EASY MONETARY POLICY AND TIGHT CAPITAL REQUIREMENT

AN EMPIRICAL STUDY OF BANK LENDING BEHAVIOR

by

Zefan Wang

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics

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Abstract

The paper studies the effects of the risk-based capital ratio on bank lending due to the substantially heightened capital requirements (Basel III and the Stress Tests) in the U.S.. The effectiveness of monetary policy is examined as well. In addition, the effects of the capital ratio on banks' common stock equity and retained earings are examined. The study uses the quarterly bank level data from the FDIC ranging from 2001 Q4 to 2017 Q3. The unbalanced dataset covers between 6,000 and 9,000 depository institutions in the U.S., with a total of 500,000 observations across 64 quarters. The data is divided into two sub-samples to compare the effects between pre and post the introduction of the heightened requirements in 2009. The analysis uses standard dynamic lending models based on several studies including Kashyap & Stein (1995), Gambacorta & Mistrulli (2004), Berrospide & Edge (2010), Gambacorta & Shin (2016) and Borio & Gambacorta (2017). Dynamic panel regression methods such as system GMM and lags of explantory variables are used to mitigate the endogeneity issues according to Anderson & Hsiao (1981), Arellano & Bond (1991), Ahn & Schmidt (1995) and Blundell & Bond (1998).

The regression results suggest that the risk-based capital ratio is generally insignificant, or only marginally positive in affecting banks' lending growth rate after the introduction of heightened capital requirements. Factors such as monetary policy, the liquidity ratio[1] and non-performing loans are statistically significant, hence more important in affecting lending than the risk-based capital ratio. The observed effectiveness of

[1] A ratio of sum of cash and securities to total assets, reflecting banks' liquidity position.

monetary policy in stimulating lending decreases across sub-samples.[2] Moreover, the risk-based capital ratio does not significantly affect banks' common stock equity and cumulative retained earnings.

[2]The coefficient of cumulative effects of monetary policy changes sign across sub-samples. Explanations are given in section 6.1 - Analysis and Results.

Chapter 1

FOREWORD

Economic growth in the U.S. has been slow since the Great Recession. Bank lending growth has been slow during the same time. Regulators engaged in several stimulative policies, but the recovery has not picked up the pace. Multiple factors such as the saving glut, low interest rates, liquidity shortage, uncertainty about risks and the hallucinations of "this time is different" are accused of contributing to the banking crisis and the following credit crunch, which amplifies the recession into a deep and prolonged one. (Mizen, 2008; Rosengren, 2008; Brunnermeier, 2009; Cecchetti, 2009; Reinhart & Rogoff, 2009; Illes et al., 2015). While stricter regulations have been imposed on banks since the recession, others believe that excess regulations do not justify the benefits and could lead to a slower economy with a less stable banking system.

This paper will revisit the topic of risk-based capital requirements in affecting bank lending under the current settings of the U.S.. The risk-based capital standard (Basel) has been substantially heightened since the Great Recession. Basel III introduced a new standard of Common Equity Tier 1 Capital (CET1)[1] of an unprecedented 4.5%, or 7% if including an additional 2.5% conservation buffer as a way to improve capital quality and quantity. It also raised the existing standard on the Tier 1 capital ratio[2] from 4% to 6%. The U.S. Federal Reserve Board determined that it will implement

[1] A measure of the risk-based capital ratio based on the essential capital including retained earnings and common stock equity. The detailed definition is provided in section 5 - Data, Method and Model. Explanations on other types of capital are given in section 3 - Background.

[2] A measure of the risk-based capital ratio based on capital including not only re-

Basel III by 2019 on all sizes of banks, except for bank holding companies (BHCs) with assets of less than $500 million. In addition, the stress tests implemented in the U.S. require the largest BHCs to meet stricter risk-based capital requirements under different economic scenarios. Together, the risk-based capital requirement has been substantially heightened after the recession. Thus, using recent data to analyze the effects of the substantially heightened capital requirements would provide new insights into the subject. Moreover, this paper will take a step further to study two essential components of CET1, specifically banks' common stockholders' equity and retained earnings. This study will also examine the effectiveness of monetary policy with a substantially heightened capital requirements across sub-samples.

The empirical analysis uses quarterly bank-level data from the FDIC ranging from 2001 Q4 to 2017 Q3. The data on CET1 is only available after 2015 for all banks. A proxy for CET1 thus will be constructed to compare the effects across sub-samples. The data will be divided into 2 sub-samples. The first sub-sample covers periods from 2001 Q4 to 2008 Q4, which can be used to measure the effects prior to the introduction of the heightened capital requirements. The second sub-sample covers periods beginning in 2009 Q1, when the stress test is implemented and Basel III requirements are being phased in. The economic specifications are based on the standard dynamic lending model. Dynamic panel regressions including system GMM are used to address the endogeneity issues. The purpose of this research is to evaluate the effects of the risk-based capital ratio on bank lending, retained earnings and common stockholders' equity across sub-samples. The effectiveness of monetary policy is examined as well.

tained earnings and common stock equity, but also preferred stock equity. The detailed definition is provided in section 5 - Data, Method and Model. Explanations on other types of capital are given in section 3 - Background.

Chapter 2

INTRODUCTION

The outbreak of the financial crisis put financial intermediaries under the spotlight of public attention. Lax supervision of the financial system was criticized for being one of the major causes of the recession. In addition, the fear of failure of systemically important financial institutions required public resources to bail out troubled banks for their risk taking activities. Regulators around the globe subsequently issued a series of heightened standards including the heavily debated increases in the risk-based capital requirements to enhance supervision and to internalize the costs to banks themselves, arguing that the more capital banks hold, the more they can lend during a crisis. In addition, more capital increases the buffer against loan losses.

On the other hand, the banking industry has been asking for less regulation for years. They argue that layers of regulations have become overwhelming for business, and they could lend more if the required capital levels were lower or structured differently. Other observers also worry about banks' future and the slow growth seen in the U.S. economy. They are concerned that the heightened capital requirements might lead to a slower economy with a less stable banking system (Congdon & Hanke, 2017; Gramm & Solon, 2016; Sarin & Summers, 2016).

Moreover, increasing attention has been paid to the interplay between prudential supervision and monetary policy. Monetary policy and prudential supervision can work at cross-purposes. Monetary policy could affect systemic risk, and prudential regulation could affect economic growth (Yellen, 2011).

The connection relies on the validity of the credit view of money. The traditional money view does not give a special role to loans, neither does it differentiate the loan rate from the common interest rate. It assumes that money pumped into banking would be automatically multiplied and transferred to the economy. However, the credit view argues a more significant role is played by banks. Asset allocations decided by banks are critical for conducting monetary policy (Bernanke, 1988; Bernanke & Gertler, 1995).

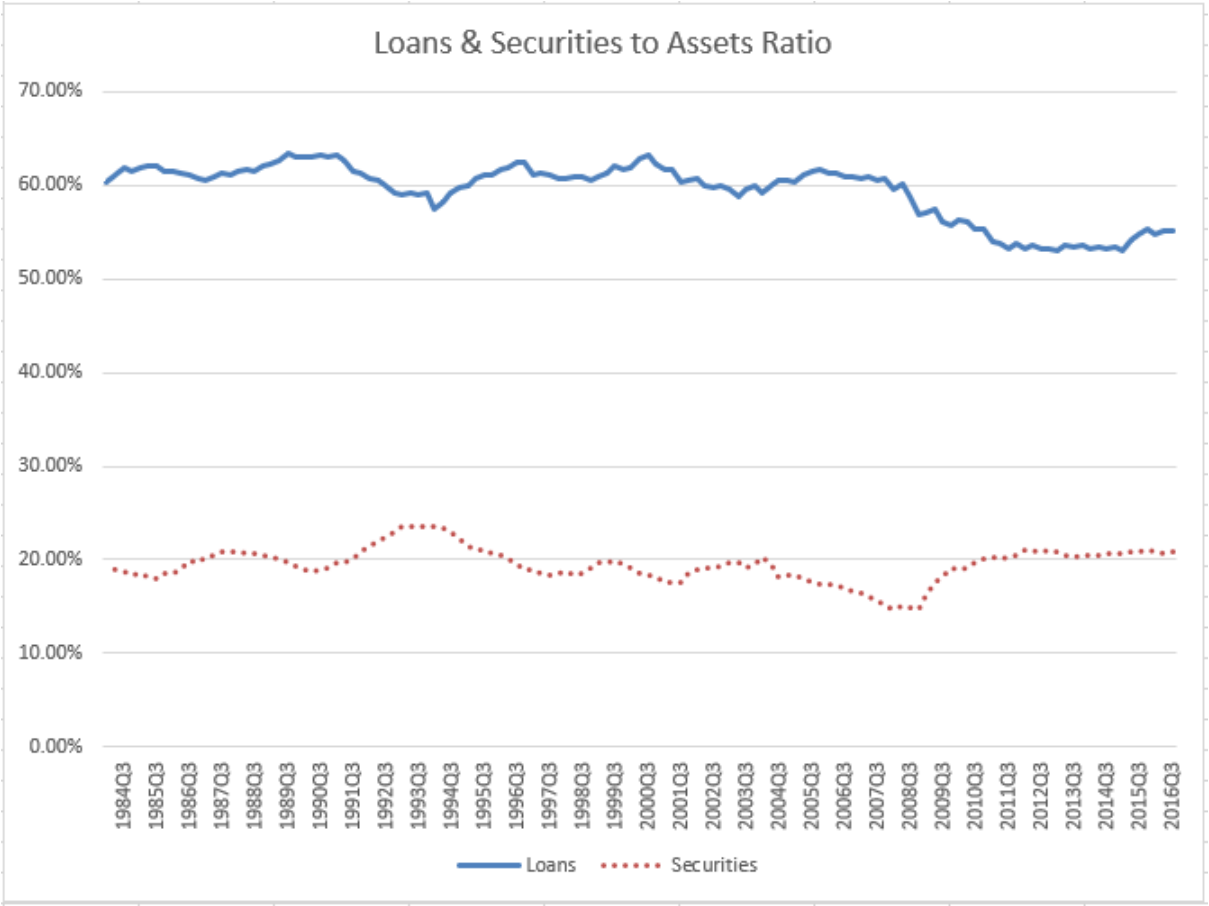
Subjected to a substantially heightened capital standard which brings the relationship between bank lending and capital to a new high level, banks might restrain lending during bad times or recoveries due to a capital shortage and constraints, even if monetary easing is conducted. They might also find making loans unattractive compared with alternative ways of allocating assets, such as investing. Hence the effectiveness of monetary policy to stimulate recoveries might be weakened with heightened capital requirements in recent periods.

In contrast, monetary tightening which drains reserves out of banking might be more effective with heighted capital constraints. For example, under-capitalized banks might incur higher costs on alternative funds which leads them to cut back loans further. Monetary tightening might also reduce banks' profitability, which prevents capital accumulation in the long term, thus reducing bank lending. That is to say, monetary policy might be asymmetric (Chami & Cosimano, 2010; Kishan & Opiela, 2006; Van den Heuvel et al., 2002). The Fed might have an easier time in conducting monetary tightening than easing. As suggested by Bliss & Kaufman (2002), the standard textbook model in which banks are only subjected to the reserve requirement is incomplete. An additional capital constraint should be incorporated to analyze the effects of monetary policy.

Motivated by the debates presented above, this paper aims to examine the effects of the risk-based capital ratio and monetary policy on U.S. bank lending in recent

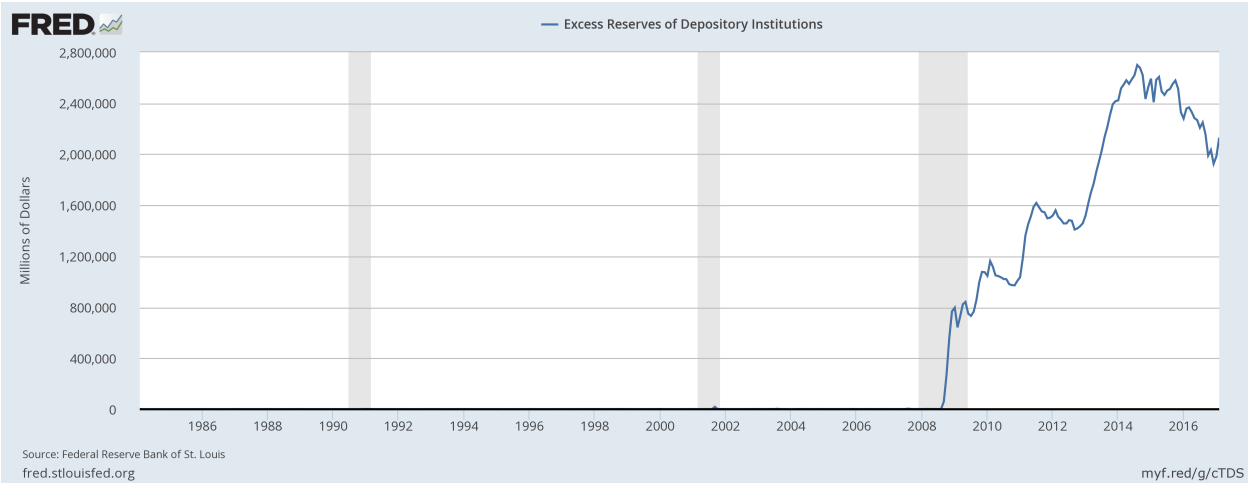
years. Aggregate data below shows that banks reduced assets allocated to lending but increased security holdings since the Great Recession. Excess reserves have also been built up dramatically since then.

Figure 2.1: Loans and Securities to Assets Ratio



Aggregate Quarterly Data from the FDIC

Figure 2.2: Excess Reserve



This paper is built on both the credit crunch literature and the bank lending channel literature. It contributes to the existing literature in three ways:

First, previous literature on the Basel capital standards has not reached a conclusion on their effects on bank lending. However, the risk-based capital standard has become more restrictive now than before due to changes in requirements. Basel III introduces a 7% requirement on the higher-quality capital CET1 including the conservation buffer[1], and even higher if including a counter-cyclical buffer[2] for globally systemically important banks. It also raises the existing standard for the Tier 1 capital ratio from 4% to 6%. One might expect that the risk-based capital standard has become more relevant now than before. The stress tests implemented in the U.S. also enhance the effects of risk-based capital requirements on lending for large BHCs. In the meanwhile, regulators has been giving banks time to prepare for the implementation of Basel III, which could mitigate the effects to some extent. Thus, studying the phase-in periods using recent data might provide new insights into the subject.

Second, different from the previous literature, this paper will consider two essential components of CET1 — retained earnings and common stockholders' equity.[3] Banks can meet the required capital ratios either by cutting loans (decrease denominator) or raising certain types of capital (increase numerator). In the case of CET1, banks could raise either common stockholders' equity or retained earnings by cutting dividends. Companies are known for being reluctant to cut dividends. Cutting dividends could convey a bad signal to the public. Dividends also serve as income to investors.

[1] A conservation buffer is a mandatory 2.5% of the risk-based capital ratio that banks need to hold as buffer against potential losses.

[2] A counter-cyclical buffer can range between 0% and 2.5% depending on banks' specific risks.

[3] As mentioned in the forward, CET1 includes mainly common stocks and retained earnings. It does not include preferred stocks. The detailed definition is given in section 5 - Data, Method and Model section. Explanations on other types of capital are provided in section 3 - Background.

On the other hand, banks could also be reluctant to issue common stocks due to information asymmetry or a lemon premium during a crisis, and it is a dilution of earnings (Myers & Majluf, 1984; Hyun & Rhee, 2011). However, what happened in the U.S. was that the 19 largest BHCs under the Supervisory Capital Assessment Program (SCAP) [4] had to raise their capital to a satisfactory level within 6 months in 2009. The Comprehensive Capital Analysis and Review (CCAR) [5] allows the Fed to object to the largest banks' plans of stock repurchase and dividend payout. According to the Fed, "The 19 institutions paid out 15 percent of net income in common dividends in 2011 compared with a payout of 38 percent of net income in 2006. They also raised more in common equity than they repurchased in 2011" (Board of Governors of the Federal Reserve System, 2012). Smaller community banks are not subject to the stress tests, but they will be subjected to the Basel III capital requirement by 2019. They might have to rely on retained earnings to gradually build up CET1, because they have limited access to public funding. The combined regulatory pressure from both the stress tests and Basel III could affect banks' retained earnings beyond the effects from profitability by altering their dividend payout policy. The regulatory push on banks of all sizes to manage their capital deliberately would justify the need to study the dynamics between retained earnings and common stockholders' equity as sources of regulatory capital.

Third, the previous literature puts insufficient emphasis on the connection between monetary policy and capital requirements. This paper will examine the effectiveness of monetary policy in stimulating bank lending with heightened capital requirements using recent quarterly bank level data.

The empirical analysis uses quarterly bank level data from the FDIC during the period 2001 Q4 to 2017 Q3. The dataset is divided into two sub-samples covering pre and post implementation of heightened capital requirements in the U.S. Because

[4] SCAP is the precursor of the current stress tests.

[5] CCAR is a part of the stress tests that takes into consideration banks' capital plan.

data on CET1 is only available for all the FDIC insured banks starting from 2015, a proxy for CET1 is constructed. The empirical specifications are based on the standard dynamic lending model in several papers such as Kashyap & Stein (1995), Gambacorta & Mistrulli (2004), Berrospide & Edge (2010), Gambacorta & Shin (2016) and Borio & Gambacorta (2017). The analysis uses dynamic panel regressions such as system GMM to control for endogeneity. The analysis takes advantage of a large amount of information that can be extracted from a large panel dataset.

Section 3 introduces the background of the Basel Accord chronologically, ending with some background on the U.S. stress tests. Section 4 reviews the related literature. Section 5 describes data, methods and models used for the regressions. Section 6 goes through the analysis process and the regression results. Section 7 provides ideas for future extensions. Section 8 concludes the findings.

Chapter 3

BACKGROUND OF THE RISK-BASED CAPITAL STANDARDS

This section will introduce the background of the Basel capital standard chronologically, with some observations on the U.S. stress tests. The Basel capital requirement was simple and straightforward when it was first introduced in 1988, but it has become more complicated and heightened since then.

3.1 Basel I

The risk-based capital standard was initially introduced in 1988 (Basel I). It was constructed by the Basel Committee on Banking Supervision (BCBS) which comprised representatives of central banks and supervisory authorities of the G10 countries. The standard aimed to improve the soundness of internationally active banks and establish competitive equality across countries by issuing a common capital standard with some discretion within each country. The focus of Basel I was to address credit risks inherent in banks. Two tiers of capital were introduced. Tier 1 capital[1] consists of equity capital and disclosed reserves (post-tax retained earnings). Other reserves or debts that can be used to absorb losses for an on-going basis are counted into Tier 2 capital[2]. It classified banks' assets into broad categories and assigned 5 possible weights to each category. The risk-based capital ratios can be calculated as capital divided by risk-weighted assets. The standard ratio was set at 8% for total capital[3] to risk-weighted assets and

[1]Tier 1 capital is also called core capital, it includes retained earnings, common stock equity and preferred stock equity.

[2]Tier 2 capital is supplementary capital which includes subordinated debt.

[3]Total capital is the sum of Tier 1 capital and Tier 2 capital.

4% for tier 1 capital to risk-weighted assets (Basel Committee on Banking Supervision, 1988).

The standard was straightforward. The intention was to improve banks' capitalization which supports the risk-taking behavior by raising capital (the numerator, see the importance of banks' capitalization to their lending (Shin, 2016; Berger & Bouwman, 2013)). However, bank capital deteriorates during recessions. The side effects come when banks choose to cut loans (the denominator) instead as capital requirements become binding. Some studies suggest that banks are more likely to reduce loans than to issue equities during recessions (Myers & Majluf, 1984; Hyun & Rhee, 2011). Banks' reluctance to extend lending might result in a leftward shift in the credit supply curve, which might have negative effects on the real economy beyond demand effects during recessions. A spate of literature thus emerged around 1990 [4] in the U.S. to study the regulatory-induced credit crunch, or put another way, the capital crunch (Bernanke & Lown, 1991; Berger & Udell, 1994; Furlong, 1992; Hancock & Wilcox, 1994; Peek & Rosengren, 1996). The literature will be reviewed in section 4.

3.2 Basel II

The first consultative paper for Basel II was released in 1999, and formalized in 2004. The new standard aimed to improve the soundness of internationally active banks by providing a more risk-sensitive capital standard. It recognized the importance of other forms of risks such as operational risks. It gave banks more discretion when evaluating risks which could depend on the characteristics of borrowers. It also meant to address issues such as regulatory arbitrage in which banks could artificially boost their capital ratios, for example, securitisation through a "special purpose vehicle" (Jackson et al., 1999).

[4] A time when a recession coincided with the introduction of Basel I.

The Basel II introduced the concept of 3 pillars – minimum capital requirements, supervisory review and market discipline. Pillar 1 minimum capital requirements retained the previous total risk-based capital requirements of an 8% minimum ratio. It allowed banks to choose between a standardized approach specified by supervisors and an internal-ratings based approach. The standardized approach was essentially the Basel I requirement, but weighted assets based on external ratings given from rating agencies. The internal-ratings based approach allowed banks to build models under supervisory reviews to calculate capital requirements based on factors such as the probability of default. Pillar 2 and pillar 3 were to enhance supervisory examination and market transparency (Basel Committee on Banking Supervision, 2004).

A flood of literature appeared around the beginning of 2000 to study the potential effects of Basel II. The main argument was that Basel II was procyclical and would increase the cyclicality of business cycles. By measuring risks based on factors such as the probability of default of borrowers which certainly would increase during recessions, banks would be subjected to tighter capital requirements when a recession occurs. This might lead to a more severe retrenchment in credit supply (Kashyap & Stein, 2004; Gordy & Howells, 2006; Andersen, 2011).

3.3 Basel III

The consultative paper for Basel III was announced at the end of 2009, and formalized in 2010. Basel III aims to improve the resilience of the banking sector by addressing lessons from the financial crisis. It improves several aspects of Basel II and heightens the risk-based capital requirements qualitatively and quantitatively. It means to be a standard applicable to all sizes of banks, but more stringent for systemically important banks.

One purpose of Basel III is to improve capital quality and quantity. As stated in

the consultative paper, banks could hold as little as 2% of common equity to risk-based assets but still display a strong Tier 1 ratios under Basel II. However, it was retained earnings, which are a part of banks' common equity bases, that absorbed credit loses and writedowns during the Great Recession (Basel Committee on Banking Supervision, 2009). Basel III thus introduces a new minimum requirement of 4.5% on common equity tier 1 capital to enhance the quality and quantity of essential bank capital. It also raises the existing requirement for the tier 1 capital ratio from 4% to 6%. The requirement for the total capital ratio stays at 8%. In addition, Basel III introduces a capital conservation buffer of 2.5% CET1 that can be drawn down during times of stress, hence raising the CET1[5] requirement to an unprecedented 7%. The quantitative impact study released by the Basel Committee showed that a group of 94 internationally active and well diversified big banks in the aggregate had a shortfall of €577 billion to reach the 7% CET1 requirement by the end of 2009, and a shortfall of €25 billion for the other 169 banks in the study (Basel Committee on Banking Supervision, 2010b). Moreover, a countercyclical buffer which ranges from 0% to 2% will be added to address the procyclicality in Basel II. An additional loss absorbing requirement will also be imposed on globally systemically important banks (Basel Committee on Banking Supervision, 2011a).

These buffers aim to push banks to build up capital in good times thus dampening the procyclicality of capital requirements. Other aspects of Basel III include a leverage ratio[6] and a liquidity coverage ratio[7] (Basel Committee on Banking Supervision, 2010a). The U.S. Fed determined that Basel III will be implemented in the U.S. on

[5] As mentioned in the previous context, CET1 is the most essential type of capital, which includes retained earnings and common stock equity. Tier 1 capital including CET1 and preferred stock equity. Tier 2 capital including supplementary capital such as subordinated debt. Total capital is the sum of Tier 1 and Tier 2 capital.

[6] Different from risk-based capital ratios which are calculated using risk-weighted assets, a leverage ratio is a ratio of certain type of capital to unweighted total assets.

[7] A ratio that measures banks' ability to meet short-term obligations using high liquid assets including cash and treasury bonds.

all banks except for BHCs with assets less than $500 million in 2013. The implementation date for a 4.5% minimum of CET1 is 2015; for a 7% of CET1 including 2.5% of conservation buffer is 2019 (Board of Governors of the Federal Reserve System, 2013).

As summarized above, the Basel capital standard has become more stringent over the years. One might expect that the capital standard is more relevant in affecting banks' lending decisions than before. On the other hand, regulators have been giving banks extended time to prepare for the full implementation. Thus, using recent data to study the phase-in periods might provide insights into the subject.

3.4 The U.S. Stress Tests

The U.S. Fed designed the stress tests during the financial crisis. The precursor of the current Dodd-Frank Act Stress Test (DFAST) is the Supervisory Capital Assessment Program (SCAP) which started in 2009. SCAP included the 19 largest U.S. BHCs. It performed stress tests on these banks under different economic scenarios, and required them to attain a satisfactory level of capital within 6 months. If banks cannot raise the amount of capital needed, the U.S. treasury will be a backstop for them. This could convey a bad signal to the public. The bank-specific test results were also disclosed to the public. The unprecedented move meant to gain public confidence at the time. The program was successful, because banks under the program ended up raising enough capital by themselves. SCAP was closed later, but experience was gained and implemented in the current stress tests (Board of Governors of the Federal Reserve System, 2009).

In 2011, the Comprehensive Capital Analysis and Review (CCAR) was implemented. It incorporates banks' future capital plans into scenario tests and allows the Fed to object to banks' plans of stock repurchase and dividend payout due to quantitative or qualitative concerns. The first participants were the previous 19 largest BHCs

under SCAP. CCAR later extended coverage to BHCs that have over $50 billion of consolidated assets (Board of Governors of the Federal Reserve System, 2017a).

The Dood-Frank Act Stress Test (DFAST) was formally implemented in 2013. It included the 19 largest BHCs and was extended to other banks with over $50 billion of assets later. It tests banks' capital ratio under various economic scenarios assuming banks do not repurchase stocks and keep their previous dividend payout plan. The focus was on the Tier 1 common ratio (T1C) which is a US measure of essential common equity capital [8]. The requirement was around 4.5% - 5%. The results of DFAST also serves as an input for CCAR. Both DFAST and CCAR comprise the current stress tests (Board of Governors of the Federal Reserve System, 2017b).

In addition to largest BHCs, banks with assets over $10 billion but under $50 billion are required to perform company-run stress tests based on supervisory scenarios, but they are not subjected to the stress tests like the biggest companies are. Smaller community banks are not subjected to any form of stress tests. The current stress tests and SCAP successfully pushed the largest banks to raise high-quality capital over time and cut dividend payouts compared with their pre-crisis level. According to the Federal Reserve, "The common equity capital ratio – which compares high-quality capital to risk-weighted assets – of the 34 bank holding companies in the 2017 CCAR has more than doubled from 5.5% in the first quarter of 2009 to 12.5% in the first quarter of 2017. This reflects an increase of more than $750 billion in common equity capital to a total of $1.25 trillion during the same period" (Board of Governors of the Federal Reserve System, 2017c).

[8]The Fed later switched to use CET1 as Basel III was gradually phased-in in the U.S.. The detailed definition of the capital ratio is provided in section 5 - Data, Method and Model.

Chapter 4

LITERATURE REVIEW

This section will review two strands of literature. 1. Literature associated with regulatory-induced lending slowdowns — the credit crunch literature. 2. Literature on the effectiveness of monetary policy and its relationship with capital requirements — the bank lending channel literature.

4.1 Credit Crunch

The literature on regulatory-induced credit crunches has a relatively long history of debate. However, it has not reached a conclusion despite many theoretic and empirical works that have been done in the field. The literature has extended into various branches over time. Studies in these branches generally try to answer several questions:

1. Do capital requirements improve banks' capitalization? And how do capitalization and capital requirements affect banks' lending and investing behavior?

2. Do capital requirements enhance procyclicality of lending, in other words, do capital requirements make lending more stringent during bad times?

3. How does the effectiveness of monetary policy change when capital requirements are binding (VanHoose, 2008)? This question closely relates to the credit view of money which states that part of monetary policy works though bank credit.

4. What is the optimal level of capital requirements in terms of benefits and costs?

This subsection will review several related studies in the credit crunch literature. The bank lending channel literature will be reviewed in the next subsection.

First, how does one define a bank credit crunch? Bernanke & Lown (1991) defined it as a significant leftward shift in the credit supply curve holding constant both the safe real interest rate and the quality of potential borrowers. By comparing loan growth rates across recessions, they argued that the unusually slow growth rate seen in 1990 suggested an additional role played by supply factors other than demand factors seen in a normal recession. Berger & Udell (1994) defined it as a decrease in loan growth compared with normal times rather than recessions. Clair & Tucker (1993) viewed credit crunches as localized events that occur at different times in different parts of a country. They examined closely the contraction of bank credit that began in Texas in 1986. In sum, the general concept of a credit crunch is that it is a reduction in credit supply beyond a normal demand reduction seen in business cycles.

The first spate of the literature emerged around the beginning of 1990, when a recession coincided with the introduction of Basel I, to study the observed credit crunch in the U.S.. Some believe it was a regulatory-induced incident while others think it was more likely to be a demand-driven business cycle.

Bernanke & Lown (1991) examined the credit crunch using state-level data from 1989-1991. They believed that "the credit crunch" might be better called "the capital crunch", because it was due to loan writedowns and credit losses during the recession, which reduced banks' capital. The drop in capital ratios then caused banks to sell assets and reduce lending in order to comply with the regulatory standard. They thus examined the relationship between loan growth and the capital-to-asset ratio across states. They also conducted a case study on banks in New England where loan growth slowed the most. Their results showed that loan growth was positively related to the capital-to-asset ratio. Banks with lower capital levels had slower loan growth. They concluded that the

capital crunch contributed to the slowdown in lending. However, because the magnitude was not extremely large [1], they believed that demand factors played the major role in the lending slowdown.

Furlong (1992) studied the same issue using bank-level data from 1985-1991 and found that loan growth was positively related to the capital-to-asset ratio. The study showed that the capital standard indeed tightened in the early 1990s compared with the 1980s. The sensitivity of loan growth to banks' capital positions increased during the credit crunch as well. The effects were found to be more pronounced for large banks than smaller banks. The author believed that it could be due to the reason that capital regulation tends to be binding more often for larger banks.

By exclusively focusing on banks in New England and the liability side of those banks' balance sheets, Peek & Rosengren (1992) were able to isolate supply factors from demand factors to some extent. They found a strong positive relationship between a bank's capital stock and the growth rate of its deposits. They concluded that a capital crunch happened in New England, but they could not test further if the capital crunch caused a credit crunch because the data was insufficient at the time.

Peek & Rosengren (1993) again examined the credit crunch on FDIC insured banks in New England from another perspective. By including a dummy variable for banks under formal regulatory action, they differentiated the effects of regulatory enforcement actions on banks' lending from banks' voluntary retrenchment. They found that banks facing formal regulatory actions shrank at a significantly faster rate than those without. A large share of reduced lending was concentrated in loan categories that depend on local banks. They thus concluded that the capital crunch had resulted in a credit crunch in New England.

[1] Bernanke & Lown (1991) found that the capital ratio explained approximately 2-3 percentage points of the decline in lending.

U.S. banks were also subjected to a tier 1 leverage ratio requirement[2] at the time, which is a ratio of tier 1 equity capital to unweighted assets. Baer & McElravey (1992) studied the effects of the risk-based capital ratio together with the leverage ratio on asset growth of U.S. bank holding companies from 1989-1991. They argued that the leverage ratio requirement was more binding than the risk-based capital requirements. Their results showed that differences in the equity ratio could explain 45 percent of the variation in asset growth rates while the risk-based capital requirements could explain only 12 percent of the variation in growth rates.

Hancock & Wilcox (1994) further investigated whether banks have increased their holdings of securities at the expense of business loans in response to shortfalls of capital. Their results showed that banks contracted their portfolios in response to shortfalls relative to either an unweighted 4.75 percent leverage ratio or a risk-weighted 8 percent capital standard. Contrary to widely held perceptions, their result showed that banks with less capital than required by the risk-weighted standard appeared to have shifted away from assets with low risk weights (securities and single-family mortgages) and to have shifted toward assets with higher risk weights (commercial real estate and business loans) without further elaboration. When they included both shortfall variables in a regression, shortfalls relative to the unweighted capital standard significantly affected bank credit, while shortfalls of capital relative to the risk-weighted standard did not.

Berger & Udell (1994) tested different credit crunch hypotheses including the risk-based capital standard, the leverage ratio, loan examinations, voluntary risk retrenchment, and two demand side hypotheses – macro-demand and secular decline. They took advantage of a large amount of bank level data from 1979-1992. They used 1979-1989 as control periods in the regression. They found that the risk-based capital

[2]A leverage ratio differs from the risk-based capital ratio on the denominator used in the calculation. Leverage ratio uses a simple unweighted total assets as denominator instead of risk-weighted assets used in the calculation of risk-based capital ratios.

hypothesis was the worst of all the alternative explanations of the bank credit reallocation in the 1990s. The results for the risk-based capital hypothesis were inconsistent with the predictions. Other credit crunch hypotheses provided only limited support for a supply side "credit crunch". The demand factors however proved to be relatively strong.

On the other hand, Lown & Wenninger (1994) argued that supply-side banking problems contributed to the lending slowdown to some extent. In their cross-sectional regressions, they regressed the loan growth rate on the capital ratio, the growth rate of employment, and the loan loss reserve ratio using state-level data. Their results showed that only employment and loan losses were significant in determining loan growth for 1988 and 1989. However, capital was significant when it was included in the regressions by itself and when employment was also included for 1990 and 1991. When loan losses were included, the siginificance of capital weakens. They believed that it could be that the loan-loss ratio likely reflects more accurately the current market value of the banking system's portfolio in each state, which reduces capital's significance when the loan loss reserve ratio is included in the regressions. They concluded that roughly 15% to 40% of the lending slowdown from 1989 - 1990 could be explained by supply-side factors in the banking industry.

Lown & Peristiani (1996) reexamined the issue by studying the effects of bank capital on consumer loan rates from 1988-1992. They found that large, low-capitalized banks deliberately curtailed consumer credit by raising interest rates on consumer loans. The result implied that banking behavior was consistent with the credit crunch hypothesis. Their result on non-performing loans also suggested that the credit slowdown was caused by numerous factors, each of which could have played a significant role at one point in time.

Isolating effects of supply factors from demand factors was always an obstacle. However, Peek & Rosengren (1996) were able to conduct a cleaner natural experiment

that differentiates effects of risk-based capital requirements from demand factors. By studying the branches of Japanese banks that operated in the U.S., they found that binding risk-based capital requirements associated with the Japanese stock market decline resulted in a decrease in lending by Japanese banks in the United States that was both economically and statistically significant from 1988-1995. Their result showed that a 1-percentage-point decline in the parent's risk-based capital ratio resulted in a statistically significant decline in total loans at U.S. branches of nearly 4 percent of assets annually, which translates into roughly a 6-percent decline in total loans.

Several newer studies focused on the behavior of different sizes of banks. Hancock & Wilcox (1998) examined economic activity and bank loans using state-level data from 1989-1992. They found that small banks shrank their loan portfolios considerably more than large banks did in response to declines in capital. They argued that large banks tended to increase loans more when small banks were under increased capital pressure than vice versa. They believed that one reason could be that large businesses may have taken out loans from large banks to fund trade credit for their small business customers. Or it could be that large banks may be able to handle all the borrowing demands of many small businesses. However, a small bank may not be able to fund the borrowings of even one large firm. They also found that real economic activity was reduced more by capital declines and loan declines at small banks than at large banks. They argued that it could be that the customers of large banks have alternative sources of credit while small banks' customers may not be able as quickly to arrange for credit through other small banks. They concluded that small banks were making "high powered loans" in that dollar-for-dollar loan declines in their loans had larger impacts on economic activity than loan declines at large banks did.

Berrospide & Edge (2010) studied large BHCs in the U.S. from 1990-2008 for post Basel periods. Their results showed that bank capitalization only had modest long-run effects on lending while demand factors and perceived risks of banks were the main

drivers using both panel regressions and VARs.

Kashyap et al. (2010) studied the impacts of introducing substantially heightened Basel III capital requirements on large financial institutions. Their results showed that the frictions associated with raising new external equity finance are likely to be greater than the ongoing costs of holding equity on the balance sheet, implying that the new requirements should be phased in gradually. If phased in abruptly, the new requirements have negative effects on lending activities. In addition, they argued that capital requirements have only modest long-run, steady-state impacts on loan rates, in the range of 25 to 45 basis points for a ten percentage-point increase in the capital requirements.

The topic of a credit crunch has also been widely studied internationally. Although the results might not be applicable to the U.S., I will briefly mention several studies here. Woo (2003) and Watanabe (2007) gave evidence that the regulatory-driven capital crunch caused the credit crunch in Japan in 1990s using panel regressions.

Kok & Schepens (2013) studied effects of banks' deviations from their optimal capital ratios on banks' balance sheet activities for a group of large European banks from 2004-2011. They found asymmetries in banks' reactions to deviations from optimal capital levels. Overcapitalized banks preferred to reshuffle risk-weighted assets or increase asset holdings when deviating from their optimal Tier 1 risk-based ratio, whereas they would rather increase equity levels or reshuffle risk-weighted assets without changing asset holdings when being below target. When looking at the equity ratio, under-capitalized banks deleveraged and lowered loan growth during the financial crisis, whereas banks tended to adjust equity levels, for example, through changes in retained earnings in the pre-crisis periods.

Bridges et al. (2014) estimated the effects of changes in capital requirements on banks' capital ratios and lending using data for bank groups in the United Kingdom from 1990 to 2011. Capital requirements were set individually on banks in the

U.K. for the past two decades. They found that changes in capital requirements typically lead to a positive change in actual capital ratios. Capital requirements affected lending with heterogeneous responses in different sectors of the economy. Banks cut (in descending order based on point estimates) loan growth for commercial real estate, other corporate and household secured lending. The response of unsecured household lending was smaller and insignificant over the first year. Loan growth mostly recovered within three years. Their results confirmed that regulatory requirements affected capital ratios permanently and credit supply temporarily.

Mustika et al. (2015) examined the credit crunch from 2006-2008 in Indonesia following Berger & Udell (1994). They studied banks' behavior of reducing lending and increasing riskless security holdings under regulatory burden and tightening monetary policy. They concluded that the 'Risk-Based Capital Credit Crunch Hypothesis' performed the worst of all the alternative explanations of the bank credit reallocation of 2006-2008 while the "Macro demand-side hypothesis" best explained the credit crunch. More extensive literature reviews on the credit crunch can be found in VanHoose (2007), VanHoose (2008) and Borio & Zhu (2012).

There are also large amounts of recent literature that study the equilibrium effects of capital requirements on bank lending and economic growth using general equilibrium models and simulation. They generally find that increasing the capital requirements would raise lending rates, reduce lending and economic growth in equilibrium. For 1% increase in capital requirments, there will be around 5 to 15 basis points increase in lending rates, and 0.15% to 0.6% decrease in economic output. They also find that the current capital ratio standard is not at the optimal level, which is higher than the current requirements. Due to the reason that different analysis were based on different assumptions, and conclusions vary significantly when assumptions are different, it is hard to summarize the results using one measure. A great summary of this branch of the literature can be found in D'Erasmo (2018).

A lot of studies have been done since the introduction of the risk-based capital standard. To summarize the above findings, some believe that it is demand factors rather than the risk-based capital requirements that affect bank lending. However, others think that the risk-based capital ratio did explain bank lending to some degree beyond the demand effects. Moreover, banks of different sizes might react differently to a shortage of capital. While the significance of the risk-based capital ratio in affecting bank lending is still in debate, some believe that the relationship is positive arguing that banks with more capital would be able to lend more during recessions, and others believe that the relationship is negative since stringent capital requirements would raise banks' costs and lending rates, and thus decrease economic growth. These debates justify the need to study the subject further using recent data because the risk-based capital requirement has been significantly heightened after the Great Recession, and the conclusion could provide more information for policy makers when deciding to strengthen or relax the standard.

4.2 Bank Lending Channel

Another issue this paper will examine is the effectiveness of monetary policy in affecting bank lending with heightened capital requirements. The assumption is that a bank lending channel exists. I also believe that the heightened capital requirements would strengthen the effectiveness of monetary tightening, but weaken the effectiveness of monetary easing. This section will briefly review the literature regarding the existence of a bank lending channel first, then describe several studies that examine the relationship between monetary policy and capital requirements.

The conventional money view of monetary policy treats loans as indistinguishable from money and assigns a common interest rate. The credit view on the other hand emphasizes that banks' decisions on managing their asset portfolios will determine whether the policy's impact falls primarily on open-market interest rates or on

effective bank loan rates. The credit view argues that not only the LM curve but also the IS curve shifts for a given monetary policy as banks' lending affects consumption and investments. It means to be an addition to the money view (Bernanke, 1988; Bernanke & Blinder, 1988; Woodford, 2010).

Bernanke & Gertler (1995) summarized two relevant channels of the credit view – the balance sheet channel and the bank lending channel. The balance sheet channel states that borrowers' balance sheets deteriorate following a monetary tightening. The sustained weakening of balance sheets implies that the premium for external finance may rise, thus reducing demand for credits. The bank lending channel states that banks can not perfectly offset the reduction in reservable deposits after a monetary tightening by issuing other sources of deposits, and thus cut lending as a result. The bank lending channel relies on the failure of the proposition made in Modigliani & Miller (1958), which states that the investment decision in the firm will be completely unaffected by the type of security used to finance the investment.

A number of studies examined the existence of the bank lending channel. For example, Kashyap et al. (1992) examined the composition of external finance from a firm's perspective. They found that a monetary tightening reduced banks' supplies of loans and encouraged firms' issuance of commercial paper. The shift in the mix of loans and commercial paper affected investment and the real economy as well. The shift in the external finance of firms provided evidence of the existence of the bank lending channel.

Kashyap & Stein (1995) further studied balance sheet behavior across different sizes of banks from 1976-1992 in the U.S.. They argued that if the lending channel exists, the balance sheet items of small and big banks should react differently to a monetary tightening due to their access to alternative funds. Their results suggested that both lending and securities holdings of small banks were more sensitive to a contraction

in monetary policy than those of big banks. A newer study from Kashyap & Stein (2000) found evidence that the impact of monetary policy on lending was stronger for small banks with less liquid balance sheets than small banks with liquid balance sheets.

While there are other studies that examined the existence of bank lending channel, the review will stop here and focus on the literature regarding the relationship between the effectiveness of monetary policy and capital requirements.

4.2.1 Monetary Policy and Capital Requirement

Traditionally, monetary policy works through reserves, and banks were only subjected to reserve requirements. It is assumed that money pumped into the banking system will be lent out to the economy. However, the capital requirement introduced an additional constraint for banks, which could amplify or weaken the bank lending channel depending on the policy stance. For example, banks with binding capital requirements might not be able to lend due to the capital constraints and choose to invest instead even when a monetary easing is conducted. On the other hand, monetary tightening is still effective by draining reserves out of banking. That is to say, monetary policy is asymmetric when banks are subjected to capital requirements (Bliss & Kaufman, 2002).

Van den Heuvel et al. (2002) summarize that monetary policy works through banks' capital as an additional capital channel, which might amplify or weaken the bank lending channel depending on the policy stance. For example, given a monetary easing, capital requirements can block the bank lending channel by preventing banks from making loans. On the other hand, a monetary tightening can reinforce the bank lending channel for less capitalized banks because they incur a higher "lemon premium" for alternative funding. Additionally, a monetary tightening that raises deposit costs will reduce banks' profitability, which results in less capital accumulation in the long-term.

It also reduces banks' incentive to make loans. A bank then would find it less valuable to hold capital, which further reinforces the reduction in lending in the presence of risk-based capital requirements (Chami & Cosimano, 2010).

Peek & Rosengren (1995) was one of first studies that addressed the effects of monetary policy on capital constrained banks. They studied bank lending in New England from 1976-1994. They argued that loans by capital-constrained banks will rise in response to a tightening of monetary policy, because decreases in bank reserves that reduce transactions deposits are exactly offset by an increase in non-transactions deposits. On the other hand, a tightening of monetary policy will reduce loans for unconstrained banks because changes in non-transactions deposits do not exactly offset changes in transactions deposits. Although the study inspires the idea of studying capital's effects on loans differentiating the capital-constrained and unconstrained banks, it contradicts the conclusions reached from other newer studies. It was argued that several preliminary assumptions are likely to be violated in the real world. It could be that banks are not be able to offset the reduction in transactions deposits completely. And capital-unconstrained banks might have better access or lower costs to alternative funds.

Kishan & Opiela (2000) examined effects of monetary policy on US banks of different size and capitalization groups from 1980-1995. They found loans of small under-capitalized banks were the most responsive to monetary policy, while large well-capitalized banks could shield the effects of contractionary monetary policy because of their better access to alternative funds.

Kishan & Opiela (2006) further examined the cross-sectional asymmetry and policy-stance asymmetry in the bank lending channel by comparing pre- and post-Basel periods using data from 1980-1999. They argued that monetary easing and tightening should have different effectiveness with capital requirements. Banks with different capitalization should react differently to a particular stance of monetary policy as well. They

found that contractionary monetary policy reduced loans of small low-capital banks relative to high-capital banks. That is to say monetary tightening is more effective in restraining loans from small low-capital banks. However, expansionary monetary policy was not able to increase loan growth of low-capital banks relative to high-capital banks in the post Basel/FDICIA periods. The results suggest an asymmetry of monetary policy with capital requirements. Their results did not hold in the pre-Basel/FDICIA periods however, indicating that regulation constraints must be of a certain level of stringency for the results to hold.

Van den Heuvel (2012) examined the effects of monetary policy on output using US state-level data from 1969-1995. He found that when a state's banking sector starts out with a low capital-asset ratio, its subsequent output growth is more sensitive to changes in the Federal funds rate. The result was consistent with the existence of a "bank capital channel".

Bijapur (2010) examined the effectiveness of monetary policy in boosting GDP growth and credit[3] during credit crunch periods using a VAR from 1972-2009. He concluded that the impacts of policy rate cuts on GDP growth and credit became weaker during credit crunch periods. That is to say, monetary stimulus could be less effective during credit crunch periods. They believed that the reason could be due to both a "credit crunch" effect and a "recession" effect, but they did not investigate further.

Orzechowski (2016) studied the long-run relationship among monetary policy, bank capital, and lending using annual data for U.S. commercial banks from 1966-2013. The empirical analysis used an autoregressive model to examine loan activity between high and low-bank-capital states. The results showed that commercial loans at high

[3]They use the TED spread as a measure of credit availability. The TED spread is the difference between the three-month Treasury bill rate and the three-month LIBOR based on US dollars. It reflects the difference between the interest rate on short-term US government debt and the interest rate on interbank loans.

capital banks had a stronger negative relationship to changes in the federal funds rates than low capital banks. Real estate loans showed a slightly stronger negative correlation with the federal funds rate for high capital banks than banks with low capital levels. The author argued that it could be that high capital banks have greater flexibility to rearrange their balance sheet items to support loan growth while low capital banks are constrained by capital requirements. He concluded that monetary policy may have asymmetric effects on different capitalized banks. However, the study did not differentiate between monetary easing and tightening across the long time period. The study could have offered more evidence if different monetary stances are considered.

Gambacorta & Mistrulli (2004) examined the response of lending to monetary policy and output shocks in Italy from 1992-2001. They found well-capitalized banks could better shield their lending from monetary policy shocks and GDP shocks. In another study, Gambacorta & Shin (2016) examined loan growth of a group of large banks in the G-10 countries and several other countries from 1994-2012. They found that loan growth was positively related to capital levels. Banks with higher capital levels had faster loan growth. They also found that a monetary tightening had smaller effects for banks with higher capitalization. They argued that banks with higher capital ratios incur a lower cost in borrowing through debt, and thus could supply more credit than lower capitalized banks.

Cecchetti & Li (2008) and Angeloni & Faia (2013) also provided suggestions on the optimal monetary policy and prudential regulation when they are affected by each other. More extensive literature reviews on the relationship between monetary policy and capital requirements can be found in Borio & Zhu (2012) and the Basel Committee on Banking Supervision (2011b).

As summarized above, the empirical evidence on the effectiveness of monetary policy in affecting bank lending with capital requirements in the recent periods is in-

sufficient, especially when different bank status and monetary policy states are considered. To summarize, under a monetary easing, a well-capitalized bank could lend more because they are not subjected to the capital constraints, while an under-capitalized bank could not lend much because they are constrained by the capital requirements. In this case, monetary easing is more effective for well-capitalized banks than under-capitalized banks. On the other hand, if a monetary tightening is conducted, well-capitalized banks can still lend if they have lower costs and better access to alternative funding. Under-capitalized banks would cut lending as desired by policy makers. In this case, monetary tightening is more effective for under-capitalized banks than well-capitalized banks.

This paper uses recent data to study the effects of risk-based capital ratios and monetary policy on bank lending across sub-samples that cover periods before and after the introduction of the heightened capital requirements. The sample periods provide a great comparison on the effects of monetary policy while capital requirements were being enhanced. It also provides more evidence on the effectiveness of monetary easing which was heavily implemented during the recession.

Chapter 5

DATA, METHOD AND MODEL

5.1 Objectives

The empirical research will try to answer the following questions:

1. How does the risk-based capital ratio affect bank lending before and after the heightened requirements?

2. How is the effectiveness of monetary policy different in affecting bank lending across sub-samples?

3. How does the risk-based capital ratio affect banks' common stock equity and retained earnings? How does monetary policy affect them?

Answers to these questions would provide insight on how banks' lending behavior is affected by their regulatory capital ratios or other related factors, the effectiveness of monetary policy across sub-samples, and the dynamics between common stock equity and retained earnings.

5.2 Data

Before I discuss the data used for the regressions, I would like to provide the definition for different kinds of regulatory capital. The risk-based capital ratios are calculated by dividing the regulatory capital by the risk-weighted assets. The core capital

ratios are Common Equity Tier 1 Capital (CET1) ratio and Tier 1 Capital (T1) ratio.[1] They are calculated using the respective regulatory capital divided by the risk-weighted assets. Definition of Regulatory Capital (Board of Governors of the Federal Reserve System (2014), footnote 22):

Common Equity Tier 1 (CET1):

$$\begin{aligned} CET1 = &\text{ Common Stocks and Related Surplus + Retained Earnings} \\ &\text{+ Accumulated Other Comprehensive Income} \\ &\text{+ Limited Amounts of CET1 Minority Interst} \\ &\text{- Applicable Regulatory Adjustments and Deductions} \end{aligned}$$

Tier 1 Capital (T1):

$$T1 = CET1 + \text{Additional Tier 1 Capital (non-cumulative perpetual preferred stocks)}$$

Tier 1 Common (T1C)[2]:

$$T1C = T1 - \text{Non-common Elements (non-cumulative perpetual preferred stocks)}$$

The empirical analysis uses quarterly bank level data from the FDIC during the period 2001 Q4 to 2017 Q3. Data on CET1 is only available for all banks beginning in 2015. A proxy that is explained below for CET1 is thus constructed. The dataset is divided into 2 sub-samples to compare the effects before and after the introduction

[1]The difference between CET1 and T1 is that prefered stocks equity is included in T1, not in CET1.

[2]CET1 is not exactly the same as T1C. T1C was the U.S. measure of high quality of capital, which was transited to CET1 around 2014-2015.

of higher-quality capital requirements. The first sub-sample ranges from 2001 Q4 to 2008 Q4, which represents periods before the introduction of Basel III and the stress tests. The second sub-sample ranges from 2009 Q1 to 2017 Q3, when the heightened capital requirements have been introduced and are phased in. I choose the cutoff year at 2009 because it is the year when the first round of the stress tests were performed under SCAP. The 19 largest U.S. BHCs were under SCAP in 2009. The tests gradually expanded to cover other large BHCs with assets of more than $50 billion between 2012 and 2014 [3].

Several potential proxies for CET1 can be constructed. CET1 mainly consists of common stocks and retained earnings. The sum of common stockholders' equity and retained earnings over risk-weighted assets could provide an approximate proxy. Another proxy could be Tier 1 capital minus preferred stocks over risk-weighted assets since CET1 excludes preferred stocks. The latter proxy is a better approximation than the previous one by comparing the proxy with the real data after 2015. The test statistics have also shown that the two numbers are the same or similar for most of the banks[4] Thus I use Tier 1 capital minus preferred stocks over risk-weighted assets as the proxy for risk-based capital ratios in the regressions. To be noted, this proxy is highly correlated with Tier 1 capital ratio due to the fact that lots of banks do not have preferred stocks equity, thus the two capital ratios are the same for most of the banks.

In addition, I tried to divide the data set into three sub-samples, with the third sub-sample using the real data for CET1 after 2015 as a comparison. However, due to the small sample and colinearity issues, the regressions are not well estimated. I thus dropped the original plan of using three sub-samples as in my dissertation proposal.

[3]The starting year of DFAST and CCAR to cover all banks with assets of more than $50 billion was 2014, some large BHCs were covered under CapPR during the transition.

[4]ANOVA and t-tests have shown that the proxy and CET1 are not significantly different for 2015-2017.

The whole data set covers between 6,000 - 9,000 depository institutions insured by the FDIC in the U.S. from 2001 Q4 - 2017 Q3, with a total of 500,000 observations. The data is unbalanced due to the fact that some banks drop out while others enter the industry over these years. The data starts with 9,000 banks in 2002. The number of banks declines gradually by an average of 50 per quarter to 6,000 banks in 2017 due to mergers and acquisitions. Although the data is unbalanced, it contains all the necessary information on both active banks and inactive banks until they cease operations. Therefore, the data is sufficient to measure all the effects of risk-based capital ratios on bank lending. The analysis uses dynamic panel regressions and focus on the difference between sub-samples.

5.3 Methods

The model used in the regressions is based on the standard dynamic lending model following Berrospide & Edge (2010) and Borio & Gambacorta (2017). The dependent variables in the analysis are the growth rates of bank's loans, retained earnings, or common stockholders' equity. The factors of interest are the risk-based capital ratio and monetary policy. Lagged variables are used to mitigate the endogeneity problem. Since the dynamic lending model contains lagged dependent variables as regressors, dynamic panel regressions such as system GMM are used to mitigate endogeneity and provide consistant estimates according to Anderson & Hsiao (1981), Arellano & Bond (1991), Ahn & Schmidt (1995) and Blundell & Bond (1998). Ordinary Least Square and Fixed Effects estimates are also used and shown for comparison.

In my initial proposal, I planed to also examine effects of risk-based capital ratios and monetary policy across bank groups based on their regulatory pressure. My plan was introducing two dummy variables to differentiate banks that undergo different regulatory pressure (either Basel III or the stress tests, none or both) during the phase-in periods. This will establish the control group and trial group. The largest BHCs

[5] in the U.S. are subject to both Basel III and the stress tests. The first round of the stress tests was performed in 2009 on the 19 largest U.S. banks, and extended to cover other large BHCs with assets of over $50 billion gradually. The Federal Reserve Board releases the bank-specific results for these banks, and can object to their capital plan such as repurchasing stocks and raising dividend payout for quantitative or qualitative concerns. Medium size banks with assets of over $10 billion but under $50 billion need to perform company-run stress tests under supervisory scenarios and disclose the results since 2013, but they are not subject to the supervisory stress tests. The Fed will not issue statements regarding these banks' tests. In addition, these banks need to prepare for the full implementation of Basel III in 2019 (7% of CET1 including the conservation buffer). Smaller community banks are not subject to any form of the stress tests, but they need to prepare for the implementation of Basel III. BHCs with assets of less than $500 million are subjected to neither the stress tests nor Basel III. However, I find that the overall effects of the risk-based capital ratio are insignificant in affecting lending through later analysis, and it is not significant in the regressions for specific groups either, which contradicts my initial speculation. Therefore, I no longer think it is necessary to compare the effects across bank groups. The regression results for specific bank groups are provided in Table 20 in the appendix. It shows that the risk-based capital ratio is not significant in affecting lending for all three bank groups[6] Although one of the lags of the risk-based capital ratio is significantly positive for the bank group subjected to both Basel and the Stress tests, the cumulative effects of the risk-based capital ratio are not significant. I also compared the effects for specific bank groups across sub-samples. The effects of the risk-based capital ratio remain insignificant for bank groups between sub-samples. The regressions are also not well estimated due to

[5] 34 banks with assets of over $50 billion participate in the supervisory stress tests in 2017.

[6] Three bank groups are banks subjected to either Basel or the Stress tests, banks subjected to both Basel and the Stress tests, and banks subjected to neither Basel nor the Stress tests.

the small sample size for some bank groups. These results are not presented in this paper, but can be provided if requested.

Macro economic conditions and bank's specific characteristics such as size and profitability of loan are controlled. Lags are also used for these factors. By comparing effects from different sub-samples, the analysis could shed light on how the substantially heightened capital requirements and monetary policy affect bank lending, retained earnings or common stock equity during the phase-in periods.

5.4 Model

The empirical specifications presented here are based on the standard dynamic lending regressions to study the effects of bank capital and monetary policy on bank loan growth, see Kashyap & Stein (1995), Gambacorta & Mistrulli (2004), Berrospide & Edge (2010), Gambacorta & Shin (2016) and Borio & Gambacorta (2017) for more details. I add several macroeconomic control variables and bank specific variables to the regressions.

The factors of interest are the risk-based capital ratio and monetary policy. Demand factors and other supply factors such as perceived risks by banks are controlled in the regressions. Some studies suggest that estimates are biased if these variables are not included. I also tried to add time effects and trends in the initial models and regressions. However, because several variables such as GDP are dropped out due to severe colinearity, I thus use quarterly dummies instead to control for seasonal effects. The effects across sub-sample periods can be studied by estimating within each sub-sample.

The baseline specification here is based on the standard dynamic lending model:

$$\Delta \ln L_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j \, \Delta \ln L_{i,t-j} + \eta \; CET1R_{i,t-1} + \sum_{j=1}^{4} \mu_j \, \Delta MP_{t-j} + \phi \; Z_{i,t-j} + \varepsilon_{i,t}$$

L_{it}: Level of bank's total loans and leases. The model includes four lags of loan growth rate $\Delta \ln L_{i,t-j}$ for serial adjustments. Specific types of loan such as industry and commercial loan and auto loan can also be used as dependent variables in future studies. The quarterly bank level data comes from the FDIC's financial data.

CET1R: A ratio of higher-quality capital over risk-weighted assets. The proxy of CET1 (Tier 1 capital less preferred stock equity) to risk-weighted assets is used. The quarterly bank level data comes from the FDIC's financial data. One lag of this variable is used in the baseline regressions. Five lags of this variables are used in the regressions for the robustness check to find cumulative effects.

MP: A proxy of monetary policy. Following Bernanke & Blinder (1992), I use the federal funds rate ranging from 2001 Q4 - 2017 Q3. Four lags are included in the regressions. The data comes from FRED.

Z control variables:

Demand Factors: As several studies argued, demand factors played a major role in the credit crunch (Bernanke & Lown, 1991; Berger & Udell, 1994). I include several demand control variables: four lags of the real GDP growth rate, four lags of the inflation rate (CPI), four lags of the unemployment rate and four lags of the growth rate of state level personal income. The quarterly national data such as real GDP, inflation and the unemployment rate are from FRED. Real and nominal GDP data are available until 2017 Q2. The state level personal income is from the U.S. Bureau of Economic

Analysis.

Perceived Risk by Banks: As argued in several studies, the reduced supply of credit might be caused by voluntary credit retrenchment from banks because of high risks during recessions (Berger & Udell, 1994; Peek & Rosengren, 1993). High uncertainty also affects the transmission of monetary policy to lending. Thus leaving out this factor might cause the results to be biased (Baum et al., 2013). One proxy for perceived risks by banks is net charge-offs. I follow Berrospide & Edge (2010) and add one lag of the net charge-offs to total assets ratio as a control variable. However, net charge-offs alone might not be able to capture the whole picture of the rising of credit risks. Therefore, I also add one lag of the ratio of non-performing loans[7] to total assets following Berger & Udell (1994). Some also argue that the CP-Bill spread[8] can reflect risks, but others believe it is more likely to reflect the stance of monetary policy (Bernanke & Blinder, 1992), thus I do not add this spread into regressions.

Bank Specific Variables: One lag of bank size measured by the log of bank's total assets is included. One lag of the liquidity ratio measured by the ratio of the sum of cash and all securities to total assets is included. One lag of bank's cost of funding measured by the ratio of total interest expense on deposits to average earning assets is included.

Profitability on lending: Some argue that banks' profitability also played a major role in affecting loan growth during a credit crunch (Sharpe, 1995). Borio & Gambacorta (2017) also found that the effectiveness of monetary policy is reduced in a low-interest-rate environment. The impact of low rates on the profitability of banks lending helped to explain the reduced lending in the period from 2010-2014 for large international banks. The reason is that deposit rates usually follow short-term rates while

[7] Assets past due 30 - 89 days, 90 + days, and nonaccrual

[8] The difference between 3 month commercial paper rate and 3 month treasury bill rate.

lending rates follow long-term rates. Thus a monetary easing that lowers federal funds rate will reduce deposit rates faster than lending rates, which increases the spread for lending activities during normal times. However, when interest rate is already low, a lower federal funds rate will not be able to lower deposit rates further, while lending rates that follow long-term rates will come down eventually, which reduces the spread for lending activities. Lowered profitability also makes it harder to accumulate capital. A proxy for this variable is hard to find, as data is missing on lending rates. And even if there is data on loan rates, it might not accurately reflect the true price of a loan because loans usually involve collateral. However, data on interest income from loans and leases is available. Thus, one lag of the ratio of interest income from domestic office loans to total assets is included in the regressions. It also helps to see if the substantially heightened capital requirements affect banks' retained earnings after controlling for profitability.

Intermediation costs: banks' intermediation costs could also be one of the supply-side factors causing a credit crunch. Jaremski & Sapci (2017) argue that banks' intermediation costs (non-interest expenses) are counter-cyclical because of housing prices. House prices decrease during recessions, which would increase banks' costs of monitoring, screening and litigation which could cause a credit crunch in the economy. Using quarterly data for large U.S. commercial bank hold companies from 1993-2012, they show that house prices are the main driving source of the counter-cyclicality of banks' intermediation costs using both panel regressions and VARs. However, they do not further demonstrate if the intermediation costs or house prices have caused slowed loan growth in their study. Due to the reason that higher non-interest expense could divert banks' resource from lending, one lag of the ratio of non-interest expense to average assets is included.

Basel III: A dummy variable that differentiates banks into groups. It equals to 1 if the bank is subjected to Basel III after 2013. It equals to 0 for the sub-sample periods

before 2013. A bank is assumed to be subjected to Basel III if it has over $500 million of assets, or its BHC has over $500 million of assets. Data on BHCs is from the Federal Reserve Bank of Chicago.

Stress Test: A dummy variable that differentiates banks into groups. It equals to 1 for the largest BHCs that are subject to the stress tests after 2009. It equals to 0 for the sub-sample periods before 2009. This variable is 1 for all the largest banks whose BHCs participate in the CCAR, DFAST, or SCAP since 2009. This variable is 1 for all the medium size banks whose assets are above $10 billion, or BHCs with assets of over $10 billion starting in 2013.

Other control variables such as quarterly dummies are also included.

5.5 Common Stockholders' Equity and Retained Earnings

As mentioned in the introduction, both common stockholders' equity and retained earnings are essential components of CET1 or T1C. The substantially heightened capital requirements push banks to either cut lending or raise high quality capital. Although the requirements are stringent, banks have been given a long time to prepare for the implementation. The risk-based capital requirements might not affect banks' lending significantly if banks can raise enough essential capital moving toward the deadline. On the other hand, banks might cut lending if they can not raise sufficient capital. The relationship between the risk-based capital ratio and loan growth will be negative in this case. The previous section investigates this question. This section further explores the question by examining how common stockholders' equity and retained earnings would be affected by the heightened capital requirements.

In general, companies are reluctant to cut dividends. It could convey a bad signal to the public. Dividends are also an income source to investors. On the other hand, companies are reluctant to issue common stocks due to information asymmetry prob-

lems/higher lemon premiums during a crisis. It is also a dilution of earnings. However, the regulatory pressure has pushed US banks to manage their capital plan diligently since the financial crisis. The Fed can also object to banks' plan of stock repurchase or increasing dividend payout if the test results are unsatisfactory. According to the Fed, "The 19 institutions paid out 15 percent of net income in common dividends in 2011 compared with a payout of 38 percent of net income in 2006. They also raised more in common equity than they repurchased in 2011" (Board of Governors of the Federal Reserve System, 2012). By 2017, the largest 34 BHCs has raised the common equity ratio from 5.5% in 2009 to 12.5%, an increase of more than $750 billion (Board of Governors of the Federal Reserve System, 2017c). Smaller banks are not subject to the stress tests, but they need to prepare for the implementation of Basel III by 2019. They might rely on accumulating retained earnings from profits over time, because they might not have the same access to public funding as large banks do. This section studies how the risk-based capital ratio affects banks' common stock equity and retained earnings.

Most of the literature focused on how bank's assets (Loans and Securities) react to their capital level. Few studies examined the source of capital. Gambacorta & Shin (2016) investigated the effects of the equity-to-total assets ratio on banks' cost of debt financing, annual loan growth and equity growth for 105 large international banking institutions from the G10 countries from 1994-2012. They found that a 1 percentage point increase in the equity-to-total assets ratio is associated with a 4 basis point reduction in the cost of debt financing and with a 0.6 percentage point increase in loan growth. They suggested the importance of greater retention of earnings and hence higher bank capital would have facilitated the transmission of accommodative monetary policy. However, they did not further examine how retained earnings would be affected by the leverage ratio[9].

[9]They studied the effects using a leverage ratio. As mention before, it is a more straightforward measure of capital using a certain type of capital over unweighted total assets. The risk-based capital ratio uses risk-weighted total assets as denominator.

Kok & Schepens (2013) studied how deviations from banks' capital targets affect both the numerator (Tier 1 capital or retained earnings) and denominator (risk-weighted asset) of the capital ratio, and loan growth for large European banks from 2004-2011. Their results suggested that the effects of Tier 1 ratio on retained earnings are not significant. They believe that it could be that retained earnings are at least in the short term largely determined by exogenous macroeconomic and financial factors, and are not a sufficiently reliable tool to change Tier 1 ratios when they are off target.

In sum, there is not a sufficient amount of evidence from the literature on how heightened capital requirements affect common stockholders' equity and retained earnings. This study would provide more evidence on the subject. The results would suggest how banks raise their capital during recessions, either through retained earnings or common stock equity. It will also imply which capital source between common stock equity and retained earning is more rigid to change during bad times. The empirical specifications follow the above specification for bank lending. I use the growth rate of common stockholders' equity and retained earnings (undivided profit) instead of loan growth as the dependent variables.

The specifications below follow the baseline specification of lending but use the growth rate of undivided profit and common stockholders' equity as dependent variables:

$$\Delta\%RE_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j \, \Delta\%RE_{i,t-j} + \eta \, CET1R_{i,t-1} + \sum_{j=1}^{4} \mu_j \, \Delta MP_{t-j} + \phi \, Z_{i,t-j} + \varepsilon_{i,t}$$

$$\Delta \ln CS_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j \, \Delta \ln CS_{i,t-j} + \eta \, CET1R_{i,t-1} + \sum_{j=1}^{4} \mu_j \, \Delta MP_{t-j} + \phi \, Z_{i,t-j} + \varepsilon_{i,t}$$

Chapter 6

ANALYSIS AND RESULTS

This section presents the analysis process and regression results. It is divided into three sub-sections which cover regressions for loans, retained earnings and common stock equity respectively. In each section, I will describe the analysis, regression results, and tables of estimates. The explicit regression results are provided in the appendix.

6.1 Loan

This section reports all the regression results using bank loan growth rate as dependent variable. The first regression shown in Table 1 is a one step system GMM with standard variance. The risk-based capital ratio is significantly positive in affecting bank loan growth for all time periods, before 2009, and after 2009, suggesting that banks with more capital could lend more. Monetary policy is significantly negative before 2009, however, the sign reverses after 2009. Thus monetary easing is effective in affecting lending before 2009, but not so effective afterwards. The explanations will be provided below after I discuss the two step system GMM with robust variance. Other bank specific factors are significant as well, however, one can see that some t statistics are quite large for some variables. Considering the characteristics of the panel data, I believe that heteroskedasticity would be an issue. Therefore, I will not focus on this result which is based on standard variance, and focus on the regression results with robust variance instead. In addition, because the two step system GMM is argued to

be more efficient than the one step system GMM, I thus will focus on the result from two step system GMM with robust variance. The full regression results for one step GMM with robust variance, ordinary least squares and fixed effects are provided in the appendix for comparison.

Table 6.1: One Step System GMM (Standard Variance)

	All Sample	Pre 2009	Post 2009
Capital Ratio	0.000019***	0.000066**	0.000011*
	(3.46)	(2.94)	(2.11)
Monetary Policy (-1)	-0.0050*	-0.0042	0.10***
	(-2.23)	(-0.86)	(13.84)
Monetary Policy (-2)	-0.0080***	-0.028***	0.0077
	(-3.52)	(-6.74)	(1.12)
Monetary Policy (-3)	0.00021	-0.051***	0.046***
	(0.09)	(-7.85)	(8.88)
Monetary Policy (-4)	0.0026	-0.031***	0.014**
	(0.99)	(-4.57)	(3.02)
Net Charge-off	0.012***	0.017***	-0.0059***
	(8.47)	(6.49)	(-3.58)
Nonperforming Loan	-0.0010	-0.0032**	-0.0029***
	(-1.72)	(-3.21)	(-4.04)
Asset	-0.35***	-0.52***	-0.44***
	(-90.21)	(-69.14)	(-65.69)
Liquidity Ratio	0.0100***	0.012***	0.0082***
	(65.26)	(45.83)	(42.73)
Interest Expense	0.0036*	-0.039***	0.067***
	(2.50)	(-11.99)	(26.07)
Income on Loan	0.0019***	0.00027	0.0024***
	(7.91)	(0.52)	(8.85)
Intermediation Cost	0.0012**	-0.0027***	0.0066***
	(3.11)	(-5.02)	(10.78)
Observations	449038	206697	242341

t statistics in parentheses
All variables are in lag form, number in parenthese indicate lag order
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The regression results reported in Table 2 are based on the two step system GMM with robust variance. I will focus on these regressions results. Different from the regressions using standard variance, most factors become insignificant when robust variance is used. The risk-based capital ratio becomes insignificant in affecting bank lending across all the samples. Other bank specific variables such as assets level, non-performing loans, and liquidity ratio remain significant across sub-samples. Bank's asset level is negatively related to the loan growth rate, suggesting that loan growth for small banks is faster than large banks. The negative nonperforming loan relationship suggests that banks reduce lending if too much risk is observed. The positive liquidity ratio coefficients show that banks with more cash and securities would be able to lend more across periods, implying that banks with more liquid assets in hand could withstand the depressed situations seen in the recession.

Monetary policy coefficients are negatively related to banks' loan growth rates before 2009, however, they are generally positive after 2009. The negative relationship before 2009 suggests that monetary policy is effective in boosting or reducing banks' loan growth during this period. The positive relationship between monetary policy and loan growth after 2009 could be due to multiple reasons, which deserves further exploration. First, it could be that monetary policy was ineffective after 2009. This could be caused by the heightened capital requirements or issues related to the recession. The heightened capital requirements could require banks to raise more capital before they can lend even if the federal funds rate was kept low. The recession could depress the demand and thus the loan growth. In addition, the increased uncertain risks associated with the recession could deter banks from lending. The combined effects could render monetary policy not as effective as before 2009. Second, the monetary policy was effective but the federal funds rate was kept low and unchanged between 2009 and 2015. Due to the small variation of the fed funds rate during this period, monetary policy should be insignificant in affecting lending. However, the economy and loan demand

were in recovery during the period. So when the Fed began to unwind monetary policy after 2015, the time coincidence between the increasing federal funds rate and rising loan growth gives a strong positive relationship after 2015. The combined effects of the two periods might give a positive coefficient overall. I estimated the regressions for sub-sample from 2010 - 2015 and sub-sample after 2015. Although the estimations are not perfect due to the small sample sizes, the general results indicate that monetary policy was not significant during period 2010 - 2015, but become more positively significant after 2015. In sum, the effects of monetary policy after 2009 are not as negative as the effects before 2009, and this could be due to multiple reasons summarized above. The following statistical test for the linear combination of all the lagged coefficients for monetary policy also suggests the same conclusion.

Test for Linear Combination of Monetary Policy

	All Sample	Pre 2009	Post 2009
Cumulative Monetary Policy	-0.0077	-0.089***	0.14**
	(-0.94)	(-5.51)	(2.87)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.2: Two Step System GMM (Robust Variance)

	All Sample	Pre 2009	Post 2009
Capital Ratio	0.000020	0.000089	0.000011
	(1.37)	(0.59)	(1.12)
Monetary Policy (-1)	-0.0031	-0.0070	0.084***
	(-0.30)	(-1.17)	(3.41)
Monetary Policy (-2)	-0.0057*	-0.018***	0.0080
	(-2.02)	(-3.85)	(0.50)
Monetary Policy (-3)	-0.00040	-0.038***	0.036*
	(-0.06)	(-4.96)	(2.30)
Monetary Policy (-4)	0.0015	-0.025**	0.013
	(0.21)	(-3.04)	(1.08)
Net Charge-off	0.011	0.0051	-0.0056
	(1.45)	(0.49)	(-0.47)
Nonperforming Loan	-0.0015	-0.0032***	-0.0032*
	(-1.31)	(-5.34)	(-2.40)
Asset	-0.34***	-0.45***	-0.43***
	(-7.45)	(-5.59)	(-4.11)
Liquidity Ratio	0.0095***	0.010***	0.0078***
	(6.81)	(6.18)	(4.91)
Interest Expense	0.0041	-0.027	0.066
	(0.17)	(-1.85)	(1.53)
Income on Loan	0.0020	0.00091	0.0024
	(0.57)	(0.12)	(0.63)
Intermediation Cost	0.0013	-0.0025	0.0066
	(0.35)	(-0.49)	(1.04)
Observations	449038	206697	242341

t statistics in parentheses
All variables are in lag form, number in parenthese indicate lag order
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A robustness check of the significance of the risk-based capital ratio in affecting bank loan growth is conducted by adding more lags of the capital ratio into the regression. I add 5 lags of the risk-based capital ratio into the regression to include one year's effects. I also tried to use OLS and information criterion to select the best order of lags which is 13. The general results are similar for regressions including 5 lags of capital ratio and regressions including 13 lags of the capital ratio. The following results in Table 3 are based on the regression including 5 lags of the capital ratio. The general results remain similar to the results from the previous regression. The only difference is that the first and fifth lag of the risk-based capital ratio are positively significant, with the fifth lag significant at 5% significance level. The results could imply that the risk-based capital ratio is more important in affecting bank lending after 2009 due to the heightened capital requirements. In addition, it could suggest that banks with more capital could lend more, not the other way around. However, due to the small magnitude and low significance, the risk-based capital ratio is marginally positively significant after the recession at most. The conclusion for a significant effect is not affirmative. Moreover, the test for the cumulative effects of the risk-based capital ratio does not support a significant effect. Therefore, I conclude that the risk-based capital ratio does not significantly affect bank loan growth, or it could affect bank loan growth positively at a marginal extent after 2009 at most.

The empirical specification:

$$\Delta \ln L_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j \, \Delta \ln L_{i,t-j} + \sum_{j=1}^{5} \eta_j \, CET1R_{i,t-j} + \sum_{j=1}^{4} \mu_j \, \Delta MP_{t-j} + \phi \, Z_{i,t-j} + \varepsilon_{i,t}$$

Test for Linear Combination of Monetary Policy

	All Sample	Pre 2009	Post 2009
Cumulative Monetary Policy	-0.0078	-0.088***	0.14**
	(-0.95)	(-5.35)	(2.87)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Test for Linear Combination of Capital Ratio

	All Sample	Pre 2009	Post 2009
Cumulative Capital Ratio	0.000074	0.00032	0.000075
	(1.52)	(0.78)	(1.40)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.3: Two Step System GMM (Robust Variance) with More Capital Lags

	All Sample	Pre 2009	Post 2009
Capital Ratio (-1)	0.000036	0.00015	0.000034
	(1.73)	(0.82)	(1.75)
Capital Ratio (-2)	0.000023	0.000099	0.000021
	(1.42)	(0.82)	(1.28)
Capital Ratio (-3)	0.000012	0.000048	0.000011
	(0.90)	(0.60)	(0.63)
Capital Ratio (-4)	-0.0000075	0.000042	-0.000019
	(-0.64)	(0.63)	(-1.54)
Capital Ratio (-5)	0.000011	-0.000013	0.000029*
	(0.86)	(-0.41)	(2.01)
Monetary Policy (-1)	-0.0031	-0.0070	0.084***
	(-0.30)	(-1.17)	(3.41)
Monetary Policy (-2)	-0.0058*	-0.018***	0.0080
	(-2.02)	(-3.81)	(0.49)
Monetary Policy (-3)	-0.00042	-0.038***	0.036*
	(-0.06)	(-4.80)	(2.31)
Monetary Policy (-4)	0.0015	-0.025**	0.013
	(0.21)	(-2.99)	(1.09)
Net Charge-off	0.011	0.0052	-0.0056
	(1.45)	(0.50)	(-0.47)
Nonperforming Loan	-0.0015	-0.0032***	-0.0032*
	(-1.29)	(-5.32)	(-2.38)
Asset	-0.34***	-0.44***	-0.43***
	(-7.47)	(-5.42)	(-4.16)
Liquidity Ratio	0.0095***	0.010***	0.0077***
	(6.80)	(6.13)	(4.90)
Interest Expense	0.0040	-0.027	0.065
	(0.17)	(-1.82)	(1.53)
Income on Loan	0.0020	0.00091	0.0024
	(0.56)	(0.12)	(0.61)
Intermediation Cost	0.0014	-0.0025	0.0067
	(0.36)	(-0.50)	(1.06)
Observations	449038	206697	242341

t statistics in parentheses
All variables are in lag form, number in parenthese indicate lag order
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Another robustness check is using different cutoff periods for the sub-samples. The cutoff period for the previous regressions is 2008 Q4. The first sub-sample is from 2001 Q4 to 2008 Q4. The second sub-sample is from 2009 Q1 to 2017 Q3. The SCAP was introduced during 2009 Q1, however, the effects might come with lags. Therefore, one might try different cutoffs to see how results change. I tried different cutoffs after 2009 Q1. All of them show insignificant results as in the previous regressions except for the cutoff at 2009 Q3. Table 4 shows the regression results for cutoff at 2009 Q3. The first and fifth lag of the risk-based capital ratio are more significant than before while the significance of other factors remains the same. The tests of cumulative effects below show that the post 2009 effects of the risk-based capital ratio are positively significant at the 10% significance level. The significance level is still too weak to make an affirmative conclusion for a significant effect. Thus my conclusions remain as above — the effects of the risk-based capital ratio are not significant in affecting bank loan growth, or at most positively marginally significant after the introduction of heightened capital requirements.

Test for Linear Combination of Monetary Policy

	Pre 2009Q3	Post 2009Q3
Cumulative Monetary Policy	-0.018**	0.11
	(-2.80)	(1.48)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Test for Linear Combination of Capital Ratio

	Pre 2009Q3	Post 2009Q3
Cumulative Capital Ratio	0.00029	0.000076
	(0.97)	(1.66)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.4: Two Step System GMM (Robust Variance) with Cutoff at 2009 Q3

	Pre 2009Q3	Post 2009Q3
Capital Ratio (-1)	0.00016	0.000035*
	(0.96)	(2.17)
Capital Ratio (-2)	0.000058	0.000020
	(0.75)	(1.52)
Capital Ratio (-3)	0.000055	0.0000089
	(0.90)	(0.67)
Capital Ratio (-4)	0.000028	-0.000017
	(0.73)	(-1.57)
Capital Ratio (-5)	-0.0000072	0.000028**
	(-0.65)	(2.84)
Monetary Policy (-1)	-0.000019	0.061*
	(-0.00)	(2.04)
Monetary Policy (-2)	-0.0012	0.010
	(-0.45)	(0.30)
Monetary Policy (-3)	-0.0053	0.0032
	(-1.37)	(0.19)
Monetary Policy (-4)	-0.011*	0.036*
	(-2.30)	(2.09)
Net Charge-off	0.0084	-0.0072
	(0.98)	(-0.52)
Nonperforming Loan	-0.0025***	-0.0025
	(-3.52)	(-1.63)
Asset	-0.37***	-0.44***
	(-5.65)	(-4.02)
Liquidity Ratio	0.0091***	0.0081***
	(6.52)	(4.50)
Interest Expense	0.0063	0.079
	(0.75)	(1.38)
Income on Loan	0.00016	0.0027
	(0.02)	(0.70)
Intermediation Cost	-0.0010	0.0078
	(-0.25)	(1.03)
Observations	230927	218111

t statistics in parentheses
All variables are in lag form
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In sum, I conclude that the effects of the risk-based capital ratio are not significant in affecting banks' loan growth rate, or marginally positive at most after 2009, not before. The results could suggest that the heightened capital requirements make the risk-based capital ratio more relevant than before, but still not sufficient to affect banks' lending decisions. Other factors such as bank's asset levels, non-performing loans, liquidity ratio and monetary policy matter more. In addition to the system GMM, I used other regression techniques such as ordinary least squares and fixed effects, which are commonly used for panel data, for models with and without the dynamic dependent variables as well. Results from the fixed effects model are similar to the results from the system GMM regressions, showing that the effects are weakly positive with standard variance and insignificant with robust variance. The results from the OLS regressions show a contradictory result which suggests a negative relationship between the capital ratio and loan growth after 2009. Because the results from these regression techniques might not be consistent due to endogeneity and mis-specification, I focus on the results from the system GMM regressions in the paper. I also used the change in the risk-based capital ratio instead of the level of the risk-based capital ratio, which obtains similar results. Results for regressions using other techniques are provided in the appendix for comparison.

6.2 Retained Earnings

The insignificant or marginally positive results from the previous sections imply that banks have not cut lending due to the heightened capital requirements as argued by some observers. Another topic this paper examines is how do banks raise the regulatory capital ratio if they do not cut loans, through retained earnings or common stock equity? As mentioned in the introduction, companies are generally reluctant to either cut dividend payout or issue common stocks. However, which one can be adjusted by banks flexibly and comfortably due to the regulatory push is the focus of this study. It aims to provide more evidence on banks' behavior reacting to the heightened risk-based capital requirements. All the regressions presented in this section use the percent change in banks' undivided profit as dependent variables. The results can give an indication on how banks manage their cumulative retained earnings when facing heightened capital requirements.

The regression results shown in Table 5 are based on the one step system GMM with robust variance. Two step system GMM is not available for these regressions due to column rank issues. Although the coefficients for the risk-based capital ratio are generally negative, none of them are statistically significant. The only significant factors might be nonperforming loans and assets level. The liquidity ratio is not significant in this case. As the results suggest, larger banks have a slower retained earnings growth rate compared with smaller banks. The reason could be that large and mature companies tend to pay their shareholders more dividends, while smaller companies tend to retain the income to invest in new opportunities. Banks with more nonperforming loans also have a slower retained earning growth rate, which means banks that have more bad loans would generate less income. The first lag of monetary policy is significantly negative before 2009. However, the cumulative effects for the linear combination shown below also suggest insignificant effects of monetary policy and the risk-based capital ratio. The weak negative relationship between the capital ratio and retained earnings growth

rate combined with the results from the regressions for common stock equity would give implications on the dynamic between the two capital sources, which I discuss below after the common stock equity section.

Other than the insignificant conclusions for the results, one alternative explanation is that the model could be over-specified. As one can see from Table 5, the dynamic lags of retained earnings are not significant like the dynamic lags of loan growth in the loan regressions. Thus the model with dynamic lags and the use of system GMM might not be appropriate. The ordinary least squares and fixed effects models without dynamic lags might be sufficient for a consistent estimation. Therefore, I estimated regressions using both OLS and FE as well. Because the correlation between the fixed effects and other explanatory variables is weak, I focus on the results from the OLS regressions and present them here.

Test for Linear Combination of Monetary Policy

	All Sample	Pre 2009	Post 2009
Cumulative Monetary Policy	24.6	-21.2	-118.2
	(0.96)	(-0.68)	(-0.64)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Test for Linear Combination of Capital Ratio

	All Sample	Pre 2009	Post 2009
Cumulative Capital Ratio	-0.020	-0.100	-0.0090
	(-0.73)	(-1.49)	(-0.34)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.5: Retained Earnings - One Step System GMM (Robust Variance)

	All Sample		Pre 2009		Post 2009	
Retained Earnings (-1)	0.0019	(1.37)	-0.00053	(-0.25)	0.0028	(0.90)
Retained Earnings (-2)	0.012	(1.35)	0.013	(0.97)	0.011	(0.99)
Retained Earnings (-3)	0.0019	(1.33)	-0.00015	(-0.05)	0.0030	(1.42)
Retained Earnings (-4)	-0.0013	(-0.60)	0.0017	(1.09)	-0.0023	(-0.73)
Capital Ratio (-1)	-0.0056	(-0.99)	-0.022	(-0.73)	-0.00025	(-0.05)
Capital Ratio (-2)	-0.0072	(-1.49)	-0.019	(-0.76)	-0.00029	(-0.08)
Capital Ratio (-3)	-0.0053	(-0.56)	-0.040	(-1.35)	-0.0025	(-0.39)
Capital Ratio (-4)	-0.00095	(-0.10)	-0.018	(-0.87)	-0.0028	(-0.35)
Capital Ratio (-5)	-0.0014	(-0.20)	-0.0011	(-0.15)	-0.0032	(-0.27)
Monetary Policy (-1)	-10.9	(-0.52)	-61.8*	(-2.28)	-161.3	(-1.14)
Monetary Policy (-2)	12.2	(1.08)	-15.9	(-0.75)	20.8	(1.09)
Monetary Policy (-3)	29.5	(1.13)	-4.90	(-0.15)	56.4	(1.62)
Monetary Policy (-4)	-6.19	(-0.32)	61.3	(1.84)	-34.1	(-0.53)
Net Charge-off	-4.24	(-0.41)	18.8	(1.15)	-2.77	(-0.14)
Nonperforming Loan	-8.95*	(-2.04)	-13.7	(-1.31)	-5.70	(-0.80)
Asset	-114.9	(-1.92)	-179.8	(-1.88)	-74.3	(-0.86)
Liquidity Ratio	0.90	(1.06)	0.78	(0.67)	0.75	(0.61)
Interest Expense	-74.0	(-0.99)	-1.91	(-0.04)	-167.6	(-0.81)
Income on Loan	-5.41	(-0.87)	-3.79	(-1.03)	-36.5	(-0.92)
Intermediation Cost	-20.2	(-1.51)	-31.1	(-1.23)	-2.59	(-1.10)
Observations	448340		206320		242020	

t statistics in parentheses

All variables are in lag form, number in parenthese indicate lag order

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The regression results shown in Table 6 are based on the model without the dynamic lags of the dependent variable. OLS is a consistent estimator if there is no correlation between the fixed effects and other explanatory variables. I tried regressions using both OLS and FE models. Due to the weak correlation, I focus on the OLS results here. As one can see, the risk-based capital ratio is not significant in affecting banks' cumulative retained earning growth. The first lag of monetary policy is significantly negative before 2009. The fourth lag is significantly positive. The lags are not significant cumulatively. Net charge-off has a positive relationship with retained earnings. This contradicts my prediction. This could due to the time effects before the recession, when net charge-offs rose as risks increased, while retained earnings were not reduced due to the rigid dividend payout policy. The liquidity ratio displays a negative relationship with retained earnings growth, suggesting that banks with more cash and securities in hand would have slower cumulative retained earnings growth. This could be due to the income cost of holding cash instead of investing it.

Test for Linear Combination of Monetary Policy

	All Sample	Pre 2009	Post 2009
Cumulative Monetary Policy	1.03	3.93	-37.2
	(0.06)	(0.27)	(-0.61)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.6: Retained Earnings - Model without Dynamic Lags using OLS (Robust Variance)

	All Sample	Pre 2009	Post 2009
Capital Ratio (-1)	0.0036	0.030	0.0015
	(1.63)	(1.32)	(0.90)
Monetary Policy (-1)	-4.57	-48.6*	-28.2
	(-0.36)	(-2.37)	(-0.58)
Monetary Policy (-2)	-6.81	-8.48	-5.31
	(-0.50)	(-0.47)	(-0.22)
Monetary Policy (-3)	5.15	6.24	-3.04
	(0.20)	(0.34)	(-0.07)
Monetary Policy (-4)	7.26	54.8**	-0.66
	(0.26)	(2.62)	(-0.01)
Net Charge-off	2.03	18.5*	3.23
	(0.32)	(2.21)	(0.31)
Nonperforming Loan	-1.49	-6.13	-0.058
	(-0.70)	(-0.96)	(-0.06)
Asset	2.92	-1.66	4.39
	(1.01)	(-0.56)	(1.27)
Liquidity Ratio	-0.72*	-0.55*	-1.40
	(-2.12)	(-2.11)	(-1.64)
Interest Expense	-4.29	0.87	-10.6
	(-0.65)	(0.14)	(-0.34)
Income on Loan	-6.22	-3.01	-26.2
	(-1.25)	(-1.10)	(-1.36)
Intermediation Cost	-1.47	-2.86	-0.18
	(-1.26)	(-1.26)	(-0.41)
Observations	448689	206512	242177

t statistics in parentheses
All variables are in lag form, number in parenthese indicate lag order
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In general, I do not think banks' cumulative retained earning growth rates are affected by the risk-based capital ratio or monetary policy due to their rigid dividend payout policy. Factors such as the risk-based capital ratio and monetary policy do not significantly affect banks' retained earnings across different regressions. Bank specific factors such as nonperforming loans, assets and the liquidity ratio are significant inconsistently depending on the regression used. The results could suggest that banks' cumulative retained earnings are deliberately managed and can not be changed easily. Combined with the results from the regressions for the common stock equity presented in the next section, I believe that common stock equity can be more flexibly adjusted by banks than retained earnings or dividend payout during times such as recession, or post-recession recovery. Common stocks can be issued during these bad times to build capital needed. However, cumulative retained earnings can not be easily built during these times due to bad loans and deteriorating profitability. On the other hand, retained earnings can be built gradually during good times through income, which might be a preferred way of raising capital compared with issuing common stock. Therefore, I believe that common stock equity is the main source of the regulatory capital during the crisis and the recovery since it is more easily adjustable than retained earnings, while cumulative retained earnings can be built up during good times.

6.3 Common Stock Equity

This section reports the regression results for the common stock equity specifications. As shown in Table 7, Most of the coefficients of the risk-based capital ratio are not significant except for the fourth lag. They are insignificant cumulatively. On the other hand, the coefficients for monetary policy are significantly negative before 2009, insignificant afterwards. This could suggest that a contractionary monetary policy would cause banks to repurchase more common stocks; an expansionary monetary policy would cause banks to raise more common stock equity before 2009. This could be due to the fact that a contractionary monetary policy would raise interest rates and banks' profitability, thus allow them to repurchase more common stocks. The negative relationship exists only before 2009, the sign of the coefficient changes after 2009. As demonstrated in the regression results based on a different cutoff period at 2009 Q3 presented next, the relationship between monetary policy and banks' common stock equity become significantly positive after 2009 Q3. I will explain this below after discussing the regression results.

Other than monetary policy, banks' assets levels have a negative effect on their common stock equity reflecting the size difference across banks. The coefficient for the liquidity ratio is significantly positive for the whole sample, suggesting that banks with more liquid assets would have faster growth in common stock equity. This could imply that banks that are in a safe place in terms of solvency would have better access to public funds, which may be due to a lower costs than banks that are in a panic situation. In addition, the coefficient on the income generated from loans is significantly negative before 2009, suggesting that higher income generated by loans can relieve banks from issuing more common stocks. Moreover, the coefficients for the dynamic lags of the dependent variable are significant at the first lags in this case. It justifies the use of a model with dynamic terms and the two step system GMM to reduce the endogeneity issue.

In addition to the baseline specification, I estimated the regressions using a different cutoff at 2009 Q3 as in the loan regressions. I also estimated regressions for the model without the dynamic lags using OLS and fixed effects models. Due to the strong correlation between the fixed effects and other explanatory variables, I focus and report the regression results for the fixed effects model below.

Test for Linear Combination of Monetary Policy

	All Sample	Pre 2009	Post 2009
Cumulative Monetary Policy	-0.0061	-0.040**	0.017
	(-1.19)	(-3.25)	(1.00)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Test for Linear Combination of Capital Ratio

	All Sample	Pre 2009	Post 2009
Cumulative Capital Ratio	-0.0000015	-0.000057	0.0000024
	(-0.14)	(-0.59)	(0.56)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.7: Common Stock Equity - Two Step System GMM (Robust Variance)

	All Sample		Pre 2009		Post 2009	
Common Stock Equity (-1)	-0.063***	(-4.26)	-0.044**	(-3.02)	-0.077**	(-3.08)
Common Stock Equity (-2)	-0.012	(-1.91)	-0.0072	(-0.84)	-0.014	(-1.28)
Common Stock Equity (-3)	-0.0093	(-1.19)	-0.00086	(-0.14)	-0.017	(-1.16)
Common Stock Equity (-4)	-0.020	(-1.63)	-0.0049	(-0.72)	-0.034	(-1.54)
Capital Ratio (-1)	0.0000040	(1.43)	-0.000013	(-0.37)	0.0000025	(0.77)
Capital Ratio (-2)	-0.0000020	(-0.54)	-0.000016	(-0.58)	-0.0000010	(-0.56)
Capital Ratio (-3)	-0.0000023	(-0.83)	-0.000011	(-0.54)	-0.0000016	(-0.47)
Capital Ratio (-4)	-0.0000042*	(-2.05)	-0.000012	(-0.74)	-0.00000097	(-0.53)
Capital Ratio (-5)	0.0000030	(1.01)	-0.0000056	(-1.34)	0.0000035	(0.93)
Monetary Policy (-1)	-0.00034	(-0.11)	0.0039	(1.20)	-0.0095	(-0.93)
Monetary Policy (-2)	-0.0043	(-1.42)	-0.0088*	(-2.03)	-0.0013	(-0.16)
Monetary Policy (-3)	0.00033	(0.09)	-0.021**	(-2.88)	0.019*	(2.16)
Monetary Policy (-4)	-0.0018	(-0.48)	-0.013*	(-2.01)	0.0087	(1.10)
Net Charge-off	-0.0010	(-0.24)	-0.0067	(-0.70)	0.0033	(0.81)
Nonperforming Loan	0.00026	(0.21)	-0.00046	(-0.45)	0.00018	(0.10)
Asset	-0.13***	(-3.31)	-0.25***	(-3.87)	-0.028	(-0.62)
Liquidity Ratio	0.0011*	(2.10)	0.0010	(1.31)	0.00056	(0.86)
Interest Expense	-0.011	(-1.76)	-0.0072	(-0.87)	-0.0081	(-0.99)
Income on Loan	-0.00077	(-1.94)	-0.0013*	(-2.48)	-0.00038	(-0.92)
Intermediation Cost	-0.00083	(-0.77)	-0.0015	(-0.90)	-0.0013	(-0.99)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, number in parenthese indicate lag order

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The regression results reported in Table 8 are based on the sub-samples with a cutoff period at 2009 Q3. The results are similar to the results from previous regressions. The risk-based capital ratio is not significant in affecting the growth rate of banks' common stock equity. The coefficients of monetary policy are negatively significant at the 10% significance level before 2009 Q3. Unlike the insignificant results from the previous regressions, the cumulative coefficient of monetary policy is positively significant after 2009 Q3. This could due to the general time trend effects when the sub-samples are changed. It could be that banks were raising their common stock equity capital while the fed was unwinding the expansionary monetary policy. Other bank specific factors such as assets level and income on loan remain negatively significant.

Test for Linear Combination of Monetary Policy

	Pre 2009Q3	Post 2009Q3
Cumulative Monetary Policy	-0.0088	0.13*
	(-1.96)	(1.98)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Test for Linear Combination of Capital Ratio

	Pre 2009Q3	Post 2009Q3
Cumulative Capital Ratio	-0.000065	0.0000021
	(-1.13)	(0.47)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.8: Common Stock Equity - Two Step System GMM (Robust Variance) Cutoff 2009Q3

	Pre 2009Q3		Post 2009Q3	
Common Stock Equity (-1)	-0.059***	(-3.85)	-0.065**	(-3.08)
Common Stock Equity (-2)	-0.014	(-1.44)	-0.0092	(-0.87)
Common Stock Equity (-3)	0.00092	(0.13)	-0.014	(-0.86)
Common Stock Equity (-4)	-0.0076	(-1.13)	-0.032	(-1.29)
Capital Ratio (-1)	-0.000020	(-1.04)	0.0000023	(0.70)
Capital Ratio (-2)	-0.000015	(-0.83)	-0.0000014	(-0.68)
Capital Ratio (-3)	-0.000013	(-1.12)	-0.0000021	(-0.63)
Capital Ratio (-4)	-0.000012	(-1.08)	7.7e-09	(0.00)
Capital Ratio (-5)	-0.0000047	(-1.71)	0.0000033	(0.94)
Monetary Policy (-1)	0.0058*	(2.08)	0.038	(1.19)
Monetary Policy (-2)	-0.000034	(-0.02)	0.026	(1.26)
Monetary Policy (-3)	-0.0087**	(-2.60)	0.019	(1.69)
Monetary Policy (-4)	-0.0058	(-1.57)	0.046*	(2.54)
Net Charge-off	-0.0066	(-0.88)	0.0031	(0.67)
Nonperforming Loan	-0.00045	(-0.48)	0.00053	(0.25)
Asset	-0.24***	(-4.00)	-0.017	(-0.37)
Liquidity Ratio	0.00086	(1.32)	0.00079	(1.05)
Interest Expense	-0.0038	(-0.76)	-0.0063	(-0.69)
Income on Loan	-0.0011*	(-2.23)	-0.00038	(-0.81)
Intermediation Cost	-0.00095	(-0.69)	-0.0015	(-0.81)
Observations	230927		218111	

t statistics in parentheses
All variables are in lag form
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Lastly, the regressions result presented in Table 9 are for a robustness check using the fixed effects model without dynamic lags. The results should be consistent if the dynamic lags are not present in the true model. The risk-based capital ratio remains insignificant across samples. The coefficient of the cumulative monetary policy effect becomes insignificant before 2009, but remains negative. The post 2009 cumulative effect of monetary policy is positively significant at the 10% significance level. Banks' asset levels remain negatively significant as before. The liquidity ratio is now positively significant before 2009 instead of for the whole sample period. The coefficient of income generated from the domestic loans changes its sign and becomes positively significant after 2009. This result contradicts the results from the previous regressions based on the two step system GMM. In this case, I would lean toward the previous conclusion given by the system GMM because it is consistent if the dynamic lags are present in the true model, while consistency does not hold for the fixed effects model estimates.

Test for Linear Combination of Monetary Policy

	All Sample	Pre 2009	Post 2009
Cumulative Monetary Policy	0.0020	-0.0020	0.022
	(0.66)	(-0.28)	(1.73)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.9: Common Stock Equity - Model without Dynamic Lags (Robust Variance) using FE

	All Sample	Pre 2009	Post 2009
Capital Ratio (-1)	-0.00000077	-0.000015	-0.00000038
	(-0.94)	(-1.51)	(-0.58)
Monetary Policy (-1)	0.0058*	0.016**	0.0032
	(2.19)	(2.97)	(0.30)
Monetary Policy (-2)	-0.0030	-0.00080	-0.0053
	(-1.01)	(-0.14)	(-0.66)
Monetary Policy (-3)	-0.000034	-0.0069	0.020
	(-0.01)	(-0.88)	(1.92)
Monetary Policy (-4)	-0.00081	-0.0099	0.0048
	(-0.24)	(-1.22)	(0.72)
Net Charge-off	-0.0037	-0.0097	-0.0014
	(-1.14)	(-0.90)	(-0.66)
Nonperforming Loan	0.000100	0.0013	0.00012
	(0.20)	(1.16)	(0.16)
Asset	-0.0084**	-0.021**	-0.0097
	(-3.29)	(-2.70)	(-1.38)
Liquidity Ratio	0.000059	0.00047*	-0.00012
	(0.66)	(2.19)	(-0.73)
Interest Expense	-0.00074	0.0028	0.0021
	(-0.73)	(1.11)	(0.75)
Income on Loan	0.00014	0.00024	0.00038**
	(0.73)	(0.45)	(2.67)
Intermediation Cost	-0.00012	-0.00021	-0.00033
	(-0.69)	(-0.61)	(-1.31)
Observations	449038	206697	242341

t statistics in parentheses
All variables are in lag form, number in parenthese indicate lag order
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In sum, I think that although banks' common stock equity is not affected by the risk-based capital ratio, it can be affected by monetary policy and other bank specific variables more easily than banks' rigid dividend payout policy. Due to the rigid dividend payout policy and bad economic outlook, banks cannot raise their capital level through retained earnings in a short time, but they could do it by issuing more common stock equity which can be more freely adjusted than retained earnings during recessions. On the other hand, banks could gradually build the regulatory capital without affecting loan growth during good times through retained earnings. Combined with the regression results from the previous sections, I believe that banks can adjust their common stock equity more freely during bad times to raise their regulatory capital ratio without cutting loans. Factors such as monetary policy, asset levels, nonperforming loans and liquidity ratio matter more than the risk-based capital ratio in affecting banks' decisions regarding their lending and capital sources.

Chapter 7

FUTURE EXTENSIONS

Based on the results from all the regressions, literature and empirical models, several extensions can be made in future studies.

First, I use lags for all the macroeconomic and bank specific variables to reduce endogeneity for regressions using the system GMM. In addition, one can go further to identify which bank specific variables are endogenous, predetermined, or exogenous based on the literature, and then treat every factor differently when estimating system GMM. Although this is difficult due to the ambiguity for each variable and their relationship with bank lending, it might improve the estimation consistency or efficiency. Alternatively, methods using the general equilibrium model might be better for this purpose. A summary of the revelent literature can be found in D'Erasmo (2018).

Second, interaction terms between monetary policy and the risk-based capital ratio can be added to study their relationship with bank lending. A specification with interaction could be:

$$\Delta \ln L_{i,t} = \alpha_i + \sum_{j=1}^{4} \beta_j \, \Delta \ln L_{i,t-j} + \eta \; CET1R_{i,t-1} + \sum_{j=1}^{4} \mu_j \, \Delta MP_{t-j} + \sum_{j=1}^{4} \lambda_j \, CET1R_{i,t-1} \cdot \Delta MP_{t-j} + \phi \; Z_{i,t-j} + \varepsilon_{i,t}$$

Due to its complexity for estimation and interpretation, I do not estimate this model it in this paper. I believe a simpler or more straightforward model and method would be sufficient and practical for the issue, but one can extend the model specification by

adding more relevant terms based on the information criterion given more time.

Lastly, the model for retained earnings and common stock equity can be refined for estimation and inference purposes. In this paper, I use the standard dynamic lending model as the base empirical specification because it better suits my main purpose. Alternatively, one can use the separate literature for retained earnings and common stock equity to extend the model.

Chapter 8

CONCLUSIONS

The current debate about banks' risk-based capital ratio is focused on its effects on bank lending and economic growth, and the optimal level of the capital standard. While the significance of the risk-based capital standard is still undecided, some believe that the risk-based capital ratio has a positive relationship with lending, while others believe that the relationship is negative. The question boils down to a question on banks' behavior. If the relationship between the risk-based capital ratio and bank lending is found to be positive, it could imply that banks raise their regulatory capital ratios through building more capital (numerator), which is sought by the regulators — the more capital banks have, the more they can lend. It could also suggest that the risk-based capital ratios are not at their optimal level. However, if the relationship is found to be negative, then banks could be raising their regulatory capital ratio by cutting risky loans (denominator), which reduces economic growth. This is not what regulators want from the regulatory enhancement. It could also suggest that the transition time is too short for banks to raise their regulatory capital ratios in a healthy way.

Based on the regressions results, I conclude that the risk-based capital ratio does not significantly affect banks' loan growth. Or it could affect banks loan growth with a marginal, positive effect. This marginal positive relationship makes sense that banks could lend more if risks are held constant, which is true in the standard dynamic lending model. The relationship could become negative if risks are not taken into consideration. Other factors such as bank's asset level, non-performing loans, the liquidity ratio and monetary policy matter more to banks' lending decisions. Monetary policy is effective

in boosting or reducing bank lending before the recession, but not so effective after the recession when capital requirements are heightened. This could be due to the heightened capital requirements or other issues related to the recession. The little variation in the federal funds rate between 2009 and 2015, and the coincidence between the Fed's unwinding monetary policy and the recovered loan demand could provide an explanation for the positive effects of monetary policy after 2009. Future investigation is needed to draw a conclusion. In addition, the risk-based capital ratio does not significantly affect banks' retained earnings. The risk-based capital ratio could have an effect on banks' common stock equity, as could monetary policy. My results are consistent with the existing literature. As suggested by the existing literature, the risk-based capital ratio might not significantly affect bank lending. The effects are positive and economically insignificant even if it does have effects on lending, not negative. Similar to the literature, retained earnings are not affected by the capital ratio. Based on the results, banks' common stock equities can be more flexibly adjusted, and easily affected by the capital ratio and monetary policy than their retained earnings.

Based on the observations from all the regressions, I believe that the risk-based capital ratio do not significantly affect bank lending, or does not affect it negatively. I think the requirements have not achieve the optimal ratio. Thus, it is not necessary to relax the heightened capital requirements so soon. In addition, some observers argue that some sectors exhibit a trend of a bubble again 10 years after the recession. However, I am uncertain if the regulators should make the risk-based capital requirements more stringent, which might cause a negative effect on economic growth in equilibrium.

Chapter 9

APPENDIX

Other Test Statistics[1]

[1]The Arellano-Bond auto-correlation tests of system GMM, residual tests, tests for validity of the proxy, and other tests are performed in STATA. Test statistics can be provided if requested.

Table 9.1: One Step System GMM (Standard Variance)

	All Sample		Pre 2009		Post 2009	
Loan Growth (-1)	-0.24***	(-158.17)	-0.18***	(-75.56)	-0.29***	(-139.87)
Loan Growth (-2)	-0.074***	(-45.54)	-0.066***	(-26.79)	-0.076***	(-34.25)
Loan Growth (-3)	-0.097***	(-57.24)	-0.041***	(-15.91)	-0.13***	(-54.27)
Loan Growth (-4)	0.0017	(1.45)	-0.015***	(-9.23)	0.015***	(8.19)
Capital Ratio	0.000019***	(3.46)	0.000066**	(2.94)	0.000011*	(2.11)
Monetary Policy (-1)	-0.0050*	(-2.23)	-0.0042	(-0.86)	0.10***	(13.84)
Monetary Policy (-2)	-0.0080***	(-3.52)	-0.028***	(-6.74)	0.0077	(1.12)
Monetary Policy (-3)	0.00021	(0.09)	-0.051***	(-7.85)	0.046***	(8.88)
Monetary Policy (-4)	0.0026	(0.99)	-0.031***	(-4.57)	0.014**	(3.02)
GDP (-1)	-0.66***	(-5.61)	-2.76***	(-9.84)	0.33	(1.58)
GDP (-2)	0.019	(0.16)	-0.53	(-0.86)	0.18	(0.90)
GDP (-3)	0.022	(0.16)	1.30**	(2.62)	1.23***	(5.97)
GDP (-4)	-0.44**	(-3.22)	0.059	(0.11)	0.016	(0.08)
Inflation (-1)	-0.0047***	(-4.97)	-0.0037	(-1.83)	0.0035*	(2.27)
Inflation (-2)	0.00043	(0.51)	0.0015	(0.60)	0.0069***	(4.84)
Inflation (-3)	-0.0037***	(-4.48)	0.0047	(1.82)	-0.00069	(-0.51)
Inflation (-4)	-0.0011	(-1.21)	0.0037	(1.10)	0.0022	(1.55)
Unemployment (-1)	-0.0059*	(-1.97)	-0.074***	(-6.94)	-0.0066	(-1.68)
Unemployment (-2)	-0.0050	(-1.66)	-0.012	(-0.92)	-0.00075	(-0.17)
Unemployment (-3)	0.012***	(3.36)	-0.025	(-1.83)	-0.025***	(-4.02)
Unemployment (-4)	-0.014***	(-5.09)	-0.080***	(-9.04)	-0.0029	(-0.71)
State Personal Income (-1)	0.082***	(4.30)	-0.023	(-0.83)	0.22***	(7.76)
State Personal Income (-2)	0.081***	(4.40)	-0.0093	(-0.34)	0.22***	(8.70)
State Personal Income (-3)	-0.25***	(-13.83)	-0.44***	(-15.43)	0.056*	(2.21)
State Personal Income (-4)	-0.14***	(-7.53)	-0.19***	(-6.13)	0.050	(1.95)
Net Charge-off	0.012***	(8.47)	0.017***	(6.49)	-0.0059***	(-3.58)
Nonperforming Loan	-0.0010	(-1.72)	-0.0032**	(-3.21)	-0.0029***	(-4.04)
Asset	-0.35***	(-90.21)	-0.52***	(-69.14)	-0.44***	(-65.69)
Liquidity Ratio	0.0100***	(65.26)	0.012***	(45.83)	0.0082***	(42.73)
Interest Expense	0.0036*	(2.50)	-0.039***	(-11.99)	0.067***	(26.07)
Income on Loan	0.0019***	(7.91)	0.00027	(0.52)	0.0024***	(8.85)
Intermediation Cost	0.0012**	(3.11)	-0.0027***	(-5.02)	0.0066***	(10.78)
q2	0.026***	(18.08)	0.023***	(7.86)	0.026***	(12.16)
q3	0.024***	(17.72)	0.021***	(6.84)	0.031***	(16.49)
q4	0.011***	(8.47)	0.011***	(4.16)	0.014***	(6.53)
Constant	6.48***	(85.39)	10.5***	(68.09)	8.33***	(62.77)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.2: One Step System GMM (Robust Variance)

	All Sample		Pre 2009		Post 2009	
Loan Growth (-1)	-0.24***	(-4.43)	-0.18***	(-3.48)	-0.29***	(-3.65)
Loan Growth (-2)	-0.074*	(-2.57)	-0.066*	(-2.16)	-0.076	(-1.26)
Loan Growth (-3)	-0.097*	(-2.41)	-0.041	(-1.11)	-0.13**	(-2.95)
Loan Growth (-4)	0.0017	(0.11)	-0.015	(-1.12)	0.015	(0.56)
Capital Ratio	0.000019	(1.49)	0.000066	(1.03)	0.000011	(1.27)
Monetary Policy (-1)	-0.0050	(-0.35)	-0.0042	(-0.49)	0.10***	(3.73)
Monetary Policy (-2)	-0.0080*	(-2.05)	-0.028***	(-3.47)	0.0077	(0.33)
Monetary Policy (-3)	0.00021	(0.02)	-0.051***	(-3.60)	0.046*	(2.25)
Monetary Policy (-4)	0.0026	(0.26)	-0.031*	(-2.55)	0.014	(0.92)
GDP (-1)	-0.66	(-1.49)	-2.76***	(-3.78)	0.33	(0.33)
GDP (-2)	0.019	(0.05)	-0.53	(-0.44)	0.18	(0.25)
GDP (-3)	0.022	(0.05)	1.30	(1.47)	1.23	(1.66)
GDP (-4)	-0.44	(-1.21)	0.059	(0.05)	0.016	(0.02)
Inflation (-1)	-0.0047	(-1.67)	-0.0037	(-0.78)	0.0035	(0.77)
Inflation (-2)	0.00043	(0.15)	0.0015	(0.30)	0.0069*	(2.22)
Inflation (-3)	-0.0037	(-1.74)	0.0047	(1.09)	-0.00069	(-0.17)
Inflation (-4)	-0.0011	(-0.50)	0.0037	(0.58)	0.0022	(0.42)
Unemployment (-1)	-0.0059	(-0.45)	-0.074**	(-2.91)	-0.0066	(-0.27)
Unemployment (-2)	-0.0050	(-0.63)	-0.012	(-0.68)	-0.00075	(-0.07)
Unemployment (-3)	0.012	(1.31)	-0.025	(-1.51)	-0.025	(-1.18)
Unemployment (-4)	-0.014	(-1.04)	-0.080**	(-2.89)	-0.0029	(-0.16)
State Personal Income (-1)	0.082	(0.83)	-0.023	(-0.25)	0.22	(1.16)
State Personal Income (-2)	0.081	(1.12)	-0.0093	(-0.11)	0.22	(1.72)
State Personal Income (-3)	-0.25	(-1.20)	-0.44	(-1.04)	0.056	(0.70)
State Personal Income (-4)	-0.14	(-1.29)	-0.19	(-0.83)	0.050	(0.72)
Net Charge-off	0.012	(1.50)	0.017	(1.49)	-0.0059	(-0.45)
Nonperforming Loan	-0.0010	(-0.61)	-0.0032**	(-2.85)	-0.0029	(-1.47)
Asset	-0.35***	(-7.57)	-0.52***	(-5.55)	-0.44***	(-4.19)
Liquidity Ratio	0.0100***	(7.01)	0.012***	(5.80)	0.0082***	(4.99)
Interest Expense	0.0036	(0.13)	-0.039	(-1.81)	0.067	(1.51)
Income on Loan	0.0019	(0.54)	0.00027	(0.03)	0.0024	(0.63)
Intermediation Cost	0.0012	(0.32)	-0.0027	(-0.53)	0.0066	(1.04)
q2	0.026*	(2.39)	0.023	(0.88)	0.026*	(2.15)
q3	0.024***	(3.32)	0.021	(1.12)	0.031***	(3.51)
q4	0.011*	(2.46)	0.011	(1.22)	0.014	(1.65)
Constant	6.48***	(7.06)	10.5***	(5.48)	8.33***	(4.05)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.3: Two Step System GMM (Robust Variance)

	All Sample		Pre 2009		Post 2009	
Loan Growth (-1)	-0.24***	(-4.43)	-0.18***	(-3.50)	-0.29***	(-3.65)
Loan Growth (-2)	-0.074**	(-2.58)	-0.066*	(-2.23)	-0.076	(-1.26)
Loan Growth (-3)	-0.097*	(-2.42)	-0.039	(-1.12)	-0.13**	(-2.95)
Loan Growth (-4)	0.0019	(0.12)	-0.013	(-0.98)	0.015	(0.57)
Capital Ratio	0.000020	(1.37)	0.000089	(0.59)	0.000011	(1.12)
Monetary Policy (-1)	-0.0031	(-0.30)	-0.0070	(-1.17)	0.084***	(3.41)
Monetary Policy (-2)	-0.0057*	(-2.02)	-0.018***	(-3.85)	0.0080	(0.50)
Monetary Policy (-3)	-0.00040	(-0.06)	-0.038***	(-4.96)	0.036*	(2.30)
Monetary Policy (-4)	0.0015	(0.21)	-0.025**	(-3.04)	0.013	(1.08)
GDP (-1)	-0.47	(-1.47)	-1.96***	(-4.99)	0.30	(0.44)
GDP (-2)	-0.047	(-0.16)	0.13	(0.18)	0.18	(0.34)
GDP (-3)	0.045	(0.14)	0.51	(1.12)	0.90	(1.81)
GDP (-4)	-0.33	(-1.25)	0.23	(0.51)	0.061	(0.10)
Inflation (-1)	-0.0033	(-1.53)	-0.0021	(-0.59)	0.0031	(0.95)
Inflation (-2)	0.00056	(0.28)	0.0011	(0.31)	0.0047*	(2.30)
Inflation (-3)	-0.0027	(-1.47)	0.0046*	(2.25)	0.000087	(0.03)
Inflation (-4)	-0.00041	(-0.28)	0.0026	(0.92)	0.0013	(0.36)
Unemployment (-1)	-0.0061	(-0.62)	-0.060***	(-3.82)	-0.0084	(-0.49)
Unemployment (-2)	-0.0024	(-0.40)	0.0053	(0.67)	0.00070	(0.09)
Unemployment (-3)	0.0088	(1.28)	-0.033***	(-3.57)	-0.016	(-1.13)
Unemployment (-4)	-0.012	(-1.24)	-0.036*	(-2.14)	-0.0063	(-0.47)
State Personal Income (-1)	0.077	(0.82)	-0.045	(-0.51)	0.21	(1.20)
State Personal Income (-2)	0.077	(1.12)	-0.042	(-0.50)	0.21	(1.74)
State Personal Income (-3)	-0.25	(-1.24)	-0.40	(-0.95)	0.048	(0.62)
State Personal Income (-4)	-0.15	(-1.35)	-0.19	(-0.82)	0.042	(0.63)
Net Charge-off	0.011	(1.45)	0.0051	(0.49)	-0.0056	(-0.47)
Nonperforming Loan	-0.0015	(-1.31)	-0.0032***	(-5.34)	-0.0032*	(-2.40)
Asset	-0.34***	(-7.45)	-0.45***	(-5.59)	-0.43***	(-4.11)
Liquidity Ratio	0.0095***	(6.81)	0.010***	(6.18)	0.0078***	(4.91)
Interest Expense	0.0041	(0.17)	-0.027	(-1.85)	0.066	(1.53)
Income on Loan	0.0020	(0.57)	0.00091	(0.12)	0.0024	(0.63)
Intermediation Cost	0.0013	(0.35)	-0.0025	(-0.49)	0.0066	(1.04)
q2	0.023*	(2.21)	0.018	(0.75)	0.024*	(2.06)
q3	0.021**	(3.09)	0.019	(1.14)	0.027**	(3.15)
q4	0.010**	(2.61)	0.0080	(0.93)	0.012	(1.91)
Constant	6.23***	(6.98)	8.83***	(5.50)	8.09***	(3.99)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.4: Two Step System GMM (Robust Variance) with More Capital Lags

	All Sample		Pre 2009		Post 2009	
Loan Growth (-1)	-0.24***	(-4.44)	-0.18***	(-3.51)	-0.29***	(-3.66)
Loan Growth (-2)	-0.074**	(-2.58)	-0.067*	(-2.25)	-0.077	(-1.27)
Loan Growth (-3)	-0.097*	(-2.42)	-0.039	(-1.13)	-0.13**	(-2.96)
Loan Growth (-4)	0.0016	(0.10)	-0.013	(-0.98)	0.014	(0.54)
Capital Ratio (-1)	0.000036	(1.73)	0.00015	(0.82)	0.000034	(1.75)
Capital Ratio (-2)	0.000023	(1.42)	0.000099	(0.82)	0.000021	(1.28)
Capital Ratio (-3)	0.000012	(0.90)	0.000048	(0.60)	0.000011	(0.63)
Capital Ratio (-4)	-0.0000075	(-0.64)	0.000042	(0.63)	-0.000019	(-1.54)
Capital Ratio (-5)	0.000011	(0.86)	-0.000013	(-0.41)	0.000029*	(2.01)
Monetary Policy (-1)	-0.0031	(-0.30)	-0.0070	(-1.17)	0.084***	(3.41)
Monetary Policy (-2)	-0.0058*	(-2.02)	-0.018***	(-3.81)	0.0080	(0.49)
Monetary Policy (-3)	-0.00042	(-0.06)	-0.038***	(-4.80)	0.036*	(2.31)
Monetary Policy (-4)	0.0015	(0.21)	-0.025**	(-2.99)	0.013	(1.09)
GDP (-1)	-0.47	(-1.47)	-1.95***	(-4.92)	0.30	(0.44)
GDP (-2)	-0.048	(-0.16)	0.14	(0.19)	0.18	(0.34)
GDP (-3)	0.044	(0.14)	0.50	(1.09)	0.90	(1.82)
GDP (-4)	-0.33	(-1.26)	0.23	(0.51)	0.060	(0.10)
Inflation (-1)	-0.0033	(-1.54)	-0.0020	(-0.58)	0.0031	(0.94)
Inflation (-2)	0.00055	(0.28)	0.0012	(0.32)	0.0047*	(2.31)
Inflation (-3)	-0.0027	(-1.47)	0.0045*	(2.23)	0.000072	(0.02)
Inflation (-4)	-0.00042	(-0.28)	0.0025	(0.90)	0.0013	(0.35)
Unemployment (-1)	-0.0061	(-0.63)	-0.060***	(-3.74)	-0.0085	(-0.49)
Unemployment (-2)	-0.0024	(-0.40)	0.0054	(0.68)	0.00076	(0.10)
Unemployment (-3)	0.0088	(1.29)	-0.033***	(-3.56)	-0.016	(-1.13)
Unemployment (-4)	-0.012	(-1.24)	-0.035*	(-2.08)	-0.0063	(-0.47)
State Personal Income (-1)	0.077	(0.82)	-0.045	(-0.51)	0.21	(1.20)
State Personal Income (-2)	0.077	(1.12)	-0.042	(-0.51)	0.21	(1.74)
State Personal Income (-3)	-0.25	(-1.24)	-0.40	(-0.95)	0.048	(0.62)
State Personal Income (-4)	-0.15	(-1.35)	-0.19	(-0.83)	0.042	(0.63)
Net Charge-off	0.011	(1.45)	0.0052	(0.50)	-0.0056	(-0.47)
Nonperforming Loan	-0.0015	(-1.29)	-0.0032***	(-5.32)	-0.0032*	(-2.38)
Asset	-0.34***	(-7.47)	-0.44***	(-5.42)	-0.43***	(-4.16)
Liquidity Ratio	0.0095***	(6.80)	0.010***	(6.13)	0.0077***	(4.90)
Interest Expense	0.0040	(0.17)	-0.027	(-1.82)	0.065	(1.53)
Income on Loan	0.0020	(0.56)	0.00091	(0.12)	0.0024	(0.61)
Intermediation Cost	0.0014	(0.36)	-0.0025	(-0.50)	0.0067	(1.06)
q2	0.023*	(2.21)	0.018	(0.76)	0.024*	(2.05)
q3	0.021**	(3.08)	0.019	(1.14)	0.027**	(3.14)
q4	0.010**	(2.60)	0.0080	(0.92)	0.012	(1.90)
Constant	6.23***	(7.01)	8.76***	(5.32)	8.13***	(4.03)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.5: Two Step System GMM (Robust Variance) with Cutoff at 2009 Q3

	Pre 2009Q3		Post 2009Q3	
Loan Growth (-1)	-0.20***	(-3.63)	-0.28***	(-3.62)
Loan Growth (-2)	-0.067*	(-2.37)	-0.070	(-1.12)
Loan Growth (-3)	-0.037	(-1.16)	-0.16**	(-2.58)
Loan Growth (-4)	-0.0075	(-0.69)	0.0027	(0.09)
Capital Ratio (-1)	0.00016	(0.96)	0.000035*	(2.17)
Capital Ratio (-2)	0.000058	(0.75)	0.000020	(1.52)
Capital Ratio (-3)	0.000055	(0.90)	0.0000089	(0.67)
Capital Ratio (-4)	0.000028	(0.73)	-0.000017	(-1.57)
Capital Ratio (-5)	-0.0000072	(-0.65)	0.000028**	(2.84)
Monetary Policy (-1)	-0.000019	(-0.00)	0.061*	(2.04)
Monetary Policy (-2)	-0.0012	(-0.45)	0.010	(0.30)
Monetary Policy (-3)	-0.0053	(-1.37)	0.0032	(0.19)
Monetary Policy (-4)	-0.011*	(-2.30)	0.036*	(2.09)
GDP (-1)	-1.34***	(-3.43)	0.41	(0.62)
GDP (-2)	-0.94*	(-2.02)	0.076	(0.16)
GDP (-3)	-1.18***	(-3.69)	0.86	(1.78)
GDP (-4)	-0.65**	(-3.23)	-0.18	(-0.37)
Inflation (-1)	0.0023	(0.98)	0.0047	(1.46)
Inflation (-2)	0.00079	(0.35)	0.0035	(1.57)
Inflation (-3)	0.0014	(0.54)	0.0020	(0.69)
Inflation (-4)	0.00048	(0.26)	0.00064	(0.14)
Unemployment (-1)	-0.040**	(-2.92)	-0.0079	(-0.57)
Unemployment (-2)	0.041***	(3.32)	-0.0080	(-0.51)
Unemployment (-3)	0.0019	(0.26)	-0.013	(-0.92)
Unemployment (-4)	-0.027*	(-2.17)	-0.0047	(-0.32)
State Personal Income (-1)	-0.060	(-0.71)	0.19	(0.94)
State Personal Income (-2)	-0.039	(-0.48)	0.25	(1.72)
State Personal Income (-3)	-0.35	(-0.95)	0.0098	(0.09)
State Personal Income (-4)	-0.12	(-0.65)	0.065	(0.82)
Net Charge-off	0.0084	(0.98)	-0.0072	(-0.52)
Nonperforming Loan	-0.0025***	(-3.52)	-0.0025	(-1.63)
Asset	-0.37***	(-5.65)	-0.44***	(-4.02)
Liquidity Ratio	0.0091***	(6.52)	0.0081***	(4.50)
Interest Expense	0.0063	(0.75)	0.079	(1.38)
Income on Loan	0.00016	(0.02)	0.0027	(0.70)
Intermediation Cost	-0.0010	(-0.25)	0.0078	(1.03)
q2	0.019	(0.80)	0.024	(1.90)
q3	0.018	(1.10)	0.028**	(3.15)
q4	0.0032	(0.38)	0.012	(1.79)
Constant	6.82***	(5.46)	8.24***	(3.89)
Observations	230927		218111	

t statistics in parentheses

All variables are in lag form

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.6: Model without Dynamic Dependent Variables using OLS (Standard Variance)

	All Sample		Pre 2009		Post 2009	
Capital Ratio (-1)	-0.0000035	(-1.81)	0.0000039	(0.56)	-0.0000044*	(-2.23)
Monetary Policy (-1)	0.0051*	(2.53)	0.0011	(0.23)	0.0032	(0.34)
Monetary Policy (-2)	-0.00053	(-0.22)	-0.0039	(-0.91)	-0.0032	(-0.37)
Monetary Policy (-3)	0.0016	(0.67)	-0.0015	(-0.26)	-0.0024	(-0.29)
Monetary Policy (-4)	-0.0085***	(-3.44)	-0.013*	(-2.01)	-0.0049	(-1.02)
GDP (-1)	-0.32**	(-3.18)	-0.84**	(-3.05)	-0.079	(-0.37)
GDP (-2)	0.024	(0.20)	0.070	(0.11)	0.22	(0.99)
GDP (-3)	0.36**	(2.76)	-0.14	(-0.26)	0.36	(1.61)
GDP (-4)	0.026	(0.22)	-0.44	(-0.85)	-0.47*	(-2.32)
Inflation (-1)	0.0019*	(2.16)	-0.00067	(-0.36)	-0.00055	(-0.33)
Inflation (-2)	0.0015	(1.86)	0.0031	(1.26)	0.0017	(1.06)
Inflation (-3)	-0.00039	(-0.46)	-0.0014	(-0.52)	0.000077	(0.05)
Inflation (-4)	0.0021*	(2.43)	0.0018	(0.56)	0.00089	(0.62)
Unemployment (-1)	-0.0070*	(-2.51)	-0.031**	(-2.95)	-0.0052	(-1.28)
Unemployment (-2)	0.0073*	(2.26)	0.0035	(0.27)	0.0061	(1.12)
Unemployment (-3)	0.0029	(0.81)	0.018	(1.20)	-0.0070	(-1.04)
Unemployment (-4)	-0.0061*	(-2.56)	0.0037	(0.42)	0.0027	(0.69)
State Personal Income (-1)	0.055**	(3.28)	0.0054	(0.23)	0.11***	(4.24)
State Personal Income (-2)	0.048**	(2.84)	0.032	(1.38)	0.074**	(2.86)
State Personal Income (-3)	-0.19***	(-11.56)	-0.40***	(-16.07)	0.0068	(0.28)
State Personal Income (-4)	0.018	(1.09)	0.060*	(2.39)	-0.015	(-0.63)
Net Charge-off	-0.014***	(-15.02)	-0.0090***	(-5.52)	-0.017***	(-15.14)
Nonperforming Loan	-0.0050***	(-22.92)	-0.0069***	(-16.44)	-0.0043***	(-16.65)
Asset	0.00099**	(3.09)	-0.00019	(-0.39)	0.0021***	(4.90)
Liquidity Ratio	-0.00021***	(-7.18)	-0.00034***	(-7.39)	-0.00013***	(-3.46)
Interest Expense	0.0019**	(2.97)	-0.0016	(-1.66)	0.0075***	(5.77)
Income on Loan	-0.00045*	(-2.14)	-0.0025***	(-5.51)	0.00027	(1.14)
Intermediation Cost	0.00012	(1.84)	0.00019*	(2.02)	-0.000020	(-0.22)
q2	0.016***	(10.75)	0.0087**	(2.99)	0.020***	(8.85)
q3	0.011***	(8.00)	0.0094**	(2.94)	0.014***	(6.60)
q4	0.0030*	(2.20)	0.000081	(0.03)	0.0073**	(3.23)
Constant	0.020**	(2.76)	0.094***	(4.86)	-0.010	(-1.07)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.7: Model without Dynamic Dependent Variables using OLS (Robust Variance)

	All Sample		Pre 2009		Post 2009	
Capital Ratio (-1)	-0.0000035	(-1.62)	0.0000039	(0.38)	-0.0000044	(-1.89)
Monetary Policy (-1)	0.0051	(0.70)	0.0011	(0.22)	0.0032	(0.38)
Monetary Policy (-2)	-0.00053	(-0.23)	-0.0039	(-0.83)	-0.0032	(-0.36)
Monetary Policy (-3)	0.0016	(0.27)	-0.0015	(-0.27)	-0.0024	(-0.30)
Monetary Policy (-4)	-0.0085	(-1.43)	-0.013	(-1.74)	-0.0049	(-0.38)
GDP (-1)	-0.32*	(-2.51)	-0.84**	(-3.18)	-0.079	(-0.24)
GDP (-2)	0.024	(0.08)	0.070	(0.09)	0.22	(0.46)
GDP (-3)	0.36	(1.37)	-0.14	(-0.24)	0.36	(1.06)
GDP (-4)	0.026	(0.11)	-0.44	(-0.82)	-0.47	(-0.70)
Inflation (-1)	0.0019	(0.96)	-0.00067	(-0.26)	-0.00055	(-0.25)
Inflation (-2)	0.0015	(0.69)	0.0031	(1.45)	0.0017	(0.85)
Inflation (-3)	-0.00039	(-0.23)	-0.0014	(-0.50)	0.000077	(0.04)
Inflation (-4)	0.0021	(1.13)	0.0018	(0.61)	0.00089	(0.37)
Unemployment (-1)	-0.0070	(-0.66)	-0.031**	(-2.63)	-0.0052	(-0.40)
Unemployment (-2)	0.0073	(1.81)	0.0035	(0.30)	0.0061	(0.93)
Unemployment (-3)	0.0029	(0.47)	0.018	(1.09)	-0.0070	(-1.06)
Unemployment (-4)	-0.0061	(-1.08)	0.0037	(0.40)	0.0027	(0.20)
State Personal Income (-1)	0.055	(1.03)	0.0054	(0.12)	0.11	(0.96)
State Personal Income (-2)	0.048	(1.82)	0.032*	(1.96)	0.074	(1.21)
State Personal Income (-3)	-0.19	(-0.94)	-0.40	(-0.97)	0.0068	(0.41)
State Personal Income (-4)	0.018	(1.00)	0.060	(1.68)	-0.015	(-0.75)
Net Charge-off	-0.014**	(-2.88)	-0.0090**	(-3.01)	-0.017*	(-2.30)
Nonperforming Loan	-0.0050***	(-8.90)	-0.0069***	(-8.65)	-0.0043***	(-3.45)
Asset	0.00099	(1.72)	-0.00019	(-0.24)	0.0021*	(2.38)
Liquidity Ratio	-0.00021	(-1.88)	-0.00034**	(-2.73)	-0.00013	(-0.51)
Interest Expense	0.0019	(0.26)	-0.0016	(-0.85)	0.0075	(0.23)
Income on Loan	-0.00045	(-0.51)	-0.0025	(-1.53)	0.00027	(0.42)
Intermediation Cost	0.00012	(0.47)	0.00019	(0.56)	-0.000020	(-0.05)
q2	0.016***	(5.10)	0.0087	(1.48)	0.020***	(6.94)
q3	0.011***	(4.73)	0.0094	(1.88)	0.014***	(4.84)
q4	0.0030	(1.68)	0.000081	(0.03)	0.0073**	(2.69)
Constant	0.020	(1.16)	0.094*	(2.24)	-0.010	(-0.54)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.8: Model without Dynamic Dependent Variables using FE (Standard Variance)

	All Sample		Pre 2009		Post 2009	
Capital Ratio (-1)	-0.0000033	(-1.12)	0.000057***	(3.88)	-0.0000042	(-1.33)
Monetary Policy (-1)	0.0027	(1.34)	-0.0013	(-0.29)	0.0093	(0.99)
Monetary Policy (-2)	-0.0034	(-1.45)	-0.0063	(-1.47)	0.00040	(0.05)
Monetary Policy (-3)	0.0028	(1.16)	-0.0045	(-0.77)	-0.0035	(-0.41)
Monetary Policy (-4)	-0.0039	(-1.58)	-0.018**	(-2.88)	0.0016	(0.33)
GDP (-1)	-0.71***	(-6.93)	-1.32***	(-4.86)	-0.043	(-0.20)
GDP (-2)	-0.16	(-1.25)	-0.29	(-0.45)	0.11	(0.50)
GDP (-3)	0.078	(0.59)	0.021	(0.04)	0.39	(1.74)
GDP (-4)	-0.29*	(-2.33)	-0.82	(-1.58)	-0.56**	(-2.71)
Inflation (-1)	0.00015	(0.17)	0.00073	(0.40)	-0.00029	(-0.18)
Inflation (-2)	0.0011	(1.28)	0.0039	(1.57)	0.0017	(1.06)
Inflation (-3)	-0.0010	(-1.23)	-0.00019	(-0.07)	0.00022	(0.13)
Inflation (-4)	0.00095	(1.10)	0.00040	(0.13)	0.000069	(0.05)
Unemployment (-1)	-0.012***	(-4.21)	-0.041***	(-3.92)	-0.0080	(-1.96)
Unemployment (-2)	0.0067*	(2.10)	0.0033	(0.25)	0.0024	(0.45)
Unemployment (-3)	0.011**	(2.96)	0.014	(0.97)	-0.0064	(-0.95)
Unemployment (-4)	-0.0086***	(-3.55)	-0.013	(-1.48)	0.0046	(1.18)
State Personal Income (-1)	0.052**	(3.10)	0.022	(0.94)	0.11***	(4.26)
State Personal Income (-2)	0.040*	(2.38)	0.040	(1.70)	0.064*	(2.45)
State Personal Income (-3)	-0.21***	(-12.69)	-0.40***	(-15.88)	-0.012	(-0.47)
State Personal Income (-4)	-0.00024	(-0.01)	0.033	(1.28)	-0.030	(-1.27)
Net Charge-off	-0.012***	(-11.72)	-0.0039*	(-1.97)	-0.0093***	(-7.23)
Nonperforming Loan	-0.0064***	(-22.92)	-0.0078***	(-13.16)	-0.0051***	(-12.29)
Asset	-0.036***	(-25.01)	-0.094***	(-27.67)	-0.034***	(-11.73)
Liquidity Ratio	0.00077***	(13.45)	0.0024***	(19.88)	0.0011***	(12.11)
Interest Expense	-0.00012	(-0.15)	-0.011***	(-6.16)	0.025***	(12.41)
Income on Loan	-0.00020	(-0.93)	-0.0018***	(-3.61)	0.00069**	(2.77)
Intermediation Cost	0.00025	(1.57)	-0.000070	(-0.27)	0.0010***	(3.40)
q2	0.018***	(12.18)	0.013***	(4.41)	0.024***	(10.34)
q3	0.014***	(9.76)	0.013***	(4.15)	0.017***	(8.45)
q4	0.0046***	(3.37)	0.0019	(0.68)	0.0092***	(4.07)
Constant	0.70***	(24.81)	1.96***	(28.84)	0.65***	(11.28)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.9: Model without Dynamic Dependent Variables using FE (Robust Variance)

	All Sample		Pre 2009		Post 2009	
Capital Ratio (-1)	-0.0000033	(-0.74)	0.000057	(1.40)	-0.0000042	(-0.96)
Monetary Policy (-1)	0.0027	(0.50)	-0.0013	(-0.22)	0.0093	(1.34)
Monetary Policy (-2)	-0.0034	(-1.41)	-0.0063	(-1.35)	0.00040	(0.05)
Monetary Policy (-3)	0.0028	(0.63)	-0.0045	(-0.74)	-0.0035	(-0.43)
Monetary Policy (-4)	-0.0039	(-0.72)	-0.018**	(-2.58)	0.0016	(0.17)
GDP (-1)	-0.71***	(-4.14)	-1.32***	(-5.12)	-0.043	(-0.15)
GDP (-2)	-0.16	(-0.58)	-0.29	(-0.36)	0.11	(0.30)
GDP (-3)	0.078	(0.32)	0.021	(0.03)	0.39	(1.23)
GDP (-4)	-0.29	(-1.28)	-0.82	(-1.53)	-0.56	(-1.01)
Inflation (-1)	0.00015	(0.09)	0.00073	(0.31)	-0.00029	(-0.14)
Inflation (-2)	0.0011	(0.68)	0.0039	(1.77)	0.0017	(1.00)
Inflation (-3)	-0.0010	(-0.65)	-0.00019	(-0.06)	0.00022	(0.12)
Inflation (-4)	0.00095	(0.59)	0.00040	(0.13)	0.000069	(0.03)
Unemployment (-1)	-0.012	(-1.37)	-0.041**	(-3.02)	-0.0080	(-0.73)
Unemployment (-2)	0.0067	(1.47)	0.0033	(0.23)	0.0024	(0.39)
Unemployment (-3)	0.011	(1.81)	0.014	(0.89)	-0.0064	(-0.89)
Unemployment (-4)	-0.0086	(-1.85)	-0.013	(-1.29)	0.0046	(0.41)
State Personal Income (-1)	0.052	(0.99)	0.022	(0.56)	0.11	(0.97)
State Personal Income (-2)	0.040	(1.50)	0.040*	(2.23)	0.064	(1.07)
State Personal Income (-3)	-0.21	(-1.06)	-0.40	(-0.97)	-0.012	(-0.64)
State Personal Income (-4)	-0.00024	(-0.01)	0.033	(0.83)	-0.030	(-1.59)
Net Charge-off	-0.012	(-1.86)	-0.0039	(-0.64)	-0.0093	(-1.32)
Nonperforming Loan	-0.0064***	(-9.51)	-0.0078***	(-6.48)	-0.0051***	(-6.47)
Asset	-0.036***	(-5.71)	-0.094***	(-5.01)	-0.034**	(-2.71)
Liquidity Ratio	0.00077***	(3.61)	0.0024***	(3.96)	0.0011***	(3.83)
Interest Expense	-0.00012	(-0.02)	-0.011	(-1.90)	0.025	(1.04)
Income on Loan	-0.00020	(-0.24)	-0.0018	(-0.84)	0.00069	(1.12)
Intermediation Cost	0.00025	(0.30)	-0.000070	(-0.06)	0.0010	(0.66)
q2	0.018***	(6.25)	0.013	(1.83)	0.024***	(9.38)
q3	0.014***	(5.61)	0.013	(1.86)	0.017***	(6.63)
q4	0.0046**	(2.62)	0.0019	(0.45)	0.0092***	(3.47)
Constant	0.70***	(5.74)	1.96***	(5.37)	0.65**	(2.62)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.10: Two Step System GMM (Robust Variance) with Change in the Capital Ratio

	All Sample		Pre 2009		Post 2009		Cutoff 2009Q3	
Loan Growth (-1)	-0.24***	(-4.49)	-0.18***	(-3.49)	-0.29***	(-3.67)	-0.28***	(-3.60)
Loan Growth (-2)	-0.074**	(-2.64)	-0.071*	(-2.13)	-0.078	(-1.29)	-0.076	(-1.22)
Loan Growth (-3)	-0.10**	(-2.62)	-0.046	(-1.31)	-0.13**	(-3.00)	-0.17**	(-2.64)
Loan Growth (-4)	-0.015	(-0.59)	-0.036	(-1.55)	0.0099	(0.26)	-0.0023	(-0.06)
Change in Capital Ratio (-1)	0.000035	(1.74)	0.00016	(0.97)	0.000033	(1.60)	0.000038*	(2.01)
Change in Capital Ratio (-2)	0.000052	(1.65)	0.00020	(1.04)	0.000049	(1.48)	0.000054	(1.81)
Change in Capital Ratio (-3)	0.000052	(1.61)	0.00018	(0.94)	0.000047	(1.46)	0.000052	(1.71)
Change in Capital Ratio (-4)	0.000026	(1.14)	0.00014	(1.07)	0.000010	(0.55)	0.000019	(0.89)
Change in Capital Ratio (-5)	0.000019	(1.66)	0.0000073	(0.35)	0.000019	(1.37)	0.000029	(1.74)
Monetary Policy (-1)	-0.0024	(-0.24)	-0.0062	(-0.92)	0.086***	(3.52)	0.060*	(2.05)
Monetary Policy (-2)	-0.0056	(-1.52)	-0.021	(-1.62)	0.0079	(0.49)	0.0076	(0.22)
Monetary Policy (-3)	-0.00084	(-0.12)	-0.040***	(-5.13)	0.037*	(2.36)	0.0034	(0.20)
Monetary Policy (-4)	0.00072	(0.09)	-0.022	(-1.47)	0.013	(1.14)	0.037*	(2.13)
GDP (-1)	-0.47	(-1.51)	-2.04***	(-5.66)	0.32	(0.47)	0.41	(0.60)
GDP (-2)	-0.042	(-0.11)	0.31	(0.23)	0.16	(0.30)	0.043	(0.09)
GDP (-3)	0.039	(0.10)	0.88	(0.73)	0.90	(1.81)	0.87	(1.81)
GDP (-4)	-0.30	(-1.05)	0.41	(0.46)	0.062	(0.11)	-0.19	(-0.40)
Inflation (-1)	-0.0037	(-1.89)	-0.0037	(-0.65)	0.0027	(0.80)	0.0045	(1.37)
Inflation (-2)	0.00012	(0.06)	-0.000054	(-0.01)	0.0047*	(2.30)	0.0035	(1.57)
Inflation (-3)	-0.0031	(-1.64)	0.0032	(1.03)	-0.00026	(-0.09)	0.0020	(0.68)
Inflation (-4)	-0.00057	(-0.37)	0.0013	(0.25)	0.0013	(0.34)	0.00078	(0.18)
Unemployment (-1)	-0.0065	(-0.61)	-0.057**	(-2.70)	-0.0091	(-0.53)	-0.0086	(-0.63)
Unemployment (-2)	-0.0028	(-0.44)	0.00070	(0.10)	0.00077	(0.10)	-0.0092	(-0.59)
Unemployment (-3)	0.0096	(1.23)	-0.040	(-1.05)	-0.016	(-1.14)	-0.013	(-0.96)
Unemployment (-4)	-0.012	(-1.13)	-0.041**	(-2.83)	-0.0060	(-0.46)	-0.0036	(-0.24)
State Personal Income (-1)	0.074	(0.77)	-0.026	(-0.27)	0.19	(1.10)	0.18	(0.88)
State Personal Income (-2)	0.068	(0.97)	-0.031	(-0.37)	0.20	(1.66)	0.24	(1.66)
State Personal Income (-3)	-0.27	(-1.29)	-0.44	(-1.02)	0.036	(0.45)	0.0020	(0.02)
State Personal Income (-4)	-0.16	(-1.47)	-0.22	(-0.97)	0.031	(0.44)	0.062	(0.75)
Net Charge-off	0.010	(1.39)	0.0056	(0.67)	-0.0055	(-0.47)	-0.0072	(-0.52)
Nonperforming Loan	-0.0016	(-1.40)	-0.0036***	(-5.05)	-0.0032*	(-2.36)	-0.0025	(-1.63)
Asset	-0.35***	(-7.46)	-0.45***	(-5.24)	-0.44***	(-4.30)	-0.45***	(-4.07)
Liquidity Ratio	0.0096***	(6.74)	0.010***	(6.18)	0.0078***	(4.87)	0.0081***	(4.50)
Interest Expense	0.0048	(0.19)	-0.036	(-1.64)	0.067	(1.59)	0.085	(1.52)
Income on Loan	0.0018	(0.49)	0.00049	(0.07)	0.0023	(0.58)	0.0026	(0.66)
Intermediation Cost	0.00081	(0.20)	-0.0044	(-0.71)	0.0071	(1.12)	0.0084	(1.10)
q2	0.023*	(2.13)	0.017	(0.70)	0.024*	(2.03)	0.024	(1.92)
q3	0.021**	(2.97)	0.018	(1.06)	0.027**	(3.12)	0.028**	(3.16)
q4	0.010*	(2.57)	0.0082	(0.94)	0.012	(1.90)	0.012	(1.81)
Constant	6.42***	(6.99)	8.95***	(5.31)	8.37***	(4.16)	8.40***	(3.94)
Observations	438837		196685		242152		218033	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: One step system GMM is used for the bank group subjected to both Basel and the stress tests due to data availability. Two step system GMM is used for the other two bank groups.

Table 9.11: System GMM (Robust Variance) for Bank Groups

	Either Basel or Stress		Both		Neither	
Loan Growth (-1)	-0.16*	(-2.04)	-0.63***	(-4.54)	-0.51***	(-5.39)
Loan Growth (-2)	-0.013	(-0.27)	-0.24	(-1.42)	-0.27*	(-2.40)
Loan Growth (-3)	-0.036	(-0.88)	-0.48**	(-3.05)	-0.24***	(-4.24)
Loan Growth (-4)	-0.058	(-1.20)	-0.45	(-1.53)	0.036	(1.45)
Capital Ratio (-1)	0.000022	(1.13)	0.000021	(1.58)	0.000019	(0.25)
Capital Ratio (-2)	0.000014	(1.15)	0.000018*	(2.56)	0.000034	(0.73)
Capital Ratio (-3)	0.000013	(0.62)	-0.0000043	(-0.39)	0.000015	(0.58)
Capital Ratio (-4)	-0.0000034	(-0.20)	-0.000021	(-1.83)	-0.000032	(-0.80)
Capital Ratio (-5)	0.000037	(1.25)	0.0000022	(0.12)	0.000063	(0.94)
Monetary Policy (-1)	0.063	(0.67)	-0.64	(-1.79)	0.040*	(2.25)
Monetary Policy (-2)	0.15*	(2.15)	-0.85*	(-2.16)	0.0025	(0.24)
Monetary Policy (-3)	0.059	(0.68)	0.85*	(2.48)	0.011	(1.07)
Monetary Policy (-4)	0.064	(0.64)	0.66	(1.28)	-0.014	(-1.74)
GDP (-1)	2.10	(0.38)	-48.1*	(-2.41)	0.034	(0.12)
GDP (-2)	2.19	(0.58)			0.31	(0.66)
GDP (-3)	4.58*	(2.30)	7.98	(0.58)	0.99*	(2.46)
GDP (-4)	0.19	(0.06)	33.6*	(2.39)	0.48	(0.96)
Inflation (-1)	0.031	(1.81)	-0.12	(-1.82)	-0.00041	(-0.21)
Inflation (-2)	0.013	(0.55)	0.26**	(2.63)	0.0029*	(2.32)
Inflation (-3)	0.027	(1.48)	0.012	(0.26)	-0.0014	(-0.63)
Inflation (-4)	-0.0045	(-0.14)	0.35*	(2.54)	0.0040	(1.69)
Unemployment (-1)	0.064	(1.10)	0.12	(0.42)	0.0067	(0.47)
Unemployment (-2)	-0.017	(-0.52)	-0.058	(-0.45)	0.0030	(0.58)
Unemployment (-3)	-0.027	(-0.25)	-0.25	(-0.83)	-0.020	(-1.62)
Unemployment (-4)	-0.033	(-0.32)	0.25	(1.23)	0.0013	(0.16)
State Personal Income (-1)	0.29	(0.74)	-3.07	(-1.26)	0.0036	(0.04)
State Personal Income (-2)	0.16	(0.55)	-0.057	(-0.03)	0.0058	(0.15)
State Personal Income (-3)	-0.059	(-0.26)	-0.71	(-1.26)	-0.051	(-0.91)
State Personal Income (-4)	0.012	(0.09)	-0.96	(-1.15)	-0.039	(-1.06)
Net Charge-off	0.0013	(0.02)	0.083	(0.57)	0.0011	(0.29)
Nonperforming Loan	-0.017	(-1.18)	0.070	(1.01)	-0.0041***	(-5.64)
Asset	-0.43**	(-2.96)	0.81**	(2.81)	-0.18***	(-4.13)
Liquidity Ratio	0.010*	(2.47)	-0.010	(-1.02)	0.0040***	(3.35)
Interest Expense	-0.00095	(-0.00)	-1.25	(-1.85)	0.050	(1.59)
Income on Loan	0.0057	(1.22)	-0.018	(-0.35)	-0.013*	(-2.46)
Intermediation Cost	0.015	(0.98)	-0.029	(-1.35)	0.0063	(1.08)
q2	0.029	(1.16)	0.25*	(1.97)	-0.018	(-1.23)
q3	0.024	(0.86)	0.27*	(2.06)	-0.0045	(-0.46)
q4	-0.0026	(-0.11)	0.19*	(2.07)	0.0034	(0.75)
Constant	8.26**	(2.79)	-18.5**	(-2.77)	3.40***	(4.07)
Observations	55850		3287		186491	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.12: Retained Earnings - One Step System GMM (Robust Variance)

	All Sample		Pre 2009		Post 2009	
Retained Earnings (-1)	0.0019	(1.37)	-0.00053	(-0.25)	0.0028	(0.90)
Retained Earnings (-2)	0.012	(1.35)	0.013	(0.97)	0.011	(0.99)
Retained Earnings (-3)	0.0019	(1.33)	-0.00015	(-0.05)	0.0030	(1.42)
Retained Earnings (-4)	-0.0013	(-0.60)	0.0017	(1.09)	-0.0023	(-0.73)
Capital Ratio (-1)	-0.0056	(-0.99)	-0.022	(-0.73)	-0.00025	(-0.05)
Capital Ratio (-2)	-0.0072	(-1.49)	-0.019	(-0.76)	-0.00029	(-0.08)
Capital Ratio (-3)	-0.0053	(-0.56)	-0.040	(-1.35)	-0.0025	(-0.39)
Capital Ratio (-4)	-0.00095	(-0.10)	-0.018	(-0.87)	-0.0028	(-0.35)
Capital Ratio (-5)	-0.0014	(-0.20)	-0.0011	(-0.15)	-0.0032	(-0.27)
Monetary Policy (-1)	-10.9	(-0.52)	-61.8*	(-2.28)	-161.3	(-1.14)
Monetary Policy (-2)	12.2	(1.08)	-15.9	(-0.75)	20.8	(1.09)
Monetary Policy (-3)	29.5	(1.13)	-4.90	(-0.15)	56.4	(1.62)
Monetary Policy (-4)	-6.19	(-0.32)	61.3	(1.84)	-34.1	(-0.53)
GDP (-1)	-1849.3**	(-2.60)	-2802.3	(-1.86)	-923.8	(-0.94)
GDP (-2)	-54.1	(-0.09)	9740.1**	(3.06)	-646.5	(-0.75)
GDP (-3)	314.7	(0.37)	151.9	(0.07)	-851.5	(-1.16)
GDP (-4)	242.6	(0.29)	4128.7	(0.99)	204.6	(0.23)
Inflation (-1)	4.51	(1.03)	-4.30	(-0.35)	-8.25	(-1.26)
Inflation (-2)	7.39	(1.73)	29.7**	(2.67)	11.3*	(2.06)
Inflation (-3)	6.31	(1.39)	-15.8	(-1.64)	-7.73	(-1.47)
Inflation (-4)	6.89	(1.88)	-5.39	(-0.32)	16.3	(1.20)
Unemployment (-1)	30.9	(1.71)	107.4	(1.48)	21.0	(0.59)
Unemployment (-2)	-23.4	(-1.84)	-64.5	(-1.60)	18.9	(0.90)
Unemployment (-3)	3.91	(0.22)	-190.2*	(-2.56)	-31.1	(-0.95)
Unemployment (-4)	-19.1	(-0.94)	101.1	(1.89)	2.19	(0.14)
State Personal Income (-1)	132.8	(0.87)	243.9	(0.91)	-53.9	(-0.50)
State Personal Income (-2)	111.3	(0.98)	201.4	(0.99)	-44.5	(-0.35)
State Personal Income (-3)	127.3	(1.51)	221.6	(1.59)	-17.6	(-0.20)
State Personal Income (-4)	62.0	(1.18)	152.5	(1.95)	-173.1	(-1.37)
Net Charge-off	-4.24	(-0.41)	18.8	(1.15)	-2.77	(-0.14)
Nonperforming Loan	-8.95*	(-2.04)	-13.7	(-1.31)	-5.70	(-0.80)
Asset	-114.9	(-1.92)	-179.8	(-1.88)	-74.3	(-0.86)
Liquidity Ratio	0.90	(1.06)	0.78	(0.67)	0.75	(0.61)
Interest Expense	-74.0	(-0.99)	-1.91	(-0.04)	-167.6	(-0.81)
Income on Loan	-5.41	(-0.87)	-3.79	(-1.03)	-36.5	(-0.92)
Intermediation Cost	-20.2	(-1.51)	-31.1	(-1.23)	-2.59	(-1.10)
q2	-23.3	(-0.98)	-34.9	(-1.82)	-95.9	(-0.85)
q3	-13.3	(-0.95)	-22.1	(-1.19)	-85.6	(-0.99)
q4	-17.0	(-1.44)	-26.6*	(-2.28)	-34.0	(-0.91)
Constant	2422.8*	(2.10)	3664.2	(1.95)	1640.4	(0.95)
Observations	448340		206320		242020	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.13: Retained Earnings - Model without Dynamic Lags using OLS (Standard Variance)

	All Sample		Pre 2009		Post 2009	
Capital Ratio (-1)	0.0036	(0.22)	0.030	(0.87)	0.0015	(0.07)
Monetary Policy (-1)	-4.57	(-0.26)	-48.6*	(-2.17)	-28.2	(-0.27)
Monetary Policy (-2)	-6.81	(-0.33)	-8.48	(-0.40)	-5.31	(-0.05)
Monetary Policy (-3)	5.15	(0.25)	6.24	(0.22)	-3.04	(-0.03)
Monetary Policy (-4)	7.26	(0.34)	54.8	(1.73)	-0.66	(-0.01)
GDP (-1)	-631.5	(-0.73)	-1695.8	(-1.26)	-1396.5	(-0.59)
GDP (-2)	885.8	(0.83)	8721.5**	(2.69)	1883.2	(0.77)
GDP (-3)	1527.8	(1.35)	-21.7	(-0.01)	1103.9	(0.44)
GDP (-4)	512.0	(0.49)	3436.0	(1.35)	2153.4	(0.95)
Inflation (-1)	-8.42	(-1.12)	-2.52	(-0.28)	-17.3	(-0.92)
Inflation (-2)	4.86	(0.69)	24.1*	(1.98)	14.3	(0.82)
Inflation (-3)	4.49	(0.61)	-13.0	(-1.00)	2.51	(0.13)
Inflation (-4)	8.72	(1.17)	-5.36	(-0.34)	10.3	(0.64)
Unemployment (-1)	42.7	(1.78)	104.1*	(2.01)	28.6	(0.63)
Unemployment (-2)	-50.8	(-1.83)	-50.7	(-0.79)	-27.8	(-0.46)
Unemployment (-3)	44.5	(1.43)	-157.2*	(-2.16)	62.0	(0.82)
Unemployment (-4)	-30.1	(-1.45)	114.2**	(2.62)	-56.0	(-1.30)
State Personal Income (-1)	-105.5	(-0.73)	-82.1	(-0.73)	-92.9	(-0.33)
State Personal Income (-2)	-14.9	(-0.10)	-1.18	(-0.01)	-46.9	(-0.16)
State Personal Income (-3)	3.68	(0.03)	109.0	(0.91)	-51.3	(-0.19)
State Personal Income (-4)	-57.3	(-0.39)	51.2	(0.42)	-245.6	(-0.93)
Net Charge-off	2.03	(0.26)	18.5*	(2.32)	3.23	(0.26)
Nonperforming Loan	-1.49	(-0.78)	-6.13**	(-2.97)	-0.058	(-0.02)
Asset	2.92	(1.05)	-1.66	(-0.69)	4.39	(0.92)
Liquidity Ratio	-0.72**	(-2.74)	-0.55*	(-2.46)	-1.40**	(-2.84)
Interest Expense	-4.29	(-0.78)	0.87	(0.18)	-10.6	(-0.73)
Income on Loan	-6.22	(-1.87)	-3.01	(-1.35)	-26.2**	(-2.81)
Intermediation Cost	-1.47**	(-2.64)	-2.86***	(-6.24)	-0.18	(-0.19)
q2	-8.69	(-0.57)	-34.3*	(-2.41)	-21.4	(-0.63)
q3	-9.03	(-0.68)	-21.2	(-1.35)	-33.9	(-1.23)
q4	-13.1	(-1.08)	-27.1*	(-1.98)	-10.6	(-0.40)
Constant	-46.6	(-0.74)	-45.1	(-0.48)	-10.3	(-0.09)
Observations	448689		206512		242177	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.14: Retained Earnings - Model without Dynamic Lags using OLS (Robust Variance)

	All Sample		Pre 2009		Post 2009	
Capital Ratio (-1)	0.0036	(1.63)	0.030	(1.32)	0.0015	(0.90)
Monetary Policy (-1)	-4.57	(-0.36)	-48.6*	(-2.37)	-28.2	(-0.58)
Monetary Policy (-2)	-6.81	(-0.50)	-8.48	(-0.47)	-5.31	(-0.22)
Monetary Policy (-3)	5.15	(0.20)	6.24	(0.34)	-3.04	(-0.07)
Monetary Policy (-4)	7.26	(0.26)	54.8**	(2.62)	-0.66	(-0.01)
GDP (-1)	-631.5	(-1.22)	-1695.8	(-1.35)	-1396.5	(-1.27)
GDP (-2)	885.8	(1.10)	8721.5**	(3.02)	1883.2	(0.86)
GDP (-3)	1527.8	(1.34)	-21.7	(-0.01)	1103.9	(0.70)
GDP (-4)	512.0	(0.73)	3436.0	(1.16)	2153.4	(1.24)
Inflation (-1)	-8.42	(-0.74)	-2.52	(-0.28)	-17.3	(-1.38)
Inflation (-2)	4.86	(1.26)	24.1*	(2.53)	14.3	(1.83)
Inflation (-3)	4.49	(0.94)	-13.0	(-1.29)	2.51	(0.36)
Inflation (-4)	8.72	(1.90)	-5.36	(-0.65)	10.3	(1.46)
Unemployment (-1)	42.7*	(2.18)	104.1	(1.82)	28.6	(1.20)
Unemployment (-2)	-50.8*	(-2.30)	-50.7	(-1.34)	-27.8	(-0.81)
Unemployment (-3)	44.5	(0.94)	-157.2*	(-2.27)	62.0	(0.94)
Unemployment (-4)	-30.1	(-0.91)	114.2**	(2.64)	-56.0	(-1.13)
State Personal Income (-1)	-105.5	(-1.24)	-82.1	(-0.82)	-92.9	(-0.74)
State Personal Income (-2)	-14.9	(-0.76)	-1.18	(-0.06)	-46.9	(-0.86)
State Personal Income (-3)	3.68	(0.05)	109.0	(1.12)	-51.3	(-1.57)
State Personal Income (-4)	-57.3	(-0.83)	51.2	(1.36)	-245.6	(-1.61)
Net Charge-off	2.03	(0.32)	18.5*	(2.21)	3.23	(0.31)
Nonperforming Loan	-1.49	(-0.70)	-6.13	(-0.96)	-0.058	(-0.06)
Asset	2.92	(1.01)	-1.66	(-0.56)	4.39	(1.27)
Liquidity Ratio	-0.72*	(-2.12)	-0.55*	(-2.11)	-1.40	(-1.64)
Interest Expense	-4.29	(-0.65)	0.87	(0.14)	-10.6	(-0.34)
Income on Loan	-6.22	(-1.25)	-3.01	(-1.10)	-26.2	(-1.36)
Intermediation Cost	-1.47	(-1.26)	-2.86	(-1.26)	-0.18	(-0.41)
q2	-8.69	(-0.41)	-34.3*	(-2.27)	-21.4	(-0.43)
q3	-9.03	(-0.82)	-21.2	(-1.42)	-33.9	(-0.99)
q4	-13.1	(-1.34)	-27.1*	(-2.25)	-10.6	(-0.72)
Constant	-46.6	(-0.69)	-45.1	(-0.61)	-10.3	(-0.17)
Observations	448689		206512		242177	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.15: Common Stock Equity - Two Step System GMM (Robust Variance)

	All Sample		Pre 2009		Post 2009	
Common Stock Equity (-1)	-0.063***	(-4.26)	-0.044**	(-3.02)	-0.077**	(-3.08)
Common Stock Equity (-2)	-0.012	(-1.91)	-0.0072	(-0.84)	-0.014	(-1.28)
Common Stock Equity (-3)	-0.0093	(-1.19)	-0.00086	(-0.14)	-0.017	(-1.16)
Common Stock Equity (-4)	-0.020	(-1.63)	-0.0049	(-0.72)	-0.034	(-1.54)
Capital Ratio (-1)	0.0000040	(1.43)	-0.000013	(-0.37)	0.0000025	(0.77)
Capital Ratio (-2)	-0.0000020	(-0.54)	-0.000016	(-0.58)	-0.0000010	(-0.56)
Capital Ratio (-3)	-0.0000023	(-0.83)	-0.000011	(-0.54)	-0.0000016	(-0.47)
Capital Ratio (-4)	-0.0000042*	(-2.05)	-0.000012	(-0.74)	-0.00000097	(-0.53)
Capital Ratio (-5)	0.0000030	(1.01)	-0.0000056	(-1.34)	0.0000035	(0.93)
Monetary Policy (-1)	-0.00034	(-0.11)	0.0039	(1.20)	-0.0095	(-0.93)
Monetary Policy (-2)	-0.0043	(-1.42)	-0.0088*	(-2.03)	-0.0013	(-0.16)
Monetary Policy (-3)	0.00033	(0.09)	-0.021**	(-2.88)	0.019*	(2.16)
Monetary Policy (-4)	-0.0018	(-0.48)	-0.013*	(-2.01)	0.0087	(1.10)
GDP (-1)	0.055	(0.32)	-0.64*	(-2.15)	-0.44	(-1.20)
GDP (-2)	-0.22	(-1.29)	-1.00*	(-2.04)	-0.43	(-1.25)
GDP (-3)	0.32	(1.41)	0.40	(1.12)	-0.100	(-0.36)
GDP (-4)	-0.48*	(-2.13)	-0.26	(-0.50)	-0.87**	(-2.67)
Inflation (-1)	0.000082	(0.05)	0.0032	(1.62)	-0.00061	(-0.29)
Inflation (-2)	-0.00080	(-0.61)	-0.00030	(-0.15)	-0.00020	(-0.10)
Inflation (-3)	0.00043	(0.36)	0.0080**	(3.27)	-0.0014	(-0.85)
Inflation (-4)	-0.00099	(-0.67)	0.0012	(0.46)	0.000044	(0.02)
Unemployment (-1)	-0.0031	(-0.71)	-0.032**	(-2.85)	-0.0010	(-0.15)
Unemployment (-2)	0.0017	(0.40)	0.018*	(2.09)	-0.0071	(-1.15)
Unemployment (-3)	-0.0031	(-0.65)	-0.011	(-0.77)	-0.0018	(-0.21)
Unemployment (-4)	0.0018	(0.41)	-0.022*	(-2.27)	0.0069	(0.98)
State Personal Income (-1)	-0.0079	(-0.22)	0.016	(0.39)	-0.097	(-1.56)
State Personal Income (-2)	-0.012	(-0.41)	0.0032	(0.09)	-0.085	(-1.70)
State Personal Income (-3)	-0.021	(-1.00)	0.011	(0.39)	-0.060	(-1.86)
State Personal Income (-4)	-0.015	(-0.61)	0.023	(1.05)	-0.028	(-1.08)
Net Charge-off	-0.0010	(-0.24)	-0.0067	(-0.70)	0.0033	(0.81)
Nonperforming Loan	0.00026	(0.21)	-0.00046	(-0.45)	0.00018	(0.10)
Asset	-0.13***	(-3.31)	-0.25***	(-3.87)	-0.028	(-0.62)
Liquidity Ratio	0.0011*	(2.10)	0.0010	(1.31)	0.00056	(0.86)
Interest Expense	-0.011	(-1.76)	-0.0072	(-0.87)	-0.0081	(-0.99)
Income on Loan	-0.00077	(-1.94)	-0.0013*	(-2.48)	-0.00038	(-0.92)
Intermediation Cost	-0.00083	(-0.77)	-0.0015	(-0.90)	-0.0013	(-0.99)
q2	-0.00083	(-0.38)	-0.0065*	(-2.45)	0.0036	(1.15)
q3	-0.0019	(-0.89)	-0.0031	(-1.12)	0.0016	(0.56)
q4	-0.0016	(-0.87)	-0.0029	(-1.60)	0.00068	(0.24)
Constant	2.53***	(3.33)	4.91***	(3.84)	0.55	(0.65)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.16: Common Stock Equity - Two Step System GMM (Robust Variance) Cutoff 2009Q3

	Pre 2009Q3		Post 2009Q3	
Common Stock Equity (-1)	-0.059***	(-3.85)	-0.065**	(-3.08)
Common Stock Equity (-2)	-0.014	(-1.44)	-0.0092	(-0.87)
Common Stock Equity (-3)	0.00092	(0.13)	-0.014	(-0.86)
Common Stock Equity (-4)	-0.0076	(-1.13)	-0.032	(-1.29)
Capital Ratio (-1)	-0.000020	(-1.04)	0.0000023	(0.70)
Capital Ratio (-2)	-0.000015	(-0.83)	-0.0000014	(-0.68)
Capital Ratio (-3)	-0.000013	(-1.12)	-0.0000021	(-0.63)
Capital Ratio (-4)	-0.000012	(-1.08)	7.7e-09	(0.00)
Capital Ratio (-5)	-0.0000047	(-1.71)	0.0000033	(0.94)
Monetary Policy (-1)	0.0058*	(2.08)	0.038	(1.19)
Monetary Policy (-2)	-0.000034	(-0.02)	0.026	(1.26)
Monetary Policy (-3)	-0.0087**	(-2.60)	0.019	(1.69)
Monetary Policy (-4)	-0.0058	(-1.57)	0.046*	(2.54)
GDP (-1)	-0.40*	(-2.00)	-0.012	(-0.03)
GDP (-2)	-1.31***	(-4.77)	-0.59	(-1.75)
GDP (-3)	-0.24	(-0.92)	-0.43	(-1.39)
GDP (-4)	-0.62*	(-2.39)	-1.11***	(-3.32)
Inflation (-1)	0.0052**	(3.02)	-0.0013	(-0.56)
Inflation (-2)	-0.0016	(-1.10)	-0.0030	(-1.24)
Inflation (-3)	0.0045**	(2.77)	-0.0057*	(-2.51)
Inflation (-4)	-0.00038	(-0.18)	-0.0066	(-1.96)
Unemployment (-1)	-0.022**	(-2.65)	-0.0039	(-0.65)
Unemployment (-2)	0.030***	(3.65)	0.00079	(0.12)
Unemployment (-3)	0.0025	(0.25)	0.0028	(0.32)
Unemployment (-4)	-0.019**	(-2.66)	0.0014	(0.18)
State Personal Income (-1)	0.012	(0.30)	-0.12	(-1.61)
State Personal Income (-2)	0.0076	(0.24)	-0.094	(-1.62)
State Personal Income (-3)	0.0092	(0.36)	-0.068	(-1.79)
State Personal Income (-4)	0.025	(1.14)	-0.044	(-1.55)
Net Charge-off	-0.0066	(-0.88)	0.0031	(0.67)
Nonperforming Loan	-0.00045	(-0.48)	0.00053	(0.25)
Asset	-0.24***	(-4.00)	-0.017	(-0.37)
Liquidity Ratio	0.00086	(1.32)	0.00079	(1.05)
Interest Expense	-0.0038	(-0.76)	-0.0063	(-0.69)
Income on Loan	-0.0011*	(-2.23)	-0.00038	(-0.81)
Intermediation Cost	-0.00095	(-0.69)	-0.0015	(-0.81)
q2	-0.0049*	(-2.26)	0.0021	(0.66)
q3	-0.0028	(-1.44)	0.0026	(0.74)
q4	-0.0037*	(-2.04)	0.00046	(0.16)
Constant	4.49***	(4.02)	0.32	(0.35)
Observations	230927		218111	

t statistics in parentheses
All variables are in lag form
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.17: Common Stock Equity - Model without Dynamic Lags (Robust Variance) using FE

	All Sample		Pre 2009		Post 2009	
Capital Ratio (-1)	-0.00000077	(-0.94)	-0.000015	(-1.51)	-0.00000038	(-0.58)
Monetary Policy (-1)	0.0058*	(2.19)	0.016**	(2.97)	0.0032	(0.30)
Monetary Policy (-2)	-0.0030	(-1.01)	-0.00080	(-0.14)	-0.0053	(-0.66)
Monetary Policy (-3)	-0.000034	(-0.01)	-0.0069	(-0.88)	0.020	(1.92)
Monetary Policy (-4)	-0.00081	(-0.24)	-0.0099	(-1.22)	0.0048	(0.72)
GDP (-1)	-0.13	(-0.96)	-0.034	(-0.10)	-0.46	(-1.64)
GDP (-2)	-0.31	(-1.91)	-1.64*	(-2.01)	-0.075	(-0.25)
GDP (-3)	0.38	(1.83)	0.37	(0.52)	0.057	(0.18)
GDP (-4)	-0.29	(-1.73)	-0.94	(-1.25)	-0.50	(-1.87)
Inflation (-1)	-0.000035	(-0.03)	0.0046	(1.91)	-0.00096	(-0.47)
Inflation (-2)	-0.000045	(-0.04)	0.00042	(0.13)	-0.0013	(-0.64)
Inflation (-3)	0.00083	(0.76)	0.0078*	(2.27)	-0.0011	(-0.59)
Inflation (-4)	-0.00050	(-0.39)	0.0017	(0.40)	-0.00023	(-0.11)
Unemployment (-1)	-0.0028	(-0.73)	-0.030*	(-2.02)	0.00014	(0.03)
Unemployment (-2)	0.0065	(1.52)	0.027	(1.61)	0.00029	(0.04)
Unemployment (-3)	-0.0021	(-0.46)	0.021	(1.09)	0.0022	(0.24)
Unemployment (-4)	-0.0020	(-0.63)	-0.020	(-1.86)	-0.0034	(-0.63)
State Personal Income (-1)	0.017	(1.47)	0.026	(1.46)	0.014	(0.90)
State Personal Income (-2)	0.0036	(0.38)	0.0016	(0.13)	0.012	(0.81)
State Personal Income (-3)	-0.015	(-1.27)	-0.024	(-1.37)	0.019	(1.14)
State Personal Income (-4)	-0.014	(-0.63)	-0.0086	(-0.20)	0.0039	(0.20)
Net Charge-off	-0.0037	(-1.14)	-0.0097	(-0.90)	-0.0014	(-0.66)
Nonperforming Loan	0.000100	(0.20)	0.0013	(1.16)	0.00012	(0.16)
Asset	-0.0084**	(-3.29)	-0.021**	(-2.70)	-0.0097	(-1.38)
Liquidity Ratio	0.000059	(0.66)	0.00047*	(2.19)	-0.00012	(-0.73)
Interest Expense	-0.00074	(-0.73)	0.0028	(1.11)	0.0021	(0.75)
Income on Loan	0.00014	(0.73)	0.00024	(0.45)	0.00038**	(2.67)
Intermediation Cost	-0.00012	(-0.69)	-0.00021	(-0.61)	-0.00033	(-1.31)
q2	0.0031	(1.75)	0.0026	(0.74)	0.0078**	(2.69)
q3	0.00098	(0.54)	0.00048	(0.10)	0.0033	(1.23)
q4	0.00015	(0.08)	-0.00098	(-0.28)	0.0018	(0.61)
Constant	0.16**	(3.25)	0.38**	(2.58)	0.20	(1.43)
Observations	449038		206697		242341	

t statistics in parentheses

All variables are in lag form, the negative numbers in parentheses indicate lag order, lag 1 if no parenthese

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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