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Financial Flexibility and the Cost of External Finance for U.S. Bank Holding Companies

This paper models a bank with access to two segmented capital markets, the market for insured deposits and the market for uninsured claims. We illustrate how higher costs of accessing either market leads to lower firm values and a greater incentive to carry liquid assets. We test our model on a sample of large banking firms, and label banks with relatively lower costs of accessing the two markets as more "financially flexible." Our two key findings are (1) banks with greater financial flexibility have greater value, and (2) banks with greater financial flexibility devote a smaller percentage of assets to cash and marketable securities, consistent with the notion that financial flexibility reduces the sensitivity of firm profits to internal wealth shocks, thus reducing the firm's need to carry financial slack.

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BANKS RAISE FUNDS FROM segmented markets. While investors determine the risk premium in pricing uninsured claims, regulators play an important role in setting the risk premium on insured claims by assessing deposit insurance premia, and imposing other regulatory requirements. This simple difference has been used to explain a number of observed regularities including bank risk taking, regulator behavior, and investor responses to bank news. And yet, little empirical work has explored banks' choices of how much funding to raise from each

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source, or the determinants of that choice. While logic argues that individual banks will trade off the relative benefits and costs of raising funds from these two sources, quantification of these factors, especially the costs, may be problematic.

To understand some of the issues that must be addressed when quantifying the costs of accessing segmented markets, consider the following example. Assume two capital markets price a particular bank's securities differently. As the relative rates charged by the two markets change, the bank will obviously find it advantageous to increase its reliance on the now relatively cheaper market. The degree to which a bank can exploit changes in relative rates depends on its costs of accessing the two markets. The cheaper the bank's access costs, the better it can take advantage of pricing discrepancies.

Yet access to segmented markets will impact the bank in ways beyond simple arbitrage. Consider a bank that relies heavily on internal funds for investment. With perfect capital markets, shortfalls in internal funds can be offset with equivalent increases in external funds. However, if capital market imperfections exist such that the marginal cost of external funds increases in the quantity raised, then the bank may forgo lending when faced with internal fund shortfalls. We argue that access to segmented capital markets results in a marginal (deadweight) cost of access (totaled across all markets) that is less sensitive to quantity, making costs of internal fund shortfalls more similar in magnitude to the benefits of equivalent sized windfalls. Thus, the impact of variability in internal funds on firm value will be lower for banks with access to segmented markets. This latter benefit to segmented market access has important implications for the interaction between investment and financing decisions.

To ensure that we recognize both of the above-described benefits to accessing segmented markets, we begin our analysis with a theoretical model that explicitly admits the possibility of raising external capital from two segmented markets. We assume an increasing marginal cost of raising funds in either market, and illustrate how these access costs and relative prices in the two markets combine to affect a bank's capital raising activities. We show that higher access costs attenuate a bank's incentive to switch funding sources when the markets' relative prices change (i.e. the bank with high access costs will alter its funding mix to a lesser degree than the bank with low access costs).

Second, we show that a bank with access to two markets faces a deadweight cost of external finance function that is less convex than an otherwise identical bank's with access to only one market. Moreover, the lower the access cost convexity of *either* market, the lower the bank's total external finance cost convexity. Lower convexity of the deadweight cost of external finance translates into reduced concavity in the bank's profits with respect to internal funds (i.e., the firm will be more insulated from shocks to internal funds). Finally, our model presents a corollary to this latter result. Specifically, we model the bank's decision to carry costly liquid assets—financial slack. If there is uncertainty regarding next period's rate charged by the capital markets, the bank invests in liquid assets as a buffer against the uncertainty. The model shows that the bank with less convex access costs carries less slack.

Given explicit costs to carrying slack in the model, we thus link cheaper access to segmented markets with higher value, in a way altogether different from a simple arbitrage story.[1]

We then test the model's predictions. Our focus on U.S. banking firms is particularly advantageous here because U.S. banks frequently raise funds in both the insured and uninsured markets, and they are required to regularly report detailed firm-level data to regulators. To test our model, we treat each bank's mix of funds—raised from the insured deposit and uninsured liability markets—as their solution to the model's profit maximization (cost minimization) problem. Since the model implies that a bank trades off the benefits of a lower rate in a particular market against their cost of accessing the two markets, changes in the relative prices across the two markets will lead banks with relatively low access costs to adjust their mix of claims to a greater degree. This is the insight that we use to construct a measure of access costs as the sensitivity of relative insured deposit use to the difference in rates charged in the insured and uninsured claims markets. We denote banks with lower access costs as having greater financial flexibility.

Our main tests focus on the link between our proxy for access costs (financial flexibility) and firm value. Unfortunately, this test does not allow us to determine whether flexibility is valuable because of flexible banks' ability to arbitrage differential prices of claims in two markets, or because of the reduced sensitivity of profits to internal wealth. To test the latter explanation, we relate our proxy for flexibility to a measure of financial slack. Our model suggests that we will find a negative relation between slack and flexibility, supporting the argument that value is rising in flexibility (at least partly) because of the reduced sensitivity of profits to internal wealth.

Our results from testing the model can be summarized as follows. First, there appears to be considerable variation across banks in their costs of accessing the insured deposit and uninsured liability markets (financial flexibility). In particular, there is substantial cross-sectional variation among our sample banks in their sensitivities of relative insured deposit use to the relative prices across the two markets. Second, banks with greater financial flexibility have higher values, as proxied by market-to-book ratios. Taken together, these results suggest that banks benefit from cheaper access to alternative financing venues. Finally, banks with greater financial flexibility carry less financial slack (cash and marketable securities).

Our work also has important implications outside the banking industry. The evidence that financial flexibility can be valuable when there are differential costs to alternative capital sources suggests that capital structure choice is not irrelevant. The ability to respond nimbly to changes in market prices by altering capital structure is recognized as valuable by equity markets. Although it is easier to detect for banks, this value-enhancing aspect of financial flexibility is not likely confined to banks.[2]

1. Similarly, in the context of Froot, Scharfstein, and Stein (1993), if hedging is costly then less convexity in access costs will result in less hedging and higher firm value.

2. For example, the desire by many foreign companies to list ADRs on U.S. exchanges strongly suggests that access to segmented markets is viewed as valuable by firms other than U.S. financial institutions.

Moreover, our results likely understate the importance of access to segmented markets for the following two reasons. First, the fact that the evidence presented is found within the same class of claims (liabilities) suggests that the magnitude of such an effect may be even greater across different types of claims. Second, the fact that we find significant results for a sample of firms that all have access to both markets suggests that the effect would be even larger if we included firms with access to only a single market in our tests.

Our results also have important implications for regulators. Froot, Scharfstein, and Stein (1993) show that in a world with costly external financing, hedging is beneficial when it reduces the sensitivity of investment to cash flow. In this paper, financial flexibility is valuable for essentially the same reason. It reduces capital costs below what they would be without flexibility, encouraging bank investment in the marginal borrower. This interpretation has implications for the effects of regulatory policy on credit availability in the economy as a whole. For example, during times of increasing market risk premia, banks may choose to curtail their lending as uninsured financing costs become exorbitant. The regulator can counter this decline in lending activity by altering the relative costs of insured deposits. However the effectiveness of such regulatory action depends on banks' access costs to the two markets.[3]

Our work has an additional implication for bank regulators in particular. Our evidence that banks trade off liquid asset holdings against flexibility implies that banks can hold liquidity either as securities or as unused borrowing capacity in the wholesale money market. Given uncertainty on the part of bank supervisors over how to measure liquidity, our results imply that there is no unique measure to be had.

The rest of this paper is organized as follows. Section 1 presents our model. Section 2 describes our data. Section 3 presents our methodology and empirical evidence of banks adjusting their insured deposit use in response to changes in their cost relative to the cost of uninsured liabilities. Section 4 reports evidence on the relation between financial flexibility and firm value. Section 5 investigates the possibility that financial flexibility is valuable because it substitutes for the need to carry a buffer stock of liquid assets. Section 6 concludes.

1. THE MODEL

We specify a two-period model where the firm can raise funds from two segmented capital markets, A and B. At time zero, the firm chooses to invest in liquid assets, and then a shock to the cost of capital charged by market B occurs. At time one, the firm chooses investment and the amount and mix of external funds raised from

3. Kashyap and Stein (1995, 2000) find that a contraction in monetary policy (causing an increase in the cost of core deposits), decreases banks' reliance on core deposits, and that such shocks deter loan growth at small banks with less liquid assets, cash, and securities. Given that we limit our sample to large banks, our results suggest that altering the regulatory imposed price of risk could have similar effects on lending activity at large banks.

markets A and B based on the difference between the rates charged in the markets and the costs of accessing the markets. The uncertainty in the cost of capital charged by market B coupled with a concave profit function (stemming from an assumed concave production function and convex external finance cost function) leads the value maximizing firm to carry liquid assets as a buffer against the impact of the shock. The less financial flexibility a firm has to alter its mix of funds the greater the incentive to carry liquid assets. Our analysis begins with the firm's time one problem.

1.1 The Time One Problem

The firm's time one problem is as follows:

$$\underset{I,e_A,e_B}{\text{Max}}\ \pi = f(I) - I - C(e_A,e_B) \tag{1}$$

subject to the budget constraint

$$I = e_A + e_B + L_0(1 + r_L)$$

where I is the level of investment, e_A and e_B are externally raised funds from markets A and B. L_0 is the amount of liquid assets the firm chose to carry in the previous period and r_L is the return on liquid assets. The production and cost of external finance functions, respectively, are

$$f(I) = \alpha I + \alpha_I I^2$$

$$C(e_A,e_B) = \rho e_A + (\rho + \varepsilon)e_B + \delta_A e_A^2 + \delta_B e_B^2$$

where ρ is the cost of funds in market A and ε is the realized value of the shock to the rate charged in market B.

We assume $\alpha > 0$, $\alpha_I < 0$, $\delta_A > 0$, $\delta_B > 0$, and $\rho > 0$. The costs of raising external finance or "access costs" are captured by δ_A and δ_B. Notice we do not specify the source of segmentation. Rather, we assume the markets are segmented from the investor's point of view, and that this segmentation results in the two markets charging different rates. For simplicity, we also assume it is always optimal for the firm to raise some amount of external finance (i.e., $I^* > L_0(1 + r_L)$).

Taking the first-order conditions, the firm sets the marginal costs of capital in markets A and B equal to each other, while at the same time equating marginal revenue with marginal cost:

$$\rho + 2\delta_A e_A = \rho + \varepsilon + 2\delta_B e_B = \alpha + 2\alpha_I I - 1 \tag{2}$$

Solving for optimal investment and external finance raised in markets A and B, we have:

$$I^* = \frac{1}{2\alpha_I}\left[\rho + 1 - \alpha + 2\delta_A\left(\frac{\varepsilon + \frac{\delta_B}{\alpha_I}(\rho + 1 - \alpha) - 2\delta_B L_0(1 + r_L)}{2\left(\delta_A + \delta_B - \delta_A\frac{\delta_B}{\alpha_I}\right)}\right)\right] \tag{3}$$

$$e_A^* = \frac{\varepsilon + \frac{\delta_B}{\alpha_I}(\rho + 1 - \alpha) - 2\delta_B L_0(1 + r_L)}{2\left(\delta_A + \delta_B - \delta_A\frac{\delta_B}{\alpha_I}\right)} \tag{4}$$

$$e_{\mathrm{B}}^{*} = \frac{\delta_{\mathrm{A}}}{\delta_{\mathrm{B}}}\left(\frac{\varepsilon + \frac{\delta_{\mathrm{B}}}{\alpha_I}(\rho + 1 - \alpha) - 2\delta_{\mathrm{B}}L_0(1 + r_{\mathrm{L}})}{2\left(\delta_{\mathrm{A}} + \delta_{\mathrm{B}} - \delta_{\mathrm{A}}\frac{\delta_{\mathrm{B}}}{\alpha_I}\right)}\right) - \frac{\varepsilon}{2\delta_{\mathrm{B}}} \tag{5}$$

We can now compute comparative statistics to show that the greater the shock to the cost of funds in market B the greater the firm's reliance upon market A and the less its reliance on market B.

$$\frac{\partial e_{\mathrm{A}}^{*}}{\partial \varepsilon} = \frac{1}{2\left(\delta_{\mathrm{A}} + \delta_{\mathrm{B}} - \delta_{\mathrm{A}}\frac{\delta_{\mathrm{B}}}{\alpha_I}\right)} > 0 \tag{6}$$

$$\frac{\partial e_{\mathrm{B}}^{*}}{\partial \varepsilon} = \frac{\delta_{\mathrm{A}}}{\left(\delta_{\mathrm{A}} + \delta_{\mathrm{B}} - \delta_{\mathrm{A}}\frac{\delta_{\mathrm{B}}}{\alpha_I}\right)} - 1 < 0 \tag{7}$$

As we would expect, firms arbitrage rate differentials across markets. Of course, if a firm faces deadweight costs to executing the arbitrage, this will mitigate its incentive to alter their mix of claims. In particular, the greater the convexity of external finance costs in either market A or B (i.e., the higher is either δ_{A} or δ_{B}) the less responsive the firm is, in terms of adjusting capital acquisition in response to the shock.

$$\frac{\partial^2 e_{\mathrm{A}}^{*}}{\partial \varepsilon \partial \delta_{\mathrm{A}}} = -\frac{1}{2}\left(\delta_{\mathrm{A}} + \delta_{\mathrm{B}} - \delta_{\mathrm{A}}\frac{\delta_{\mathrm{B}}}{\alpha_I}\right)^{-2}\left(1 - \frac{\delta_{\mathrm{B}}}{\alpha_I}\right) < 0 \tag{8}$$

$$\frac{\partial^2 e_{\mathrm{A}}^{*}}{\partial \varepsilon \partial \delta_{\mathrm{B}}} = -\frac{1}{2}\left(\delta_{\mathrm{A}} + \delta_{\mathrm{B}} - \delta_{\mathrm{A}}\frac{\delta_{\mathrm{B}}}{\alpha_I}\right)^{-2}\left(1 - \frac{\delta_{\mathrm{A}}}{\alpha_I}\right) < 0 \tag{9}$$

This is the result that allows us to construct a proxy for costs of accessing segmented markets (across firms), and it leads us to our first hypothesis:

HYPOTHESIS 1: *The change in market A funding in response to a change in the rate charged in market B, decreases in the convexity of external financing costs (i.e., decreases in* δ_{A} *and* δ_{B}*).*

Next, it can be shown that profits decline in the convexity of external finance costs (market A's convexity term, δ_{A} will be used in this comparative static). Fully differentiating the profit equation (1), evaluated at the optimal choices of investment and external finance, with respect to δ_{A} and applying the envelope theorem:[4]

4. More explicitly, Equation (10) is derived by fully differentiating the profit Equation (1) with respect to δ_{A}:

$$\frac{d\pi^*}{d\delta_{\mathrm{A}}} = (f_I - 1)\frac{dI^*}{d\delta_{\mathrm{A}}} - C_{e_{\mathrm{A}}}\frac{de_{\mathrm{A}}^{*}}{d\delta_{\mathrm{A}}} - C_{e_{\mathrm{B}}}\frac{de_{\mathrm{B}}^{*}}{d\delta_{\mathrm{A}}}$$

Applying the chain rule and recognizing that

$$\frac{dI^*}{d\delta_{\mathrm{A}}} = \frac{de_{\mathrm{A}}^{*}}{d\delta_{\mathrm{A}}} + \frac{de_{\mathrm{B}}^{*}}{d\delta_{\mathrm{A}}},$$

we have

$$\frac{d\pi^*}{d\delta_{\mathrm{A}}} = (f_I - 1 - C_{e_{\mathrm{A}}})\frac{de_{\mathrm{A}}^{*}}{d\delta_{\mathrm{A}}} + (f_I - 1 - C_{e_{\mathrm{B}}})\frac{de_{\mathrm{B}}^{*}}{d\delta_{\mathrm{A}}} - e_{\mathrm{A}}^{*2}$$

The first-order conditions imply that the terms in parentheses equal zero.

$$\frac{\mathrm{d}\pi^*}{\mathrm{d}\delta_\mathrm{A}} = -e_\mathrm{A}^{*2} \tag{10}$$

which is clearly less than zero. Similarly,

$$\frac{\mathrm{d}\pi^*}{\mathrm{d}\delta_\mathrm{B}} = -e_\mathrm{B}^{*2} < 0.$$

This leads to our second hypothesis:

HYPOTHESIS 2: *Firm value will be decreasing in the convexity of external financing costs.*

The intuition behind this result is straightforward. Less convex costs of external finance are associated with higher firm profits. In terms of our specific external finance cost functions, it can be shown that the convexity of the total costs of raising external finance from the two markets is lower than that from either market alone. A formal proof is provided in Appendix A.

1.2 The Demand for Liquid Assets

Thus far, we have shown that financial flexibility is positively related to firm value. Since this result is driven by the fact that flexibility measures the convexity in the total cost of external finance, we can speak of another effect of flexibility on firms. Namely firms with less financial flexibility will have a greater incentive to carry liquid assets to better insulate them from shocks to the differential rates charged by the capital markets.

Investing in liquid assets at time 0 provides certain funds at time 1. In this sense, investment in liquid assets reduces the impact of future uncertainty by minimizing the need for external finance. However, liquid assets may be costly due to tax reasons or agency issues between managers and shareholders.[5] This suggests that liquid assets, in isolation, will have a negative net present value. Therefore, firms will only choose to carry slack if it reduces uncertainty in future finance costs.

At time 0, the firm chooses to invest in liquid assets, L, in order to maximize the expected profits at time 1:

$$P(L) = \max_{L_0} E_0[f(I) - I - C(e)] + X_0 - L_0 \tag{11}$$

where e is the vector $\{e_\mathrm{A}, e_\mathrm{B}\}$, X_0 is the firm's endowment at time 0, and X_0—L_0 is the dividend paid at time 0. $E_0()$ denotes the expectation at time 0. The first-order condition with respect to L is

$$E\left[(f_I - 1)\frac{\mathrm{d}I^*}{\mathrm{d}L} - C_{e_\mathrm{A}}\frac{\mathrm{d}e_\mathrm{A}^*}{\mathrm{d}L} - C_{e_\mathrm{B}}\frac{\mathrm{d}e_\mathrm{B}^*}{\mathrm{d}L}\right] - 1 = 0 \tag{12}$$

5. Our motivation for investment in liquid assets is similar to Kim, Mauer, and Sherman (1998) and Opler, Pinkowitz, Stulz, and Williamson (1999). They provide similar arguments suggesting that investment in liquid assets is costly.

Using the implicit function theorem and applying the envelope theorem, we have

$$\frac{dL^*}{d\delta_A} = \frac{2e_A^*\dfrac{\partial e_A^*}{\partial L}}{f_{II}\left(\dfrac{\partial I^*}{\partial L}\right)^2 - C_{e_Ae_A}\left(\dfrac{\partial e_A^*}{\partial L}\right)^2 - C_{e_Be_B}\left(\dfrac{\partial e_B^*}{\partial L}\right)^2} \tag{13}$$

Since $\partial e_A^*/\partial L$ is negative (from Equation (4)), the numerator is negative, and given that $f_{II} < 0$, $C_{e_Ae_A} > 0$, and $C_{e_Be_B} > 0$, the denominator is negative. Thus, we have $dL^*/d\delta_A > 0$ and firms with higher access costs optimally carry more slack. This leads to our third and final hypothesis:

HYPOTHESIS 3: *Firms facing greater convexity in the costs of external finance will carry more liquid assets.*

1.3 Interpreting the Model in the Context of the U.S. Commercial Banking Industry

As noted in the Introduction, an advantage of using U.S. banking data is the frequency with which U.S. banks raise funds in both the insured deposits and uninsured liabilities markets. Moreover, data on their financing mix is provided on a timely basis. The combination of differential pricing mechanisms in the two markets (regulators levy a risk-based deposit insurance premium for using insured deposits while markets price uninsured liabilities), and data availability, create a natural setting for testing our model. In the context of our model, insured deposits represent market A and uninsured liabilities represent market B. We now discuss whether our model is a reasonable characterization of the problem banks face in their funding decisions.

The assumption that costs of accessing insured deposits (from market A) are positive and increasing, $\delta_A > 0$, is consistent with a broad banking literature.[6] Insured deposits are in finite supply and may entail significant transactions costs. For example, there may be search costs associated with attempts to access depositors outside the local market, or there may be costs to increasing its share of insured deposits within a local market, such as advertising costs or building new branches. Alternatively, the bank may pay such costs directly via higher interest rates in the hopes of attracting new depositors. While all banks face these costs to some extent, the form and magnitude of these costs may vary depending on geographical location, bank reputation, and other bank-specific characteristics. Banks also have varying degrees of market power that should result in cross-sectional differences in individual bank access costs (see Rosen (2001) for more detail on the determinants of insured deposit rates).

Casual empirical evidence supports the view that banks face significant costs of raising additional insured deposits. For example, a story in the January 11, 1995

6. See, for example, Flannery (1982) and Stein (1998).

edition of the *American Banker* describes one effort made by a bank to raise additional insured deposits by having a CD sale:

> The CD campaign, dubbed the 'One-derful One-Day CD Sale,' was part of a push by UJB Financial Corp. to bring in $200 million in fresh deposits. Similar events were staged last Saturday at the Princeton, N.J.-based banking company's 269 branches across New Jersey and Pennsylvania. UJB isn't alone. Throughout the country, banks are coming up with strategies to bring back savings dollars that had migrated to mutual funds and other uninsured investments in recent years.

Evidence on insured deposit rates also supports the view that these access costs vary across banks. According to bankrate.com (the internet sibling of the *Bank Rate Monitor* newsletter) Chase Manhattan, Bank of New York, and Citibank offered rates of 5.40, 5.55, and 5.80% on their one-year FDIC insured CDs. E*TRADE Bank was simultaneously offering 7.45%.[7] As noted above, banks may pay access costs directly via higher interest rates or through non-rate mechanisms. Given these banks are operating in the same market—these rates were quoted for one-year insured CDs in the New York region—differential offer rates suggest their costs of access differ.

The positive deadweight cost to raising uninsured funds also deserves discussion. The fixed costs associated with issuing public bonds or other uninsured claims are an obvious candidate for deadweight costs. So too are the costs due to information asymmetries regarding firm value (see Stein, 1998 for a discussion regarding banks). Finally, concavity in a bank's production function is also standard (again, see for example, Stein, 1998).

We may also inquire about the relative convexity of the deadweight costs in the two markets, δ_A versus δ_B. Our conjecture is that $\delta_A > \delta_B$ is a reasonable characterization of the bank's fundraising parameters. In particular, many large banks continue to use uninsured liabilities, even though the rate charged on insured claims is lower. If $\delta_A > \delta_B$ were not true, the total cost of raising insured funds would always lie below the total cost of raising uninsured funds, and all banks with access to both would go to the corner solution.

2. DATA

To estimate financial flexibility, we collect a sample of banks during 1992–95. We choose U.S. commercial banks because they have access to clearly segmented markets, they access the markets frequently, and regulators require that they report detailed data on their capital raising activities on a quarterly basis. Banks raise capital in both the uninsured liability market and the insured deposit market. In the case of uninsured liabilities, claimholders bear the default risk and set the cost of claims accordingly. In the case of insured deposits, the FDIC bears the default

7. These rates were offered in the New York region on 5/24/2000. Chase Manhattan, Bank of New York, and E*Trade required a $1,000 minimum deposit while Citibank's minimum was $500.

risk on behalf of the claimholders and, along with other regulators, sets its own cost associated with default risk. Thus, banks effectively face two "prices" for bearing their default risk: one imposed by the regulator and the other imposed through the market (i.e., the markets are segmented—see Billett, Garfinkel, and O'Neal, 1998).

Our sample criteria are as follows. Each bank must be publicly traded with the necessary information on COMPUSTAT at the end of 1995.[8] Also, each sample bank must have at least 12 quarters of complete data on insured deposit use between 1992:2 and 1995:4.[9,10] Our insured deposit data comes from the quarterly Call Report tapes for individual banks, which we aggregate to the bank holding company level. There are 3562 BHC quarters (observations) from 231 bank holding companies that meet our criteria. We estimate insured deposits as total deposits less deposit amounts of over \$100,000 and foreign deposits, plus fully insured brokered deposit amounts of more than \$100,000. Our insured deposit use variable is calculated as insured deposits scaled by total liabilities (ID/TL). Relatively high (low) values of ID/TL are consistent with relatively high (low) reliance on insured deposits.

A concern with estimating the sensitivity of insured deposit use to variation in the spread between insured and uninsured claims' interest rates, is that the required rate of return associated with insured funds is not simply the risk-free rate, even though insured deposits are considered risk-free. In particular, the regulatory imposed cost of risk must be considered a part of ρ for insured deposits. Since many risk-related regulatory costs are unobservable, we chose a time period, 1992–95, when regulatory costs were relatively constant.[11] As long as risk-related regulatory costs are constant during our sample period, we can effectively ignore them as they may be interpreted as simply adding a constant to ρ.

Of course, other factors may also affect banks' insured deposit rates. In particular, if a bank has significant market power, they may be able to offer lower rates than their less powerful cohorts, ceteris paribus. Obviously, it would be difficult to measure market power directly, but we posit that this is unnecessary. Specifically, market power to offer lower rates can be construed as lower access costs. Thus, to the extent that we measure access costs reasonably accurately, we need not be concerned with this effect. The flip side of this argument implies that we need to be careful when we measure access costs. If our measure of access costs is going

8. Our COMPUSTAT data includes information on total assets, net income, book value of equity, price per share, and shares outstanding.

9. We eliminate any bank/quarters that indicate assets in that quarter are at least 20% different from assets in the previous quarter. Although our conclusions are insensitive to this sampling technique (see robustness Section 5.3), we do not wish to attribute significant changes in the use of insured deposits (relative to total liabilities) to large changes in the scaling variable that may be driven by "one-time" adjustments in bank structure (for example through mergers or divestitures).

10. As we discuss below, we use the previous quarter's SPREAD to explain the current quarter's insured deposit use. Since *bank* (not corporate) spread data is only available starting in the first quarter of 1992, our first usable insured deposit variable comes from the second quarter of 1992.

11. The FDIC Improvement Act (FDICIA), effected in December of 1991, dramatically altered risk-related regulatory costs including the introduction of risk-related deposit insurance premia. Premia were assessed based on the banks capital adequacy and CAMEL rating (the regulatory assessment of bank condition). The premia ranged up to 31 basis points until January 1, 1996 when the maximum premia that could be charged was reduced to 27 basis points.

to include market power, which allows banks to charge lower rates than their similar risk cohorts, then it better include it for every bank in our sample. Unfortunately, some banks may embed access costs in the rate they offer on insured claims, while others may not (refer to the examples in Section 1.3). This concern motivates our specific choice for the spread between rates charged in the two markets.

To estimate the differential rates across the two markets, we use the spread between the yield on a *portfolio* of 3-month BBB-rated bank bonds and the yield on 3-month Treasuries (SPREAD) as our proxy for ε.[12] We ignore bank-specific rates on insured claims because some banks' rates include access costs while other banks' spreads do not (because they offer other non-rate concessions). Given that we measure access costs as the sensitivity of insured deposit use to SPREAD, use of individual bank spreads would cause our estimates of financial flexibility to include access costs for some banks but not for others. This would clearly induce biases.

In Sections 5 and 6, we assess the robustness of our results to a modification of our proxy for ε. Our particular concern is that our measure of SPREAD is insensitive to bank risk. In reality, relatively safe banks may have lower ε than riskier banks. Thus, in addition to tests based on SPREAD, we also conduct tests using SPREAD interacted with a measure of bank risk. We use the quarterly standard deviation of daily stock returns to measure bank risk (RISK). Default risk is increasing in both asset risk (asset volatility) and leverage. Equity volatility has the benefit of capturing both asset risk as well as financial leverage.[13]

Table 1 presents means and standard deviations (across banks) of RISK, the ratio of insured deposits to total liabilities, leverage, total assets, and market/book assets for each quarter in our sample 1992:1–1995:4. It also reports the SPREAD measure for each quarter. While not monotonic, RISK and SPREAD are generally declining through our sample period, as is the ratio of insured deposits to total liabilities. This is not surprising given that over this period the banking industry as a whole went from financial instability to record profitability. The cross-sectional variation in insured deposit use is also substantial—the standard deviation (across banks) within each quarterly period averages 13.06% over our sample period.

3. METHODOLOGY

The model in Section 2 implies that a bank's insured deposit use will be related to the differential rates charged in markets A and B (which we proxy with SPREAD), and the costs of accessing the segmented markets (Equation (6)). Specifically, the sensitivity of claim use to variation in ε is decreasing in the convexity of the

12. The data for BBB-rated bank bond yields comes from Bloomberg and is available beginning the first quarter of 1992.

13. We also used asset volatility as our proxy for default risk and the results were similar. To measure asset volatility, we unlevered the equity returns to get implied asset returns. Asset volatility is measured as the standard deviation of these asset returns.

TABLE 1
DESCRIPTIVE STATISTICS

		Risk		ID/TL		Total Assets		Market/Book		Leverage	
Period	Spread	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1992:1	1.59	0.029	0.02	0.816	0.128	7,392	22,316	1.14	0.26	0.93	0.02
1992:2	1.49	0.028	0.02	0.821	0.125	7,801	24,499	1.14	0.25	0.93	0.02
1992:3	1.26	0.028	0.02	0.82	0.126	7,980	24,945	1.14	0.24	0.93	0.02
1992:4	1.41	0.029	0.02	0.833	0.122	8,041	24,345	1.15	0.28	0.93	0.01
1993:1	1.16	0.028	0.02	0.826	0.126	8,150	25,054	1.15	0.17	0.92	0.02
1993:2	0.84	0.027	0.02	0.826	0.127	8,390	25,495	1.13	0.17	0.92	0.02
1993:3	0.74	0.025	0.02	0.823	0.129	8,583	26,120	1.13	0.19	0.92	0.02
1993:4	1.03	0.025	0.02	0.824	0.129	9,423	26,616	1.1	0.13	0.92	0.02
1994:1	0.79	0.025	0.02	0.818	0.135	9,942	29,081	1.09	0.1	0.92	0.02
1994:2	1.1	0.025	0.02	0.818	0.134	10,140	29,445	1.09	0.1	0.92	0.02
1994:3	1.21	0.022	0.02	0.803	0.135	10,333	30,056	1.09	0.09	0.92	0.02
1994:4	1.27	0.023	0.02	0.8	0.134	10,562	30,125	1.07	0.08	0.92	0.02
1995:1	0.83	0.022	0.01	0.794	0.135	11,302	32,737	1.07	0.09	0.91	0.02
1995:2	0.29	0.02	0.01	0.791	0.136	11,634	32,838	1.08	0.1	0.91	0.02
1995:3	0.52	0.021	0.01	0.785	0.136	10,953	31,656	1.09	0.1	0.91	0.02
1995:4	0.45	0.022	0.02	0.788	0.133	11,928	33,714	1.1	0.11	0.91	0.02

NOTES: Table presents the averages (μ) and standard deviations (σ) (across banks) for risk, insured deposit use, total assets, market/book and leverage for each quarter between 1992:1 and 1995:4. Also presented is the spread between 3-month BBB rated bank liabilities and 3-month Treasury bond yields. Sample is all banks with complete COMPUSTAT data at end of 1995 and at least 12 quarters of insured deposit use data over the period 1992:2 through 1995:4. Risk is the standard deviation of daily stock returns over the quarter. ID/TL is the ratio of insured deposits to total liabilities. Leverage is total liabilities divided by total assets. Market-to-book (Q) = (Assets – book equity + market value of equity)/Assets.

costs of accessing the markets (Equations (8) and (9)). Thus, we estimate a bank's cost of access by regressing insured deposit use on SPREAD, our proxy for the difference in the rate charged in the uninsured and insured markets.

$$\mathrm{ID}_t = (\mathrm{SPREAD}_{t-1})b + a + \xi_t \tag{14}$$

ID_t is scaled by total liabilities at time t to correct for heteroskedasticity.[14]

The estimate of parameter b is our measure of financial flexibility. Recall from our model that δ_A and δ_B are our coefficients of convexity in the bank's cost of external finance function—higher δs imply greater convexity in the costs of external finance (access costs). Given the model's result that banks' responses to varying spreads are declining in δs, larger bs imply smaller access costs. When a bank has lower access costs, it pays a smaller cost of switching financing venues and will take fuller advantage of any price differential between two markets. Given our data, a larger SPREAD implies a greater advantage to insured claims financing, and firms with lower deadweight costs of switching markets will exploit the price differential to a greater degree—i.e. they will raise more insured claims. In sum, larger values of b imply that a bank substitutes more insured for uninsured funds in response to an increase in the credit risk spread. We refer to our empirical estimate of b as FLEX.

Also noted in the data section, we might wish to control for firm risk in our estimates of FLEX. One potential problem is that our estimate of SPREAD may be too high for safe banks and too low for risky banks, resulting in an unintended

14. In the robustness section, we show that our results persist under different scaling techniques.

correlation between our measure of FLEX and bank risk. Therefore, we also estimate the sensitivity of insured deposit use to the interactive variable RISK*SPREAD. While our primary results are based on FLEX estimates from regressions of insured deposit use on SPREAD by itself, we also report results using FLEX estimated with RISK*SPREAD as the independent variable (see below). In general, all of our results and conclusions are robust to using RISK*SPREAD as our regressor in Equation (14).

3.1 Econometric Technique

Our data consists of 3562 bank/quarters. Such panel data can encompass a variety of econometric problems. For example, there may be autocorrelation within each cross-sectional group (i.e., bank) and there may be heteroskedasticity across groups. Therefore, we use a random coefficients model (RCM) to estimate Equation (14).

There are several advantages to the RCM.[15] Like OLS, the RCM methodology allows us to obtain the average effect of an explanatory variable on the dependent variable. However, unlike OLS, the RCM does not restrict each cross-sectional unit (bank) within the panel of data to exhibit the same sensitivity of dependent to independent variables. In fact, the RCM allows both intercepts *and slopes* in a regression equation to vary by "cross-sectional unit".[16] For example, we recognize that some banks may be more flexible (i.e., their cost of access is lower), implying different slopes across banks. Thus, the RCM methodology permits us to estimate the average (sample-wide) sensitivity of changes in insured deposit use to the above SPREAD variable, while allowing each bank to exhibit a different measure of flexibility.[17]

The RCM also controls for autocorrelation within each group's (cross-sectional unit's) error term, and the RCM corrects for heteroskedasticity across groups. A final advantage of the RCM is the allowance for different intercepts across banks (fixed effects). This will mitigate concerns over omitted firm-specific variables that are fixed during our sample window.

3.2 Results

Table 2A contains the results from estimating the relationship between insured deposit use and SPREAD over the complete time-series cross-sectional sample of 3562 bank/quarters. The results are consistent with the model's prediction: insured deposit use is increasing in SPREAD. According to the random coefficients regression, the matrix-weighted average (i.e., GLS version) of the bank-specific coefficients on SPREAD, b, is 0.019 with a t-statistic of 6.93, significant at the 1% level.

15. See Hsiao (1986), Swamy (1971, 1974), and Hildreth and Houck (1968) for detailed descriptions of the random coefficients model.

16. A fixed-effects model assumes only the intercept of the regression equation can vary with the fixed effects.

17. In this sense, RCM is like separate OLS for each sample bank, but allowing for cross-correlations in the panel. Our results are robust to estimating bank specific sensitivities using individual bank OLS regressions. See the robustness (Section 5.3) for more details.

TABLE 2

Random Coefficients Estimation of the Model

Panel A. Average Coefficient from Random Coefficients Model Estimation of ID/TL.

	Coefficient
SPREAD	0.019***
(coefficient = b)	(6.93)
Constant	0.791***
(coefficient = a)	(85.73)
χ^2 test (p-value)	<0.001

Panel B. Univariate Statistics on the Cross-sectional (Across Banks) Distribution of FLEX (Firm-Specific Coefficients (bs) from RCM Described in Panel A)

	Mean	Median	Standard Deviation
FLEX	0.019***	0.017***	0.026

Notes: Random coefficients regressions of ID/TL (insured deposit use at time t divided by total liabilities contemporaneous) on the measure SPREAD (measured at time t-1). Spread is the difference between 3-month BBB rated bank liabilities and 3-month Treasury bond yields. Data is a panel of 3,562 bank quarters (231 different banks). T-statistics in parentheses. χ^2 test p-value is for test of the null hypothesis of homogeneity of coefficients across banks.

Specification: $\frac{ID_t}{TL_t} = a + b(\text{SPREAD}_{t-1}) + \varepsilon_t$

*,**,*** Denotes significance at 10, 5, and 1% levels, respectively.

Economically, an increase in SPREAD of 100 basis points is associated with a roughly 1.9% change in insured deposit use on average.[18,19]

Importantly, the χ^2 statistic for the test of homogeneity of coefficients across groups rejects at well beyond the 1% level, the null hypothesis that all banks have the same sensitivity of insured deposit use to SPREAD. We conclude that there is significant variation in financial flexibility across banks, as measured by the individual bank coefficients. Our evidence indicates that banks do indeed differ in their costs of accessing segmented markets.

The mean, median, and standard deviation statistics for FLEX are provided in Table 2B. The mean (0.019) is remarkably close to the median (0.017). The standard deviation (across banks) of the FLEX coefficient is 0.026. This appears to be large relative to the measures of central tendency, consistent with the χ^2 test of homogeneity of coefficients across groups. Economically, banks with a one standard deviation above the mean FLEX, will exhibit a 2.37 times larger response to a change in spread than banks with a mean value of FLEX.

18. The independent variable (SPREAD) takes the value of one when the credit risk spread is 1%.
19. If we substitute RISK*SPREAD for SPREAD as our independent variable, the coefficient (FLEX) averages 0.875 across banks with a t-statistic of 7.37 (significant with 99% confidence). Obviously, this number is much larger than FLEX's value of 0.019 reported in Table 2. Since average bank risk over our sample equals 0.025, the independent variable RISK*SPREAD in the RCM is much smaller, implying a larger coefficient is expected.

3.3 Financial Flexibility and Firm-Specific Characteristics

Convexity in a firm's cost of external funds (financial flexibility) is potentially related to firm-specific characteristics that proxy for information and agency problems. We examine this possibility empirically in Table 3, by relating our measure of flexibility (FLEX) to measures of bank size and leverage, as well as to other variables that will appear as controls in our cross-sectional work below (return on assets, risk and general insured deposit use). While flexibility is measured over a window that ends at 1995:4, we measure the bank-specific characteristics as of 1995:4.

The results in Table 3 indicate that FLEX is positively correlated with bank size (log of bank assets), and bank leverage (liabilities divided by assets). It is negatively related to bank risk (standard deviation of stock returns) and general insured deposit use. Each correlation is significant with at least 99% confidence. Finally, FLEX does not appear to be correlated with bank return on assets.

We expect bank size and FLEX to be positively correlated. Kashyap and Stein (1995) use bank size as an inverse proxy for the degree of asymmetric information that a bank faces in raising uninsured finance. They argue that large banks will face less severe problems than smaller banks when accessing the capital markets. Similarly, if there are economies of scale in transactions costs associated with raising certain types of uninsured liabilities, then large banks will have an advantage in the uninsured market. These advantages manifest themselves in the form of lower convexity in the bank's external finance function. Alternatively, the positive relationship between size and FLEX could be due to cheaper access to insured deposits. For example, if large banks are more diversified geographically, then these banks will have access to insured deposits across numerous regional insured deposit markets.

TABLE 3

Firm Characteristics and their Relation to Financial Flexibility: Univariate Results

Correlations:	FLEX
LNTA	0.364
	(<0.01)
LVG	0.238
	(<0.01)
ROA	0.032
	(0.63)
RISK	−0.172
	(<0.01)
ID/TL	−0.462
	(<0.01)

Notes: Financial flexibility measure (for each bank) is based on the bank specific coefficients from a random coefficients model explaining insured deposit use as a function of SPREAD. Spread is the difference between 3-month BBB-rated bank liabilities and 3-month Treasury bond yields. All firm specific characteristics are calculated at end of 1995. LVG is total liabilities divided by total assets for the bank. ROA denotes return on assets. LNTA denotes the natural log of total assets. ID/TL is the ratio of insured deposits to total liabilities. Risk is the standard deviation of daily stock returns over the quarter. Sample is 231 banks with COMPUSTAT data at end of 1995:4 and sufficient information to run the RCM regression. *p*-values in parentheses.

The positive relationship between FLEX and leverage is consistent with low access cost (high flexibility) banks being considered less risky, allowing greater debt capacity. Confirmatory evidence of this notion is seen in the negative relation between risk and FLEX. Finally, the negative relation between flexibility and general insured deposit levels suggests that greater flexibility results from cheaper access to uninsured funds.

Overall, flexibility appears to be significantly related to several bank-specific characteristics. As many of these characteristics are likely correlated with bank value proxies, we will need to control for them in our cross-sectional work below.

4. THE RELATION BETWEEN FINANCING FLEXIBILITY AND FIRM VALUE

If banks with lower flexibility do indeed have higher access costs, then these same banks should have lower values, ceteris paribus (see Hypothesis 2 of the model). We report evidence consistent with our theory—banks with greater financing flexibility are valued more highly by the market. We present two sets of results concerning the relation between financing flexibility and firm value. First, we show that market-to-book (or Q) ratios and financial flexibility are positively related in a univariate framework, examining mean and median Qs for "high flex," "medium flex," and "low flex" banks. Afterwards, we present cross-sectional regression results that control for other factors likely to affect financial flexibility and/or firm value.

4.1 Univariate Results

Table 4 presents univariate tests for differences in average and median Q ratios between "high", "medium" and "low" flexibility banks. A bank is classified as "high", "medium", or "low" FLEX depending on whether its measure of flexibility is in the upper, middle, or lower third of the distribution of flexibility measures (across banks).

TABLE 4

UNIVARIATE STATISTICS ON MARKET-TO-BOOK (Q) CLASSIFIED BY TWO MEASURES OF FINANCIAL FLEXIBILITY

	FLEX			Significance test for differences between
Market-to-Book (Q)	LOW	MED	HIGH	HIGH, MED and LOW
Mean	1.046	1.059	1.065	$F = 3.95^{**}$
Median	1.052	1.051	1.056	$\chi^2 = 5.26^{*}$
N	77	77	77	

NOTES: Market-to-book is calculated as the book value of assets minus the book value of equity plus market value of equity all divided by book value of assets, calculated at the end of 1995:4. Financial flexibility measure (for each bank) is based on the bank specific coefficients from a random coefficients model explaining insured deposit use as a function of SPREAD. Spread is the difference between 3-month BBB rated bank liabilities and 3-month Treasury bond yields. FLEX is classified as high(medium, low) if firm's FLEX is in the upper(middle, lower) third of the sample distribution of 231 bank flexibilities. Sample is 231 banks with COMPUSTAT data at end of 1995:4 and sufficient information to run RCM regression. *,**,***Denotes significance at 10, 5, and 1% levels respectively.

The results indicate that different flexibility banks exhibit different measures of our Q ratio. The null hypothesis that the mean Q ratios for high, medium, and low flexibility banks are all equal is rejected at the 5% level. Similarly, a Kruskal–Wallis test of the null hypothesis that the median Q ratios are all equal is rejected at the 10% level.

Focusing on the two extremes—high and low flexibility banks—economically, the 0.019 difference between the mean Q ratios suggests that high flexibility banks are roughly 1.8% more valuable than low flexibility banks. While this difference may not appear overly large, the high leverage of banks implies that the difference in equity values is indeed substantial. For example, given typical leverage of 90%, the 0.019 difference in Q ratios is associated with a 13% difference in market values of equity.[20]

Taken together, we interpret our univariate results as follows. An increase in the spread between the two markets' prices on claims reduces the relative price of insured claims for a bank. The greater a bank's sensitivity of insured deposit use to this variation (FLEX), the lower its apparent cost of accessing the two markets. This is valuable for two reasons. First, banks with lower access costs obtain favorable relative pricing with a larger net (of access costs) gain, when market prices change. Second, lower access costs could be driven by reduced convexity in the bank's external finance cost function. This implies reduced concavity of profits in internal wealth. Banks with more flexibility are better insulated from shocks to internal wealth. As we will see later, this leads them to carry less slack, which enhances firm value.

4.2 Multivariate Results

The above univariate results suggest that financial flexibility is valuable. However, they do not control for other characteristics that may be correlated with bank values and financial flexibility. Below, we describe our control variables and their potential effects on Q ratios.

Leverage: Morck, Shleifer, and Vishny (1988) document a negative relationship between Q and leverage for nonbanking firms. We measure leverage as total liabilities divided by total assets.

ROA: Banks with greater ROA may own assets that are more productive, leading to higher Q ratios. ROA is measured as net income divided by total assets.

RISK: Demsetz, Saidenberg, and Strahan (1996) find that riskier banks are associated with lower Q ratios. Risk is measured as the standard deviation of logged stock returns.

20. Consider two hypothetical banks, one with low flexibility, the other with high, and both with total assets of 100 and book value of debt equal to 90. The low FLEX bank has a Q of 1.046 implying a market value of equity of 14.6, while the high FLEX bank has a Q of 1.065 and a market value of equity of 16.5, by a similar calculation. There is an approximately 13% difference between these two market values of equity.

ASSETS: Larger banks may be more valuable due to enhanced market power. Alternatively larger banks may be perceived as too big to fail (O'Hara and Shaw 1990) and thus may be more highly valued by the market. Assets are measured as the log of total assets.

ID/TL: Keeley (1990) argues that a bank's franchise value is related to its core deposits ratio and finds a positive relationship between Q and the ratio of core deposits to assets. We use ID/TL (equal to insured deposits divided by total liabilities) because it maintains comparability with our variable used to calculate flexibility. Our results are robust to controlling for ID/TA.

Table 5 presents results from regressions of our Q ratio on FLEX and our control variables for leverage, return on assets, risk, size, and insured deposit use. One potential concern is that the measure of FLEX is a generated regressor. Thus, the resulting standard errors of the coefficient on this variable in the Q regressions may be biased low. To alleviate this concern, we bootstrap all Table 5 regressions to get unbiased t-statistics. We report both bias-corrected coefficients and t-stats using

TABLE 5

THE VALUE OF FINANCIAL FLEXIBILITY

	I	II	III	IV
FLEX	0.369***		0.509***	
	(2.91)		(4.54)	
$FLEX_2$				0.011***
				(4.12)
HIGHFLEX		0.010*		
		(1.71)		
LOWFLEX		−0.016***		
		(−2.80)		
LVG		−0.961***	−0.970***	−0.962***
		(−4.61)	(−4.70)	(−4.60)
ROA		2.033	1.866	1.875
		(0.63)	(0.58)	(0.58)
RISK		0.609*	0.567*	0.564*
		(1.76)	(1.72)	(1.69)
LNTA		0.011***	0.011***	0.010***
		(5.00)	(4.99)	(4.73)
ID/TL		0.056**	0.070**	0.064***
		(2.44)	(3.03)	(2.81)
Constant	1.050***	1.787***	1.776***	1.782***
	(339.83)	(8.85)	(8.85)	(8.79)
F-Statistic	12.66***	12.57***	16.52***	15.52***
Adjusted R^2	0.05	0.26	0.29	0.27

Bootstrap regressions of market-to-book (Q) on financial flexibility. Q is calculated as the book value of assets minus the book value of equity plus market value of equity all divided by book value of assets, calculated at the end of 1995:4. Financial flexibility measures (for each bank) are based on the bank specific coefficients from a random coefficients model explaining insured deposit use as a function of SPREAD. Spread is the difference between 3-month BBB rated bank liabilities and 3-month Treasury bond yields. $FLEX_2$ is the bank specific coefficient from a random coefficients model explaining insured deposit use as a function of RISK*SPREAD. HIGHFLEX (LOWFLEX) is a dummy variable equal to one if the firm's FLEX is in the upper (lower) third of the distribution of all 231 bank flexibilities, zero otherwise. All control variables besides FLEX (i.e. RISK, LVG, ROA, ID/TL, LNTA) are measured at the end of 1995:4. LVG is total liabilities divided by total assets for the bank. ROA denotes return on assets. LNTA denotes the natural log of total assets. ID/TL is the ratio of insured deposits to total liabilities. Risk is the standard deviation of daily stock returns over the quarter. Sample is 231 banks with non-missing values for all regression variables. Coefficients and standard errors used to calculate T-statistics (in parentheses) are based on bootstrap re-sampling (10,000 iterations).

Specification: $Q_i = a + b_1\text{FLEX}_i + + b_2\text{LVG}_i + b_3\text{ROA}_i + b_4\text{RISK}_i + b_5\text{LNTA}_i + b_6(\text{ID/TL})_i + \varepsilon_i$

*,**,*** denotes significance at 10, 5, and 1% levels, respectively.

approximate standard errors, based on bootstraps with 10,000 re-samples. In addition, our results are robust to simply White-correcting the standard errors.[21]

Four different regression models are presented. In model I, we examine the correlation between *Q* and FLEX without any controls. Model II regresses *Q* on two dummy variables. HIGHFLEX equals one when the bank's FLEX value is in the top third of all flex values and zero otherwise. LOWFLEX equals one if the banks FLEX value is in the bottom third and zero otherwise (the intercept in this regression captures the effects of FLEX for medium flexibility banks). Model III is a regression of *Q* on our continuous measure of FLEX and controls. Model IV mirrors model III, but substitutes our measure of FLEX from the regression of ID/TL on RISK*SPREAD for the usual measure of FLEX.

Model I indicates that *Q* is increasing in flexibility. The coefficient on FLEX is 0.369 with a *t*-statistic of 2.91, significant at the 1% level. Model II leads to similar conclusions. The coefficient on HIGHFLEX is 0.010, significant at the 10% level, and the coefficient on LOWFLEX is −0.016, significant at the 1% level. Moreover, an *F*-test reveals that the coefficients on HIGHFLEX and LOWFLEX are significantly different at the 1% level (p-value = 0.0002). In Models III and IV, we revert to the continuous variable values of FLEX (from the RCM of ID/TL on SPREAD by itself or interacted with RISK), and we continue to include control variables. In both specifications, FLEX carries a significantly positive coefficient.[22] The control variables carry consistent coefficients across specifications. Higher leverage (total liabilities divided by total assets) banks are associated with lower *Q* ratios. Return on assets and risk do not appear to affect *Q* (with 95% confidence). Larger banks appear to have higher *Q* ratios, consistent with the well-documented "too big to fail" doctrine. Finally, bank insured deposit use does appear to affect *Q*, consistent with the evidence in Keeley (1990).

Economically, the 0.509 coefficient on FLEX (in specification III) implies that a one standard deviation increase in FLEX is associated with an increase in *Q* of 0.013. Given 90% book leverage and a mean sample *Q*-ratio of 1.097, a bank with a one standard deviation below the mean value of FLEX will have a market value of equity that is 13.41% less than a bank with a value of FLEX one standard deviation above the mean (see Note 20 for a discussion). In general, financial flexibility and its implied ability to defray the costs of increased credit risk

21. We should also mention concerns with errors in variables problems. In particular, since FLEX is estimated, errors in its estimated values may be correlated with other variables of interest. An obvious culprit (mentioned earlier) is market power. Banks with substantial market power in deposit markets may also tend to be more highly valued. However, we argue that deposit market power is an important component of financial flexibility. Since banks with greater market power are likely to be able to offer favorable (to them) rates on insured claims, they will likely do more substituting into these claims when spreads widen. This is akin to having lower access costs.

22. The reader will note that the coefficients on FLEX in specifications III and IV appear to be of different magnitudes. This is driven by differing values of FLEX. Our FLEX coefficient from regressing ID/TL on SPREAD alone (used in model III) is much smaller than the FLEX coefficient when we use SPREAD*RISK as the independent variable in the RCM. Since RISK is a standard deviation of daily returns, its value is smaller than SPREAD and so the interactive is smaller than SPREAD by itself, which leads to the larger FLEX and consequently smaller coefficient on FLEX in specification IV.

spreads and/or reduce the need to carry slack (see below), appears to be valuable even in a multivariate setting.

4.3 Robustness of Results

Our results are robust to various scaling alternatives. When we scale our measure of insured deposits by total liabilities lagged one quarter, by total assets, or by total deposits we continue to find (1) significantly positive measures of FLEX at the 5% level or better, and (2) the relationship between FLEX and Q to be significantly positive at the 10% level or better. These adjustments are designed to allay concerns that our results are driven by a particular scaling technique. We also reconstruct FLEX for the sub-sample of banks with complete data over our entire sample window. Our conclusions are unchanged using this sample. Finally, our results are robust to "Windsorising" outlier flexibility measures. Specifically, for FLEX measures outside the 10th (or 5th) and 90th (or 95th) percentile values, we reset the flexibility measure to the values associated with those percentiles. We then re-run our Q-ratio regressions using the "Windsorised" flexibility measures and in all cases document significantly positive coefficients on the FLEX variable.

To allay potential concerns with our RCM methodology for estimating FLEX, we run separate OLS time-series regressions for each bank in the sample, to arrive at individual bank sensitivities of insured deposit use to SPREAD. We continue to document a positive relation between FLEX measured in this fashion and banks' Q ratios. We also acknowledge the limited nature of the dependent variable (ID/TL) in our regressions to obtain FLEX. To assuage any concerns that this drives our results, we re-specify the dependent variable in these regressions as $\log(y/(1 - y))$ where y is the ID/TL ratio. Again, our results are robust to this transformation. In short, it appears that numerous approaches to estimating FLEX yield the conclusion that banks with greater financial flexibility are valued higher by the market.

Finally, we use a number of alternative proxies for SPREAD and re-run our tests. We measure SPREAD using the difference between the yield on a portfolio of 6-month BBB Bank bonds and 6-month Treasuries, 7-year BBB Bank bonds and 7-year Treasuries, BBB corporate bonds and 7-year treasuries, and BBB corporate bonds and AAA corporate bonds. Our results are robust to all of these measures.

We also use the spread between the secondary market 3-month CD (obtained from the Federal Reserve's H15 report) and 3-month Treasuries. When we regress insured deposit use on this SPREAD proxy, our average estimate of bank FLEX is significantly negative. The relationship between this FLEX measure and Q is also significantly negative. These results are inconsistent with our findings using bond and note spreads and inconsistent with our model. There are a number of possible explanations and interpretations of these results.

Perhaps our model better applies to the choice between deposit and nondeposit liabilities. Increases in the CD spread may then correspond to increases in banks' incentive to move out of deposits (both insured and uninsured) and into nondeposit liabilities. However, the robustness of our results to scaling insured deposits by total deposits, discussed above, suggests that there is active substitution between insured and uninsured deposits, consistent with our model.

Another possible explanation is that CD rates and their corresponding spreads reflect banks' funding decisions in an imperfectly elastic market. As banks bid more (less) aggressively for large CDs, the CD spread increases (decreases). In this case, the inelastic nature of the deposit market causes the CD spread to capture not only the price of risk in the market, but also a portion of access costs—the inelasticity. If banks pursue CDs more aggressively in relatively safe states of the economy, then this proxy for the market's price of risk will be too low in weak economic times and too high during strong economic times. Given that banks rely more heavily on insured deposits during downturns, such an explanation would impart a negative bias on the measures of FLEX.

Finally, another potential issue with the data on CD rates may be the lack of a constant risk profile among the surveyed CD issuers. Our other spread measures are all based on a portfolio of same rated securities (BBB or BAA).[23] In the case of the CD data, rates reflect all issuers, not just those in a particular rating category. Thus, average CD spreads may vary through time if the risk composition of CD issuers varies. For example, the market for risky bank CDs may dry up in a down economy. At these times, relatively safe banks issue the bulk of CDs, and the average CD spread will tend to reflect the risk characteristics of relatively safe banks. By contrast, in an up economy riskier banks increase their activity in the CD market and the measured average CD spread may actually widen. Examinations of the time-series pattern of CD spreads within our sample period are consistent with these last two explanations. Namely, CD spreads are narrowest during the early part of our sample period when the banking industry was the weakest, and CD spreads are approximately three times wider towards the end of our sample period when the industry is healthiest.

5. FINANCIAL FLEXIBILITY AS A SUBSTITUTE FOR FINANCIAL SLACK

The model in Section 2 also indicates that firms with cheaper access to segmented markets will optimally carry fewer liquid assets (see Equation (13)). The intuition is that lower access costs (greater flexibilities) allow firms to obtain capital for projects while experiencing smaller deadweight costs of external finance. Since slack is carried for arguably the same reason, the two are considered substitutes. We expect more flexible banks to carry less slack. We investigate the empirical relationship between financial flexibility and a measure of slack below.

We measure slack (at the end of 1995:4, consistent with our sampling methodology) as cash and marketable securities (with a few adjustments), scaled by total assets. Our adjustments are designed to ensure that we do not count ostensibly "liquid"

23. While ratings do a good job of measuring relative risk, they do not measure absolute risk. Thus, even the BBB-rated yield spreads do not hold risk perfectly constant. However, holding the rating constant should serve to reduce the variability in risk.

asset holdings as slack, when in fact they are restricted from being converted into cash. Our measure of slack therefore does not include required reserves. Moreover, we recognize that some government bonds are pledged against state and local government deposits, and thus do not include these in our measure of slack. Finally, we do include net federal funds in our measure of slack.

Table 6 presents regressions of our slack measure on our flexibility proxies (either FLEX from a regression of ID/TL on SPREAD alone or SPREAD*RISK) and the usual control variables. The results indicate that greater flexibility is associated with a smaller percentage of assets in cash and marketable securities. In specification I (where FLEX comes from the regression with SPREAD alone), the coefficient on FLEX (–1.058) is significantly negative (t-statistic = –3.74). The –1.058 coefficient is also economically significant. Given that the standard deviation of FLEX is 0.026, a bank with a one standard deviation below the mean value of FLEX will carry an additional 5.5% of its assets in cash and marketable securities than a bank with a value of FLEX one standard deviation above the mean. In specification II (where FLEX comes from the regression with SPREAD*RISK as the independent variable), the coefficient on FLEX (–0.023) carries a t-statistic of –3.92.

Taken together with our previous results on the value of flexibility, we conclude that there is support for our model. Firms (in this case banks) can benefit from access to segmented markets for two reasons. First, differential prices across claims

TABLE 6

Regressions of Financial Slack (Cash/Assets) on Financial Flexibility

	I	II
FLEX	−1.058**	
	(−3.73)	
$FLEX_2$		−0.023***
		(−3.92)
LVG	1.557***	1.546***
	(2.97)	(2.91)
ROA	0.353	0.348
	(0.07)	(0.06)
RISK	0.378	0.384
	(0.55)	(0.56)
LNTA	−0.027***	−0.025***
	(−3.74)	(−3.50)
ID/TL	0.034	0.046
	(0.42)	(0.56)
Constant	−1.088**	−1.103**
	(−2.44)	(−2.43)
F-Statistic	15.50***	15.09***
Adjusted R^2	0.27	0.27

Notes: Financial slack is calculated as cash plus marketable securities (including net fed funds but not including required reserves and pledged (to government deposits and securities) all divided by total (book) assets. FLEX is from a RCM regression of ID/TL on SPREAD. $FLEX_2$ is the bank specific coefficient from a random coefficients model explaining insured deposit use as a function of RISK*SPREAD. LVG is total liabilities divided by total assets for the bank. ROA denotes return on assets. LNTA denotes the natural log of total assets. ID/TL is the ratio of insured deposits to total liabilities. Risk is the standard deviation of daily stock returns over the quarter. Sample is 231 banks with COMPUSTAT data at end of 1995:4 and sufficient information to calculate flexibility. Coefficients and standard errors used to calculate T-statistics (in parentheses) are based on bootstrap re-sampling (10,000 iterations). *,**,*** denotes significance at 10, 5, 1% levels, respectively.

can be arbitraged by firms with access to both markets, but only at a cost (of access). The lower the access costs, the greater the net benefits of the arbitrage. Second, lower access costs could be due to reduced convexity in a firm's external finance cost function. This implies reduced concavity of profits in internal wealth and a reduction in the benefits to carrying (expensive) slack. Firms with greater flexibility will therefore carry less slack and have higher value.

6. CONCLUSIONS

The subject of segmented capital markets has received considerable attention. While many papers focus on whether firms face markets that are segmented in terms of the price of capital, we take the next step of assessing the value of access to segmented markets from two perspectives. First, access may be valuable when markets charge different prices for capital. Firms with low access costs can arbitrage such differences more cheaply. Second, firms can reduce the convexity of their external finance cost function, if they have access to more than one capital market. Intuitively, access to a second source of finance allows the firm to pay the "lower envelope" of access costs. Both of the above conclusions emerge naturally from our model.

Our model also allows us to specify an empirical strategy for measuring access costs on a firm-by-firm basis. We approach this empirical estimation using a sample of banking firms. Banks face segmented markets for insured and uninsured liabilities. Our model implies that firms should optimally adjust their reliance on one market as its relative price (compared to the other market) changes, balancing the benefit of the lower relative price with the cost of accessing that market. Thus, we measure costs of access using the sensitivity of relative insured deposit use to variation in the credit risk spread.

We estimate each sample bank's sensitivity of insured deposit use to spread over the period 1992:1 through 1995:4 using a random coefficients model. We find substantial cross-sectional variation in these sensitivities, suggesting differential costs of accessing capital markets. We label banks with greater sensitivities as having more financial flexibility. We find that a bank's value is positively related to its measure of financing flexibility.

As an additional examination of how financial flexibility influences firm value, we examine the influence of it on firms' decisions to carry financial slack. In particular, we argue that financial flexibility may reduce the firm's need to carry financial slack as a buffer against uncertainty in internal funds. Consistent with this notion, we find that banks with greater financial flexibility carry less financial slack (in the form of cash and marketable securities).

Our results have important implications for the extant banking literature. If banks carry liquid assets to curb the costs of asymmetric information, then our evidence points to an alternative means of defraying such costs. We also augment the previous evidence on the relation between bank franchise value and insured deposit use—at a minimum, financial flexibility is an additional determinant of bank value that must be recognized. Finally, our results suggest an alternative explanation for the desirability of demandable debt as a financing vehicle for banks (see Calomiris and Kahn, 1991, Flannery, 1994, and Kashyap, Rajan and Stein, 2002 for extant explanations). The short-term nature of demandable debt may allow banks to more rapidly adjust their funding mix in response to changes in the credit risk spread.

More generally, our paper extends the work on capital acquisition strategies in the face of costly external finance. Previous studies illustrate how hedging (Froot, Scharfstein, and Stein 1993) and financial slack (Kim, Mauer and Sherman 1998) can (improve investment behavior and) enhance firm value in the face of costly external finance. We suggest an alternative means of defraying such costs, namely by enhancing access to multiple capital markets.

Appendix A: The Convexity of the External Finance Costs with Segmented Markets

We examine in detail the convexity of the total cost of raising external finance in the presence of segmented markets. We begin with a cost minimization where the firm chooses to raise a given amount of external funds.

$$\mathrm{TC} = \min_{e_A, e_B} \rho e_A + (\rho + \varepsilon)e_B + \delta_A e_A^2 + \delta_B e_B^2 \quad \text{s.t. } e^A + e^B = \bar{e}$$

The first-order conditions imply

$$\rho + 2\delta_A e_A = \rho + \varepsilon + 2\delta_B e_B$$

Solving, we obtain

$$e_A = \frac{2\delta_B \bar{e} + \varepsilon}{2(\delta_A + \delta_B)}$$

and

$$e_B = \bar{e} - e_A$$

Plugging these into the TC equation, and taking the second partial with respect to $\bar{e}$, we obtain:

$$\mathrm{TC}_{\bar{e}\bar{e}} = \frac{2\delta_A \delta_B}{\delta_A + \delta_B}$$

which indicates the convexity of the total cost function when a firm has access to two markets.

By contrast, if a firm has access to only one market (insured deposits or A for banks), the convexity of the total cost curve is $2\delta_A$. Therefore, we can say that convexity in total costs will be lower with access to a second market.

PROOF

$$2\delta_A > 2\delta_B\left(1 - \frac{\delta_B}{\delta_B + \delta_A}\right)$$

$$\delta_A(\delta_B + \delta_A) > \delta_B(\delta_B + \delta_A - \delta_B)$$

$$\delta_B + \delta_A > \delta_B$$

$$\delta_A > 0.$$

The proof is trivial if the bank's access to a single market is for market B.

Finally, convexity of total costs is increasing in the convexity of costs to either market:

$$\frac{\partial TC_{\overline{ee}}}{\partial \delta^A} = 2\left(\frac{\delta^B}{\delta^B + \delta^A}\right)^2 > 0$$

$$\frac{\partial TC_{\overline{ee}}}{\partial \delta^B} = 2\left(\frac{\delta^A}{\delta^B + \delta^A}\right)^2 > 0$$

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