An Empirical Study on the Effect of Financial Leverage on Bank Value

by

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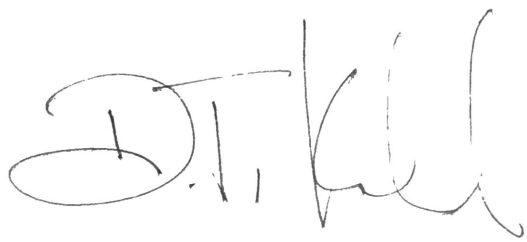


INTRODUCTION

Bank mergers have been receiving considerable attention due to their high rate of occurrence throughout the 1980s. In fact, since 1980s, more mergers have taken place in banking than in any other industry. This is due in part to the intensified competition within the industry which resulted from banking deregulations begun in the 1970s. There has also been growing competition from nonbank financial institutions. This increased competitiveness has caused many banks to fail.

The FDIC (Federal Deposit Insurance Corporation) is in charge of the disposition of failed banks and will usually try to arrange a merger between a failed bank and another bank. Of course, the FDIC is best known for its deposit insurance, insulating depositors of up to $100,000 per account from the failure risk of their bank. The FDIC charges both explicit (1/12 of one percent of bank's total domestic deposits are paid into the FDIC insurance fund) and implicit rates (regulation) for this insurance. However, due to the protection the FDIC offers member banks, they have an incentive to use excessive amounts of debt. Stephen Buser, Andrew Chen, and Edward Kane [1] (hereafter BCK) studied the FDIC's pricing structure adequacy. They argue that the excessive debt levels, or financial leverage, employed by banks explains the need for regulatory disencentives to bank risk-taking and that the existence of such a need is a

main aspect of the controversy over bank capital levels.

Financial leverage has been found to be a significant determinant in the pricing of bank acquisitions[2]. This project will focus on analyzing how financial leverage affects the value of a bank. To study this empirical relationship, various financial, economic, and market data were obtained for 217 bank mergers occurring in 1985. The variables were then entered into a statistical regression model. To isolate the effect of leverage on price/book ratio, these other variables were held constant.

This study will first review the financial theories relevant to our analysis. Next, variables used in the study will be explained, as well as the statistical model selection, its characteristics, and the regression equation. The statistical hypothesis to be tested is stated along with its implications. This is followed by a discussion of the results of the statistical model. Finally, the study will be summarized and conclusions drawn.

RELEVANT THEORY

Relevant to this study is Modigliani and Miller's (hereafter MM) theory of the firm [3 pp.287]. When MM incorporated taxes into their no-tax model, they showed that a firm's value increases as they increase their debt. Their tax model can be written as follows:

$$V_L = V_U + TB_L \qquad (1)$$

where V_L is the equilibrium value of the levered firm (positive debt), V_U is is the equilibrium if the firm were unlevered (no debt), T is the tax rate and B_L is the equilibrium value of the levered firm's bonds.

All income that is used to pay interest is not taxed, while income that is going to equity is taxed. This tax advantage of debt results in a higher value for a levered firm. A very high debt-equity ratio would capitalize on this tax advantage and would therefore seem optimal. To understand why firms do not utilize such high debt-equity ratios in reality, one must first examine the assumptions behind MM theory.

MM's main assumptions is that of perfect markets [3 pp.289-290]. This means that there are no transaction costs and that firms and individuals can borrow and lend at the rate of interest. These assumptions do not hold in reality. In reality, firms are subject to financial distress costs, the most extreme case is that of bankruptcy.

As a firm increases its borrowing, it also incurs higher debt payments. This rise in debt costs in turn increases their probability of going bankrupt. This can be shown as follows:

$$V_L = V_U + TB - BC \qquad (2)$$

where the increasing probability of bankruptcy increases the expected bankruptcy costs (BC) and thereby reduces the value of increasing debt.

Bankruptcy costs are the costs associated with declaring the firm insolvent and having it taken over by its creditors, usually to distribute the assets among themselves. The largest costs are the accounting and legal fees resulting from the transaction. Financial distress costs, of which bankruptcy costs are a subset, are defined as added costs incurred when a firm's difficulty in meeting its obligations to creditors causes it to change its operating or external financing activities [3 pp.374-375]. Financial distress costs also include increased production and financing costs, decreased sales, and foregone or delayed investments. It is these financial distress costs which help explain why firms are not indifferent to their levels of debt.

But what if debt holders were insulated from the threat of bankruptcy? The firm would then utilize high levels of debt to increase its value. Due to FDIC insurance on deposit accounts of up to $100,000, banks can insulate depositors from failure risk. In this regard, Buser, Chen,

and Kane (BCK) argue that, since deposit insurance is underpriced, banks have an incentive to use excessive amounts of debt, or financial leverage.

The FDIC does charge "explicit" premiums - a rebatable fraction equal to 1/12 of one percent of a bank's total domestic deposits that must be paid into the FDIC insurance fund. However, BCK contend that not only are these explicit premiums below the fair market price of deposit insurance, but that this underpricing is deliberate. The explicit premiums are priced below the market value of the insurance to encourage state chartered banks to become member banks of the FDIC, giving the FDIC regulatory control over them.

Due to this underpricing, there needs to be some way to discourage excessive risk-taking by client banks. The FDIC could either increase (or restructure) the explicit premiums or could employ an active regulatory policy. They do, in fact, utilize the latter function in the form of their implicit premiums. BCK point out that the increased regulation by the FDIC of high risk banks imposes a larger tax and increases the cost of deposit insurance to them.

One way to increase these implicit premiums is by requiring higher capital levels. Other implicit premiums include examination of bank records and supervising managerial activity. They can also supervise deposit rates and conditions for withdrawal, deny new banks' applications for deposit insurance, and deny branch and merger proposals. These regulatory costs have taken the place of the absent

bankruptcy costs.

Others, such as Sharpe [5] and Merton [4], suggest that the FDIC should increase the explicit premiums so that the added value, which results from the deposit insurance being priced below its fair market value is eliminated. In other words, the value of the member banks, net of these explicit premiums, would equal its uninsured value at each and every level of deposits.

The only problem with such "fair value" pricing strategy is that it provides no incentive for banks to accept FDIC regulation in return for the deposit insurance. While non-insured banks are regulated by state banking commissioners, it is assumed that the FDIC imposes tougher restrictions. Encouraging bank membership in the FDIC is considered important because the FDIC focuses on protecting depositors and promoting sound banking practices. Therefore, their premiums should be structured to provide client banks an opportunity to increase their value above what it would be if they were uninsured.

To analyze the added value of insurance, one should first look at the impact of "free" insurance - - no explicit or implicit premiums. This is illustrated in Figure 1 in which:

V_O = value of bank with no insurance

V_I = value of bank with "free" insurance.

The vertical difference between V_O and V_I shows the value of free insurance at any level of deposits.

Next, BCK assumed that the FDIC would prevent a bank from accepting leverage beyond a maximum level of deposits.

Figure 1

Impact of "Free" Insurance on Bank Value

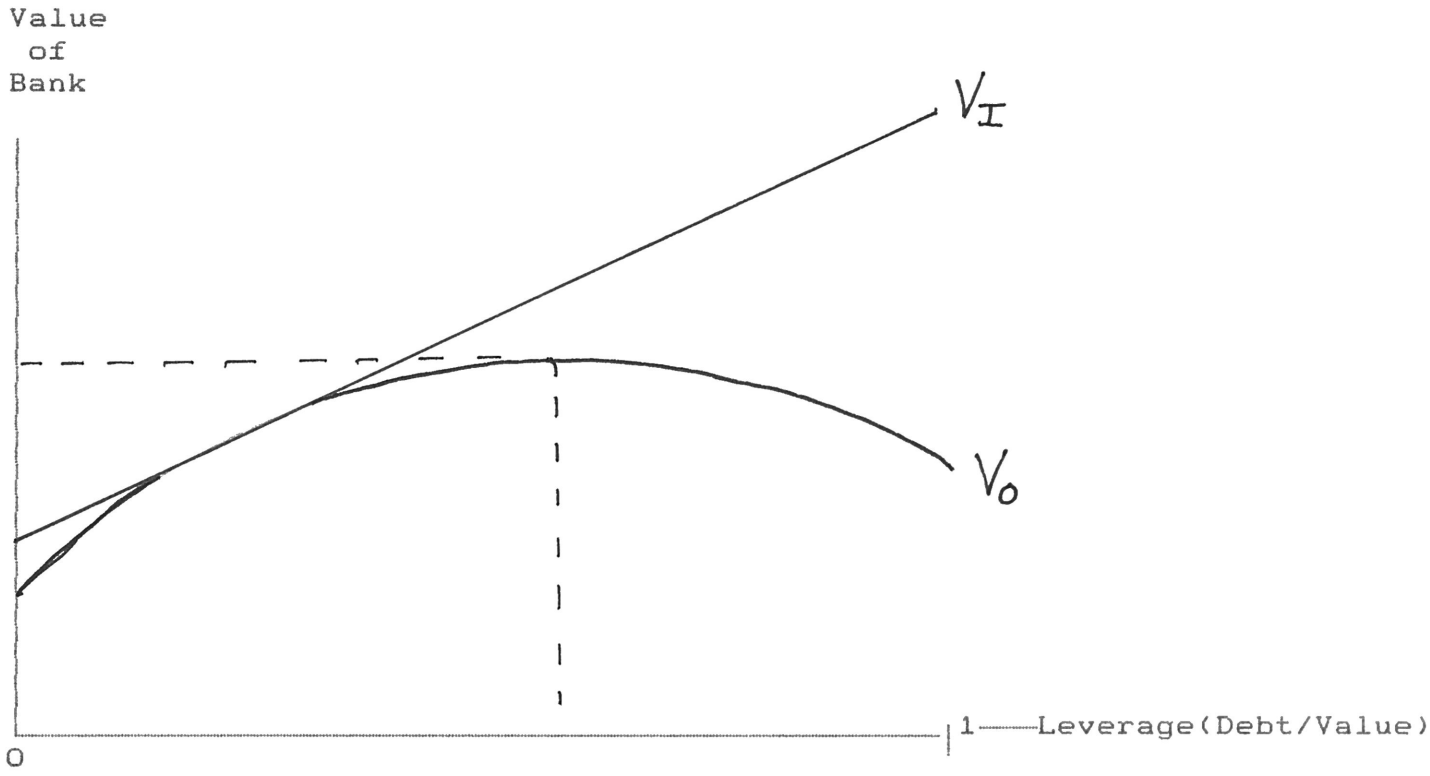
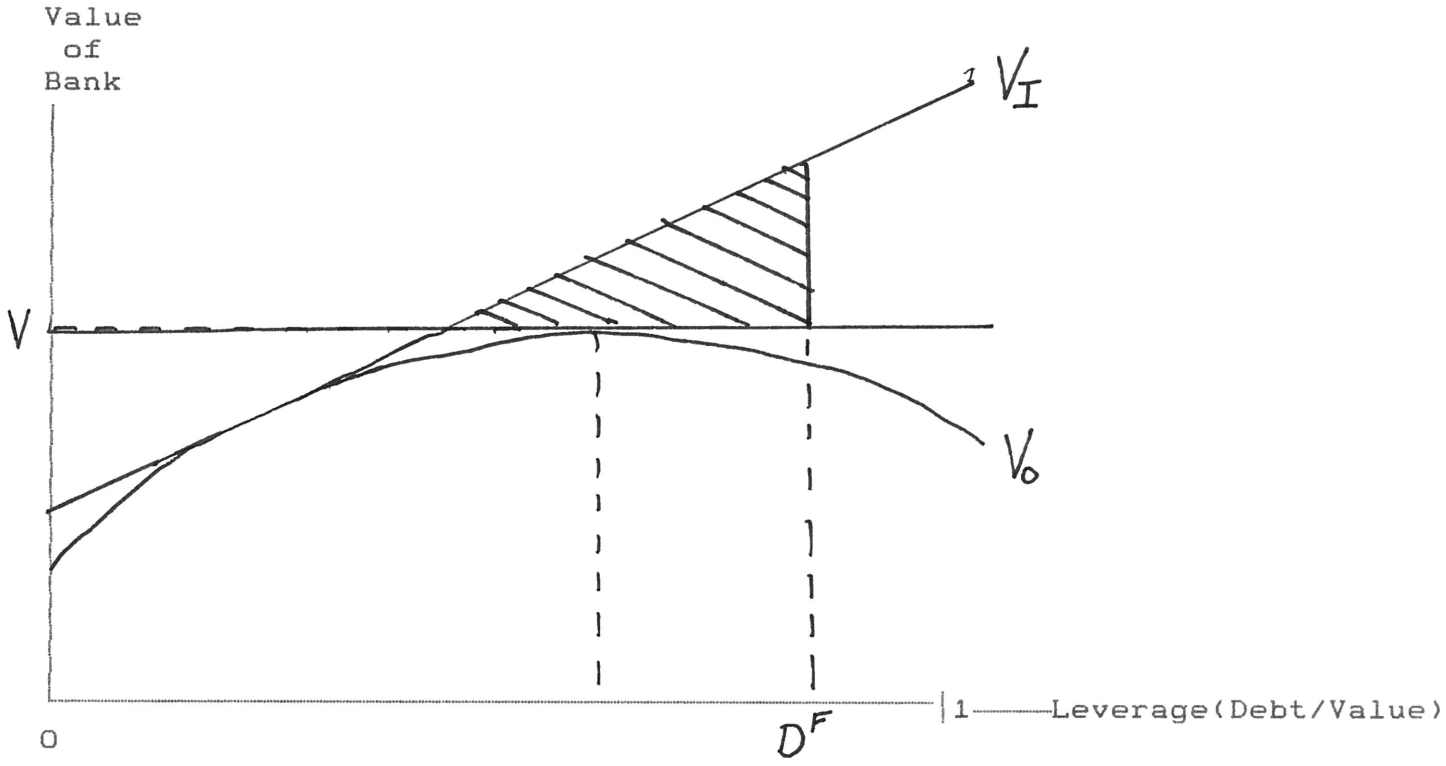


Figure 2

Acceptable Insurance Contracts



This is portrayed in figure 2 in which:

D_F = maximum level of deposits

V = boundary for bank indifference to insurance.

The resulting triangle is the set of insurance contracts that are acceptable to both the FDIC and the bank.

BCK can now show the optimum level of insured deposits. This is illustrated in Figure 3 in which:

V_{IR} = value of bank with insurance and regulation (implicit premiums)

V_{FDIC} = value of bank with insurance, explicit and implicit premiums

V^* = optimal value of bank with FDIC insurance

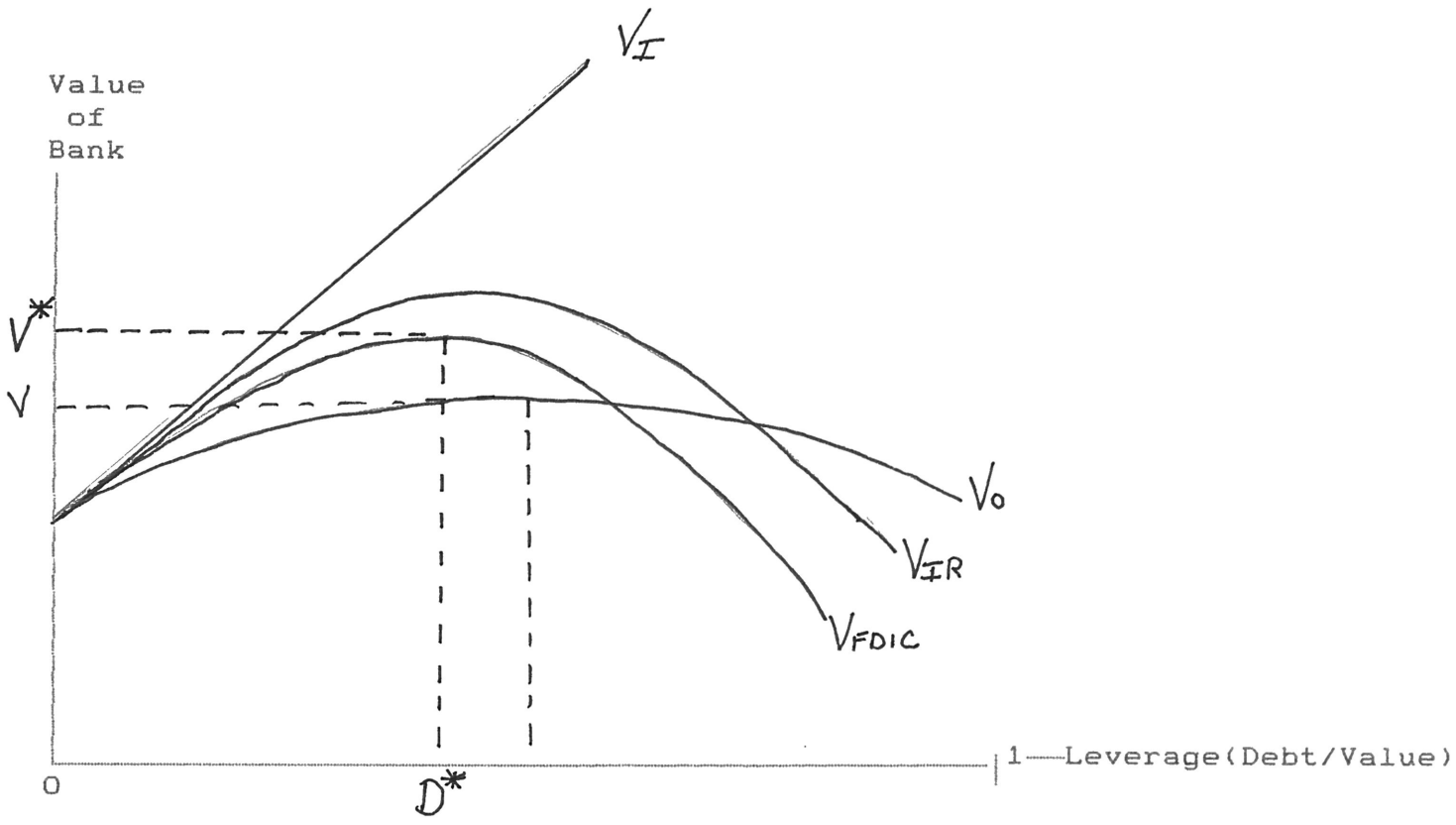
D^* = optimal level of deposits for bank with FDIC insurance.

The vertical difference between V_{FDIC} and V_O portrays the benefit of FDIC insurance on the bank's value. The vertical difference between V_{FDIC} and V_{IR} shows how the explicit premium lowers the value of the insurance. The vertical difference between V_{IR} and V_I illustrates the varying value of the implicit premium, or regulation. An insured bank's value is optimized at V^* which corresponds to D^* level of deposits on the V_{FDIC} curve.

The FDIC uses regulatory interference to act as a risk - related structure of implicit premiums which discourages excessive risk-taking by member banks. It simultaneously provides an incentive equal to the added value of deposit insurance to be an FDIC member bank. BCK predict that banks will keep their leverage levels close to the FDIC regulatory standard for capital adequacy. That is, banks try to increase their

Figure 3

Optimal Capital Structure with
Implicit and Explicit Premiums



value through financial leverage while not incurring the regulatory costs due to inadequate capital.

A basic premise in the BCK paper, which the present paper seeks to examine, is that financial leverage increases the bank value. The reason for this is the low cost of debt due to low priced deposit insurance. However, no empirical evidence is available to verify this assumption in their model of bank behavior.

METHODOLOGY

The present study seeks to examine the empirical relationship between financial leverage and bank value. The details of our methodology are discussed in this section.

DATA

Data were obtained from a sample of 217 bank mergers occurring in 1985. Most (about 75%) of the mergers included in the sample were those of relatively small banks with less than $100,000 in total assets.

Financial data for individual banks were obtained from Income and Call Report data tapes available from the Federal Reserve. Economic data were gathered for the counties in which the target (acquired) banks were located. These economic or market characteristics data were collected from several government sources. Various financial and market ratios were calculated and added to the data base. Table 1 lists the variables used.

VARIABLES

Price/book ratio was chosen to represent the value of the banks (dependent variable). It is a widely-used measure of bank value in other bank merger studies. Because profit maximization is such an important business objective,

Table 1
Financial Variables

I2170	Total Assets
NITA	Net Income/Total Assets
NITE	Net Income/Total Equity
INTTA	Net Interest Income/Total Assets
OPITA	Net Operating Income/Total Assets
CDTE	Cash Dividends/Total Equity
TETA	Total Equity/Total Assets
LEV	Total Debt/Total Assets 1 - TE/TA
TETL	Total Equity/Total Loans
TEPLLTA	Total Equity + Provision for Possible Loan Losses/Total Assets
DDTD	Demand Deposits/Total Deposits
TLTA	Total Loans/Total Assets
PLLTA	Provision for Possible Loan Losses/Total Assets
GCMRTL	Net Charge Offs on Loans/Total Loans
CILTA	Commercial and Industrial Loans/Total Assets
CSTA	Cash and Securities/Total Assets
TXRT	Income Tax/Income before income taxes, security gains or losses
MUNTA	Municipal Securities/Total Assets
PRICAP	Primary Capital/Total Assets
SECCAP	Secondary Capital/Total Assets

Table 1 continued
Market Variables

PPRCNTCG	Population Percentage Change
IPRCNTCG	Income Percentage Change
PRCNTG30	Percentage of Households with over $30,000 Income
PRCBOOK	Price/Book Ratio
TERMCASH	Percentage of Acquisition Offer Involving Cash
TERMNOTE	Percentage of Acquisition Offer Involving Notes
TRMCOMM	Percentage of Acquisition Offer Involving Common Stock
TRMPRFD	Percentage of Acquisition Offer Involving Preferred Stock
POP83	Population in 1983
INC83	Income in 1983
SMSA	Standard Metropolitan Statistical Area (Dummy Variable)

several profit ratios are included. Net income/total assets measures the overall efficiency of a firm in managing its total investments in assets. Net interest income/total assets indicates the amount of net interest a firm generates from its assets. It is especially important for banks because the vast majority of their revenues comes from the interest paid on their loans. Net operating income/total assets measures the amount of income remaining after paying operating expenses and thus also reflects the firm's efficiency. These three variables are all expected to be positively correlated to the price/book ratio since firms are usually willing to pay more for a highly profitable or efficient business.

The main capital ratio is that of total equity/total assets. It is further broken down into primary capital/total assets and secondary capital/total assets ratios. Primary capital includes perpetual preferred stock, common stock surplus, undivided profits and capital measures. Secondary capital is primary capital plus notes and debentures subordinated to deposits and limited life preferred stock. These capital ratios along with total equity/total loans are included as control variables because capital is such an important component of book value. Higher capital ratios should result in a higher valued firm.

There are also several asset and liability mixture ratios. Demand deposit/time deposits ratio is expected to have a positive correlation with value since demand deposits

are a cheaper source of deposits for banks than time deposits are. Total loans/total assets ratio should be positively correlated since it is through loans that banks make their profits. The affect of the cash and securities/total assets ratio and the municipal securities/total assets ratio is unclear. While higher amounts of cash and securities increase the banks stability, they usually do not generate high profits.

Market characteristic ratios were included as independent variables due to their possible effect on earnings potential. Market growth, represented by population percentage change and income percentage change, should increase a bank's price/book ratio. Market size is measured by both population and per capita income for 1983. A larger market should also serve to increase the bank's value. SMSA was included to control for possible differences in the degree of economic integration between metropolitan and non metropolitan areas.

Variables involving the terms of the acquisition were added to control for possible price variance on banks of equal value due to the composition of the acquisition offer. The price of the offer could vary as a result of the risk differences among cash, notes, common stock, and preferred stock acquisitions. For example, since cash is less risky than a common stock offer, an acquisition involving cash could be priced lower than an acquisition which involved common stock.

MODEL

The statistical regression model used in this study was the stepwise procedure. With this method, independent variables are added one by one to the model. The F statistic of the variable to be added must be significant at the .15 level. After each new variable that is added, the stepwise method reviews the variables already included. Any variable with a significant F statistic is deleted from the model. The significance level necessary for remaining in the model was set at .15. Also, we should note that the leverage variable was forced to be included in the model.

Stepwise regression is useful when one has many independent variables with likely intercorrelations between the variables. As each new variable is included, the stepwise procedure prints out the following information: source of the variation regression,variation error, variation total, degrees of freedom, sums of squares for regression, error and total, mean squares for regression and error, F value, significance probability of the F value, R square, and C(p) which is a measure of total squared error. It also provides the B values estimated regression coefficients), standard error of B estimates, Type II sum of squares (sum of squares that would be added to the error sum if that variable were removed), F value, and the significance probability of the F value for each included variable.

The regression equation used is as follows:

$$\text{Prcbook} = B_0 + B_1 \text{XLEV} + B_2 \text{XOPITA} + B_3 \text{XCDTE} + B_4 \text{XNITA} + B_5 \text{XTETL} + B_6 \text{XTEPLLTA} + B_7 \text{XDDTD} + B_8 \text{XTLTA} + B_9 \text{XPLLTA} + B_{11} \text{XCILTA} + B_{12} \text{XCSTA} + B_{13} \text{XNITE} + B_{14} \text{XPPCNTCG} + B_{15} \text{XIPCNTCG} + B_{16} \text{XI2170} + B_{17} \text{XPOP83} + B_{18} \text{XINC83} + B_{19} \text{XINTTA} + B_{20} \text{XTRMCASH} + B_{21} \text{XTRMNOTE} + B_{22} \text{XTRMCOM} + B_{23} \text{XTRMPRF} + B_{24} \text{XTXRT} + B_{25} \text{XMUNTA} + B_{26} \text{XPRICAP} + B_{27} \text{XSECCAP} \quad (3)$$

The X in front of the variable name indicates the use of the log of the variable. Because some of the variables varied widely due to the large size range of the sample banks, this log transformation improves the interpretation of the parameters (coefficients) by increasing the normality of the data.

The coefficients represent the percentage change in the dependent variable (price/book ratio) for a one percent change in that independent variable. The independent variables are factors that have been shown to affect bank acquisition premiums (measured by price/book ratio) [2]. Since this study seeks to isolate the effect of leverage on the price/book ratio, these other variables were held constant.

HYPOTHESES

The statistical hypothesis to be tested is as follows:

$$H_O : B_{LEV} \leq 0$$
$$H_A : B_{LEV} > 0 \qquad (4)$$

It is expected that leverage is positively correlated to the price/book ratio, holding other factors affecting the price/book ratio constant. In other words, as a bank's leverage increases, so does its stock price. If the results show that leverage is positively correlated with the value of the bank and that the degree of correlation is substantial, then our study supports BCK's assumption that financial leverage increases bank value. Failure to accept the null hypothesis (H_O) would lend support for the alternate hypothesis (H_A) which is consistent with BCK.

RESULTS

Tables 2, 3, and 4 show that the leverage variable is positive and highly statistically significant. The P statistic is 0.0001, 0.0085 and 0.0153 for all sample banks, small sample banks and large sample banks respectively. Large sample banks are those with more than or equal to $100,000 in total assets. Small sample banks have less than $100,000 in total assets. For all sample banks, leverage's F value (15.04) is higher than any other variable's. The leverage coefficient in the all sample banks regression is 5.16, second only to 11.97 for net income to total assets. The 5.16 coefficient means that a 1.00% change in leverage is associated with a 5.16% increase in bank price/book ratios. For small sample banks, the leverage coefficient was again second to net income to total assets at 3.67. For large sample banks, the leverage coefficient dominated at 64.16.

The regression model produced reasonable results. The R square for small banks was .230, while the R square for large sample banks was .576. This means that the significant variables accounted for 57.60% of the value of the bank in the large sample regression. Because B_{LEV} (coefficient for the leverage term) is positive, our alternative hypothesis is supported. In other words, the use of financial leverage does actually increase bank value.

Stepwise Regression

All Sample Banks

Sample Size	215
R Square	0.266
F (Overall)	9.36
Probability > F	0.0001

Variables	B^	F	(p>F)
Intercept	3.63		
LEV	5.16	15.04	0.0001
CD/TE	-0.95	3.41	0.0663
NI/TA	11.97	13.83	0.0003
DD/TD	0.32	11.34	0.0009
CIL/TA	-1.00	4.89	0.0281
PPCNTCG	0.13	6.13	0.0141
INT/TA	0.47	6.29	0.0129
TRMCASH	-0.02	9.94	0.0019

Stepwise Regression

Banks with Less Than or Equal to
$100,000 in Total Assets

Sample Size	168
R Square	0.23
Overall F	6.87
Probability > F	0.0001

Variables	B^	F	(p)F)
Intercept	2.74		
LEV	3.67	7.11	0.0085
NI/TA	11.53	11.57	0.0008
DD/TD	0.41	20.47	0.0001
CIL/TA	-0.75	2.40	0.1232
PPCNTCG	0.10	3.05	0.0824
TRMCASH	-0.02	6.73	0.0104
TRMPRF	0.06	2.97	0.0868

Stepwise Regression

Banks with More Than $100,001 in Total Assets

Sample Size	46
R Square	0.576
Overall F	6.44
Probability > F	0.0001

Variables	B^	F	(p>F)
Intercept	13.41		
LEV	64.16	6.45	0.0153
TE/TL	4.57	4.69	0.0366
TL/TA	3.84	3.58	0.0661
PPCNTCG	0.48	8.98	0.0048
INC83	1.16	9.14	0.0045
INT/TA	2.33	24.98	0.0001
TRMCOM	0.04	8.33	0.0064
TRMPRF	-0.07	4.35	0.0438

SUMMARY AND CONCLUSIONS

Mergers are a relatively observable form of business decision. As such, they are well suited for an empirical study of business behavior, from which implications and relationships can be drawn. This paper examined data from over 200 bank mergers to analyze how financial leverage affects the value of a bank as represented by its price/book ratio.

Analysis was performed by running a stepwise statistical regression model on both financial and market characteristic variables that had been previously shown to be significant determinants of bank merger premiums. The results suggest that the degree of financial leverage can cause substantial variations in bank value This relationship is most relevant in the large banks. For these banks, a one percent increase in leverage explained a 64.16 percent increase in the price/book ratio. For small banks, a one percent increase in leverage was less important, explaining a 3.67 percent increase in the price/book ratio. In both cases, the leverage variable was highly significant.

The relationship between financial leverage and bank value has important implications. Given the deposit insurance provided by the FDIC, banks do have an incentive to use inordinate amounts of leverage to increase their value. The risk-related structure of the implicit

premiums (regulatory interference) is intended to counteract this incentive. As BCK have contended, regulatory standards for capital adequacy are the critical element in the FDIC pricing strategy because it is these standards that determine the anticipated net value of the deposit insurance as a function of bank leverage. This research would support this contention.

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