	1.71%	1.02%	2.00%
	Boom	1.97%	2.18%	1.17%	1.98%	1.75%
	Diff.	*-0.28%*	*-0.39%*	*0.54%*	*-0.96%***	*0.24%*
Change in Deposits < 0	Crisis	37.00%	34.85%	36.91%	39.74%	32.46%
	Boom	35.39%	29.82%	43.44%	34.67%	36.55%
	Diff.	*1.61%*	*5.02%**	*-6.53%***	*5.07%**	*-4.09%*

Table 4 - Asset Changes, Net Equity Issuance, Cash Dividends Paid, and Divestitures by Large Commercial Banks

Means of commercial bank characteristics are reported. Low/High Deposit Banks are determined for each quarter as the bottom/top quartile of large commercial banks based on lag(Deposits scaled by Total Assets). Banks with Low/High Equity Ratio are determined in the quarter immediately preceeding a crisis at the bottom/top quartile of large commercial banks based on Equity scaled by Total Assets. Change in Assets (Loans) is the percentage change in total assets (loans) from prior quarter scaled by lagged total assets. Net Charge-Offs, Loan Loss Reserves, and Cash Dividend are as reported for the current quarter in Compustat and are scaled by total assets as of the end of the prior quarter. Investment Securities Gain/Loss is as reported for the current quarter in Compustat and is scaled by common equity as of the end of prior quarter. Net Equity Issuance is calculated as sale minus purchase of common and preferred stock. If data on sale and purchase of stock is not available, the Net Equity Issuance is estimated as the change in shareholder equity less the change in retained earnings. Any observation for which the estimated net equity issuance is in excess of the 1st/99th percentile is excluded from the sample. Divestiture is an indicator variable equal to one if the bank divested a subsidiary during a current quarter and zero otherwise (data from SDC). Failed banks are excluded from the sample after the date of their failure per FDIC website. For analysis of accounting-based information, any observation that involves a bank acquiring another bank during the relevant fiscal quarter is eliminated from the analysis. Statistical significance at the 1%, 5%, and 10% level is indicated with ***, **, and *, respectively.

		All Banks	Low Deposits Banks	High Deposits Banks	Low Equity Ratio Banks	High Equity Ratio Banks
Change in Assets	Crisis	2.63%	2.70%	2.66%	1.78%	3.04%
	Boom	3.51%	3.83%	2.35%	3.75%	3.14%
	Diff.	*-0.87%***	*-1.13%**	*0.31%*	*-1.98%****	*-0.10%*
Change in Loans	Crisis	1.27%	1.20%	1.25%	0.82%	1.31%
	Boom	2.25%	2.12%	1.98%	2.22%	2.05%
	Diff.	*-0.99%****	*-0.92%****	*-0.72%***	*-1.41%****	*-0.74%***
Net Charge-Offs	Crisis	0.13%	0.15%	0.13%	0.15%	0.13%
	Boom	0.09%	0.11%	0.07%	0.10%	0.11%
	Diff.	*0.05%****	*0.04%**	*0.06%****	*0.05%****	*0.02%*
Inv. Securities Gain, Loss	Crisis	0.04%	0.02%	0.08%	-0.04%	0.02%
	Boom	0.09%	0.15%	0.06%	0.19%	0.05%
	Diff.	*-0.06%**	*-0.13%*	*0.02%*	*-0.23%**	*-0.02%*
Net Equity Issuance	Crisis	0.13%	0.12%	0.18%	0.12%	0.15%
	Boom	0.06%	0.07%	0.09%	0.12%	0.04%
	Diff.	*0.07%****	*0.05%*	*0.09%*	*0.00%*	*0.10%**
Cash Dividend	Crisis	0.08%	0.06%	0.09%	0.05%	0.11%
	Boom	0.10%	0.08%	0.11%	0.05%	0.12%
	Diff.	*-0.02%****	*-0.01%****	*-0.02%****	*0.00%*	*-0.01%***
Divestiture	Crisis	3.31%	3.75%	3.04%	3.49%	2.44%
	Boom	8.11%	8.40%	5.09%	7.96%	4.67%
	Diff.	*-4.81%****	*-4.65%****	*-2.06%**	*-4.47%****	*-2.22%***

Table 5 - OLS Regression Analysis of Quarterly Net Debt Issuance, Change in Equity Ratio, and Change in Total Assets by Large Commercial Banks; Crisis and Boom Periods

Banks with Low/High Deposits(t-1) is an indicator variable equal to one if the bank fell in the lowest/highest quartile of in-sample distribution of total deposits to total assets ratio during the prior quarter and to 0 otherwise. High Inv. Securities(t-1) is an indicator variable equal to 1 if the bank fell in the highest quartile of in-sample distribution of investment securities to total assets ratio during the prior quarter and to 0 otherwise. Divestiture Occuring w/in 90 Days of Acquisition is an indicator variable equal to one if a divestiture occured within 90 calendar days of the day of the most recent acquisition. Net Debt Issuance < 0 equals to Net Debt Issuance if Net Debt Issuance is negative and to zero otherwise. Net Debt Issuance > 0 equals to Net Debt Issuance if Net Debt Issuance is not negative and to zero otherwise. All other variables are defined in prior tables. Any observation for which the estimated net equity issuance is in excess of the 1st/99th percentile is excluded from the sample. Accounting variables are scaled by total assets as of the end of prior quarter and percentages are used for all continuous variables (i.e., 10%=10). Failed banks are excluded from the sample after the date of their failure. Heteroskedasticity-consistent standard errors are used. ***, **, and * denotes statistical significance at 1%, 5%, and 10%.

	Net Debt Issuance		Change in Equity Ratio		% Change in Total Assets	
	1	2	3	4	5	6
Intercept	0.85 ***	0.13	-0.01	0.03 *	3.74 ***	-1.38 ***
Crisis (t)	-0.18	0.18	0.01	0.07 ***	-0.36	-0.12
Banks with Low Equity Ratio (pre-crisis)	-0.37 *	-0.13			-1.56 ***	-0.27 *
Banks with High Equity Ratio (pre-crisis)	-0.12	-0.25 **			0.43	0.25 *
Net Charge-Offs		0.75		0.22 **		-0.50
Number of Acquisitions in Current Quarter						0.05
Divestiture						-0.01
Divestiture Occuring w/in 90 Days of Acq.						-0.27
log(prior quarter Total Assets)						0.16 ***
Liabilities & Equity:						
Banks with Low Deposits(t-1) Indicator	0.02	0.29	0.03	0.02	-0.81	-0.04
Banks with High Deposits(t-1) Indicator	0.04	-0.08	0.04	0.00	-0.87 *	-0.02
Change in Deposits		-0.42 ***		-0.06 ***		0.93 ***
Net Debt Issuance				-0.06 ***		
Net Debt Issuance $\geq$ 0						0.87 ***
Net Debt Issuance < 0						0.81 ***
Net Equity Issuance		-0.24		0.45 ***		0.96 ***
Change in Dividend				0.24 **		
Assets:						
Change in Loans		0.55 ***		0.05 ***		0.17 ***
Change in Inv. Securities		0.55 ***		-0.01		0.12 **
High Inv. Securities (t-1) Indicator		-0.01				
Inv. Securities Gain, Loss		1.62		0.03		4.25 ***
Extraord and Discont. Items		15.27		1.32 *		1.77
Crisis (t) x :						
Net Charge-Offs		-1.45		-0.72 ***		0.58
Banks with Low Deposits(t-1) Indicator	-0.28	-0.40	-0.04	-0.04	0.60	0.12
Banks with High Deposits(t-1) Indicator	-0.04	0.03	-0.01	0.00	0.66	-0.02
Change in Deposits		0.31 ***		0.04 **		-0.39 ***
Net Debt Issuance				0.03 **		
Net Debt Issuance $\geq$ 0						-0.19
Net Debt Issuance < 0						-0.27
Net Equity Issuance		-0.05		0.08		-0.29
Change in Dividend				-0.56 **		
Change in Loans		-0.36 ***		-0.07 ***		0.53 ***
Change in Inv. Securities		-0.01		0.00		0.33 ***
High Inv. Securities (t-1) Indicator		0.04				
Inv. Securities Gain, Loss		-1.69		0.93 **		-4.08 **
Extraord and Discont. Items		-14.44		-0.41		-2.10
Adjusted R-squared	0.004	0.361	-0.001	0.503	0.002	0.943
Observations	4,288	4,288	4,264	4,264	4,288	4,288

Table 6 - OLS Regression Analysis of Quarterly Net Debt Issuance, Change in Equity Ratio, and Change in Total Assets by Large Commercial Banks; Crisis Periods Only

This table reports coefficients of OLS regressions where the dependent variable is Net Debt Issuance scaled by prior quarter Total Assets (Panel A), change in equity ratio from prior period (Panel B), or quarterly percentage change in total assets (Panel C). Sample includes all large commercial banks with available data in crisis periods only (defind in Table 1). All variables are defined in prior tables. Failed banks are excluded from the sample after the date of their failure. Any observation for which the estimated net equity issuance is in excess of the 1st/99th percentile is excluded from the sample. Percentages are used for all continuous variables (i.e., 10%=10). Heteroskedasticity-consistent standard errors are used. ***, **, and * denotes statistical significance at 1%, 5%, and 10%.

Panel A: Net Debt Issuance	All Crisis Periods	1/80 - 11/82	12/88 - 12/92	8/98 - 1/99	3/01 - 11/01	3/07 - 12/08
	1	2	3	4	5	6
Intercept	0.31 ***	0.52 ***	-0.05	1.13 **	-0.04	0.93 ***
Banks with Low Equity Ratio (pre-crisis)	-0.13	-0.19	-0.19	-3.02 *	0.01	-0.31
Banks with High Equity Ratio (pre-crisis)	-0.25 **	-0.28	-0.23 *	-0.83	0.40	-0.03
Net Charge-Offs	-0.70 **	-1.18	0.28	-0.02	1.35 *	-1.66
Liabilities & Equity:						
Banks with Low Deposits(t-1) Indicator	-0.10	-0.42 *	0.29	-0.66	0.63	-0.76 *
Banks with High Deposits(t-1) Indicator	-0.05	-0.09	0.07	-0.22	-0.59 *	0.12
Change in Deposits	-0.11 **	-0.19 ***	-0.26 ***	-0.30 **	-0.42 ***	-0.07
Net Equity Issuance	-0.29 *	-0.66	-0.45	0.20	-0.46	-0.36
Assets:						
Change in Loans	0.18 **	0.37 ***	0.43 ***	0.30 **	0.67 ***	-0.11 **
Change in Inv. Securities	0.54 ***	0.54 ***	0.42 ***	0.78 ***	0.57 ***	0.76 ***
High Inv. Securities (t-1) Indicator	0.03	0.37	-0.06	0.71	-0.06	0.05
Inv. Securities Gain, Loss	-0.07	-3.03	1.49	6.66	8.25	0.30
Extraord and Discont. Items	0.82	16.74 ***	-0.13	-1.50	-22.83	2.52
Adjusted R-squared	0.306	0.233	0.347	0.653	0.689	0.465
Observations	2,546	641	1,341	79	137	348

Table 6 - Continued

Panel B: Change in Equity Ratio	All Crisis Periods	1/80 - 11/82	12/88 - 12/92	8/98 - 1/99	3/01 - 11/01	3/07 - 12/08
	1	2	3	4	5	6
Intercept	0.10 ***	0.10 ***	0.11 ***	-0.05	0.18 ***	0.03
Net Charge-Offs	-0.49 ***	-0.24 **	-0.29 ***	0.14	0.07	-1.23 **
Liabilities & Equity Changes, Dividends:						
Banks with Low Deposits(t-1) Indicator	-0.03	0.01	0.01	0.18	-0.12	-0.11
Banks with High Deposits(t-1) Indicator	0.00	0.02	-0.01	-0.10	-0.02	0.06
Change in Deposits	-0.03 *	-0.05 ***	-0.06 ***	0.02	-0.05 ***	-0.10 ***
Net Debt Issuance	-0.03 **	-0.05 ***	-0.05 ***	-0.02	-0.06 ***	-0.03
Net Equity Issuance	0.53 ***	0.50 ***	0.47 ***	0.31 ***	0.58 ***	0.58 ***
Change in Dividend	-0.32	-0.19	-0.17	-0.41	-0.73 **	-0.30
Asset Changes:						
Change in Loans	-0.02	0.01	0.04 ***	-0.05 *	-0.01	-0.06 **
Change in Inv. Securities	-0.01	0.01 **	0.01	-0.01	0.01	0.01
Inv. Securities Gain, Loss	0.96 ***	0.28 ***	0.12	-3.39 **	-0.69	1.18 **
Extraord and Discont. Items	0.91 ***	1.05 ***	0.76 ***	-0.61	0.72	1.16 ***
Adjusted R-squared	0.441	0.728	0.456	0.444	0.765	0.555
Observations	2,532	636	1,334	78	137	347

Panel C: Change in Total Assets	All Crisis Periods	1/80 - 11/82	12/88 - 12/92	8/98 - 1/99	3/01 - 11/01	3/07 - 12/08
	1	2	3	4	5	6
Intercept	-1.60 **	0.29	0.19	1.44	-1.83	-6.35 **
Banks with Low Equity Ratio (pre-crisis)	-0.27 *	-0.06	0.03	-1.43 ***	0.08	1.20 *
Banks with High Equity Ratio (pre-crisis)	0.25 *	0.00	-0.02	0.13	0.03	1.02 **
Net Charge-Offs	0.05	-0.95	-0.31	1.45 *	0.68	-0.98
Number of Acquisitions in Current Quarter	0.21	0.01	-0.05	0.03	0.17	0.30
Divestiture Indicator	0.14	0.41	0.20	-0.57	-0.40	-0.59
Divestiture Occuring w/in 90 Days of Acq.	-0.21		1.50			-0.26
log(prior quarter Total Assets)	0.17 **	0.01	-0.01	-0.16	0.20	0.48 **
Liabilities & Equity Changes, Dividends:						
Banks with Low Deposits(t-1) Indicator	0.08	-0.04	-0.10	0.79	0.30	-0.53
Banks with High Deposits(t-1) Indicator	-0.03	0.02	0.00	-0.30	-0.14	-0.04
Change in Deposits	0.54 ***	1.03 ***	0.99 ***	1.19 ***	0.92 ***	0.70 ***
Net Debt Issuance $\geq$ 0	0.68 ***	1.02 ***	0.99 ***	1.11 ***	0.99 ***	0.47 ***
Net Debt Issuance < 0	0.54 ***	1.00 ***	0.98 ***	1.13 ***	0.83 ***	0.31 **
Net Equity Issuance	0.67 ***	0.68 ***	0.76 ***	0.61 *	0.77 ***	1.01 ***
Asset Changes:						
Change in Loans	0.70 ***	0.02	0.09 ***	-0.16 *	0.10	1.32 ***
Change in Inv. Securities	0.44 ***	-0.01	0.05 ***	-0.06	0.20 **	0.82 ***
Inv. Securities Gain, Loss	0.14	0.83	1.67 ***	-7.78	-1.34	-1.08
Extraord and Discont. Items	-0.34	-0.39	0.09	-0.99	-1.61	-4.02 *
Adjusted R-squared	0.924	0.983	0.991	0.997	0.981	0.928
Observations	2,546	641	1,341	79	137	348

Table 7 - Funding, Asset Changes, Net Equity Issuance, and Dividends Paid by Investment Banks

Low/High S-T Debt is determined based relative to the in-sample median of short-term debt to total assets. Net Debt Issuance is calculated as change in short-term debt (based on balance sheet information) plus change in long-term debt (based on financing cash flows items and if not available, change in long-term debt based on balance sheet information. All variables are defined in prior tables. With the exception of Extraordinary Items which is scaled by prior quarter equity, all accounting variables are scaled by total assets as of the end of prior quarter. Divestiture is an indicator variable equal to one if the bank divested some of its subsidiaries and zero otherwise (data from SDC). For analysis of accounting-based information, any observation involving an acquisition during the relevant fiscal quarter is dropped from the calculation of average and median. ***, **, and * denotes statistical significance at 1%, 5%, and 10%.

		All	Low S-T Debt	High S-T Debt
Net Debt Issuance	Crisis	1.13%	0.48%	1.95%
	Boom	2.31%	1.85%	2.76%
	Diff.	*-1.18%*	*-1.36%*	*-0.81%*
Net Debt Issuance < 0	Crisis	44.68%	50.00%	37.14%
	Boom	29.76%	28.57%	29.13%
	Diff.	*14.92%***	*21.43%***	*8.02%*
Net L-T Debt Issuance	Crisis	0.55%	0.34%	0.82%
	Boom	0.75%	0.94%	0.74%
	Diff.	*-0.20%*	*-0.60%*	*0.08%*
Change in Assets	Crisis	4.24%	4.81%	3.45%
	Boom	4.59%	4.63%	4.77%
	Diff.	*-0.35%*	*0.18%*	*-1.32%*
Equity / Total Assets	Crisis	6.85%	9.43%	3.70%
	Boom	4.13%	5.99%	3.01%
	Diff.	*2.72%***	*3.44%***	*0.68%***
Change in Finc'l Instr. Owned	Crisis	0.17%	-0.69%	1.44%
(N differs)	Boom	1.33%	0.57%	1.72%
	Diff.	*-1.15%**	*-1.25%**	*-0.28%*
Change in Cash and S-T Inv.	Crisis	0.77%	0.07%	1.42%
(N differs)	Boom	0.91%	0.25%	1.13%
	Diff.	*-0.14%*	*-0.18%*	*0.28%*
Change in Trading Related Assets	Crisis	1.31%	2.31%	0.21%
(N differs)	Boom	1.88%	2.46%	1.84%
	Diff.	*-0.57%*	*-0.15%*	*-1.63%**
Net Equity Issued	Crisis	0.04%	0.09%	-0.01%
	Boom	-0.02%	0.00%	-0.04%
	Diff.	*0.06%*	*0.08%*	*0.03%**
Dividends	Crisis	0.05%	0.06%	0.028%
	Boom	0.03%	0.04%	0.024%
	Diff.	*0.02%*	*0.02%*	*0.004%*
Extraordinary Items	Crisis	0.00%	0.01%	0.00%
	Boom	-0.02%	0.06%	-0.07%
	Diff.	*0.02%*	*-0.06%**	*0.07%*
Divestiture	Crisis	7.38%	9.70%	4.72%
	Boom	9.36%	18.18%	3.88%
	Diff.	*-1.98%*	*-8.48%*	*0.83%*

Table 8 - OLS Regression Analysis of Investment Banks

The sample includes all investment banks with available data in crisis and boom periods only (Panel A) and crisis periods only (Panel B) as defined in Table 1. All variables are defined in prior tables; accounting variables are scaled by total assets as of end of the prior quarter. Percentages are used for all continuous variables (i.e., 10%=10). Heteroskedasticity-consistent standard errors are used. ***, **, and * denotes statistical significance at 1%, 5%, and 10%.

Panel A: Crisis and Boom Periods	Net Debt Issuance		Change in Equity Ratio		% Change in Total Assets	
	1	2	3	4	5	6
Intercept	0.01	-0.03	0.00	0.00	0.03 ***	0.01
Crisis (t)	-1.09	5.17 **	0.32	0.08	-3.51 ***	0.31
Net Charge-Offs		16.41		-0.63		2.80
log(prior quarter Total Assets)						0.00
Number of Acquisitions in Current Quarter						-0.02
Divestiture						-0.01
Liabilities & Equity Changes, Dividends:						
Banks with High S-T Debt(t-1) Indicator	1.78	-0.45	0.01	0.03	1.59	0.50
Net Debt Issuance				0.01		
Net Debt Issuance ≥ 0						0.30 **
Net Debt Issuance < 0						-0.01
Net Equity Issuance		-2.18		0.16		-0.96
Change in Dividend				0.00		
Asset Changes:						
Finc'l Instr. Owned(t-1)		0.08		0.00		-0.03
Change in Finc'l Instr. Owned		1.03 ***		-0.03 ***		0.86 ***
Change in Trading Related Assets		0.52 ***		-0.01		0.79 ***
Extraord and Discont. Items		-3.91		-0.38		22.44 ***
Crisis (t) x :						
Net Charge-Offs		-23.90 *		0.34		-1.35
Banks with High S-T Debt(t-1) Indicator	0.71	1.04	-0.32	-0.14	1.84	0.72
Net Debt Issuance				-0.04 ***		
Net Debt Issuance ≥ 0						0.40 *
Net Debt Issuance < 0						0.96 ***
Net Equity Issuance		1.04		0.31		2.25
Change in Dividend				0.67		
Finc'l Instr. Owned(t-1)		-0.14 **		0.01		-0.01
Change in Finc'l Instr. Owned		-0.02		-0.03		-0.32 *
Change in Trading Related Assets		-0.32		0.01		-0.54 ***
Extraord and Discont. Items		1.86		-10.12 ***		-38.15 ***
Adjusted R-squared	0.016	0.396	0.003	0.173	0.044	0.782
Observations	326	326	326	326	326	326

Table 8 - Continued

Panel B: Crisis Periods Only	Net Debt Issuance			Change in Equity Ratio			% Change in Total Assets		
	All	12/88 - 12/92	3/07 - 12/08	All	12/88 - 12/92	3/07 - 12/08	All	12/88 - 12/92	3/07 - 12/08
	1	2	3	4	5	6	7	8	9
Intercept	0.03 **	0.03 *	0.01	0.00	0.00	0.00	0.01	0.14 **	0.03
Net Charge-Offs	-7.49 **	-5.78	-11.25	-0.29	-0.12	-1.43	1.42	1.48	41.22 ***
log(prior quarter Total Assets)							0.00	-0.01	0.00
Number of Acquisitions in Current Quarter							-0.02	0.00	0.02
Divestiture							0.00	0.02 **	0.01
Liabilities & Equity Changes, Dividends:									
Banks with High S-T Debt(t-1) Indicator	0.60	1.56	-0.58	-0.12	-0.08	-0.17	1.23	1.20 *	2.63 **
Net Debt Issuance				-0.04 **	-0.05 ***	-0.08			
Net Debt Issuance $\geq$ 0							0.70 ***	1.00 ***	-0.12
Net Debt Issuance < 0							0.95 ***	0.99 ***	0.86 ***
Net Equity Issuance	-1.14 ***	-3.56 **	-1.21 ***	0.47 **	0.40	0.38 *	1.28 ***	1.49 ***	1.02 ***
Change in Dividend				0.68	6.05	0.86			
Asset Changes:									
Finc'l Instr. Owned(t-1)	-0.06 *	-0.11	-0.02	0.00	0.00	0.00	-0.04		0.08
Change in Finc'l Instr. Owned	1.01 ***	1.30 ***	0.58 ***	-0.06	0.02	-0.14	0.54 ***	0.07 ***	0.83 ***
Change in Trading Related Assets	0.20	0.15	0.41 ***	0.00	0.00	0.04	0.25 **	0.09	0.84 ***
Extraord and Discont. Items	-2.05	-6.18	5.18	-10.51 ***	-8.46 ***	-10.56 *	-17.78	1.42 ***	-47.44 ***
Adjusted R-squared	0.451	0.450	0.434	0.182	0.347	0.162	0.779	0.948	0.745
Observations	198	89	74	198	89	74	198	89	74

Table 9 - Hedge Fund Family and Stock Characteristics During Crises and Booms

Panel A reports fund family characteristics and stock characteristics for the sample of hedge funds, by fund type (constrained or unconstrained) and period (crisis or boom). Constrained and unconstrained funds are defined as in Section 5 and crisis and boom periods are described in Table 1. Fund quarterly flow is scaled by beginning of quarter assets, and fund quarterly return is net the risk-free rate. For stock characteristics, prior year annual excess return is net of the risk free rate. Total assets and Tobin's Q use most recent Compustat filing. Market capitalization and bid/ask spread are as of the previous quarter, using daily data. The Amihud illiquidity measure is defined in Section 5, and is multiplied by 106. Panel B reports detail of decreases in existing positions, by percent of a stock's total market capitalization sold and the average transaction size. Two-tailed t-tests for differences in means and two-tailed Wilcoxon Rank-Sum tests for differences in medians are peformed and statistical significance at the 1%, 5%, and 10% level is indicated with ***, **, and *, respectively.

		All		Constrained Hedge Funds		Unconstrained Hedge Funds		Difference: Constrained - Unconstrained	
		Ave	*Median*	*Ave*	*Median*	*Ave*	*Median*	*Ave*	*Median*
Panel A: Characteristics									
Family Characteristics									
Fund Quarterly Flow	Crisis	0.00	0.01	-0.14	-0.07	0.10	0.04	-0.24***	-0.12***
	Boom	0.04	0.01	-0.10	-0.05	0.13	0.07	-0.23***	-0.13***
	Diff	-0.04***	-0.00**	-0.04***	-0.02**	-0.03	-0.03*		
Fund Quarterly Return	Crisis	0.00	0.01	-0.02	-0.01	0.02	0.03	-0.04***	-0.04***
	Boom	0.05	0.03	0.04	0.02	0.06	0.04	-0.02***	-0.02***
	Diff	-0.05***	-0.02***	-0.06***	-0.03***	-0.04**	-0.04**		
Stock Characteristics (All Holds)									
Prior Year Annual Excess Return	Crisis	0.00	-0.05	-0.01	-0.05	0.03	0.01	-0.04***	-0.06***
	Boom	0.11	-0.07	0.11	-0.09	0.32	0.03	-0.21***	-0.12***
	Diff	-0.11***	0.02***	-0.12***	0.04***	-0.29***	0.02***		
Total Assets ($ million)	Crisis	5,481	582	7,563	1,149	13,106	2,218	-5,543***	-1,069***
	Boom	5,380	717	8,358	1,383	11,005	1,719	-2,647***	-336***
	Diff	101	135***	-795***	-234***	2,101***	499**		
Tobin's Q	Crisis	2.94	1.73	2.83	1.77	3.17	1.98	-0.34***	-0.21***
	Boom	3.69	1.81	3.92	1.94	4.39	2.06	-0.47***	-0.12***
	Diff	-0.75***	-0.08***	-1.09***	-0.17***	-1.22***	-0.08**		
Market Capitalization, Prior Qtr. ($ mil.)	Crisis	12,617	1,959	10,912	1,879	16,206	2,538	-5,294***	-660***
	Boom	10,050	1,355	9,848	1,503	13,774	1,676	-3,926***	-174***
	Diff	2,567***	6,034***	1,064***	376***	2,432**	862***		
Amihud Illiquidity Measure * 10^6	Crisis	0.15	0.15	0.07	0.06	0.05	0.03	0.02*	0.03***
	Boom	0.09	0.08	0.06	0.04	0.05	0.03	0.02***	0.01*
	Diff	0.06***	0.07***	0.01**	0.02***	0.00*	-0.00***		
Bid/Ask Spread: (Bid-Ask)/Bid	Crisis	0.013	0.004	0.010	0.003	0.006	0.003	0.007	0.000
	Boom	0.012	0.012	0.011	0.011	0.009	0.010	0.000	0.001***
	Diff	0.001	-0.008***	-0.001	-0.008***	-0.003***	-0.007***		
Panel B: Detail of Stock Sales									
Percent of Market Cap. Sold	Crisis	0.003	0.000	0.004	0.000	0.003	0.000	0.001	0.000***
	Boom	0.003	0.000	0.003	0.000	0.003	0.001	0.000	-0.001
	Diff	0.000	-0.000***	0.001	-0.000	0.000	-0.001***		
Transaction Size ($ million)	Crisis	4.89	0.78	6.01	0.87	4.82	0.77	1.19***	0.10***
	Boom	3.57	0.69	3.37	0.61	3.52	0.68	-0.015	-0.07*
	Diff	1.32***	0.09***	2.66***	0.26***	1.30***	0.09***		

Table 10: Hedge Fund Sales and Purchases

This table reports detail on the disposition of stocks by hedge funds each quarter, relative to their positions in the prior quarter. Each quarter, an individual stock's position maybe be unchanged, increased, or sold. The "sold" category includes both full and partial sales. Each quarter, the change in market value of each stock is measured relative to its prior position in the fund, and stocks are aggregated by firm by quarter. The Increase in Existing Holdings is the proportion of prior period market value of stocks in which hedge funds increased their holdings. Two-tailed t-tests for differences in means are peformed and statistical significance at the 1%, 5%, and 10% level is indicated with ***, **, and *, respectively.

		All Families	Constrained Hedge Funds	Unconstrained Hedge Funds	Difference: Constrained - Unconstrained
Proportion Unchanged	Crisis	0.09	0.07	0.20	-0.13***
	Boom	0.09	0.08	0.16	-0.08**
	Diff	-0.01	-0.01	0.04	
Proportion Sold	Crisis	0.45	0.51	0.29	0.22***
	Boom	0.44	0.46	0.35	0.11**
	Diff	0.01	0.05**	-0.06	
Proportion with Increases	Crisis	0.25	0.20	0.29	-0.09***
	Boom	0.24	0.23	0.27	-0.04
	Diff	0.01	-0.03*	0.02	
Increase in Existing Holdings	Crisis	0.15	0.16	0.14	0.02
	Boom	0.14	0.12	0.15	-0.03
	Diff	0.01	0.04**	-0.01	

Table 11: Regression Analysis of Hedge Fund Sales and Purchases

Panel A reports results of OLS regressions where the dependent variable is the proportion of stock sold. All indicator variables are multiplied by 100. Specifications 1 to 3 include both crisis and boom periods, and specifications 4 to 7 include only crisis periods. Specifications 2 through 7 include dummy variables for constrained or unconstrained. Specifications 1 to 3, which include all periods (crisis and boom) include a dummy variable set to 1 if the period of interest is a crisis period, and zero otherwise. Finally, specification 3 includes interaction variables of the constrained (unconstrained) indicator variables with the crisis indicator. All standard errors are clustered at the fund and time levels. p-values are reported below coefficients in parentheses. Panel B performs the same regressions, with the dependent variable of net sales (Sold - Increases of Existing Positions). Statistical significance at the 1%, 5%, and 10% level is indicated with ***, **, and * respectively.

Panel A: Dependent Variable: Value of Stock Sold as a Proportion of Prior Period Market Value

	Crisis and Boom Periods			Crisis Periods:			
				All	8/1998 - 1/1999	3/2001 - 11/2001	3/2007 - 12/2008
	1	**2**	**3**	**4**	**5**	**6**	**7**
Intercept	1.02 ***	0.99 ***	1.01 ***	0.93 ***	-0.75	0.94 ***	0.93 ***
Constrained Fund Indicator		8.91 ***	4.55 *	10.98 ***	-9.42	6.23 *	13.19 ***
Unconstrained Fund Indicator		-9.35 ***	-5.12	-11.81 ***		-10.29	-12.61 ***
Crisis Indicator	0.19	0.55	-0.94				
Crisis Indicator **x** Constrained Fund Indicator			6.29 **				
Crisis Indicator **x** Unconstrained Fund Indicator			-6.36				
Quarterly Fund Flow	-0.06 *	0.04	0.04	0.05	-0.30	0.14 *	0.04
Log of Fund Size	-0.04 ***	-0.04 ***	-0.04 ***	-0.04 ***	0.04	-0.03 *	-0.04 ***
Quarterly Return	-0.09	-0.05	-0.04	-0.05	0.03	-0.05	-0.05
Log Fund Age	0.02	0.02	0.02	0.02	0.19 ***	0.05 **	0.01
Fund Incentive Fee	0.00	0.06	0.07	0.23	1.84 ***	-0.04	0.41
Fund Management Fee	7.19 ***	6.89 ***	6.83 ***	6.95 ***	-6.71	6.59	7.48 ***
Adjusted R-squared	0.08	0.11	0.12	0.12	0.31	0.12	0.14
Observations	1,894	1,894	1,894	1,308	42	238	1,028

Table 11 - Continued

Panel B: Dependent Variable: Net Sales

	Crisis and Boom Periods			Crisis Periods:			
				All	8/1998 - 1/1999	3/2001 - 11/2001	3/2007 - 12/2008
	1	**2**	**3**	**4**	**5**	**6**	**7**
Intercept	0.66 ***	0.65 ***	0.66 ***	0.69 ***	-0.16	0.24	0.75 ***
Constrained Fund Indicator		8.89 ***	7.22 **	9.42 ***	-13.72	7.15 *	10.30 ***
Unconstrained Fund Indicator		-8.33 ***	-4.31	-9.99 ***		-15.00 **	-8.80 ***
Crisis Indicator	-1.16	-0.76	-1.13				
Crisis Indicator x Constrained Fund Indicator			2.41				
Crisis Indicator x Unconstrained Fund Indicator			-6.11				
Quarterly Fund Flow	-0.10 ***	0.00	0.00	-0.01	-0.50 ***	0.10	-0.02
Log of Fund Size	-0.02 ***	-0.03 ***	-0.02 ***	-0.03 ***	0.01	-0.01	-0.03 ***
Quarterly Return	-0.19 ***	-0.14 **	-0.14 *	-0.14	0.22	-0.05	-0.16
Log Fund Age	0.02 **	0.02 **	0.02 **	0.03 ***	0.20 ***	0.06 ***	0.03
Fund Incentive Fee	0.05	0.10	0.11	0.07	1.63 *	0.41	0.05
Fund Management Fee	0.99	0.67	0.67	-0.39	-10.66	0.78	-0.04
Adjusted R-squared	0.03	0.05	0.05	0.06	0.34	0.06	0.06
Observations	1,799	1,799	1,799	1,243	40	226	977

Table 12 - Characteristics of Stocks Sold and Not Sold

This table reports detail on stocks that hedge funds sell as compared to stocks they do not sell ("Unchanged" + "Increased" from Table 10). Characteristics are measured in the periods prior to sale. Two-tailed t-tests for differences in means are performed. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

		Sold			Not Sold			Difference:	
		Constrained	Unconstrained	Difference: Constrained - Unconstrained	Constrained	Unconstrained	Difference: Constrained - Unconstrained	Sold - Not Sold (Constrained)	Sold - Not Sold (Unconstrained)
Prior Year Annual Excess Return		-0.01	0.05	-0.06***	0.01	0.02	-0.01	-0.03***	0.02
	Crisis								
	Boom	0.11	0.39	-0.28***	0.07	0.25	-0.18***	0.03	0.14**
	Diff	-0.12***	-0.34***		-0.06***	-0.23***			
Total Assets	Crisis	8,541	11,847	-3,305***	21,950	29,065	-7,103**	-13,408***	17,219***
	Boom	8,230	10,740	-2,510***	21,388	23,715	-2,328	-13,157***	12,975***
	Diff	311	1,107		562	5,350			
Tobin's Q	Crisis	2.86	2.99	-0.13	5.11	4.19	0.92	-2.25***	1.20*
	Boom	3.90	4.61	-0.71***	4.00	5.04	1.04**	-0.10	-0.43
	Diff	-1.04***	-1.62***		1.11	-0.85			
Market Capitalization, Prior Qtr.	Crisis	10,614	16,206	-5,592***	11,435	18,621	-7,186***	-822***	-2,415
	Boom	8,172	13,774	-5,602***	13,223	14,413	-1,190	-5,051***	-639
	Diff	2,442***	2,432**		-1,788***	4,208**			
Amihud Illiquidity Measure *	Crisis	0.08	0.05	0.03*	0.07	0.04	0.03	0.01	0.01
	Boom	0.05	0.05	0.01	0.07	0.07	0.00**	-0.02	-0.02
	Diff	0.03**	0.00***		0.00	-0.03			
Bid/Ask Spread: (Bid-Ask)/Bid									
	Crisis	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.000**
	Boom	0.01	0.01	0.00***	0.01	0.01	0.00*	0.00	0.00
	Diff	0.00	0.00***		0.00	-0.00***			