

Loan Portfolio and Performance of Bank Holding Companies in the US: 2006-2008

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Abstract

The paper examines loan portfolio of bank holding companies in the US during the years 2006-2008 to identify any significant differences in bank lending before and during the financial crisis. The results of the study suggest that for the largest banks there was no significant change in loan portfolio throughout 2006-8. However, for small banks, the share of real estate loans slightly increased in 2008 where as the share of consumer loans declined suggesting some possible substitution of consumer loans by real estate loans. The study also examines the relationship between loan types and overall performance of bank holding companies in order to identify any significant difference in the effect of loan on bank profitability between the years 2006, 2007 and 2008. The empirical evidence suggests that higher aggregate loans were consistently associated with lower bank performance throughout 2006-08 where as evidence for the varying effect of loan portfolio on performance throughout 2006-08 is limited.

Keywords: loan portfolio, bank holding company, bank performance

JEL classification: G01, G10, G21

1. Introduction

Commercial banks are distinguished from other financial institutions by their accepting deposits and provision of loans. The Federal Reserve classifies bank loans into several categories: real estate loan, agricultural loan, commercial and industrial loan (C&I), loan to depository institutions, consumer loan, obligations to state and political subdivision, and foreign loan (Saunders, 2008). Loans are the basic source of revenue and a major part of asset for banks. Loan portfolio problems have historically been a major cause of bank failure (Comptroller's Handbook, 1998). Loans are associated with default risk in addition to the inherent risk of individual loans. Thus, according to the Modern Portfolio Theory the objective of the bank manager is to choose a loan portfolio that minimizes risk given the expected return of the portfolio.

The recent financial crisis of 2008 had severe consequences for commercial banks. According to the Federal Deposit Insurance Corporation (FDIC) 25 commercial banks failed and several others declared bankruptcy during 2008. These failures are likely to cause a decline in confidence that would make commercial banks reluctant to lend money amongst themselves or to others.

Recent papers find evidence that bank loans have declined during the peak of the recent financial crisis (August-October 2008) relative to the credit booms of May-July 2007. Contessi et al (2009b) showed that bank credit had expanded strongly in the fourth quarter of 2007, particularly for C&I loans but was followed by a sharp contraction until the first quarter of 2008. Subsequently, there was a mild contraction in the third and fourth quarters of 2008. Contessi et al (2009b) argue that lending declined for the major types of loans (C&I, consumer loans and real estate loans) and for all US banks during the third and fourth quarters of 2008.

Similarly, Chari et al (2008) argued that bank lending to non-financial corporations and individuals declined sharply during the crisis while interbank lending was essentially nonexistent. However, they added that such evidence is not evident in the aggregate data. In fact, using aggregate data they showed that C&I loans increased slightly during the crisis, consumer

loans did not decline and interbank loans also did not decline during the crisis. Consistent with this result Ivashina et al (2008) found a slightly rising trend of C&I loans for much of 2008.

The use of aggregated data can be misleading when making conclusions about what happened to loans during the crisis (Contessi, 2009a). A deeper look at disaggregated data shows a steep decline of loans during the crisis (Cohen-Cole et al, 2008, Chari, 2008, Ivashina et al, 2008). Ivashina et al (2008) estimated that during August-October 2008, loans from commercial banks were 36% less than the previous 3 months.

The effect of loans on the performance of banks differs for different types of banks, different macroeconomic condition (Athanasoglou, 2005, Demirguc-Kunt et al, 2000), and different institutional factors (Cornett et al, 2009). Regarding the relationship between loan portfolio and bank returns, Acharaya (2002) found that loan diversification reduces bank return while endogenously producing riskier loans for all banks in a sample of Italian banks in the 1990s.

The purpose of this study is to examine if there is a statistical difference in the amount of lending, type of lending and loan portfolio of US bank holding companies in the years 2006-2008. Mean estimation is used to compare bank lending during the crisis years to the patterns observed in 2006. In addition, this paper examines the relationship between loan portfolio and overall performance of bank holding companies (hereafter 'banks'). The study investigates if loan and loan composition affects bank profitability and if there is any significant difference in the effect of loan portfolio on bank profitability between the years 2006-2008. To address this issue seemingly unrelated regression technique is used to determine which loan types were most detrimental for bank return and how (or if) these variables had significantly changed throughout 2006-08.

Section 2 describes the main variables used in the paper, presents the econometric model and compares values of the major loan types in 2007-2008 to those given in 2006 using mean estimation and descriptive statistics. Following, section 3 presents regression results and discusses major findings. Finally, the major findings are summarized and conclusions are drawn in section 4.

2. Data and Methodology

The study examines a cross-sectional data of 19,947 US consolidated bank-year observations obtained from Federal Financial Institution Examination Council Call Report (FFIEC 031) found on the Chicago Federal Reserve's website. Bank holding company data is obtained by aggregating commercial bank values at the highest holding level. The sample contains 4,805 single banks which are not associated with any bank holding company. Initially, the study analyses all the 19,947 bank-year observations.

Table 1 classifies the sample of banks into five size-groups according to their end of year asset. Total asset is classified as greater than \$10 billion, \$3 billion - \$10 billion, \$1 billion - \$3 billion, \$500 million - \$1 billion-\$ and less than \$500 million.

The total number of banks declined from 2006 to 2008 in the sample. In addition, the sample is dominated by small sized banks for all the years. The number of small sized banks declined from 2006 to 2008 where as the number of large banks did not decline during the period under study. This is likely to suggest that the financial crisis hit smaller banks relatively harder, and that the smaller banks were more likely to be acquired and bought by larger banks.

The Report of Condition and Income identifies 9 types of bank loan: real estate loans, C&I loans, consumer loans, loans to depository institutions, agricultural loans, obligations of states and political subdivisions in the US, loans to foreign governments, lease financing receivables and others. Let $L_{j,i}$ be the j^{th} loan type for each bank holding company i (bank) where $j=1,2,\dots,k$ and $i=1,2,\dots,n$. If L_i is the amount of total loans given by the i^{th} bank, then for the i^{th} bank

$$L_i = \sum_{j=1}^k L_{j,i} \quad (1)$$

Loan portfolio for each bank is measured by the share of each loan type from total loans ($S_{i,j}$) The share of each loan type, $S_{j,i}$, from total loans for the i^{th} bank is the unit of analysis in this study and is calculated as

$$S_{j,i} = \frac{L_{j,i}}{L_i} \quad (2)$$

The purpose of this study is to examine what happened to each type of loans during the years under study. Table 2 provides a mean estimation of the share of the major loan types namely real estate loans, C&I loans, consumer loans and agricultural loans. The other types of loans each account for about one or less than one percent of total loans and hence are not included in the analysis. For the smallest banks in the sample (Panel E), consumer loans significantly declined in 2007 and 2008, but there was a significant increase in the share of real estate loans. This suggests that the small banks might have substituted consumer loans by real estate loans toward the crisis periods. There is no evidence of such a substitution tendency for big banks. In the sample with all banks (Panel F), there is a significant decline in the share of consumer loans in 2007 and 2008. During the same time the share of real estate loans increased significantly. This suggests that the action of the small banks drive the result obtained for the entire sample.

Loans, as the major source of revenue for banks, affect bank performance. This paper investigates whether the different type of loans affect bank performance differently. The performance of banks is measured by return to assets (ROA which is the ratio of net income to total assets) and return to equity (ROE which is the ratio of net income to total capital equity). In determining the effect of loan portfolio on performance I regress ROA on the $S_{j,i}$ variables (see equation 2) along with some control variables to measure the contemporaneous and lagged effect of loan on bank performance. Current loans are usually not settled in the same year, thus it is possible that *both* current and past loans affect current bank performance.¹ To study both the contemporaneous and lagged effect of loan on performance a system of two linear equations is estimated for the years 2006, 2007 and 2008 as follows

$$ROA_{i,t} = \alpha + \sum_{j=1}^k \beta_j S_{j,i,t} + \gamma X_{i,t} + \delta L_{i,t} + \varepsilon_{i,t}$$

$$ROA_{i,t} = \alpha' + \sum_{j=1}^k \beta'_j S_{j,i,t-1} + \gamma' X_{i,t} + \delta' L_{i,t-1} + \varepsilon'_{i,t} \quad (3)$$

¹ If we include both current and past loans in a single equation we get the marginal effect of current loan on performance given past loans, or the marginal effect of past loan on performance given current loans.

Where $E(\varepsilon_{i,t}) = E(\varepsilon'_{i,t}) = 0$ but $E(\varepsilon_{i,t}, \varepsilon'_{i,t}) \neq 0$, $i=1,2,\dots,n$, $j=1,2,\dots,k$ and $t=2006, 2007, 2008$. X is a list of control variables including size of the bank, riskiness of loans measured by loan loss allowance and capital measure by total equity capital.

β_j measures the direct effect of current year's share of the j 'th loan type on current bank performance, β'_j measures the direct effect of previous year's share of the j 'th loan type on current performance, δ measures the effect of current total loans on current performance and δ' measures the effect of previous year's total loan on current performance.

At first glance, the above equations may seem unrelated, but the equations are related through the correlation of the error terms. Elements of $\varepsilon_{i,t}$ may be contemporaneously correlated to elements of $\varepsilon'_{i,t}$ due to the common dependent variable. In addition, a common regressor $X_{i,t}$ is used for both equations, and for all time periods. Thus, in empirical tests, it would be incorrect to exclusively rely on the conclusions drawn from *Ordinary Least Squares*. For such a series of equations Greene (2008) proposed the use of seemingly unrelated regression (SUR) to get efficient estimates of the coefficients. SUR is a technique used for analyzing a system of multiple equations with cross-equation parameter restrictions and correlated error terms (Greene, 2008). In this case, SUR estimates obtained from a cross section of banks would be more efficient than OLS equation-by-equation estimates. The advantage of a cross sectional data is that it helps to see the difference in the performance across banks and to identify whether banks with a certain loan type had better performance than the rest.

3. Empirical Results and Discussion

3.1 The impact of current and previous loans on performance

To determine the impact of loans on the performance of bank holding companies, only banks with at least one higher holding company are included in the sample. Some 4,805 commercial banks are single banks and are excluded from the sample to form a sample of 15,142 observations. In this sample, most banks have a lower average performance in 2008 as compared to 2007, but a lower aggregate loan in 2007 as compared to 2008. Thus, in 2008 higher loans seem to have been associated with a lower performance. In 2008, the average size of banks is higher than both 2007 and 2008 which suggests that smaller banks might have disappeared in

2008 due to mergers or acquisition by bigger banks. Table 3 summarizes the key variables used in the study for the years 2006-08.

The share of real estate loans, agricultural loans, loans to individuals and C&I loans take a higher share in total loans, thus those are the only types of loans included in the regression. To estimate the effect of past and current loan portfolio on current bank performance *equation-by-equation Ordinary Least Squares* is initially applied to the sample of banks. Table 4 presents regression results using four alternative models excluding and including control variables.

The amount of current and past aggregate loan is negatively related to current performance. Those banks which gave out higher levels of total loans had a lower return on asset; this may be due to many reasons including default risks associated with different types of loans in addition to the inherent risk of individual loans.

The estimation results suggest that both past and current loan to the real estate sector have a significant positive impact on performance, even after controlling for size, capital and risk. Banks which give more loans for the purpose of residential and non-residential property construction had the highest performance. Both previous year and current year loans to the real estate sector are important for performance of banks. Similarly, banks with a higher share of current consumer loans have a higher current performance, and this holds true after controlling for the effect of asset, capital and risk.

A surprising result is that bank size is negatively related to performance; bigger banks tend to have a lower return on assets. This may be because larger banks have the capacity to give out larger loans which when defaulted affect bank performance negatively or it may be due to the higher exposure to risky activities.

3.2. Differences in the impact of loan on performance across 2006-2008

As argued in section 2, analysis based only on OLS is not sufficient since it generates inefficient coefficients. To analyze and compare the effect of loan portfolio on performance during and before the financial crisis a seemingly unrelated regression (SUR) is used. Table 6 presents results from the *SUR* regression.

The composition of both previous and current year's loan are not a significant determinant of current bank performance. It did not matter to which sector banks were lending and hence the loan portfolio was not a determinant of bank performance in the years 2007 and 2008. But total loans significantly and negatively affect current performance in both 2007 and 2008 suggesting that only the size of aggregate loans and not the decomposition of loan affect performance during the financial crisis (2007-08). Unlike the OLS results, the SUR regressions produce no significant effect of loan portfolio on bank performance; as long as banks gave out lower aggregate loans they would have higher performance in subsequent years

The results for 2006 produced very small and statistically insignificant coefficients and are not reported. Similar results are obtained when controlling² for size, capital and risk. The coefficient on bank size is negative and highly significant. Consistent with the OLS results, total loans continue to have a negative impact on bank performance. The OLS regression produced a positive effect of lending to the real estate sector. This difference occurs because the OLS results measure the effect of change in current loan portfolio on current performance *and* the effect of change in past loan portfolio on current performance *independently* where as in the SUR the *simultaneous* effect of past and current loan portfolio create no effect on current performance. Therefore, if we separate past real estate loans and current real estate loans, these variables independently affect current performance. But their simultaneous change has no significant effect on performance.

6. Conclusions

The study investigates possible differences in the loan portfolio of US bank holding companies in the years 2006-2008. For the larger banks there is no significant change in loan portfolio in 2007 and 2008 as compared to 2006. However, for small banks, the share of real estate loans slightly increased in 2008 where as the share of consumer loans declined, suggesting some possible substitution of consumer loans by real estate loans.

² Additional controls used are interest and non-interest income. Interest income has a significant positive coefficient suggesting that returns from loans are important determinants of bank performance. The significance or the signs of the loan portfolio variables were unaltered by the inclusion of additional controls.

The study also examines the effect of loan on the performance of US bank holding companies. The regression model provides consistence evidence that higher aggregate loans (both past and current) were associated with lower bank performance. Higher current real estate loans and higher past real estate loans are independently associated with higher bank performance, but there is no sufficient evidence for a simultaneous effect of current and past real estate loans on bank performance. In addition, there is no sufficient evidence to claim that the effect of loan portfolio on performance does differ in the years 2006-07.

Table 1

Number of bank holding companies examined between 2006 and 2008

Year	Number of banks	Total Asset >\$10 b	Total Asset \$3b-\$10 b	Total Asset \$1b-\$3 b	Total Asset \$500 m -\$1 b	Total Asset < \$500m
2006	6,724	81	103	310	524	5,706
2007	6,665	73	114	325	535	5,618
2008	6,558	76	115	332	576	5,459
Total	19,947	230	332	967	1,635	16,783

Table 2

Loan Composition indicators: 2006-2008

Panel A contains results for banks with end of year total asset greater than \$10 billion, Panel B contains results for banks with total asset \$3 billion-\$10 billion, Panel C contains results for banks with asset \$1 billion-\$3 billion, Panel D contains results for banks with total asset 500 million-\$1 billion, Panel E contains results for banks with asset less than \$500 million and Panel F contains results for all banks in the sample. Tests are made for differences in the mean of the values between 2006 & 2007 and between 2007 & 2008. The level of significance is reported for those differences which are significant, where a=difference in 2006 & 2007 at 1% level, b=difference in 2006 & 2007 at 5% level, c=difference in 2006 & 2007 at 10% level, d=difference in 2007 & 2008 at 1% level, e=difference in 2007 & 2008 at 5% level and f=difference in 2007 & 2008 at 10% level. The mean values of $S_{j,t}$ are calculated over the entire banks in each group and the averages are reported for the three years below. Values are expressed in percentage. The null hypothesis tested is: $H_0: \frac{1}{n} \sum_i S_{j,t,i} - \frac{1}{n} \sum_i S_{j,t',i} = 0$, t & t' represent years 2006,2007 and 2008 where $t \neq t'$

Loan composition indicators : 2006-2008

Panel A: Banks with total assets > \$ 10 b	2006	2007	2008
Real estate loans to total loans	59.6	60.0	57.4
Agricultural loan to total loans	0.5	0.5	0.4
C&I loans to total loans	19.8	21.1	21.9
Consumer loan to total loans	9.9	9.7	11.8
Real estate loans to total asset	38.9	39.8	37.6
Agricultural loan to total asset	0.3	0.3	0.3
C&I loans to total asset	12.3	13.5	12.9
Consumer loan to total asset	5.9	6.0	7.5
Panel B: Banks with total assets \$3 b-\$10 b			
Real estate loans to total loans	69.1	70.2	70.9
Agricultural loan to total loans	1.2	1.1	1.1
C& I loans to total loans	18.3	18.2	18.9
Consumer loan to total loans	7.1	6.4	4.9
Real estate loans to total asset	47	48.3	48.6
Agricultural loan to total asset	0.8	0.8	0.7
C&I loans to total asset	11.8	12.2	12.8
Consumer loan to total asset	4.7	4.2	3.3
Panel C: Banks with total assets \$1b-\$3b			
Real estate loans to total loans	75.9	75.7	75.6
Agricultural loan to total loans	1.6	1.5	1.7
C&I loans to total loans	13.9	14.1	14.2

Consumer loan to total loans	5.3	5.4	5.1
Real estate loans to total asset	54.4	55.2	55.6
Agricultural loan to total asset	1.1	1.1	1.2
C&I loans to total asset	9.9	10.1	10.2
Consumer loan to total asset	3.7	3.7	3.5
Panel D: Banks with total assets \$1b-\$500 m			
Real estate loans to total loans	76.7	76.9	77.5
Agricultural loan to total loans	2.2	2.1	2.1
C&I loans to total loans	12.5	13.1	13.0
Consumer loan to total loans	5.2	4.8	4.5
Real estate loans to total asset	54.6	56.2 ^c	56.7
Agricultural loan to total asset	1.6	1.6	1.5
C&I loans to total asset	8.9	9.5	9.4
Consumer loan to total asset	3.5	3.4	3.1
Panel E: Banks with total assets < \$500 m			
Real estate loans to total loans	65.8	66.2	67.4 ^d
Agricultural loan to total loans	9	9	9
C&I loans to total loans	1.3	1.5	1.6
Consumer loan to total loans	8.2	7.8 ^a	7.3 ^d
Real estate loans to total asset	43.9	44.7 ^b	46.0 ^d
Agricultural loan to total asset	5.6	5.5	5.5
C&I loans to total asset	0.9	1.0 ^b	1.1
Consumer loan to total asset	5.0	4.7 ^a	4.4 ^d
Panel F: All Banks			
Real estate loans to total loans	67.3	67.7	68.8 ^d
Agricultural loan to total loans	7.8	7.7	7.6
C&I loans to total loans	3.6	3.9 ^c	4.1
Consumer loan to total loans	7.9	7.4 ^a	6.9 ^d
Real estate loans to total asset	45.5	46.4 ^a	47.6 ^d
Agricultural loan to total asset	4.9	4.8	4.7
C&I loans to total asset	2.4	2.7 ^a	2.9
Consumer loan to total asset	4.8	4.6 ^a	4.3 ^d

Table 3
Averages of key variables

Key Variables	2006	2007	2008
Total loans (in \$ million)	1,148	1,278	1,346
Return on assets: <i>ROA</i>	0.452	1.043	0.092
Return on equity: <i>ROE</i>	6.719	9.499	0.951
Loan loss allowance (in \$ million)	14.3	16.9	30.3
Total equity capital (in \$ million)	239.1	220.4	228.1
Tier 1 capital (in \$ million)	155.6	153.7	171.1
Net income (in \$ million)	58.3	67.8	21.9
Total assets (in \$ million)	1,943	2,161	2,432

Table 4

Impact of Loan Portfolio on Performance

Equation-by-Equation Ordinary Least Squares: Dependent $\log(\text{ROA})_t^3$					
Past loan shares are used with and without control variables in model 2 and 1 respectively, whereas current loan shares are used in model 3 and 4 without and with control variables. Definition of the variables is provided in Table 5. Significance level: a = 1%, b = 5%, c = 10%					
	(1)	(2)	(3)	(4)	
<i>Sh_realestate_{t-1}</i>	0.363 ^a	0.265 ^c	<i>Sh_realestate_t</i>	0.411 ^a	0.227 ^c
<i>Sh_agri_{t-1}</i>	0.028	-0.077	<i>Sh_agri_t</i>	0.030	-0.126
<i>Sh_C&I_{t-1}</i>	-0.330	0.044	<i>Sh_C&I_t</i>	-0.391 ^c	0.218
<i>Sh_individual_{t-1}</i>	-0.044	0.322	<i>Sh_individual_t</i>	-0.073	0.692 ^a
<i>Ln(loan)_t</i>	-0.876 ^a	-0.087 ^c	<i>Ln(loan)_t</i>	-0.874 ^a	-0.083 ^c
<i>Ln(Size)_t</i>		-0.884 ^a	<i>Ln(Size)_t</i>		-0.893 ^a
<i>Ln(Equity)_t</i>		0.004	<i>Ln(Equity)_t</i>		0.0019
<i>Ln(LLA)_t</i>		0.044	<i>Ln(LLA)_t</i>		0.039
<i>constant</i>	12.35	13.83	<i>constant</i>	12.214	13.97
<i>R²</i>	0.40	0.417	<i>R²</i>	0.407	0.420
<i>Obs.</i>	9,474	9,466	<i>Obs.</i>	13,700	13,686

³Robustness checks are made by using $\log(\text{ROE})_t$ as a dependent variable, by using a random effects model and by running a year-by-year OLS. Results are similar except that in the year-by-year OLS, the significance of the share of real estate loans in explaining bank performance is weaker.

Table 5

Definition of Variables

Key Variables

$Ln(LLA)_t$: natural logarithm of loan loss allowance at time t

$Ln(Equity)_t$: natural logarithm of total equity capital at time t

$Ln (Size)_t$: natural logarithm of total asset at time t

$Ln(ROA)_t$: natural logarithm of return on assets, ratio of net income to asset at time t

$Sh_realestate_t$: the share of real estate loans from total loans at time t

Sh_agri_t : the share of agricultural loans from total loans at time t

$Sh_C\&I_t$: the share of construction and industrial loans from total loans at time t

$Sh_individual_t$: the share of consumer loans from total loans at time t

Table 6

Differences in the impact of Loan on Performance across 2006-2008

Seemingly Unrelated Regression: Dependent $\log(\text{ROA})_t$					
The two linear equations in the model (see Equation 3) are estimated simultaneously with current and past loan shares as independent variables. Definition of the variables is provided in Table 5. Significance level: a = 1%, b = 5%, c = 10%					
	2007	2008		2007	2008
<i>Sh_realestate</i> _{t-1}	-0.044	-0.178	<i>Sh_realestate</i> _t	0.064	0.212
<i>Sh_agri</i> _{t-1}	0.052	0.001	<i>Sh_agri</i> _t	-0.128	0.109
<i>Sh_C&I</i> _{t-1}	0.013	-0.241	<i>Sh_C&I</i> _t	-0.245	0.050
<i>Sh_individual</i> _{t-1}	-0.333	-0.195	<i>Sh_individual</i> _t	-0.096	0.104
<i>Ln(loan)</i> _{t-1}	-0.031 ^c	-0.012	<i>Ln(loan)</i> _t	-0.340 ^a	-0.366 ^a
<i>constant</i>	-3.110	-3.605	<i>constant</i>	1.79	1.85
<i>Obs.</i>	4,709	4,163	<i>Obs.</i>	4,709	4,163

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