# The Response of U.S.-Based Commercial Banks to Credit Stimuli

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This paper presents a study of the effectiveness of monetary policy on financial intermediation. Specifically, I aim to determine how commercial banks responded, via commercial lending, to the trillions of dollars of policy innovations to stimulate the credit markets during the 2008 global financial crisis. To that end, I compare the change in commercial lending by United States-based commercial banks during the stimulus period of October 1, 2007 through September 30, 2011 to that activity in the earlier non-stimulus period of October 1, 2002 through September 30, 2006. After comparing 1,977 commercial loans in the stimulus period and 1,844 loans in the non-stimulus period, I find that commercial lending by commercial banks that lent during both periods increased by $235 billion more in the stimulus period than in the non-stimulus period.

Two reasons support this increase in financial intermediation. First, the regression analysis shows a significant impact of the monetary policy-driven credit stimuli on the increase in commercial lending for five of the six credit stimuli in which the lending commercial banks participated. Second, the event-study results reflect positive and significant market reaction to the participation of the banks in the credit stimuli policies, which appears to have encouraged the banks to borrow so that they could lend. These findings that commercial lending increased and that such an increase can be attributed to the banks' participation in monetary policy credit stimuli bring key new contributions to the financial literature. It appears that U.S.-based commercial banks responded positively to the credit stimuli.

*JEL classification*: G21, G28, E52, E58
*Keywords*: Commercial Banks, Commercial Lending, Financial Crisis, Monetary Policy

## 1. Introduction

A stimulus is designed to incite a response of action. The desired response to credit stimuli by commercial banks around the world was that lending would be maintained or increased from prior levels. The focus of this research is on increases in commercial lending. In this paper, I call upon the theory of financial intermediation (Diamond and Dybvig, 1983) and the credit channel theory of monetary policy effectiveness (Bernanke and Gertler, 1995) to determine how commercial banks responded to the trillions of dollars of policy innovations offered by central banks and governments to stimulate the credit markets during the 2008 global financial crisis. To that end, this study addresses the research question of,

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"Did United States-based commercial banks respond to credit stimuli with increased commercial lending during the stimulus period of October 2007 through September 2011 when compared to the earlier non-stimulus period[2] of October 2002 through September 2006?" Three reasons emerge as to the importance of knowing how commercial banks carried out their financial intermediation function of commercial lending in response to the credit stimuli. First, this research will aid in understanding the effectiveness of monetary policy, specifically stimulus efforts that, according to the credit channel theory of monetary policy, should increase the amount of credit that banks issue to firms and households and, therefore benefit the real economy. Second, this knowledge will provide evidence to affirm or refute the claims of the financial media that the stimuli were not working and that banks were hoarding cash while not conducting commercial lending during the 2008 financial crisis. Third, the data lends itself to future research on the determinative characteristics of corporate borrowers during the crisis as a comparison can be performed of the companies that received commercial loans versus those that did not. Such information for future research could influence strategic planning at the corporations that seek debt financing through bank loans to drive the economy. With these reasons in place, and the use of loan-level data for commercial loans only, versus the aggregated impact of other loan types, this research will make valuable contributions to the financial literature.

The answer to the research question of this study will be uncovered through a robust research design of univariate, regression, and event-study analyses. To that end, we compare the change in commercial lending by United States-based commercial banks during the stimulus period of October 1, 2007 through September 30, 2011 to that activity in the earlier non-stimulus period of October 1, 2002 through September 30, 2006. A lender was included in the sample if it issued at least one loan during both of the stated periods - the stimulus period and the non-stimulus period – and was registered as a commercial bank. Twenty-five lenders makeup the final distribution of five small banks with total assets of less than $25 billion, 16 medium banks with total assets between $25 and $400 billion, and four large banks with total assets greater than $400 billion. After comparing 1,977 commercial loans in the stimulus period and 1,844 loans in the non-stimulus period, univariate analysis provides insight into the demand and supply of commercial loans in the United States (U.S.). Regression analysis engages two dependent variables of the: (1) change in the number of loan transactions and (2) value of the loans and various independent variables with fixed effects to account for variations in size of the banks and time periods using quarterly data. Lastly, event-study analysis sheds light on the economic impact on the U.S.-based commercial banks around the dates of their

[2] The period of October 1, 2002 through September 30, 2006 is identified as the "non-stimulus" period because it did not include a financial crisis and had fewer programs to induce lending than the crisis stimulus period of October 1, 2007 through September 30, 2011.

participation in and the release of information on the Federal Reserve and U.S. Treasury Department's credit stimuli. Results of these analyses follow.

I find that commercial lending by commercial banks that lent during both periods increased by $235 billion more in the stimulus period than in the non-stimulus period. Two reasons support this univariate-based increase in financial intermediation. First, the regression analysis shows significant impact of the monetary policy driven credit stimuli on the increase in commercial lending for five of the six credit stimuli in which the lending commercial banks participated. Second, the event-study results reflect positive and significant market reaction to the participation of the banks in the credit stimuli policies, which appears to have encouraged the banks to borrow so that they could lend. These findings that commercial lending increased and that such increase can be attributed to the banks' participation in monetary policy credit stimuli bring key new contributions to the financial literature. In answer to the research question, it is clear that U.S.-based commercial banks responded positively to the effective U.S. monetary policy credit stimuli.

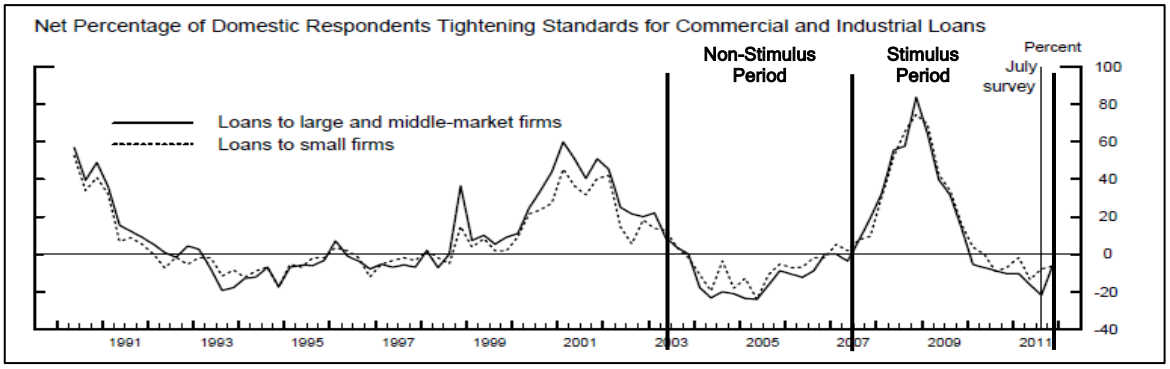
**1.1. Literature Review**

To determine if the credit stimuli positively or negatively influenced commercial lending, it is initially important to understand the key factors needed for commercial banks to lend. Three overarching factors emerge in the literature. First, Madura (2012) states that one key factor for banks to make loans is the availability of funds. He identifies funds as deposits, borrowed funds, bond issues, and bank capital. Second, Bernanke and Lown (1991) and Ghosh (2008) found that demand for loans is a key factor given that lending was down when the demand for loans was down. Third, Lown and Morgan (2002, 2006) found that the level of lending standards imposed by banks is a key factor of lending as tightened lending standards lead to reduced commercial loan growth. With funds, demand for loans, and lending standards established as the key factors for lending, I explore what the data reveals about these factors.

Of the three overarching factors stated above, the univariate analysis provides insights on the demand for loans and lending standards during the period of study. Table 3 provides evidence that the demand for loans remained strong at $11.4 trillion in both the stimulus period of October 1, 2007 through September 30, 2011 and the non-stimulus period of October 1, 2002 through September 30, 2006. Therefore, the sample banks of this study had the necessary factor of loan demand in place. Figure III addresses the factor of lending standards as it captures the responses of loan officers of the 51 domestic banks and 22 U.S. branches and agencies of foreign banks who completed the Senior Loan Officer Opinion Survey on Bank Lending Practices as reported by the Federal Reserve System. The figure shows that lending standards tightened more during the stimulus period when compared to the non-stimulus period. According to Lown and Morgan (2002, 2006), such tightened lending

standards would lead to reduced commercial loan growth. However, Figure I also shows that lending standards then eased toward the end of the stimulus period. The univariate analysis shows that the demand for loans and adjustments in lending standards were in place for lending to occur during the period of study.

**Figure I: Lending Standards, 1991 – 2011**




Source:http://www.federalreserve.gov/boarddocs/snloansurvey/201111/default.htm

A review of the literature on the sources of funds (i.e. deposits) and the effects of monetary policy on bank lending also was conducted. The existing literature on the importance of deposits as a source of funding for bank lending produced mixed results. Edwards and Mishkin (1995) stated that the original near-zero interest costs on deposits gave banks an advantage when they could lend those deposited funds at profitable rates. The reversal of that advantage occurred in the 1980s when other financial institutions began offering earnings on deposits. Banks were then forced to seek (and gain) the elimination of Regulation Q that put a ceiling on the interest that it could pay on deposits. Edwards and Mishkin (1995) added that such developments reduced the importance of deposits as a funding source for banks to lend. However, Ivashina and Scharfstein (2010) and Mora (2010) found significance in a bank's deposit holdings. Ivashina and Scharfstein (2010) examined the number of loan transactions issued by commercial and investment banks from 2000 to 2008. They found that new loans to large borrowers fell during the peak of the crisis (i.e. 4th quarter of 2008) and the peak of the credit boom (i.e. 2nd quarter of 2007) when compared to the prior quarter, by 47% and 79%, respectively. They attributed this decline to the change in deposits and stated that the banks' loans receivables increased due to draws on credit lines, rather than new loan issuances, and loans payable decreased due to a run by short-term bank creditors. Such results based on aggregate data is offset by Mora (2010) who presented further evidence, both from aggregate and individual bank data, that funds did not flow into bank deposits as robustly as in past times of stress and, therefore, bank lending did not increase as much. Given the conflicting views of these researchers on the importance of deposits to lending, I look at the role of deposit insurance to resolve these differences.

Deposit insurance[3] was developed to provide a safety net to depositors and bankers alike. Though it was in place in various forms prior to the establishment of the Federal Deposit Insurance Corporation (FDIC), the deposit insurance provisions of the Banking Act of 1933 officially formed the FDIC and deposit insurance terms. (FDIC, 1998). While proponents of deposit insurance believed that it would aid in maintaining financial stability in the banking sector, opponents at the time saw the potential for additional risk-taking by bankers covered by insurance protection. In a 2000 paper, Diamond and Rajan studied the impact of deposit insurance on lending and found that bank lending is reduced when not all of the deposits are insured, but that lending increases when all deposits are insured as the banks are "safe" to invest in loans due to the insurance subsidy. On the other hand, in a policy research working paper for The World Bank, Anginer, Demirguc-Kunt, and Zhu (2012wp) looked at over 4,000 banks in 96 countries in periods of crisis and non-crisis to determine the impact of deposit insurance on bank risk-taking. They found that, during the period of non-crisis, the safety net provided by deposit insurance increased bank risk-taking and reduced overall financial stability. However, during the period of crisis, deposit insurance did not lead to increased bank risk, as such was lower, and greater systemic stability ensued. The net effect was that the non-crisis period's results were more dominant and, overall, deposit insurance led to increased bank risk and reduced stability. As the focus of this research is on periods of financial crisis, the results from the crisis-period apply to this work and, during crisis periods, the researchers found that deposit insurance led to reduced bank risk-taking.

In a further examination, the existing financial literature was reviewed for the effects of monetary policy on bank lending both in general and in relation to specific credit stimuli programs. Thakor (1996) developed a model that explained that the Fed's effort to stimulate bank lending by increasing the money supply during the 1990-1991 "credit crunch" was unsuccessful because the effect of monetary policy depends on its effects on the term structure of interest rates. According to the model, if monetary policy increases the money supply, but decreases short-term interest rates more than long-term rates, then lending decreases. Similarly, Thakor (1996) found that if monetary policy increases the money supply, but decreases long-term rates more than short-term rates, then lending remains flat or increases. Diamond and Rajan (2000) looked at the level of the increase in cash (i.e. capital) infused by a central bank into the banking sector. They found that if the amount of cash is only large enough to prevent bank runs, for example, then loans could be recalled and

[3] For example, the Federal Deposit Insurance Corporation's (FDIC) increase of the limit of deposit insurance from $100,000 to $250,000 per depositor, per account, per institution provided security to customers on the safety of their deposits, which is believed to have encouraged increases in deposited funds. Such a benefit has not been quantified, but its impact is tested by the inclusion of deposits in the regression analysis.

lending standards tightened, which, according to other researchers, would lead to reductions in lending. On the other hand, if the amount of cash is considered "substantially large", they found that banks can extend new loans. In studying over 900,000 transactions during the period of 1976 through 1993, Kashyap and Stein (2000) found that monetary policy's effect on lending is stronger for banks with less liquid balance sheets, which are typically the smaller banks. They also found that the largest banks make heavier use of the Federal funds market whereas the smaller banks made very little to no use of Federal funds to aid liquidity. Similarly, Keister and McAndrews (2009) studied the high levels of bank excess reserves and found that such excess is simply a by-product of the Federal Reserve's new programs. However, they qualified their findings by stating that the reality of banks holding excess reserves provides no information about the initiatives' effects on bank lending or on the economy. Therefore, the liquidity of the balance sheet could be a determinant of commercial lending along with interest rates (Thakor, 1996) and capital infusions (Diamond and Rajan, 2000).

In addition to the impact of the items stated above, researchers examined the direct effect of specific credit stimulus programs on bank lending. Berrospide and Edge (2010) concluded that the extensive capital injections under the Capital Purchase Program of TARP did not lead to growth in lending because banks base loan decisions on either demand or risk or both rather than levels of capital. Black and Hazelwood (2012) studied the effect of TARP on bank risk-taking and found that, relative to non-TARP banks, the risk of loan originations increased at large TARP banks, but decreased at small TARP banks. However, at large TARP banks, there was an increase in risk-taking without an increase in lending. Possibly this was due to the conflicting goals of the TARP program for bank capitalization and bank lending. Cole (2012), in looking at the particular impact of stimulus efforts on lending to small businesses, concluded that TARP participants decreased lending to businesses of all sizes more so than did non-TARP participants. Overall, the existing financial literature concludes that bank lending was down even after the many credit stimulus efforts during the 2008 financial crisis.

In other words, these researchers state that the credit stimulus did not stimulate bank lending due to the stimulus being too small as well as the conflicting goals of stimulus programs such as TARP and interest on excess reserves, among other reasons as stated above. However, most of the referenced papers used data on more than one loan type (i.e. commercial, real estate, personal, etc.) and each of the papers covered loan activity in periods that ended before or during 2009, which was near the height of the crisis. This paper analyzes data on commercial loans only to remove the possible effect of netting commercial loan activity with that of the other loan types and, not only extends the period to September 2011 to show the potential lag in the response to the credit stimuli, but also compares the stimulus period of October 1, 2007 through September 30, 2011 to a non-stimulus period of October 1, 2002 through September 30, 2006 (i.e. five years prior to the stimulus period) as a

form of "control period". In addition, this paper looks at not only the change in the number of loan transactions, as Ivashina and Sharfstein (2010) did, but also examines the change in dollar value of loan activity based on loan-level data versus aggregate or even bank-level data. These improvements in research methodology are reflected later in this paper and reflect its significant contributions to the financial literature.

The remainder of the paper is organized as follows. Section 2 presents the background of the study by way of preceding events, theoretical foundation, data, and univariate analysis to determine the change in commercial lending over the stimulus period when compared to the non-stimulus period. Section 3 addresses methodology and analyses by starting with hypothesis development and comprehensively covering regression and event-study analyses. Section 4 provides results. Section 5 concludes.

## 2. Background of the Study

### 2.1 Preceding Events

In August 2007, the Board of Governors of the Federal Reserve Board (Fed) became concerned about the state of the financial markets. More specifically, the Fed stated in an August 17, 2007 press release that:

*"Financial market conditions have deteriorated, and tighter credit conditions and increased uncertainty have the potential to restrain economic growth going forward. In these circumstances, although recent data suggest that the economy has continued to expand at a moderate pace, the Federal Open Market Committee judges that the downside risks to growth have increased appreciably. The Committee is monitoring the situation and is prepared to act as needed to mitigate the adverse effects on the economy arising from the disruptions in financial markets". (Federal Reserve Board, 2007a)*

Later that day, the Fed determined that lending in the United States (U.S.) needed to be stimulated "to promote the restoration of orderly conditions in the financial markets". At that time, the Board took its first stimulus action – the reduction of the spread between the primary credit rate (or discount rate) and the Federal funds rate to 50 basis points. (Federal Reserve Board, 2007b). From August 2007 through December 2012, the spread fluctuated from a low of 25 basis points to a high of 75 basis points. Prior to the financial crisis, the spread between the Federal Reserve's primary credit rate and the Federal funds rate was consistently set at 100 basis points.

In addition to the interest rate adjustments, that made less expensive funds available for commercial banks to borrow so that they could lend to households and businesses, the U.S. central bank engaged in stimulating credit flow via multiple other methods during the 2008 financial crisis. In the U.S., some of those methods included coordinated collaboration with the U.S. Department of Treasury (U.S.

Treasury) and other Federal agencies. Table 1 summarizes the 20 credit stimuli programs offered to U.S.-based commercial banks.

Of the 20 credit stimuli programs included in Table 1, the Federal Reserve Board developed fourteen of the programs, the U.S. Treasury led four of the programs, and other Federal agencies implemented two of the programs. The Federal Reserve Board developed its 14 credit stimuli programs within the framework of three goals set to provide: (1) access to banks to short-term credit; (2) liquidity directly to borrowers and investors aimed at lessening the demands on bank deposits; and (3) support to the functioning of the overall credit markets. (Bernanke, 2009). This research focuses on the programs (i.e. identified by bold type in Table 1) related to goals one and two, as goal three extends the credit stimuli to the mortgage market and away from commercial lending efforts. Similarly, the U.S. Treasury introduced the Financial Stability Plan to fulfill the purposes of: (1) restarting the credit flow, (2) cleaning up and strengthening the nation's banks, and (3) aiding households and small businesses. (Geithner, 2009). The goals and purposes of these programs clearly state the intention of the Federal Reserve Board and the U.S. Treasury to increase the amount of credit issued by banks to households and businesses.

Several stimulus programs are intentionally excluded from Table 1. The excluded programs are those that were not implemented to stimulate the corporate credit market. Two such programs are Quantitative Easing and Operation Twist. The goals of those efforts were to stimulate the housing market in general and consumer credit in particular, as well as decrease the unemployment rate (Kenny, 2013). In both programs, the Fed set out to lower long-term interest rates by purchasing long-term Treasury bonds. However, the lowering of long-term interest rates might have hindered the profits of the commercial banks (Hilsenrath and Di Leo, 2011), which could have the opposite effect of stimulating corporate credit markets. Therefore, due to the focus of Quantitative Easing and Operation Twist on stimulating credit to personal consumers and the potential for it to be a disincentive to commercial banks to lend to corporate borrowers, these stimulus programs are excluded from the scope of this study.

Table 2 provides a summary of stimulus support to specific U.S.-based financial institutions from the Federal Reserve, U.S. Department of Treasury and other government agencies. Several items of stimulus support are intentionally excluded from Table 2. The excluded programs are those that were made available to non-commercial banks, such as American International Group, Inc., Fannie Mae, Freddie Mac, Ginnie Mae, etc.

Tables 1 and 2 tell the story of the trillions of dollars offered to U.S.-based commercial banks, either collectively or targeted, to incentivize them to engage in commercial lending during the 2008 financial crisis. The aim of this paper is to determine if maintained or increased commercial lending resulted from such an investment in commercial banks.

**Table 1: Summary of U.S. Credit Stimuli, by date**

| Name of Program | Date of First Action | Program Description and/or Status |
|---|---|---|
| Reduction of Spread between Key Lending Rates | August 17, 2007 (7 subsequent actions) | Primary credit discount window rate reduced from 6.25% to 5.75%, which resulted in a spread of 50 basis points with the Federal Funds rate. That spread was maintained throughout the financial crisis. |
| Lowering of Target Federal Funds Rate | September 18, 2007 (25 subsequent actions) | Target range of Federal Funds Rate initially reduced from 5.25% to 4.75%. By 2008, the range was set at 0.00% to 0.25% and was maintained at that level. |
| Swap Line Agreements | December 12, 2007 (for liquidity lines) and April 6, 2009 (for foreign currency agreements) (14 subsequent actions) | Swap lines and agreements were opened with the European Central Bank ($210 bn+), Swiss National Bank ($7 bn+), Bank of Australia, Sverige Rilksbank, Norges Bank, Bank of Japan (no cap), Brazil ($30 bn), Mexico ($30 bn), Korea ($30 bn), and Singapore ($30 bn). In September 2009, total swap lines doubled to $620 bn. |
| **Term Auction Facility (TAF)** | December 12, 2007 (13 subsequent actions) | First auction took place for $20 bn of 28-day credit. In Feb 2008, auctions increased to $30 bn every two weeks and with longer terms. 84-day credit increased to $75 bn. Overall, TAF funding increased to $900 bn. |
| **Troubled Asset Relief Program (TARP)/ Capital Purchase Program (CPP)** | February 13, 2008 (and October 3, 2008) (2 subsequent actions) | In execution of the Emergency Economic Stabilization Act of 2008, TARP was funded with $700 billion total. An estimated $331 bn was made available to commercial banks with the Treasury Department using $250 billion to purchase senior preferred shares of financial institutions under the Capital Purchase Program (CPP) |
| Term Securities Lending Facility (TSLF)/TSLF Options Program (TOP) | March 11, 2008 (5 subsequent actions) | This weekly auction program was funded to lend up to $200 bn of Treasury securities, as well as options to draw upon TSLF loans, to primary dealers secured by other securities for a term of 28 days rather than overnight. Program closed on February 1, 2010. |
| Primary Dealer Credit Facility (PDCF) | March 16, 2008 (2 subsequent actions) | PDCF offered overnight loans that totaled about $9 bn to primary dealers to provide liquidity in the market for U.S. Treasury securities. Program closed on February 1, 2010 |
| **Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF)** | September 19, 2008 (1 subsequent action) | This program allowed eligible financial institutions to borrow $217 bn in funds to purchase asset-backed commercial paper to restore liquidity to that market. Program closed on February 1, 2010. |
| Interest Payments on Required and Excess Reserves | October 6, 2008 (3 subsequent actions) | Interest was paid on average required reserve balances and average excess balances maintained over a reserve maintenance period. Rate paid on excess reserves started at 75 basis points less than the targeted federal funds rate. Rate increased by 0.40% later in October 2008 and again in November 2008. |
| **Commercial Paper Funding Facility (CPFF)** | October 7, 2008 | Through a special purpose vehicle (SPV), this facility was funded with $2.3 trillion to purchase three-month unsecured and asset-backed commercial paper directly from eligible issuers. Program closed on Feb. 1, 2010. |

| Name of Program | Date of First Action | Program Description and/or Status |
|---|---|---|
| Temporary Liquidity Guarantee Program | October 14, 2008 | Federal Deposit Insurance Corporation (FDIC) provides insurance on newly issued senior unsecured debt of eligible financial institutions and full coverage of non-interest-bearing deposit transaction accounts, regardless of dollar amount. Program closed on October 31, 2009. |
| Change in the Definition of Tier 1 capital | October 15, 2008 | Definition changed to include in Tier 1 capital the $250 bn of senior preferred shares purchased under the Treasury Department's Capital Purchase Program through TARP. SOURCE: http://www.federalreserve.gov/newsevents/press/bcreg/20081020a.htm |
| Money Market Investor Funding Facility (MMIFF) | October 21, 2008 | A maximum amount of $600 bn was made available to special purpose vehicles to purchase certain money market instruments from eligible institutions. The Federal Reserve provided 90% of the funding and the private sector provided 10%. SOURCE: http://www.newyorkfed.org/markets/mmiff_faq.html |
| Agency Mortgage-Backed Securities (MBS) Program | November 2008 (2 subsequent actions) | The low target for the Federal Funds rate led the Federal Open Market Committee (FOMC) to expand its holdings of mortgage-backed securities guaranteed by Fannie Mae, Freddie Mac, and Ginnie Mae. $1.25 trillion in agency MBS were purchased |
| Term Asset-Backed Securities Loan Facility (TALF) | November 25, 2008 (8 subsequent actions) | TALF provided loans initially collateralized only by AAA asset-backed securities and later accepted a wider range of collateral. This program was jointly conducted with the Department of Treasury, which used TARP funds for its participation. Total of $1 trillion was set aside for the program. |
| **Supervisory Capital Assessment Program (SCAP) (also referred to as "stress tests")** | February 23, 2009 (2 subsequent actions) | In a joint effort conducted by the Federal Reserve and four governmental agencies, an assessment of the capital status of 19 of the largest bank holding companies (BHCs) was conducted to determine the need for capital infusions. Ten of the 19 BHCs needed capital. Only one of the 10 needed government capital. The other nine obtained private capital. |
| Redemption of Treasury Capital | June 1, 2009 | The 19 BHCs that participated in SCAP were allowed to redeem the U.S. Treasury capital with certain considerations in place. This "stock buy-back" was approved if, for example, the BHC could prove that it could continue to perform its intermediary role. |
| Legacy Securities Public-Private Investment Program (PPIP) | July 8, 2009 | The Treasury Department committed $22.1 bn and partnered with nine PPIFs in the private sector to put capital back into the market for legacy securities. The goal of PPIP was to help financial institutions begin to remove these assets from their balance sheets so that funds could be re-deploy as new credit to households and businesses. |
| Term Deposit Facility (TDF) | May 10, 2010 (NOTE: Reg D was amended on December 28, 2009) (13 subsequent actions) | With maturities extended to as long as 84 days, term deposits allowed eligible institutions to participate in a series of small-value auctions of $1 bn to $5 bn of term deposits. This program has been continued beyond the scope of this study. |
| Changes in FDIC Deposit Insurance Coverage Issued | July 21, 2010 (2 subsequent actions) | After the July 2010 signing of the Dodd-Frank Act, the FDIC permanently raised the maximum deposit insurance amount to $250,000 per depositor, per institution. On November 9, 2010, a ruling allowed for unlimited insurance coverage of noninterest-bearing transaction accounts beginning December 31, 2010 through December 31, 2012. |

Notes: To stimulate financial institutions to exercise their financial intermediary role in the economy, the Federal Reserve System, U.S. Department of Treasury, and other government agencies offered the listed 20 programs during the period of August 17, 2007 through September 30, 2011.
SOURCE: http://www.newyorkfed.org/research/global_economy/Crisis_Timeline.pdf

**Table 2: Summary of U.S. Credit Stimuli to Specific Financial Institutions, by date**

| Financial Institution | Description of Action | Date of First Action |
|---|---|---|
| J.P. Morgan | Approved purchase of Bear Stearns | March 14, 2008 |
| Bank of America | Approved purchase of Countrywide | June 5, 2008 |
| Goldman Sachs (GS) | Approved as a bank holding company | September 21, 2008 |
| Morgan Stanley (MS) | Approved as a bank holding company | September 21, 2008 |
| Merrill Lynch | Authorized lending to Merrill Lynch at the primary credit rate | September 21, 2008 |
| Citigroup | Agreed to provide liquidity to aid in the Wachovia purchase (NOTE: Wells Fargo ultimately purchased Wachovia). | September 29, 2008 |
| Wells Fargo | Approved purchase of Wachovia. (NOTE: Wells Fargo's offer was chosen by Wachovia over that of Citigroup). | October 12, 2008 |
| Bank of America | Agreed jointly with Treasury and FDIC to provide non-recourse loan as aid | January 16, 2009 |

Notes: This table summarizes the financial institutions that benefited from those targeted programs and the description of the action.
SOURCE: http://www.newyorkfed.org/research/global_economy/Crisis_Timeline.pdf

## 2.2 Theoretical Foundation

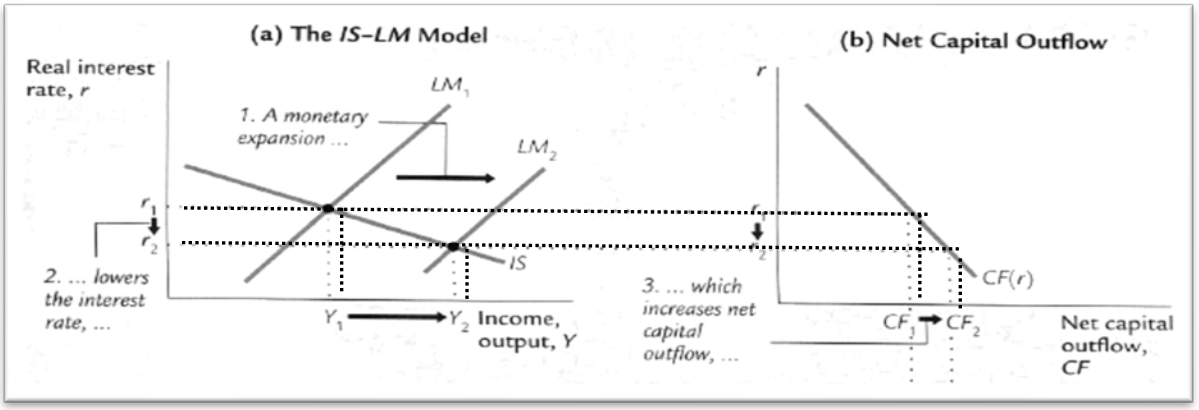
The theory of financial intermediation (Diamond and Dybvig, 1983) states that banks conduct the primary function of creating liquidity using demand deposits. However, the effect of monetary policy is intentionally excluded from the theory's assumptions. That effect is introduced in this study through other theoretical foundations.

Monetary policy can have either expansionary or contractionary effects on the economy. Expansionary monetary policy is used by a central bank to increase the money supply of an economy and to stimulate spending. In large and open economies such as the United States, the use of expansionary monetary policy has the effects on the goods market (IS) and the money market (LM) as shown in Figure II, which represents the Mundell-Fleming Model (i.e. the IS/LM curve for open economies). According to Mankiw (2010) and classical economic theory, the increase in the money supply, as brought on by expansionary monetary policy, results in a shift of the LM curve to the right to reflect the increase in income. This increase in income leads to a fall in real interest rates, which is designed to spur net capital outflow by way of bank lending.

These relationships between the supply of credit and interest rates are reinforced in the Loanable Funds Model developed in 1965 by Knut Wicksell (Belke and Polleit, 2009). In the Loanable Funds Model, the supply of credit is defined as

not only credit provided by lenders (i.e. commercial banks and others), but also funds acquired through the sell of bonds and new credit made available by the monetary policy of the Federal Reserve System (Evans, 1999). If the goal of monetary policy is to create credit, the Federal Reserve will do so through open market operations that increase the money supply (or expansionary monetary policy). Such a monetary policy approach should result in a decrease in interest rates, which the Loanable Funds Model states has the effect of increasing the supply of credit.

**Figure II: Effects of Expansionary Monetary Policy**




Notes: This figure shows the effects of expansionary monetary policy on the goods market (IS) and the money market (LM), which represent the Mundell-Fleming Model (i.e. the IS/LM curve for open economies).

Further study of the IS/LM Model and the Loanable Funds Model resulted in Bernanke and Blinder's (1988) development of the credit channel theory of monetary policy effectiveness, which gave symmetric treatment to money and credit. Though the original credit channel was best described as an enhancement to monetary policy transmission rather than the mechanism itself, it also was seen as a set of factors that heighten the effects of changes in interest rates in expansionary [or contracting] economic times. To build upon that early work and further explain the influence of monetary policy on credit supply, Bernanke and Gertler (1995) determined that the credit channel theory also impacted the external finance premium of firms through two components - a balance sheet channel and a bank lending channel. They found that changes in a central bank's policies not only affect the amount of credit that banks issue, but also affect the real economy.

This paper calls upon both the theory of financial intermediation and the credit channel theory as the foundational basis for determining the lending response of U.S.-based commercial banks to expansionary, credit-stimulating monetary policy.

**2.3 Data, Univariate Analysis, and the Change in Commercial Lending**

The data used for this research is derived from the Thomson One database of loan-level data of commercial loans announced[4] worldwide on the dates of October 1, 2002 through September 30, 2006 (i.e. the "non-stimulus period") and October 1, 2007 through September 30, 2011 (i.e. the "stimulus period"). The non-stimulus period, which is five years prior to the stimulus period, was selected as the timeframe when there was little or no central bank or government actions in place to purposely stimulate the credit markets and no financial crisis. The stimulus period was determined based on the start of the Federal Reserve Board's stimulus actions in August 2007 lagged to October 1, 2007.

Through univariate analysis, I first compare the demand and supply of commercial loans in the U.S. Panel A of Table 3 provides a summary of the loan-level data from Thomson One and reflects the number of loans requested by publicly traded companies during the stimulus period of 15,792 requests compared to 16,898 requests in the non-stimulus period. Such requests for funding represent loan demand during the stated periods and is relatively flat being down by only 1,106 loan requests (or 6.5%) over the two periods. However, with regard to the value of the loan demand, public companies in both the stimulus and non-stimulus periods made total loan requests of approximately $11.4 trillion. Overall, this level of demand for loans from public companies further shows that the value of demand for new commercial loan requests (i.e. not line of credit draws) remained strong during the stimulus and non-stimulus periods.

In a further look at the demand for loans from publicly traded corporations, the data in Panel A of Table 3 shows that "Net Loan Requests Approved" to public companies increased in quantity and dollar value in the stimulus period compared to the non-stimulus period. More specifically, only 1,747 loan requests from public companies were denied in the stimulus period compared to 4,896 denied requests in the non-stimulus period. It must be noted here that the denied loan requests are those that were not funded by a financial institution or syndicate by September 30, 2011 for the stimulus period or by September 30, 2006 for the non-stimulus period. Those loan requests funded after the end of the period were excluded from this analysis. The net result is that 14,045 commercial loans were approved for publicly traded corporations in the stimulus period while only 12,002 commercial loans were approved in the non-stimulus period, which reflects a 17% increase in the quantity of loans approved in the stimulus period. The dollar value of loans approved to publicly traded companies reflects a 35% increase during the stimulus period when one compares the $9.4 trillion in loan value in the stimulus period to the $7 trillion in loan

[4] Per the ThomsonOne database, the loan announcement date is the date which a company has announced a request to the financial institutions for financing. In this study, the number and value of the loans announced on that date represent "loan requests" and "loan demand".

value in the non-stimulus period. Based on this univariate analysis, it is clear that, worldwide, greater commercial loan quantity and value were supplied during the stimulus period than during the non-stimulus period. Using loan-level data for commercial loans only, these results differ from the existing financial literature; possibly due to the micro level of the data and the focus only on commercial lending versus the aggregated impact of other loan types.

**Table 3: Comparison of Loans Requested and Funded, by period**

| **Panel A – Loans Requested** | Stimulus Period | | Non-Stimulus Period | |
|---|---|---|---|---|
| Description | Quantity | Value ($ mil) | Quantity | Value ($ mil) |
| Net Loans Requested from Researchable Public Companies | 15792 | 11426638 | 16898 | 11411369 |
| LESS: Denied Loan Requests from Public Companies | -1747 | -1988368 | -4896 | -4439892 |
| Net Loan Requests Approved by All Lenders for Funding to Public Companies | 14045 | 9438270 | 12002 | 6971477 |
| **Panel B - Loans Funded** | | | | |
| Net Loan Requests Approved by All Lenders for Funding to Public Companies | 14045 | 9438270 | 12002 | 6971477 |
| LESS: | | | | |
| Portion of Loan Requests not Funded | - | -3707566 | - | -2678444 |
| Total Loans Funded by All Lenders | 14045 | 5730704 | 12002 | 4293033 |
| LESS: | | | | |
| Loans funded by Lenders/Syndicates of Non-US-based financial institutions | -12068 | -5060319 | -10158 | -3858243 |
| Net Loans Funded by U.S.-based Commercial Banks | 1977 | 670385 | 1844 | 434790 |

Notes: This table reflects loans requested (i.e. demand for credit) in Panel A and loans funded (i.e. supply of credit) in Panel B.

This research provides further analysis of commercial loans funded by commercial banks based in the United States. In Panel B of Table 3, the "Total Loans Funded by All Lenders" is netted to reflect the net loans funded by the commercial banks of the sample that are based in the United States in aggregate. With a total of 1,977 loans to be studied in the stimulus period and 1,844 loans in the earlier non-stimulus period, the data once again shows that more commercial lending occurred in the stimulus period than in the non-stimulus period. In addition, the funding value of $670 billion in the stimulus period is 54% greater than the $435 billion of commercial loans issued in the non-stimulus period.

In summary, Table 3 states that the demand for loans by publicly traded companies was relatively even in the two comparison periods. With regard to the

supply of loans to meet the demand, the data shows that supply (or commercial loans issued) was $235 billion more in the stimulus period than in the non-stimulus.

The sample of lenders for this study was determined based on the loan-level data. A lender was included in the sample if it issued at least one loan during both of the stated periods - the stimulus period and the non-stimulus period – and was registered as a commercial bank. Loan activity in both periods was necessary for the calculation of the change in lending for each lender. As the database of loans includes both transactions by single banks as well as syndicates, any transaction that included a lender included in the sample was counted as a transaction for that lender even though the other lenders in the syndicate might have been excluded from the sample. However, only the amount of the transaction to which the U.S.-based lender contributed was counted in the loan activity.

To capture the lending activity of the lenders that are U.S.-based commercial banks, I used the entity's primary SIC code and the National Information Center (NIC) of the Federal Reserve to identify relationships between entities. Non-commercial banks were excluded from the sample as well as those with foreign parents. The original sample of 71 lenders became 45 commercial banks. To ensure the ability to conduct the event-study analysis for the economic importance of this study, I grouped the 45 commercial banks into the 25 parent companies that serve as the trading entity for the subsidiary banks. The lending response of the 45 subsidiaries was included with that of the 25 respective parent banks in both periods of study, regardless of when the relationship began, to capture comparative total loan-level activity.

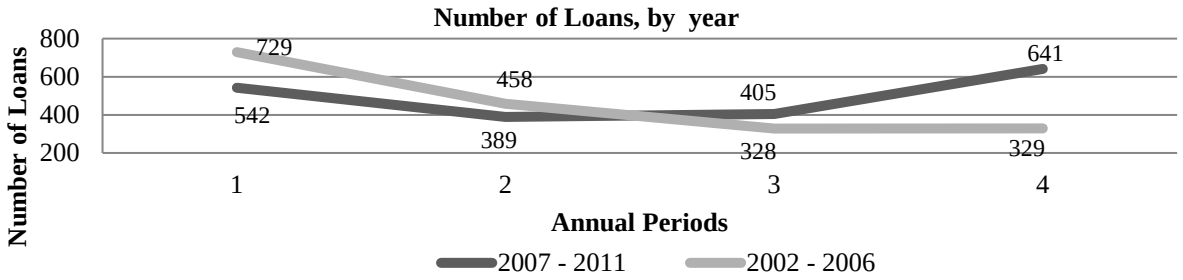
**Table 4: Summary Statistics of Final Data Sample**

| | Stimulus Period | Non-Stimulus Period |
|---|---|---|
| Description | Loans funded by U.S.-based Commercial Banks | Loans funded by U.S.-based Commercial Banks |
| Quantity | 1,977 | 1,844 |
| Total Value Funded ($ mil) | $670,385 | $434,790 |
| Minimum ($ mil) | $1 | $1 |
| Maximum ($ mil) | $14,741 | $7,575 |
| Average ($ mil) | $339 | $236 |
| Average Time to Final Maturity (years) | 3.42 | 3.55 |

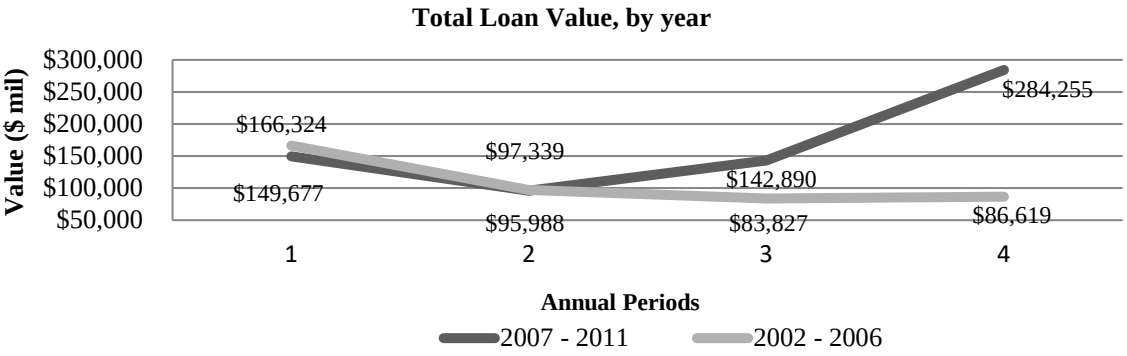
These summary statistics are shown graphically on an annual basis for U.S.-based lenders in Figure III. Panel A of Figure III depicts that U.S.-based lenders increased the number of commercial loans issued in period three, or the October 2009 through September 2010 stimulus period, over the loans issued in the non-stimulus period. With regard to total loan value and average loan size, by year, Panels B and C show that U.S.-based commercial banks report commercial loan values and average loan

**Figure III: Corporate Loans funded by U.S.-based Commercial Banks, by year**

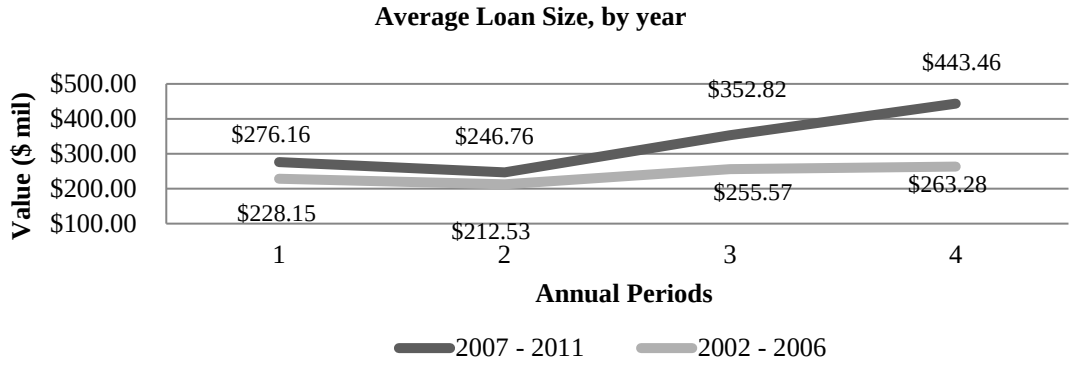
**Panel A - Number of Loans, by year:**




**Panel B - Total Loan Value, by year:**




**Panel C – Average Loan Size, by year:**




Notes: Based on the commercial loans funded by U.S.-based commercial banks, the number of loans, loan value in millions of dollars, and average loan size during the stimulus period exceeded that of the non-stimulus period after fiscal period two. Panels A, B, and C below show this result graphically.

sizes in the stimulus period greater than those in the non-stimulus period starting in period 2, or the annual period of October 2008 through September 2009. The story here preliminarily appears to be that commercial banks in the U.S. responded with increases in commercial lending in period 2 of the stimulus period. Given that the research question asks if commercial banks were responding to the credit stimuli with an increase in commercial lending, I use the audit[5] of the Federal Reserve System's programs by the Government Accounting Office (GAO) (U.S. GAO, 2011) as the basis to determine the amount of the credit stimuli. The programs of the Federal Reserve System alone ranged from $1.5 trillion to $16 trillion based on the debates in the media. However, the GAO audit reports the amount outstanding at the peak of the credit stimuli programs as $3.243 trillion. In addition, approximately $250 billion was made available to financial institutions through the U.S. Department of Treasury's CPP program of TARP. There also was other assistance that cannot be quantified. However, it is a reasonable estimate that a total of $3.493 trillion was invested by the United States central bank and government agencies to revive the flow of credit during the 2008 financial crisis. When the $3.493 trillion dollars of investment is compared to the increase in commercial lending of $236 billion, as shown on Table 4 by the difference in the "Total Value Funded ($ mil)" between the two periods, the result is a 6.75% return on investment for the Federal government's efforts. The challenge of this research is to determine if the increase in commercial lending was the result of the $3.493 trillion dollars of credit stimuli.

Based on the Thomson One loan-level data being used in this research, the univariate analysis provides evidence that total loan demand decreased by only 6.5% in quantity but increased by 0.13% in dollar value. In other words, demand was flat, but the supply of loans was up during the stimulus period. The total loan supply increased by 7% in quantity and by 54% in dollar value. The following sections reflect regression and event-study analysis for a more robust examination of the data to determine if the credit stimuli influenced the results.

## 3. Methodology and Analysis

### 3.1 Methodology

Based on the actions of U.S.-based commercial banks and the U.S. central bank and government agencies, I address two hypotheses. First, I hypothesize, based on the reports of the financial media, that commercial lending in the stimulus period decreased in comparison to the non-stimulus period. The null hypothesis is that commercial lending in the stimulus period was equal to or greater than that of the non-stimulus period. If the results show a rejection of the null hypothesis, then

[5] The findings from the GAO Audit of the Federal Reserve System's programs are outside of the scope of this research. For further information, the full report can be found at http://www.gao.gov/new.items/d11696.pdf.

commercial lending increased in the stimulus period when compared to the non-stimulus period. Based on the results of the univariate analysis in section 2.3, I must reject the null hypothesis as commercial lending by U.S.-based commercial banks did increase in the stimulus period when compared to the non-stimulus period.

Second, I hypothesize, based on the findings in the existing literature, that the change in commercial lending in the stimulus period was not in response to the credit stimuli. The null hypothesis is that the change in commercial lending in the stimulus period was in response to the credit stimuli. If the results show a rejection of the null hypothesis, then commercial lending in the stimulus period was not in response to the credit stimuli. This determination will be made after a review of the results from the robust research methodology.

To test this hypothesis, I use loan-level data from the ThomsonOne database. The 1,977 loans in the stimulus period of October 1, 2007 through September 30, 2011 and 1,844 loans in the non-stimulus period of October 1, 2002 through September 30, 2006 were selected based on dates of funding requests and ultimate approval in the stated periods. This use of loan-level data and the comparison of time periods five years apart represent a significant break from most of the existing literature, which generally either uses aggregate data within the financial crisis time period or includes only a short interval prior to the crisis. In addition, though Contessi and Francis (2009) state that actual loan origination data is needed for analysis of the credit activity of commercial banks, one can agree that this loan-level data provides more detail than summary balance sheet or aggregate data. In addition, the non-stimulus period represents a valid control period to which to compare the responses of the lenders to the central bank's actions during the stimulus period.

The 25 U.S.-based commercial banks, as defined in Section 2.3, were separated into size groupings for this analysis. The size groupings were based on the average of the annual total assets for the years of the stimulus and non-stimulus period, respectively. The splits were set to achieve equal numbers of banks in each size category for each period to allow for the calculation of the change in lending activity for each bank. The result was a distribution of five small banks with total assets of less than $25 billion, 16 medium banks with total assets between $25 and $400 billion, and four large banks with total assets greater than $400 billion.

### 3.2 Regression Analysis

Regression analysis was used to determine the relationship between the change in the number of loan transactions or value of the loans, as the dependent variables, and the various independent variables. The dependent variable was calculated as follows:

$$ChginNum_{jt} = Number\ of\ loans_{Stimulus\ \ Period} - Number\ of\ loans_{Non-stimulus\ \ Period}$$

or (1)

$$ChginVal_{jt} = Value\ of\ loans\ (\$\ mil)_{Stimulus\ \ Period} -$$

$$Value\ \ of\ loans\ (\$\ mil)_{Non-stimulus\ \ Period}$$

In line with the determination by Gambacorta and Marques-Ibanez (2011) that quarterly data is needed to determine the short-term impact of monetary policy on lending, each calculation was performed on a quarterly basis with the corresponding quarter five years prior to the stimulus period date. For example, the number or value of loans signed during the quarter of October 1, 2007 through December 31, 2007 in the stimulus period were offset by the number or value of loans signed during the quarter of October 1, 2002 through December 31, 2002 in the non-stimulus period. This pattern continued through the 16 quarters that ended July 1, 2011 through September 30, 2011, which was offset by the loan activity during the quarter of July 1, 2006 through September 30, 2006.

The independent variables used in this study reflect the participation of the sample of banks in the five programs stated above along with the variables of the change in total deposits or total deposits to capture the effect of the stimulus action of increasing the deposit insurance limit. The regression model used is as follows:

$$ChginNum_{jt} \quad or \quad ChginVal_{jt} =$$

$$\alpha_j + \beta_1 AMLF_{jt} + \beta_2 CPFF_{jt} + \beta_3 CPP_{jt} + \beta_4 SCAP_{jt} + \beta_5 TAF_{jt}$$

$$+ \beta_6 ChginDep\ (or\ TotalDep)_{jt} +$$

$$\beta_7 Bank\ Fixed\ Effects + \beta_8 Time\ Fixed\ Effects + \epsilon_{jt}, \qquad (2)$$

where $ChginNum_{jt}$ is the change in the number of loans for the $j^{th}$ bank during quarter t and $ChginVal_{jt}$ is the change in the value of the loans for the $j^{th}$ bank during quarter t; β is a parameter that measures the sensitivity of each independent variable to the dependent variable. $AMLF_{jt}$, $CPFF_{jt}$, $CPP_{jt,}$ and TAFjt capture the dollar value of the bank's, j, participation in the stated program during the quarter, t. $SCAP_{jt}$ participation is reflected as a dummy variable during the quarter of the release of the results as it represents the stress tests that were performed on the 19 largest banks, of which 11 are in this sample of banks. $ChginDep_{jt}$ or $TotalDep_{jt}$ reflect the level of deposits of the bank, j, during the quarter, t, as either the change or the total deposits in the regression. $\varepsilon_{jt}$ is a random variable that, by construction, must have an expected value of zero, and is assumed to be uncorrelated with the independent variables.

This regression analysis also includes attention to the impact of the differences between the commercial banks and quarterly periods of the sample, as well as the endogenous nature of the bank lending decision. To address the differences between the commercial banks, bank fixed effects were included in the regression model. To address the differences between the quarterly periods, time fixed effects were included in the model. Endogeneity in the bank lending decision was addressed by lagging the data in each independent variable by one quarter.

In addition, regression analysis was conducted based on the bank's size, as measured by average total assets as described previously. For that analysis, the sample was divided into subsets that reflect the banks of each size category. Equation (2) was then regressed using the change in the number of loans as the dependent variable to account for the differences in dollar values of funding available based on size. Overall, the analysis was done to determine the impact of the stimuli on lending based on the size of the bank.

### 3.3 Event-study analysis

Event-study analysis was conducted to assess the economic impact on the U.S.-based commercial banks around the dates of their participation in and the release of information on the Federal Reserve and U.S. Treasury Department's credit stimuli. The goal of this analysis was to determine whether the sample of U.S. commercial banks benefited via the equity markets from the nearly $3.5 to $9 trillion (Isidore, 2010) in credit stimulus that was made available to eligible institutions. In other words, did the market react positively or negatively to the participation of banks in the credit stimuli? However, this event-study analysis does not address stigma issues, but guides awareness on the reactions of the market to stimuli participation in general.

Given that information is the driver of market reaction, it must be noted that the credit stimuli programs were made available during similar periods and that the participation of the 25 U.S. commercial banks in the sample occurred during similar periods. As such, "contagion effects" of their participation likely occurred, which can lead to biased event study results due to the events for the firms in the sample being clustered around similar calendar dates (Seiler, 2004). That clustering results in no specific event being credited with influencing the market's reaction on any given day. With this limitation relating to the use of the commonly used Market Model (MacKinlay, 1997), results were obtained using the Market-Adjusted Return Model[6]. This event-study analysis was conducted for the five general stimuli programs and the sample that received specific financial support for stimulating credit. The Market-adjusted Return Model is a restricted market model that

[6] Eventus software, via SAS, was used to generate the event study results under the Market-adjusted Return Model.

potentially reduces some of the bias due to event clustering because it does not require an estimation period. The restrictions used in this model are that $\alpha_j$ is set constant at zero and $\beta_j$ is set constant at one given that the estimation period is not used to calculate normal model parameters (Campbell, Lo, and MacKinlay, 1997). Therefore, market-adjusted returns are computed by subtracting the observed return on the market index for day t, $R_{mt}$, from the rate of return of the common stock of the $j^{th}$ firm on day t:

$$A_{jt} = R_{jt} - R_{mt} \quad (3)$$

The average abnormal return (or average prediction error) $AAR_t$ is the sample mean:

$$AAR_t = \frac{\sum_{j=1}^{N} Ajt}{N}, \quad (4)$$

where t is defined in trading days relative to the event date. With T1 representing 30 trading days before the event and T2 representing 30 days after the event, the cumulative average abnormal return is:

$$CAAR_{T1,T2} = \frac{1}{N} \sum_{j=1}^{N} * \sum_{t=T1}^{T2} Ajt. \quad (5)$$

The Market-adjusted Return Model was used to calculate the single-date and twin-date mean cumulative abnormal returns.

The period between the date that the bank participated in one of the five credit stimuli programs and the date that the Federal Reserve released information on that participation to the public (i.e. December 1, 2010) is known as "twin dates" in event study analysis. Twin dates exist for three of the five programs under study, which means that the information was not released to the public on the dates of the actual transactions. The date of December 1, 2010 is the release date for the AMLF, CPFF, and TAF programs. The CPP program of TARP and the SCAP programs released information to the public on the date of the actual transactions and, therefore, this analysis was conducted only on the single dates for those two programs.

In the twin date analysis, the window is defined as the period between two event dates. In this case, the period between the date of the transaction and the date of the release of information – December 1, 2010. The cumulative abnormal return was calculated as:

$$CAR_{T1j,T2j} = \sum_{t=T1j}^{T2j} Ajt, \quad (6)$$

where $T1_j$ , $T2_j$ are the two event dates specific to firm j. The cumulative abnormal return for the single and twin date analysis was used to determine the overall market response to the bank's participation in the stated programs.

**4. Results**

The results of the regression and event-study analyses are presented in Tables 5 through 10. Tables 5 through 8 capture the results of the regression analysis. The number of observations in the regression analysis reflects the number of banks in the sample multiplied by the 16 quarters of data. Tables 9 and 10 provide results of the event-study. The data tells the story of the impact of the credit stimuli on commercial lending and the market's reaction.

Based on the dependent variable of the change in the number of loan transactions, Table 5 shows the significance of the AMLF, CPFF, CPP, SCAP, and TAF programs, as well as deposits in each of the four models. SCAP and TAF show negative impact, which means that the bank's participation in those programs results in a reduction in the number of commercial loans issued. It is also clear from Table 6 that the Change in Deposits variable in model (3) had an insignificant impact on commercial lending, while the Total Deposits variable in model (4) is significant.

**Table 5: Regression Results based on Number of Loan Transactions**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Intercept | 1.2015 * | -2.934 | -3.0051 | -39.7517 *** |
| AMLF | -0.0001 | -0.0001 | -0.0001 | -0.0001 |
| CPFF | 0.0023 ** | 0.0023 ** | 0.0023 ** | 0.0024 ** |
| CPP | 0.0007 * | 0.0008 * | 0.0007 * | 0.0005 * |
| SCAP | -11.6706 ** | -11.0134 * | -10.9663 * | -13.1847 ** |
| TAF | -0.0002 ** | -0.0002 ** | -0.0002 ** | -0.0002 ** |
| Change in Deposits | | | 0.0000 | |
| Total Deposits | | | | 0.0001 ** |
| Bank Fixed Effects | N | Y | Y | Y |
| Time Fixed Effects | N | Y | Y | Y |
| Observations | 400 | 400 | 400 | 400 |
| $R^2$ | 0.0779 | 0.3045 | 0.3047 | 0.4325 |
| Adjusted $R^2$ | 0.0662 | 0.2183 | 0.2163 | 0.3604 |

Notes: The dependent variable in these regression models is the change in the number of loan transactions. Significance is indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

Table 6 reflects the use of the change in the value of the loans ($ millions) as the dependent variable. In this case, the CPP program was only significant in the model without fixed effects. Only two programs, SCAP and TAF, are consistently significant and with negative impact. Again, the Change in Deposits variable in model (3) is not significant, while the Total Deposits variable in model (4) is significant.

**Table 6: Regression Results based on Value of Loans ($ mil)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Intercept | 647.807 *** | 1316.465 | 1290.129 | -6952.03 *** |
| AMLF | -0.0186 | -0.014 | -0.1675 | -0.0291 |
| CPFF | 0.1098 | 0.1326 | 0.15202 | 0.1667 |
| CPP | 0.1494 ** | 0.0678 | 0.0571 | 0.0065 |
| SCAP | -2042.83 ** | -2766.37 ** | -2748.93 ** | -3254 *** |
| TAF | -0.0228 | -0.0409 ** | -0.04331 ** | -0.0357 ** |
| Change in Deposits | | | 0.0024 | |
| Total Deposits | | | | 0.0117 **** |
| Bank Fixed Effects | N | Y | Y | Y |
| Time Fixed Effects | N | Y | Y | Y |
| Observations | 400 | 400 | 400 | 400 |
| $R^2$ | 0.0269 | 0.3484 | 0.3487 | 0.4438 |
| Adjusted $R^2$ | 0.0145 | 0.2677 | 0.2659 | 0.3731 |

Notes: The dependent variable in these regression models is the change in the value of the loan ($ mil). Significance is indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

**Table 7: Regression Results by Size of Bank**

| | Small | Medium | Large |
|---|---|---|---|
| Intercept | -0.5852 | -11.8589 *** | -31.1744 *** |
| AMLF | n/a | -0.0001 | -0.0019 |
| CPFF | n/a | n/a | 0.0027 ** |
| CPP | -0.0027 | -0.0013 ** | 0.0016 |
| SCAP | n/a | -3.4395 | 0.3664 |
| TAF | -0.0006 | 0.0000 | -0.0001 |
| Total Deposits | -0.0003 *** | 0.0001 *** | 0.0000 |
| Bank Fixed Effects | Y | Y | Y |
| Time Fixed Effects | Y | Y | Y |
| Number of Observations | 80 | 256 | 64 |
| $R^2$ | 0.4374 | 0.4957 | 0.7732 |
| Adjusted $R^2$ | 0.2202 | 0.4154 | 0.6515 |

Notes: This table reflects the regression results by size of bank. The dependent variable is the change in the number of loan transactions, which is calculated as the number in the stimulus period minus the non-stimulus period, per bank, per quarter. The data for each independent variable is lagged one quarter to address endogeneity. The split of the banks by size is shown in Table 5. Significance is indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

When the sample is delineated by the size of the bank, using the change in the number of loan transactions as the dependent variable, three clear results are seen in

Table 7. First, the small banks did not participate in three of the five programs and show no significance of influence of the other two programs. In addition, though the small banks show significance from the Total Deposits variable, the impact is negative. Second, the medium-sized banks experienced significant impact from the CPP program of TARP and greater significance, as well as positive results, from Total Deposits. Third, the large banks were able to increase commercial lending activity based on the significant result from participation in the CPFF, Commercial Paper Funding Facility, but not any other variables.

Table 8 reflects the regression results using the change in the number of commercial loans as the dependent variable and splits the sample by the seven banks that had decreases in lending compared to the 18 banks that had increases in lending. The results show that CPP, SCAP, and Total Deposits significantly influenced those banks that had decreases in lending. However, the SCAP impact was again negative. With regard to the 18 banks that had increases in lending, the results show that CPFF, SCAP, TAF, and Total Deposits significantly influenced their lending; though negative results prevail.

**Table 8: Regression Results, by Decrease or Increase in Lending**

| | Decrease | | Increase | |
|---|---|---|---|---|
| Intercept | -10.1783 | *** | -44.4935 | *** |
| AMLF | 0.0001 | | -0.0001 | |
| CPFF | n/a | | 0.0026 | *** |
| CPP | 0.0001 | ** | 0.0003 | |
| SCAP | -8.2606 | * | -15.7019 | *** |
| TAF | -0.0001 | | -0.0001 | ** |
| Total Deposits | 0 | *** | 0.0001 | *** |
| Bank Fixed Effects | Y | | Y | |
| Time Fixed Effects | Y | | Y | |
| Number of Observations | 112 | | 288 | |
| $R^2$ | 0.4916 | | 0.4310 | |
| Adjusted $R^2$ | 0.3361 | | 0.3441 | |

Notes: This table reflects the regression results of the seven commercial banks that had a decrease in commercial lending compared to the 18 commercial banks that had an increase in commercial lending. The dependent variable is the change in the number of loan transactions, which is calculated as the number of transactions in the stimulus period minus those in the non-stimulus period, per bank, per quarter. The data for each independent variable are lagged one quarter to address endogeneity. Significance is indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

The event study analysis captures two single dates and one twin period for each bank's participation in the stated credit stimuli, as described above. Tables 9 and 10 reflect the mean cumulative abnormal returns for this analysis.

On the date of the actual loan transaction, identified as the "Loan" column in Table 9, the market reacted in a fully positive and significant way based on the Market-adjusted Return Model. The market's response was both positive and significant to the banks that participated in the AMLF, CPFF, and TAF programs. The CPP drew a negative and insignificant reaction from the market based on the date of the transaction. The SCAP produced positive cumulative abnormal return of 35.1% in reaction to the banks' participation in SCAP or better known as "stress tests". Even though three programs (i.e. AMLF, CPFF, and TAF) did not release information to the public on or near the date of the transactions, the market had clear and significant reactions on the banks' participation. With regard to the two programs (i.e. CPP and SCAP) that did release information to the public on or near the transaction date, significance and sign split the results. A look at the twin-date analysis could provide more insights as to whether the public's original knowledge of the transactions affected their reaction to the news.

**Table 9: Event Study Results of Mean Cumulative Abnormal Returns**

| Market-adjusted Model | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Loan | | Twin | | Release | | | |
| Program | | | | | Participants | | Non-Participants | |
| AMLF | 9.78% | *** | 45.50% | *** | 9.66% | * | 6.35% | *** |
| (positive: negative) | (30:11) | | (36:5) | | (4:0) | | (17:4) | |
| CPFF | 1.58% | $ | 41.70% | ** | 9.51% | ** | 6.22% | *** |
| (positive: negative) | (20:11) | | (28:3) | | (5:0) | | (16:4) | |
| CPP | -13.27% | | n/a | | n/a | | n/a | |
| (positive: negative) | (10:11) | | | | | | | |
| SCAP | 35.08% | $ | n/a | | n/a | | n/a | |
| (positive: negative) | (10:1) | | | | | | | |
| TAF | 5.93% | $ | 48.72% | *** | 6.92% | ** | 6.80% | ** |
| (positive: negative) | (138:114) | | (209:43) | | (13:3) | | (8:1) | |

Notes: This event-study analysis reflects the response of the market during three periods. The "loan date" is the date that the loan or stimulus participation was transacted, the "twin period" is the range of dates between the transaction date and the date of release of information for the applicable programs. The "release date" is the date that the Federal Reserve Board provided participation information to the public. The results are presented according to the Market-adjusted Model. $ = 0.10 significance; * = 0.05 significance; ** = 0.01 significance; *** = 0.001 significance

As reported on Table 9, in the "Twin" column, the event study analysis of the twin-date period shows positive and significant market reaction for all programs. The results also show a sizeable increase in cumulative abnormal return. Such interim period results are greater than the results on the release date of the participation information.

On the dates of the release of the information to the public after the transaction date, I analyzed the market's reaction to the participants and the non-participants in the program. In the "Release" columns of Table 9, the market's reaction was positive and significant for both participants and non-participants in all programs. It is interesting to note that, though the program participants and non-participants got the same positive reaction from the market, the cumulative abnormal returns of the non-participants are consistently less than that of the participants in the program on the release date. It appears that there was an overall greater positive reaction from the market to the participation of the sample of banks in the general credit stimulus programs than that for non-participants.

With regard to the specific support that was provided to four of the U.S.-based commercial banks in the sample, Table 10 presents the mean cumulative abnormal returns. The analysis shows primarily insignificant results. However, the market spoke loudly with a return of -78.94% significant return in reaction to the joint agreement of the Federal Reserve Board, U.S. Treasury, and FDIC to provide a non-recourse loan as aid to Bank of America. Overall, these event-study results show that the market was paying attention.

**Table 10: Event Study Results of Bank-Specific Stimulus Efforts**

| Bank | Description of Action | Market-adjusted Model |
|---|---|---|
| JP Morgan & Co., Inc. (March 14, 2008) | Fed approved purchase of Bear Stearns | 0.35% |
| Bank of America Corp. (June 5, 2008) | Fed approved purchase of Countrywide | -12.98% |
| Citigroup (September 29, 2008) | Fed agreed to provide liquidity to aid in the Wachovia purchase (NOTE: Wells Fargo ultimately purchased Wachovia) | 4.24% |
| Wells Fargo & Co., Inc. (October 12, 2008) | Fed approved purchase of Wachovia (NOTE: Wells Fargo's offer was chosen by Wachovia) | 35.85% |
| Bank of America Corp. (January 16, 2009) | Fed agreed jointly with Treasury and FDIC to provide non-recourse loan as aid. | -78.94% |

Notes: In addition to the general stimuli that was made available to the eligible financial institutions, the Federal Reserve Board and government agencies also provided stimuli specifically to designated banks for identified purposes. The event-study analysis of those transactions, on the date of execution, is provided using the Market-adjusted Model. $ = 0.10 significance; * = 0.05 significance; ** = 0.01 significance; *** = 0.001 significance

## 5. Conclusion

This paper addresses the research question of, "Did United States-based commercial banks respond to credit stimuli with increased commercial lending during the stimulus period of October 2007 through September 2011 when compared to the earlier non-stimulus period of October 2002 through September 2006?" The answer of "yes" is based on not only the results of the univariate, regression, and event-study analyses of this paper, but also on the U.S. approach to monetary policy and the distinctions of this paper from existing financial literature. The results of this paper contribute to the financial literature by focusing on commercial lending versus the broad look at commercial, mortgage, and personal loans of other papers. Such a broad look in other research netted the declines of the other loan types with what is now known to be increases in commercial lending during the 2008 financial crisis. In addition, the use in this paper of loan-level data versus balance sheet or aggregated data of other papers aids the contribution to the financial literature with details not examined by other researchers. Such distinctions from other literature has informed the public that the financial media got it wrong and policy makers got it right. Overall, the increase in commercial lending of $235 billion, in relation to the $3.493 trillion in quantifiable credit stimuli, equates to a 6.75% return on the investment in U.S. banks and the economy.

**References**

Anginer, D., Demirguc-Kunt, A. & Ahu, M. (2010wp). How Does Deposit Insurance Affect Bank Risk?: Evidence from the Recent Crisis. Policy Research Working Paper 6289, The World Bank, Retrieved from: http://elibrary.worldbank.org/content/workingpaper/10.1596/1813-9450-6289.

Ashcraft, A. (2006). New Evidence on the Lending Channel. *Journal of Money, Credit, and Banking*, 38 (3), p. 751-775.

Belke, A. & Polleit, T. (2009). *Monetary Economics in Globalised Financial Markets.* Berlin: Springer-Verlag.

Bernanke, B. (2009). Speech at the Stamp Lecture, London, England. Retrieved from Federal Reserve System Website: http://www.federalreserve.gov/newsevents/speech/bernanke20090113ahtm.

Bernanke, B. and Blinder, A. (1988). IS IT MONEY OR CREDIT, OR BOTH, OR NEITHER? Credit, Money, and Aggregate Demand. *The American Economic Review*. 78 (2), p. 435-439.

Bernanke, B. and Gertler, M. (1995). Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives*. 9 (4), p. 27-48.

Bernanke, B., & Lown, C. (1991). The Credit Crunch. *Brookings Papers on Economic Activity*, 1991(2), 205-247.

Berrospide, J. M., & Edge, R. M. (2010). The effects of bank capital on lending: What do we know, and what does it mean? *International Journal of Central Banking*, 5-64.

Black, L., & Hazelwood, L. (2012). The effect of TARP on bank risk-taking. *Journal of Financial Stability*, 1-14. Retrieved from http://dx.doi.org/10.1016/j.jfs.2012.04.001.

Black, L. & Rosen, R. (2007). How the Credit Channel Works: Differentiating the Bank Lending Channel and the Balance Sheet Channel (wp-2007-13). Federal Reserve Bank of Chicago.

Campbell, J. Y., Lo, A. W., & MacKinlay, A. C. (1997). *The econometrics of financial markets*. Princeton, N.J: Princeton University Press.

Cole, R., (2012). How Did the Financial Crisis Affect Small Business Lending in the United States?, Retrieved from U.S. Small Business Administration website, http://www.sba.gov/advocacy/7540/361941

Contessi, S., & Francis, J. L. (2009). *U.S. commercial bank lending through 2008: Q4: New evidence from gross credit flows* (2009-011C). Retrieved from Federal ReserveBank of St. Louis: http://research.stlouisfed.org/wp/2009/2009-011.pdf

Diamond, D. W., & Dybvig, P. H. (1983), Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy*, 91 (3), 401-419.

Diamond, D. W., & Rajan, R. G. (2000). A Theory of Bank Capital. *Journal of Finance*, 55 (6), 2431-2465.

Edwards, F. R., & Mishkin, F. S. (1995). The Decline of Traditional Banking: Implications for Financial Stability and Regulatory Policy. *FRBNY Economic Policy Review*, July 1995, 27-47.

Evans, G.R. (1999). Chapter 3 The Loanable Funds Model. Retrieved from:http://www2.hmc.edu/~evans/chap3.pdf.

Fama, E.F. (2013). Was There Ever a Lending Channel? *European FinancialManagement*, 19 (5), 837-851.

Federal Deposit Insurance Corporation (FDIC). (1998). A Brief History of Deposit Insurance in the United States, Retrieved from: http://www.fdic.gov/bank/historical/brief/brhist.pdf.

Federal Reserve Board (2007a). Press Release on the deterioration of financial market conditions. Retrieved from: http://www.federalreserve.gov/newsevents/press/monetary/20070817b.htm.

Federal Reserve Board (2007b). Press Release on the first rate reduction to restore the financial markets. Retrieved from: http://www.federalreserve.gov/newsevents/press/monetary/20070817a.htm.

Gambacorta, L. & Marques-Ibanez, D. (2011). The bank lending channel: Lessons from the crisis. *BIS working paper, No. 345.* p. 1-32.

Geithner, T. (2009). *Secretary Geithner Introduces Financial Stability Plan.* Washington, DC. Retrieved from http://www.treasury.gov/press-center/press-releases/Pages/tg18.aspx.

Ghosh, S. (2008). Revisiting the Credit Crunch of 1990s: An Empirical Evidence. *European Journal of Economics, Finance and Administrative Sciences*, 13, 57-66.

Hendricks, T.& Kempa, B. (2011). Monetary Policy and the Credit Channel, Broad and Narrow. *Eastern Economic Journal.* 37, p. 403–416.

Hilsenrath, J. & Di Leo, L. (2011, September 22). Fed Launches New Stimulus. *The Wall Street Journal*, A1-A2.

Isidore, C. (2010, December 1). Fed made $9 trillion in emergency overnight loans. *CNN Money.* Retrieved from: http://money.cnn.com/2010/12/01/news/economy/fed_reserve_data_release/ index.htm.

Ivashina, V., & Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. *Journal of Financial Economics*, 97, 319-338. doi:10.1016/j.jfineco.2009.12.001.

Kashyap, A. K., & Stein, J. C. (2000). What do a million observations on banks say about the transmission of monetary policy? *American Economic Review*, *90*(3), 407-428. doi:10.1257/aer.90.3.407.

Keister, T., & McAndrews, J. J. (2009). Why are banks holding so many excess reserves? *Current Issues in Economics and Finance*, *15*(8), 1-11.

Kenny, T. (2013). What is Operation Twist? About.com. Retrieved from http://bonds.about.com/od/advancedbonds/a/What-Is-Operation-Twist.htm?p=1.

Lown, C. S., & Morgan, D. P. (2002). Credit Effects in the Monetary Mechanism, Federal Reserve Board of New York Economic Policy Review, 217-235.

Lown, C. S., & Morgan, D. P. (2006). The Credit Cycle and the Business Cycle: New Findings Using the Loan Officer Opinion Survey. *Journal of Money, Credit and Banking*, 38 (6), 1575-1597.

MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature*, *35*(1), 13-39. Retrieved from http://www.jstor.org/stable/2729691.

Madura, J. (2012). *Financial Markets and Institutions.* Mason, Ohio, Cengage Learning.

Mankiw, N.G. (2010). *Macroeconomics.* New York, NY: Worth Publishers.

Mora, N. (2010). Can banks provide liquidity in a financial crisis? *Economic Review Third Quarter 2010 (Federal Reserve Bank of Kansas City)*, 31-67.

Morris, C. & Sellon, Jr., G. (1995). Bank Lending and Monetary Policy: Evidence on a Credit Channel. *Economic Review; Federal Reserve Bank of Kansas City*, Second quarter, p. 59-75.

Seiler, M. J. (2004). *Performing financial studies: A methodological cookbook*. Upper Saddle River, NJ: Prentice Hall.

Thakor, A. V. (1996). Capital Requirements, Monetary Policy, and Aggregate Bank Lending: Theory and Empirical Evidence. *The Journal of Finance*, 51(1), 279-324.

U.S. Government Accounting Office (GAO). (2011). Federal Reserve System: Opportunities Exist to Strengthen Policies and Processes for Managing Emergency Assistance (i.e. Audit Report) (GAO-11-696). Retrieved from http://www.gao.gov/new.items/d11696.pdf.