The Effect of Local Deposits on Overall Bank Health

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Introduction

From the beginning of 2006 to the end of 2010 a total of 117 community banks failed within Georgia alone. The focus of this study is to identify the main contributing factors to overall bank health and curb the rate of community bank failures. The OLS model used confirms the assumption that there is a relevant positive correlation between local deposits and the health of community banks. However, the model also reveals some counterintuitive results in regards to the true effects of some internal variables within the banks.

Literature in Review

The first item that must be addressed is the difference between core and brokered deposits and the significance of each. Every bank's deposits can be split into these two groups. Core deposits are made us mostly of deposits from the local community with a vested interest in the bank based on the safety of their money and the utilities the bank has to offer. The brokered deposits are those that are simply made by a broker because that bank's interest rate was the most appealing at the time. These are predominantly large sums of money simply using the bank to generate more money as long as it is the most convenient option. Core deposits are viewed as the most stable part of a bank's liabilities and thus are often used as one measure of a bank's strength. They are considered stable because the bank can

confidently loan against these deposits with minimal fear that the local community will have a mass withdrawal of money from the bank causing a large liquidity shock. Brokered deposits on the other hand can be volatile in the sense that upon discovering a better interest rate they can be withdrawn and allocated elsewhere at the drop of a hat, making these much riskier to loan against.

Now, Jill Wetmore (2004) discusses the major decline in core deposits in line with the decline of interest rates. This in combination with the rise in stock prices lead people to switch from saving accounts to money market type account. Also, a healthy banking system was promoting lending activity, which brings us to Wetman's main focus, the dramatic increase of the loans-to-core deposits ratio. If very high loans-to-core-deposit ratios are in fact indicators of high risk this information will affect the price of the stock for that bank. Wetmore goes on to say that this is in fact what will be tested.

Wetmore uses panel data in a formula to test if the loans-to-core-deposits ratio is significantly related to the bank's stock return. The equation used is as follows.

$$R_{jt} = Y_{jt+} B_{mt} R_{mt} + P_{m,L} R_{lcdt} * R_{mt} + B_{int} R_{int} + P_{int,L} R_{lcdt} * R_{intt} + E_j$$

In this formula t= time t; $R_{m=}$ return on NYSE; R_{in} = yield on 10-year bond interest rates; R_{lcd} = percent change in loans-to-core-deposits; R_j = return on stock for bank j.

Bank holding companies were selected from the top 100 with the most total assets in 1992 and the final sample size was 82. Stock price information was gathered from the Standard and Poor's Daily Stock Price Guide for the corresponding time period. Steps were also taken to control for stock splits and dividends. The formal definitions used for what exactly qualifies as a core deposit or to be counted in the loans-to-core-deposits ratio is the same as defined by the FDIC in May of 2002.

The results show that surprisingly, prior to 1994 the loans-to-core-deposits ratio was actually negatively and significantly related to market risk while also showing no tie to the bank's interest rate at all. However, Post 1994 the opposite is true. From then on the loans-to-core-deposits ratio was both significantly and positively related to the measurement of risk. The sample was also split into two groups to measure any difference between banks with little merger activity and those with a large amount of merger activity. The result here was that there is no significant connection between the level of mergers a bank is involved with and the loans-to-core-deposit ratio.

Now, an explanation for this outcome flip can be found in one of the critiques for this model. During this time there was new legislation and regulations being passed every day that affected the every day operations and management of banks. Specifically the Riegle-Neal Interstate Banking and Branching Efficiency Act which went into effect in 1994, the same year as the switch in the loans-to-core-deposits ratio correlation. This act "prevents banks from acquiring branches outside of their home states for the purpose deposit production. Therefore… bank managers have

an incentive to increase the loan-to-deposit ratio by either reducing the level of deposits or increasing the level of loans." (Wetmore, 2004)

Another variable that is crucial in helping to determine what factors into the over all health of the bank is managerial decision making. (Anderson & Fraser, 2000) Due to the principle agent problem, the managers in decision making positions often do not have the same goals in mind for the firm as the owners. Anderson and Fraser show that managerial shareholdings were positively related to total and specific firm risk until regulatory legislation was passed in 1989 and 1991 which resulted in managerial shareholdings becoming negatively related to risk taken.

As the previous two examples have shown political influence and regulatory legislation can cause independent variables to affect the in completely different ways. This is also true of other outside forces even times of financial crisis when banks are most vulnerable to drastic change. For instance it was found during the 1990's, when Japan was in financial turmoil, close bank-firm relationships actually increased the chances of firm bankruptcy instead of decreasing it as usual. (Akashi, Kasuya, & Fukuda, 2008)

Wetmore's article fits into the literature for this area of study almost as a sort of intermediary. It bridges the gap between the fundamental understanding and explanation of the importance core deposits, and the highly complex empirical analysis of the risk involved in banking, specifically with interest rates. For instance, by first reading an article such as Kenneth Spong and James Harvey's 2001 article "The decline in core deposits: What can banks do?" one gains a grasp for the

magnitude of how important core deposits actually are and how banks go about managing them and certain options that they have. It lays the foundation for research to build on it and is a nice transition into Wetmore's article. Wetmore then begins the transition from simple models, to more complex empirical research and theory such as Bernell Stone in his "Systematic Interest Rate-Risk in a two index model of returns".

However, both Wetmore and Stone use stock returns as measures of health and volatility. (Stone, 1974; Wetmore, 2004) This should not be an adequate measure of health due to the fact that the stock market, and thus the price of each bank's stock, is affected by much more than just the individual bank's actions.

Data & Methodology

The measure of health used in this model is tier 1 leverage capital ratio. Tier 1 leverage capital ratio can be measured by the formula.

Tier 1 Leverage Capital Ratio = Tier 1 Capital/Average Assets

Tier 1 Capital can be found by adding up [common stock, undivided dividends, paid-in-surplus; Non-cumulative perpetual preferred stock; and minority interest in consolidated subsidies] and subtract [all intangible assets (with very limited exceptions); identified losses; and deferred tax assets in excess of FDIC limitations].

The data for all community banks throughout Georgia was gathered from the FDIC for the years of 2006 through 2010. The data covers a total of 359 community banks over the five-year span, with community banks being defined as any bank with total assets of less than one billion dollars. A bank's balance sheet is designed to report how and where the bank is allocating resources and gives a broad look at

most of the moves made by the bank from a financial point of view. This OLS model incorporates variables taken from breaking down each bank's balance sheet into individual variables to account for all actions taken by the bank to measure the relevance of core deposits to tier one ratio.

$$\text{Tier One} = \beta_0 + \beta_1 \text{Core\%} + \beta_2 \text{Cash Due} + \beta_3 \text{Held Sec} + \beta_4 \text{Sale Sec}$$
$$+ \beta_5 \text{Fed Funds Sold} + \beta_6 \text{Sec Agree to Sell} + \beta_7 \text{Loans/Lease for sale}$$
$$+ \beta_8 \text{Loans and Leases} + \beta_9 \text{Trading Assets} + \beta_{10} \text{Fixed Assets} + \beta_{11} \text{OREO}$$
$$+ \beta_{12} \text{Inv Uncon Subs} + \beta_{13} \text{Inv in Real} + \beta_{14} \text{Goodwill}$$
$$+ \beta_{15} \text{Intangible Assets} + \beta_{16} \text{Other Assets} + \beta_{17} \text{Subsidiaries}$$
$$+ \beta_{18} \text{Other Liabilities} + \beta_{19} \text{Debentures} + \beta_{20} \text{OBM}$$
$$+ \beta_{21} \text{Trading Liabilities} + \beta_{22} \text{Fed Funds Purch} + \beta_{23} \text{Sec Agree to Purch}$$
$$+ \beta_{24} \text{Year} + e$$

The variable of focus is each bank's tier one capital ratio, which is one measure of the over all health of a bank. By dividing tier 1 capital by average assets as opposed to simply total assets leverages the assets to control for risk. This leveraging accounts for the riskiness of things such as different types of loans, which this study does not delve into the specifics of. This ratio is used by the FDIC as a measure of bank health, and mandates that banks have at least an .08 tier 1 capital ratio to maintain in operation. The FDIC classifies ratios from .06-.08 as adequate but will still pressure banks to raise this ratio. Anything lower than .06 and sometimes, even ratios within the adequate ratio are deemed unacceptable and if

banks do not meet the required tier 1 ratio standards they are shut down by the FDIC. It is for this reason that the tier 1 ratio is used here as the measure of bank health. Despite the strict definition of exactly what variables make up tier 1 capital ratio itself, it can also be interpreted as a measure of managerial decisions. A high tier 1 capital ratio is indicative of conservative banking strategies by more capital on hand to cover the banks liabilities and the opposite is true of a low tier 1 capital ratio. Bank managers have complete information in regards to their bank's operations and make their decisions based on these activities. This being the case, since tier 1 capital ratio is a reflection of management decisions, it is therefore a function of all other operations.

The independent variable of interest is the percentage of total deposits that are core deposits. Core deposits are deposits made to the bank by the local community surrounding the bank as opposed to deposits made by brokers simply looking for the best interest rate. The belief is that these deposits are more stable than brokered deposits, which could be easily withdrawn at any time by the broker in favor of a better interest rate. This stability should promote bank health and thus tier 1 capital ratio in a positive manner.

The purpose of a balance sheet is to record every in and out of a firm in an action-reaction sense. Each time money is spent something is purchased and each time something is sold payment is received. All of this is accounted for in order to "balance" the balance sheet, thus it records all financial operations of the bank. These operations are the determinants in managerial decision-making, and

therefore the determinants of tier 1 capital ratio. These determinants can be broken up into the two sides of the balance sheet, which are assets and equity/liabilities.

The group containing the most variables is the asset group. Now, by definition total assets make up the denominator of the tier 1 capital ratio. This being the case the coefficient on all of the variables that fall under this category should be negative, because if they rise tier 1 capital ratio will fall. Most assets are also obtained through an outflow of capital. This decreases the numerator in the tier 1 capital ratio also driving it down. This is logical because every asset is an entity owned by the bank with some level of risk involved. If there are more assets then there will be more risk, and if there is more risk the bank is less healthy.

The first of these asset variables is "cash due" which stands for cash due from depositories. "Held Sec" stands for held-to-maturity securities. These are all of the investments in securities that the bank plans on holding until they mature. "Sale Sec" stands for available-for-sale securities. These are all of the investments made in securities that the bank plans on selling in a secondary market before maturity. "Fed Funds Sold" stands for federal funds sold in domestic offices. This is money the bank loans to the Federal Reserve Bank usually fairly short term for a modest interest rate. "Sec Agree to Sell" stands for securities purchased under agreement to resell. These are investments made in securities with specific dates that banks are committed to sell them by.

Now moving on to some more tangible assets, "Loans/Leases for sale" stands for loans and leases held for sale. These are loans, which are made, packaged together,

and sold to larger banks. “Loans and Leases” are the basic loans made by a bank for its own portfolio, and “Trading Assets” are all the assets that the bank has for resale. “Fixed Assets”, also known as premises and fixed assets, are all major assets, such as buildings and offices, used by the bank.

The last group of asset variables is not quite so straightforward. “OREO” stands for other real estate owned. This mainly consists of properties, which have forfeited on payments, that the bank was forced to repossess. “Inv Uncon Subs” stands for investment in unconsolidated subsidiaries and companies. These are companies that the bank has invested in but only reports their worth. Otherwise they report their own balance sheets. “Inv in Real” are direct investments in real estate or real estate investment trusts as a moneymaking venture. “Goodwill” is the excess value of a purchase of another company over its book value. “Intangible Assets” stands for other identifiable intangible assets. This could include patents or intellectual property. Finally, all other remaining assets fall under the “Other Assets” variable.

The same way the equity/liabilities side of a balance sheet has the exact opposite effect of an asset side input, the equity/liability variables should have the opposite effect on the tier 1 capital ratio. Liabilities are actually capital received in exchange for some sort of entity to be repaid later, and capital is also the numerator in the formulaic definition of tier 1 capital ratio. Increasing equity capital, consolidated subsidiaries, or liabilities would increase capital. This positive relationship would cause tier 1 capital ratio to increase or decrease hand in hand (at a relative magnitude) with the equity/liabilities variables. Therefore, the coefficient on all equity/liability variables should be positive. Liabilities can also by obtained through

the outflow of assets, which lowers the denominator in the formula, further driving up the ratio. This is logical because capital is virtually risk free because it can not be defaulted on, have its value swing wildly within the course of a day or, even disappear. Having capital also allows a bank to cover other risks if something were to go wrong. For instance if an earthquake destroyed one an office the bank could pay for damages out of pocket because it had sufficient capital.

The first of these risk-covering variables is “Subsidiaries”, which are the subtotals of the consolidated balance sheets of any subsidiaries the bank may have.

The liability variables begin with “Debentures”, which stands for subordinated notes and debentures. This is money that the bank borrows from various investors subordinated to other borrowers or capital. “OBM” stands for other borrowed money. “Trading Liabilities” are liabilities that a bank can sell to other investment companies or investors. This is usually a hedging instrument to offset the volatility of some assets.

Finally, the liability side of securities starts with “Fed Funds Purch”, which stands for Federal funds purchased in domestic offices. This is money borrowed from the federal bank typically for short periods of time. This is essentially the opposite of “Fed Funds Sold”. “Sec Agree to Purch” stands for securities sold under agreement to repurchase. These are securities sold by the bank under a specified agreement to buy them back on a specific date in the future. This is essentially the opposite of “Sec Agree to Sell”. Lastly, “Other Liabilities” are all other liabilities not accounted for.

To cap the end of the model, a variable for year (Year) was included to account for any regulatory or policy changes made over the sample period and the last input is the stochastic error term.

Findings

The results of the regression, including coefficients, t-values, and p-values, for each of the twenty-five variables can are all recorded in Table 1.

Percentage of core deposits, which is the independent variable of interest, is estimated to be significant at the one percent level along with Cash Due, Loans and Leases, Fixed Assets, OREO, Goodwill, Intangible Assets, and Other Assets. Additionally it estimated the variables Sec Agree to Purch and year to be significant at the five percent level. The remaining variables were of no statistical significance.

As expected the percentage of core deposits is not only statistically significant, but is also positively correlated with the tier 1 leverage capital ratio. The percentage of core deposits has a coefficient of .078. This means that every time the percentage of core deposits increases by one the tier 1 leverage capital ratio will increase by .078. This is a relatively large effect considering the mean tier 1 leverage capital ratio is .129 as seen in Table 2. However, since percentage of core deposits is also a ratio an increase of 1 would be an increase of 100%. It is a little easier to conceptualize it as a 1% increase in percentage of core deposits would result in a roughly .078% increase in tier one leverage capital ratio.

Another variable proving to be a curiosity in the results is other assets. Other assets has is estimated to be significant on the one percent level and has an astronomically high t-value at 16, relative to the other variables. This high t-score is

interpreted to mean that the coefficient for other assets was calculated with a great deal of accuracy. The coefficient itself is .00000381, which means with every increase by one dollar in the tier 1 leverage capital ratio will raise by .00000381. This initially seems low but when comparing millions of dollars to ratio percentages in the single digits the ratio evens out. This is even one of the larger coefficients out of those variables that are statistically significant.

Upon checking the assumptions that the asset variables would have more negative coefficients and the equity/liability variables would have more positive coefficients, the regression results showed that this was not the case. It actually proved to be the opposite with 8 out of 15 asset variable coefficients showing up positive and 5 out of 7 equity/liability variable coefficients being negative. The most likely explanation of this is that not only is tier 1 leverage capital ratio a function of these variables, but these variables are also a function of tier one leverage capital ratio. That is to say, the negative relationship between the equity/liability variables and tier 1 leverage capital ratio is caused if a bank has a low tier one leverage capital ratio and is facing pressure from the FDIC to raise capital to rectify this. That will cause liabilities to rise with the dropping tier 1 leverage capital ratio as bank managers scramble to do whatever they can to raise capital, thus high levels of liabilities signify an unhealthy bank. The opposite would be true with the asset variables. A high tier 1 leverage capital ratio signifying the bank is stable and prosperous would encourage lending and more risk in an attempt to earn profit with a stable base to start from. This would lead to asset variables increasing hand

in hand with tier 1 leverage capital ratio creating a positive relationship between the two.

Source	SS	df	MS		
Model	1.70618206	24	.071090919	Number of obs =	511
Residual	.726769824	486	.001495411	F(24, 486) =	47.54
				Prob > F =	0.0000
Total	2.43295189	510	.004770494	R-squared =	0.7013
				Adj R-squared =	0.6865
				Root MSE =	.03867

tier1lever~o	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
core	.0783754	.022176	3.53	0.000	.0348028	.121948
cashanddue~s	3.17e-07	1.21e-07	2.63	0.009	7.98e-08	5.53e-07
heldtomatu~s	-3.27e-07	4.13e-07	-0.79	0.430	-1.14e-06	4.86e-07
availablef~s	7.28e-08	8.75e-08	0.83	0.406	-9.92e-08	2.45e-07
federalf~ics	5.90e-08	1.99e-07	0.30	0.767	-3.32e-07	4.50e-07
securspurc~l	4.48e-06	4.36e-06	1.03	0.304	-4.08e-06	.000013
loansandle~e	-4.87e-08	2.03e-07	-0.24	0.810	-4.48e-07	3.50e-07
loanslease~w	-1.16e-07	2.70e-08	-4.30	0.000	-1.69e-07	-6.31e-08
totaltradi~s	.0000497	.0000651	0.76	0.446	-.0000783	.0001777
premisesfi~s	-2.62e-06	5.75e-07	-4.56	0.000	-3.75e-06	-1.49e-06
otherreale~d	-1.72e-06	1.95e-07	-8.84	0.000	-2.11e-06	-1.34e-06
investinun~o	-.0000113	7.18e-06	-1.57	0.117	-.0000254	2.82e-06
invinre	3.30e-06	.0000242	0.14	0.892	-.0000442	.0000508
goodwill	3.28e-06	6.93e-07	4.73	0.000	1.92e-06	4.64e-06
otherident~t	-.0000108	3.94e-06	-2.75	0.006	-.0000186	-3.07e-06
otherassets	3.81e-06	2.38e-07	16.04	0.000	3.34e-06	4.28e-06
minorityin~e	-4.83e-06	.0000116	-0.42	0.678	-.0000277	.000018
otherliabi~l	4.84e-07	1.44e-06	0.34	0.736	-2.34e-06	3.31e-06
subordinat~s	4.23e-06	3.91e-06	1.08	0.280	-3.45e-06	.0000119
otherborro~y	-1.92e-07	1.74e-07	-1.11	0.269	-5.34e-07	1.49e-07
tradinglia~s	-.0004759	.0004954	-0.96	0.337	-.0014493	.0004976
federalf~fcs	-7.55e-07	1.82e-06	-0.41	0.679	-4.33e-06	2.82e-06
securssold~h	-9.45e-07	4.37e-07	-2.16	0.031	-1.80e-06	-8.54e-08
year	-.008578	.0036958	-2.32	0.021	-.0158397	-.0013163
_cons	17.23772	7.415639	2.32	0.021	2.667045	31.80839

Table 1. Regression Results

Variable	Obs	Mean	Std. Dev.	Min	Max
core	1447	.91302	.1180076	.24	1
tier1lever~o	1447	.1285833	.4878102	-.02	18.09
cashanddue~s	1447	10622.16	17267.87	64	364290
heldtomatu~s	1447	1554.146	7349.537	0	107892
availablef~s	1447	28204.88	29576.84	0	212912
federalf~ics	1447	6183.781	11153.71	0	250540
securspurc~l	1447	420.9143	13255.96	0	500000
loansandle~e	1447	986.1044	8338.154	0	142493
loanslease~w	1447	149146.8	136715.1	0	805412
totaltradi~s	1447	109.2979	2510.442	0	71630
premisesfi~s	1447	4502.123	4815.676	0	37898
otherreale~d	1447	3533.678	7921.988	0	93239
investinun~o	1447	18.74292	195.4644	-11	3766
goodwill	1447	969.7623	5660.519	0	81262
otherident~t	1447	219.1037	1311.144	0	28688
otherassets	1447	5768.334	8823.51	33	233877
minorityin~e	1447	6.562543	121.7815	0	3690
otherliabi~l	1447	1615.957	2607.514	0	41857
subordinat~s	1447	48.20663	625.7921	0	10000
otherborro~y	1447	9960.084	19692.82	0	500000
tradinglia~s	1447	.3932274	7.251616	0	167
federalf~fcs	1447	1092.57	5502.863	0	105465
securssold~h	1447	1577.598	5682.261	0	70020
year	1447	2007.853	1.39294	2006	2010

Table 2. Summary Statistics

Issues

The main issue with this model is that is does not account for any external factors affecting the bank. Things such as the income of the areas where banks are located and the number of banks competing in a certain area are obviously going to have some effect on the health of the bank. Even natural disasters and policy differences between areas can have huge impacts. These could all be rectified through geographic variables perhaps based on county and a multitude of dummy variables. A difference-in-difference model could also be implemented to account for

policy changes over time. Another issue could be management temperament. Some bank directors are going to be riskier than other but with such a large sample size it is difficult to apply fixed effects to neutralize this. Finally, there is the issue of multicollinearity. Lastly, as discussed before there is the issue of tier 1 leverage capital actually influencing the independent variables. In this case some sort of instrument variable would have to be found as a replacement.

Conclusion

The model verified the belief that the percentage of core deposits out of a bank's total deposits would have a relevant positive correlation to the over all health of the bank, which is measured by tier 1 leverage capital ratio. However, the results proved to be counterintuitive to the assumption that the asset variables would be negatively correlated to the tier 1 leverage capital ratio, while the equity/liability variables would be positively correlated to the latter. The regression showed the opposite to be true more than likely due to the fact that the tier 1 leverage function also affects some independent variables. The next step is to incorporate any and all external factors that affect the over all well being of community banks. This will prevent the effect of these external variables from getting eaten up by the internal variables creating bias. This spread of effects will give a clearer view to which variables truly matter and possibly even render some of the variables that were experiencing feedback from the dependant variable irrelevant.

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