# LIQUIDITY RISK AND PORTFOLIO DECISIONS: EVIDENCE FROM SYNDICATED LENDING

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## Abstract

Transactions deposits help banks manage liquidity demands from un-drawn lines of credit. Using data on syndicated loan originations, we show that banks with high transactions deposits specialize in lending that comes with systematic liquidity-risk exposure. We show that links from transactions deposits to liquidity exposure are about 50% larger at participant banks than at lead arrangers. Participants also tend to diversify across industries more than lead banks. While a key synergy linking deposits to lending stems from hedging systematic liquidity risk, our results also point to information and monitoring concerns as important determinants of bank portfolio decisions.

# LIQUIDITY RISK AND PORTFOLIO DECISIONS: EVIDENCE FROM SYNDICATED LENDING

## Introduction

Banks provide liquidity both to demand depositors and to borrowers who use lines of credit and un-drawn loan commitments (we use these terms interchangeably).[1] With both products, banks promise their customers cash on demand. The liquidity insurance offered by these products exposes banks to the risk that they will have insufficient cash to meet random demands from their depositors or their borrowers, especially if many customers demand liquidity at the same time. Using syndicated loans data, this paper shows that transactions deposits help banks manage their systematic liquidity risk, particularly for passive banks acting as participants. In contrast, transactions deposits are less important for lead banks, whose responsibilities include not only risk management but also relationship management.

Why do banks provide liquidity through credit lines? Kashyap, Rajan and Stein (2002) (KRS hereafter) explain the combination of transactions deposits and credit lines with a risk-management motive. In their model, as long as liquidity demands from depositors and borrowers are not too correlated, the bank reduces its buffer stock of cash by serving both customers. Holding cash raises costs for both agency and tax reasons (Myers and Rajan, 1998). Thus, their

[1] Early literature attempts to understand how banks' role in liquidity production leads to fragility. Diamond and Dybvig (1983) argue that by pooling their funds in an intermediary, agents can insure against idiosyncratic liquidity shocks while still investing most of their wealth in high-return but illiquid projects. This structure leads to the potential for a self-fulfilling bank run and sets up a policy rationale for deposit insurance. More recent theoretical and empirical studies focus on liquidity risk from the asset side. For example, Berger and Bouwman (2006) document the importance of banks in liquidity production on both sides of bank balance sheets, and show that this role has grown sharply over time. There is also a growing literature showing the liquidity-risk management or liquidity shocks to banks affect loan supply. See Paravisini (2004), Kwaja and Mian (2005), Loutskina (2005) and Loutskina and Strahan (2006).

model yields a synergy because combining transactions deposits with unused loan commitments allows banks to diversify away liquidity shocks. Gatev and Strahan (2006) show that banks are endowed with a unique hedge for the *systematic* risk that occurs when large borrowers increase their demand for bank credit during episodes of reduced market liquidity: offsetting inflows into government-protected transactions deposits. Banks' structure allows them to sell excess liquidity to firms at precisely those times when they need cash because markets are tight. Thus, deposits afford banks a comparative advantage in offering liquidity insurance relative to other financial intermediaries.

In the first part of this paper, we test how transactions deposits affect new originations in the syndicated lending market. Our approach has several advantages over existing studies. First, we measure the relative importance of liquidity exposure in banks' new lending. The existing evidence relies on the stock of off-balance sheet commitments relative to on-balance sheet loans from all past lending. These data (from *Call Reports*) do not allow researchers to separate *ex ante* exposure (i.e. supply) from *ex-post* realizations of liquidity demands because when borrowers draw funds, those funds move onto the lender's balance sheet. In contrast, our dependent variable measures the maximum potential future exposure from lines of credit relative to a bank's total exposure from all new lending (i.e. lines of credit plus term loans). Thus, we can measure banks' ex ante liquidity exposure. Moreover, we control for borrower characteristics in some of our tests, which matter because large borrowers have a greater relative demand for liquidity facilities and because their take-down behavior depends on market conditions (Sufi, 2006).

In the second part of the paper, we separate our measure into exposures faced by lead banks v. participants. This distinction helps us distinguish between relationship management and liquidity-risk management motives. In contrast to lead banks, participants concentrate on funding alone and thus focus on liquidity-risk management to the exclusion of other factors.

In our first set of results, we show that origination of new lines of credit increases with transactions deposits. The result holds under four measures of exposure (the dependent variable) and under various statistical models and specifications (e.g. GLS v. OLS; within v. between regressions; with or without controls for bank and borrower characteristics). We then show that banks with high transactions deposits tilt away from credit and toward liquidity risk: first, they lend more to large borrowers and to rated borrowers, where credit can easily be assessed given the transparency of these firms; second, their loans are less likely to be secured and carry lower interest rates (even controlling for borrower attributes). We then split liquidity exposure into two parts, depending on whether borrowers are rated or unrated. Rated firms tend draw on bank loans when credit supply dries up in the commercial paper and bond markets (Gatev & Strahan, 2006). The link from transactions deposits to liquidity exposure is driven completely by the rated firms, suggesting that transactions deposits hedge *systematic* liquidity shocks. Moreover, there is a weaker link from transaction deposits to exposure to rated firms for term loans than for lines of credit.

In the second set of results, we contrast lending decisions by lead versus participant banks to distinguish between liquidity risk management and relationship management. To provide liquidity, banks need not just cash but also information. Borrowers may draw funds from lines when their access to other sources of liquidity dries up, such as during periods of

reduced creditworthiness. Banks must therefore overcome the information asymmetry between corporate insiders on the one hand and their creditors and investors on the other.[2] In the case of a syndicated loans, the lead bank has the primary responsibility for gathering information about the borrower and managing the relationship over time, including doing 'due diligence' at origination and monitoring of credit risk over the life of the loan.[3] In contrast, participant banks supply funds but are less involved in the relationship on a day-to-day basis. Thus, lead banks are more actively involved in maintaining a relationship with the borrower. Also, participant banks rely on the lead to price the deal correctly. These distinctions between the lead and the participant allow us to develop a second test of the hypothesis that transaction deposits are an important element of bank liquidity risk management. We argue that for participant banks, the decision to originate new loans is driven by the incremental liquidity exposure; hence, the size of the participant's transactions deposit base, which provides systematic liquidity-risk hedging capacity, ought to be a primary driver of its portfolio allocation decisions.

As evidence, we first estimate how bank characteristics shape lenders' role as a lead arranger. Large banks, well-capitalized banks, and banks with high levels of pre-existing loan commitments act mainly as lead members of a syndicate rather than as participants. All of these results are strong both statistically and economically, and suggest the important role played by reputation for the lead bank. The effect of pre-existing loan commitments is particularly

[2] Banks' role as delegated monitor explains why they tend to hold large and well diversified loan portfolios, and why they tend to fund themselves mostly with debt (Diamond, 1984). Deposits – banks' main source of debt – tend to be short term and subject to a 'sequential service constraint', meaning that priority of payment comes on a first-come, first-served basis. This unique capital structure stems from bank-loan opaqueness. Loans make "bad" collateral because outsiders cannot value them; by subjecting themselves to the possibility of a run, banks increase their borrowing capacity against their loans (Calomiris and Kahn, 1991; Flannery, 1994; Diamond and Rajan, 2001).

[3] While the lead bank generally interacts with the borrower, all members of the syndicate retain control rights. For example, renegotiation usually requires unanimous support from all lenders.

striking; its effect on the lead-bank share is nearly as large economically as that of bank size. Commitments expose customers to their lender because access to future funds are only valuable if the lender can credibly commit to pay. Pre-existing loan commitments thus proxies for the bank's reputation (as do size and capital), consistent with our argument that lending decisions for lead banks encompass more than simple risk management considerations on the part of the lender.

In our last test, we separate the sample into two parts, depending on whether a bank acts mainly as a lead or as a passive participant. Portfolio decisions for banks acting as participants ought to reflect risk management motives; for lead banks, however, lending decisions ought to depend on reputation and relationship concerns as well as risk management concerns. Thus, we expect transactions deposits to matter more for participants than leads. We split our sample based on the actual lead-bank share, and based on the predicted lead-bank share from a set of predetermined bank characteristics. In both cases, transactions deposits are positively related to liquidity exposure for both leads and participants, but this effect is about 50% larger for the participant banks.

**Background**

What is the nature of the deposit-lending synergy that allows banks to provide liquidity to both borrowers and depositors? Kashyap, Rajan and Stein (2002) explain the combination of transactions deposits and loan commitments with a risk-management motive. They present a model where as long as liquidity demands from depositors and borrowers are not highly correlated, an intermediary will reduce its costly cash buffer by serving both customers. Holding cash raises costs for both agency and tax reasons (Myers and Rajan, 1998). Thus, the KRS

model yields a diversification synergy between transactions deposits and unused loan commitments. KRS report empirical evidence of a positive correlation across banks between unused loan commitments and transactions deposits. However, they do not test the key implication of their model that by exposing themselves to asset-side and liability-side liquidity risks simultaneously, banks can benefit from a diversification synergy.

Gatev and Strahan (2006) suggest a stronger hypothesis, supported by findings that the correlation is not only low but is often *negative*. They show that a hedging externality can be attributed to transaction deposits because flows into these accounts offset the systematic liquidity risk exposure associated with origination of loan commitments and lines of credit. Gatev and Strahan (2006) extend KRS by considering the possibility that liquidity production could expose banks to systematic liquidity risk. A bank with many open credit lines may face a problem if systematic increases in liquidity demand occur periodically.[4] Gatev and Strahan (2006) show that funding to banks increases when market liquidity declines, meaning that liquidity demands become negatively correlated in tight markets. There are several reasons why banks enjoy funding inflows when liquidity dries up. First, the banking system has explicit guarantees of its liabilities.[5] Second, banks have access to emergency liquidity support from the central bank. Third, large banks such as Continental Illinois have been supported in the face of financial

[4] For example, during the first weeks of October 1998, following the coordinated restructuring of the hedge fund Long Term Capital Management, spreads between safe Treasury securities and risky commercial paper rose dramatically. Many large firms were consequently unable to roll over their commercial paper as it came due, leading to a sharp reduction in the amount of commercial paper outstanding and a corresponding increase in take-downs on pre-existing lines of credit (Saidenberg and Strahan, 1999). As a result of this market pullback, banks faced a spike in demand for cash as many of their largest customers drew funds from pre-existing backup lines of credit.

[5] Deposit insurance limits have recently been expanded for the first time sine 1980. In addition, some small banks have begun to avoid binding limits on deposit insurance by splitting very large deposits across multiple institutions. For a broad discussion for deposit insurance and policy ramifications, see Kroszner and Strahan (2005).

distress (O'Hara and Shaw, 1990). Thus, funding inflows occur because banks are rationally viewed as a safe haven for funds. Consistent with this notion, Pennacchi (2006) finds that during the years before the introduction of federal deposit insurance, bank funding supply did *not* increase when spreads tightened.

Gatev, Schuermann and Strahan (2006) find evidence that supports the notion that inflows into transaction deposits increase the capacity of banks to bear systematic liquidity risk. They show that lower stock return volatility for banks with high levels of both unused commitments and transactions deposits. The results suggest that bank risk, measured by stock return volatility, increases with unused loan commitments, reflecting asset-side liquidity risk exposure. This increase, however, is mitigated by transactions deposits. In fact, risk *does not* increase with loan commitments for banks with high levels of transactions deposits. Gatev et al. also show that these results are stronger during the 1998 'flight to quality'.

The ability of banks to absorb liquidity shocks is especially important during market crises. In a case study, Gatev, Schuermann and Strahan (2005) focus on the behavior of deposit flows *across banks* during the 1998 crisis. During the three-months leading up to the crisis, bank stock prices where buffeted by news of the Russian default, followed by the demise of LTCM in late September, and finally by the drying up of the commercial paper market in the first weeks of October.[6] To understand how banks weathered the 1998 storm, Gatev et al. (2005) explore the

[6] For policy discussion on LTCM, see Edwards (1999). For a discussion of bank exposure to the hedge fund, see Kho, Dong and Stulz (2002) and Furfine (2002). Chava and Purnanadam (2005) provide evidence that the CP market ceased to function at the beginning of October 1998. They compare abnormal returns for firms with and without access to this market. They show first that stock prices of CP issuers fell much less than other firms when bank financial condition deteriorated during September of 1998 (while markets continued to function). During the first two weeks of October, however, the stock prices of *all* firms, regardless of their ability to access the CP market, fell equally. Thus, *all* firms became bank dependent – even CP issuers - during these weeks because CP markets ceased to function and even large corporations relied on banks for liquidity.

cross-sectional patterns in deposit flows. They found that first, investors moved funds from markets into banks; second, banks with higher levels of transactions deposits before the crisis had the largest flows of new money during the crisis; and third, that *all* of the flows of new money were concentrated in bank demand deposits. This evidence indicates that banks structured to bear increased demands for liquidity from borrowers (i.e. banks with transactions deposits) could meet those demands easily (because money flowed into those accounts). Thus, while government safety nets can explain why banks generally receive funding during crises, the evidence from Gatev et al. as well as Kashyap et al. suggests that the structure of banks also is important.

Before the introduction of government safety nets, transactions deposits tended to expose banks to liquidity risk when consumers removed deposits en-masse, either to increase consumption or because they had lost confidence in the banking system. This bank-run problem has traditionally been viewed as the primary source of liquidity risk and creates a public policy rationale for FDIC insurance as well as reserve requirements for demand deposits (Diamond and Dybvig, 1983). Today, in crisis investors run to banks, not away from them (at least they do in the U.S.). And, banks funded with transactions accounts receive the inflow. Thus, rather than open banks to liquidity risk, transactions deposits today help banks hedge that risk, which now stems more from the lending side.

**Data**

We build our measures of liquidity exposure from the syndicated loan originations data in Loan Pricing Corporation's *Dealscan*, which offers the most complete record of bank lending to large businesses currently available. *Dealscan* provides data on the identity of the borrower, the

name and role of each lender (lead v. participant), the percentage of each loan funded by each lender, the loan amount, the loan type (lines of credit versus term loans), and price and non-price terms (collateral & maturity).[7] For each loan in *Dealscan* we identify all lenders, and we then compute the total amount of new lending made by each lender by summing across the dollar amount committed by that lender during each year from 1991 to 2005. We split the commitments into amounts with liquidity risk (lines of credit) and amounts without liquidity risk (other loans).[8]

*Dealscan* contains limited information about borrowers, such as sales during the year prior to the loan, the credit rating at the close of the loan (if the borrower is rated), and the industry. We use these data to compute the average borrower size for each bank, equal to the log of average sales during the year prior to loan origination, the fraction of commitments to borrowers with a credit rating, and the fraction of commitments to borrowers in each of nine one-digit SIC-code bins. We test how the inclusion of these firm controls affects our main results.[9] As a caveat, we remind the reader that while *Dealscan* offers the most complete loan data available, it does provide better coverage for large, public companies than for smaller companies because LPC relies mainly on SEC filings by firms to build their dataset.

[7] *Dealscan* also contains some information on covenants in text fields.

[8] *Dealscan* records the facility type for each loan. We code the following three types as lines of credit: "Revolver/Line < 1 Yr.", "Revolver/Line >= 1 Yr.," and "364-Day Facility." There are some facilities that are neither liquidity nor standard term loans such as standby letters of credit. Our results are robust to dropping these loans.

[9] In future research we plan to extend our exploration of the role of borrower characteristics beyond size and rating.

For bank characteristics, we merge the *Dealscan* annual aggregate data to the *Call Reports* from the end of year previous year.[10] *Call Reports* contain data on bank size (assets), liability structure, capital, and balance-sheet liquidity, all of which we use in our main tests.

After combining the two datasets we are left with an unbalanced panel spanning 1991 to 2005, with bank-year as the unit of observation. The sample period reflects several data limitations. First, prior to 1991, *Dealscan* coverage was relatively poor. Second, there are no data from *Call Reports* on unused commitments prior to 1991. The final sample includes about 120 (mostly large) banks per year, or between 1,400 and 1,700 observations overall (depending on the set of controls included in the model).

**Research Design & Summary Statistics**

We are interested in whether transactions deposits provide a hedge for liquidity risk exposure using an OLS regression setup. In our benchmark tests, we estimate regressions with the following structure:

$$\textit{Incremental liquidity exposure}_{i,t} = \alpha_t + \beta_1 \textit{Transactions Deposit/Total Deposits}_{i,t-1} + \beta_2 \textit{Prior liquidity exposure}_{i,t-1} + \textit{Other controls}_{i,t-1} + \varepsilon_{i,t},$$

where $i$ is an index for banks; $t$ is an index for years; and $\alpha_t$ equals a year-specific intercept. We include the annual time dummies to sweep out trends such as the gradual decline over time in bank deposits.

[10] *Call Report* data are available at the website of the Federal Reserve Bank of Chicago (http://www.chicagofed.org/economic_research_and_data/).

We follow KRS in using the ratio of transactions deposits to total deposits as our measure of the potential hedge afforded by combining liquidity exposure on both sides of the bank balance sheet. Based on the notion that transaction deposits hedge liquidity risk exposure, we expect that $\beta_1 > 0$. On the other hand, prior commitments could be negatively correlated with incremental liquidity risk exposure (reflecting a bank's hesitance to become too exposed to liquidity), or positively correlated with incremental liquidity exposure (reflecting a bank's market specialization).

Our dependent variable equals the relative importance of liquidity to a bank's total new lending during the year, where: *Incremental Liquidity Exposure*$_{i,t}$ = (New commitments on lines of credit$_{i,t}$) / (new commitments on lines$_{i,t}$ + new commitments on term loans$_{i,t}$). We use four proxies to construct new commitments for bank *i* in year *t:*

(1) New commitments$_{i,t}$ = $\Sigma_j$ Commitment$_{i,j,t}$*share$_{i,j,t}$ (*j* indexes new loans)

(2) New commitments$_{i,t}$ = $\Sigma_j$ Commitment$_{i,j,t}$*maturity$_{i,j,t}$*share$_{i,j,t}$

(3) New commitments$_{i,t}$ = $\Sigma_j$ Commitment$_{i,j,t}$*(1/N$_{i,j,t}$)

(4) New commitments$_{i,t}$ = $\Sigma_j$ Commitment$_{i,j,t}$*maturity*(1/N$_{i,j,t}$)

As noted, the numerator of our liquidity measure includes commitments on just lines of credit, whereas the denominator includes commitments for all types of new loans. Thus, the ratio measures the relative importance of new lending that exposes the bank to liquidity risk. The first measure uses the *Dealscan* data on each bank's share of funding (*share*$_{i,j,t}$). This variable, however, is missing for a large number of observations (more than 50%), so we construct a second measure in which each bank's share is assumed to equal 1/number of

participants ($N_{i,j,t}$). The other two measures weight the commitment amounts by the maturity of the loan.

For control variables, we include bank characteristics (from the fourth quarter of the year before banks' new loans were originated, labeled *t-1*) and contemporaneous borrower characteristics. The bank characteristics include the following:

*Prior liquidity Exposure* = Existing un-drawn commitments / (loans + commitments)

*Deposits* = Total deposits / assets

*Bank size* = Log of assets

*Capital ratio* = Book value of equity / assets

*Balance-sheet liquidity* = (Cash + securities) / assets

Table 1 reports summary statistics. This table illustrates the advantage of using *Dealscan* data rather than the *Call Report* data used in previous studies. For example, the dollar-weighted share of new loans with liquidity exposure ranges from 65% to 79% for the average bank in a given year, whereas previous studies using only *Call Report* data report a much lower number. For example, KRS report a median value of just 26% for large banks, near the 30% mean reported here. Part of this difference occurs because exposure from *Call Reports* includes draw-down realizations; once a borrower draws funds from a line, those funds move from the off-balance sheet accounts onto the lender's balance sheet. Thus, the old variable contains substantial measurement error. This commitment ratio could be low, for example, either because the bank chose not to supply much liquidity, or because the bank experienced an unusually high

realization of liquidity demand. Table 1 also highlights the fact that our sample focuses mainly on the largest banks. The mean size, for example, equals $33 billion in assets.

Table 1 also reports summary statistics for the lead share for each bank-year. This variable is constructed in a similar way to our measure of liquidity exposure, where for each bank we sum its total lending in which it acts as the lead lender, relative to its total new lending during the year. The four measures range from 0.28 to 0.37, although some of our banks are almost always lead lenders while others are almost always participants. For example, in 2001 *Dealscan* reports that First Merit bank participated in 10 loans, but only as a participant. In contrast, *Dealscan* records that Citibank acted as a lead bank in 95% of its total 2001 lending (almost 1,000 loans).

**Baseline Results**

Table 2 reports the benchmark regression results. We estimate the model for the first measure of liquidity exposure in which we use the information on each bank's actual lending shares within the syndicate (measure 1 above). Loans for which the share is missing are not included. Each regression includes unreported time effects, and we cluster the residual at the bank level in computing standard errors. To establish the main result, moving from the left to right columns we report a series of models in which we introduce an increasing number of control variables.

As the table shows, the effect of transactions deposits on the liquidity exposure variable is stable across these six specifications. The coefficient on transactions deposits equals 0.44 in the simplest model, which includes only annual time indicators, falls to 0.37 when we add the log of bank assets, and then remains at that level as we add past commitments, total deposits to

assets, capital to assets, and the balance sheet liquidity ratio. The fit of the model improves with these additional variables, but the basic finding does not. In all six models the key coefficient is statistically significant at better than one percent. Moreover, the effect of transactions deposits is economically large. A standard deviation increase in this variable comes with an increase in lending that exposes the bank to liquidity risk of about 4.3 percentage points (0.36 * 0.12 = 0.043). This effect is similar in magnitude to the effect of a standard deviation increase in the log of bank assets ($\sigma = 1.48$), where a standard deviation increase comes with an increase in liquidity exposure of about 4.4 percentage points (1.48 * 0.03 = 0.044).

In Table 3, we test whether the results vary with our measure of liquidity exposure, the dependent variable. In this table, we report regressions using each of the four measures of bank liquidity exposure defined above. (Column 1 of Table 3 replicates column 6 of Table 2.) The table shows that banks with more transactions deposits expose themselves to more liquidity risk in subsequent lending relative to other banks across all four measures. Coefficient magnitudes are larger when we use all loans to build the dependent variable (comparing columns 1 & 3 with 2 & 4). This difference makes sense because columns 2 & 4 implicitly give more weight to participant banks relative to lead banks (lead-bank share averages around 30%, compared to about 10% for participants), and, as we show below, the relationships that we estimate are stronger for participant banks. Magnitudes are not affected by whether or not we weight commitments by maturity (comparing columns 1 & 2 with 3 & 4). This similarity may reflect the distinction between contractual maturity (observable) and de facto maturity (unobservable). Contractual maturity for 22% of the lines of credit equals 364 days exactly, presumably to avoid

a capital requirement on the un-drawn funds under the Basel I Capital Accord.[11] Banks routinely roll over these "364-day facilities" each year, however, so the de facto maturity may be much longer than what we can observe.

Tables 2 & 3 also show that large banks are more active suppliers of liquidity facilities than smaller banks, which may in part reflect the greater demand for liquidity from large borrowers that are more likely to be served by large banks. In addition, large banks may be better able to manage liquidity risk than smaller banks. For example, large banks typically have better access to overnight liquidity in the Federal Funds market than smaller banks. Also, we find a negative correlation between the capital ratio and the relative importance of liquidity. This negative relationship could in part reflect the impact of the Basel I capital treatment for un-drawn commitments (zero for loans with maturity less than one year), and because the expected loss on lines of credit is lower than expected losses on term loans.

*Robustness Tests*

We have checked several (unreported) robustness tests on the statistical procedure that we have used to estimate our baseline models. First, we have estimated a weighted least-squares procedure, where weights depend on the number of loans originated by a bank during the year. The logic of this weighting scheme is that there may be less error in the dependent variable, and hence less variance in the residual, for banks making more loans. This weighting approach, however, boils down to giving more weight to large banks. These results are qualitatively consistent for the transactions deposit coefficient and remain statistically significant (t-statistics

[11] Under the 1988 Basel I Capital Accord, capital requirements for un-drawn loan commitments under one year equal zero. For off-balance sheet loan commitments above one year, however, banks are required to hold capital reflecting the credit quality of the counterparty (crudely measured). This regulatory loophole will be closed under the revision to the Capital Accord ("Basel II").

> 3), although the coefficient magnitudes fall somewhat. The effect of bank size in the weighted regression falls and loses statistical significant.

In a second set of tests, we have added a bank-specific component to the error term and compute both the 'within' and 'between' estimator. Here we again find similar results. Relative to the pooled OLS model in Table 1, column 1 (transaction deposit coefficient = 0.36), the between estimator equals 0.49 (t-statistic = 3.12) and the within estimator equals 0.26 (t-statistic = 2.04). The 'between' estimator essentially builds off a single cross-section, based on the time-series averaged data for each bank. As an alternative, we have estimated year-by-year cross sectional regression and find that the positive effect of transactions deposits is consistent over time.

Third, we have compared the relative share of liquidity risk born by non-bank lenders in the *Dealscan* sample compared to all banks (even those that we are not able to match to Call Report). If transactions deposits afford banks a special ability to bear liquidity risk, then banks should expose themselves to more liquidity risk relative to other intermediaries without access to deposits. The non-bank lenders include investment banks, pension funds, hedge funds and finance companies. As shown in Table 1, about 75% of banks' overall exposure in lending is associated with liquidity in our sample. This percentage is similar using all banks in *Dealscan*. For non-banks, the percentage of exposure in liquidity facilities is only around 30%; and the 40 percentage point gap remains stable over time. In particular, there is no trend toward convergence in these portfolio shares.[12]

[12] This difference is even evident controlling for borrower fixed effects. In other words, there are many deals with both a liquidity facility and a term loan. Typically banks fund most of the liquidity facility, while non-bank lenders are more likely to specialize in funding only the term loan piece.

**Borrower Characteristics & Loan Terms**

If banks with high levels of transactions deposits have a comparative advantage in bearing liquidity risk, we would expect to see this advantage shape not only the type of product offered but also the kinds of borrowers served. In Table 4, we regress average borrower size and the share of loans to rated firms (based on the loans originated during the bank-year) on prior-year bank characteristics (columns 1 and 2). Banks with liquidity hedging capacity tilt their lending toward larger firms and rated firms – firms where credit quality is relatively easy to assess and where liquidity risk, particularly systematic liquidity risk, is likely to be more important. We have also regressed the share of banks' exposure to rated firms on the same set of variables separately for lines of credit and for term loans (not reported). The effect of transactions deposits on banks' exposure to rated firms is roughly twice as large for lines of credit as for term loans, and this difference is statistically significant at the one percent level.

The last two columns of Table 4 explore how two loan terms – the share of loans secured by collateral and the average all-in spread over LIBOR – vary with bank and borrower characteristics. Banks with transactions deposits tend to make loans with less collateral (significant at the 10% level) and with lower interest rates (significant at 5%); since both of these loan terms are protection to the lender against default, this again suggests that transactions deposits give lenders a comparative advantage in bearing liquidity risk (relative to credit risk). In contrast, we find a positive (but not significant) relationship between transactions deposits and the fees charged on the un-drawn commitments under bank lines of credit (not reported).[13]

[13] Loan maturity is not correlated with the transaction deposits ratio.

In Table 5, we refine the basic test by adding borrower characteristics – log of average sales and the share of loans to rated borrowers, along with nine industry-share variables – to the right-hand side of the benchmark regressions. Adding these variables reduces the effect of bank size (because large banks tend to lend more to large, rated borrowers), but leaves the other coefficients similar to those from the benchmark model. Again, we find that banks with more transactions deposits focus more on lending that exposes them to liquidity risk. Moreover, we also find in these regressions that the total-deposits-to-assets ratio also has a positive and significant coefficient.

Table 6 decomposes the liquidity exposure into two components, one stemming from rated borrowers and the other stemming from unrated borrowers. Liquidity demanded from rated borrowers should capture systematic liquidity risk exposure of the lender better than unrated borrowers' demand because rated borrowers normally rely on markets for their primary source of funds and only use bank liquidity as insurance against market pullbacks. The results indicate that *all* of the positive association between transactions deposits and liquidity exposure comes from these large rated firms.[14] The coefficient on the exposure from unrated firms is consistently small, negative and not statistically significant. This result is consistent with the implications of KRS and Gatev and Strahan (2006) - transactions deposits provide a hedge for the liquidity risk exposure of the bank, and this hedge acts most powerfully when borrower demands for liquidity are likely to impose a systematic risk on the lender.

[14] Because the sum of dependent variables in Table 6 equal those used earlier, the coefficients in the model for rated and unrated exposures (e.g. columns 1 & 5, 2& 6, etc.) add up to the coefficients from Table 3.

**Lead vs. Participant Banks**

To better understand these effects, we next consider separately each bank's exposure to liquidity risk, depending on whether the bank acts mainly as a lead lender (i.e. the bank has above-median share of loans as a lead) or not (i.e the bank has below-median share of loans as a lead).[15] Our identifying assumption is that participant banks rely on the lead lender for negotiation and pricing of loans, and they also rely to a large though not perfect degree on the lead in cases of covenant violations or default. Thus, the pure risk management advantage of transactions deposits ought to matter more for banks that act mainly as passive participants, while the lead bank has to take account not only of diversification but also its ability to understand the borrower and monitor over the life of the loan. Lead banks as monitors of the borrower face a moral hazard problem relative to participants. This problem is solved in part through incentives (e.g. lead banks keep some 'skin' in the game by holding the largest piece of syndicated loans, and they do so more when borrowers are opaque) and in part though reputation.[16] Thus, risk management is likely to be second order in importance for lead banks.

Before we test our main hypothesis, we first validate the identifying assumption by testing how bank characteristics correlate with a bank's role as a lead arranger in the syndicated

[15] In classifying banks, we rely on *Dealscan's* lender role variable. We define any bank that plays an active role as a 'lead' bank; passive banks we call 'participants.' The *Dealscan* variable takes on many different values for banks that are 'active'. For example, 18% of the observations are coded as 'admin agent'; 7.5% are coded as 'co-agent'; 6.5% as 'documentation agent', and so on. In about 46% of the observations, a bank is coded as 'participant'. In constructing our lead-bank share, we define a bank as playing some kind of active role if *Dealscan* does not code the bank as 'participant'.

[16] For example, Dennis & Mullineaux (2000), Lee & Mullineaux (2004), Jones, Lang and Nigro (2005) and Sufi (2007) all report evidence that the share of the lead bank and the concentration of the syndicated reflect borrower opacity and the resulting moral hazard problem. Ivashina (2007) uses risk management concerns (industry-level diversification) as an instrument that shifts a lead bank's willingness to fund a fraction of a loan and finds that prices reflect the lead bank's incentive to monitor effectively. Her study suggests that lead banks trade off risk management concerns against their need to preserve monitoring incentives.

lending market. Table 7 reports these results using the same basic structure as above. The dependent variable equals the dollar-weighted share of commitments (both lines and term loans) for which the bank acts as the lead, and the explanatory variables are the same as those in Tables 2 – 6 above. As before the unit of observation is the bank-year, all regressions include annual time effects, and standard errors are built by clustering at the bank level.

We find three bank characteristics matter. First, lead banks tend to be large, although this result only shows up when we control for average borrower size. Second, banks with high levels of pre-existing un-drawn loan commitments are more active as leads. This second result is large economically; a one standard deviation increase in commitments comes with an increase in the lead-bank share of about seven percentage points (relative to the mean of about 30%). This effect is almost as large as a standard deviation increase in bank size (which increases the lead share by about 10 percentage points). Third, the capital-asset ratio is positively related to lead bank share. A standard deviation increase in capital comes with an increase in the lead share of about three percentage points. We find no correlation between transactions deposits and the lead-bank share.

The last two results, linking past commitments and capital to the lead-bank share, are consistent with the special role played by lead arrangers. The lead bank must be trusted by participants because the leader prices the deal and monitors the borrower; loan commitments here (along with size) acts as a proxy for a bank's reputation, since bank customers have counter-party exposure to their lender when they have access to un-drawn loan commitments. Capital is also an important input for lead banks, both as another proxy for reputation and because lead banks face underwriter risk when they guarantee a commitment to borrowers. For example, if demand from participant banks is lower than expected, the lead bank must have the capital to

hold a larger fraction of the loan than initially anticipated. These results thus validate the main assumption underlying our final test, the idea that the pure risk management motivation of combining transactions deposits with loan commitments ought to matter most for the passive participant banks relative to lead banks.

In Tables 8 and 9, we re-estimate our model of liquidity exposure after splitting the sample based the actual or predicted lead-bank share. In Table 8, we split at the median of the actual lead-bank share. In Table 9, we split at the median of the predicted lead-bank share (based on the regression in column 3 of Table 7). This second split depends only a bank's characteristics in the prior year. Also, this second split is not based on bank size – the coefficient on size is close to zero in the lead-bank models that exclude borrower characteristics. The latter are excluded because they depend on the current year's loan portfolio allocation and are thus not predetermined relative to the dependent variable (similar to the problem with splitting on the current year's lead share).

In both tables we find a larger effect of hedging-capacity on loan portfolio decisions for passive investor banks. For the participants, the coefficient on transactions deposits ranges from 0.38 to 0.49 when we split based on the actual lead-bank share (Table 8), and from 0.40 to 0.56 when we split by the predicted lead-bank share (Table 9). In contrast, for banks that specialize in *leading* loan syndicates, the coefficient ranges from 0.21 to 0.32 when we split by actual lead-bank share, and from 0.16 to 0.26 when we split by the predicted lead-bank share. These results confirm our central argument that transactions deposits are critical for systematic liquidity risk management, which in this case is the primary risk management objective of syndicate participant banks.

In the last regressions (Table 10), we estimate the link from bank characteristics to a simple measure of the concentration of their lending positions, equal to the sum of squared shares of all lending exposures to firms by 2-digit SIC code. This measure approaches zero for banks with lending diversified widely across industries, and it approaches one for banks that specialize in a single industry. We find a strong negative correlation between bank size and this index, as one would naturally expect (Demsetz and Strahan, 1997). We also find a positive relationship between a bank's activity as lead and this measure of diversification. The positive correlation suggests that lead banks specialize in certain industries relative to banks that act as passive participants. As before, this correlation supports our identification assumption: lead banks place less emphasize on risk management relative to passive participants. Intuitively, the lead bank's role as primary monitor and relationship manager entails a more concentrated portfolio, while participants diversify risk exposures by lending across a wide variety of industries, and they offset the liquidity exposure by combining lines of credit with their transactions deposit base.

In another set of (unreported) tests, we have also decomposed our initial dependent variable into two parts, one reflecting the total commitments made on lines where a given bank acts as the lead lender, and the other reflecting total commitments on lines where the bank acts only as a passive participant.[17] In this approach, there are two liquidity measures for each bank. We use the same denominator as before (total exposure), so the sum of these two variables equals the original measure of liquidity exposure from the prior tables. This decomposition allows us to separate the relationship management motive (attributed to the lead bank) from the pure liquidity risk management motive (which we assume drives the portfolio decisions of

[17] This last test is not reported here but it available from the authors.

participant banks) without splitting the sample. In other words, we are testing whether banks manage their own liquidity exposure differently depending on whether or not they act as lead on a given loan. These results are similar to the approach where we split the sample based on a bank's overall emphasis on lead lending. That is, we find that the effect of transactions deposits is about 50% larger for banks' liquidity exposures as participants compared to their exposures as leads.

**Conclusions**

Banks with more transactions deposits have a comparative advantage in supplying lines of credit – loans that expose them to the possibility of unexpected demands for cash. The advantage stems from two sources. First, by combining transactions deposits and loan commitments, a bank can hedge out the idiosyncratic demands for liquidity from depositors and borrowers. Second, because safety nets protect deposits, investors tend to move money into banks during periods of market turmoil. These funding inflows provide a natural hedge for unexpected liquidity shortages during market-wide shocks, and they help banks supply credit when markets would not do so.

Our results show that banks' funding advantage shows up most notably in lines of credit to rated firms, where liquidity risk is likely to contain a significant systematic component, and also when banks act mainly as passive participants. Lead banks are responsible for information production and monitoring the relationship with the borrower over time; hence, their specific liquidity position is less important in driving their portfolio decisions. Our results do support the idea that a key synergy linking deposits to lending stems from liquidity risk, but they also point to information and monitoring concerns as important determinants of bank portfolio decisions.

## References


Berger, A.N. and C.H.S. Bouwman, 2006, "The Measurement of Bank Liquidity Creation and the Effect of Capital," Available at SSRN: http://ssrn.com/abstract=672784; September.

Berlin, M. and L. J. Mester, 1999, "Deposits and Relationship Lending," *Review of Financial Studies* 12, 579-607.

Bitler, M. P., A. M. Robb, and J. D. Wolken, 2001, Financial Services used by Small Businesses: Evidence from the 1998 Survey of Small Business Finance, *Federal Reserve Bulletin*, 183-205.

Boyd, J. and M. Gertler, 1994, "Are Banks Dead? Or, Are the Reports Greatly Exaggerated?" Federal Reserve Bank of Minneapolis, *Quarterly Review* (Summer), 1-19.

Calomiris, C., 1989, "The Motivations for Loan Commitments Backing Commercial Paper," *Journal of Banking and Finance* 13, 271-277.

Calomiris, C., 1994, "Is the Discount Window Necessary: A Penn Central Perspective," *Federal Reserve Bank of Saint Louis Review*, 31-55.

Calomiris, C., and C. Kahn, 1991, "The Role of Demandable Debt in Structuring Optimal Banking Arrangements," *American Economic Review* 81, 497-513.

Chava, S. and A.K. Purnanandam, 2006, "The Effect of Banking Crisis on Bank-Dependent Borrowers," EFA 2006 Zurich Meetings Available at SSRN: http://ssrn.com/abstract=821804; July.

Demsetz, R. S., and P. E. Strahan, 1997, "Diversification, Size, and Risk at Bank Holding Companies," *Journal of Money, Credit and Banking* 29, 300-313.

Diamond, D., 1984, "Financial Intermediation and Delegated Monitoring," *Review of Economic Studies* 51, 393-414.

Diamond, D., and P. Dybvig, 1983, "Bank Runs, Deposit Insurance, and Liquidity," *Journal of Political Economy* 91, 401-419.

Diamond, D., and R. G. Rajan, 2001, "Liquidity Risk, Liquidity Creation and Financial Fragility: A Theory of Banking," *Journal of Political Economy* 91, 401-419.

Dennis, Steven A. and Donald Mullineaux, 2000, "Syndicated Loans," *Journal of Financial Intermediation* 9, 404-26.

Edwards, F., 1999, "Hedge Funds and the Collapse of Long-Term Capital Management," *Journal of Economic Perspectives* 13, 189-209.

Fama, E. F., 1985, "What's Different about Banks?" *Journal of Monetary Economics* 15, 29-39.

Flannery, M., 1994, "Debt Maturity and the Deadweight Costs of Leverage: Optimally Financing Banking Firms, *American Economic Review* 84, 320-331.

Furfine, C., 2002, "The Costs and Benefits of Moral Suasion: Evidence from the Rescue of Long-Term Capital Management," BIS Working Paper No. 103; FRB Chicago Working Paper No. 2002-11 Available at SSRN: http://ssrn.com/abstract=286453; June; forthcoming in the *Journal of Business*.

Garber, P., and D. Weisbrod, 1990, "Banks in the Market for Liquidity," working paper no. 3381, National Bureau of Economic Research.

Gatev. E., 2006, "Liquidity Risk and Limited Arbitrage: Are Taxpayers Helping Hedge Funds Get Rich?" Working Paper, Carroll School of Management, Boston College.

Gatev, E., and P. E. Strahan, 2006, "Banks Advantage in Hedging Liquidity Risk: Theory and Evidence from the Commercial Paper Market," *Journal of Finance* 61, 867-892.

Gatev, E., T. Schuermann, and P. E. Strahan, 2005, "How Do Banks Manage Liquidity Risk? Evidence from the Equity and Deposit Markets in the Fall of 1998", in Mark Carey and René Stulz (eds.), *Risks of Financial Institutions*, Chicago, IL: University of Chicago Press.

Gatev, E., T. Schuermann, and P. E. Strahan, 2006, Managing Bank Liquidity Risk: How Deposit-loan Synergies Vary With Market Conditions, forthcoming in the *Review of Financial Studies.*

Jones, Jonathan, William Lang and Peter Nigro, 2005, "Agent Bank Behavior in Bank Loan Syndications," *Journal of Financial Research* 28, 385-402.

Ivashina, Victoria, 2007, "Agency Effects on Syndicated Loan Rates," unpublished working paper, Harvard Business School.

Kane, E., 1974, "All for the Best: The Federal Reserve Board's 60th Annual Report," *American Economic Review* 64, December, 835-850.

Kashyap, A. K., R. G. Rajan, and J. C. Stein, 2002, "Banks as Liquidity Providers: An Explanation for the Co-existence of Lending and Deposit-Taking," *Journal of Finance* 57, 33-74.

Khwaja, A. I., and A. Mian, 2005, "Tracing the Impact of Bank Liquidity Shocks," mimeo, Working Paper, Graduate School of Business, University of Chicago.

Kroszner, R. S., and P. E. Strahan, 2005, "Bank Regulations in the United States: Causes, Consequences and Implications for the Future," Working Paper, Carroll School of Management, Boston College.

Kho, B., D. Lee, and R. M. Stulz, 2000, "US Banks, Crises and Bailouts: From Mexico to LTCM," *American Economic Review* 90, 28-31.

Lee, Sang Whi and Donald J. Mullineaux, 2004, "Monitoring, Financial Distress, and the Structure of Commercial Lending Syndicates," *Financial Management* 33, 107-30.

Loutskina, E., 2005, "Does Securitization affect Bank Lending? Evidence from Bank Responses to Funding Shocks," Working Paper, Carroll School of Management, Boston College.

Loutskina, E., and P. E. Strahan, 2006, "Securitization and the Declining Impact of Bank Financial Condition on Loan Supply: Evidence from Mortgage Acceptance Rates," Working Paper, Carroll School of Management, Boston College.

Mester, L., L. Nakamura, M. Renault, 2006, "Transactions Accounts and Loan Monitoring," Federal Reserve Bank of Philadelphia Working Paper No. 04-20; forthcoming in *Review of Financial Studies*.

Mishkin, F., and P. E. Strahan, "What will Technology do to Financial Structure?" 1998, in *The Effect of Technology on the Financial Sector*, Brookings-Wharton Papers on Financial Services, edited by R. Litan and A. Santomero, 249-87.

Myers, S. C., and R. G. Rajan, 1998, "The Paradox of Liquidity," *Quarterly Journal of Economics* 113, 733-71.

O'Hara, M., and W. Shaw, 1990, "Deposit Insurance and Wealth Effects: The Benefit of Being Too Big to Fail," *Journal of Finance* 45, 1587-1600.

Paravisini, D., 2004, "Constrained Banks, Constrained Borrowers: The Effects of Bank Liquidity on the Availability of Credit," Working Paper, MIT.

Pennacchi, G., 2006, "Deposit Insurance, Bank Regulation and Financial System Risk," *Journal of Monetary Economics* 53, 1-30.

Saidenberg, M. R., and P. E. Strahan, 1999, "Are Banks Still Important for Financing Large Businesses?" 1999, Federal Reserve Bank of New York's *Current Issues in Economics and Finance* 5(12), 1-6.

Stiroh, K., 2005, "New Evidence on the Determinants of Bank Specific Risk," Working Paper, Federal Reserve Bank of New York; forthcoming in the *Journal of Financial Services Research.*

Strahan, P. E., 2005, "Banking Structure and Lending: What We Do and Do Not Know," Working Paper, Carroll School of Management, Boston College.

Sufi, A., 2006, "Bank Lines of Credit in Corporate Finance: An Empirical Investigation," Working Paper, Graduate School of Business, University of Chicago; forthcoming in *Review of Financial Studies*.

Sufi, A., 2007, "Information Asymmetry and Financing Arrangements: Evidence from Syndicated Loans," *Journal of Finance* 62(2), 629-68.

**Table 1: Summary Statistics**

This tables reports summary statistics for bank-year variables on loan allocations and lender characteristics. The sample includes roughly 120 banks per year (those that we could match by name from Dealscan to the Call Reports), over the 1991 to 2005 period.

| | Mean | Standard Deviation |
|---|---|---|
| *Share of Loans with Liquidity Exposure (Dollar-weighted share new loans in lines of credit)* | | |
| Loans with Lender Share | 0.76 | 0.29 |
| All Loans[1] | 0.69 | 0.31 |
| Maturity-Weighted Loans, with Lender Share | 0.73 | 0.30 |
| Maturity-Weighted, all Loans | 0.65 | 0.31 |
| *Lead Share (Dollar-weighted share of new Loans where bank is lead)* | | |
| Loans with Lender Share | 0.37 | 0.35 |
| All Loans[1] | 0.29 | 0.34 |
| Maturity-Weighted Loans, with Lender Share | 0.36 | 0.35 |
| Maturity-Weighted, all Loans | 0.28 | 0.34 |
| Bank Assets (billions of dollars) | $33 | $91 |
| Undrawn Commitments / (Commitments+Loans) | 0.30 | 0.14 |
| Transactions Deposits / Deposits | 0.25 | 0.12 |
| Total Deposits / Assets | 0.74 | 0.12 |
| Capital / Assets | 0.08 | 0.02 |
| Marketable Securities / Assets | 0.23 | 0.12 |

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.

**Table 2: Regression of Share of Loan Originations with Liquidity Risk on Lender Characteristics**

This table reports a regression of the share of a bank's new loans that are lines of credit and thus expose the bank to future liquidity exposure, as a function of the prior year's characteristics. The unit of observation varies by bank-year. The sample includes about 120 banks per year, from 1991 to 2005. All regressions include year indicator variables.

| | Dependent Variable = L/C Share, using loan shares | | | | | |
|---|---|---|---|---|---|---|
| Transactions Deposits / Deposits | 0.44 | 0.37 | 0.37 | 0.37 | 0.36 | 0.36 |
| | (4.38)** | (3.93)** | (3.77)** | (3.91)** | (3.94)** | (3.83)** |
| Log of Bank Assets | - | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 |
| | - | (4.75)** | (4.01)** | (4.84)** | (4.72)** | (3.76)** |
| Undrawn Commitments / (Commitments+Loans) | - | - | 0.02 | 0.02 | 0.03 | 0.02 |
| | - | - | (0.32) | (0.38) | (0.55) | (0.34) |
| Total Deposits / Assets | - | - | - | 0.24 | 0.20 | 0.16 |
| | - | - | - | (2.44)* | (2.04)* | (1.72) |
| Capital / Assets | - | - | - | - | -1.67 | -1.84 |
| | - | - | - | - | (3.37)** | (3.75)** |
| Marketable Securities / Assets | - | - | - | - | - | -0.19 |
| | - | - | - | - | - | (2.29)* |
| Observations | 1,460 | 1,460 | 1,460 | 1,460 | 1,460 | 1,460 |
| R-squared | 0.07 | 0.09 | 0.09 | 0.1 | 0.11 | 0.12 |

Absolute value of t-statistics in parentheses; standard errors clustered by bank.

* significant at 5% level; ** significant at 1% level

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.

**Table 3: Regression of Share of Loan Originations with Liquidity Risk on Lender Characteristics**

This table reports a regression of the share of a bank's new loans that are lines of credit and thus expose the bank to future liquidity exposure, as a function of the prior year's characteristics. The unit of observation varies by bank-year. The sample includes about 120 banks per year, from 1991 to 2005. All regressions include year indicator variables.

| | L/C Share | | Maturity-weighted L/C Share | |
|---|---|---|---|---|
| | Loans with Lender Share | All Loans[1] | Loans with Lender Share | All Loans |
| Transactions Deposits / Deposits | 0.36 | 0.46 | 0.35 | 0.46 |
| | (3.83)** | (5.22)** | (3.44)** | (4.85)** |
| Log of Bank Assets | 0.03 | 0.03 | 0.02 | 0.03 |
| | (3.76)** | (4.29)** | (3.13)** | (2.96)** |
| Undrawn Commitments / (Commitments+Loans) | 0.02 | 0.09 | -0.03 | 0.04 |
| | (0.34) | (1.50) | (0.43) | (0.51) |
| Total Deposits / Assets | 0.16 | 0.14 | 0.12 | 0.20 |
| | (1.72) | (1.48) | (1.26) | (1.99)* |
| Capital / Assets | -1.84 | -1.45 | -1.85 | -1.76 |
| | (3.75)** | (3.19)** | (3.56)** | (3.89)** |
| Marketable Securities / Assets | -0.19 | 0.07 | -0.22 | 0.09 |
| | (2.29)* | (0.90) | (2.64)** | (1.10) |
| Observations | 1,460 | 1,797 | 1,446 | 1,762 |
| R-squared | 0.12 | 0.12 | 0.12 | 0.08 |

Absolute value of t-statistics in parentheses; standard errors clustered by bank.

* significant at 5% level; ** significant at 1% level

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.

**Table 4: Regression of Average Borrower Characteristics and Loan Terms on Lender Characteristics**

This table reports regressions of the average borrower characteristics and loan terms on lender characteristics. The regressions with loan terms include borrower characteristics as regressors, include a full set of 1-digit SIC variables indicating the share of loans to borrowers in each industry class. The unit of observation varies by bank-year. The sample includes about 120 banks per year, from 1991 to 2005. All regressions include year indicator variables.

| | Log of Mean Borrower Sales | Share of Loans to Rated Borrowers | Share of Loans that are Secured | Mean Drawn All-in Spread |
|---|---|---|---|---|
| Transactions Deposits / Deposits | 1.49 | 0.31 | -0.19 | -46.92 |
| | (2.31)* | (2.69)** | (1.89) | (2.14)* |
| Log of Bank Assets | 0.472 | 0.043 | -0.001 | -1.936 |
| | (7.73)** | (4.38)** | (0.18) | (0.95) |
| Undrawn Commitments / (Commitments+Loans) | 1.19 | 0.09 | -0.16 | -43.91 |
| | (1.93) | (0.92) | (1.85) | (1.85) |
| Total Deposits / Assets | -1.09 | -0.07 | -0.01 | -47.78 |
| | (1.82) | (0.66) | (0.13) | (1.83) |
| Capital / Assets | 0.84 | 0.76 | -0.15 | 95.21 |
| | (0.32) | (1.49) | (0.35) | (0.70) |
| Marketable Securities / Assets | -0.09 | -0.04 | -0.21 | -63.96 |
| | (0.14) | (0.39) | (2.29)* | (3.71)** |
| Log of Mean Borrower Sales | - | - | -0.05 | -25.23 |
| | - | - | (7.18)** | (13.57)** |
| Share of Rated Borrowers | - | - | -0.0940 | -31.7910 |
| | - | - | (2.02)* | (3.29)** |
| Observations | 1,665 | 1,797 | 1,527 | 1,619 |
| R-squared | 0.29 | 0.12 | 0.25 | 0.48 |

Absolute value of t-statistics in parentheses; standard errors clustered by bank.

* significant at 5% level; ** significant at 1% level

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.

**Table 5: Share of Loan Originations with Liquidity Risk on Lender Characteristics, Including Borrower Controls**

This table reports a regression of the share of a bank's new loans that are lines of credit and thus expose the bank to future liquidity exposure, as a function of the prior year's characteristics. The regressions include borrower characteristics as regressors, including a full set of 1-digit SIC variables indicating the share of loans to borrowers in each industry class. The unit of observation varies by bank-year. The sample includes about 120 banks per year, from 1991 to 2005. All regressions include year indicator variables.

| | L/C Share | | Maturity-weighted L/C Share | |
|---|---|---|---|---|
| | Loans with Lender Share | All Loans[1] | Loans with Lender Share | All Loans |
| Transactions Deposits / Deposits | 0.26 | 0.38 | 0.27 | 0.37 |
| | (2.94)** | (4.45)** | (2.71)** | (4.07)** |
| Log of Bank Assets | 0.013 | 0.012 | 0.012 | 0.006 |
| | (1.64) | (1.37) | (1.48) | (0.59) |
| Undrawn Commitments / (Commitments+Loans) | -0.02 | -0.01 | -0.07 | -0.08 |
| | (0.21) | (0.08) | (1.00) | (1.36) |
| Total Deposits / Assets | 0.27 | 0.20 | 0.22 | 0.26 |
| | (3.00)** | (2.09)* | (2.52)* | (2.75)** |
| Capital / Assets | -1.71 | -1.37 | -1.74 | -1.73 |
| | (3.59)** | (2.94)** | (3.47)** | (3.96)** |
| Marketable Securities / Assets | -0.18 | 0.07 | -0.21 | 0.08 |
| | (2.20)* | (0.88) | (2.49)* | (0.92) |
| Log of Mean Borrower Sales | 0.03 | 0.04 | 0.02 | 0.04 |
| | (3.18)** | (5.65)** | (2.90)** | (5.43)** |
| Share of Rated Borrowers | 0.0500 | -0.0060 | 0.0650 | 0.0270 |
| | (1.03) | (0.15) | (1.29) | (0.65) |
| Observations | 1,417 | 1,659 | 1,407 | 1,640 |
| R-squared | 0.16 | 0.16 | 0.17 | 0.14 |

Absolute value of t-statistics in parentheses; standard errors clustered by bank.

* significant at 5% level; ** significant at 1% level

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.

**Table 6: Share of Loan Originations with Liquidity Risk on Lender Characteristics, Rated v. Unrated Firms**

This table reports a regression of the share of a bank's new loans that are lines of credit and thus expose the bank to future liquidity exposure, as a function of the prior year's characteristics. The unit of observation varies by bank-year. The sample includes about 120 banks per year, from 1991 to 2005. All regressions include year indicator variables.

| | Exposure from Rated Borrowers | | | | Exposure from Unrated Borrowers | | | |
|---|---|---|---|---|---|---|---|---|
| | L/C Share | | Maturity-weighted L/C Share | | L/C Share | | Maturity-weighted L/C Share | |
| | Loans with Lender Share | All Loans[1] | Loans with Lender Share | All Loans | Loans with Lender Share | All Loans[1] | Loans with Lender Share | All Loans |
| Transactions Deposits / Deposits | 0.48 | 0.44 | 0.45 | 0.41 | -0.12 | 0.02 | -0.10 | 0.05 |
| | (3.75)** | (3.61)** | (3.40)** | (3.50)** | (1.00) | (0.18) | (0.82) | (0.40) |
| Log of Bank Assets | 0.052 | 0.059 | 0.049 | 0.051 | -0.025 | -0.026 | -0.025 | -0.026 |
| | (4.75)** | (6.48)** | (4.53)** | (5.71)** | (2.27)* | (2.82)** | (2.31)* | (3.17)** |
| Undrawn Commitments / (Commitments+Loans) | 0.19 | 0.10 | 0.18 | 0.11 | -0.17 | 0.00 | -0.20 | -0.08 |
| | (1.65) | (0.99) | (1.57) | (1.11) | (1.26) | (0.04) | (1.69) | (0.93) |
| Total Deposits / Assets | -0.26 | -0.02 | -0.26 | 0.01 | 0.43 | 0.16 | 0.37 | 0.18 |
| | (2.10)* | (0.13) | (2.05)* | (0.13) | (3.85)** | (1.56) | (3.57)** | (1.96) |
| Capital / Assets | 0.00 | -0.23 | -0.03 | -0.35 | -1.84 | -1.22 | -1.82 | -1.42 |
| | (0.01) | (0.63) | (0.05) | (0.86) | (3.99)** | (2.55)* | (4.09)** | (3.62)** |
| Marketable Securities / Assets | -0.08 | 0.04 | -0.09 | 0.07 | -0.11 | 0.03 | -0.13 | 0.03 |
| | (0.74) | (0.47) | (0.86) | (0.75) | (0.94) | (0.34) | (1.18) | (0.27) |
| Observations | 1,460 | 1,797 | 1,446 | 1,762 | 1,460 | 1,797 | 1,446 | 1,762 |
| R-squared | 0.22 | 0.16 | 0.2 | 0.14 | 0.11 | 0.06 | 0.1 | 0.06 |

Absolute value of t-statistics in parentheses; standard errors clustered by bank.

* significant at 5% level; ** significant at 1% level

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.

**Table 7: Share of Loan Originations where Bank Acts as Lead Lender on Lender Characteristics, Including Borrower Characteristics**

This table reports a regression of the share of a bank's new loans in which the banks acts as the lead arranger, as a function of the prior year's characteristics. The regressions include borrower characteristics as regressors, including a full set of 1-digit SIC variables indicating the share of loans to borrowers in each industry class. The unit of observation varies by bank-year. The sample includes about 120 banks per year, from 1991 to 2005. All regressions include year indicator variables.

| | Lead Share | | | | Maturity-weighted Lead Share | | | |
|---|---|---|---|---|---|---|---|---|
| | Loans with Lender Share | | All Loans[1] | | Loans with Lender Share | | All Loans[1] | |
| Transactions Deposits / Deposits | -0.25 | -0.03 | -0.05 | 0.04 | -0.27 | -0.05 | -0.11 | -0.03 |
| | (1.84) | (0.24) | (0.37) | (0.35) | (1.92) | (0.41) | (0.81) | (0.23) |
| Log of Bank Assets | 0.018 | 0.068 | 0.018 | 0.067 | 0.022 | 0.071 | 0.018 | 0.064 |
| | (1.25) | (4.99)** | (1.28) | (4.19)** | (1.50) | (5.03)** | (1.22) | (3.99)** |
| Undrawn Commitments / (Commitments+Loans) | 0.48 | 0.59 | 0.41 | 0.51 | 0.49 | 0.59 | 0.41 | 0.50 |
| | (3.21)** | (6.68)** | (3.05)** | (4.89)** | (3.33)** | (6.73)** | (3.49)** | (5.62)** |
| Total Deposits / Assets | 0.05 | -0.16 | -0.19 | -0.30 | 0.02 | -0.18 | -0.22 | -0.32 |
| | (0.28) | (1.09) | (1.22) | (2.02)* | (0.10) | (1.19) | (1.38) | (2.03)* |
| Capital / Assets | 1.61 | 1.77 | 1.42 | 1.48 | 1.83 | 1.99 | 1.32 | 1.61 |
| | (2.67)** | (3.36)** | (2.86)** | (3.06)** | (2.96)** | (3.61)** | (2.46)* | (2.84)** |
| Marketable Securities / Assets | (0.11) | (0.11) | (0.15) | (0.19) | (0.09) | (0.10) | (0.21) | (0.24) |
| | (0.88) | (0.95) | (1.33) | (1.39) | (0.68) | (0.83) | (1.78) | (1.75) |
| Log of Mean Borrower Sales | - | -0.11 | - | -0.06 | - | -0.11 | - | -0.05 |
| | - | (2.19)* | - | (1.56) | - | (2.31)* | - | (1.37) |
| Share of Rated Borrowers | - | -0.09 | - | -0.08 | - | -0.09 | - | -0.08 |
| | - | (11.07)** | - | (11.24)** | - | (10.38)** | - | (10.89)** |
| Observations | 1,460 | 1,417 | 1,797 | 1,659 | 1,446 | 1,407 | 1,762 | 1,640 |
| R-squared | 0.12 | 0.34 | 0.12 | 0.32 | 0.11 | 0.32 | 0.12 | 0.3 |

Absolute value of t-statistics in parentheses; standard errors clustered by bank.

* significant at 5% level; ** significant at 1% level

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.

**Table 8: Share of Loan Originations with Liquidity Risk on Lender Characteristics, Lead Banks v. Participants**

This table reports a regression of the share of a bank's new loans that are lines of credit and thus expose the bank to future liquidity exposure, as a function of the prior year's characteristics. The regressions include borrower characteristics as regressors, including a full set of 1-digit SIC variables indicating the share of loans to borrowers in each industry class. The unit of observation varies by bank-year. The sample includes about 120 banks per year, from 1991 to 2005. All regressions include year indicator variables.

| | L/C Share | | | | Maturity-weighted L/C Share | | | |
|---|---|---|---|---|---|---|---|---|
| | Loans with Lender Share | | All Loans[1] | | Loans with Lender Share | | All Loans[1] | |
| | Lead Share Below Median | Lead Share Above Median | Lead Share Below Median | Lead Share Above Median | Lead Share Below Median | Lead Share Above Median | Lead Share Below Median | Lead Share Above Median |
| Transactions Deposits / Deposits | 0.43 | 0.21 | 0.49 | 0.31 | 0.38 | 0.25 | 0.48 | 0.32 |
| | (3.00)** | (1.84) | (3.93)** | (2.90)** | (2.49)* | (1.95) | (3.61)** | (2.72)** |
| Log of Bank Assets | 0.028 | 0.017 | 0.025 | 0.018 | 0.026 | 0.018 | 0.023 | 0.013 |
| | (1.74) | (1.59) | (1.88) | (1.44) | (1.54) | (1.67) | (1.60) | (0.94) |
| Undrawn Commitments / (Commitments+Loans) | -0.03 | 0.00 | -0.02 | 0.07 | -0.10 | -0.01 | -0.03 | 0.00 |
| | (0.30) | (0.04) | (0.19) | (0.98) | (0.83) | (0.14) | (0.38) | (0.04) |
| Total Deposits / Assets | 0.29 | 0.21 | 0.09 | 0.20 | 0.23 | 0.12 | 0.14 | 0.26 |
| | (1.78) | (2.17)* | (0.64) | (1.94) | (1.36) | (1.37) | (0.99) | (2.51)* |
| Capital / Assets | -1.64 | -1.23 | -1.98 | -0.27 | -1.68 | -1.30 | -1.84 | -0.90 |
| | (2.22)* | (2.17)* | (3.47)** | -0.55 | (2.16)* | (2.06)* | (3.07)** | -1.66 |
| Marketable Securities / Assets | -0.19 | -0.20 | 0.12 | -0.05 | -0.20 | -0.29 | 0.13 | -0.06 |
| | (1.39) | (2.16)* | (1.24) | (0.43) | (1.61) | (2.75)** | (1.34) | (0.55) |
| Log of Mean Borrower Sales | 0.02 | 0.04 | 0.04 | 0.04 | 0.02 | 0.03 | 0.03 | 0.04 |
| | (1.45) | (2.91)** | (4.81)** | (3.45)** | (1.49) | (2.48)* | (4.13)** | (3.41)** |
| Share of Rated Borrowers | 0.1180 | -0.1570 | 0.0280 | -0.1690 | 0.1370 | -0.1820 | 0.0640 | -0.1520 |
| | (2.08)* | (1.67) | (0.64) | (1.78) | (2.34)* | (1.91) | (1.42) | (1.64) |
| Observations | 633 | 784 | 824 | 835 | 629 | 778 | 812 | 828 |
| R-squared | 0.15 | 0.24 | 0.21 | 0.2 | 0.15 | 0.24 | 0.19 | 0.16 |

Absolute value of t-statistics in parentheses; standard errors clustered by bank.

* significant at 5% level; ** significant at 1% level

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.

**Table 9: Share of Loan Originations with Liquidity Risk on Lender Characteristics, Predicted Value of Lead Share**

This table reports a regression of the share of a bank's new loans that are lines of credit and thus expose the bank to future liquidity exposure, as a function of the prior year's characteristics. The regressions include borrower characteristics as regressors, including a full set of 1-digit SIC variables indicating the share of loans to borrowers in each industry class. The unit of observation varies by bank-year. The sample includes about 120 banks per year, from 1991 to 2005. All regressions include year indicator variables.

| | L/C Share | | | | Maturity-weighted L/C Share | | | |
|---|---|---|---|---|---|---|---|---|
| | Loans with Lender Share | | All Loans[1] | | Loans with Lender Share | | All Loans[1] | |
| | Predicted Lead Share Below Median | Predicted Lead Share Above Median | Predicted Lead Share Below Median | Predicted Lead Share Above Median | Predicted Lead Share Below Median | Predicted Lead Share Above Median | Predicted Lead Share Below Median | Predicted Lead Share Above Median |
| Transactions Deposits / Deposits | 0.41 | 0.16 | 0.56 | 0.22 | 0.40 | 0.17 | 0.51 | 0.26 |
| | (2.71)** | (1.33) | (4.17)** | (2.05)* | (2.49)* | (1.30) | (3.61)** | (2.25)* |
| Log of Bank Assets | 0.034 | 0.004 | 0.029 | 0.004 | 0.026 | 0.006 | 0.023 | -0.008 |
| | (2.33)* | (0.45) | (1.99)* | (0.38) | (1.70) | (0.65) | (1.54) | (0.71) |
| Undrawn Commitments / (Commitments+Loans) | -0.02 | -0.01 | -0.11 | 0.07 | -0.15 | -0.05 | -0.12 | -0.07 |
| | (0.08) | (0.17) | (0.66) | (1.24) | (0.77) | (0.64) | (0.72) | (1.00) |
| Total Deposits / Assets | 0.22 | 0.33 | 0.07 | 0.29 | 0.10 | 0.34 | 0.05 | 0.42 |
| | (1.33) | (3.27)** | (0.43) | (2.77)** | (0.58) | (3.78)** | (0.34) | (4.43)** |
| Capital / Assets | -0.62 | -1.90 | -1.24 | -1.24 | -0.82 | -1.89 | -1.33 | -1.79 |
| | -0.56 | (3.95)** | -1.14 | (2.45)* | -0.72 | (3.69)** | -1.21 | (3.98)** |
| Marketable Securities / Assets | -0.29 | 0.01 | -0.04 | 0.17 | -0.36 | 0.01 | 0.00 | 0.14 |
| | (2.21)* | (0.12) | (0.31) | (1.81) | (2.96)** | (0.08) | (0.02) | (1.32) |
| Log of Mean Borrower Sales | 0.01 | 0.04 | 0.03 | 0.05 | 0.01 | 0.04 | 0.03 | 0.06 |
| | (0.73) | (4.04)** | (3.55)** | (4.93)** | (0.44) | (3.81)** | (2.79)** | (5.27)** |
| Share of Rated Borrowers | 0.0550 | 0.0690 | -0.0020 | -0.0030 | 0.0570 | 0.1070 | 0.0300 | 0.0380 |
| | (0.88) | (0.97) | (0.04) | (0.04) | (0.89) | (1.45) | (0.62) | (0.53) |
| Observations | 586 | 831 | 785 | 874 | 579 | 828 | 771 | 869 |
| R-squared | 0.15 | 0.26 | 0.13 | 0.26 | 0.16 | 0.27 | 0.12 | 0.26 |

Absolute value of t-statistics in parentheses; standard errors clustered by bank.

* significant at 5% level; ** significant at 1% level

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.

**Table 10: Regression of Loan Portfolio Diversification on Lender Characteristics**

This table reports a regression of the sum of squared shares by 2-digit SIC industry code of a bank's new loans (a diversification score), as a function of the prior year's characteristics. The regressions include borrower characteristics as regressors, including a full set of 1-digit SIC variables indicating the share of loans to borrowers in each industry class. The unit of observation varies by bank-year. The sample includes about 120 banks per year, from 1991 to 2005. All regressions include year indicator variables.

| | Diversification of New Loan Originations | | |
|---|---|---|---|
| Lead Share | 0.16 | 0.18 | 0.10 |
| | (4.33)** | (5.72)** | (2.73)** |
| Log of Bank Assets | -0.17 | -0.15 | -0.11 |
| | (19.67)** | (12.16)** | (8.21)** |
| Transactions Deposits / Deposits | - | -0.166 | -0.148 |
| | - | (1.47) | (1.34) |
| Undrawn Commitments / (Commitments+Loans) | - | -0.31 | -0.22 |
| | - | (2.06)* | (1.60) |
| Total Deposits / Assets | - | -0.03 | -0.09 |
| | - | (0.22) | (0.82) |
| Capital / Assets | - | 0.01 | 0.11 |
| | - | (0.03) | (0.29) |
| Marketable Securities / Assets | - | 0.17 | 0.15 |
| | - | (1.28) | (1.27) |
| Log of Mean Borrower Sales | - | - | 0.24 |
| | - | - | (6.65)** |
| Share of Rated Borrowers | - | - | -0.0740 |
| | - | - | (8.60)** |
| Observations | 1,802 | 1,797 | 1,659 |
| R-squared | 0.46 | 0.48 | 0.53 |

Absolute value of t-statistics in parentheses; standard errors clustered by bank.

* significant at 5% level; ** significant at 1% level

[1]For the sample including all loans, each bank in a syndicate is assumed to hold an equal share of each loan.