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Risk Management, Capital Structure and Lending at Banks

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Abstract

We test how active management of bank credit risk exposure through the loan sales market affects capital structure, lending, profits, and risk. We find that banks that rebalance their C&I loan portfolio exposures by both buying and selling loans – that is, banks that use the loan sales market for risk management purposes rather than to alter their holdings of loans -- hold less capital than other banks; they also make more risky loans (loans to businesses) as a percentage of total assets than other banks. Holding size, leverage and lending activities constant, banks active in the loan sales market have lower risk and higher profits than other banks. We conclude that increasingly sophisticated risk management practices in banking are likely to improve the availability of bank credit but not to reduce bank risk.

Risk Management, Capital Structure and Lending at Banks

I. Introduction

It is difficult to imagine another sector of the economy where as many risks are managed jointly as in banking. By its very nature, banking is an attempt to manage multiple and seemingly opposing needs. Banks stand ready to provide liquidity on demand to depositors through the checking account and to extend credit as well as liquidity to their borrowers through lines of credit (Kashyap, Rajan, and Stein, 1999). Because of these fundamental roles, banks have always been concerned with both solvency and liquidity. Traditionally, banks held capital as a buffer against insolvency, and they held liquid assets – cash and securities – to guard against unexpected withdrawals by depositors or draw downs by borrowers (Saidenberg and Strahan, 1999).

In recent years, risk management at banks has come under increasing scrutiny. Banks and bank consultants have attempted to sell sophisticated credit risk management systems that can account for borrower risk (e.g. rating), and, perhaps more important, the risk-reducing benefits of diversification across borrowers in a large portfolio. Regulators have even begun to consider using banks' internal credit models to devise capital adequacy standards.

Why do banks bother? In a Modigliani –Miller world, firms generally should not waste resources managing risks because shareholders can do so more efficiently by holding a well-diversified portfolio. Banks (intermediaries) would not exist in such a world, however. Financial market frictions such as moral hazard and adverse selection

problems require banks to invest in private information that makes bank loans illiquid (Diamond, 1984). Because these loans are illiquid and thus costly to trade, and because bank failure itself is costly when their loans incorporate private information, banks have an incentive to avoid failure through a variety of means, including holding a capital buffer of sufficient size, holding enough liquid assets, and engaging in risk management. Froot, Scharfstein and Stein (1993) and Froot and Stein (1998) present a rigorous theoretical analysis of how these frictions can affect non-financial firms' investment as well as banks' lending and risk-taking decisions. According to their model, active risk management can allow banks to hold less capital and to invest more aggressively in risky and illiquid loans.

In this paper, we test how access to the loan sales market affects bank capital structure and lending decisions. Hedging activities in the form of derivatives trading and swap activities - activities that allow firms to manage their *market* risks - have been shown to influence firm performance and risk (e.g. Brewer, Minton, and Moser, 1999). Our approach is to test whether banks that are better able to trade *credit* risks in the loan sales market experience significant benefits. We find clear evidence that they do. In particular, banks that purchase and sell their loans – our proxy for banks that use the loan sales market to engage in credit-risk management – hold a lower level of capital per dollar of assets than banks not engaged in loan buying or selling. Moreover, banks that are on both sides of the loan sales market also hold less capital than either banks that only sell loans but don't buy them, or banks that only buy loans but don't sell them. This difference is important because it suggests that active rebalancing of credit risk – buying and selling rather than just selling (or buying) – allows banks to alter their capital

structure. Our key results are therefore not driven by reverse causality whereby banks looking to increase their capital ratios go out and sell loans.

We also find that banks that rebalance through loan sales and purchases hold lower levels of liquid assets (as a percentage of the whole balance sheet) relative to most other banks, although there is no statistically significant difference in the liquidity ratios between the buy-and-sell banks and the banks that just sell loans.

Consistent with Froot and Stein (1998), we also find that credit risk management through active loan purchase and sales activity affects banks' investments in risky loans. Banks that purchase and sell loans hold more risky loans (C&I loans and commercial real estate loans) as a percentage of the balance sheet than other banks.[1] Again, these results are especially striking because banks that manage their credit risk (buy and sell loans) hold more risky loans than banks that merely sell loans (but don't buy them) or banks that merely buy loans (but don't sell them).

In our last set of results, we test whether loan sales activity leads to lower risk and higher returns on equity (ROE) and risk-adjusted returns on equity (RAROC). We find that the buy-and-sell banks do display significantly lower risk (i.e. lower variability of loan losses and profits) and higher profit than banks doing similar activities but not using loan sales to manage their credit risk. However, while risk-managing banks do have less risk and more profit than banks engaged in similar activities that do not manage credit risk via the loan sales market, the risk managing banks do *not* have lower risk than other banks unconditionally. That is, when compared to banks overall, the buy-sell banks appear no safer and, perhaps, somewhat riskier; but when compared to their peers, banks

[1] In an earlier draft, we also found that banks that buy and sell loans hold more risky loans as a fraction of the whole loan portfolio.

with similar operating and financial ratios, the buy-sell banks exhibit significantly lower risk. Together with the results on capital structure and lending, these results suggest that banks use the risk-reducing benefits of risk management to take on more profitable, but higher risk, activities and to operate with greater financial leverage.

Our results have implications not only for how banks manage their credit risk, but also for how regulators ought to view these efforts. In particular, one of the aims of the recently proposed revisions to the 1988 Basel Capital Accord is to create incentives for banks to engage in more active and sophisticated risk management by offering a range of risk-based capital adequacy rules. The proposal states that "For credit risk, this range [of capital adequacy rules] begins with the standardized approach and extends to the "foundation" and "advanced" internal-ratings based (IRB) approaches... This evolutionary approach will motivate banks to continuously improve their risk management and measurement capabilities so as to avail themselves of the more risk-sensitive methodologies and thus more accurate capital requirements" (Bank for International Settlements, 2001). While we agree with the idea of creating incentives for banks to improve their risk management systems, our results suggest that regulators should not expect better risk management to lead to less *risk*. Instead, our results suggest that banks that enhance their ability to manage credit risk will operate with greater leverage and will lend more of their assets to risky borrowers. Thus, the benefits of advances in risk management in banking will likely be greater credit availability rather than reduced risk in the banking system.

In the next section, we discuss previous studies of risk management and firm investment. We then explain our empirical methods and results in Section III. We

conclude in Section IV with implications for the likely effects of recent innovations in bank risk management for the availability of bank credit.

II. Risk Management, Capital Structure and Investment

While a significant amount of work has gone into analyzing risk management in banking, the issues are not specific to financial institutions. Non-financial firms also manage their risk exposures extensively, which in turn affects their investment decisions, profitability, and value. Allayannis and Weston (1999), for example, examine the use of foreign currency derivatives in a sample of large U.S. non-financial firms and report that there is a positive relation between firm value and the use of foreign currency derivatives. Their evidence suggests that hedging raises firm value. Minton and Schrand (1999) use a sample of non-financial firms in 37 industries and find that cash flow volatility leads to internal cash flow shortfalls, which in turn lead to higher costs of capital and forgone investments. Firms able to minimize cash flow volatility seem to be able to invest more.

In contrast to our work, extant studies of bank loan sales have not emphasized the links between risk management, capital structure and lending. Recent papers have rather viewed loan sales as a response to regulatory costs (Benveniste and Berger, 1987), as a source of nonlocal bank capital to support local investments (Carlstrom and Samolyk 1995, Pennacchi 1988), as a function of funding costs and risks (Gorton and Pennacchi, 1995), and possibly as a way to diversify (Demsetz 1999).[2]

In a recent paper, Dahiya, Puri, and Saunders (2000) test whether loan sales announcements provide a negative signal about the prospects of the borrower whose loan is sold by a bank. They also examine, in a small sample (19 institutions), the characteristics of loan sellers. They find that stock prices fall at the announcement of a

loan sale and that many of the firms whose loans have been sold subsequently go bankrupt. This evidence provides further support for the idea that banks hold private information about their borrowers that makes loan sales difficult due to adverse selection.

Another strand of the banking literature emphasizes the link between the internal capital markets and bank lending. For instance, Houston, James, and Marcus (1997) report that lending at banks owned by multi-bank bank holding companies (BHCs) is less subject to changes in cash flow and capital. Jayaratne and Morgan (1999) find that shifts in deposit supply affects lending most at small, unaffiliated banks that do not have access to large internal capital markets. Bank size also seems to allow banks to operate with less capital and, at the same time, engage in more lending. Demsetz and Strahan (1997) show that larger BHCs manage to hold less capital and are able to pursue higher-risk activities, particularly C&I lending. Ackavein, Berger and Humphrey (1997) find that large banks following mergers tend to decrease their capital and increase their lending. There also appears to be evidence that off-balance sheet activities in general and loan sales in particular help banking firms lower their capital levels to avoid regulatory taxes and improve their risk tolerance (Gorton and Haubrich 1990).

One of the contributions of this paper is to go beyond the internal capital markets, as measured by both bank size and access to a multi-bank BHC, and test whether banks that use the loan sales market to manage credit risk alter their capital structure and lending decisions in a complementary way. If banks with access to bigger internal capital markets (e.g. big banks and banks owned by multi-bank BHCs) hold less capital and lend more, then the same ought to be true for banks that use the external loan sales market to manage their credit risk. We test this idea by estimating whether banks that buy and sell

[2] For a review of the possible motives for loan sales, see Berger and Udell (1987).

loans hold less capital and engage in more risky lending than other banks, even after controlling for their size and holding company affiliation as proxies for the effectiveness and scope of the internal capital market. Our empirical model can be viewed as a simple test of a model of risk management á la Froot and Stein in which hedging activities add value by allowing the bank to conserve on costly capital, and by ensuring that sufficient internal funds are available to take advantage of attractive investment opportunities.

III. Empirical Methods and Results

A. Methods and Data

Decision making in banking is not and should not be compartmentalized. Actions that affect capital structure, investment decisions, and portfolio risks are not taken in isolation. It is quite the norm that a single action or trading decision affects all of the above. A bank loan is not purely an investment; this decision also affects risk-based capital requirements, as well as firm risk (through multiple layers of credit, interest rate and other risks). Detailed loan-level data for a broad cross-section of banks is not available to the researcher. Thus, one cannot observe how a particular loan decision affects the make-up of the overall portfolio or its risk and capital implications. We are therefore left to infer implications from aggregate data and aggregate actions.

Our data come from the *Reports of Income and Condition* (the "Call Report") for all domestic commercial banks in the United States. These data include the sale and purchase of all loans originated by the bank, excluding residential real estate and consumer loans. If a bank were involved in a syndicated loan and sold its portion of the syndication, this would be counted as a loan sale as well. The data also include only those loans sold or purchased without recourse, meaning that the risk of the loan must

have left the balance sheet of the selling bank to be counted. Data on both loan purchases and sales are available quarterly from June of 1987 through the end of 1993. We use these figure to compute annual flows of loans sold and purchased from June to June in each year from 1988 to 1993. So, for example, the 1988 loan sales figures reflect loans sold between June of 1987 and June of 1988. In this example, we would then assign these flows to the balance sheet figures as of June of 1988.

As noted above, our purpose is to test how active management of credit risk, as proxied by loan sales and purchases, affects a financial institution's capital structure, lending, profits, and risk. We estimate a series of cross-sectional, reduced form regressions that relate measures of capital structure, investments in risky loans, profits and risk to control variables (designed to capture the extent of a bank's access to an internal capital market) to measures of the bank's use of the loan sales market to foster risk management. Our dependent variables are the following:

Capital and Liquidity Variables

Capital/Assets ratio = Book value of equity / Assets

Liquidity ratio = Cash + Federal Funds Sold + Securities / Assets

Lending Variables

Commercial & Industrial Loans / Assets

Commercial Real Estate Loans / Assets

Risk Variables

Time-series standard deviation of each bank's ROE (Earnings/Capital)

Time-series standard deviation of each banks's Loan Loss Provisions/Total Loans

Profit Variables

Time-series mean of each bank's ROE

RAROC = Time-series mean ROE / time-series standard deviation of bank's ROE.

To capture the effect of internal capital markets (Jayaratne and Morgan 1999, Demsetz and Strahan 1997, Houston, James and Marcus 1997), we include as regressors indicator variables for banks owned by multi-bank holding companies and multi-state bank holding companies. We also create indicators to capture the effect of firm size based on the bank's total assets. Following Demsetz (1999), we avoid imposing a linear (or log-linear) relationship between size and our dependent variables. Instead, we include indicators for eight asset classes, with firms in asset size greater than $10 billion acting as the omitted category.[3]

We need to be careful to isolate risk management activities in the loan sales market from other reasons why banks might buy or sell loans. For instance, banks may sell (buy) in response to relatively strong (weak) loan demand conditions. Similarly, unusually strong funding conditions may induce loan purchase activity, while unusually weak funding conditions may induce loan sales. Again following Demsetz (1999), we create three indicator variables to reflect a bank's activities in the loan sales market: these variables denote whether a bank only sells loans, whether it only buys loans, or whether it buys and sells loans; firms that do not participate at all act as the omitted category in the regressions. We focus our attention on banks that both buy and sell loans, since demand

[3] We have also estimated our models with an indicator equal to one for banks that hold interest rate derivatives contracts (mainly plain-vanilla swaps) as a proxy for banks that manage market risk. This indicator variable is positively related to the C&I loans to assets ratio but not related to bank capital

and funding conditions are unlikely to be driving the results for these banks. Our theory suggests that banks that engage more actively in risk management in this way will be able to conserve capital and operate with fewer liquid assets, and at the same time, they will be able to take advantage of more risky lending opportunities without unduly increasing their credit risk.[4]

Table 1 provides the descriptive statistics for the full sample for each of the variables in the models. The sample starts with 74,045 bank/year observations. (For the risk and profit variables, which are computed from time-series statistics for each bank, we have just a single observation per bank.) We then lose some observations due to missing data or obviously incorrect data. For example, we dropped observations where the balance sheet ratios exceeded one. In addition, the ratio of earnings to capital (ROE) has large positive and negative outliers. We therefore trim this variable at the 1st and 99th percentile of its distribution before constructing mean ROE and RAROC for each bank. Similarly, we trim the ratio of loan loss provisions to total loans at the 1st and 99th percentiles. We then trim the two risk measures, the standard deviation of ROE and the standard deviation of the loan loss provisions to loans ratio, at *their* respective 1st and 99th percentiles. We do the same for RAROC.

We also report mean characteristics in Table 1 for banks that buy loans, sell loans, buy and sell loans, or do neither. These simple comparisons suggest that banks that buy and sell loans have the lowest capital-to-assets and liquid assets ratios and the highest

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structure variables or commercial real estate lending. Its inclusion in the model does not change the other results that we focus on below.

[4] In a second set of specifications, we have also replaced the indicator variables with the ratio of *gross* sales (sales + purchases) of loans to total C&I loans, and the ratio of net purchases (purchases - sales) of loans to total C&I loans. The net purchases variable controls for loan demand effects (low loan demand leading to net purchases) or funding supply effects (high supply of funding leading to net purchases). The gross loan

levels of risky loans as a percentage of the balance sheet.[5] On its face, these comparisons support the idea that active risk management via the external loan sales market adds value to banks by allowing them to conserve on capital and liquid assets and engage more in the activity that generates value – risky lending. Of course, the banks that buy and sell loans are also larger and more likely to affiliate with multi-bank and multi-state bank holding companies than the other banks. Thus, these banks also seem to have access to a better (or at least bigger) internal capital market. We now control for this effect in our regressions.

B. Loan Sales, Capital Structure and Lending Choices

Table 2 reports our regression results for the capital-to-assets ratio. Both BHC affiliation and increasing bank size seem to be associated with lower capital-asset ratios, suggesting that larger internal capital markets do allow banks to operate with a smaller cushion against insolvency. In contrast, and somewhat to our surprise, however, banks affiliated with multi-state BHCs do not seem to hold less capital.

Our proxy for a bank's use of loan sales activity to manage risk suggests very strongly that banks can conserve on capital by actively managing their credit risk through loan sales. The buy-and-sell variables are negative and significant (both economically and statistically) in all years; they suggest that banks that manage their credit risk by both buying and selling loans have capital-asset ratios 1.2 to 1.5 percentage points lower than banks that do not participate at all in this market. Perhaps more important, the banks that

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sales ratio measures how aggressively a bank manages or rebalances its loan portfolio. These results are largely consistent with those reported using the indicator specifications.

[5] The simple comparison between buy-sell, buy only, sell only and buy-sell banks are not available for the risk and profit variables since these are constructed as time-series averages for each bank. We also averaged our indicator variables for our risk and profit regressions over time, i.e. a bank that sold only in 2 of the 6 years will have a sell only value of 2/6. Demsetz (2000) shows that most banks remain in the same loan sales category from year to year, but some will switch categories in time.

appear to rebalance their risk through both purchase and sale have capital-asset ratios about 0.2 to 0.4 percentage points lower than banks that just sell loans, and this difference is statistically significant at the one percent level in all six years.

The results for liquid assets (the cash + securities-to-assets ratio) provide further support to our expectation that firms that engage in loan trading can afford to reduce their buffer of liquid assets. Once again, as shown in Table 3, control variables perform as expected -- large banks affiliated with BHCs (especially multi-state BHCs) hold fewer liquid assets. Moreover, we again find that banks that both buy and sell loans hold lower levels of liquid assets than either banks that neither buy nor sell, or banks that only buy loans. We find no statistically meaningful differences in liquidity ratios, however, for the buy-and-sell banks and the sell-only banks.

Overall, Tables 2 and 3 suggest that risk management via the loan sales market affects banks' capital structure and liquidity choices. In Tables 4 and 5, we show that credit risk management through loan purchase and sales activity also affects lending decisions -- banks that use the loan sales market to manage credit risk invest a greater fraction of their assets in risky loans. In Table 4, we examine the ratio of C&I loans to assets, and in Table 5 we examine the ratio of commercial real estate loans to total assets. The results, after controlling for size and BHC affiliation, provide further support for our hypothesis.

Looking first at Table 4 (C&I loans per dollar of assets), we find that, at a minimum, C&I loans-to-assets are 2.8 percentage points higher, on average, at banks that buy and sell loans compared to banks that do not participate in the loan sales market. Moreover, the buy-and-sell banks hold C&I loans-to-assets ratio 1.6 to 4.2 percentage

points higher than the banks that buy only, and 0.2 to 1.9 percentage points higher than banks that sell only. The difference in C&I lending for the buy-sell banks and the sell-only banks is statistically significant in five of the six years.

For commercial real estate lending, the pattern is similar. Relative to banks not involved in the loan sales market, commercial real estate loans per dollar of assets are at least 2.8 percentage points higher at the buy-sell banks. Compared with the buy-only banks, the buy-and-sell banks hold 1.5 to 2.7 percentage points more commercial real estate loans, and compared with the sell-only banks, they hold 0.3 to 1.1 percentage points more commercial real estate loans. The difference in commercial real estate lending between the buy-sell and sell-only banks is statistically significant at the one percent level in four of the six years, and at the 10 percent level in one of the six years.

The results to this point establish a strong and consistent correlation between capital, liquidity, risky lending and banks' activity in the loan sales market for credit risk management. These correlations suggest that banks that engage in risk management alter their financial and operating strategies toward ones that would, on their own, increase risk. As is always the case, however, it is difficult to rule out reverse causality. Perhaps banks with higher risk (e.g. banks with less capital or banks with higher levels of risky loans) choose to institute a more active risk management program to offset (or partially offset) their greater financial and operating risk, rather than the other way around.

To rule out reverse causality, we replace the three loan sales indicators reported in the regressions of Tables 2-5, with a single variable intended to capture the extent of loan sales activities by <u>other</u> banks headquartered in the same local market, defined as a Metropolitan Statistical Area (MSA). (For banks not headquartered in an MSA, we use

the county as the local market.) The idea is to replace variables that reflect a bank's *choice* of whether or not to manage risk via the loan sales market (the three loan sales indicator variables) with a variable that captures the *cost* of using the loan sales market for this purpose. The premise is that a bank is more likely to face a low cost of using the loan sales market for risk management if other banks in the same local area do so. This lower cost, for example, could reflect the nature of the borrowers or industries located near the bank.[6]

As a measure of banks' use of the loan sales market – call it the "depth" of the local loan sales market – we compute the sum of all loans made by banks headquartered in the same MSA (or non-MSA county) that both buy and sell loans, divided by all loans made by all banks in the MSA. This variable ranges from a low of zero (no other bank in the market is a buy-sell bank) to one (all other banks in the local market are buy-sell banks). We do not include lending by the bank in question in constructing local loan sales depth because we want our measure of loan sales activity to be insensitive to the actual choices made by the bank. Thus, the results are unlikely to be driven by reverse causality.

Before testing how a bank's capital, liquidity and lending depend on local loan market depth, we first note that this variable exhibits a high correlation with the buy-sell indicator variable. Thus, we seem to have identified a good instrument; if a bank is located in a market where many of its competitors actively use the loan sales market, then

[6] Survey evidence suggests that firms (as well as households) tend to borrow from banks that are geographically close.

the bank does too.[7] For example, in year-by-year cross sectional regressions similar to those in Tables 2-5 with the buy-sell indicator as the *dependent* variable and the size indicators, the multi-bank and multi-state BHC indicators and our measure of local loan market depth as explanatory variables, the coefficient on the market depth variable ranges from 0.17 to 0.20 with a t-statistic that never falls below 14.

Table 6 reports the results. To preserve space, we only report the coefficients on our measure of the depth of the local loan sales market. For all four variables and for all six years, the coefficients are large and statistically significant. First, we find that banks hold less capital per dollar of asset if they are located in markets with many active loan sellers and buyers. For example, a bank in a market where none of its competitors act as both a loan buyer and seller has, on average, a capital-asset ratio 0.3 to 0.6 percentage points higher than a similar bank located in a market where all of its competitors use the loan sales market for risk management. Second, a bank in a market where none of its competitors act as both a loan buyer and seller has, on average, a liquid assets-to-total assets ratio 2.2 to 4.1 percentage points higher than a similar bank located in a market where all of its competitors use the loan sales market. The same story holds for lending. Banks in markets where competitors use the loan sales market as both buyers and sellers hold 2.0 to 4.6 percent more C&I loans per dollar of assets and 1.7 to 3.2 percent more commercial real estate loans per dollar of assets.[8]

[7] Note that we cannot re-estimate the models of Tables 2-5 using an instrumental variables procedure because the model is not identified. We have three endogenous variables – the three loan sales indicators – but just a single instrument. Thus, we report what could be interpreted as a reduced form instead.

[8] This analysis may raise the concern that our results have only to do with differences in bank behavior that reflect difference across local markets. For example, one interpretation of these findings is that they reflect an unobservable characteristic of the loans that makes them both safer and, thus, easier to sell. To rule this out, we have estimated our model with MSA-level (or non-MSA county-level) fixed effects on the assumption that banks tend to lend to local firms, and that loans to firms in the same MSA are

C. Loan Sales Activity, Risk, and Profits

In our last set of results, we estimate the relationship between loan sales activity and two measures of risk, the standard deviation of a bank's return on equity and the standard deviation of a bank's loan loss provisions to total loans. These standard deviations reflect the *time series* variability in the two ratios, one reflecting a bank's overall profitability and the other reflecting the losses realized on its loan portfolio. We then test whether profit (mean ROE) and risk-adjusted profit (the ratio of a bank's mean ROE to the standard deviation ROE, what we call "RAROC") is higher at banks engaged in loan sales and purchases than at other banks.[9] Because the risk and profit measures are based on time-series data for each bank, we only estimate a single cross-sectional model. We thus report the "between" estimator, which exploits the full panel dataset but estimates the regression using the time-series averages of both the dependent and explanatory variables for each bank. This estimator depends on variation between banks, so it is analogous to the earlier annual cross sectional results.[10]

As reported in Table 7, there is a strong relationship between activity in the loan sales market and the two risk measures, although the effects depend on whether or not we control for capital structure and lending activities. Without controls for activities, banks that buy and sell loans appear to have *higher* volatility of ROE than banks not engaged at all in the loan sales market, or banks that only buy loans (column 1). However,

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homogeneous. In these models we continue to find that the buy-sell banks have statistically significantly lower capital ratios and higher ratios of risky loans to assets than the other banks.

[9] This analysis is similar in spirit to Demsetz and Strahan (1997), who link stock return volatility to bank characteristics. Here, we use accounting measures of risk rather than market measures of risk because we need to include the smaller banks without publicly traded stock to have sufficient variation in our loan sales variables.

[10] In principle, we could estimate the relationship between ROE and loan sales activity on a year-by-year basis, as we do with the balance sheet ratios. However, since ROE tends to fluctuate over time, we decided to report the relationship based on average profits over our sample period.

controlling for activities, the buy-and-sell banks are safer than otherwise similar banks (i.e. banks with similar capital structures and loan portfolios) that do not avail themselves of the opportunity to manage risks through the external markets (column 2). For example, the volatility of ROE is about 0.006 lower for the buy-sell banks than for banks outside the loan sales market entirely. Relative to the sell-only banks, ROE volatility is about 0.004 lower for the buy-sell banks; both of these differences are statistically significant at the one percent level. These differences are also economically significant, representing a decline in the volatility of ROE equal to more than 10 percent of its unconditional mean (0.032—see Table 1). Comparing the buy-sell and buy only banks, we also find that buy-sell banks have lower volatility of ROE, but the difference is not statistically significant at conventional levels.

Table 7 displays a similar pattern for loan loss volatility. Unconditionally, the buy-sell banks have loan loss volatility that is not significantly different from that displayed by banks not engaged at all in the loans sales market and banks that only buy loans (column 3). Controlling for activities, however, the buy-sell banks have considerably lower loan loss volatility than the other three sets of banks (column 4). For example, the buy-sell banks have loan loss volatility about 0.0005 lower than banks not engaged at all in loan sales, and they have loan loss volatility that is 0.0003 lower than the sell-only banks, or about 15 percent of the mean volatility of loan losses (Table 1). Both of these differences are statistically significant at the one percent level. Compared with the buy-only banks, we find that loan loss volatility is 0.0002 lower for the buy-sell banks, and this difference is statistically significant at the five percent level (p-value=0.03).

As a final test of our hypotheses, we want to estimate how bank profit varies with risk management activities in the loan sales market. Our sample period, however, covers a time of turmoil in the U.S. banking industry in which loans to businesses experienced very poor performance. Because the banks active in loan sales held more of these loans (see above), and because these loans turned out to experience losses, the relationship between ex-post profits and loan sales activity would be obscured during our sample period in the absence of controls for activities. We therefore account for the very poor ex-post performance of banks' lending to businesses during this period in our regressions to remove this bias by including the capital structure and lending activity variables analyzed in Tables 2-5 in our last set of regressions.

In Table 8 we report the relationship between loan sales and bank profits (ROE) and risk-adjusted profits (RAROC). We find that the banks that use loan sales to manage credit risks – the banks that both buy and sell loans – have significantly higher ROE and risk-adjusted profits (RAROC) than all three other groups of banks. Relative to banks that do not engage in loans sales, for example, the buy-sell banks have an average ROE that is 0.9 percentage points higher, and relative to the sell-only banks, the buy-and-sell banks experienced an average ROE that is 0.7 percentage points higher. Similarly, the buy-and-sell banks display higher risk-adjusted profits than banks in the other three groups.

Banks that manage their risks by both buying and selling loans appear to benefit. They can operate with less capital and hold fewer liquid assets on their balance sheet, and they can engage in more risky lending – lending to business – rather than safe lending (consumer and residential real estate), all without unduly increasing their risk. These

strategies raise profits. What explains the banks that don't manage their risks through the loan sales market? One possibility is that loans with private information are hard to sell at arm's length unless a bank has established a strong reputation over time in this market. In fact, the recent results by Dahiya, Puri, and Saunders are consistent with this view. Alternatively, during our sample period there may be mainly poorly managed banks that have been able to persist in the U.S. due to regulations that reduce competitive pressures and government subsidies (see Jayaratne and Strahan, 1998 and Berger, Kashyap and Scalise, 1995).

Trends toward more widespread adoption of risk management techniques support our finding that banks benefit by using these techniques to increase profit. During the past few years, sophisticated banks and financial consultants have begun successfully marketing risk management software to banks. JP Morgan, for example, developed its *Creditmetrics* model to allow banks to estimate how diversification across rating categories, industries, and countries affect the overall loss distribution for their portfolio. Our study focuses on banks' uses of the loan sales market for risk management during the late 1980s and early 1990s because of data availability, but we would expect other risk management techniques that have been adopted over the past several years to have had similar effects on bank capital structure, lending and profits. Rigorous testing of the effects of these new risk management techniques, however, will have to wait for more time to pass and more data to be collected.

IV. Conclusions

We have long been intrigued by the mechanisms through which banks seem to cater to many and opposing needs. Liquidity, profitability, and solvency goals seem to

cross paths and by and large contradict one another. The extant empirical literature for non-financial firms indicates that active risk management through both internal capital markets (e.g. scale and diversification) and through active engagement in the external capital markets (e.g. active use of derivatives) provide ways to manage liquidity and cash flow and achieve higher investment.

We have considered the case of the loan sales market as one tool (that we can measure empirically) which banks use to align their risk management, lending and capital structure goals. The focus in the banking literature has been on how banks use their internal capital markets. Our results support these studies, since we find that bigger banks affiliated with multi-bank BHCs enjoy lower capital ratios and higher lending. We extend these results by showing that access to and aggressive use of an external loan sales market to manage credit risk leads to the same effects. Loan sales activity allows a bank to hold less capital, invest less in low-yield, high-liquidity assets, while at the same time increase its holdings of higher-risk, higher-return assets. The relationship between risk and loan sales activity suggests that these moves toward higher risk activities do not, in fact, result in higher risk. It seems that the risk-reducing benefits of engagement in the loan sales market are, in effect, spent by banks on higher risk activities. The motivation for these changes in capital structure and lending practices is profit -- we find that profits are higher at banks that buy and sell loans.

We conclude that the banks that engage in both buying and selling of loans are better able to take advantage of positive net-present-value investment opportunities, as they are able to increase their C&I and commercial real estate loans and are better able to manage with less liquidity and less capital. The buying and selling of loans at the same

time seems to allow banks to be more flexible and more aggressive. The flexibility reduces the burden of carrying more capital, and lower yield higher liquidity assets; and the aggressiveness allows them to increase their higher risk and higher yield assets.

In recent years we have seen banks trade credit risks using credit derivatives, and we have seen the emergence of sophisticated credit risk measurement systems that take account of correlations across borrowers in different industries, countries and market segments. Regulators have decided that such innovations ought to be encouraged and even used to help determine capital adequacy standards. Our look at how banks have used the loan sales market suggests that developments in risk management are healthy ones that are likely to increase the availability of bank credit, but we caution that regulators ought not expect that these technologies will be employed to reduce *risk*.

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Table 1
Summary Statistics

		Full Sample Statistics		***Buy Only***	***Sell Only***	***Buy and Sell***	***Neither Buy nor Sell***
Variable	*Obs.*	*Mean*	*Std. Dev.*	*Mean*	*Mean*	*Mean*	*Mean*
Capital / Assets	72,611	0.091	0.034	0.092	0.089	0.083	0.100
Securities / Assets	74,043	0.429	0.163	0.466	0.402	0.392	0.474
C&I Loans / Assets	73,938	0.105	0.094	0.093	0.111	0.126	0.078
CRE / Assets	74,044	0.088	0.083	0.082	0.095	0.104	0.067
Total Assets (Millions of $s)	74,045	269	2,599	116	137	530	99
In a Multi-bank Holding Company?	74,045	0.314	-	0.351	0.215	0.477	0.166
In a Multi-state Holding Company?	74,045	0.122	-	0.113	0.090	0.178	0.078
Std. Dev. of return on equity (ROE)	12,670	0.032	0.029	-	-	-	-
Std. Dev. of Loan Loss Provisions/Total Loans	12,732	0.002	0.003	-	-	-	-
Average ROE	13,896	0.053	0.051	-	-	-	-
RAROC (Avg. ROE / Std. Dev. of ROE)	12,672	3.695	3.307	-	-	-	-
Buy loans?	73,033	0.119	-	1	0	0	0
Sell loans?	73,033	0.188	-	0	1	0	0
Buy and sell loans?	73,033	0.378	-	0	0	1	0

Table 2
Dependent Variable: Capital to Asset Ratio

	1988	1989	1990	1991	1992	1993
Constant	0.070**	0.074**	0.071**	0.075**	0.079**	0.086**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Multi-bank holding company	-0.005**	-0.006**	-0.006**	-0.007**	-0.005**	-0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Multi-state bank holding company	-0.002**	0.001	0.002	0.001	0.003**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Assets < $10 mil	0.046**	0.044**	0.046**	0.039**	0.040**	0.034**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$10 mil < Assets < $25 mil	0.033**	0.031**	0.034**	0.029**	0.027**	0.023**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$25 mil < Assets < $50 mil	0.028**	0.027**	0.029**	0.025**	0.024**	0.021**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$50 mil < Assets < $100 mil	0.026**	0.023**	0.026**	0.021**	0.020**	0.017**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$100 mil < Assets < $500 mil	0.021**	0.018**	0.020**	0.016**	0.015**	0.011**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$500 mil < Assets < $1 bil	0.015**	0.012**	0.014**	0.010**	0.009**	0.006**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$1 bil < Assets < $5 bil	0.013**	0.009**	0.011**	0.011**	0.009**	0.009**
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)
$5 bil < Assets < $10 bil	0.010**	0.006**	0.007**	0.006*	0.008**	0.008*
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)
Sell loans	-0.012**	-0.011**	-0.011**	-0.008**	-0.009**	-0.009*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Buy loans	-0.005**	-0.006**	-0.005**	-0.005**	-0.006**	-0.007**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Buy and sell loans	-0.015**	-0.014**	-0.013**	-0.012**	-0.013**	-0.013**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
P-value for F-Test that Sell=Buy and Sell	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
R^2	0.131	0.125	0.111	0.101	0.089	0.083
N	12,893	12,445	12,147	11,813	11,483	11,066

Heteroskedasticity-consistent standard errors are reported below coefficients in parentheses (See White, 1980). **Significant at the 1% level *Significant at the 5% level . Assets above $10 billion is the omitted category for the size indicator variables. Banks that neither buy nor sell loans constitute the omitted category for the sell and buy indicator variables.

Table 3
Dependent Variable: Ratio of Cash Plus Securities to Assets

	1988	1989	1990	1991	1992	1993
Constant	0.277**	0.275**	0.292**	0.292**	0.322**	0.343**
	(0.016)	(0.017)	(0.016)	(0.017)	(0.018)	(0.017)
Multi-bank holding company	-0.008**	0.001	0.004	0.005	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Multi-state bank holding company	-0.015**	-0.029**	-0.036**	-0.025**	-0.022**	-0.016**
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Assets < $10 mil	0.260**	0.250**	0.248**	0.258**	0.234**	0.223**
	(0.017)	(0.018)	(0.018)	(0.019)	(0.020)	(0.020)
$10 mil < Assets < $25 mil	0.224**	0.215**	0.200**	0.201**	0.176**	0.162**
	(0.016)	(0.017)	(0.017)	(0.017)	(0.018)	(0.017)
$25 mil < Assets < $50 mil	0.205**	0.194**	0.181**	0.180**	0.156**	0.142**
	(0.016)	(0.017)	(0.016)	(0.017)	(0.018)	(0.017)
$50 mil < Assets < $100 mil	0.197**	0.181**	0.168**	0.173**	0.154**	0.132**
	(0.016)	(0.017)	(0.016)	(0.017)	(0.018)	(0.017)
$100 mil < Assets < $500 mil	0.162**	0.141**	0.129**	0.135**	0.120**	0.110**
	(0.016)	(0.017)	(0.016)	(0.017)	(0.017)	(0.017)
$500 mil < Assets < $1 bil	0.105**	0.079**	0.070**	0.083**	0.086**	0.074**
	(0.018)	(0.019)	(0.018)	(0.019)	(0.019)	(0.020)
$1 bil < Assets < $5 bil	0.069**	0.066**	0.061**	0.075**	0.076**	0.069**
	(0.017)	(0.018)	(0.018)	(0.019)	(0.020)	(0.019)
$5 bil < Assets < $10 bil	0.019	0.007	0.002	0.004	0.007	-0.010
	(0.019)	(0.021)	(0.020)	(0.021)	(0.023)	(0.025)
Sell loans	-0.069**	-0.064**	-0.066**	-0.063**	-0.062**	-0.068**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Buy loans	-0.003	-0.001	0.002	-0.001	-0.002	-0.010*
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Buy and sell loans	-0.072**	-0.061**	-0.061**	-0.062**	-0.065**	-0.069**
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
P-value for F-Test that Sell=Buy and Sell	0.39	0.52	0.16	0.65	0.45	0.78
R^2	0.126	0.126	0.129	0.112	0.096	0.095
N	13,165	12,722	12,348	12,009	11,617	11,170

Heteroskedasticity-consistent standard errors are reported below coefficients in parentheses (See White, 1980). **Significant at the 1% level *Significant at the 5% level . Assets above $10 billion is the omitted category for the size indicator variables. Banks that neither buy nor sell loans constitute the omitted category for the sell and buy indicator variables.

Table 4
Dependent Variable: Ratio of C&I Loans to Assets

	1988	1989	1990	1991	1992	1993
Constant	0.183**	0.181**	0.179**	0.177**	0.175**	0.151**
	(0.018)	(0.017)	(0.015)	(0.013)	(0.017)	(0.013)
Multi-bank holding company	-0.006*	-0.006*	-0.006*	-0.006**	-0.005**	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Multi-state bank holding company	0.001	-0.008*	-0.003	0.001	-0.003	-0.004
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Assets < $10 mil	-0.118**	-0.120**	-0.126**	-0.131**	-0.130**	-0.111**
	(0.018)	(0.017)	(0.016)	(0.014)	(0.017)	(0.014)
$10 mil < Assets < $25 mil	-0.102**	-0.107**	-0.109**	-0.111**	-0.112**	-0.094**
	(0.018)	(0.017)	(0.015)	(0.013)	(0.017)	(0.013)
$25 mil < Assets < $50 mil	-0.094**	-0.095**	-0.101**	-0.102**	-0.104**	-0.083**
	(0.018)	(0.017)	(0.015)	(0.013)	(0.017)	(0.013)
$50 mil < Assets < $100 mil	-0.084**	-0.089**	-0.097**	-0.098**	-0.101**	-0.081**
	(0.018)	(0.017)	(0.015)	(0.013)	(0.017)	(0.013)
$100 mil < Assets < $500 mil	-0.067**	-0.073**	-0.082**	-0.084**	-0.086**	-0.069**
	(0.018)	(0.017)	(0.015)	(0.013)	(0.017)	(0.013)
$500 mil < Assets < $1 bil	-0.046*	-0.040*	-0.062**	-0.068**	-0.069**	-0.056**
	(0.019)	(0.019)	(0.016)	(0.014)	(0.018)	(0.014)
$1 bil < Assets < $5 bil	-0.030	-0.035*	-0.047**	-0.050**	-0.051**	-0.042**
	(0.019)	(0.018)	(0.016)	(0.015)	(0.018)	(0.015)
$5 bil < Assets < $10 bil	-0.002	-0.009	-0.032	-0.041*	-0.045*	-0.030
	(0.025)	(0.023)	(0.020)	(0.017)	(0.020)	(0.017)
Sell loans	0.038**	0.035**	0.032**	0.028**	0.023**	0.026**
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Buy loans	0.015**	0.015**	0.018**	0.015**	0.012**	0.012**
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Buy and sell loans	0.057**	0.051**	0.047**	0.039**	0.034**	0.028**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
P-value for F-Test that Sell=Buy and Sell	<0.01	<0.01	<0.01	<0.01	<0.01	0.23
R^2	0.091	0.094	0.087	0.082	0.081	0.063
N	13,149	12,706	12,341	12,003	11,612	11,165

Heteroskedasticity-consistent standard errors are reported below coefficients in parentheses (See White, 1980). **Significant at the 1% level *Significant at the 5% level . Assets above $10 billion is the omitted category for the size indicator variables. Banks that neither buy nor sell loans constitute the omitted category for the sell and buy indicator variables.

Table 5
Dependent Variable: Ratio of Commercial Real Estate Loans to Assets

	1988	1989	1990	1991	1992	1993
Constant	0.067**	0.082**	0.097**	0.085**	0.077**	0.072**
	(0.010)	(0.010)	(0.010)	(0.009)	(0.008)	(0.007)
Multi-bank holding company	0.004	0.001	-0.005*	-0.007**	-0.008**	-0.009**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Multi-state bank holding company	-0.002	-0.002	-0.001	0.001	-0.003	-0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Assets < $10 mil	-0.051**	-0.059**	-0.081**	-0.071**	-0.061**	-0.055**
	(0.010)	(0.010)	(0.010)	(0.009)	(0.008)	(0.007)
$10 mil < Assets < $25 mil	-0.028**	-0.042**	-0.057**	-0.045**	-0.037**	-0.033**
	(0.010)	(0.010)	(0.010)	(0.009)	(0.008)	(0.007)
$25 mil < Assets < $50 mil	-0.009	-0.019	-0.035**	-0.018	-0.007	-0.001
	(0.010)	(0.010)	(0.010)	(0.009)	(0.008)	(0.007)
$50 mil < Assets < $100 mil	0.009	0.002	-0.014	0.002	0.013	0.021**
	(0.010)	(0.010)	(0.010)	(0.009)	(0.008)	(0.007)
$100 mil < Assets < $500 mil	0.027**	0.022*	0.011	0.026**	0.035**	0.042**
	(0.010)	(0.010)	(0.010)	(0.009)	(0.008)	(0.007)
$500 mil < Assets < $1 bil	0.044**	0.044**	0.025*	0.043**	0.046**	0.045**
	(0.012)	(0.012)	(0.011)	(0.010)	(0.009)	(0.008)
$1 bil < Assets < $5 bil	0.032**	0.028**	0.016	0.025*	0.028**	0.033**
	(0.011)	(0.011)	(0.011)	(0.010)	(0.009)	(0.008)
$5 bil < Assets < $10 bil	0.020	0.021	-0.003	0.014	0.025	0.026*
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.013)
Sell loans	0.023**	0.023**	0.024**	0.023**	0.027**	0.027**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Buy loans	0.007**	0.008**	0.010**	0.013**	0.015**	0.016**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Buy and sell loans	0.034**	0.029**	0.031**	0.028**	0.030**	0.031**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
P-value for F-Test that Sell=Buy and Sell	<0.01	<0.01	<0.01	0.01	0.16	0.09
R^2	0.149	0.147	0.152	0.145	0.134	0.131
N	13,165	12,722	12,348	12,009	11,618	11,170

Heteroskedasticity-consistent standard errors are reported below coefficients in parentheses (See White, 1980). **Significant at the 1% level *Significant at the 5% level . Assets above $10 billion is the omitted category for the size indicator variables. Banks that neither buy nor sell loans constitute the omitted category for the sell and buy indicator variables.

Table 6
The Relationship between Capital, Liquidity and Bank Lending to the Depth of Local Loan Sales Market

Dependent Variable	1988	1989	1990	1991	1992	1993
Capital / Assets	-0.006**	-0.004**	-0.003**	-0.004**	-0.004**	-0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Cash plus Securities / Assets	-0.041**	-0.028**	-0.030**	-0.031**	-0.024**	-0.022**
	(0.001)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
C&I Loans / Assets	0.046**	0.037**	0.033**	0.031**	0.024**	0.020**
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Commercial Real Estate Loans / Assets	0.032**	0.025**	0.027**	0.023**	0.020**	0.017**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)

Each cell in this table represents the coefficient estimate from one variable in a multiple regression (i.e. there are 24 regression equations represented here). The dependent variables in each regression are the same as those reported in Tables 2-5. All of the bank characteristics (except the loan sales variables) are also the same as those reported in Tables 2-5, but these are not reported to conserve space. The coefficient on our measure of the depth of the local loan sales market, defined as the amount of lending done by banks that both buy and sell loans as a fraction of all lending done in the same local market as the bank, is reported here, along with its standard error. Heteroskedasticity-consistent standard errors are reported below coefficients in parentheses (See White, 1980). **Significant at the 1% level *Significant at the 5% level . Assets above $10 billion is the omitted category for the size indicator variables. Banks that neither buy nor sell loans constitute the omitted category for the sell and buy indicator variables.

Table 7
Dependent Variables: Volatility of Return on Equity, Volatility of Loan Loss Provisions to Total Loans

	Volatility of Return on Equity		Volatility of Loan Loss Provisions to Total Loans	
	No controls	With controls	No controls	With controls
Constant	0.042**	0.052**	0.0037**	0.0032**
	(0.005)	(0.005)	(0.0004)	(0.0004)
Capital to Asset Ratio	-	-0.295**	-	-0.0098**
		(0.009)		(0.0008)
Securities to Assets	-	-0.001	-	0.0008**
		(0.002)		(0.0002)
C&I Loans to Assets	-	0.064**	-	0.0051**
		(0.004)		(0.0003)
Commercial Real Estate to Assets	-	0.056**	-	0.0023**
		(0.004)		(0.0003)
Multi-bank holding company	-0.003**	-0.004**	-0.0004**	-0.0004**
	(0.001)	(0.001)	(0.0001)	(0.0001)
Multi-state bank holding company	0.004**	0.004**	0.0001	0.0001
	(0.001)	(0.001)	(0.0001)	(0.0001)
Assets < $10 mil	-0.005	0.017**	-0.0009*	0.0001
	(0.005)	(0.004)	(0.0004)	(0.0004)
$10 mil < Assets < $25 mil	-0.010*	0.007	-0.0009*	-0.0002
	(0.005)	(0.004)	(0.0004)	(0.0004)
$25 mil < Assets < $50 mil	-0.013**	0.001	-0.0013*	-0.0007
	(0.005)	(0.004)	(0.0004)	(0.0004)
$50 mil < Assets < $100 mil	-0.016**	-0.004	-0.0015**	-0.0010*
	(0.005)	(0.004)	(0.0004)	(0.0004)
$100 mil < Assets < $500 mil	-0.015**	-0.008	-0.0015**	-0.0011**
	(0.005)	(0.004)	(0.0004)	(0.0004)
$500 mil < Assets < $1 bil	-0.010	-0.006	-0.0007	-0.0005
	(0.004)	(0.004)	(0.0005)	(0.0004)
$1 bil < Assets < $5 bil	-0.006	-0.003	-0.0005	-0.0003
	(0.004)	(0.004)	(0.0005)	(0.0004)
$5 bil < Assets < $10 bil	-0.005	-0.001	0.0007	0.0009
	(0.006)	(0.006)	(0.0006)	(0.0006)
Sell loans	0.008**	-0.002*	0.0002*	-0.0002
	(0.001)	(0.001)	(0.0001)	(0.0001)
Buy loans	-0.001	-0.005**	-0.0001	-0.0003*
	(0.001)	(0.001)	(0.0001)	(0.001)
Buy and sell loans	0.006**	-0.006**	0.0001	-0.0005**
	(0.001)	(0.001)	(0.0001)	(0.0001)
P-value for F-Test that Sell=Buy and Sell	0.05	<0.01	0.02	<0.01
P-value for F-Test that Buy=Buy and Sell	<0.01	0.28	0.34	0.03
R^2	0.020	0.167	0.018	0.053
N	12,670	12,598	12,732	12,712

This table estimates the relationship between the average volatility of ROE and loan losses for each bank on the average value of its balance sheet characteristics and loan sales indicator variables. Heteroskedasticity-consistent standard errors are reported below coefficients in parentheses (See White, 1980). **Significant at the 1% level * Significant at the 5% level . Assets above $10 billion is the omitted category for the size indicator variables. Banks that neither buy nor sell loans constitute the omitted category for the sell and buy in dicator variables.

Table 8
Dependent Variables: Mean Return on Equity (ROE) and RAROC (Mean ROE/Volatility of ROE)

	Return Regressions	
	Average ROE	RAROC
Constant	0.111**	4.093**
	(0.008)	(0.533)
Capital to Asset Ratio	0.076**	16.794**
	(0.014)	(1.015)
Securities to Assets	-0.016**	-0.540*
	(0.003)	(0.237)
C&I Loans to Assets	-0.124**	-7.086**
	(0.006)	(0.429)
Commercial Real Estate to Assets	-0.105**	-8.046**
	(0.006)	(0.429)
Multi-bank holding company	0.002	0.505**
	(0.001)	(0.082)
Multi-state bank holding company	-0.003	-0.279*
	(0.002)	(0.117)
Assets < $10 mil	-0.074**	-2.901**
	(0.008)	(0.530)
$10 mil < Assets < $25 mil	-0.056**	-1.541**
	(0.008)	(0.514)
$25 mil < Assets < $50 mil	-0.041**	-0.740
	(0.008)	(0.513)
$50 mil < Assets < $100 mil	-0.031**	0.023
	(0.008)	(0.513)
$100 mil < Assets < $500 mil	-0.021**	0.675
	(0.008)	(0.510)
$500 mil < Assets < $1 bil	-0.021*	0.158
	(0.008)	(0.553)
$1 bil < Assets < $5 bil	-0.018*	0.097
	(0.008)	(0.537)
$5 bil < Assets < $10 bil	-0.012	-0.104
	(0.011)	(0.718)
Sell loans	0.002	0.075
	(0.002)	(0.124)
Buy loans	0.001	-0.075
	(0.002)	(0.152)
Buy and sell loans	0.009**	0.483**
	(0.001)	(0.095)
P-value for F-Test that Sell=Buy and Sell	<0.01	<0.01
R^2	0.109	0.120
N	13,766	12,598

This table estimates the relationship between the average volatility of ROE and loan losses for each bank, average ROE and RAROC on the average value of its balance sheet characteristics and loan sales indicator variables. Heteroskedasticity-consistent standard errors are reported below coefficients in parentheses (See White, 1980). **Significant at the 1% level *Significant at the 5% level . Assets above $10 billion is the omitted category for the size indicator variables. Banks that neither buy nor sell loans constitute the omitted category for the sell and buy indicator variables.