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**THE IMPACT OF GOVERNMENT INTERVENTION ON STOCK PRICES:**

# A study of signaling effects of bailout on U.S. banks during the financial crisis in 2008

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**Abstract:**
The year of 2008 witnessed the largest number of government bailouts in the U.S. financial history. In this thesis, we investigate the short-term impact of government intervention on stock price performance for three samples of banking organizations in the U.S., grouped according to size. Two events, the bailout of Bear Stearns on March 14 and the TARP announcement of the Capital Purchase Program on October 14, will be studied to distinguish the difference in signaling effects between a specific bailout, targeting one bank and a general bailout, targeting the financial sector as a whole. The event study results demonstrate a too big to fail (TBTF) effect under a seven day event window, with large cumulative abnormal returns accruing to banks of large size. This is most evident for the general bailout announcement of TARP, in terms of cumulative abnormal returns and level of significance. Additionally, regressions on size, bank type, loan-to-deposits, goodwill-to-assets and return on average assets are run to account for other possible sources of excess return. The coefficients indicate an overall positive relationship between a bank's risk level and cumulative abnormal returns.

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# 1 Introduction

The global financial crisis unfolding in 2008 is by many economists referred to as the worst financial crisis since the Great Depression of the 1930s. The crumbling of a series of financial institutions shocked the U.S. economy, as well as the rest of the world. The rippling effect remains evident in the financial markets today and probably many years to follow. In the midst of all chaos, the top players of U.S. economy came to the realization that it was the government's obligation to give a hand to a long-functioning free market now drowning in deep water of deteriorating mortgage-backed assets and fractured confidence. Facing the most severe stock market plunge in a long time, the U.S. government bailed out a large number of financial institutions in the banking sector unforeseen in the U.S. history. The foundation of capitalism was shaken, yet it was necessary in order to prevent another Great Depression.

In this thesis, it is in our interest to investigate the immediate impact of government intervention on banks of different sizes. To be specific, what will be studied is the signaling effects that a bailout announcement has on stock price performance of other banks. Two events of government bailout have been chosen; one specific, directed at one bank only and the other one general, targeting numerous financial institutions at the same time. The specific event of interest is the initial attempt of bailout of Bear Stearns, which occurred on March 14, 2008, in form of an emergency loan. The general event on the other hand, is pegged at the preliminary capital injection of TARP (Troubled Asset Relief Program) through the CPP (Capital Purchase Program) on October 14, 2008. The inherent difference in nature of the two events allows us to compare government bailouts in various forms as well as their impact on the financial market. With the help of Stata, an event study on abnormal and cumulative abnormal returns is conducted on three distinct samples; small banks, big banks and banks that are deemed too big to fail. The banks are grouped according to total assets, which is regarded as an important determining factor in predicting abnormal returns. The calculated cumulative abnormal returns are then regressed on a series of risk and performance measures, including asset size, bank type (classified as either investment bank or commercial bank), debt-to-assets, loan-to-deposits, goodwill-to-assets as well as return on average equity (ROAE). Lastly, various tests of significance on abnormal and cumulative abnormal returns are performed, both within and across bank samples.

The scope of the research is limited to the immediate effects of the bailout announcement on sixty banks, comprising of a small bank sample defined as having a total asset range between $393.264 - $2,129.966 million by the end of year 2007 and a big bank sample, defined as having a total asset range between $25,976 - $2,187,631 million.

The hypothesis is that both government bailout announcements implicate positive cumulative abnormal returns for banks that are perceived to be under protection by creditors and investors. However, as there is no exact list of institutions considered as too big to fail, size will be the key indicator for systematic importance or immunity against bankruptcy. We therefore expect higher abnormal returns accruing to big banks. Anticipated is that a general bailout announcement, covering a broader range of participants, will lead to abnormal returns for all banks whereas a specific bailout only benefits certain selected banks, i.e. banks deemed too big to fail.

The reasoning behind our hypothesis is that investors and creditors of a financial institution to be bailed out interpret the bailout as a positive signal, as it removes risk of bankruptcy. A higher likelihood of bailout when in crisis lowers a bank's cost of fund, which raises the valuation of the bank and in turn drives up its price per share. Size is an important factor as it increases the likelihood of protection. Further considered is the risk dimension which is regarded as a determining factor on the magnitude of cumulative abnormal returns. We assume that it is the riskiest banks, given the same level of asset size, who yield the largest abnormal return to a bailout signal.

The topic for our thesis is up-to-date and interesting to study. The year of 2008 was an exciting year in the history of finance. Never before has so many bailouts taken place, something that have caused dramatic reactions to the stock market. Government intervention has always been a controversial and sensitive subject in a capitalist society where free market dominates. The bailouts of year 2008 were without doubt overwhelmed with heavy debates. Some branded Henry Paulson, the Treasury Secretary of the United States, a socialist and an enemy of the American way of life, for proposing the massive bailout plan of TARP aimed at the entire financial system while others believed that the government was doing the best it could to save the Western capitalism from financial catastrophe. Numerous academic papers have been written on topics, such as bank runs, too big to fail effects and bailouts, which provide us with a large pool of relevant literature, both theoretical and empirical. There are several studies written on the

general bailout announcement of TARP, both the initial announcement and later implementations which happened in stages (see Joines (2010) and Brewer and Klingenhagen (2010) in section 3, Previous Literature for details). Other studies focus on specific announcements of bailout, by examining cases like Bear Stearns, Northern Rock and American International Group (see O'Hara and Shaw (1990), Goldsmith-Pinkhau and Yorulmazer (2010) and Brewer and Jagtiani (2009) under Previous Literature for further information). In this study, we compare and contrast bailouts of different levels in form of a general and a specific announcement and investigate their impact on stock performances of bank samples varying in size. Hence, we differentiate ourselves by offering yet another dimension to bailout analysis.

The event study results display significant positive cumulative abnormal returns around the general announcement date for all three samples, with the TBTF banks being most positively affected and the small banks the least. Around the Bear Stearns event, the results are somewhat less positive overall as cumulative abnormal returns are just above zero for all bank samples, with big and TBTF banks experiencing slightly higher returns. Additionally, the differences in cumulative abnormal returns between banks samples are more positive and significant at a higher level around the TARP announcement as opposed to the bailout of Bear Stearns, which showed no significant differences between big and small banks.

Regarding simple and multiple regressions it can be concluded from overall positive coefficients that cumulative abnormal returns increase with asset size, risk-taking, as well as performance from the previous year, with the size effect being more evident for the general announcement. Further concluded is that the shorter the event window in the multiple regressions, the higher the combined explanatory power of the independent variables, which applies to both events.

Our results have important implications regarding market reactions to government bailout policies in the short-run. Not only do the results give suggestions on the direction of market movement, but they also explain the underlying factors such as size and risk exposure, which caused the reaction.

## 2 Historical Background

The year of 2008 witnessed the largest number of government interventions directed at the U.S. financial system in history. TARP (Troubled Asset Relief Program) alone amounted to $700 billion, not to mention the Federal Reserve rescue effort (a rescue plan aimed at restoring liquidity) which costed over $1.5 trillion and the Federal stimulus program (a program aimed to save or create jobs and jumpstart the economy from recession) of another $577 billion, according to Federal Reserve (2009). A lot of the government bailouts were addressed to firms deemed "too big to fail", a term first introduced by the Comptroller of the Currency in 1984 to describe financial institutions that are considered too large and interconnected to be allowed to go bankrupt without receiving financial assistance from the government. These are usually large financial firms whose failure would pose systemic risk to the overall macro economy. Banks that are TBTF have been subject to controversy since the implementation of the term, as it goes against the basic principle of capitalism and market fairness, according to Stern and Feldman (2004). As Alan Greenspan, Chairman of the Federal Reserve between 1987-2006, put it: *"If they're too big to fail, they're too big"*.

Today there is no official list of what institutions should be considered as too big to fail. Joines (2010) proposes three ways of defining TBTF, the first being institutions with asset size above a certain threshold, the second being the initial TARP recipients and the third according to risk- and probability measures set by Moody's Investors Services. See section 3, Previous Literature for details. There are various terms describing the TBTF phenomena, such as "too systematic to fail" and "too interconnected to fail", which send out different signals to investors, as argued by Stern and Feldman (2004). What is central for an institution to be considered as TBTF is often a combination of size and systematic importance. The systematic importance is for example determined by interconnections through interbank lending in the Federal funds market, payment- or settlement processing and counterparty exposure in the credit default swaps market and other derivative markets, according to Brewer and Klingenhagen (2010).

A bailout describes a situation in which an individual, a business or a government provides assistance, usually in form of loans, bonds, stocks and cash, to a business on the edge of survival to avoid systematic failure of the market. A bank bailout, in particular, is when a group prevents a bank, often large national banks with many connections from going bankrupt. The assistance provider in the case of a bank bailout is often a government agency, which is

usually the only one with sufficient financial resources to help. A government bailout occurs frequently through the purchase of stocks and securities, which acts like a loan to relieve emergent liquidity stress. The U.S. central banking system Federal Reserve was created in 1913 to provide capital to important businesses facing bankruptcy. A bailout of a bank by the Treasury is funded with the taxpayers' money and the repayment of the loan can take from a few months up to years, according to Bezdecheck (2011). Sometimes government bailouts may not necessarily save a financial institution from failing. Rather, the government can let a bank go under with minimal impact on other firms in the economy, as can be observed in the case of Bear Stearns. Bailouts are controversial as many believe that poorly-performing companies should be allowed to go under as part of "the survival of the fittest" theory. Government bailouts are especially sensitive. Proponents may argue that it is for the benefit and stability of the larger economy, while opponents think that it goes against the ground principles of a free market and encourages moral hazard, leading to even worse crisis in the long run, as argued by Mishkin (2006) and Poczter (2010). As for the recent financial crisis, Shull (2010) argues that the harm caused to the financial market by allowing a TBTF institution going under outweighs moral hazard concerns, after conducting a cost-benefit analysis.

According to Wright (2010), the subprime-mortgage crisis of 2007 evolving into the systemic financial crisis of 2008 created a large level of public interventions into banking systems and to a smaller extent automakers, taxpayers and homeowners. Governments all over the world intervened repeatedly to support banks suffering from the crisis. In the U.S. it started out with the bailout of Bear Stearns in form of a $30 billion credit line and later during the weekend around March 14, the acquisition of Bear Stearns by JPMorgan Chase and Co. was a fact. On September 7, 2008, the Treasury injected billions of dollars into Fannie Mae and Freddie Mac that were later placed under legal control of the Federal Housing Finance Agency. The insurance giant AIG (American International Group), suffering from severe liquidity crisis, received a combined total of $180 billion in bailout from the Treasury and the Federal Reserve on September 16. Later in September, 2008, the Congress approved a $630 billion spending bill, including a $25 billion low-interest loan to the auto industry. In October, the Emergency Economic Stabilization Act, commonly referred to as the bailout of the U.S. financial system, spent $700 billion purchasing distressed assets and recapitalizing banks. Although bailouts were abundant in 2008, not all banks were equally lucky. Lehman Brothers, for instance, was allowed

to go under on September 15, despite its status as one of the top five investment banks in the U.S., according to Natkin and Schmidt (2009).

The first event of interest for this thesis is the bailout of Bear Stearns, which took place on Friday, March 14, 2008. This event can be perceived as a government assistance directed at a specific firm, or a specific bailout. Bear Stearns was a global investment bank highly exposed to mortgage-backed assets, which were central to the subprime-mortgage crisis in 2008. The bank had a total asset worth of $400 billion in March, 2008, and was engaged in the markets of securities, derivatives trading and clearing, brokerage services, originating and securitizing commercial and residential mortgage loans. Between January to March, 2008, the bank's financials worsened. Bear Stearns informed the Federal Reserve on Thursday, March 13, that it was out of liquidity and could not meet its financial obligations due the following day. The threat of insolvency raised concern about the stability of the financial market as Bear Stearns was trading with many other firms and was largely present in important financial markets. A huge contagion risk was expected to strike similar firms, why the resolution carried out initially was an extension of credit to Bear Stearns through JPMorgan Chase and Co. The purpose of this bridge loan was for Bear Stearns to meet its obligations due on March 14, spend the weekend exploring other possible options and for policymakers to find ways of minimizing risk spread to the rest of the market, if no private sector solutions were available. The loan was paid back on Monday, March 17, however, market pressure had worsened during the weekend, and Bear Stearns was unable to avoid bankruptcy on Monday. Hence, the bank needed large injections of liquidity from the Federal Reserve, or an acquisition by a stronger firm. The only viable bidder was JPMorgan Chase and Co. and on Sunday, March 16, Bear Stearns accepted an offer to merge with JPMorgan Chase and Co, according to the Federal Reserve (2012). Initially a price of $2 per share was suggested to save the banking industry temporarily from collapse. The price was then raised to $10 per share, because of a potential fear of Bear Stearns' shareholders, outraged at the fire sale deal.

The second event of interest is the TARP announcement of the Capital Purchase Program. TARP was a government program created to purchase assets and equity from financial institutions in an attempt to curb the ongoing financial crisis. The bankruptcy of Lehman Brothers and the September events had prompted policymakers and regulators in the last two weeks of September to implement a systematic problem addressing program to prevent a second

Great Depression and a systematic collapse. TARP can be divided into the five segments, comprising of the Auto Programs, the Bank Investment Programs, the Credit Market Programs, the Housing Program and the investment in American International Group (AIG). The massive government bailout announcement plan of TARP is looked upon as a general bailout, targeting the whole financial sector. The Treasury invested in the TARP through the issuance of investment loans, asset guarantees and purchases from various financial institutions. On behalf of the taxpayers, the Treasury received financial instruments, such as equity securities[4], debt securities and additional notes in exchange from the firms. As of March 31, 2013, the Treasury had recovered over 94 percent of the total funds disbursed, according to U.S. Department of the Treasury (2013).

On Tuesday morning, October 14, 2008, the Capital Purchase Program was released as the Secretary of the Treasury Henry Paulson announced an injection of $250 billion into banking organizations in the U.S. Half of this amount would be invested in nine major banks in form of purchase of senior preferred stock and warrants and the other half available to thousands of small regional banks, according to Dash and Landler (2008). The small or medium banks needed to sign up before November 14 if they wanted to participate. The aim was to stabilize the U.S. financial system and jumpstart the markets that provide mortgage, auto, student and business loans. The nine original banks that had already signed the Capital Purchase Program agreement were not stated in the announcement made by Paulson, however spread by media outlets during the day. The major banks targeted by the CPP received between $2-$25 billion on October 28, according to the Federal Reserve (2011). See Table A5 in the Appendix for bailout distribution. Paulson described the original nine TARP recipients as healthy institutions that had taken this step for the good of the U.S. economy, according to Lengell (2009).

TARP provided important assistance to small businesses, community banks, U.S. automakers and struggling homeowners. More than 450 small and community banks received funding through TARP, which in turn mainly helped small businesses with financing.

[4]Among those, preferred stock, common stock and warrants

## 3 Previous Literature

There are a lot of related work within the research field of government bailout and its effect on equity markets, both general and specific. To begin with, O'Hara and Shaw (1990) investigate the effect on equity of the TBTF guarantee announcement by the Office of the Comptroller of the Currency (U.S.) around the Continental Illinois bailout in September 1984. An event study is performed and the results show positive wealth effects accruing to the largest banks, among those TBTF banks, and negative effects to non-TBTF banks. The study also shows that the magnitude of the influence is dependent on size as well as insolvency of the banks.

Joines (2010) designs an empirical event study on stock price reactions to three September events during fall 2008; the collapse of Lehman Brothers, the bailout of AIG and the first announcement of TARP. The study tests excess returns according to three independent definitions of TBTF. The first one is derived from the original definition proposed by the Comptroller of the Currency in 1984 and includes banks with total assets above $49 billion. The second definition is given by Moody's Investors Services, based on the likelihood of government funding. The third definition of TBTF is the list of banking institutions that actually received equity injection through TARP in October 2008. The study shows insignificant results on the Lehman Brothers bankruptcy for all bank samples, implying that banks similar to Lehman were not severely punished in terms of stock performances in the short-run. When AIG was bailed out on the following day, all samples of TBTF banks displayed significant positive returns while non-TBTF banks did not. Further concluded is that the specific bailout on AIG informed the largest and most systematic firms of their protection from insolvency. Lastly, on the day of the TARP announcement, significant positive returns were observed for all banks. Regardless of size, TARP was a vote of confidence in the U.S. financial system which is viewed as beneficial by all banks.

Theoretically, Joines (2010) argues that the market is affected by a TBTF policy first through its influence on a bank's cost of fund, which is a direct reflection of the bank's trustworthiness. The higher the likelihood of bankruptcy, the less likely a bank is going to get funding from creditors and the more expensive is the funding. The interest rate a bank pays for its deposits is also positively correlated to its likelihood of bankruptcy. When a TBTF policy is introduced, the possibility of bankruptcy is removed which allows banks with TBTF status to get access to cheaper funding and pay out lower risk premium on deposits, as part of the risk is

transferred to the government. In other words, banks are subsidized by the government, which is positively perceived by investors, who in turn value the bank higher, thus driving up the share prices. However, how the market actually reacts to the TBTF policy may differ significantly from what is expected in theory. If the market expects that government protection applies to a certain bank, its cost of fund would already be adjusted for the revised risk premium. This implies that a bailout event would not lead to positive abnormal returns as it is expected. On the other hand, if a bank is expected to be fully protected, but is not bailed out, the market would react negatively. Secondly, a TBTF policy give businesses incentives to increased risk-taking, because the cost is borne by the government. Normally, a bank would try to behave responsibly and keep a low risk of insolvency to maintain high trustworthiness, which minimizes its cost of funds. A government safety net distorts this good practice, leading to moral hazard, also argued by Mishkin (2006) and Poczter (2010). Furthermore, Joines (2010) argues that positive returns to the TBTF banks may be accompanied by negative returns for small banks, if the cost of the insurance fund is paid for by all banks in the financial market. Therefore, the origin of the fund is an important influence on market reaction.

Brewer and Klingenhagen (2010) study stock price effects of various size groups of banking organizations on the TARP announcement of the Capital Purchase Program. They study cumulative abnormal returns on four different size groups, where the first group consists of the initial TARP recipients of the CPP and the next group comprises 25 domestic banks in the top 50 largest financial institutions. Two other groups consist of smaller banks with a total asset value of $5-$10 billion and $1-$5 billion, respectively. The results show large positive and statistically significant abnormal returns both for the initial TARP recipients and for the 25 large banks not included. The groups of smaller banks show positive results, but insignificant. A chi-square statistic test on the cumulative abnormal returns across groups suggests that TBTF status favored larger banks over smaller ones in terms of intra-day stock price performance. The conclusion drawn is that TARP meant positive abnormal returns for both TBTF and non-TBTF banks, with TBTF and big banks being more positively affected.

Brewer and Jagtiani (2009) study abnormal stock returns of a portfolio of investment banking organizations containing Morgan Stanley, Merrill Lynch, Lehman Brothers and Goldman Sachs upon the bailout announcement of Bear Stearns. On the announcement day they find positive and significant abnormal returns of 17,79%. The rescue and the extension of the

safety net is found to mostly have created value for other investment banking organizations that are in the same category as Bear Stearns. No significant abnormal returns on TBTF commercial banks are found in the study.

Goldsmith-Pinkhau and Yorulmazer (2010) analyze spillover effects of the government bailout announcement of Northern Rock on the UK financial system in 2008. The effects are measured by the abnormal returns on banks' stock prices, obtained from an event study. The study concludes that the spillover effects depend on similarities to a bailed out bank in terms of size, debt, wholesale, deposit, mortgage and capital. Negative spillover effects on other banks are found prior to the rescue, when Northern Rock was in deep trouble. According to the results, banks reacted positively as soon as a bailout rescue was announced. The extent to which the news affect a bank are found to be largely dependent on its structure of liability and source of funding.

## 4 Data and Methodology

The main statistical method used consists of an event study, which is a powerful tool that enables us to assess financial implications around the release of some kind of new information. An event study provides an effective framework to measure stock price responses to a change in the regulatory environment or a specific announcement. The data analysis and statistical software Stata has been used in order to calculate abnormal and cumulative abnormal returns around the announcement dates of the two events stated earlier, as well as to test for significance, run simple and multiple regressions and perform statistical analysis. In short, the event study is used to investigate potential differences between abnormal and cumulative abnormal returns between bank samples and events. Regressions are run in order to investigate what explanatory power size has on each event, as well as to see if cumulative abnormal returns can be better explained by additional risk indicators.

Our data set contains of stock price information and balance sheet items over 30 small and big U.S. banks, respectively, based on total assets. The big banks were selected based on total assets of late 2007 ranging from $25,976 - $2,187,631 million. The sample of small banks is defined as having the total asset range between $393.264 - $2,129.966 million by end of 2007. Table A1-A4 in the Appendix provide further details on sample characteristics. The two bank samples have been selected after careful research based on specific criteria, such as having an asset value in a predetermined range, having publicly traded stocks and giving the information needed, such as stock prices and balance sheet items, around and some time before the events. Our intention was to include the biggest U.S. banks as of end of 2007, as well as to cover small banks with a total asset base on average around $1 billion. Data on stock prices and ratios of total assets, debt-to-assets, net loan-to-deposits, goodwill-to-assets and return on average equity (ROAE) have been retrieved from Thomson One Analytics, Wharton Research Data Services (WRDS), using CRSP and Compustat, as well as from complementary annual reports. Comparable returns for the S&P 500 Index were also obtained from WRDS. Stock prices for all banks were collected around the announcement day and five months prior to the events, to include both estimation- and event window used in the event study.

Due to limited time and access to financial data, our sample is likely to suffer from several potential selection biases. First of all, we have intentionally selected 30 big banks and 30 small banks according to asset size instead of including all banks in the U.S. or by drawing a

random sample from a population of banks. This may lead to a biased sample in which participants are not objectively represented and properly balanced. Consequently, the results based on our sample cannot be fully generalized for banks in general. In other words, the external validity is called into question. Due to the small size of the sample, the accuracy of the causal relationship is also a concern, i.e. our sample may undermine internal validity of the results.

Also needed is to determine whether the results obtained from the event study and the regressions are statistically significant. Therefore, a t-test is performed in the event study, i.e. we test for statistical significance and show if a given event created significant effects related to TBTF and bailout, in terms of abnormal and cumulative abnormal returns. T-statistics are reported and based on corresponding p-values one can conclude whether the results are significant on the 1%, 5% and 10% levels, under the assumption of normal distributions. Also performed is a Wilcoxon signed-rank test in order to test whether a sample median differs significantly from a hypothesized value. The test provides us with z-statistics and regarding the characteristics of this test, one does not need to assume a normal distribution, instead only an assumption of a symmetric distribution is required, according to Newbold (2009). In addition, we provide an independent two sample t-test assuming unequal variances in order to define levels of significance for the differences in abnormal and cumulative abnormal returns between big and small bank samples around each event. Small and big banks are compared, as well as small and TBTF banks.

## 4.1 Event Study

### 4.1.1 Initial Assumptions

According to MacKinlay (1997), an event study relies on some important assumptions that need to be taken into account when implementing the study. First of all, the event is assumed to consist of new, not anticipated, information to the market, which is immediately incorporated into stock prices. Further assumed is that the market participants can correctly interpret what the event and the new information imply. Other factors influencing the firm are anticipated to remain constant and only the specific event is occurring.

### 4.1.2 Methodology

By using the event study methodology proposed by MacKinlay (1997) one can compare realized and expected normal returns and map out abnormal effects on stock prices after the occurrence of a particular event or the release of new information. Regarding the event definition of this thesis, what will be examined is the two separate events of government intervention stated earlier. Thus, the announcement date, day 0 for the event comprising Bear Stearns is set to March 14, 2008, when the bank was given the promise of bailout from the Federal Reserve. Simultaneously, the announcement date regarding the general announcement of bailout through TARP is set to October 14, 2008, as the information of payment through the Capital Purchase Program was released.

Around each event an event study on abnormal and cumulative abnormal returns is conducted on three distinct samples. In addition to a big and a small bank sample, also included is a sample containing nine big banks, that are considered as too big to fail. As previously stated, there are many distinctions of TBTF and we have chosen to include the nine banks based on the definition of TBTF as the financial institutions that received initial TARP injections ($125 billion) through the CPP program. These banks consist of JPMorgan Chase and Co, Citigroup Inc, Bank of America, Goldman Sachs, Morgan Stanley, Merrill Lynch, Wells Fargo & Company, State Street Corporation and The Bank of New York Mellon. The distribution of bailout money among these financial institutions is presented in Table A5 in the Appendix.

An estimation window of five months (100 reported days excluding weekends) prior to the event window has been used in the study in order to calculate expected normal returns. The estimation window of Bear Stearns ranges between 16/10/2007 - 10/03/2008 and that of TARP from 19/05/2008 - 08/10/2008. Our main event window stretches over a total of seven days (-3,3), including the three days before and after the announcement day. In addition, two shorter event windows containing five (-2,2) and three days (-1,1) were studied. We include up to three days preceding the events in our event window in order to capture potential leakage of information prior to the events and also up to three days after the announcement, in order to capture both immediate and short-term effects. The full event window regarding Bear Stearns ranges between 11/03/2008 - 19/03/2008 and the corresponding event window around TARP stretches between 09/10/2008 - 17/10/2008. The market has been particularly volatile in 2008 and a lot of events were occurring one after another, as explained in section 2, Historical

Background. In September alone, several giant financial institutions faced life-altering events, which led to huge turmoil in the stock market, both upwards and downwards. We would therefore like to keep our event windows rather short, in order to minimize the possibility that the results get contaminated by other shocks to the market unrelated to our focus. Therefore, no conclusion will be drawn regarding the long-term impact, which is left uncovered in the thesis.

In the event study, abnormal returns as well as cumulative abnormal returns around the announcement day are calculated according the following formulas:

$$AR_{i\tau} = R_{i\tau} - E(R_{i\tau} \mid x_{\tau}) \qquad (1)$$

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau = \tau_1}^{\tau_2} AR_{i\tau} \qquad (2)$$

The abnormal return, $AR_{i\tau}$, for stock *i* at time $\tau$ is the realized return $R_{i\tau}$ minus the expected, normal, return $E(R_{i\tau})$, given exogenous factors determining returns, $x_{\tau}$. The cumulative abnormal return $CAR_i$ $(\tau_1, \tau_2)$ is the sum of the abnormal returns, $\sum AR_{i\tau}$, during the event window, which are defined by $\tau_1$ and $\tau_2$. In order to obtain the abnormal returns, one compare the realized returns in the event window to the returns one would normally expect, absent the event, which are part of the estimation window. Normal returns can be calculated using Constant-mean return, Market Model return or using a benchmark such as industry return or the return on the S&P 500 Index. The model used in this thesis is the Market Model, which according to Ahern (2009) is the most commonly used prediction model. The realized return can be described by the following formula:

$$R_{i\tau} = \alpha_i + \beta_i R_{m\tau} + \varepsilon_{i\tau} \qquad (3)$$

$R_{m\tau}$ is the return of the market, given by the S&P 500 Composite Index Return, which is the return on the Standard & Poor's Composite Index, including 500 firms as proxy for the market portfolio. The expected, normal return of the market is calculated through an OLS regression using Stata. The estimates of $\alpha_i$ and $\beta_i$ are obtained from the Stata regression when regressing realized stock returns on the S&P500 market return during the pre-specified estimation window.

Using the estimates of $\alpha_i$ and $\beta_i$, one can predict the expected, normal return given the market return through the following formula:

$$E(R_{i\tau} | R_{m\tau}) = \hat{\alpha}_i + \hat{\beta}_i R_{m\tau} \quad (4)$$

The abnormal returns are then calculated by plugging the estimates of $\alpha_i$ and $\beta_i$ into the formula below. The returns are summed up to provide the cumulative abnormal returns for the event window of interest, according to Equation 2 above.

$$AR_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau} \quad (5)$$

### 4.2 Regressions

#### 4.2.1 Methodology

Simple regressions are run to investigate how cumulative abnormal returns can be explained by differences in total asset size. The control variables used in the initial regressions are the logarithmic values of the total asset values. As discussed earlier, the likelihood of a bailout increases with asset size, which, together with number of connections, is an indicator for systematic importance. Standard OLS regressions on all banks for each and every event on the three different event windows are performed, controlling for heteroskedasticity by running the regressions with robust standard errors. Calculations of $R^2$, or the coefficient of determination, are made in order to investigate how well observed outcomes are replicated by our regression model, that is, how much of the cumulative abnormal returns that can be explained by the variation in total asset values.

In the second stage multiple regressions are performed to investigate whether other variables contribute to explain the differences in cumulative abnormal returns. According to theory, the riskiest banks benefit the most from a protection guarantee. However, the riskiness of a particular bank is difficult to measure as it depends on many factors, such as its debt level and exposure to mortgage-backed assets. Considered candidates of control variables are a bank type dummy (taking the value 1 if it is an investment bank and 0 if it is a commercial bank based on SIC codes), debt-to-assets and goodwill-to-assets ratio, which are risk indicators, net loan-to-deposits ratio, a liquidity measure, as well as return on average equity (ROAE).

Regarding bank type, investment banks are traditionally viewed as riskier than commercial banks. This is because the performance of an investment bank, which is predominantly a security business, is highly linked to the stock market, whereas a commercial bank, whose main businesses include accepting deposits and making loans, is mainly influenced by the condition of the overall economy. The second indicator of risk, the total debt-to-assets ratio, measures the leverage of a firm by determining how much of the capital that is financed by debt. The more debt relative to assets a specific firm has, the more leveraged, or risky it is.

Goodwill is defined as the amount above the fair net book value a firm pays for an acquisition. It is part of the intangible assets which could be anything ranging from brand recognition, customer loyalty to employee satisfaction. Since it is not amortized on like most other intangibles, firms have the incentive to maximize goodwill and minimize other intangibles. From this perspective, a firm with a large amount of goodwill implies a higher risk relative to a firm with a smaller amount of goodwill, all else being equal. Goodwill can also be an indicator for both opportunity and uncertainty. It somewhat magnifies the effect that risk has on returns.

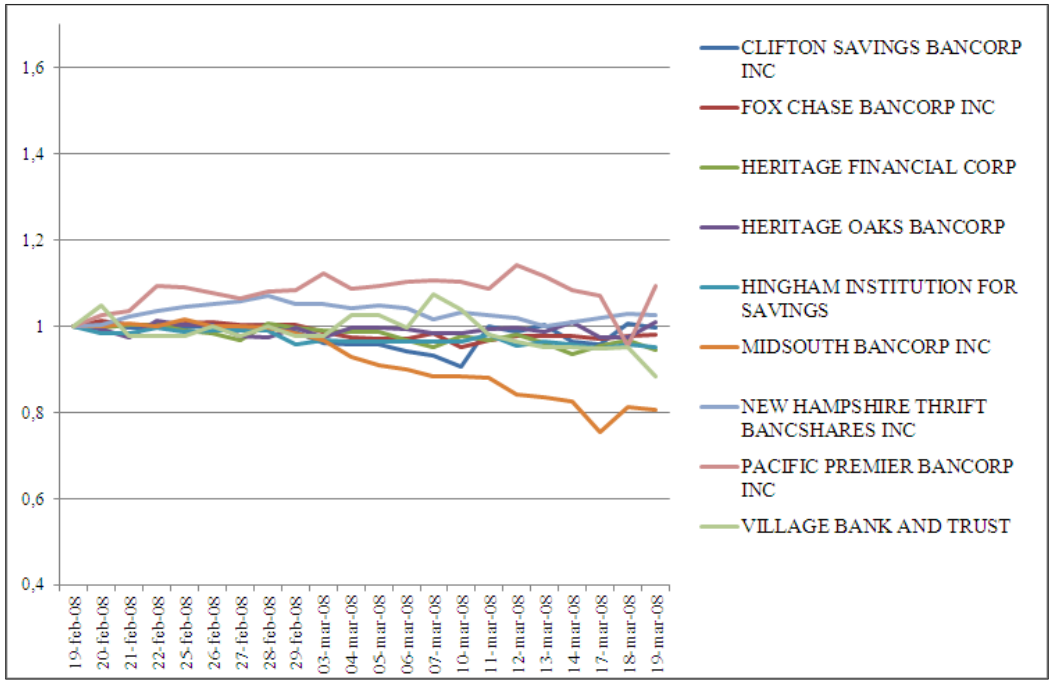
Another way of looking at risk is by studying liquidity, which can be measured by net loan-to-deposits (LTD) ratio, i.e. by dividing a bank's net loans by its total deposits. This ratio is often used by policy makers in order to determine lending practices of banks. A too high LTD ratio indicates a lack of ability to cover potential fund requirements, which signals high risk-taking within the firm. Lastly, return on average equity (ROAE) is a measure of firm performance and it is calculated by dividing net income by average equity.

Calculations of $R^2$ are also performed in the multiple regressions and levels of significance are reported. We also consider potential biases affecting the results obtained from the regressions, such as attribution bias, issues on multicollinearity and problems of endogeneity. Attribution bias is caused by the loss of observations in a study and includes withdrawals. Problems of multicollinearity arises when independent variables in a multiple regression model are closely correlated to one another, which we investigate through regressions and we check the co-movements of variables through the creation of a correlation matrix. Endogeneity arises when there is a correlation between independent variables and the error term. Hence, there might also be a risk of omitted variables in our regressions, according to Wooldridge (2009).

## 5 Results

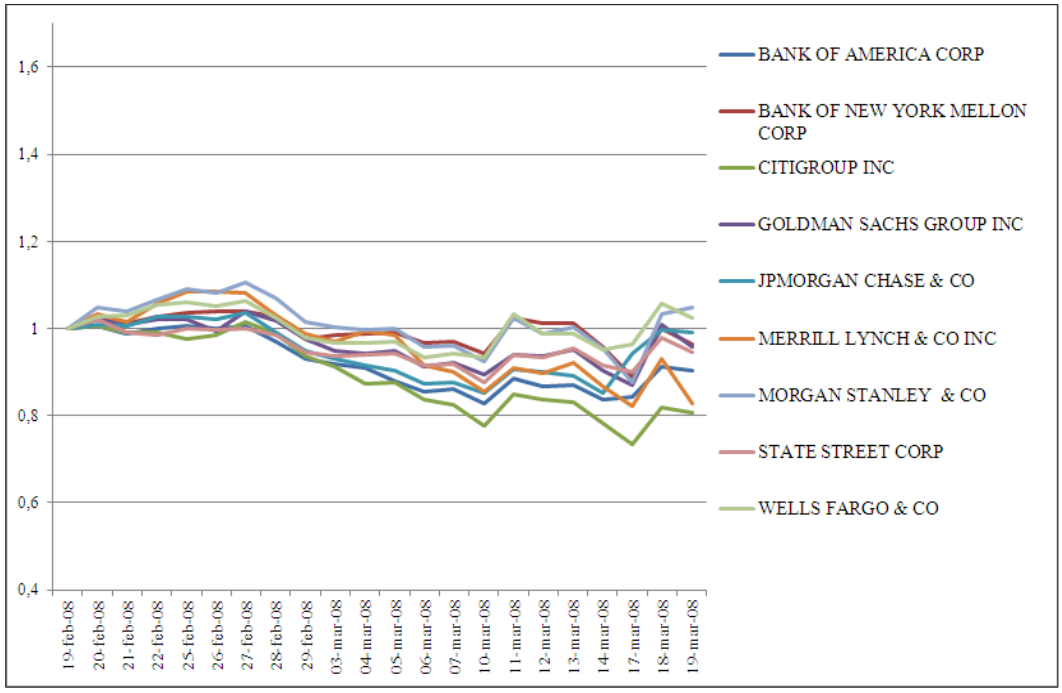
Normalized stock price development for each event containing the smallest banks as well as the TBTF institutions one month before and during the event window are shown in Graph 1-4 below. By studying the graphs, one can conclude that the TBTF institutions tend to follow each other closely, whereas the small banks follow a more unpredictable pattern. This is probably due to the fact that TBTF banks are highly interconnected whereas small banks operate more independently. One can observe a relatively more obvious upward movement around the announcement of TARP, being most distinct for the TBTF banks, as seen in Graph 4. On the other hand, the event of Bear Stearns shows a much more diffuse development of stock prices for both bank samples, according to Graph 1 and 2. By studying the stock price development for TBTF banks around Bear Stearns in Graph 2, an upward movement is observed, starting from March 17, which is the Monday after the announcement of the bailout of Bear Stearns.

***Graph 1.*** *Stock price development for small banks around the bailout of Bear Stearns*



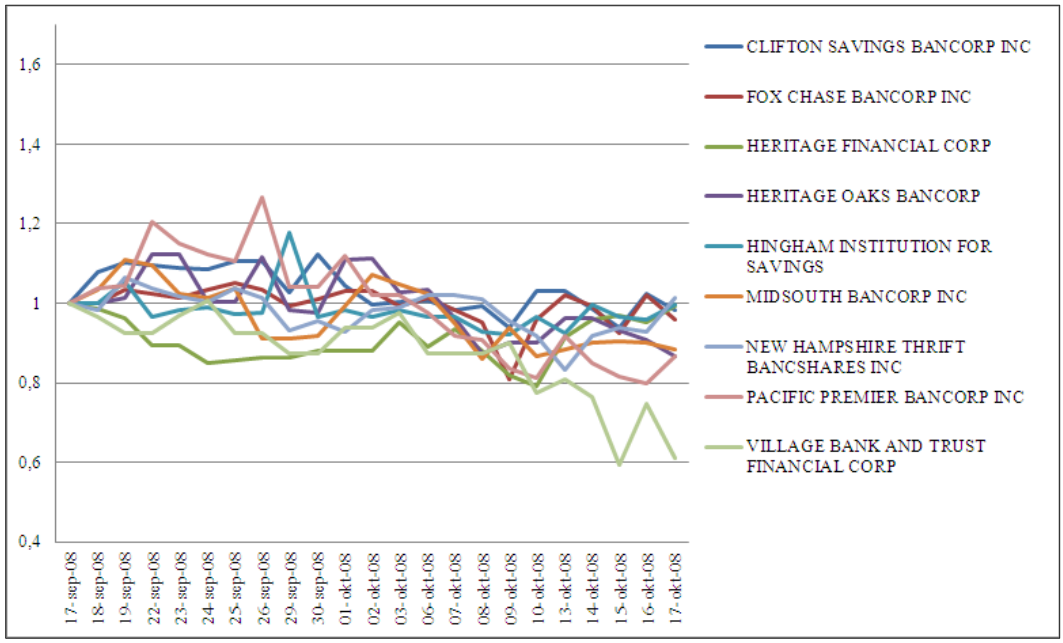

*Notes: Graph 1 displays stock price development before and around the bailout announcement of Bear Stearns for the smallest banks between 2008-02-19 and 2008-03-19.*

***Graph 2.*** *Stock price development for TBTF banks around the bailout of Bear Stearns*



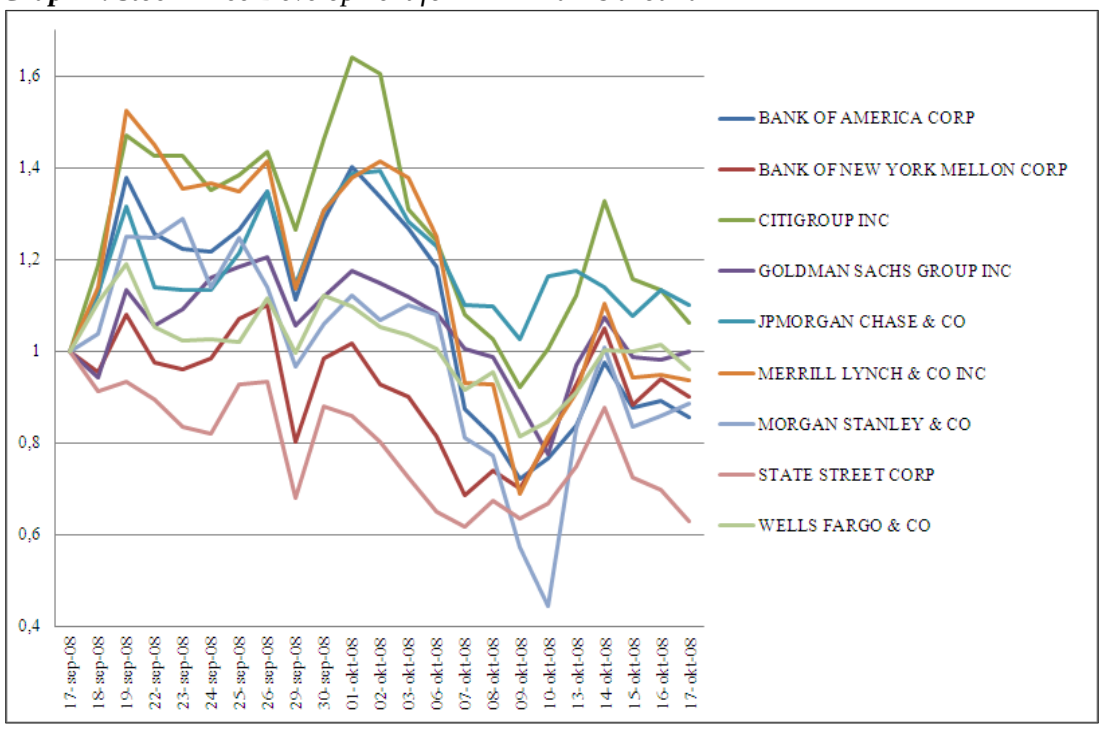

*Notes: Graph 2 displays stock price development before and around the bailout announcement of Bear Stearns for the TBTF banks between 2008-02-19 and 2008-03-19.*

***Graph 3.*** *Stock price development for small banks around TARP*




*Notes: Graph 3 displays stock price development before and around the TARP announcement of CPP for the smallest banks in our sample between 2008-09-17 and 2008-10-17.*

***Graph 4.*** *Stock Price Development for TBTF Banks around TARP*




*Notes: Graph 4 displays stock price development before and around the TARP announcement of the CPP for the TBTF banks between 2008-09-17 and 2008-10-17.*

### 5.1 Event Study Results

Regarding the outline in this section, we present the event study results by first focusing on the event around Bear Stearns. Abnormal returns are presented, followed by cumulative abnormal returns for our different size groups. Then the results from the two sample t-test are presented, in order to investigate if the differences in abnormal and cumulative abnormal returns between bank samples are significant. The same procedure applies to the event of TARP. Last in the section is a summary of the event study results, followed by a discussion of potential biases.

As can be seen in Table B1 in the Appendix, the abnormal returns around the specific announcement and bailout of Bear Stearns are insignificant for the smallest banks according to the t-statistics. As can be seen in Figure 1, representing mean values below, abnormal returns are close to zero during the whole event window. Big banks show somewhat more extreme values in absolute abnormal returns, as well as a larger degree of significance, as reported in Table B1 in the Appendix. On the announcement day, the small bank sample shows abnormal mean returns of -0,003 (insignificant), compared to the big bank sample that experienced abnormal mean

returns of -0,009, significant at the 5% level. The TBTF sample shows even more extreme values in absolute terms with an abnormal return of -0,016, significant at the 1% level, on the announcement day. According to Table B1 in the Appendix, the standard deviation of abnormal returns over the full event window for small banks ranges between 0,021 - 0,042 and for big banks it lies between 0,016 - 0,039, thus, small banks are more dispersed in abnormal returns.

***Figure 1.*** *AR for small banks around Bear Stearns*

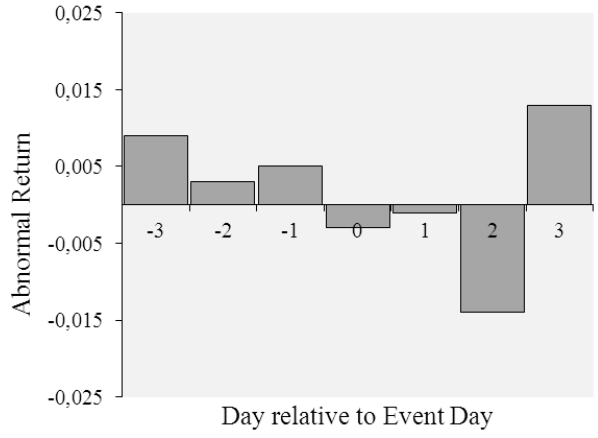
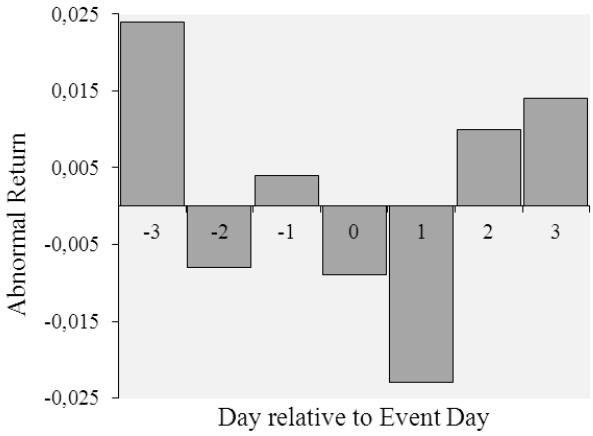



***Figure 2.*** *AR for big banks around Bear Stearns*




*Notes: Figure 1 and 2 display abnormal returns for small and big banks around the bailout announcement of Bear Stearns, during the full event window comprising of seven days.*

Cumulative abnormal stock price effects around the bailout announcement of Bear Stearns are reported in Table B2 in the Appendix. Figure 3 and 4 below show the cumulative abnormal returns during the full event window containing seven days. When studying this event window, significant positive cumulative abnormal returns across all three bank samples are present, with positive returns being highest for the TBTF banks (0,039) when studying mean values, somewhat less for big banks (0,012) and even lesser for small banks (0,011). When studying a shorter event window comprising five days, the cumulative abnormal returns are still significant, however negative for small banks (-0,012) and big banks (-0,027) and positive for TBTF banks (0,014).

***Figure 3.*** *CAR for small banks around Bear Stearns*

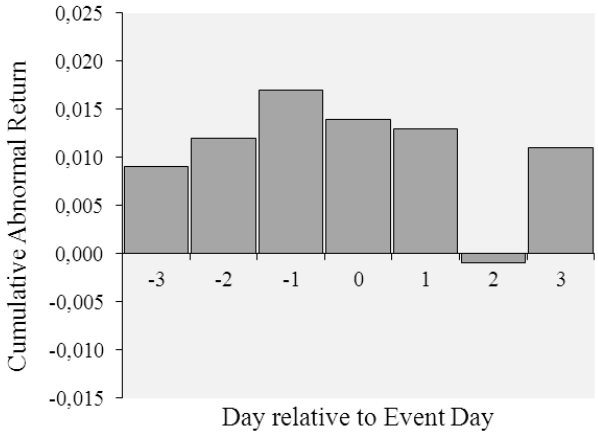
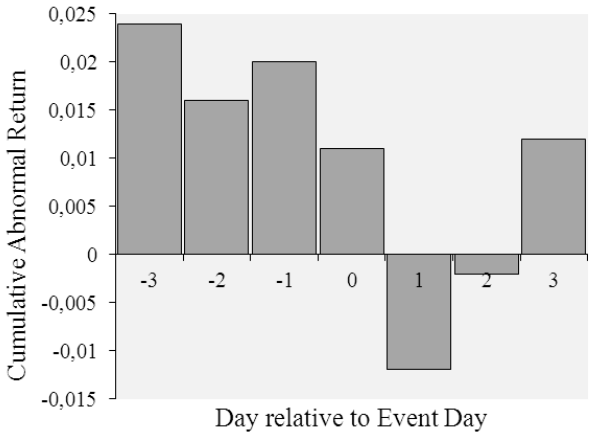



***Figure 4.*** *CAR for big banks around Bear Stearns*




*Notes: Figure 3 and 4 display cumulative abnormal returns for small and big banks around the bailout announcement of Bear Stearns, during the full event window comprising of seven days.*

Table B3 in the Appendix presents t-statistics and levels of significance of the differences in abnormal and cumulative abnormal returns between the different bank samples around the bailout of Bear Stearns. According to the table, no significant differences in abnormal or cumulative abnormal returns are present between the small and big bank samples close to the announcement day. The greatest difference is observed between the TBTF banks and the small banks with TBTF banks showing greater cumulative abnormal returns, however, the difference is not statistically significant.

Regarding the event around the TARP announcement, as can be seen in Table B4 in the Appendix, a negative stock price performance is seen in all firms regardless of size, on the day before announcement, followed by mostly positive abnormal returns during the next coming days. One can observe large abnormal returns accruing to the big banks as well as the TBTF banks. For small banks, the overall abnormal returns are not significant, as compared to the big and TBTF banks, which show high levels of statistical significance. On announcement day, the abnormal returns for the small bank sample has the insignificant mean value of 0,008 and for the big sample the abnormal return is 0,126, significant at the 1% level, whereas TBTF institutions show 0,138 in abnormal returns on the same day, also significant at the 1% level. These results can be seen in Figure 5 and 6 below and in Table B4 in the Appendix. The standard deviation of abnormal returns for small banks during the event window of seven days ranges between 0,056 - 0,121 and for big banks it lies between 0,037 - 0,193. Thus, the overall volatility around the

TARP event is much higher for all banks, regardless of size, than around the bailout of Bear Stearns.

***Figure 5.*** *AR for small banks around TARP*

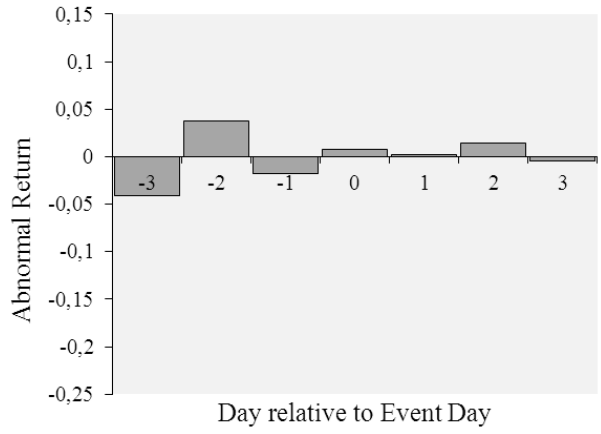
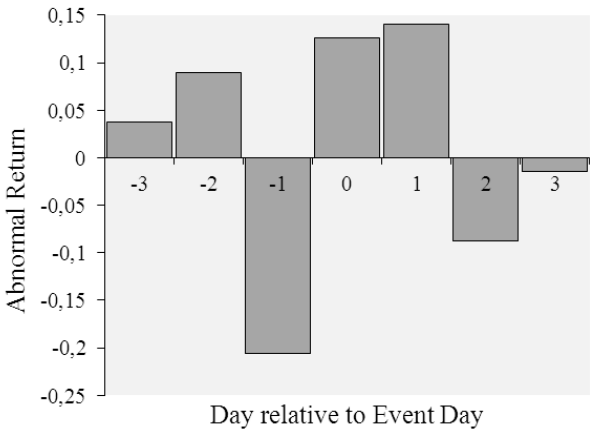



***Figure 6.*** *AR for big banks around TARP*




*Notes: Figure 5 and 6 display abnormal returns for small and big banks around the TARP announcement of the CPP program, during the full event window comprising of seven days.*

When studying the cumulative abnormal returns around TARP during the event window containing five days, small banks show significant returns of 0,040 at the 1% level, according to Table B5 in the Appendix. Big banks and TBTF banks show large and significant returns at the 1% level during all three event windows around the TARP announcement, with TBTF banks experiencing the highest cumulative abnormal returns. In the event window comprising of five days, the significant cumulative abnormal return for the big bank sample is 0,065 and for the TBTF banks it is even higher (0,084). When studying the seven-day long event window, the big banks show mean cumulative abnormal returns of 0,087 and TBTF banks 0,094.

***Figure 7.*** *CAR for small banks around TARP*

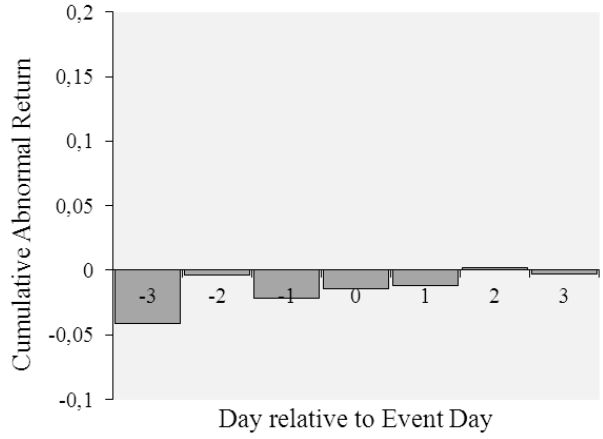
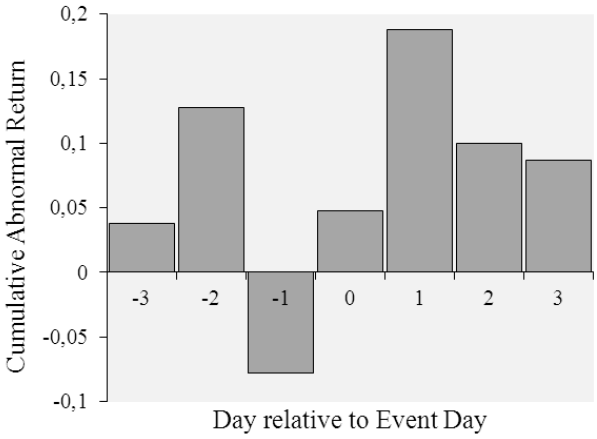



***Figure 8.*** *CAR for big banks around TARP*




*Notes: Figure 7 and 8 display cumulative abnormal returns for small and big banks around the TARP announcement of the CPP program, during the full event window comprising of seven days.*

The results from the two sample t-test around the announcement of TARP are reported in Table B6 in the Appendix. Significant differences are observed between the abnormal returns of big banks and that of small banks with big banks displaying higher values. Thus, the announcement of TARP, compared to the bailout announcement of Bear Stearns, had a larger degree of statistically significant differences between small and big banks. Differences in cumulative abnormal returns are significant during the seven-day long event window (-3, 3) with a difference between TBTF and small banks of 0,096, significant the 5% level. According to the event study, the announcement of TARP can be seen as a positive effect on the stock market overall. Hence, a too big to fail signal effect is evident, as shown in greater abnormal and cumulative abnormal returns for the banks with greater asset values.

To summarize the event study results, one can conclude that in both events, the overall abnormal and cumulative abnormal returns were higher for the biggest and TBTF banks. The event of TARP and the CPP release benefitted all banks, regardless of size, to a larger extent, than the bailout of Bear Stearns, both in terms of abnormal and cumulative abnormal returns. The TARP event also showed higher levels of significance in excess returns as well as in differences between small and big banks, compared to the Bear Stearns event. The days around the bailout of Bear Stearns showed no significant differences in abnormal returns between big and small banks close to the announcement day.

Regarding biases around the event study results, there is a potential threat that the underlying assumptions, on which the study is based, are not fully met. This raises concerns on our main results and performed tests. For example, the possibility of other events coinciding with our event window makes it difficult to single out the effect for the events chosen in this study. For Bear Stearns, there is a reason to suspect that the event study assumption that the market participants can correctly interpret what the specific event and the new information imply, is not fulfilled. The weekend after March 14 consisted of several happenings, which possibly puzzled investors and equity holders of what to expect from the market. The event study of Bear Stearns can be misleading, since it also captures the equity effects on the take-over of Bear Stearns by JPMorgan Chase and Co. on Monday, March 17, which might therefore bias the results.

### 5.2 Regression Results

Regarding the outline in this section, we begin with displaying descriptive statistics for the variables of interest. We then present the results from the investigation of whether, and to what extent, our potential control variables co-move and present the decision of what variables to include in the multiple regressions, except from size. This is followed by a graphical illustration of the relationship between cumulative abnormal returns and total assets around each event. The robustness and statistical significance of these relationships are then determined through simple and multiple regressions. First, the results from the simple and multiple regressions run around Bear Stearns are presented, followed by the case for TARP. The section ends with a summary of regression results and a discussion on potential biases.

Shown in Table 1 below are descriptive statistics for variables of interest included in our main regressions. As seen in the table, the big bank sample possess higher values in almost all explanatory variables compared to the small bank sample, including total debt-to-assets, net loan-to-deposits and goodwill-to-assets. This implies that big banks in general take on more risks as debt-to-assets, net loan-to-deposits and goodwill are indicators for risk of different dimensions. The small and the big sample display similar levels of ROAE. All banks in the small bank sample are commercial banks, whereas the sample of big and TBTF banks contain investment banks as well. Studying the TBTF sample, the net loan-to-deposits ratio shows a lower value (0,547) as opposed to the other two samples. To a large extent, this could be

explained by the fact that several banks in the TBTF sample are involved in investment banking, with three banks being 100% investment banks. Hence, these banks do not deal with individual/business loans associated with commercial banking.

***Table 1.*** *Descriptive statistics for variables of interest*

**Small Banks (N=30)**

| *Variable* | *Mean* | *Median* | *Std dev* | *Min* | *Max* | *Type* |
|---|---|---|---|---|---|---|
| *Size* | *6,898* | *6,827* | *0,328* | *5,974* | *7,664* | *discrete* |
| *Bank type* | *0* | *0* | *0* | *0* | *0* | *dummy* |
| *Total debt-to-assets* | *0,038* | *0,028* | *0,035* | *0* | *0,142* | *discrete* |
| *Net loan-to-deposits* | *1,031* | *0,984* | *0,215* | *0,738* | *1,611* | *discrete* |
| *Goodwill-to-assets* | *0,007* | *0,002* | *0,010* | *0* | *0,034* | *discrete* |
| *ROAE* | *0,096* | *0,091* | *0,063* | *-0,039* | *0,222* | *discrete* |

**Big Banks (N=30)**

| *Variable* | *Mean* | *Median* | *Std dev* | *Min* | *Max* | *Type* |
|---|---|---|---|---|---|---|
| *Size* | *12,050* | *11,845* | *1,310* | *10,165* | *14,598* | *discrete* |
| *Bank Type* | *0,133* | *0* | *0,346* | *0* | *1* | *dummy* |
| *Total debt-to-assets* | *0,219* | *0,205* | *0,112* | *0,004* | *0,462* | *discrete* |
| *Net loan-to-deposits* | *1,706* | *1,032* | *4,328* | *0* | *23,698* | *discrete* |
| *Goodwill-to-assets* | *0,060* | *0,033* | *0,143* | *0,003* | *0,805* | *discrete* |
| *ROAE* | *0,094* | *0,108* | *0,133* | *-0,411* | *0,313* | *discrete* |

**TBTF Banks (N=9)**

| *Variable* | *Mean* | *Median* | *Std. dev.* | *Min* | *Max* | *Type* |
|---|---|---|---|---|---|---|
| *Size* | *13,574* | *13,860* | *0,957* | *11,867* | *14,598* | *discrete* |
| *Bank Type* | *0,333* | *0* | *0,500* | *0* | *1* | *dummy* |
| *Total debt-to-assets* | *0,286* | *0,280* | *0,104* | *0,126* | *0,462* | *discrete* |
| *Net loan-to-deposits* | *0,547* | *0,559* | *0,462* | *0* | *1,094* | *discrete* |
| *Goodwill-to-assets* | *0,027* | *0,023* | *0,026* | *0,003* | *0,083* | *discrete* |
| *ROAE* | *0,132* | *0,117* | *0,086* | *0,023* | *0,313* | *discrete* |

*Notes: Table 1 shows descriptive statistics for variables of interest considered in the regressions for each bank sample as of end of 2007. Size is calculated as the logarithmic value of total assets. Bank type takes the value 0 if commercial bank and 1 if investment bank, based on SIC code.*

Table 2 below consists of a correlation matrix displaying the correlations between the explanatory variables. The coefficients describe how the variables co-move with one another and the table is studied in order to investigate the potential risk of multicollinearity. As can be seen,

debt-to-assets and size are among the most highly correlated variables, with a positive correlation of 0,875. When regressing size on debt-to-assets, a strong relationship between the two variables are found. Therefore, one of the correlated coefficients would not only contribute little incremental information to our regression, but also pose a risk of distorting the coefficient of the other explanatory variable (size in this case), why we have chosen to exclude the debt-to-assets ratio, after various regression trials. By doing so, the accuracy of the size variable and hence our regression model is enhanced.

***Table 2.*** *Correlation matrix of control variables*

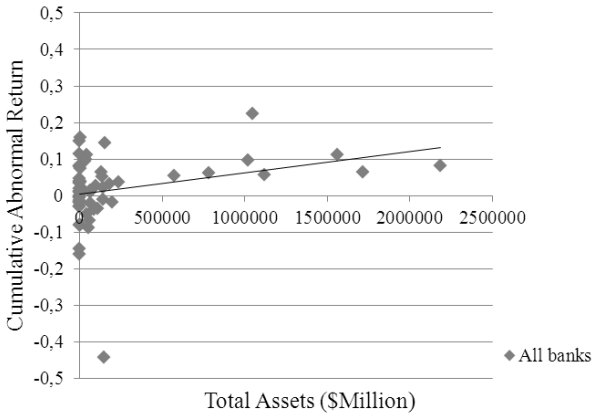
| | ***Size*** | ***Bank Type*** | ***D/A*** | ***LTD*** | ***GW/A*** | ***ROAE*** |
|---|---|---|---|---|---|---|
| ***Size*** | *1,000* | | | | | |
| ***Bank Type*** | *0,322* | *1,000* | | | | |
| ***D/A*** | *0,875* | *0,366* | *1,000* | | | |
| ***LTD*** | *-0,322* | *-0,598* | *-0,193* | *1,000* | | |
| ***GW/A*** | *0,205* | *-0,057* | *0,041* | *-0,122* | *1,000* | |
| ***ROAE*** | *0,046* | *0,197* | *-0,064* | *-0,289* | *0,025* | *1,000* |

*Notes: Table 2 shows correlations between independent variables considered in the multiple regressions.*

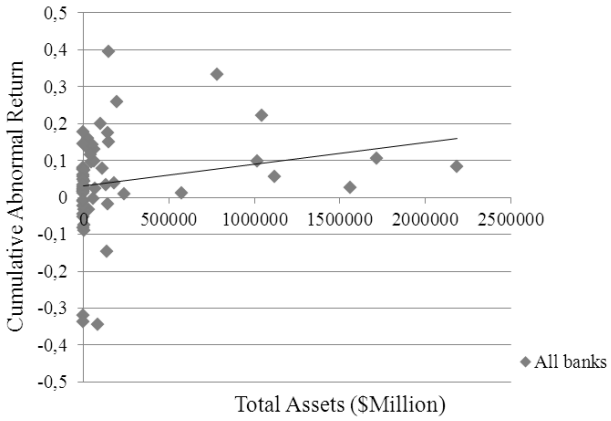
Graph 5-6 below display cumulative abnormal returns for all banks as a function of total asset values in the full event window comprising seven days. Both events display a positive correlation between asset size (independent variable) and cumulative abnormal returns (dependent variable). The robustness and statistical significance of these relationships will be examined throughout the following regressions.

***Graph 5-6.*** *Cumulative abnormal returns as a function of size*

***Graph 5.*** *CAR (-3,3) around Bear Stearns described by size*




***Graph 6.*** *CAR (-3,3) around TARP described by size*




*Notes: Graph 5 and 6 show the relationship between cumulative abnormal returns and total asset size around each event during the full event window. All banks are included in the respective plot.*

The results from the simple and multiple regressions run on Bear Stearns are shown in Table 3 below. From the results of the simple regressions, one can conclude that size alone is not a significantly important factor in predicting cumulative abnormal returns during either three event windows. This is probably due to sample and time frame selection bias, keeping in mind that we have neither the complete population nor a random sample. Rather, our samples (big bank sample and small bank sample) are relatively homogenous within their respective group. The size coefficient has an insignificant value of 0,005. The coefficient of determination, $R^2$, has the highest value of 0,027 in the event window comprising seven days, which is minimal.

When studying multiple regressions performed on Bear Stearns, size explains cumulative abnormal returns at a 5% significant level during the full event window. The size coefficient has a significant value of 0,007, meaning that a 100% increase in asset size leads to 0,7% increase in cumulative abnormal returns. Net loan-to-deposits (0,058) is significant at the 10% level and ROAE at the 5% significance level in the full event window.

***Table 3.*** *Simple and multiple regressions around the bailout of Bear Stearns*

**Simple Regressions**

| **All Banks** | **CAR (-3, 3)** | **CAR (-2, 2)** | **CAR (-1, 1)** |
|---|---|---|---|
| *Size* | *0,005* | *0,003* | *0,007* |
| | *(1,32)* | *(0,67)* | *(0,94)* |
| *Constant* | *-0,035* | *-0,043* | *-0,056* |
| | *(-0,96)* | *(-1,13)* | *(-1,06)* |
| $R^2$ | *0,027* | *0,009* | *0,022* |

**Multiple Regressions**

| **All Banks** | **CAR (-3, 3)** | **CAR (-2, 2)** | **CAR (-1, 1)** |
|---|---|---|---|
| *Size* | *0,007*** | *0,002* | *0,002* |
| | *(2,41)* | *(0,75)* | *(0,69)* |
| *Bank type* | *0,125* | *0,148* | *0,412**** |
| | *(1,53)* | *(1,32)* | *(2,93)* |
| *Net loan-to-deposits* | *0,058** | *-0,009* | *0,018* |
| | *(1,94)* | *(-0,30)* | *(0,64)* |
| *Goodwill-to-assets* | *-0,035* | *-0,065** | *0,012* |
| | *(-1,33)* | *(-1,84)* | *(0,41)* |
| *ROAE* | *0,162*** | *0,037* | *-0,047* |
| | *(2,04)* | *(0,49)* | *(-0,45)* |
| *Constant* | *-0,118*** | *-0,021* | *-0,028* |
| | *(-2,28)* | *(-0,52)* | *(-0,75)* |
| $R^2$ | *0,226* | *0,270* | *0,656* |

*Notes: t-statistics are reported in the parentheses. All parameters are estimated by OLS regression using robust standard errors. For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%.*

The results from the simple and multiple regressions performed around the announcement of TARP are shown in Table 4 below. Results from the simple regressions show that the size coefficients, which are positive, are significant for the seven day and three day event window at the 1% and 5% significance level, respectively. From a seven day perspective, an 100% increase in asset size leads to 1,7% increase in cumulative abnormal return. The size coefficient in a seven-day event window (0,017) is higher than the corresponding coefficient in the simple regression run around Bear Stearns (0,005). Thus, one can conclude that size is a powerful predicting factor in a general bailout announcement, as opposed to a specific announcement, according to our simple regressions.

As for the multiple regressions, a significant positive coefficient (0,013) of the size parameter at the 5% significance level during the full event window if found. Also, goodwill-to-asset is positive and significant at the 1% significance level regardless of the length of the event window.

***Table 4.*** *Simple and multiple regressions around the TARP announcement*

**Simple Regressions**

| **All Banks** | **CAR (-3, 3)** | **CAR (-2, 2)** | **CAR (-1, 1)** |
|---|---|---|---|
| *Size* | *0,017*** | *0,007* | *0,018*** |
| | *(2.99)* | *(1,26)* | *(2,42)* |
| *Constant* | *-0,116*** | *-0,014* | *-0,160*** |
| | *(-2,18)* | *(-0,26)* | *(-2,39)* |
| $R^2$ | *0,130* | *0,024* | *0,110* |

**Multiple Regressions**

| **All Banks** | **CAR (-3, 3)** | **CAR (-2, 2)** | **CAR (-1, 1)** |
|---|---|---|---|
| *Size* | *0,013*** | *0,003* | *0,008* |
| | *(2,06)* | *(0,57)* | *(1,30)* |
| *Bank type* | *0,051* | *0,117* | *0,387*** |
| | *(0,5)* | *(0,74)* | *(2,31)* |
| *Net-loan-to-deposits* | *0,024* | *0,061* | *0,039* |
| | *(0,45)* | *(1,17)* | *(0,87)* |
| *Goodwill-to-assets* | *0,131**** | *0,117**** | *0,115**** |
| | *(2,73)* | *(3,16)* | *(2,84)* |
| *ROAE* | *0,213* | *0,490*** | *0,212* |
| | *(1,03)* | *(2,34)* | *(0,98)* |
| *Constant* | *-0,139* | *-0,097* | *-0,147** |
| | *(-1,53)* | *(-1,09)* | *(-1,70)* |
| $R^2$ | *0,156* | *0,174* | *0,313* |

*Notes: t-statistics are reported in the parentheses. All parameters are estimated by OLS regression using robust standard errors. For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%.*

The above results indicate that size has a positive impact on cumulative abnormal returns for both the general and specific bailout announcement during all three event windows. Nevertheless, the level of significance differ somewhat between event windows with a few coefficients being insignificant. Size tends to play a bigger role in explaining cumulative abnormal returns in the TARP case in contrast to the Bear Stearns bailout, as reflected in both

larger and more statistically significant coefficients. As for the other variables, all of them displayed positive coefficients during the TARP event, implying a positive relationship between all risk measures and the cumulative abnormal returns. Consequently, one can conclude that high risk firms, based on size (which display high positive correlation with debt level/leverage), bank type, net loan-to-deposits, goodwill-to-assets as well as ROAE, tend to benefit more under a general bailout, at least in the short run. However, the significance of the coefficients differs between variables and event windows. Another interesting observation regarding the TARP event is the influence goodwill has on cumulative abnormal returns, which are statistically significant at 1% level under all event windows. As an indicator for uncertainty, opportunity as well as magnifier for risk-return relationship, a high level of goodwill seemed to have definitely boosted investors' confidence.

Furthermore, being an investment bank increases the cumulative abnormal returns significantly in the shortest event window for both the events of Bear Stearns and TARP. During a three-day event window, investment banks are expected to have around 40% higher cumulative abnormal returns for both events, in comparison to commercial banks. Moreover, as the event window is shortened, the explanatory power of independent variables goes up dramatically, as demonstrated by the increase in $R^2$. This applies to both events and is probably a reflection of quick market reaction.

Due to limited access to data, our data may suffer from endogeneity problems, such as measurement error and omitted variables. Measurement errors is a concern because several banks were missing in the databases and the values were either left as missing values or calculated manually from the annual report, which may implicate errors. Additionally, it is likely that our regressions suffer from omitted variables as there are many other potential factors that both contribute to cumulative abnormal returns and are correlated to our independent variables, such as level of interconnectedness, solvency ratios, exposure to mortgage-backed assets etc. Lastly, an attribution bias is considered as a potential threat to the validity of our results. This is relevant to our case due to loss of participants as several banks included in our sample were acquired by other firms later on and therefore are missing in the database, e.g. Merrill Lynch and Wachovia Bank. Another threat to the credibility of the results is the limited number of observations (60 small and big banks) included in the regressions. The explanatory power would naturally improve by adding more observations.

# 6 Conclusions

Throughout this thesis we have been trying to map out differences in abnormal returns between banks of various sizes around two bailout events of different nature. The results show that the general bailout announcement led to overall higher positive abnormal returns than the specific bailout, where positive abnormal returns were mostly evident for too big to fail banks. Statistically significant differences between big and small bank samples were observed under the general bailout, which supports the initial hypothesis about a TBTF effect. The results are supported by the regressions run on size, which displayed a significant positive relationship between size and cumulative abnormal returns during the TARP event. On top of that, results from multiple regressions showed that bank type, level of risk, liquidity as well as financial performance of the previous year also played a role in explaining the cumulative abnormal returns. However, the significance of the coefficients varies between variables, events and event windows.

The TARP announcement was definitely met with more positive reactions, relative to the bailout of Bear Stearns. It can be said that TARP was a sign of hope and a boost of confidence to many financial institutions suffering from huge uncertainty in the middle of the financial crisis. Although the TBTF effect was present, all banks experienced positive stock price reactions upon announcement. On the other hand, the bailout of Bear Stearns was more complex and it is somewhat unclear whether it was interpreted as a positive or negative signal, since many seemed to view it as an embarrassing bank failure which later resulted in a cheap takeover. What happened to Bear Stearns was not a bankruptcy in the traditional sense, as compared to Lehman Brothers for instance, which filed for bankruptcy on September 15 after failing in finding a buyer. Based on our empirical results, all banks experienced negative abnormal returns on the announcement day, which tilts the scale towards a negative signal effect. This goes against our hypothesis which expected positive abnormal returns accruing to big, and ultimately the TBTF bank sample. However, by increasing the length of the event window, abnormal returns become positive, probably incorporating the effect from the takeover. All in all, the conclusion is that negative market reactions to the Bear Stearns bailout on the announcement day were likely a consequence of a lack of clarity, which should be considered by policy makers.

As shown by Joines (2009), Brewer and Klingenhagen (2010), O'Hara and Shaw (1990) and Brewer and Jagtiani (2009), the positive abnormal returns found in our study also witnessed

the presence of a TBTF effect. Our results have practical implications for financial regulatory in that they highlight the inequality brought by the TBTF effect. While the intention of a bailout may be to prevent systematic failure, it is crucial to take into consideration how market reactions may favor certain groups over others. By comparing a general and a specific bailout, we distinguish the differences in impact for bailouts of different forms. In combination with size, the analysis of several risk factors, including a liquidity measure, as well as past performance also contribute to explain excess returns.

This study only considers the immediate and short-term effects of government bailout. As for the long run, Brewer and Klingenhagen (2010) raise concerns about the TBTF status, claiming that the ability of banks to raise private capital has been limited due to uncertainty about the efficacy of government aid and fears of nationalization. Potential threats, like moral hazard, are still a concern despite a temporary recovering economy, calling into question the long-term health of the financial market. Nevertheless, most of the institutions that were bailed out during the financial crisis have recovered from distress and the majority have paid back their debt.

This thesis only considers the U.S. financial system, why foreign bank reactions to these events would be of interest for future studies. Furthermore, inspired by Veronesi and Zingales (2008), a suggestion is to develop the analysis on bailouts by including a cost-benefit perspective. For future research, it would also be interesting to consider the long-term effects of a bailout as well as the evolvement of market behavior over time.

# 7 References

## 7.1 Written Sources


Ahern, Kenneth R. (2009). “Sample selection and event study estimation”. *Journal of Empirical Finance,* Vol. 16:3, pp. 466–482.

Bezdecheck, Bethany. (2011). “Bailout!: Government Intervention in Business”. The Rosen Publishing Group, Inc. New York. pp. 4-10.

Brewer, Elijah and Jagtiani, Julapa. (2009). “How much did banks pay to become too-big-to-fail and to become systematically important?”. Working Paper No. 09-34. Research Department, Federal Reserve Bank of Philadelphia.

Brewer, Elijah and Klingenhagen, Ann Marie. (2010). “Be careful what you wish for: the stock market reactions to bailing out large financial institutions. Evidence from the USA”. *Journal of Financial Regulation and Compliance*, Vol. 18:1, pp. 56-69.

Joines, Adam J. (2010). “Signals to the Market: Too Big to Fail Banks and the Recent Crisis.” University of Notre Dame.

MacKinlay, Craig A. (1997). “Event studies in economics and finance”. *Journal of Economic Literature,* Vol. 35:1, pp. 13-39.

Miskhin, Frederic S. (2006). “How big a problem is too big to fail?” A Review of Gary Stern and Ron Feldman's Too Big to Fail: The Hazards of Bank Bailouts. *Journal of Economic Literature,* Vol. 44:4, pp. 988-1004.

Newbold, Paul. (2009). “Statistics for Business and Economics”. Pearson Education. pp. 662, 392-394, 433-435.

O’Hara, Maureen and Shaw, Wayne. (1990). “Deposit Insurance and Wealth Effects: The Value of Being Too Big to Fail”. *Journal of Finance,* Vol. 45:5, pp. 1587-1600.

Poczter, Sharon L. (2010). “The Long Term Effects of a Bank Bailout Program: Evidence from an Emerging Market”. Working Paper. Haas School of Business, University of California Berkeley.

Shull, Bernard. (2010). “Too Big to Fail in Financial Crisis: Motives, Countermeasures and Prospects”. Working Paper No. 601. Levy Economics Institute.

SIGTARP 10-001. Office of the Special Inspector General For the Troubled Asset Relief Program. (2009-10-05).”Emergency capital injections provided to support the viability of Bank of America, other major banks, and the U.S. financial system”. pp. 1-2, 13, 20.

Sorkin, Andrew R. (2010). “Too Big to Fail: The Inside Story of How Wall Street and Washington Fought to Save the Financial System - and Themselves”. Penguin Group U.S. p. 78.

Stern, Gary H and Feldman, Ron J. (2004). “Too Big to Fail: The Hazards of Bank Bailouts”, Brookings Institution Press, Harrisonburg. pp. vii-xiii, 1-14.

Veronesi, Pietro and Zingales, Luigi. (2008). “Paulson’s gift”. University of Chicago Booth School of Business, Chicago 2008.

Wooldridge, Jeffrey M. (2009). “Introductory Econometrics - A Modern Approach”. 4th Edition. South-Western, Cengage Learning, Canada. pp. 89-102.

Wright, E. Robert. (2010). “Bailouts: Public Money, Private Profit”. The Columbia University Press and Social Science Research Council Series on the Privatization of Risk, New York. pp. 1-14.

Yorulmazer, Tanju and Goldsmith-Pinkhau, Paul. (2010). “Liquidity, Bank Runs and Bailouts: Spillover Effects During the Northern Rock Episode”. *Journal of Financial Services Research*. Vol 37, pp. 83-98.

### 7.2 Online Sources

Dash, Eric and Landler, Mark. (2008-10-14). “Drama Behind a $250 Billion Banking Deal”. *The New York Times*.
www.nytimes.com/2008/10/15/business/economy/15bailout.html?pagewanted%20=%20all
(Accessed 2013-04-15)

Lengell, Sean. (2009-10-05). ”Study: Bernanke, Paulson misled public on bailouts”. *The Washington Times*.
www.washingtontimes.com/news/2009/oct/05/report-bernanke-paulson-misled-on-bailouts/?page=all
(Accessed 2013-04-15)

Natkin, Jesse and Schmidt, Krista K. (2009-04-15). “History of U.S. Gov’t Bailouts”. Propublica - Journalism in the Public Interest. www.propublica.org/special/government-bailouts (Accessed 2013-04-28)

U.S. Department of the Treasury. (2013). “About TARP”. www.treasury.gov/initiatives/financial-stability/about-tarp/Pages/default.aspx (Accessed 2013-04-09)

The Fedral Reserve. (2011). “Troubled Asset Relief Program (TARP) Information”. www.federalreserve.gov/bankinforeg/tarpinfo.htm (Accessed 2013-04-20)

The Federal Reserve. (2012). “Bear Stearns, JPMorgan Chase, and Maiden Lane LLC” www.federalreserve.gov/newsevents/reform_bearstearns.htm (Accessed 2013-04-15)

Institute for Digital Research and Education, UCLA (2013) “Stata Annotated Output T-test”. www.ats.ucla.edu/stat/stata/output/ttest_output.htm (Accessed 2013-04-10)

# Appendix A - Sample Selection and Financial Data

***Table A1.*** *U.S. banks defined as "small" included in study*

| ***Ticker*** | ***Bank Name*** | ***Total Assets**** | ***SIC***** |
|---|---|---|---|
| VBFC | VILLAGE BANK AND TRUST | 393.264 | 6022 |
| CBNJ | CAPE BANCORP INC | 633.811 | 6022 |
| HOME | HOME FEDERAL BANCORP INC | 709.954 | 6035 |
| HIFS | HINGHAM INSTITUTION FOR SAVINGS | 744.602 | 6022 |
| HEOP | HERITAGE OAKS BANCORP | 745.554 | 6022 |
| PPBI | PACIFIC PREMIER BANCORP INC | 763.420 | 6022 |
| FXCB | FOX CHASE BANCORP INC | 812.919 | 6035 |
| CSBK | CLIFTON SAVINGS BANCORP INC | 814.801 | 6035 |
| NHTB | NEW HAMPSHIRE THRIFT BANCSHARES | 834.230 | 6035 |
| MSL | MIDSOUTH BANCORP INC | 854.056 | 6021 |
| HFWA | HERITAGE FINANCIAL CORP | 886.055 | 6036 |
| ASRV | AMERISERV FINANCIAL INC/PA | 904.878 | 6021 |
| PEBK | PEOPLES BANCORP NC INC | 906.782 | 6022 |
| ESSA | ESSA BANCORP INC | 910.415 | 6036 |
| FBIZ | FIRST BUSINESS FINANCIAL SERVICES INC | 918.438 | 6022 |
| EVBS | EASTERN VA BANKSHARES INC | 926.711 | 6022 |
| BMRC | BANK OF MARIN BANCORP | 933.901 | 6022 |
| NRIM | NORTHRIM BANCORP INC | 1,014.714 | 6035 |
| PMBC | PACIFIC MERCANTILE BANCORP | 1,077.023 | 6021 |
| PRWT | PREMIERWEST BANCORP | 1,157.961 | 6021 |
| HWBK | HAWTHORN BANCSHARES INC | 1,195.804 | 6021 |
| CBAN | COLONY BANKCORP INC | 1,208.776 | 6022 |
| BSRR | SIERRA BANCORP/CA | 1,233.735 | 6022 |
| CTBK | CITYBANK | 1,239.033 | 6021 |
| WTBA | WEST BANCORPORATION INC | 1,339.968 | 6022 |
| SUBK | SUFFOLK BANCORP | 1,470.581 | 6021 |
| FUNC | FIRST UNITED CORP | 1,478.909 | 6021 |
| BFIN | BANKFINANCIAL CORP | 1,480.544 | 6035 |
| PFBC | PREFERRED BANK LOS ANGELES | 1,542.610 | 6022 |
| MCBC | MACATAWA BANK CORP | 2,129.966 | 6022 |

*Notes: Table A1 defines the banks considered as "small" in the study.*

**Total Assets ($Million) as of end of 2007*

***SIC codes signaling practicing industry, where 6020-6022 are national or state commercial banks and 6035-6036 savings institutions.*

***Table A2.*** *Additional financial data on small banks*

| *Ticker* | *Bank Name* | *D/A* | *LTD* | *GW/A* | *ROAE* |
|---|---|---|---|---|---|
| VBFC | VILLAGE BANK AND TRUST | 0,032 | 0,955 | 0,002 | 0,003 |
| CBNJ | CAPE BANCORP INC | 0,000 | 0,989 | 0,000 | 0,006 |
| HOME | HOME FEDERAL BANCORP INC | 0,000 | 1,187 | 0,000 | 0,007 |
| HIFS | HINGHAM INSTITUTION FOR SAVINGS | 0,000 | 1,346 | 0,000 | 0,006 |
| HEOP | HERITAGE OAKS BANCORP | 0,021 | 0,939 | 0,015 | 0,011 |
| PPBI | PACIFIC PREMIER BANCORP INC | 0,014 | 1,609 | 0,000 | 0,005 |
| FXCB | FOX CHASE BANCORP INC | 0,025 | 0,764 | 0,000 | 0,003 |
| CSBK | CLIFTON SAVINGS BANCORP INC | 0,000 | 0,738 | 0,000 | 0,003 |
| NHTB | NEW HAMPSHIRE THRIFT BANCSHARES | 0,044 | 0,959 | 0,033 | 0,006 |
| MSL | MIDSOUTH BANCORP INC | 0,049 | 0,769 | 0,011 | 0,011 |
| HFWA | HERITAGE FINANCIAL CORP | 0,002 | 0,991 | 0,015 | 0,012 |
| ASRV | AMERISERV FINANCIAL INC/PA | 0,094 | 0,884 | 0,015 | 0,003 |
| PEBK | PEOPLES BANCORP NC INC | 0,055 | 1,028 | 0,000 | 0,011 |
| ESSA | ESSA BANCORP INC | 0,020 | 1,611 | 0,000 | -0,006 |
| FBIZ | FIRST BUSINESS FINANCIAL SERVICES INC | 0,052 | 0,919 | 0,003 | 0,004 |
| EVBS | EASTERN VA BANKSHARES INC | 0,030 | 1,043 | 0,006 | 0,010 |
| BMRC | BANK OF MARIN BANCORP | 0,005 | 0,859 | 0,000 | 0,014 |
| NRIM | NORTHRIM BANCORP INC | 0,035 | 0,811 | 0,008 | 0,012 |
| PMBC | PACIFIC MERCANTILE BANCORP | 0,023 | 1,035 | 0,000 | 0,005 |
| PRWT | PREMIERWEST BANCORP | 0,025 | 1,083 | 0,018 | 0,014 |
| HWBK | HAWTHORN BANCSHARES INC | 0,063 | 0,979 | 0,034 | 0,007 |
| CBAN | COLONY BANKCORP INC | 0,021 | 0,912 | 0,002 | 0,007 |
| BSRR | SIERRA BANCORP/CA | 0,061 | 1,070 | 0,004 | 0,017 |
| CTBK | CITYBANK | 0,106 | 1,327 | 0,000 | 0,036 |
| WTBA | WEST BANCORPORATION INC | 0,142 | 1,072 | 0,019 | 0,014 |
| SUBK | SUFFOLK BANCORP | 0,037 | 0,831 | 0,001 | 0,016 |
| FUNC | FIRST UNITED CORP | 0,047 | 0,948 | 0,008 | 0,009 |
| BFIN | BANKFINANCIAL CORP | 0,010 | 1,168 | 0,015 | 0,005 |
| PFBC | PREFERRED BANK LOS ANGELES | 0,023 | 0,972 | 0,000 | 0,018 |
| MCBC | MACATAWA BANK CORP | 0,093 | 1,127 | 0,012 | 0,004 |

*Notes: Table A2 displays additional financial data on the small bank sample. The variables consist of ratios of debt-to-assets, loan-to-deposits, goodwill-to-assets and return on average equity as of end of 2007.*

***Table A3.*** *U.S. banks defined as "big" included in study*

| ***Ticker*** | ***Bank Name*** | ***Total Assets**** | ***SIC***** |
|---|---|---|---|
| CNB | COLONIAL BANCGROUP INC | 25,976. | 6022 |
| NYB | NEW YORK COMMUNITY BANCORP INC | 30,580. | 6020 |
| DFS | DISCOVER FINANCIAL SVCS INC | 37,376. | 6141 |
| SCHW | SCHWAB (CHARLES) CORP | 42,286. | 6211 |
| HCBK | HUDSON CITY BANCORP INC | 44,424. | 6036 |
| HBAN | HUNTINGTON BANCSHARES | 54,697. | 6021 |
| ETFC | E TRADE FINANCIAL CORP | 56,846. | 6035 |
| CMA | COMERICA INC | 62,331. | 6021 |
| MTB | M & T BANK CORP | 64,875. | 6022 |
| NTRS | NORTHERN TRUST CORP | 67,611. | 6022 |
| SOV | SOVEREIGN BANCORP INC. | 84,746. | 6021 |
| KEY | KEYCORP | 99,983. | 6021 |
| FITB | FIFTH THIRD BANCORP | 110,962. | 6022 |
| BBT | BB&T CORP | 132,618. | 6021 |
| PNC | PNC FINANCIAL SVCS GROUP INC | 138,920. | 6021 |
| RF | REGIONS FINANCIAL CORP | 141,042. | 6021 |
| STT | STATE STREET CORP | 142,543. | 6022 |
| NCC | NATIONAL CITY CORP | 150,374. | 6021 |
| COF | CAPITAL ONE FINANCIAL CORP | 150,590. | 6022 |
| STI | SUNTRUST BANKS INC | 179,574. | 6021 |
| BK | BANK OF NEW YORK MELLON CORP | 197,656. | 6022 |
| USB | U S BANCORP | 237,615. | 6021 |
| WFC | WELLS FARGO & CO | 575,442. | 6021 |
| WB | WACHOVIA CORP | 782,896. | 6021 |
| MER | MERRILL LYNCH & CO INC | 1,020,050. | 6211 |
| MS | MORGAN STANLEY | 1,045,409. | 6211 |
| GS | GOLDMAN SACHS GROUP INC | 1,119,796. | 6211 |
| JPM | JPMORGAN CHASE & CO | 1,562,147. | 6021 |
| BAC | BANK OF AMERICA CORP | 1,715,746. | 6021 |
| C | CITIGROUP INC | 2,187,631. | 6021 |

*Notes: Table A3 defines the banks considered as "big" in the study.*

**Total Assets ($Million) as of end of 2007*

***SIC codes signaling practicing industry, where 6020-6022 are national or state commercial banks, 6035-6036 savings institutions, 6141 personal credit institution and 6211 investment banks.*

***Table A4.*** *Additional financial data on big banks*

| ***Ticker*** | ***Bank Name*** | ***D/A*** | ***LTD*** | ***GW/A*** | ***ROAE*** |
|---|---|---|---|---|---|
| CNB | COLONIAL BANCGROUP INC | 0,004 | 0,928 | 0,006 | . |
| NYB | NEW YORK COMMUNITY BANCORP | 0,422 | 1,541 | 0,080 | . |
| DFS | DISCOVER FINANCIAL SVCS | 0,064 | 0,812 | 0,007 | 0,029 |
| SCHW | SCHWAB (CHARLES) CORP | 0,021 | . | 0,012 | 0,025 |
| HCBK | HUDSON CITY BANCORP INC | 0,27 | 1,597 | 0,003 | 0,007 |
| HBAN | HUNTINGTON BANCSHARES | 0,123 | 1,046 | 0,056 | 0,002 |
| ETFC | E TRADE FINANCIAL CORP | 0,341 | 1,164 | 0,034 | -0,026 |
| CMA | COMERICA INC | 0,082 | 0,693 | 0,805 | 0,011 |
| MTB | M & T BANK CORP | 0,161 | 1,145 | 0,049 | 0,011 |
| NTRS | NORTHERN TRUST CORP | 0,132 | 0,492 | 0,006 | 0,011 |
| SOV | SOVEREIGN BANCORP INC. | 0,308 | 1,132 | 0,040 | -0,016 |
| KEY | KEYCORP | 0,216 | 1,103 | 0,013 | 0,010 |
| FITB | FIFTH THIRD BANCORP | 0,199 | 1,051 | 0,022 | 0,010 |
| BBT | BB&T CORP | 0,207 | 1,036 | 0,039 | 0,014 |
| PNC | PNC FINANCIAL SVCS GROUP INC | 0,172 | 0,816 | 0,061 | 0,010 |
| RF | REGIONS FINANCIAL CORP | 0,158 | 0,992 | 0,081 | 0,010 |
| STT | STATE STREET CORP | 0,170 | 0,165 | 0,032 | 0,010 |
| NCC | NATIONAL CITY CORP | 0,188 | 0,681 | 0,036 | . |
| COF | CAPITAL ONE FINANCIAL CORP | 0,204 | 1,191 | 0,085 | 0,017 |
| STI | SUNTRUST BANKS INC | 0,190 | 1,019 | 0,039 | 0,009 |
| BK | BANK OF NEW YORK MELLON CORP | 0,126 | 0,428 | 0,083 | 0,015 |
| USB | U S BANCORP | 0,319 | 1,155 | 0,032 | 0,019 |
| WFC | WELLS FARGO & CO | 0,263 | 1,094 | 0,023 | 0,016 |
| WB | WACHOVIA CORP | 0,206 | 1,029 | 0,055 | 0,009 |
| MER | MERRILL LYNCH & CO INC | 0,280 | . | 0,004 | . |
| MS | MORGAN STANLEY | 0,223 | 0,000 | 0,003 | 0,002 |
| GS | GOLDMAN SACHS GROUP INC | 0,462 | 0,000 | 0,003 | 0,012 |
| JPM | JPMORGAN CHASE & CO | 0,329 | 0,689 | 0,029 | 0,011 |
| BAC | BANK OF AMERICA CORP | 0,356 | 1,074 | 0,045 | 0,009 |
| C | CITIGROUP INC | 0,362 | 0,922 | 0,019 | 0,002 |

*Notes: Table A4 displays additional financial data on the big bank sample. The variables consist of ratios of debt-to-assets, loan-to-deposits, goodwill-to-assets and return on average equity as of end of 2007.*

***Table A5.*** *U.S. banks defined as "TBTF" included in study*

| ***Ticker*** | ***Bank Name*** | ***TARP injection[5] ($Billion)*** |
|---|---|---|
| STT | STATE STREET CORP | 2 |
| BK | BANK OF NEW YORK MELLON CORP | 3 |
| MER | MERRILL LYNCH & CO INC | 10 |
| MS | MORGAN STANLEY | 10 |
| GS | GOLDMAN SACHS GROUP INC | 10 |
| BAC | BANK OF AMERICA CORP | 15 |
| WFC | WELLS FARGO & CO | 25 |
| C | CITIGROUP INC | 25 |
| JPM | JPMORGAN CHASE & CO | 25 |
| | | = $125 Billion |

*Notes: Table A5 shows the TARP equity injection into the banks that were signed onto the CPP on October 14, 2008. These firms accepted the offer of government support by the Treasury Secretary Henry Paulson.*

[5]SIGTARP 10-001. (2009-10-05). Office of the Special Inspector General For the Troubled Asset Relief Program, p. 20

# Appendix B - Event Study Results

***Table B1.*** *Abnormal returns ($AR_i$ ($\tau_1$, $\tau_2$)) around the bailout of Bear Stearns*

## Small Banks

| ***Day:*** | ***-3*** | ***-2*** | ***-1*** | ***0*** | ***1*** | ***2*** | ***3*** |
|---|---|---|---|---|---|---|---|
| *Mean* | *0,009* | *0,003* | *0,005* | *-0,003* | *-0,001* | *-0,014** | *0,013* |
| | *(1,545)* | *(0,615)* | *(1,197)* | *(-0,767)* | *(-0,246)* | *(-1,962)* | *(1,627)* |
| *Median* | *0,004* | *0,000* | *0,004* | *-0,002* | *-0,002* | *-0,008*** | *0,012*** |
| | *(1,306)* | *(0,360)* | *(0,977)* | *(-0,792)* | *(-0,545)* | *(-2,026)* | *(2,067)* |
| *Std. dev.* | *0,032* | *0,029* | *0,021* | *0,021* | *0,030* | *0,040* | *0,042* |

## Big Banks

| ***Day:*** | ***-3*** | ***-2*** | ***-1*** | ***0*** | ***1*** | ***2*** | ***3*** |
|---|---|---|---|---|---|---|---|
| *Mean* | *0,024**** | *-0,008*** | *0,004* | *-0,009*** | *-0,023* | *0,010* | *0,014** |
| | *(5,835)* | *(-2,250)* | *(1,529)* | *(-2,146)* | *(-1,187)* | *(1,404)* | *(1,943)* |
| *Median* | *0,027**** | *-0,009*** | *0,007* | *-0,010*** | *-0,008* | *-0,002* | *0,014*** |
| | *(4,042)* | *(-2,211)* | *(1,594)* | *(-2,211)* | *(-0,915)* | *(0,915)* | *(2,335)* |
| *Std. dev.* | *0,022* | *0,020* | *0,016* | *0,022* | *0,106* | *0,039* | *0,039* |

## TBTF Banks

| ***Day:*** | ***-3*** | ***-2*** | ***-1*** | ***0*** | ***1*** | ***2*** | ***3*** |
|---|---|---|---|---|---|---|---|
| *Mean* | *0,018*** | *-0,002* | *-0,001* | *-0,016**** | *-0,009* | *0,042**** | *0,006* |
| | *(2,683)* | *(-0,443)* | *(-0,152)* | *(-5,683)* | *(0,500)* | *(3,691)* | *(0,531)* |
| *Median* | *0,015*** | *0,004* | *-0,003* | *0,013**** | *-0,024* | *0,042*** | *0,006* |
| | *(2,073)* | *(0,059)* | *(-0,296)* | *(-2,666)* | *(-0,889)* | *(2,547)* | *(0,770)* |
| *Std. dev.* | *0,020* | *0,014* | *0,014* | *0,008* | *0,056* | *0,034* | *0,037* |

*Notes: t-statistics in parentheses for mean values. z statistics in parentheses for medians. For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%.*

***Table B2.*** *Cumulative abnormal returns ($CAR_i$ ($\tau_1$, $\tau_2$)) around the bailout of Bear Stearns*

## Small Banks

| ***Event Window:*** | ***(-3, 3)*** | ***(-2, 2)*** | ***(-1, 1)*** |
|---|---|---|---|
| *Mean* | *0,011*** | *-0,012**** | *0,000* |
| | *(2,235)* | *(-3,703)* | *(0,072)* |
| *Median* | *0,010**** | *-0,006**** | *-0,001* |
| | *(2,839)* | *(-3,035)* | *(0,091)* |
| *Std. dev.* | *0,070* | *0,039* | *0,038* |
| | **N =210** | **N =150** | **N =90** |

## Big Banks

| ***Event Window:*** | ***(-3, 3)*** | ***(-2, 2)*** | ***(-1, 1)*** |
|---|---|---|---|
| *Mean* | *0,012** | *-0,027**** | *-0,027*** |
| | *(1,684)* | *(-2,828)* | *(-2,090)* |
| *Median* | *0,029**** | *-0,013*** | *-0,013** |
| | *(4,634* | *(-2,491)* | *(-1,708)* |
| *Std. dev.* | *0,103* | *0,119* | *0,121* |
| | **N =210** | **N =150** | **N =90** |

## TBTF Banks

| ***Event Window:*** | ***(-3, 3)*** | ***(-2, 2)*** | ***(-1, 1)*** |
|---|---|---|---|
| *Mean* | *0,039**** | *0,014*** | *-0,025*** |
| | *(5,846)* | *(2,394)* | *(-2,427)* |
| *Median* | *0,042**** | *0,013*** | *-0,035** |
| | *(4,847)* | *(2,402)* | *(-1,949)* |
| *Std. dev.* | *0,053* | *0,038* | *0,054* |
| | **N =63** | **N =45** | **N =27** |

*Notes: t-statistics in parentheses for mean values. z statistics in parentheses for medians. For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%.*

***Table B3.*** *Two-sample t-tests around the bailout of Bear Stearns*

**Differences in $AR_i$ between big and small banks**

| ***Day:*** | ***-3*** | ***-2*** | ***-1*** | ***0*** | ***1*** | ***2*** | ***3*** |
|---|---|---|---|---|---|---|---|
| *Mean:* | | | | | | | |
| *Big Banks (N=30)* | *0,024* | *-0,008*** | *0,004* | *-0,009*** | *-0,023* | *0,010* | *0,014** |
| *Small Banks (N=30)* | *0,009* | *0,003* | *0,005* | *-0,003* | *-0,001* | *-0,014** | *0,013* |
| *Combined* | *0,016* | *-0,003* | *0,005* | *-0,006* | *-0,012* | *-0,002* | *0,013* |
| *Diff.* | *0,015*** | *-0,011** | *-0,000* | *-0,006* | *-0,022* | *0,024*** | *0,001* |
| *t-statistics* | *2.049* | *-1,800* | *-0,028* | *-1,016* | *-1,077* | *2,380* | *0,105* |

*Notes: For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%. $H_o$ is rejected if mean(big) - mean(small) is significantly different from 0.*

**Differences in $CAR_i$ ($\tau_1$, $\tau_2$) between big and small banks**

| ***Event Window:*** | ***(-3, 3)*** | ***(-2, 2)*** | ***(-1, 1)*** |
|---|---|---|---|
| *Mean:* | | | |
| *Big Banks (N=30)* | *0,012** | *-0,027**** | *-0,027*** |
| *Small Banks (N=30)* | *0,011*** | *-0,012**** | *0,000* |
| *Combined* | *0,011* | *-0,020* | *-0,013* |
| *Diff.* | *0,001* | *-0,016* | *-0,027* |
| *t-statistics* | *0,050* | *-0,689* | *-1,163* |

*Notes: For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%. $H_o$ is rejected if mean(big) - mean(small) is significantly different from 0.*

**Differences in $CAR_i$ ($\tau_1$, $\tau_2$) between TBTF and small banks**

| ***Event Window:*** | ***(-3, 3)*** | ***(-2, 2)*** | ***(-1, 1)*** |
|---|---|---|---|
| *Mean:* | | | |
| *TBTF Banks (N=9)* | *0,039**** | *0,014*** | *-0,025*** |
| *Small Banks (N=30)* | *0,011*** | *-0,012**** | *0,000* |
| *Combined* | *0,017* | *-0,006* | *-0,006* |
| *Diff.* | *0,028* | *0,015* | *-0,025* |
| *t-statistics* | *1,293* | *1,741* | *-1,322* |

*Notes: For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%. $H_o$ is rejected if mean(TBTF) - mean(small) is significantly different from 0.*

***Table B4.*** *Abnormal returns ($AR_i$ ($\tau_1$, $\tau_2$)) around the announcement of TARP*

**Small Banks**

| ***Day:*** | ***-3*** | ***-2*** | ***-1*** | ***0*** | ***1*** | ***2*** | ***3*** |
|---|---|---|---|---|---|---|---|
| *Mean* | *-0,041*** | *0,037* | *-0,018* | *0,008* | *0,002* | *0,014* | *-0,004* |
| | *(-2,410)* | *(1,678)* | *(-0,918)* | *(0,784)* | *(0,121)* | *(1,119)* | *(-0,347)* |
| *Median* | *-0,033*** | *0,009* | *-0,024** | *0,012* | *0,010* | *0,004* | *-0,007* |
| | *(-2,211)* | *(1,532)* | *(-1,779)* | *(0,956)* | *(1,244)* | *(0,936)* | *(-0,195)* |
| *Std. dev.* | *0,094* | *0,121* | *0,109* | *0,056* | *0,095* | *0,069* | *0,065* |

**Big Banks**

| ***Day:*** | ***-3*** | ***-2*** | ***-1*** | ***0*** | ***1*** | ***2*** | ***3*** |
|---|---|---|---|---|---|---|---|
| *Mean* | *0,038*** | *0,090**** | *-0,206**** | *0,126**** | *0,140**** | *-0,088**** | *-0,014** |
| | *(2,464)* | *(4,450)* | *(-5,825)* | *(5,253)* | *(5,703)* | *(-7,820)* | *(-2,021)* |
| *Median* | *0,024*** | *0,092**** | *-0,172**** | *0,128**** | *0,108**** | *-0,068**** | *-0,019*** |
| | *(2,293)* | *(3,713)* | *(-4,227)* | *(4,021)* | *(4,679)* | *(-4,782)* | *(-2,005)* |
| *Std. dev.* | *0,084* | *0,111* | *0,193* | *0,132* | *0,134* | *0,062* | *0,037* |

**TBTF Banks**

| ***Day:*** | ***-3*** | ***-2*** | ***-1*** | ***0*** | ***1*** | ***2*** | ***3*** |
|---|---|---|---|---|---|---|---|
| *Mean* | *0,032* | *0,056* | *-0,105* | *0,138**** | *0,084**** | *-0,089**** | *-0,022* |
| | *(1,047)* | *(1,216)* | *(1,590)* | *(5,751)* | *(4,050)* | *(-8,247)* | *(-1,566)* |
| *Median* | *0,072* | *0,091* | *-0,170* | *0,162*** | *0,077*** | *-0,078**** | *-0,029* |
| | *(1,007)* | *(1,007)* | *(-1,481)* | *(2,547)* | *(2,547)* | *(-2,666)* | *(-1,481)* |
| *Std. dev.* | *0,091* | *0,138* | *0,198* | *0,072* | *0,062* | *0,032* | *0,042* |

*Notes: t-statistics in parentheses for mean values. z statistics in parentheses for medians. For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%.*

***Table B5.*** *Cumulative abnormal returns ($CAR_i$ ($\tau_1$, $\tau_2$)) around the announcement of TARP*

## Small Banks

| ***Event Window:*** | ***(-3, 3)*** | ***(-2, 2)*** | ***(-1, 1)*** |
|---|---|---|---|
| *Mean* | *-0,003* | *0,040*$^{***}$ | *-0,032*$^{***}$ |
| | *(-0,343)* | *(4,336)* | *(-2,685)* |
| *Median* | *0,017*$^{**}$ | *0,037*$^{***}$ | *-0,036*$^{***}$ |
| | *(2,291)* | *(4,246)* | *(-3,121)* |
| *Std. dev.* | *0,106* | *0,114* | *0,114* |
| | **N =210** | **N =150** | **N =90** |

## Big Banks

| ***Event Window*** | ***(-3, 3)*** | ***(-2, 2)*** | ***(-1, 1)*** |
|---|---|---|---|
| *Mean* | *0,087*$^{***}$ | *0,065*$^{***}$ | *0,059*$^{***}$ |
| | *(9,418)* | *(5,940)* | *(3,193)* |
| *Median* | *0,096*$^{***}$ | *0,061*$^{***}$ | *0,046*$^{***}$ |
| | *(9,239)* | *(6,563)* | *(3,290)* |
| *Std. dev.* | *0,135* | *0,135* | *0,176* |
| | **N =210** | **N =150** | **N =90** |

## TBTF Banks

| ***Event Window:*** | ***(-3, 3)*** | ***(-2, 2)*** | ***(-1, 1)*** |
|---|---|---|---|
| *Mean* | *0,094*$^{***}$ | *0,084*$^{***}$ | *0,117*$^{***}$ |
| | *(8,432)* | *(5,382)* | *(3,167)* |
| *Median* | *0,082*$^{***}$ | *0,065*$^{***}$ | *0,080*$^{***}$ |
| | *(6,383)* | *(4,663)* | *(3,103)* |
| *Std. dev.* | *0,088* | *0,105* | *0,192* |
| | **N =63** | **N =45** | **N =27** |

*Notes: t-statistics in parentheses for mean values. z statistics in parentheses for medians. For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%.*

***Table B6.*** *Two-sample t-tests around TARP*

**Differences in $AR_i$ ($\tau_1$, $\tau_2$) between big and small banks**

| ***Day:*** | ***-3*** | ***-2*** | ***-1*** | ***0*** | ***1*** | ***2*** | ***3*** |
|---|---|---|---|---|---|---|---|
| *Mean:* | | | | | | | |
| *Big Banks (N=30)* | *0,038*** | *0,090**** | *-0,206**** | *0,126**** | *0,140**** | *-0,088**** | *-0,014** |
| *Small Banks (N=30)* | *-0,041*** | *0,037* | *-0,018* | *0,008* | *0,002* | *0,014* | *-0,004* |
| *Combined* | *-0,002* | *0,064* | *-0,112* | *0,067* | *0,071* | *-0,037* | *-0,009* |
| *Diff.* | *0,079**** | *0,053** | *-0,187**** | *0,118**** | *0,138**** | *-0,102**** | *-0,009* |
| *t-statistics* | *3,440* | *1,770* | *-4,617* | *4,533* | *4,577* | *-6,039* | *-0,697* |

*Notes: For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%. $H_o$ is rejected if mean(big) - mean(small) is significantly different from 0.*

**Differences in $CAR_i$ ($\tau_1$, $\tau_2$) between big and small banks**

| ***Event Window:*** | *(-3, 3)* | *(-2, 2)* | *(-1, 1)* |
|---|---|---|---|
| *Mean:* | | | |
| *Big Banks (N=30)* | *0,087**** | *0,065**** | *0,059**** |
| *Small Banks (N=30)* | *-0,003* | *0,040**** | *-0,032**** |
| *Combined* | *0,042* | *0,053* | *0,013* |
| *Diff.* | *0,090**** | *0,025* | *0,091*** |
| *t-statistics* | *2,287* | *0,773* | *2,390* |

*Notes: For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%. $H_o$ is rejected if mean(big) - mean(small) is significantly different from 0.*

**Differences in $CAR_i$ ($\tau_1$, $\tau_2$) for TBTF and small banks**

| ***Event Window:*** | *(-3, 3)* | *(-2, 2)* | *(-1, 1)* |
|---|---|---|---|
| *Mean:* | | | |
| *TBTF Banks (N=9)* | *0,094**** | *0,084**** | *0,117**** |
| *Small Banks (N=30)* | *-0,003* | *0,040**** | *-0,032**** |
| *Combined* | *0,020* | *0,051* | *0,002* |
| *Diff.* | 0,096** | 0,044 | 0,149* |
| *t-statistics* | *2,736* | *1,073* | *2,219* |

*Notes: For statistical inference, one asterisk (*) denotes statistical significance at the 10% level, two asterisks (**) at 5%, and three asterisks (***) at 1%. $H_o$ is rejected if mean(TBTF) - mean(small) is significantly different from 0.*