Real estate lending-- some bankers just never learn:
a logistical regression analysis

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Abstract

This paper investigates community banks (total assets ≤ $1 billion) with high concentrations of real estate loans vs. banks with low real estate loan exposures. The time period examined includes 2002, 2006, 2007 and 2008.3, periods prior to the bursting of the real estate price bubble as well as the height of the economic and financial crisis.

A CAMEL model for assessing aggregate bank performance is used in conjunction with logistical regression analysis to examine alternative time periods. The study affirms that banks that "have not learned the lessons of past are doomed to repeat them" through poor bank performance.

Keywords: financial crisis; community banks; real estate lending; logistical regression; CAMEL rating
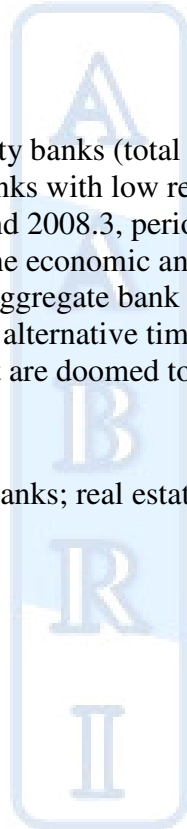
We learn from history that we learn nothing from history - George Bernard Shaw

Introduction

The current financial crisis is not the first experienced in the United States and it is unlikely to be the last. As recently as the 1980's the United States economy experienced a banking and savings and loan crisis that resulted in the loss of hundreds of banks and financial institutions. In the aftermath, laws were written, regulations implemented or tightened and directives provided with the intent of preventing subsequent financial difficulties. In particular, banks were admonished to diversify their loan portfolios and avoid undue concentrations of credit in a few lending categories. Now, approximately 20 years later, we again face another crisis, albeit on a larger scale, affecting not just a single sector of one economy, but instead, a pervasive crisis of massive and global proportions.

The real estate bubble in the United States burst with accompanying shockwaves reverberating around the globe from Reykjavík to Bucharest and London, and from Hong Kong to Dubai. The reasons behind the creation of the bubble are many and varied: a low interest rate environment created by the Federal Reserve System and maintained for an extended period of time; exceedingly lax bank mortgage lending requirements combined with moral hazard on the part of lenders; unregulated mortgage brokers that escaped lending regulations; excessive speculation on real estate prices driven by investor greed; encouragement by governmental organizations and banking regulators to provide home buyer credit to low-to-moderate income families and a securitization system buoyed by credit enhancement products, ratings agencies and credit default swaps. The convergence of these factors created a "Perfect Storm" that triggered a massive downward adjustment in global real estate market prices that persists today. For a current, comprehensive discussion of the issues related to the financial crisis see Archaya et. al., 2009.

The threat of a real estate bubble should have come as no surprise. Housing experts predicted not only an asset price bubble in housing but also the potential severity in the mid 2000's. (Smith and Smith, 2006; Shiller, 2008) The Standard and Poors/Case-Shiller Home Price Index (see Exhibit 1) plunged during the time period from 2006 to 2009 (http://www2.standardandpoors.com/portal/site/sp/en/us/page.topic/indices_csmahp/2,3,4,0,0,0,0,0,0,2,1,0,0,0,0,0.html) as fallout from subprime lending led to declining expectations for housing prices. Public confidence plummeted over fears of potential failures like Bear Stearns, AIG and Citibank and actual failure of major financial institutions like Lehman Bros. As concerns over counterparty risk spread throughout financial markets, available liquidity contracted and some credit markets effectively froze. The lack of available credit in turn created financing problems for businesses both large and small as well as for consumers who confronted great difficulty in obtaining loans from their traditional financing sources including commercial banks.
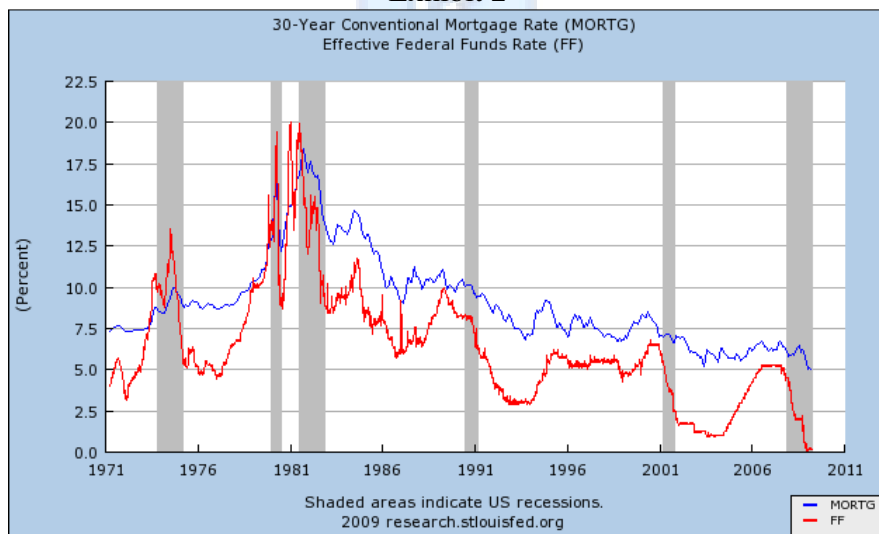
Exhibit 1
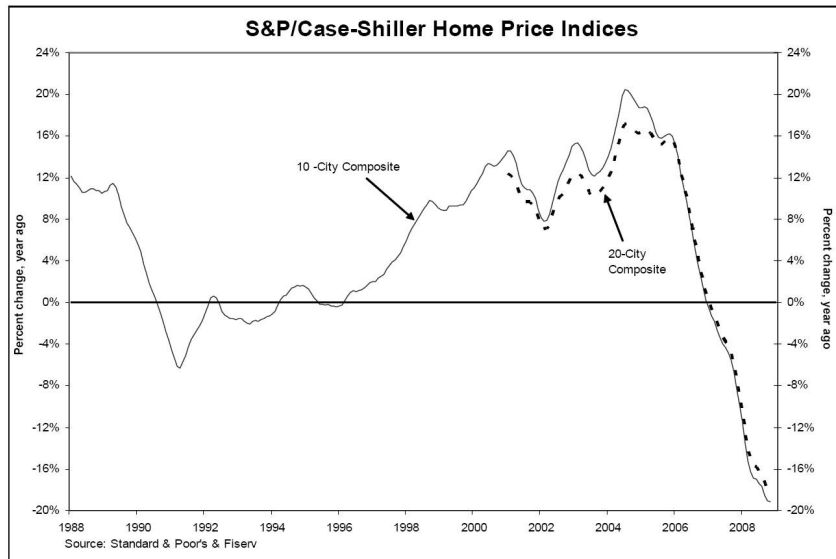
S&P/Case-Shiller Home Price Indices

Housing prices accelerated rapidly during the period after 2000, buoyed by a decline in short term interest rates prompted by an accommodative Federal Reserve monetary policy (see Exhibit 2). The associated decline in mortgage rates coupled with liberal bank lending policies and encouragement by federally sponsored institutions such as Fannie Mae and Freddie Mac to increase loans to low-to-moderate income families, helped create a speculative environment of rising home prices which ultimately created an asset price bubble that finally burst. The consequences have shaken the global financial system.
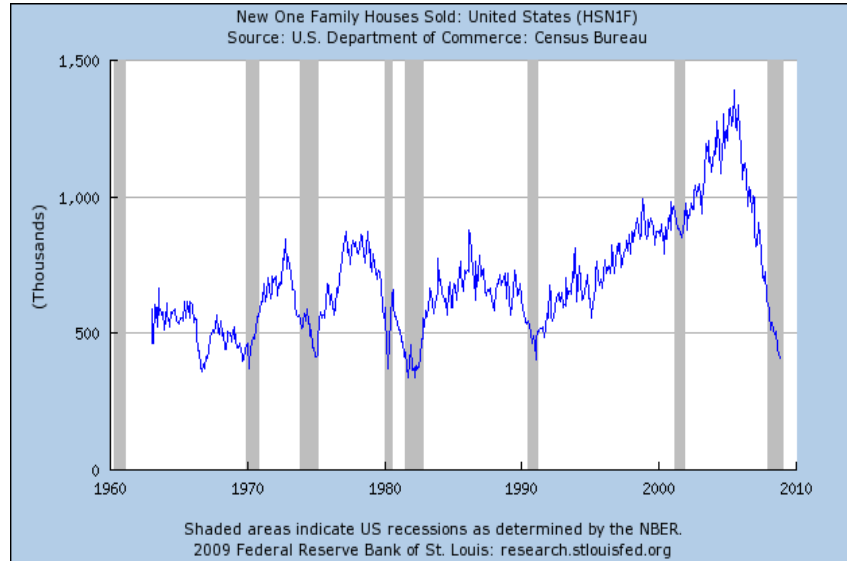
Exhibit 2

As a consequence of declining home prices in general, the market for new homes declined substantially (see Exhibit 3) as consumers reduced their demand. As credit market conditions deteriorated, home builders slashed production of new homes. Banks began to

experience declining asset quality as borrowers began to lose employment, and were unable to meet their mortgage obligations. Banks with large residential and commercial real estate exposures were especially vulnerable.

Exhibit 3

New One Family Houses Sold: United States (HSN1F)
Source: U.S. Department of Commerce: Census Bureau

Shaded areas indicate US recessions as determined by the NBER.
2009 Federal Reserve Bank of St. Louis: research.stlouisfed.org

Real Estate Lending by Community Banks

Community banks (with average total assets below $1 billion per bank) are the most numerous banking institutions in the United States with around 7,000 banks located in cities and towns across the country (*FDIC Quarterly Banking Profile*, 2009).

In the past 20 plus years, community banks have increasingly focused on residential and commercial real estate lending in the aftermath of the Banking and Savings and Loan Crisis in the late 1980's and early 1990's. As the FDIC reported in *"Managing the Crisis: The FDIC and RTC Experience, 1980–1994"* (FDIC, 1998) between 1980 and 1994, 1,617 federally insured banks with $302.6 billion in assets were closed or received FDIC financial assistance while 1,295 savings and loan institutions with $621 billion in assets also were either closed by the FSLIC or the RTC, or received FSLIC financial assistance. This created opportunities for surviving banks to capture larger market shares in real estate lending.

As savings and loan associations, traditional lenders specializing in residential mortgage lending, vanished from the financial scene in large numbers, commercial banks stepped in to fill the void. While many community banks originated residential mortgage loans, then bundled and resold them in securitized form to third party investors, others retained loans on their balance sheets. Some banks set prudential limits on real estate loans as a percentage of total loans while others, lured by the prospects of increasing profits, booked high proportions of real estate loans. This lack of diversification proved problematic when the real estate bubble burst.

There were numerous lessons that bankers should have learned from the crises of the late 1980's. Many of these were contained in the "autopsy studies" that followed the crises. For example, the Office of the Comptroller of the Currency, which regulates national banks, conducted a study of 171 failed national banks from 1979 to 1987. Among the findings: 81% of failed banks had non-existent or poorly followed loan policies; 69% had inadequate systems to

ensure compliance with internal policies and banking laws; and 59% had inadequate problem loan identification systems. (OCC, 1988 http://www.occ.treas.gov/bankfailure.pdf)

The Federal Deposit Insurance Corporation in *History of the Eighties — Lessons for the Future* (FDIC, 1999; http://www.fdic.gov/bank/historical/history/contents.html) warned of the cyclical nature of real estate lending, especially the commercial real estate market. The study found:

> But historically the commercial real estate industry had been cyclical, and that, combined with the banks aggressive lending, made it likely that lenders would eventually suffer financial losses when markets turned. When the bust did arrive in the late 1980s and continued into the early 1990s, the banking industry recorded heavy losses, many banks failed, and the bank insurance fund suffered accordingly.

Congress passed the FDIC Improvement Act in 1991 (FDICIA) in response to the banking and savings and loan crises. FDICIA mandated the creation of residential real estate guidelines which were implemented in 1992 and subsequently revised in 1999. In particular, the guidelines addressed the special problems posed by high loan to value residential real estate loans.(OTS, 1999; *http://files.ots.treas.gov/422276.pdf*)

In December, 2006 the federal banking regulators including the Federal Reserve, FDIC and OCC, created inter-agency guidance relative to commercial real estate lending. In particular, the regulators expressed concerns over undue concentrations in real estate lending. (FDIC, 2006; *http://www.fdic.gov/news/news/financial/2006/fil06104.html*)

So why did bankers fail to learn the lessons from the banking and S & L crises concerning undue concentrations of credit, especially to finance real estate lending? Why did they disregard laws, regulations and advice from banking regulators? What is the underlying economic rationale for excessive concentrations of real estate loans such as experienced by the high real estate loan exposure banks in this study?

Herring and Wachter (2002) offer some explanation with a cogent discussion of real estate bubbles and the impact on bank real estate lending behavior. They argue that banks suffer from two conditions: 1) they underestimate risks because of "disaster myopia" and 2) they ignore risks because of "perverse incentives".

Disaster myopia arises from the inability of banks to correctly assess risk due to the lack of frequent observations upon which they can develop probabilities of an economic shock. Perverse incentives exist when lenders believe they are protected against risks either through the terms and conditions of lending covenants or by institutional protections like deposit insurance. The combination of disaster myopia and perverse incentives leads banks to take additional risks by increasing loan concentrations beyond prudential limits.

Between 1980 and 1994, 1,617 federally insured banks with $302.6 billion in assets were closed or received FDIC financial assistance while 1,295 savings and loan institutions with $621 billion in assets also were either closed by the FSLIC or the RTC, or received FSLIC financial assistance--*Managing the Crisis: The FDIC and RTC Experience, 1980–1994"* (FDIC, 1998). In the aftermath, commercial banks seized the opportunity to increase their role as real estate lenders in both the residential and commercial markets. Banks became significant providers of mortgage credit for homeowners, assuming the role previously assumed by savings and loan associations.

Following the banking and savings and loan crises in the 1980's several "autopsy studies" were published. In addition, Congress passed legislation including the Financial Institutions Reform, Recovery and Enforcement Act (FIRREA) in 1989 and the Federal Deposit Insurance Corporation Improvement Act (FDICIA) in 1991 mandating the correction of many problems that emerged during the crisis. Legislation was followed by regulations implemented by federal banking regulators along with guidance to bankers directed at avoiding future problems. This guidance included directions on both commercial and residential real estate lending.

Today the global economy faces a financial crisis of immense proportions. This crisis was prompted by creation of asset price bubbles in the residential real estate market with the effects of declining housing prices spread through the securitization process via mortgage backed securities. Some commercial banks avoided the adverse consequences of declining housing prices by selling real estate loans in the market without recourse. Others, however, kept mortgage loans on their balance sheets, relying on adjustable rates to protect them against interest rate risk. These banks generally did not correctly anticipate the effects of declining prices on mortgage defaults. Some also purchased credit enhanced mortgage backed securities as bank eligible investments.

This study examines the performance of community banks (with total assets less than $1 billion) that created high real estate loan exposures (total real estate loans to total loans > 65%) vs. low real estate loan exposures (total real estate loans to total loans <25%). The high loan exposure banks appear to disregard the lessons of past banking crises that prudential limits on concentration of loans are desirable.

Methodology and Data Analysis

This paper investigates the behavior and performance of community banks in real estate lending, examining banks that set prudent limits on real estate loans (defined in the study as a ratio of real estate loans to total loans less than 25%) and those that chose to permit real estate loans to total loans to exceed 65%. This "polar extremes approach" permits researchers to eliminate the middle group, in this case banks with real estate loans to total loans greater than 25% and less than 65%. The use of this approach is discussed in Hair et. al., 1998.

Several controls were included in the study. Only community banks with assets less than or equal to $1 billion were included. Furthermore, only banks with loan/deposit ratios greater than 25% and less than or equal to 125% were included. This generally excludes special purpose banks. Finally, banks must be in existence for five years or more. This eliminates complications associated with de novo or newly chartered banks. This results in 792 low real estate exposure banks and 850 high real estate exposure banks and represents the universe of banks that meet these constraints.

Financial performance ratio data were collected for these banks for year-end 2002, 2006 and 2007 and for 2008.3, the latest available data. These are shown in Table 1. The data is collected by the Federal Deposit Insurance Corporation using legally required reporting formats. Banks face substantial fines for reporting inaccurate information. The data in the study is obtained through subscription from SNL Corporation in Charlottesville VA which provides on-line access to the data in a relational database.

Descriptive statistics for both low and high real estate loan exposure banks are contained in Table 1. Low real estate loan exposure banks are characterized by low loan to deposit ratios

(L2D) and correspondingly high liquidity ratios (LiqR) and capital adequacy ratios (E2A). While non-performing assets (NPA2A) were not a problem in 2002, they became a significant problem in 2007 and beyond for banks with large real estate loan exposures. Return on Average Assets (ROAA), a measure of bank earnings, shows predictably sharp improvement for banks with high real estate loan exposures from 2002 to 2006 during the surge in real estate lending. By 2008.3 these same banks experienced sharp earnings declines. Banks with low real estate loan exposures enjoyed steady earnings in all three periods with only a modest decline in 2008.3.

0=low real estate exposure community banks

1=high real estate loan exposure

Table 1
Descriptive Statistics 2002-2008.3

	2002-0	2002-1	2006-0	2006-1	2007-0	2007-1	2008.3-0	2008.3-1
ROAA	1.230	.931	1.196	1.240	1.221	1.102	1.164	.396
E2A	13.049	9.706	12.746	9.850	12.960	9.952	12.864	9.652
NPA2A	.931	.867	.647	.797	.694	1.536	.820	3.030
LiqR	42.374	20.276	39.052	13.709	40.660	11.356	40.604	9.808
L2D	60.845	87.253	59.114	95.401	58.606	99.002	59.143	101.678

Logistical Regression Analysis

Logistical regression analysis is used in developing a model to investigate performance differences between low real estate exposure vs. high real estate exposure community banks. The variables included in the logistical regression model represent proxy variables for the CAMEL rating system employed by state and federal banking regulators. **CAMEL** is an acronym for **C**apital adequacy, **A**sset quality, **M**anagement, **E**arnings and **L**iquidity. For further discussion of the CAMEL rating system see Rose & Hudgins, 2010.

Capital adequacy measures the invested equity capital and reserves of the bank. It represents the net worth (assets minus liabilities) of the bank and represents the buffer that protects the deposit insurance fund against losses in the case of bank insolvency. Capital adequacy in the model is approximated by the equity to asset ratio (E2A). Community banks rely heavily on private investors for initial capital investment and on retained earnings from profitable operations as a primary source of new capital to support asset growth.

Asset quality is a measure of the likelihood that an asset, especially a loan, would not be repaid with principal and interest. In the study, the ratio of non-performing assets to total assets (NPA2A) is used as a proxy for asset quality. Non-performing assets are 90 days or more past due and are likely to progress to become charge-offs.

Management in the CAMEL rating system is a subjective variable with values assigned by bank examiners. Moreover, banks are prohibited by law from revealing their aggregate CAMEL rating or any individual components. As a proxy for management, this study uses the loan to deposit ratio (L2D). Although the loan to deposit ratio is affected by cyclical economic behavior, management still has considerable control over this variable. A conservative bank can curtail lending and exercise selectivity in making loans while an aggressive bank can boost lending activity to high levels while assuming greater risks.

Earnings are approximated by the return on average assets which is defined as net income divided by average assets (ROAA). ROAA is used instead of return on equity (ROE) because the latter is affected by leverage as a bank manipulates it's capital to asset ratio.

The *liquidity* ratio (LiqR) is used to represent the liquidity component of the CAMEL rating. It measures the ability of the bank to convert short-term assets into cash in order to meet unanticipated fluctuations in short term liabilities, especially deposit withdrawals.

A Logistical Regression Model

This paper develops a logistical regression model to investigate the differences in financial performance between low real estate loan exposure and high real estate loan exposure community banks. The binary categorical nature of the dependent variable makes standard multiple regression analysis unsuitable. (Hair et. al., 1998) By contrast, logistical regression is a feasible alternative to multivariate discriminant analysis (which the authors utilize in a separate paper using the same real estate and banking data). The generalized linear form is given in equation (1).

$$Y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \qquad (1)$$

The independent variables represent proxies for capital adequacy (E2A=equity capital to total assets), asset quality (NPA2A=non-performing assets to assets), management (L2D=loan to =deposit ratio), earnings (ROAA= return on average assets) and liquidity (LiqR=liquidity ratio)

$$Y_i = \alpha + \beta_1 E2A + \beta_2 NPA2A + \beta_3 L2D + \beta_4 ROAA + \beta_5 LiqR \qquad (2)$$

Where:

α = constant

E2A= equity capital ratio   (Capital adequacy)

NPA2A= non-performing assets to total assets   (Asset quality)
      (90 days or more past due)

L2D= loan to deposit ratio   (Management proxy)

ROAA= return on average assets   (Earnings)

LiqR= liquidity ratio   (Liquidity)

The results of the logistical regression analysis appear in Table 2. The CAMEL model improves in explanatory power in more recent years as measured by two different variations of R^2, the Cox & Snell R^2 and the Nagelkerke R^2. The values for the Cox & Snell R^2 range from .397 in 2002 to .641 in 2008.3. The Nagelkerke R^2 ranges from .629 in 2002 to .854 in 2008.3. Each measure consistently strengthens through time.

All individual variables are statistically significant in 2002. In 2006, the asset quality measure (NPA2A06) is marginally insignificant at a .95 confidence level (p=.068) By 2007 the liquidity ratio LiqR07) is insignificant (p=.751) while the earnings measure (ROAA07) is not significant at a 95% level (p=.090). In the latest period, 2008.3 neither earnings (ROAA08) nor the liquidity ratio (LiqR08) is significant (each with p=.139)

Table 2
Analyzing the Logistical Regression Model Results

Year	Variable	β	SE	Wald	Significance
2008.3	L2D08	.183	.013	204.681	.000
	ROAA08	-.171	.116	2.187	.139
	E2A08	-.261	.037	50.252	.000
	NPA2A08	.337	.062	29.175	.000
	LiqR08	.017	.012	2.185	.139
	Constant	-13.819	1.145	145.765	.000
-2 Log Likelihood	594.055				
Cox & Snell R^2	.641				
Nagelkerke R^2	.854				
2007	L2D07	.150	.011	175.969	.000
	ROAA07	-.161	.095	2.883	.090
	E2A07	-.205	.029	50.075	.000
	NPA2A07	.231	.068	11.418	.001
	LiqR07	.004	.014	.101	.751
	Constant	-10.214	1.067	91.626	.000
-2 Log Likelihood	763.020				
Cox & Snell R^2	.602				
Nagelkerke R^2	.802				

Year	Variable	β	SE	Wald	Significance
2006	L2D06	.162	.010	239.723	.000
	ROAA06	-.350	.084	17.426	.000
	E2A06	-.325	.029	125.072	.000
	NPA2A06	-.145	.079	3.336	.068
	LiqR06	.043	.012	13.344	.000
	Constant	-9.850	.894	121.475	.000
-2 Log Likelihood	903.677				
Cox & Snell R^2	.566				
Nagelkerke R^2	.755				
2002	L2D02	.036	.006	34.192	.000
	ROAA02	-.046	.008	29.981	.000

	E2A02	-.202	.023	76.424	.000
	NPA2A02	-.232	.054	18.763	.000
	LiqR02	-.046	.008	29.981	.000
	Constant	1.740	.634	7.525	.006
-2 Log Likelihood	1400.999				
Cox & Snell R^2	.397				
Nagelkerke R^2	.629				

Table 3
Classification Matrix

Year		Low Real Estate Loan Exposure	High Real Estate Loan Exposure	Percentage Correct
2008	Low Real Estate Loan Exposure	715	77	90.3%
	High Real Estate Loan Exposure	40	810	95.3%
	Overall percentage			92.9%
2007	Low Real Estate Loan Exposure	705	87	89.0%
	High Real Estate Loan Exposure	45	805	94.7%
	Overall percentage			92.0%
2006	Low Real Estate Loan Exposure	680	112	85.9%
	High Real Estate Loan Exposure	58	792	93.2%
	Overall percentage			89.6%
2002	Low Real Estate Loan Exposure	612	177	77.6%
	High Real Estate Loan Exposure	127	674	84.1%
	Overall percentage			80.9%

Classification Results

The strength of a logistical regression model lies in the ability to correctly classify membership of an observation into the proper group. The CAMEL model in 2002 correctly classified 80.9% of the overall cases and 84.1% of the high real estate loan exposure cases . The accuracy improves consistently over time culminating with a 92.9% overall accuracy in 2008.3 and a 95.3% accuracy for high real estate exposure banks.

Summary and Conclusions

This study investigates the recent behavior of community bank real estate lending activity using logistical regression analysis. Banks have been admonished by their regulators to avoid excessive concentrations of real estate loans, advice based on experiences from the banking and savings and loan crises in the 1980's. Some banks have not heeded these warnings and have pursued aggressive real estate lending activities motivated by an economic environment of low interest rates, lax credit standards and encouragement to lend to low-to-moderate income borrowers. This study suggests that banks that failed to heed earlier warnings have paid a high price in terms of financial performance in the current crisis reminding of the earlier admonition from George Bernard Shaw *"We learn from history that we learn nothing from history"*.

The consequences of not only sub-prime lending, but also lending to other marginal borrowers has been seen as the bubble in housing prices burst. The analysis contained in this study suggests that there are substantial differences in financial performance between banks that have pursued high levels of real estate lending versus those that have taken a more conservative approach. The model developed herein predicts differences between high and low real estate loan concentrations with a high degree of accuracy. Moreover, the model results are not only statistically significant, but also display increased accuracy as economic and financial conditions worsen.

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