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Abstract

This study will examine the states within the Chicago-based Seventh Federal Reserve Bank District: Illinois, Indiana, Iowa, Michigan, and Wisconsin. Studying the Seventh Federal Reserve Bank states is interesting because while they are highly similar in terms of geographical closeness, the health of each states' banking sector has varied tremendously. For example, in a study comparing attributes like customer satisfaction, stability, availability of high interest rates, and size of banking community of each state in the U.S., Iowa comes in at fourteenth, Wisconsin ranks at twenty-first, and Illinois falls all the way to dead last ("Best and Worst States", 2013). This study hopes to explore the health of the banking industry within each of the five states during periods of economic expansion and contraction to see the extent to which selected variables contribute to a contracting economic state.

Loan Mix Characteristics on Bank Profitability

Alexandra Bechtel

I. Introduction

About 92% of households in the United States have a bank account (Ellis, 2012). Yet, in a survey taken in 2012, only 2% of the surveyed population said they trusted banks “very much” (“Measuring ‘Trust’ in Banking”, 2012). This lack of trust in financial institutions where people place one of the most coveted assets—money—appears contradictory. A possible explanation for this distrust may arise from a lack of profitability of financial institutions throughout periods of economic contraction. In an article in the New York Times (2013), it was noted that when the public found out that bad lending practices were the main cause of the 2008 recession, trust in banks decreased dramatically. The financial turmoil and economic contraction between 2008 and 2009 may be a legitimate reason for such current distrust.

This study will examine the states within the Chicago-based Seventh Federal Reserve Bank District: Illinois, Indiana, Iowa, Michigan, and Wisconsin. Studying the Seventh Federal Reserve Bank states is interesting because while they are highly similar in terms of geographical closeness, the health of each states’ banking sector has varied tremendously. For example, in a study comparing attributes like customer satisfaction, stability, availability of high interest rates, and size of banking community of each state in the U.S., Iowa comes in at fourteenth, Wisconsin ranks at twenty-first, and Illinois falls all the way to dead last (“Best and Worst States”, 2013). This study hopes to explore the health of the banking

industry within each of the five states during periods of economic expansion and contraction to see the extent to which selected variables contribute to a contracting economic state.

In a recent study researching the effect of commercial real estate loans on bank failures, it is found that no correlation exists between commercial real estate loans and bank failures between 1985 and 1987. However, between 1988 and 1992, the study finds a positive correlation (Fenn, 2008, p. 18). By only looking at two short periods of economic contractions, it is difficult to get an accurate measure of the effects of commercial real estate loans, or any variables on economic contractions. This study aims to look at all nine recessions that have occurred since 1966. For purposes of this paper recessions are defined as “significant decline[s] in economic activity... lasting more than a few months” (“US Business Cycle Expansions and Contractions”, 2013). The longer time frame enables a more holistic approach to see what factors affect the health of the banking industry. This study will examine the effect of real estate loans, commercial and industry loans (C & I loans), loans to individuals, and investment securities on banks profitability during recessions and years of economic expansion.

It is vital for financial institutions to understand the relationship that exists between their asset mix and their profitability. This information enables financial institutions to make educated decisions on policies regarding the amount of different types of loans and investment securities. Looking at recessions

specifically is also paramount because financial institutions may be able to reduce risks during years of economic contractions. If they are more aware of how certain asset allocation methods will affect their profitability, financial institutions will be better equipped to function favorably during those years.

In the subsequent sections, the effect of a bank's loan mix on profitability will be further discussed. Section II introduces the theoretical models relevant to this topic along with empirical works supporting the hypotheses. Section III will describe the data and methods used in this study, along with transformations that were made. Next in section IV, the results of this study will be discussed. The final section will examine possible policy implications and possible extensions of this paper.

II. Literature Review

Stiglitz and Weiss (1981) argue that financial institutions have asymmetric information with potential borrowers (p. 393). When financial institutions accept a loan application they incur an unknown level of risk. This risk is due to uncertainty of whether the borrower will repay the loan or not. Building on the asymmetric information between borrowers and financial institutions, Psillaki and Mondello (2001) apply the Information Theory to the credit market (p. 41). The Information Theory claims that gaining additional information on borrowers will decrease uncertainty for financial institutions, thus increasing the likelihood that a borrower will repay the loan, and decreasing the loans' associated risk. Unfortunately, the cost of gaining additional information on every borrower may outweigh the benefits for a financial institution.

To account for the discrepancies of asymmetric information and an unknown level of risk, many financial institutions apply the Modern Portfolio Theory. Markowitz (1959) first established the Modern Portfolio Theory when he noted that in order to diversify risk

and maximize returns on investments, investor's should choose different proportions of assets within their portfolio. Because of the unknown level of risk associated with different assets, it would be unwise for financial institutions to invest entirely into one type of asset or loan.

The Modern Portfolio Theory can be applied to this study to determine which type of asset has the greatest impact— positive or negative— on the health of the financial industry. Although Markowitz applied the Modern Portfolio Theory to the health of only individual banks initially, this study applies it to the relationship between the health of individual banks and the health of the financial industry. For example, if the majority of banks within a state are taking on real estate loans that become nonperforming, this will lead to a low interest income for the state overall.

Many studies have been conducted to find common characteristics of failed banks in the United States. The effect of real estate loans on bank profitability has been researched extensively in existing literature. Esbitt (1986) and Cole and White (2012) both find results that support the hypothesis that more real estate loans lead to a greater likelihood of bank failures in 1931 and 2009, respectively. Two similar studies focusing on the New England capital crunch in the 1980s by Peek and Rosengren (1994) and Browne (1993) find that a rapid growth in real estate loans was a major factor in the substantial number of bank failures. While extensive research has been conducted that agrees with the hypothesis that real estate loans are positively related to bank failures, this hypothesis is not without opposition. Cole & Fenn (1996) find the concentration of real estate loans by United States banks leads to a decrease in the likelihood of bank failures between 1985 and 1987. Abrams & Huang (1987) find the same results when explaining the bank failures between 1982 and 1983 in the United States.

Unfortunately, much less attention has

been given to studying investments other than real estate loans and their effect on banks and the health of the financial industry. The study by Cole and White (2012) did find that more loans to individuals and investment securities reduce the likelihood of a bank failure; yet, they find no significance for commercial and industry loans (or C&I loans).

Similarly to the aforementioned articles, this study uses comparable independent variables. The length of years being studied also overlaps the majority of the noted research. Data gathered by the FDIC was either partially or entirely used by all of the empirical works and it is used in this study. Yet, there are many important differences between this study and the existing literature. First, the majority of these studies use a logit or probit model to analyze the regression, whereas this study will use a linear regression model. A second difference is the dependent variable. Most studies referenced consider whether or not a bank failed as the dependent variable. The dependent variable, net interest margin, will be used to measure bank profitability. Herrero (2003) found net interest margin has a positive relationship with the success of a bank. For instance, a high net interest margin increases the likelihood of a bank survival. Because of this relationship, and because net interest margin is an important source of revenue for financial institutions, it is appropriate to conclude that a bank's net interest margin will be affected by their loan structure on both the individual and aggregate level. A final difference is the specific focus on periods of recession. This study has a strong focus on how different variables affect the health of the banking industry and a bank's profitability, but this study also focuses on how these effects may change during periods of recessions. Much of the existing literature does not make this distinction.

III. Data & Methods

This study utilizes data gathered from the Federal Deposit Insurance Corporation (FDIC) website for the states in the Seventh Federal Reserve Bank District: Illinois, Indiana,

Michigan, Wisconsin, and Iowa. The data ranges from 1966 to 2012 for each state, resulting in about 230 rows of cross sectional data. The reports are end of year balances pulled annually with the dollar amounts in thousands. The major transformations to the data include computing the following ratios: real estate loans/ total loans, commercial and industry loans / total loans, and individual loans / total loans. These transformations change these variables to a ratio of the type of asset to banks total loans. The ratio of, for example, real estate loans to total loans allows a more accurate representation of the magnitude of real estate loans relevant to the size of the banks total loans. Because each state's banking industry is of different magnitude, it would be misleading to simply look at the dollar value. A second transformation was also performed by using the consumer price index found on the Bureau of Labor Statistics website. All data points were adjusted to 2012 dollar value to account for the effects of inflation over time.

The trends within the data show similar trends for all states within this study. While both individual loans and commercial and industry loans have decreased over time, individual loans have decreased more significantly (Graphs 1 and 2). In 1966, C & I loans represent about 40% of Illinois' total loans, whereas C & I loans in all four other states hover just around 23%. Looking forward to 2012, all states, even Illinois, maintain their C & I loan amount to around 20% of total loans. Starting in 1985 real estate loans began to increase at a faster rate than in previous years (Figure 3). In general, securities investments increased slightly until 1990, and after that they began to decrease (Figure 4). Michigan holds the maximum investment securities amount averaging at \$31,819,863, while Illinois holds the minimum investment securities amount averaging at \$4,600,194.89. Full descriptive statistics can be found in Table 1 in the appendix.

In this study, the data will be divided into two subsamples: years of economic expansion and years of economic contraction. The dates

for each the expansions and contractions were obtained from the National Bureau of Economic Research (NBER). Preliminary examinations of the data showed an unexpected positive net interest income trend during periods of recessions. Net interest income was expected to decrease during periods of recessions because bank profitability is expected to decrease. However, during the 1981-1982 recession, all states except Iowa have an increasing net interest income. In the 2008-2009 recession, all states except Iowa have a decreasing net interest income, while Iowa is the only state to have an increasing net interest income. These findings suggest financial institutions' profitability may not follow the regular business cycle, but in fact, have their own cycle.

The strength in this data is that it encompasses nearly five decades, enabling it to cover a high number of economic expansions and contractions. This allows a comprehensive evaluation of the variables being studied. A limitation of the data is that the National Bureau of Economic Research (NBER) records economic expansions and contractions monthly, while the state data from FDIC is recorded annually. To account for this discrepancy, the economic state for the year will be determined by whichever economic state (either expanding or contracting) is experienced for the majority of the year. For example, in 2001 the economy was in contraction from March to November. This study will classify the entire year of 2001 as a year of contraction. If a year is half economic expansion and half economic contraction, whether that year is established as a year of expansion or a year of contraction will be determined by the total length of the respective contraction. For example, in 2009, the economy is contracting from January to June, which represents exactly half of the year. However, the total length of the respective contraction is from December 2007 to June 2009. Because the total length is longer than one year, 2009 will be classified as a year of contraction. If the total length of the contraction had been less than one year, it would then be classified as a year

of expansion.

A linear regression, estimated through Ordinary Least Squares, will be computed in this study using Eviews software. The empirical model being tested is:

$$\text{Net Interest Income}_t = \alpha + \beta_1 (\text{Real Estate Loans/Total Loans})_t + \beta_2 (\text{Commercial and Industry Loans/Total Loans})_t + \beta_3 (\text{Loans to Individuals/Total Loans})_t + \beta_4 (\text{Investment Securities/Total Loans})_t + \varepsilon_t$$

The dependent variable is net interest income, defined as "difference between the revenue that is generated from a bank's assets and the expenses associated with paying out its liabilities" (Net Interest Income). Net interest income is a commonly accepted measure of financial health in an economy. The independent variables will include real estate loans/total loans, commercial and industry loans/total loans, loans to individuals/total loans, and investment securities/total loans.

It is hypothesized that real estate loans, C & I loans, and loans to individuals will all have a negative correlation to net interest margin. It is also hypothesized that real estate loans will have a stronger negative magnitude than other independent variables based on the previous research by Esbitt (1986), Cole and White (2012), Rosengren (1994) and Browne (1993) as mentioned in the literature review. Investment securities are hypothesized to have a positive relationship with net interest income because both are major sources of revenue for financial institutions and should increase when a bank becomes more profitable. An interactive dummy variable will be used to designate years as either an economic expansion or contraction. A zero will be given to years of economic expansion and a one will be given to years of economic contraction. This interactive variable will allow analysis of the effect of independent variables during periods of recessions specifically. It is hypothesized that during recessions the parameters associated with the independent variables will be larger in magnitude.

IV. Results

To prepare data for regression analysis, all variables are converted from nominal measures to real measures by using the CPI to convert all dollar amounts to 2012 dollar value. This accounts for the change in inflation over time. First order differences of their logarithmic values are also taken for all variables in order to induce linearity. This transforms all variables from levels into growth rates.

To test for robustness in the estimation equation, variations of the original equation are estimated. First, only recessions that are classified as two consecutive years were included to see if the length of the recession affected its significance. Second, only financial related recessions—the recessions of 1980 and 2008—are included to see if the cause of the recession played an important role. Third, a lag of one year is used to test whether or not the previous years' value affected real estate loans, C & I loans, or loans to individuals, respectively. All of these equations produce less significant results.

The final and most significant estimation equation is as follows:

$$\begin{aligned} \text{Net Interest Income}_t = & \alpha + \beta_1 \text{ Net Interest} \\ & \text{Income}_{t-1} + \beta_2 \text{ Real Estate Loans}_t + \beta_3 \\ & \text{Recessions} * \text{Real Estate Loans}_t + \beta_4 \text{ C \& I} \\ & \text{Loans}_t + \beta_5 \text{ Recessions} * \text{C \& I Loans}_t + \beta_6 \\ & \text{Loans to Individuals}_t + \beta_7 \text{ Recessions} * \text{Loans to} \\ & \text{Individuals}_t + \beta_8 \text{ Investment Securities}_t + \beta_9 \\ & \text{Recessions} * \text{Investment Securities}_t \end{aligned}$$

Detailed results can be found in Table 2. Changes from the original equation include the addition of the net interest income lag as an independent variable, and interacting the dummy variable (recessions) with all types of loans and investment securities. The addition of a one-year lag of net interest income as an independent variable tries to capture the time-dependency of the dependent variable. That is: net interest income from the previous year significantly affects banks' profitability for the current year. While the independent variables by

themselves refer to the overall time period from 1966 to 2012, the same variables interacted with the dummies signifying recessions enable further interpretation of how each variable acted during periods of recessions specifically.

The results show that as the growth rate of real estate loans and loans to individuals (as a fraction of total loans) increases, the growth rate of the net interest income decreases. This ultimately leads to less profitable financial institutions. The growth rate of real estate loans and loans to individuals were significant at the 5% and 1% level, and both had the expected signs. The growth rate of real estate loans has the largest negative effect on the growth rate of net interest income amongst all of the variables. Therefore, real estate loans are the most risky for financial institutions out of all of the variables tested.

The growth rate of investment securities, both overall and during recessions, is significant at the 1% and 10% level. Additionally, investment securities throughout the entire time period have a stronger positive relationship with net interest income compared to just during recessions. Focusing on recession periods only, the growth rates of C & I loans and loans to individuals are also significant at the 5% and 1% level. Yet, none of these variables has the expected negative sign. The positive correlation between these variables and net interest income suggests that financial institutions with more investment securities (both overall and during recessions), C & I loans (during recessions), and loans to individuals (during recessions) have a greater likelihood of being profitable.

The growth rate of loans to individuals is significant, both overall and during recessions, at the 1% level. However, the growth rate of loans to individuals throughout the entire time period has a negative relationship with net interest income, while the growth rate of loans to individuals during recessions has a positive relationship. This relationship suggests that increases in loans to individuals during recession's raises net interest income (or increases profitability), while an

increase in loans to individuals from 1966 to 2012 generally decrease net interest income (or decreases profitability).

The adjusted R-squared of 0.6251 is used to measure the overall goodness of fit of this model. The independent variables used explain 62.51% of the variation in net interest income. To test the overall significance of the estimated equation the F-statistic was computed and found to be 7.55. The F-statistic tests the null hypothesis that all coefficients are equal to zero. With a probability of less than 1% the null hypothesis is rejected.

V. Conclusions

Using an Ordinary Least Squares regression in Eviews, this study examines the effect of different types of loans and investment securities on financial institutions' profitability. The dependent variable used is net interest income, and the independent variables used are real estate loans, C & I loans, loans to individuals, as well as investment securities, all as a fraction of total loans. Each type of loan and investment security was interacted with a dummy variable of recessions to examine the relationship between that variable and net interest income during recessions.

The findings show that the growth rate of real estate loans has a negative relationship with the growth rate of net interest income, and is significant at the 5% level. The growth rate of C & I loans during recessions was found to have a positive relationship with the growth rate of net interest income at the 5% level. The growth rates of loans to individuals, both overall and during recessions, are significant at the 1% level. However, the growth rate of loans to individuals overall is negative, yet during recessions it has a positive relationship to the growth rate of net interest income. The growth rates of investment securities, both overall and during recessions, are positive and significant at the 10% and 1% level.

A few similarities exist between this study's findings and the existing literature. Esbitt (1986) and Cole and White (2012) both found that more real estate loans lead to a greater

likelihood of bank failures. Rosengren (1994) and Browne (1993) also found that a rapid growth in real estate loans was a major factor in the substantial number of bank failures. Although this study doesn't use bank failures as the dependent variable, net interest income has a negative relationship with bank failures (Herrero 2003). The data shown in these studies indicate that the more real estate loans that a bank takes on, the more likely that particular bank is to fail, which essentially corresponds to being less profitable, or having lower net interest income. The effect of real estate loans on banks' profitability is a highly debated topic and these results also differ from previous research by Cole & Fenn (1996) and Abrams & Huang (1987), who found a negative relationship between real estate loans and bank failures.

A second similarity between these results and previous literature comes from Cole and White (2012). They found that investment securities reduce the likelihood of a bank failure. Once again, because of the connection between net interest income and bank failures, it can be reasoned that larger holdings of investment securities lead to more successful banks, or more profitable banks having a higher net interest income.

A main difference between this study and previous literature is the method used to analyze the data. Logit or probit methods are the most commonly used, while this study uses Ordinary Least Squares linear regression. The probit model is used very frequently because of its ability to manipulate binary dependent variables. Because many studies use bank failures—a binary variable—as the dependent variable, a probit model is the most appropriate. By using net interest income as the dependent variable, this study was able to use a linear regression estimation methodology.

The main insight gained from this study is the degree to which different loans affect banks' profitability. The results show that an increase in the growth rate of real estate loans leads to a decrease in a bank's profitability. Policy makers

could implement tighter restrictions on banks' ability to make new real estate loans. Tighter restrictions may help reduce the number of banks that fail from low profitability. Another possible implication could be to incentivize banks to increase the amount of investment securities they typically hold. The positive relationship between investment securities and profitability found in this study suggests this would improve banks' conditions, even in times of recessions. However, a possible drawback may arise if banks hold more investment securities. A bank's main purpose is to bring potential borrowers and lenders together in order to create capital. Thus, if a bank increases its holdings of investment securities at the expense of loans, the bank is not fulfilling its intended purpose. Although investment securities have a strong positive relationship with profitability they are necessary for a profitable bank, but a balance between profitability from investment securities and loans to create capital must be reached. Looking at recessions specifically, the growth rate of both C & I Loans and Loans to Individuals have the highest magnitude. Thus, financial institutions are more likely to be profitable during recessions if they increase the amount of C & I Loans and Loans to Individuals.

The study of the factors affecting bank profitability has many possible extensions. Breaking real estate loans down by specific categories may reveal insights into the types of real estate loans that are more risky than others. Also, using bank failures as the dependent variable may reveal how strong, or weak, the relationship between net interest income and bank failures is.

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Appendix

Table 1

	Investment Securities (in Billions)	Net Interest Margin (in Billions)	Total Real Estate Loans/ Gross Loans & Leases	Total Loans to Ind./ Total Loans	C & I/ Total Loans
Mean	\$1,887.70	\$4,561.75	52.32%	15.39%	25.93%
Maximum	\$4,512.23	\$17,471.27	131.00%	29.75%	48.43%
Minimum	\$1,422.92	\$1,059.92	18.23%	2.54%	12.07%
Range	\$43,699.34	\$16,411.35	112.77%	27.21%	36.36%

Figure 1

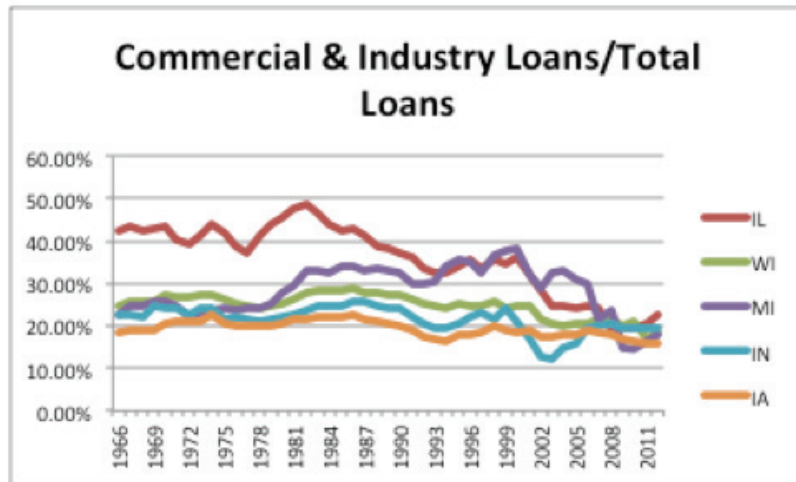


Figure 2

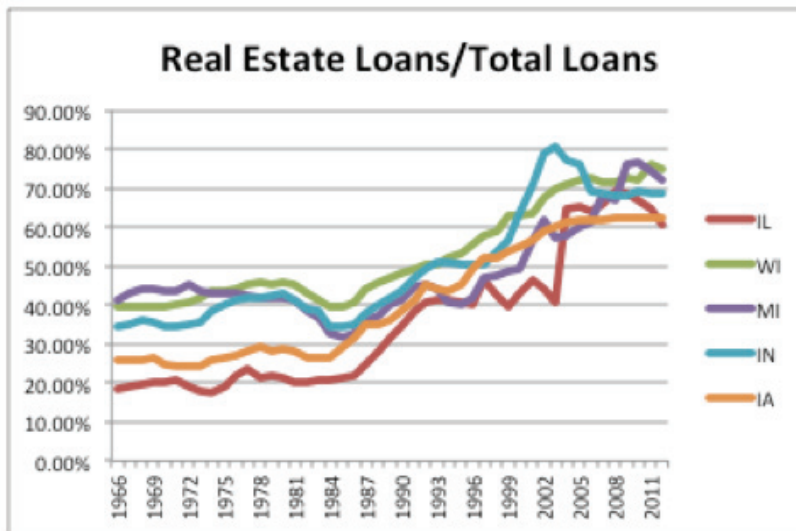


Figure 3

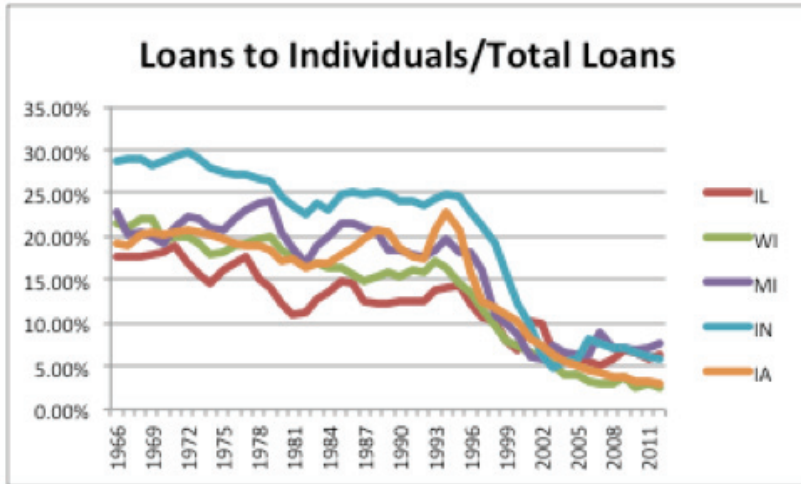


Figure 4

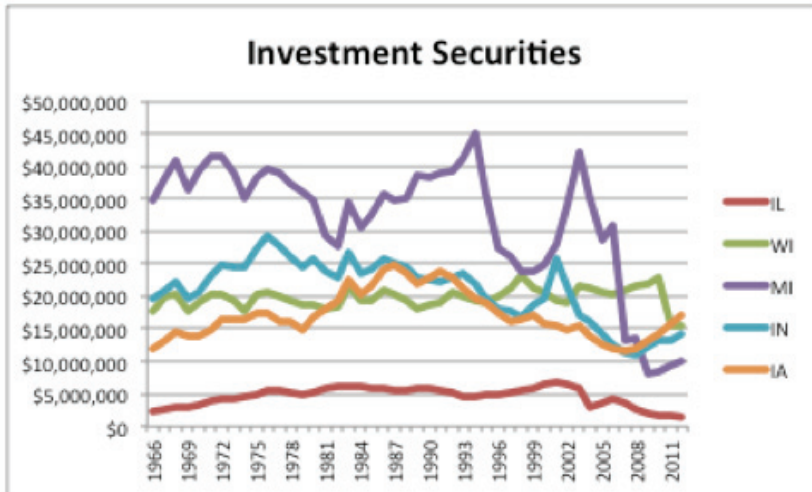


Table 2
 Estimation Results of Linear Regression Model of Bank Profitability
 1996-2012
 Dependent Variable: Net Interest Income, N=230

Real Estate Loans	0.0245** (-2.2701)
Real Estate Loans (During Recessions)	0.8100 (0.2408)
C & I Loans	0.6592 (-0.4417)
C & I Loans (During Recessions)	0.0212** (2.3272)
Loans to Individuals	0.0062*** (-2.7695)
Loans to Individuals (During Recessions)	0.0000*** (4.7150)
Investment Securities	.0000*** (7.2920)
Security Investments (During Recessions)	0.1006* (1.6511)
Adjusted R-Squared	0.6251
s.e. equation	0.0644

Significance at the 1% (***), 5% (**), and 10% (*) levels.
 T-statistics in parenthesis.