UNIVERSITEIT VAN TILBURG

TARP Repayments and the Division of the Banking Industry

Master Thesis Financial Management

Tilburg University

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Abstract

This thesis examines the repayments made under the Troubled Asset Relief Program (TARP) in 2009. It is suggested that banks that repay their funds are in a better financial condition than banks that remain in the TARP program. First, an event study conducted on a sample of 256 public banks proves that the market actually believes repayments signal a difference in financial condition between repaying and non-repaying banks. Second, a logit regression model is used to confirm there is a relationship between the financial condition of a bank, indicated by the approximated six components of the CAMELS rating, and the likelihood a bank will repay its TARP funds. Last, this paper proves that the overall financial condition of banks that repaid their TARP funds is superior to the overall financial condition of banks that remain in the TARP program.

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Date:	August 31, 2010

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1 Introduction

On October 3, 2008, the United States Congress passed the Emergency Economic Stabilization Act (EESA), or Public Law 110-343, which was signed into a law by president George W. Bush on that same day. The goal of EESA was to "restore liquidity and stability to the financial system of the United States" (Office of Financial Stability [OFS], 2009, p.7), in a response to the 2008 financial crisis. As described in the Office of Financial Stability report (OFS, 2009), the EESA established the Office of Financial Stability (Treasury-OFS) to implement the Troubled Asset Relief Program (TARP). The TARP program allowed the Secretary of the Treasury to purchase $ 700 billion in troubled assets from financial institutions.

However, soon after the implementation of TARP, lending between banks clogged and credit markets stopped functioning. Consequently, many financial institutions instantaneously found themselves to be short in liquidity. A quick response by the U.S Government was needed and therefore the Treasury launched the Capital Purchase Program (CPP) on October 14, 2008. It is the largest and most important program under TARP, representing $ 250 of the total $ 700 billion TARP budget. It is therefore subject of a growing part of literature that relates to the 2008 financial crisis. Subjects of studies that focus on TARP and the CPP program are for example: the implementation of TARP, the way TARP affected the financial system, compensation regulations under TARP, the way TARP relates to previous crises, TARP funds distribution, TARP in international perspective, and so forth (Jeffrey, Vasvari & Wittenberg-Moerman, 2010; Bayazitova & Shivdasani, 2009; King, 2009; Lei, 2010; Veronesi and Zingales, 2009; etc.)

There is a very interesting aspect of TARP that still remains underexposed, namely the repayments of TARP funds. These repayments are interesting to study for a number of reasons. First, they can be seen as signs of economic recovery. Additionally, according to a press release by the U.S. Treasury, "these repayments help to reduce Treasury's borrowing and national debt. The repayments also increase Treasury's cushion to respond to any future financial instability that might otherwise jeopardize economic recovery" ("Treasury Announces", 2009, para. 6). Bayazitova and Shivdasani (2009) are one of the few to study the market reaction to the announcement of eighteen CPP-banks to repay their funds. These announcements, however, took place primarily in March 2009. During the remainder of 2009, many banks have announced their intention to repay their TARP funds. In particular, there is one announcement that, according to Dash (2009), marked a major milestone in the bank rescue efforts of the Obama administration. It was their decision to let ten of the largest banks in the U.S. repay their TARP funds, representing well over $68 billion.

However, as Dash (2009) suggests in his article, the approval on June 9, 2009, could signal to the market that there is a difference in financial condition amongst TARP participants. On the one hand, there are the banks that are considered healthy enough to leave the TARP program, while on the other hand, there are the banks that are considered to be too weak to go without it. As a result, I am particularly interested in finding an answer to the following questions, where the two main research questions are in italics: *is there proof to be found for the presence of the mentioned signalling effect on June 9, 2009?* Furthermore, d*oes the financial condition of a bank increase the likelihood it will repay its TARP funds?* If so, are there variables that are strongest in explaining the probability of repayment? Furthermore, is there a difference to be found between banks that repaid their TARP funds during 2009 and the ones that did not, with respect to their financial condition?

By finding an answer to the questions above, I would like to contribute to the growing amount of literature that study TARP and its programs, as well as the part of literature that studies the effects of the 2008 financial crisis. In this paper I will study three aspects of the TARP repayments. First, I will conduct an event study to examine the market reaction on important repayment dates in the TARP program, using a sample of 256 publicly traded banks that participate(d) in the CPP program. The main event date in this study will be June 9, 2009. The resulting cumulative abnormal returns (CARs) of the event study should indicate whether there is evidence for a possible signalling effect resulting from TARP repayments. Second, I will determine whether the financial condition of a bank affects its TARP repayment. The financial condition, or 'healthiness', of a bank will be represented by the most commonly used rating of a bank's overall financial condition: the CAMELS rating. Usually, this rating takes a number between 1 – 5. However, I will approximate the six components of this CAMELS rating and then study the separate effect of these components on the probability a bank will repay its TARP funds. This is done by performing a logit-regression model. Finally, I will study the differences in financial condition between the sample banks that repaid their TARP funds during 2009 and the ones that did not, by conducting a *t*-test on the means of the six components of the CAMELS rating.

To summarize, this paper is organized as follows: In chapter two, the TARP program and the CPP program are discussed more elaborately. In chapter three the tool for assessing the financial condition of a bank is specified, i.e. the CAMELS rating. Chapter four gives the hypotheses development. Chapter five describes the methodologies used in this paper, namely the event study

method and logit-regression model. Chapter six will give the empirical results obtained in this study. Chapter seven concludes and in chapter eight recommendations for future research are presented.

2 TARP and the Capital Purchase Program

This chapter will give background information on TARP and its most important program, the Capital Purchase Program (CPP). First, TARP will be put in perspective by primarily comparing it to two distinct predecessors, namely the Reconstruction Finance Corporation (RFC) and the Resolution Trust Corporation (RTC). Second, the focus will shift to the most important program under TARP, the CPP. Since the CPP program is the main focus of this paper, the participation, costs of participation and the repayment of funds will be discussed. Finally, other programs within TARP are discussed, since the CPP program is not the only program established under TARP.

2.1 TARP in perspective

It is widely agreed upon that the 2008 financial crisis has its origins in the United States (U.S.). Even more specific, the crisis is said to result from troubles in the U.S. housing sector that began to emerge in 2007. Eventually, "in mid-September [2008], a series of events caused the crisis to escalate" (OFS, 2009, p.6), which is often illustrated by the bankruptcy of Lehman Brothers. As a consequence of this bankruptcy, financial markets destabilized and investor confidence diminished. The 2008 financial crisis is, however, not the first crisis in history. Reinhart and Rogoff (2008) compare the beginning of 2008 financial crisis with "eighteen bank-centered financial crises from the post-war period" (p.4). They find that in the beginning, this crisis seemed quite similar in comparison to the previous cases. Nevertheless, there are numerous differences to be acknowledged. First, the current crisis differs (widely) in scale. Harvey (2008) puts forward that the 2008 financial crisis entails both the largest banking bankruptcy (Lehman Brothers) and the largest bank failure (Washington Mutual) in the history of the United States. Besides that, Harvey (2008) suggests that the targeted assets in the Savings & Loans (S&L) crisis of over three hundred Savings and Loans institutions combined are worth less than the combined assets of Lehman Brothers and Washington Mutual. In 2008 terms, these amounts represent $ 900 billion compared to $ 946 billion respectively. When compared to the Great Depression, the differences are even more striking. The combined worth of the financial institutions that failed at that time, is estimated to be worth only $ 90.4 billion in 2008 U.S. dollars, or less than half of the deposit base of Washington Mutual in June 2008 (Harvey, 2008). Second, as mentioned, the 2008 financial crisis originated from problems in the U.S. housing sector and subsequently spread across the globe rapidly. As King (2009) mentions; "In October 2008 a number of countries announced comprehensive rescue packages to support systemically important banks" (p.1). Countries to which King (2009) refers to are: the United Kingdom, Germany, France, Switzerland, the Netherlands and off course the United States. For the latter one, this meant the

passage of EESA on October 3, 2008. The securitization of mortgages and other financial instruments allowed banks to earn huge amounts of money. Even more so, since rating agencies underestimated the risk of these packages of financial products, because "lack of competition, poor accountability or most likely an inherent difficulty in assessing risk due to the complexity" (Taylor, 2009, p.12). The resulting complexity in the financial system is something that cannot be observed at the same scale in earlier crises.

According to Laeven and Valencia (2008) there are numerous ways in which a government can react to try to resolute a crisis. They studied 42 systemic banking crises, which occurred in 37 different countries, and compared their progress and resolution. Often, a mix of measures is used to fight a crisis. If we look back in history, the U.S. resolved some of its major crises by setting up public companies to undertake actions. Two prominent examples are: the Reconstruction Finance Corporation (RFC) and the Resolution Trust Corporation (RTC). These were set up during the Great Depression and the Savings & Loans Crisis (S&L Crisis) respectively. The RFC was set up under President Hoover, in 1932, to provide financial aid to business corporations, railroads and financial institutions. During its most active period, 1932 - 1941, the RFC disbursed a total amount of $ 9.465 billion (Sprinkel, 1952). This amount represents approximately 0.9 % of the American GDP[1] for that period respectively. Conversely, the RTC was established in 1989 under President Bush, with the goal of reducing taxpayers' exposure to the S&L crisis. The RFC acquired approximately $ 125 billion in assets of almost three hundred failed savings and loans institutions. At that time, the total costs for U.S. taxpayers to resolve the problems at the affected Savings and Loans institutions were about $ 180 billion, or 3.2% of the American GDP of 1989 (Reinhart and Rogoff, 2008). According to the website of ProPublica[2], this amount represents $ 293.3 billion in 2008 U.S. dollars. In comparison, TARP represents $ 700 billion in 2008 U.S. dollars, or 4.8 % of the 2008 American GDP. However, since TARP is still up and running, the exact costs to U.S. taxpayers are unclear.

Thus, to summarize, the 2008 financial crisis is interesting to study due to the international impact. Besides that, the measures taken by the United States Government are interesting when seen in a historical perspective. Though TARP has predecessors that are comparable, the sheer size of the current measures and interventions differs greatly. This paper, however, will not study the TARP

[1] GDP figures are obtained from the Bureau of Economic Analysis website. Retrieved Juli 10, 2010, from http://www.bea.gov/national.

[2] Special website that tracks EESA (TARP). Retrieved from http://bailout.propublica.org/main/list/index

program in its entirety, but it will focus on an important aspect of TARP, namely the Capital Purchase Program. This program will be discussed in more detail in the next section.

2.2 The Capital Purchase Program

The Capital Purchase Program (CPP) is the most important program under TARP. Of the $700 billion budget for TARP, $ 250[3] billion was assigned to the CPP program. Eight, of the first nine candidates for the CPP program, received funds on October 28, 2008, just fourteen days after the announcement of the program. These eight were: Bank of America, Bank of New York Mellon, Citigroup, Goldman Sachs, JPMorgan Chase, Morgan Stanley, State Street and Wells Fargo. In total, $ 125 billion of the initial $ 250 billion was invested in these financial institutions. The reason behind the large investment of 50% of the initial budget was that these financial institutions were considered to be systemic institutions, since they together held over 55% of the U.S. banking assets (OFS, 2009).

The residual CPP-budget was made accessible to qualifying financial institutions (QFI's) of all sizes and types across the U.S. These institutions included, among others, insurance companies, bank holding companies and savings associations. As of June 5, 2010, a total of 706 financial institutions received funds under the CPP program, with an overall amount of $ 204.9 billion spent by the Treasury-OFS, according to the website of ProPublica.

Academic literature suggests that the market had confidence in the CPP program. As King (2009) shows, bank stocks outperformed the market during a two day window surrounding the announcement date on October 14, 2008. King's results are confirmed by Kim (2010), who also finds positive announcement results at the inception of the CPP program, using a sample of public banks only. Additionally, Bayazitova and Shivdasani (2009) report a substantial positive announcement effect for the first eight recipients of TARP. They also find that banks that received funds after October 14, to which they refer to as round 2 and round 3 recipients, also show a significant positive effect. These results could be explained by the fact that the Treasury made it quite attractive to participate in the TARP program. Veronesi and Zingales (2009) show that the first ten recipients of TARP received $ 125 billion for their preferred shares and warrants, estimated to be worth only $89 - $112 billion. Thus, they suggest the Treasury overpaid these companies by $13 - $36 billion. Therefore, it seems plausible to assume that banks initially perceived TARP funds to be 'cheap

[3] In march 2009, this amount was corrected downwards to $ 218 billion (OFS, 2009).

money'. Another effect that could explain the positive announcement effects is that the governments' interference could result in "the reduction in the probability of bankruptcy and hence the expected cost of bankruptcy" (Veronesi & Zingales, 2009, p. 340). Nevertheless, financial institutions willing to receive funds under the CPP program were obliged to fulfil a number of conditions before applying.

2.2.1 Participation in the Capital Purchase Program

In order to participate in the CPP program, QFI's had to file an application to their federal regulator. Participation in the program required these financial institutions to meet a number of specific criteria, the Treasuries 'viability' criteria. If a financial institution passed these viability criteria, it would receive a minimum of 1% of its risk-weighted assets, up to a maximum of $25 billion or 3 % of those risk-weighted assets (GAO, 2008).

However, it is not entirely clear which criteria were used in the assessment, since the Treasuries' viability criteria were not made public. Several academic papers have tried to estimate factors that could play a role in the acceptance of financial institutions in the CPP program. Jeffrey, Vasvari and Wittenberg-Moerman (2010) find that participating banks are more profitable, have a lower ratio of non-performing loans to total loans and have a lower book-to-market ratio, in comparison to non-participating banks. Furthermore, they find that banks with stronger capital (Tier 1) ratios and banks that are more liquid, are less likely to be approved for the program. Overall, Jeffrey, Vasvari and Wittenberg-Moerman (2010) suggest the CPP program was reserved for 'healthier' banks that suffered from temporary low levels of capital and liquidity only. Bayazitova and Shivdasani (2009) put forward that banks receiving CPP funds are larger, have a weaker capital structure, but had stronger loan portfolios than their non-recipient counterparts. Their results suggest that more economically sound banks were allocated funds. Overall, it seems that banks participating in the CPP program are more viable than their non-participating counterparts.

Nevertheless, the real incentives of banks to participate in the CPP program remain unclear, since the criteria for participation and the actual list of applicants were not made public. Conversely, there are distinct reasons for a participating bank to exit the CPP program, as will be discussed in the next section.

2.2.2 The costs of participating in the Capital Purchase Program

Although CPP funds appeared to be a cheap form of money, participation did come at a cost. At first, in return for the provided capital, the specific financial institution would have to grant senior preferred shares to the Treasury (OFS, 2009). Additionally, the Treasury would receive warrants with a ten year life span, which allowed the Treasury to purchase common stock during that lifetime for an amount of 15% of the preferred equity infusion. The Treasury would receive a dividend on the preferred shares of 5 % annually. After the first five years of the program, the annual dividend would rise to 9% a year (OFS, 2009). An important condition of the preferred shares is that they are nonvoting, "except on certain limited issues such as amendments to the charter and certain transactions that could adversely affect Treasury-OFS' rights as an investor" (OFS, 2009, p.41). If any of the financial institutions participating in the TARP could not fulfil its dividend payments for six times or more, the Treasury has the right to elect two directors to the board of an institution. As a result, a bank that is not able to pay dividends to the Treasury could lose a significant amount of control over its business to the government.

Paying dividends and the possible loss of control are not the only consequences of participation in the CPP program. Once in the program, banks were obliged to obey to additional regulation changes regarding the CPP program. These additional regulations could negatively impact the incentive to continue participating. An example, although perhaps indirect, is the changing public and political sentiment towards TARP. Bayazitova and Shivdasani (2009) suggest that ever since the inception of the TARP program, the negative public sentiment as well as the political controversy continued to increase. A major contributor to this negative public sentiment was the seemingly unrestricted bonus payments by government supported institutions. Bhagat and Romano (2009) give the fine example of American International Group (AIG) which paid over $165 million in retention bonuses to its employees, despite the fact that AIG received more than $170 billion of taxpayers' money under TARP and nearly 80% of AIG is owned by the government. The announcement of these bonus plans in March 2009 fuelled the public outrage and resulted in a severe public discussion. Even the Obama administration showed its disliking (Andrews & Baker, 2009).

Therefore, as a response, the House of Representatives passed an additional tax on bonuses, called H.R. 1586 on March 19, 2009. According to Bayazitova and Shivdasani (2009) the enacting of this law in under 24 hours, with an overwhelming majority of the votes, is perhaps one of the best examples of the changing political climate towards TARP, and thus CPP. Besides that, the passage of the H.R.1586 bill could result in significant cost increases for banks, since it could become more

difficult to retain key talent. This talent could choose to substitute a CPP bank for a non-participating bank, which was not restricted to these additional bonus requirements. In order to assess whether the changing political environment really affected the costs of TARP participation, Bayazitova and Shivdasani (2009) studied the stock price reaction around the passage of H.R.1586. They find that firms most directly affected[4] by the bill have an average excess return of -7.9%, statistically significant at the 1% level, whereas banks that did not receive TARP funds experienced a positive excess return of, on average, 1.2%. Thus it seems that the non-participating banks were expecting to benefit from this bill, whereas the participating banks were not. In other words, these results imply that financial institutions participating in the TARP, or CPP program, faced a changing cost-benefit equation in the light of the passage of H.R.1586.

Similar results are found by Kim (2010), who studied the market reaction of compensation regulations on several announcement dates. Overall, he finds that the market, represented by a sample of CPP recipients, reacts negatively on the announcement of new regulations regarding compensation limitations. These results suggest investors are concerned about losing talented executives (Kim, 2010). This could well results in an increased incentive for a participating financial institution to exit TARP.

Thus, taking into consideration the negative public sentiment as well as the dividend payments and the growing amount of compensation regulations, it seems likely to assume there exists an increasingly strong incentive for financial institutions to exit the CPP program by repaying their funds.

2.2.3 Repaying the Capital Purchase Program funds

In order to repay their funds, financial institutions are able to choose between one of two options. Either they wait three years and then redeem their shares at face value, complying to all additional regulations issued in the mean time. Or, at any time before those three years have ended, they are able to redeem their shares if they have a sufficient amount of Tier 1 capital. In order to realize this objective they would have to conduct a 'qualified equity offering[5]' to obtain enough cash to buy back the shares held by the Treasury (GAO, 2009). Besides repurchasing the preferred shares, participating institutions can also repurchase the warrants held by Treasury for a price that has to be

[4] Eight firms with government aid of $5 billion or more.
[5] A 'qualified offering' is the sale and issuance of Tier 1 qualifying perpetual preferred stock, common stock, or a combination of such stock for cash (GAO, 2009).

agreed upon. However, if they decide not to do so, the Treasury can sell these warrants to a third party (OFS 2009). A financial institutions is not obliged to redeem its warrants at the same time it redeems its preferred shares.

On March 31, 2009, the first banks began to repay their fund to the Treasury. And on June 9, 2009, the Obama administration announced its decision to let ten big financial institutions repay their CPP funds, i.e.: American Express, Bank of New York Mellon, BB&T, Capital One, Goldman Sachs, J.P. Morgan, Morgan Stanley, Northern Trust, State Street and U.S. Bancorp. The announcement formed a milestone in the government's effort to rescue the financial sector, since the banks planned to return a total $68,3 billion, which is more than a quarter of the total funds distributed under the CPP program (Dash, 2009). However, the decision to allow these banks to exit the program results in the Treasury giving up much of its controlling power over these institutions. Besides that, the possible signalling value of the announcement on June 9, could have a severe impact on the banking industry as Dash suggests in his article;

> *The announcement on Tuesday underscored the stark dividing line across the banking industry. On one side are big banks now considered healthy enough to forgo their TARP money. On the other side are those considered too weak to go without it (Dash, 2009, para. 15).*

To illustrate the point made in this article, neither Bank of America Corp nor Citigroup Inc. where allowed to return their government funds on June 9, 2009, despite receiving $25 billion each under the CPP program. Both of these banks are among the largest in the U.S., but neither was able to repay its funds as opposed to other large (competitor) banks such as J.P. Morgan and Goldman Sachs. There is consensus in academic literature that only 'healthy' banks were chosen to participate in the CPP program (Jeffrey, Vasvari & Wittenberg-Moerman, 2010; Bayazitova & Shivdasani, 2009). However, it seems there is a difference between participating banks in their ability to repay government funds, as the example of Bank of America and Citigroup shows. In other words, repayment announcements, as that of June 9, 2009, could signal that some banks leaving the TARP program are in a better financial condition than the ones remaining, as is suggested by Dash (2009).

Overall, up until May 19, 2010, as many as 74 companies have returned their CPP money according to the ProPublica website. These repayments represent well over $ 159 billion of the $204.9 billion actually disbursed under the CPP program. This does mean, however, that not all banks participating in the CPP program have repaid their funds as of May, 2010.

2.3 Other TARP programs

Besides the CPP program, there a number of other programs under TARP that are well worth mentioning. A number of these programs are the Targeted Investment program (TIP), the Systemically Significant Failing Institutions (SSFI) program, the Supervisory Capital Assessment program (SCAP) and the Capital Assistance Program (CAP). The TIP program is focussed on providing additional funds for Bank of America and Citigroup, besides the funds they received under the CPP program. The SSFI program's intention was to prevent AIG from collapsing by providing extra capital. Both of these programs together account for almost $ 110 billion of additional funds. Table B.1 of Appendix B gives an overview of the different programs under TARP and their relative size.

The SCAP program is also known as the 'stress test' on the nineteen largest U.S. bank holding companies (OFS, 2009). The goal of this test was to assess whether these banks would be able to overcome possible future losses in a number of scenarios. Among these nineteen banks were J.P. Morgan Chase, Citigroup, Bank of America Corp., Goldman Sachs, Morgan Stanley and Wells Fargo, all banks that were required to have consolidated assets in excess of $ 100 billion. The outcomes of the stress test were made public on May 7, 2009, which was highly unusual, but necessary to restore confidence in the banking industry. As a result, ten of the nineteen banks were forced to raise additional capital. The CAP program was designed to support banks, subject to the SCAP program, that were not able to raise the required capital through private sources (OFS, 2009). Nonetheless, according to Federal Reserve, the CAP program was redundant, since no investments were necessary until the very day the program closed.

2.4 Summary

TARP consists of a variety of programs to restore the stability of the U.S. financial system, of which the CPP program is the largest and most important. Participation in this program was reserved for 'healthier', more viable banks only. However, once in the program, these banks were exposed to a growing number of regulations, costs a strong negative public sentiment, which together increased the incentive for banks to repay their funds. Once the first repayments were made, a public discussion formed suggesting that some banks were 'healthy' enough to repay their funds, while others were too 'weak' to go without them. In other words, there seemed to exist a difference in financial condition between banks in the CPP program. Note that to avoid any confusions in the remainder of this paper, I will henceforth refer to the CPP program, CPP participants and CPP banks as TARP program, TARP participants and TARP banks respectively.

3 Financial condition: the CAMELS rating

The financial condition of banks is a heavily discussed subject in the wake of the 2008 financial crisis. However, how is the financial condition of a bank to be determined? One way to determine if banks are in a proper financial condition could be by stress-testing them, as is done under the SCAP program. However, in the light of this paper, I need a simplified tool which I will be able to apply in my study. Fortunately, Lei (2010) uses a very interesting tool to measure the financial condition of a bank, represented by the CAMEL(S)[6] rating.

3.1 Theory

CAMELS is the acronym for six components of a bank's condition: *C*apital adequacy, *A*sset quality, *M*anagement, *E*arnings, *L*iquidity and *S*ensitivity to market risk (Lei, 2010).The CAMELS rating is a numerical rating, frequently used by many examiners, among them the three main federal banking supervisors; the Office of the Comptroller of the Currency (OCC), the Federal Deposit Insurance Corporation (FDIC) and the Federal Reserve (Hirlte & Lopez, 1999). The rating is a summary rating which takes a value between 1 and 5 to display the financial condition of a bank. A rating of 1 or 2 is considered to be good, whereas a rating of 3 or higher is considered to result supervisory concerns (Hirtle & Lopez, 1999). However, just as the viability criteria used by the Treasury mentioned in section 2.2.1, the CAMELS rating as well as the examination material used are highly confidential and never made public (Hirlte & Lopez, 1999). A bank's CAMELS rating is only known by a select group, such as the bank's senior management and the appropriate supervisory agencies. Nevertheless, Hirtle and Lopez (1999) approximate the components of the CAMEL(S) rating by using several explanatory variables which can be found in their paper. Lei (2010) uses the knowledge and variables of Hirtle and Lopez as a basis to construct a more TARP related version of the CAMELS rating. He uses the CAMELS rating to study the determinants of TARP funds distributions. Lei (2010) suggests the CAMELS rating was the first thing Federal banking regulators looked at when they evaluated a TARP application. Hence, I believe that in the light of this paper, the CAMELS rating is a proper tool to approximate the financial condition of TARP banks.

[6] Hirtle and Lopez (1999) only define a bank's CAMEL rating. In 1997 a sixth component was added, the S. It represents the bank's sensitivity to market risk. Therefore, nowadays, the system is known as the CAMELS rating.

3.2 Application

In general, Lei (2010) uses the following approximations of the six components of the CAMELS rating: The capital adequacy (C) of a bank is approximated by the Tier 1 ratio, defined as the Tier 1 capital divided by the total of the risk-weighted assets of a bank. However, unlike Lei (2010), I will use the loans-to-asset ratio to estimate the asset quality (A), since it is a good indicator of the strength of a bank's loan-portfolio, securitized against its assets. Additionally, the loans-to-asset ratio is easier to determine than the approximation of Lei (2010)[7] and it used by Hirtle and Lopez (1999) in their models to estimate the CAMEL(S) rating as well. For management quality (M), I will use the age of a bank as approximation. Lei (2010) puts forward that literature has suggested many proxies of management quality, of which the age of a bank is the simplest one. Therefore, I assume this proxy to be of sufficient quality to use in this paper as well. I will use the same approximation for earnings (E) as Lei (2010), measured by the annualized ROA, as well as the same proxy for liquidity (L), measured by the cash-to-assets ratio. Last, the sensitivity to market risk (S) is approximated by the loans-to-deposits ratio. As Lei (2010) suggests, the loans-to- deposits ratio measures the stability of a bank's funding mix and captures a bank's sensitivity to market risk in the crisis.[8] Appendix A gives an overview of the variables used and their calculations.

In summary, the CAMELS rating is a frequently used tool for U.S. examiners to access the financial condition of a bank. It is, however, undoubtedly one of many tools used to assess banks, especially in the wake of the 2008 financial crisis, as is implied by the stress tests. Nevertheless, in the light of this paper, the approximation of the CAMELS rating allows me to use a sophisticated measure of a banks' overall financial condition in a more simplified way.

[7] Lei (2010) uses the following ratio to determine asset quality: the amounts of loans past due 90 days or more, non-accrual loans and other real estate owned, divided by the bank's capital and loan loss reserves.

[8] In the wake of the Lehman Brothers' bankruptcy, bank's funding costs rose and many banks found it difficult to roll over their public debt. In this case, deposits become a valuable source of funding for banks (Lei 2010).

4 Hypothesis development

This paper can essentially be divided in two parts. The first part examines the market reaction to two important announcement dates regarding TARP repayments, namely March 31, 2009 and June 9, 2009. The second part examines if there is a relationship between the financial condition of a bank and the probability this bank will repay its TARP funds. The following sections will make clear what I expect to find during my study.

4.1 Wealth effects: event study analysis

It seems that participating financial institutions are eager to repay their government funds within the period of three years. This trend could be explained by the increasing costs of participation, such as described in section 2.2.2. Bayazitova and Shivdasani (2009) find a positive market reaction to the announcements of the intention to repay TARP funds for eight banks studied, consistent with this view. Therefore, based on the seemingly increasing costs of participation in the TARP program, I expect to find a similar positive result for my sample. Hence, hypothesis one suggests:

Hypothesis 1a: The market reaction to exiting the TARP program will be significantly positive for the four banks that were allowed to repay their TARP funds on March 31, 2009.

Hypothesis 1b: The market reaction to exiting the TARP program will be significantly positive for the ten banks that were allowed to repay their TARP funds on June 9, 2009.

The ability of a fraction of the TARP banks to repay their funds within the standard three year period could infer that TARP banks can be divided into healthy banks and less-healthy banks, as suggested by Dash (2009). I expect this division to become more evident after the approval by the Treasury to let ten of the largest financial institutions repay their TARP funds on June 9, 2009. Since, as of June 9 forward, even large and systemic banks were allowed to repay their funds. This was clearly not the case before June 9. Consequently, as of June 9 onwards, all banks were considered 'equal'. The most important obstacle between repaying and not repaying would become the Treasury's approval, as opposed to the economical, or societal, importance of a bank. If such an approval is granted, this could signal that your bank is healthier than the banks that remain in the TARP program. And if such a signalling effect is present, I expect the market reaction of TARP banks that remain in the program to be different than the reaction of banks that are allowed to exit the TARP program. To be more specific, I expect the market reaction of the banks that remain in the

TARP program to display negative announcement results on June 9, 2009. Hence, hypothesis two holds:

Hypothesis 2: The market reaction on June 9, 2009, will be significantly negative for the banks remaining in the TARP program, as a consequence of the possible signalling effect resulting from the repayment announcement of 10 large financial institutions.

Furthermore, I expect the market reaction of the full sample to be in line with the signs of hypothesises one and two. Thus, I expect the overall market reaction to represent a positive effect on March 31, 2009 as opposed to a negative market reaction on June 9, 2009. The reason why I expect these reactions to occur is that the relative weight of the non-repaying banks in the sample is much higher than the weight of repaying-banks. Therefore, the market reaction of the non-repaying banks will have a substantial influence on the market reaction of the full sample. Therefore, hypothesis 3 holds:

Hypothesis 3a: The market reaction for the full sample will be significantly positive on March 31, 2009.

Hypothesis 3b: The market reaction for the full sample will be significantly negative on June 9, 2009.

4.2 Financial condition of banks and the repayment of TARP funds

According to Dash (2009), it seems likely that the banks repaying their TARP funds are in a better financial condition than the ones that do not. Therefore, in this paper, I would like to study if there exists a relationship between the financial health of a bank and its repayment. I choose to use the majority of Lei's approximations of the CAMELS variables in this paper as well, as described in the previous chapter. However, I will not transform the six components into a single rating variable ranging from 1 – 5, since I am particularly interested in the effects of the approximated CAMELS components separately. Overall, I find it plausible to assume that the financial condition of a bank has some influence on the probability that bank will repay its TARP funds. Hence, hypothesis 4 is:

Hypothesis 4: At least one of the six approximated components of the CAMELS rating will be of significant influence on the probability that a sample bank will repay its TARP funds.

5 Data & Methodology

In this chapter, I will discuss the way the sample is constructed. After that, a number of descriptive statistics will be given, followed by an extensive discussion on the methodologies used in this paper. The methodology section is divided in two parts. First the methodology used to examine the market reaction of TARP repayments will be discussed. Second, the methodology used to examine the relationship between a banks' financial condition and its TARP funds repayment will be given.

5.1 Sample construction

As of May 2010, 830 financial institutions received money from the Treasury, according to the ProPublica website. ProPublica is an independent, non-profit newsroom that investigates important stories in the interest of the public. Probuplica is led by the former Wall Street Journal managing editor, Paul Steiger. On its website, Probuplica tracks TARP and its different programs. The website gathers its data directly from the Treasury Department. However, also other government agencies, press releases and regulatory filings from bailout recipients are used to collect the correct amount of data.

ProPublica reports that out of the 830 TARP recipients, 706 are banks that received money under the Capital Purchase Program. For my sample, I choose only public banks, which are traded at the NYSE, NASDAQ or AMEX exchange. I consequently delete over-the-counter-traded (OTC) banks because of the lack of usable stock price data. Besides that, I choose only firms for which their stock prices are available between January 1, 2008 and December 31, 2009, resulting in a sample of 256 publicly traded banks. All of the sample banks are given in Table B.2 of appendix B. Data with regard to the repayment of government funds is also collected from the ProPublica website.

Table 1 shows that the total sample of 256 banks consists of 32 banks that are listed at the New York Stock Exchange (NYSE), 219 banks that are listed at the NASDAQ stock exchange and 5 banks that are listed at the AMEX exchange. Regardless of the fact NYSE listed banks only represent 12.5% of the full sample, they accounted for almost 88% of the distributed TARP funds amongst the sample banks. The average amount these banks received is approximately $ 4.9 billion. Overall, during the year 2009, over $ 108.5 billion of the $ 178.6 billion is repaid by the sample banks.

Table 1. Sample Data

In this Table, sample data with respect to the full sample is shown. The data is collected from the ProPublica website. Of the $ 204.9 billion disbursed under the CPP program, $ 178.6 billion is received by banks in the sample. Between parentheses, the relative weights are given in % when compared to column 1 'total of banks'.

Sample		Total of banks	Listed at NYSE	Listed at NASDAQ	Listed at AMEX
Number of banks in the sample	Total	256	32	219	5
	%		(12.50)	(85.55)	(1.95)
Amount received under TARP *$ millions*	Total	178,599	156,671	21,763	165
	%		(87.72)	(12.19)	(0.09)
	Mean	698	4,896	99	33
Amount returned under TARP during 2009 *$ millions*	Total	108,522	104,549	3,973	0
	%		(96.34)	(3.66)	(0.0)
	Mean	2,261	6,970	120	0

In Table B.3, of appendix B, can be seen that a substantial amount of the repayments is done on a single date, namely June 9, 2009. The nine banks in this subsample together repaid over $ 64 billion, or almost 60% of the total $ 108.5 billion that was repaid during the year 2009. This makes June 9 a particularly interesting date to study.

5.2 Descriptive statistics

In Table 2, summary statistics are shown for the banks in the sample. The data is collected using Datastream and Compustat. This data represents the actual figures from the financial statements at fiscal years ending 2008 and 2009. Data, not directly available in these two databases, was collected using financial statements found on the respective bank's websites.

As Table 2 shows, the average level of assets is around $46 and $47 billion in 2008 and 2009 respectively. Conversely, the median asset level is much lower, which indicates that there is a considerable difference in the size of banks in the sample. The average level of sales is $2.7 billion in 2008 and $ 2.9 billion in 2009. Again, there is a substantial difference between the mean level and median level of sales, consistent with the size difference. The average net income increases with over 280% from 2008 to 2009. This could indicate that the banks in the sample are recovering from the economic crisis, as of 2009. However, median net income levels indicate that in 2009, most of the sample firms are still reporting losses. This view is consistent with the decrease in ROA from -0,15%

in 2008 to -0,74% in 2009. This decrease points towards a worsening profitability, on average, in 2009 with respect to 2008. One explanation for this result is that the negative net incomes in 2009, used to calculate ROA, result in negative ROA's. Despite the fact that some of the larger banks in the sample show a positive ROA, the average ROA of the full sample turns out negative.

Table 2. Summary statistics

This Table shows the summary statistics for all the 256 public banks in the sample for the years 2008 and 2009. The six components of the CAMELS rating are represented by the Tier 1 ratio, Loans/Assets ratio, Age of a bank, ROA, Cash/Assets ratio and Loans/Deposits ratio. For the Tier 1 ratio, Loans/Assets and Loans/Deposits ratio, not all data was available, represented by smaller sample (N) values. A more elaborate description of the CAMELS variables can be found in appendix A.

	2008		2009	
	Mean	Median	Mean	Median
Assets ($ millions)	46,593	1,825	47,005	1,911
Sales ($ millions)	2,728	112	2,906	107
Net income ($ millions)	-60.47	3.04	110.19	-0.37
Age of bank (years)	66.50	53.50	67.50	54.50
ROA (%)	-0.15	0.31	-0.74	-0.03
Cash / Assets (%)	2.24	1.80	2.47	1.66
	(N = 256)		(N = 255)	
Tier 1 ratio (%)	11.05	10.85	11.80	11.75
	(N = 255)		(N = 254)	
Loans / Depostis (%)	110.95	100.70	95.15	91.14
Loans / Assets (%)	72.40	73.88	68.82	70.11

The other variables in the CAMELS rating, besides ROA, are: the age of a bank, the Tier 1 ratio, the loans-to-assets ratio, the cash-to-assets ratio and the loans-to-deposits ratio. Table 2 shows that the average age of the sample banks in 2009 was 67.5 years. The Tier 1 ratio as well as the cash-to-assets ratio shows an improvement in 2009 with respect to 2008. The Tier 1 ratio increases, on average, which indicates that banks have more capital at hand to cover for potential losses in the future. This result is consistent with the increasing number of regulations put in place by financial regulators as a consequence of the crisis. The cash-to-assets ratio, which is comparable to the

current ratio, also increases from 2008 until 2009. This is a sign that the liquidity of the banking firms in the sample is improving, which implies that banks are, on average, better able to repay their short-term obligations.

The loans-to-assets ratio also displays better results for 2009 compared to 2008, since a higher loans-to-assets ratio indicates a bank becomes more risky because loans are not always being repaid. In general, a sound ratio will give the financial institution a higher credit rating. The decreasing loan-to-assets ratio shown in Table 2 seems to coincide with measures taken by regulators and banks themselves to remove bad loans from a bank's balance sheet, in response to the credit crisis. On average, the asset quality of the sample banks improved, shown by a decreasing loans-to-assets ratio.

Last, the loans-to-deposits (LTD) ratio shows the percentage of a bank's loans funded through deposits. A bank is able to fund its loans via one of two possibilities; borrowing the required funds or using deposits. The latter is used more often, since it is assumed to be more stable. This assumption seems to hold even during a crisis, since the Federal Deposit Insurance Company increased its deposit insurance in October 2008 from $ 100,000 to $ 250,000 per depositor, per insured bank (Veronesi & Zingales, 2009). As a result, it seems likely that possible incentives for a depositor to withdraw its money weakened, thereby preventing a potential bank run and thus insuring a stable way of funding for banks. In general, both borrowing money and the use of deposits are short term ways of funding, while the loans of a bank are long term commitments. Therefore, banks are always in need of refinancing. During the 2008 financial crisis, borrowing money became more difficult and resulted in higher costs. As a result, a bank that is more dependent on borrowing money as a source of funding, will face these increasing costs of borrowing. In other words, this bank is more sensitive to market risk, represented by a loans-to-deposits ratio of less than 100%. On the other hand, as Bayazitova and Shivdasani (2009) suggest in their paper, an average ratio of over 100% indicates a bank is less dependent on borrowing money as a source of funding. This means it can use its deposits to fund all of its loans. This implies, however, that the 2009 loans-to-deposits ratio is, on average, worse than the ratio shown for 2008 in Table 2.

On the whole, the sample banks show an average improvement in their financial condition (health) in 2009 with respect to 2008, indicated by an improved Tier 1 ratio, cash-to-assets ratio and loans-to-assets ratio.

5.3 Event Study methodology

In order to measure a market reaction regarding TARP repayments, I will use the event study methodology. Event studies measure the stock price reaction to important corporate events and are an important tool in finance. Price reactions are measured by determining abnormal returns, which represent the difference between expected returns and the observed returns on stocks. Bowman (1983) identified five important steps in conducting an event study, which de Goeij and de Jong (2010) reduced to the following three:

1. Identify the event of interest and in particular the timing of the event.
2. Specify a "benchmark" model for normal stock return behaviour.
3. Calculate and analyse abnormal returns around the event date.

An important aspect of the first step is the determination of the event date, or announcement date. The following sections will discuss the three-step event study methodology used.

5.3.1 Event Date

The main event date defined in this study is June 9, 2009, the date on which the Treasury announced it would allow ten of the largest financial institutions in the US to repay their TARP funds. On this date, the announcement was also made public in the Wall Street Journal, for example in articles like that of Sidel and Solomon (2009). Initially, the Treasury did not give away the names of the individual financial institutions. However, later that day these firms independently announced their intentions to repay on their websites. Of the ten large firms referred to by the Treasury, nine are present in my sample, namely the Bank of New York Mellon, BB&T, Capital One, Goldman Sachs, JP Morgan, Morgan Stanley, Northern Trust, State Street and U.S. Bancorp. American Express was also among the ten financial institutions to return its TARP funds. However, according to the Yahoo Finance website, American Express is a financial services company, rather than a public bank. Therefore, I have not included American Express in my sample. Table B.3 of appendix B shows the nine banks and the amounts they committed to repay.

Besides the repayment of the nine large financial institutions on June 9, 2009, I will analyse the market reaction on the date the first repayments under the TARP program took place, namely March 31, 2009. At this date, several smaller financial institutions repaid their funds to the Treasury. Of the five firms that repaid their TARP funds on March 31, 2009, four are public banks that are present in my sample. These banks are: Bank of Marin Bancorp, Iberiabank Corp., Old National Bankcorp and Signature Bank. Table B.3, of appendix B, puts the March 31 repayments into

perspective. The four banks mentioned before, together, repaid $257 million of TARP funds, while the nine banks of June 9 repaid well over $64 billion, which is almost 250 times that amount. Even so, the total amount of funds repaid under TARP, that is including other programs, up until the announcement on June 9, 2009, was slightly more than $5,5 billion divided over twenty-four financial institutions according to ProPublica. This well explains the excitement raised by the repayment announcement of June 9, 2009.

To summarize, in this paper there are two important announcement dates, namely March 31, 2009 and June 9, 2009. Of these two dates, the emphasis will be on June 9.

5.3.2 The market model

To conduct an event study, a benchmark model is needed to compute the benchmark, or *normal* return. Over time, several models have been thoroughly examined and used. Well-known examples of empirical papers that examined the event study methodologies, still used today, are the papers by Fama, Fisher, Jensen and Roll (1969) and Brown and Warner (1985).

In this paper, I will use the "market model" as benchmark model for calculating the abnormal returns since this model specifically accounts for the systematic risk[9] of individual companies in respect to the market. The market model is specified by the following formula;

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

where R_{it} is the rate of return on the stock of firm i on day t, R_{mt} is the rate of return on the market index and ε_{it} is the random error with an expected value of zero. In defining abnormal returns, this model gives better results when compared to for example the "market-adjusted model", which assumes that the beta of each stock, β_i , is equal to one. (De Jong & De Goei, 2010).

5.3.3 Calculating and analysing abnormal returns

The abnormal returns AR_{it} are calculated on a daily basis t for each firm i, during the event period $[t_1, t_2]$. The event period is a time window in which the event is located on day t_0 and it runs from 60 days before the event until 60 days after. The formula for calculating the abnormal returns is as follows:

[9] Systematic risk is also called undiversifiable risk, or market risk. It is the risk that cannot be diversified away through diversification. It is for example the risk of a recession, or war, that affects the entire market. In asset pricing models such as the CAPM, systematic risk is represented by the Greek letter Beta, β.

$$AR_{it} = R_{it} - NR_{it} \quad (2)$$

where R_{it} is the daily realized rate of return of firm i on day t and NR_{it} is the daily normal return of firm i on day t. The daily normal returns are based on estimations calculated via the market model. These estimations are calculated for the length of the estimation period $[T_1, T_2]$. The estimation period is a time window over which the market model is estimated, which comes before the event period. There is, however, little consensus among different empirical studies on the length of the estimation period. In this paper, I have used an estimation period of 180 trading days, which ends 61 days before the event date t. The normal return NR_{it} is defined by the following formula;

$$NR_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \quad (3)$$

where $\hat{\alpha}$ and $\hat{\beta}$ are firm i 's ordinary least squares (OLS) regression coefficients for the estimation period. The return on the market index R_{mt} is defined as the CRSP (NYSE/AMEX/NASDAQ) equally-weighted return, for day t, since Brown and Warner (1980) suggest the equally- weighted and value-weighted CRSP indices offer similar results (De Jong & De Goei, 2010).

The realized return of firm i on day t is determined during the entire length of event period using the natural logarithmic function;

$$R_{it} = \ln\left(\frac{P_{it}}{P_{it-1}}\right) \quad (4)$$

where P_{it} and P_{it-1} are the prices of the stock of firm i on day t and day $t-1$, respectively. The daily stock prices are collected from the Center for Research in Security Prices (CRSP) database and when necessary, supplemented by stock price data from the Yahoo finance website[10].

After calculating the abnormal returns for each firm in the event period, I would like to analyze the abnormal performance over longer periods surrounding the event date. Therefore, I have calculated the cumulative abnormal returns (CAR's) for each firm by adding abnormal returns over a number of time windows $[t_1, t_2]$. The formula for defining the cumulative abnormal return is;

$$CAR_i = AR_{i,t1} + \ldots + AR_{i,t2} \quad (5)$$

[10] For a number of four companies, the CRSP database did not have all stock prices available on the required days of the estimation window. Therefore, the Yahoo finance website (n.d.) was consulted. Retrieved from: http://finance.yahoo.com/

In this paper, I will use a number of different time windows for which I calculate each firms' CAR. These time windows are: [0], [0,1] and [-1,1]. In each of these time windows the abnormal performance will be determined by testing whether the CAR is significantly different from zero. The null-hypothesis for these tests is $H_0 : E(CAR_i) = 0$. According to De Jong and De Goei (2010), this hypothesis can be tested in almost the same way as a one-period abnormal return AR_{it}, namely by using a simple *t*-test. However, this *t*-test comes with a number of restrictive assumptions. First, the abnormal returns AR_{it} are independently and identically distributed. Second, the abnormal returns AR_{it} follow a normal distribution with mean zero and variance σ^2 (De Jong & De Goei, 2010). However, there is much evidence that this assumption is too strong, since stock returns usually do not follow a normal distribution. Nevertheless, if the Central Limit Theorem holds, it can be assumed that abnormal returns approximately follow a standard normal distribution (De Jong & De Goei, 2010). As a result, if N_t is sufficiently large, a *t*-test can be conducted using the quantiles of the normal distribution. These are |2,36|, |1,96| and |1,67| for the 1%, 5% and 10% significance level respectively.

5.4 Regression models: OLS vs. Logit regression

To study whether there is exists a relationship between the financial condition of a sample bank and the likelihood a bank is going to repay its TARP funds, I could use an ordinary least squares (OLS) regression. In this case, I would use a dummy variable as dependent variable, which would be 1, if a company repaid its funds, or 0 otherwise. The independent variables would be the six components of the CAMELS rating. However, there a number of reasons why OLS estimations will not be entirely correct if the dependent variable is a dichotomous variable, which can take only one of two values (0 or 1). Important basic assumptions will be violated, such as the assumption of normality and the assumption of homoskedasticity. Moreover, the OLS regression will produce probabilities that are not in line with the general perception of a probability, to have a value between 0 and 1 (Sieben, 2009).

Since these problems can result in wrong conclusions, I will use a logit regression model instead. By using a logit model instead of an OLS regression, the problems of an OLS regression with a dichotomous dependent variable will fade away. Here is how it works: a logit model transforms the dependent (dummy) variable in odds. An odd is the chance a sample bank is going to repay its TARP funds in relation to the chance it will not repay. In other words, it represents the proportion of banks

that repaid relative to the banks that did not (De Vries & Huisman, 2007). The formula to calculate the odds is:

$$odds = \frac{\hat{P}_i}{(1-\hat{P}_i)} \tag{6}$$

where $\hat{P}_i$ is the proportion of banks that repaid in the sample. The odds have a range between zero and infinity. However, to come closer to a normal distribution, I would like the odds to have a range between minus infinity and plus infinity $(-\infty, +\infty)$. Therefore, the odds are transformed into a natural logarithm. Hence, the formula is:

$$ln\,(odds) = ln\left(\frac{\hat{P}_i}{(1-\hat{P}_i)}\right) \tag{7}$$

where ln stands for the natural logarithm. The result of this transformation of the dependent variable, is a regression model that looks quite similar to an OLS regression:

$$ln\left(\frac{\hat{P}_i}{(1-\hat{P}_i)}\right) = \alpha + \beta_1\, X_1 + \beta_2\, X_2 + \ \ldots\, \beta_n X_n \tag{8}$$

where α is the intercept, and β is the regression coefficient for the variable X, etc. Even though the model looks quite similar to an OLS regression, the interpretation of the coefficients requires a different approach, since the regression coefficients are logits. In other words, the coefficients give the effect of the variable on the logit (ln) of the odds.

If a coefficient is positive, it will have a positive effect on the probability of the event to occur. In other words, for an increase of 1 unit in variable X_n, the odd that a bank will repay its money will increase with e^{β_n}, ceteris paribus (De Vries & Huisman, 2007). Consequently, the probability that a bank will repay its TARP funds can be determined by converting the logit, and thus converting the regression model. The can be done by using the following formula:

$$\hat{P}_{i=1} = \frac{e^{(\alpha+\beta_1\, X_1+\beta_2\, X_2+\ \ldots\, \beta_n X_n)}}{e^{(\alpha+\beta_1\, X_1+\beta_2\, X_2+\ \ldots\, \beta_n X_n)}+\,1} \tag{9}$$

where $\hat{P}_{i=1}$ is the probability a sample bank will repay its TARP funds, given the regression model coefficients and corresponding values for the X's (different for each sample bank). Appendix C shows an example of the probability calculation which can be applied using the test results of the next section.

To determine if any of the coefficients used in the logit regression model is of significant influence on the probability of repayment, a test statistic is needed. The appropriate test statistic to use is the Wald-statistic[11]. This test-statistic follows a Chi-square distribution with *n* degrees of freedom. However, there is a second and more easy approach to determine if any of the variables is significant and that is by looking at the *p*-values. If a *p*-value is small enough, usually smaller than 0.05, than a variable is said to be significant. The overall fit of the model can be determined by looking at the outcome of a Chi-square test. If this outcome is significant, it would indicate that the respective model fits the data. The actual results are shown in the next section.

[11] The Wald-statistic could be determined by using the following equation: $x^2 = \left(\frac{\hat{B}}{\hat{\theta}}\right)^2$

6 Empirical results

This chapter shows the results acquired in this paper. First, the results of the event study are discussed. Second, it is examined if the obtained market reaction relates to the financial condition of the sample banks. Third, the results of the Logit regression model are presented. Last, the differences in financial health between the banks that repaid their TARP funds during 2009 and the ones that did not are discussed.

6.1 Cumulative abnormal returns (CAR's)

Table 3 shows the cumulative abnormal returns for different sample sizes on the two event dates. Panel A shows the CAR's of three time windows, namely: [0], [0,1] and [-1,1]. The announcement return (t=0) shows a positive CAR of 0.84% on March 31, 2009 whereas the announcement return on June 9, 2009 is -0.74%, both significant at the 5% level. These results are in line with hypothesis 3 a and b respectively. The results are stronger over a two-day window [0,1] as is suggested by the significance of the result at the 1% level. Since the sample (N=256) meets the criteria of sample size, suggested by the Central Limit Theorem, the quantiles of the normal distribution were used as critical values for the *t*-tests.

Panel B of Table 3 shows the market reaction for the banks that announced to repay their TARP funds on 31 March, 2009 or June 9, 2009. Both samples are too small to meet the conditions of the Central Limit Theorem. Therefore, the *t*-tests executed have specific critical values for each of the two samples. For the sample of four banks, the critical value of the *t*-test with n-1 degrees of freedom is |3,18| at the 5% level. For the sample of nine banks, the critical value is |2,31| at the 5% level. As can be seen in Table 3, the announcement effect of 3.27% on March 31, 2009 is significantly positive. The test loses power if the time interval is changed to a two-day period, but is again significant for a three-day window. Overall, the results are in line with hypothesis 1a. Bayazitova and Shivdasani (2009) also studied the first repayments under TARP and find a an excess return (CAR) of, on average, 2.8% on a two-day interval. However, this result includes two other banks, in addition to the four I used in my sample for March 31, 2009. Besides that, Bayazitova and Shivdasani (2009) measure their CAR on a [-1,0] interval, whereas I have measured the CAR on a [0,1] interval. Nevertheless, the results are quite similar in size and both measured over a two-day interval.

Table 3. Cumulative abnormal returns

Panel A presents the Cumulative abnormal returns (CARs) of the full sample for two event dates, namely March 31, 2009 and June 9, 2009. The CARs are given on three time intervals: [0], [0,1] and [-1,1] and presented as a percentage (%). Panel B gives the CARs for two subsamples of banks that repaid their funds either on March 31, 2009 or on June 9, 2009 respectively. Last, panel C shows the CARs of the sample banks that did not repay their funds on the respective dates, and thus at that moment, were still present in the TARP program. T-statistics are that of a Student-T distribution. *, ** and *** represent the statistical significance at the 10%, 5% and 1% level respectively.

Panel A: Abnormal returns for the full sample (N = 256)

Event window	March 31, 2009 (N = 256)		June 9, 2009 (N = 256)	
	CAR (%)	T-statistic	CAR (%)	T-statistic
Announcement (t=0)	0.84	2.28 **	-0.74	-2.35 **
CAR [0,1]	1.89	4.42 ***	-1.68	-4.59 ***
CAR [-1,1]	0.83	1.81 *	-1.38	-3.28 ***

Panel B: Abnormal returns for the repaying firms on the respective dates

Event window	March 31, 2009 (N = 4)		June 9, 2009 (N = 9)	
	CAR (%)	T-statistic	CAR (%)	T-statistic
Announcement (t=0)	3.27	4.52 **	-0.99	-1.80
CAR [0,1]	4.87	2.34	-2.44	-2.32 **
CAR [-1,1]	5.26	3.42 **	-1.25	-1.31

Panel C: Abnormal returns for the firms that did not announce to repay on this date.

Event window	March 31, 2009 (N = 252)		June 9, 2009 (N = 227)	
	CAR (%)	T-statistic	CAR (%)	T-statistic
Announcement (t=0)	0.80	2.14 **	-0.67	-1.92 *
CAR [0,1]	1.84	4.26 ***	-1.52	-3.77 ***
CAR [-1,1]	0.76	1.64	-1.29	-2.78 ***

Panel B of Table 3 also shows that the market reaction for the sample of nine repaying banks at announcement on June 9, 2009 (t=0) is negative, but not significant. However, the two-day CAR of -2.44% is significant at the 5% level. The test loses power over a three-day window. These results differ from hypothesis 1b, which predicted that the CARs would be positive. Thus, it seems that the results are not in line with the view of Bayazitova and Shivdasani (2009), who suggest that firms are eager to leave the TARP program due to increasing costs of participation. If this would have been the case, the CARs would have shown a positive sign. One possible explanation is that the market fears that the large financial institutions may scale back on their lending, now the government gives up its control. As Ellis (2009) suggests in his article, these actions could jeopardize the possible upcoming economic recovery, especially since these nine banks are among the largest in the U.S.

Last, panel C of Table 3 shows the market reaction for each of the banks that did not announce to repay their funds on March 31, 2009 or June 9, 2009 respectively. It is important to note that the sample for June 9 excludes all banks that announced, or repaid, their funds preceding this date. The reason for this is to prevent pollution of the results. In general, the results for June 9, 2009 are in line with the expectation of hypothesis 2. The CAR of -1.52% on the two day interval [0,1] is significant at the 1% level, which indicates a strong result. The results on June 9 are particularly interesting, as they seem to confirm the idea of the presence of a signalling effect. The market could believe that the banks that remain in the program are in a worse financial condition than the banks that repaid, which results in a significantly negative abnormal return. However, to prove if the financial condition of the banks in the sample differs between banks that repaid their funds and the ones that remain, additional tests are conducted in the next section.

6.2 Cumulative abnormal return & a bank's financial condition

In order to see if the market reaction in the previous section is in any way caused by the financial condition of the banks in the sample, I conduct the following regression using each bank's CAR [0,1] as the dependent variable:

$$CAR_i = \alpha + \beta_1 \text{Tier 1}_i + \beta_2 L/A_i + \beta_3 Age_i + \beta_4 ROA_i + \beta_5 C/A_i + \beta_6 LTD_i + \varepsilon_i \quad (10)$$

Table B.4 of appendix B shows the results of the OLS regression. Obviously, this model does not seem to fit at all, as a negative adjusted R^2 shows. None of the six components of the CAMELS rating has a significant effect and thus they are not appropriate for explaining the two-day CAR at around June 9, 2009. Bayazitova and Shivdasani (2009) draw a similar conclusion after studying the

intention to repay TARP funds by eight sample firms. They find it very unlikely that the positive excess returns are generated solely by information about the financial condition of an institution. Nevertheless, they acknowledge that it cannot be ruled out that the intention to repay unveils such information. In other words, the intention of banks to repay their funds could signal that they are in a better financial condition than the banks that remain in the program.

6.3 The likelihood of repaying TARP funds

To study if the six components of the CAMELS rating could increase the likelihood of a bank repaying its TARP funds, I will conduct a logit regression. This type of regression will be performed by using a dummy variable for repayment as a dependent variable. As can be seen in appendix A, the dummy variable of interest is called $Repayment\ 09_i$ and takes a value of 1 if a sample bank repaid its TARP funds during the period March 31, 2009 up until December 31, 2009, or 0 otherwise. When taking into account the approximated variables of the CAMELS rating, the logit regression model conducted looks as follows:

$$Repayment\ 09_i = \alpha + \beta_1 \text{Tier } 1_i + \beta_2 L/A_i + \beta_3 Age_i + \beta_4 ROA_i + \beta_5 C/A_i + \beta_6 LTD_i \quad (11)$$

Table 4 shows the results of the logit regression model of equation (11). Note that the goal of this paper is not to find a model that explains a repayment best, but to separately test the effect of the six components of the CAMELS rating on the probability of repayment. In other words, to test if the components of the financial condition of a bank influence the probability of a repayment.

The results in Table 4 show three consistently significant variables, namely the loans-to-assets ratio, the return on assets (ROA) and the loans-to-deposits ratio. However, not all three have the same effect on the probability of a bank repaying its TARP funds. The loans-to-assets ratio shows a negative coefficient, indicating that this variable has a negative effect on the probability of repayment. This does not seem to be a surprising result, since a higher loans-to-assets ratio indicates a bank is in greater risk of default, and consequently will be less able to repay its TARP funds. Table 5 in the next section confirms this view and shows that banks that repaid their funds during 2009 have a significantly lower loans-to-assets ratio than the sample banks that did not repay their TARP funds.

Table 4. Logit model for the Financial Condition

This table gives the outcomes of a logit-regression model as displayed in equation (11). The coefficients are displayed as logits, so they cannot be interpreted as common regression model coefficients. Column 1 gives the model with all of the 6 CAMELS rating variables. Column 2 gives the model without the cash-to-assets ratio. Last, Column 3 gives the model without the Tier 1 ratio as well as the cash-to-assets ratio. Important is to note that all of the variables, except age, are measured as of fiscal year end 2008. Since, during 2009, the end of fiscal year 2009 data was not available yet. In the parenthesis the p-values are given. A value of $p \leq 0,05$ indicates significance at the 5% level **, while a $p \leq 0,01$ indicates significance at the 1% level ***.

	Logit Model for CPP repayment in 2009 Banks that repayed in 2009 = 1 Otherwise = 0		
VARIABLES	(1)	(2)	(3)
Tier 1 ratio (%)	0.058	0.058	
	(0.414)	(0.412)	
Loans / Assets (%)	- 0.061	- 0.063	- 0.064
	(0.001) ***	(0.000) ***	(0.000) ***
Age of bank (years)	- 0.002	- 0.002	
	(0.628)	(0.610)	
ROA (%)	2.648	2.658	2.641
	(0.000) ***	(0.000) ***	(0.000) ***
Cash / Assets (%)	0.033		
	(0.743)		
Loans / Depostis (%)	0.005	0.005	0.005
	(0.007) ***	(0.005) ***	(0.004) ***
Constant	0.568	0.779	1.426
	(0.732)	(0.607)	(0.264)
Selected cases	255	255	255
Chi-square	71.00	70.89	69.96

On the other hand, ROA, as well as the loans-to-deposits ratio, have a positive influence on the probability of repayment. With regard to earnings, the strongly positive coefficient in Table 4 seems perfectly explainable by the fact that a more profitable bank will be more capable of repaying its TARP funds than a less profitable bank. Again, Table 5 in the next section seems to confirm this view, since banks that repaid their funds during 2009 have significantly better ROA's than bank that did not repay. Even more, banks that did not repay their funds seemed to show negative income numbers, resulting in negative ROA numbers. Once more, a bank with a negative net income seems less likely to be able to repay its TARP funds than a bank that has a positive net income. Besides that, due to the size of the ROA coefficient in the model, earnings seem to be the most influential factor in

the probability of repayment. Despite the fact the loans-to-deposits ratio shows a small coefficient in Table 4, it is positive and significant. This indicates that if a sample bank is less sensitive to market risk, indicated by a higher loans-to-deposits ratio, it is more likely to repay its TARP funds. This outcome seems probable, since that particular bank is less exposed to increasing costs of borrowing. It could therefore have more money available to use for the repayment of TARP funds. Overall, hypothesis four seems to be confirmed, since at least more than one of the approximated variables is significant.

As Table 4 shows, the other three components of the CAMELS rating, namely Tier 1 ratio, Age and Cash-to-Assets ratio do not show a significant result. In other words, *C*apital adequacy, *M*anagement quality and *L*iquidity do not seem to influence the probability a sample bank repaid its TARP funds. Overall, the total model in column 1 fits the data quite well, as is indicated by the Chi-square outcome of 71.00. This outcome is significant at eight degrees of freedom, indicating that the model with the six components of the CAMELS rating fits the data better than a model without these variables. To conclude, it seems that the results in Table 4 exceed the expectations of hypothesis 4, since three out of the six components of the CAMELS rating show a significant effect on the probability that a bank will repay its TARP funds.

6.4 Differences in the financial condition of banks

To examine if there exists a difference in financial health between banks that repaid their funds to the Treasury during 2009 and the ones that did not, I will conduct a commonly used *t*-test on the differences between the means of the six variables used to approximate the CAMELS rating. However, in order to conduct this *t*-test, it is important to know what kind of test can be used, namely the equal-variances or unequal-variances test. Both tests were used to obtain the results in Table 5. Appendix D will provide a clarification of the applied procedure.

Table 5 gives the results of the *t* -tests, where banks that repaid their TARP funds during 2009 are given in column (1) versus banks that did not repay their funds in column (2). The difference between the two samples is given in column (3). Note that the indicated variables are measured as of fiscal year end 2008 (except for age), since the fiscal year end variables of 2009 were obviously not available at the time the repayments occurred.

Table 5. Differences between sample banks

The difference between banks that repaid their TARP funds during 2009 and the sample banks that did not, are given in this table. The variables are measured as of fiscal year end 2008, since banks in the sample repaid their funds during 2009, at which point the end of fiscal year 2009 data was not available yet. Age, however, is measured as of 2009. T-statistic values are given between parentheses. *, ** and *** represent the statistical significance at the 10%, 5% and 1% level respectively.

	Differences in means between sample banks		
	Banks that repaid (N=48)	Banks that did not (N=208)	Difference in means
VARIABLES	(1)	(2)	(3)
Tier 1 ratio (%)	11.669	10.904	0.765 *
			(1.884)
Loans / Assets (%)	64.685	74.144	-9.459 ***
			(-3.478)
Age of bank (years)	65.688	67.914	-2.226
			(-0.275)
ROA (%)	0.660	-0.332	0.992 ***
			(9.104)
Cash / Assets (%)	2.953	2.070	0.883
			(1.407)
Loans / Depostis (%)	113.860	110.293	3.567
			(0.174)
Observations	48	208	256
(for L/D ratio)	47	208	255
(for L/A ratio)	47	208	255

Table 5 illustrates that the difference in the Tier 1 ratio is significant at the 10% level. This implies that banks that repaid their funds during 2009 are better able to sustain future losses, i.e. have a better capital adequacy. Moreover, the differences in the ROA and loans-to-assets ratio are significant at 1% level. First, higher ROAs indicate that the sample banks that repaid their TARP funds during 2009 are more profitable than the banks that did not repay. Noticeably, it seems that the banks that remained in the TARP program had a negative profitability, indicating that they were, on average, making losses compared to the sample of banks that repaid their funds. Second, banks that repaid their funds during 2009 show a significantly lower loans-to-assets ratio. In the light of this paper, this indicates that the asset quality of the banks that repaid is significantly better than the asset quality of non-repaying banks, on average. Besides the previous indicators of the financial

condition, there is no significant difference between the loans-to-deposits ratio, cash-to-assets ratio and age of the two sample groups, indicating that both banks that repaid their funds as well as banks that did not, are almost equally sensitive to market risk, almost equally liquid and almost equally as old. Overall, it seems that banks that repaid their TARP funds during 2009 are in a superior financial condition compared to the banks that remain in the program.

7 Conclusion

TARP is not unique in its kind. The United States history knows a few examples of crises in which financial institutions were in need of support. For example, the Reconstruction Finance Corporation (RFC) was set up in 1932, during the Great Depression, to provide financial aid to business corporations, railroads and financial institutions. In 1989, the Resolution Trust Corporation (RTC) was established to reduce the taxpayers' exposure to the Savings & Loans Crisis (S&L Crisis). However, compared to these two predecessors, the TARP program differs substantially in scale. The RFC and RTC represent 0.9% and 3.2% of the American GDP respectively, whereas the TARP program represents 4.8%. However, the exact costs of TARP for the U.S. taxpayer are still unclear.

The CPP program is by far the largest and most important program under TARP. In the beginning, the market seemed to show trust in the effectiveness of the program, as bank stocks outperformed the market during the announcement of the program on October 14, 2008. CPP funds also looked like 'cheap money', since the first recipients received were overpaid Besides that, the possibility of a bankruptcy would diminish as the government intervened, which also meant a reduction in the expected costs of bankruptcy. Participation in the CPP program appeared to be only for the 'healthy', more viable banks. However, once in the program, each of the participating banks would have to comply with the additional regulations that were put in place, such as additional compensation regulations illustrated by the passage of the H.R. 1586 bill. As a result, the costs of participation increased and together with the growing negative public sentiment and dividend payments, the incentives to leave the TARP program got increasingly strong.

As the first banks announced to repay their TARP funds on May 31, 2009, a new trend was set. Despite the fact these repayments were welcomed by the U.S. government, they marked the beginning of a hefty discussion about the 'healthiness' of banks in the TARP program. After the announcement on June 9, 2009, on which ten of the largest banks of the U.S. were allowed to repay their funds, the discussion intensified. It seemed the banking industry was now divided in banks that were able to repay their TARP funds, and banks that were considered too weak to go without them. This signal could results in a loss of confidence in TARP and a loss of confidence in the banks considered to be in a worse financial condition.

The results of the event study in this paper, conducted on a sample of 256 public banks, show abnormal returns around two important repayment announcement dates. Over a two-day

interval [0,1] surrounding March 31, 2009, the results show a positive cumulative abnormal return (CAR) of 1.89%, significant at the 1% level. On June 9, 2009, the CAR of -1.68% is significantly negative at the 1% level. These results indicate that the first repayments under TARP were received positively, whereas the repayment announcement of the ten (nine) largest banks on June 9, 2009, was received negatively by the market. The market reaction with regard to the subsample of these nine institutions shows a negative CAR of – 2.44% on June 9, 2009, whereas a positive market reaction was expected. This suggests that investors in these nine institutions were not in fear of increasing costs of participation, but rather feared that these large institutions would scale back on their lending, possibly jeopardizing an upcoming economic recovery. The results of the second subsample, that of the banks remaining in the program at June 9, 2009, seem to confirm the presence of a signalling effect. The negative CAR of – 1.52%, significant at the 1% level, could indicate that the investors of the banks that remained in the program, actually perceived these banks to be in a worse financial condition.

The results in section 5.3 confirm there is a relationship between the financial condition of a bank, indicated by the approximated six components of the CAMELS rating, and the likelihood a bank will repay its TARP funds. All of the sample banks that repaid their funds during 2009 were processed in a logit-regression model, to demonstrate the relationship between a repayment and the financial condition of a bank. Three of the six components of CAMELS showed a significant relationship. First, loans-to-assets ratio, or asset quality, indicates that banks that are 'loaned up', are in higher risk of default, and therefore less likely to repay their TARP funds. Second, banks that have a high profitability, measured by the return on assets (ROA), are more likely to repay their TARP funds. Last, the loans-to-deposits ratio indicates that a bank that is less sensitive to market risk, shown by a higher loans-to-deposits ratio, is more likely to repay its TARP funds.

Finally, the results in this paper confirm there is a difference in financial condition between sample banks that repaid their TARP funds during 2009, and the ones that did not. First, banks that repaid their funds have a better Tier 1 ratio, suggesting they are better able to sustain losses in the future. From the point of view of a regulator, this result seems valid, since a sufficient Tier 1 ratio could be one of the criteria to allow a bank to repay its TARP funds. Second, the results indicate that banks that repaid their TARP funds have higher earnings (ROA) than their non-repaying counterparts. Moreover, banks that did not repay their funds during 2009 show a negative ROA, indicating they were making losses on average. This results seems unambiguous, since higher earnings make a bank more able to repay their funds. Third, banks that repaid their funds show a significantly better asset

quality, measured by the loans-to-assets ratio. This indicates their asset quality is superior and therefore they have a lower probability of default. In other words, these banks are less risky and it is therefore reasonable to allow these banks to repay their funds. Overall, the results indicate that banks that repay their funds are in a better financial condition than banks that remain in the TARP program.

8 Recommendations

This paper contributes to the growing literature studying the 2008 financial crisis and more specifically TARP and the CPP program. However, there are some important limitations to this study, which future research might dissolve. First, although the conclusion seems obvious, it does shift the focus to the banks that remain in the program, since the question now could be: are the banks that remain in the program able to repay their funds at all? If not, the costs for the U.S. taxpayers could be considerable. Second, the approximated variables in this paper, that together form the six components of the CAMELS rating might be disputable. For example, age does not seem to add substantially to the results of this paper. Therefore, future research could aim at finding a model that improves the approximation of the CAMELS rating. Third, out of the 256 banks in the sample, 48 repaid their TARP funds during 2009. Despite the fact the largest repayments under TARP are present, only $ 108 billion out of the total $ 204 billion invested under the CPP program is repaid during 2009. This implies that the obtained results in this paper could be different from results that are obtained if all of the funds are repaid. Thus, future research might enhance this study by taking into account all TARP repayments. Hopefully, these results will then confirm the findings in this paper.

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Appendix A. Definition of variables

- $Repayment\ 09_i$ equals 1 if a bank repaid its TARP funds during 2009 and 0 otherwise.
- *Assets* represents the sum all assets (total assets).
- *Sales* (or revenues) represents gross sales and other operating revenue less discounts, returns and allowances.
- *Net income* (or net profit) represents bottom line income after taxes.

Table A.1. Financial health variables (six components CAMELS rating)

CAMELS component	VARIABLE	Definition	Abrreviation used in the regressions
Capital adequacy	Tier 1 ratio	Tier 1 ratio is the risk-adjusted capital ratio, or Tier 1 capital divided by risk-weighted total assets.	*Tier 1*
Asset Quality	Loan/Assets ratio	It is the total amount of loans divided by the total amount of assets. (by fiscal year end)	*L/A*
Management Quality	Age	Age is the number of years a bank exists as of 2009.	*Age*
Earnings	ROA	ROA is the return on assets, determined by deviding the net income by the avarage assets.	*ROA*
Liquidity	Cash/Assets ratio	It is the total amount of cash devidided by the total amount of assets. (by fiscal year end)	*C/A*
Sensitivity to market risk	Loan/Depostis ratio	It is the total amount of loans divided by the total amount of deposits (by fiscal year end)	*LTD*

Appendix B. Tables

Table B.1. An overview of TARP programs

In this Table, the programs officially active under TARP as of July 2010 are represented, according to the SIGTARP congressional quarterly report of April 31, 2010 . The program that is the subject of this paper is the CPP program. Note that there exists a difference between the amount of TARP expenditures as of 03/31/2010 and the total budget available under TARP. The difference is not disbursed yet. The potential TARP funding is equal to the amount actually disbursed. The % of Total Budget is calculated by dividing the funds amount by the total budget available of 699 billion.

Program	Potential TARP funding ($ billion)	% of Total Budget
Capital Purchase Program (CPP)	204.9	29.31
Automotive Industry Financing Program (AIFP)	80.7	11.55
Systemically Significant Failing Institutions (SSFI)	69.8	9.99
Making Home Affordable (MHA)	50.0	7.15
Targeted Investment Program (TIP)	40.0	5.72
Public-Private Investment Program (PPIP)	30.4	4.35
Small Business Lending Program	30.0	4.29
Term Asset-Backed Securities Loan Facility (TALF)	20.0	2.86
Asset Guarantee Program (AGP)	5.0	0.72
Auto Supplier Support Program (ASSP)	3.5	0.50
Unlocking Credit for Small Businesses (UCSB)	1.0	0.14
Community Development Capital Initiative (CDCI)	1.0	0.14
Auto Warranty Committment Program (AWCP)	0.6	0.09
TARP expenditures as of 03/31/2010	536.9	
Total budget available under TARP	699.0	

Table B.2. Sample Firms

This Table represents all firms in the sample from the ProPublica website. I do have to acknowledge that during the writing process of this paper, a working paper, by Kim (2010), was published on March 29, 2010 that uses the same sample of banks obtained from the ProPublica website. However, since our studies are substantially different, and the Propublica data is public, I see no problem in using this sample of banks in my study as well. The amount received represents the amount the bank received under the Capital Purchase Program. This amount may deviate from the total amount received under TARP, as some banks received money under several programs. The date of repayment implies that the full amount received is ´announced´ to be repaid on the respective date.

Name	Stock Exchange	Received	Returned	Amount received ($ thousands)
1st Constitution Bancorp	NASDAQ	23-dec-2008		12.000
1st Source Corp	NASDAQ	23-jan-2009		111.000
Alliance Financial Corp	NASDAQ	19-dec-2008	13-mei-2009	26.918
Ameris Bancorp	NASDAQ	21-nov-2008		52.000
AmeriServ Financial	NASDAQ	19-dec-2008		21.000
Anchor BanCorp Wisconsin	NASDAQ	30-jan-2009		110.000
Annapolis Bancorp	NASDAQ	30-jan-2009		8.152
Associated Banc-Corp	NASDAQ	21-nov-2008		525.000
Bancorp Rhode Island	NASDAQ	19-dec-2008	5-aug-2009	30.000
BancTrust Financial Group	NASDAQ	19-dec-2008		50.000
Bank of America	NYSE	28-okt-2008	9-dec-2009	15.000.000
Bank of Commerce Holdings	NASDAQ	14-nov-2008		17.000
Bank of Marin Bancorp	NASDAQ	5-dec-2008	31-mrt-2009	28.000
Bank of New York Mellon	NYSE	28-okt-2008	9-jun-2009	3.000.000
Bank of North Carolina	NASDAQ	5-dec-2008		31.260
Bank of the Carolinas Corporation	NASDAQ	17-apr-2009		13.179
Bank of the Ozarks	NASDAQ	12-dec-2008	4-nov-2009	75.000
Banner Corp	NASDAQ	21-nov-2008		124.000
Bar Harbor Bankshares	AMEX	16-jan-2009	24-feb-2010	18.751
BB&T	NYSE	14-nov-2008	9-jun-2009	3.133.640
BCSB Bancorp	NASDAQ	23-dec-2008		10.800
Berkshire Hills Bancorp	NASDAQ	19-dec-2008	27-mei-2009	40.000
Boston Private Financial Holdings	NASDAQ	21-nov-2008		154.000
Bridge Capital Holdings	NASDAQ	23-dec-2008		23.864
Broadway Financial Corporation	NASDAQ	4-dec-2009		6.000
C&F Financial Corp	NASDAQ	9-jan-2009		20.000
Cadence Financial Corp	NASDAQ	9-jan-2009		44.000
Capital Bank	NASDAQ	12-dec-2008		41.279
Capital One Financial Corp.	NYSE	14-nov-2008	9-jun-2009	3.555.199
Carolina Bank Holdings	NASDAQ	9-jan-2009		16.000
Carolina Trust Bank	NASDAQ	6-feb-2009		4.000
Carrollton Bancorp	NASDAQ	13-feb-2009		9.201
Cascade Financial Corp	NASDAQ	21-nov-2008		38.970
Cathay General Bancorp	NASDAQ	5-dec-2008		258.000
Center Bancorp	NASDAQ	9-jan-2009		10.000
Center Financial Corp	NASDAQ	12-dec-2008		55.000
CenterState Banks of Florida, Inc.	NASDAQ	21-nov-2008	30-sep-2009	27.875
Central Bancorp	NASDAQ	5-dec-2008		10.000
Central Federal Corp	NASDAQ	5-dec-2008		7.225
Central Jersey Bancorp	NASDAQ	23-dec-2008		11.300

Name	Stock Exchange	Received	Returned	Amount received ($ thousands)
Central Pacific Financial Corp	NYSE	9-jan-2009		135.000
Central Valley Community Bancorp	NASDAQ	30-jan-2009		7.000
Central Virginia Bankshares	NASDAQ	30-jan-2009		11.385
Centrue Financial	NASDAQ	9-jan-2009		32.668
CIT Group	NYSE	31-dec-2008		2.330.000
Citigroup	NYSE	28-okt-2008		25.000.000
Citizens & Northern Corporation	NASDAQ	16-jan-2009		26.440
Citizens First Corp	NASDAQ	19-dec-2008		8.779
Citizens Republic Bancorp	NASDAQ	12-dec-2008		300.000
Citizens South Banking Corp	NASDAQ	12-dec-2008		20.500
City National	NYSE	21-nov-2008	30-dec-2009	400.000
CoBiz Financial	NASDAQ	19-dec-2008		64.450
Codorus Valley Bancorp	NASDAQ	9-jan-2009		16.500
Colony Bankcorp	NASDAQ	9-jan-2009		28.000
Columbia Banking System	NASDAQ	21-nov-2008		76.898
Comerica Incorporated	NYSE	14-nov-2008	17-mrt-2010	2.250.000
Community Bankers Trust Corp	AMEX	19-dec-2008		17.680
Community Financial Corp	NASDAQ	19-dec-2008		12.643
Community Partners Bancorp	NASDAQ	30-jan-2009		9.000
Community West Bancshares	NASDAQ	19-dec-2008		15.600
Connecticut Bank and Trust Company	NASDAQ	19-dec-2008		5.448
Crescent Financial Corp	NASDAQ	9-jan-2009		24.900
CVB Financial	NASDAQ	5-dec-2008	26-apr-2009	130.000
DNB Financial Corp	NASDAQ	30-jan-2009		11.750
Eagle Bancorp	NASDAQ	5-dec-2008		38.235
East West Bancorp, Inc.	NASDAQ	5-dec-2008		306.546
Eastern Virginia Bankshares	NASDAQ	9-jan-2009		24.000
ECB Bancorp	NASDAQ	16-jan-2009		17.949
Elmira Savings Bank	NASDAQ	19-dec-2008		9.090
Emclaire Financial Corp	NASDAQ	23-dec-2008		7.500
Encore Bancshares	NASDAQ	5-dec-2008		34.000
Enterprise Financial Services Corp	NASDAQ	19-dec-2008		35.000
F.N.B. Corporation	NYSE	9-jan-2009	9-sep-2009	100.000
Farmers Capital Bank Corp	NASDAQ	9-jan-2009		30.000
Fidelity Bancorp, Inc.	NASDAQ	29-mei-2009		3.942
Fidelity Southern Corp	NASDAQ	19-dec-2008		48.200
Fifth Third Bancorp	NASDAQ	31-dec-2008		3.408.000
Financial Institutions	NASDAQ	23-dec-2008		37.515
First Bancorp	NASDAQ	9-jan-2009		65.000
First Busey Corporation	NASDAQ	6-mrt-2009		100.000
First California Financial Group	NASDAQ	19-dec-2008		25.000
First Capital Bancorp	NASDAQ	3-apr-2009		10.958
First Citizens Banc Corp	NASDAQ	23-jan-2009		23.184
First Community Bancshares	NASDAQ	15-mei-2009	8-jul-2009	14.800
First Community Bank Corp of America	NASDAQ	23-dec-2008		10.685
First Community Corp	NASDAQ	21-nov-2008		11.350
First Defiance Financial Corp	NASDAQ	5-dec-2008		37.000
First Federal Bancshares of Arkansas	NASDAQ	6-mrt-2009		16.500
First Financial Bancorp	NASDAQ	23-dec-2008	24-feb-2010	80.000

Name	Stock Exchange	Received	Returned	Amount received ($ thousands)
Mercantile Bank Corporation	NASDAQ	15-mei-2009		21.000
MetroCorp Bancshares	NASDAQ	16-jan-2009		45.000
Mid Penn Bancorp	NASDAQ	19-dec-2008		10.000
Middleburg Financial Corp	NASDAQ	30-jan-2009	23-dec-2009	22.000
MidSouth Bancorp	AMEX	9-jan-2009		20.000
Midwest Banc Holdings	NASDAQ	5-dec-2008		84.784
MidWest One Financial Group	NASDAQ	6-feb-2009		16.000
Monarch Community Bancorp	NASDAQ	6-feb-2009		6.785
Monarch Financial Holdings	NASDAQ	19-dec-2008	23-dec-2009	14.700
Morgan Stanley	NYSE	28-okt-2008	9-jun-2009	10.000.000
MutualFirst Financial	NASDAQ	23-dec-2008		32.382
Nara Bancorp	NASDAQ	21-nov-2008		67.000
National Penn Bancshares	NASDAQ	12-dec-2008		150.000
New Hampshire Thrift Bancshares	NASDAQ	16-jan-2009		10.000
NewBridge Bancorp	NASDAQ	12-dec-2008		52.372
North Central Bancshares	NASDAQ	9-jan-2009		10.200
Northeast Bancorp	NASDAQ	12-dec-2008		4.227
Northern States Financial Corp	NASDAQ	20-feb-2009		17.211
Northern Trust	NASDAQ	14-nov-2008	9-jun-2009	1.576.000
Oak Ridge Financial Services	NASDAQ	30-jan-2009		7.700
Oak Valley Bancorp	NASDAQ	5-dec-2008		13.500
OceanFirst Financial Corp	NASDAQ	16-jan-2009	30-dec-2009	38.263
Old Line Bancshares	NASDAQ	5-dec-2008	15-jul-2009	7.000
Old National Bancorp	NYSE	12-dec-2008	31-mrt-2009	100.000
Old Second Bancorp	NASDAQ	16-jan-2009		73.000
Pacific Capital Bancorp	NASDAQ	21-nov-2008		180.634
Park National Corporation	AMEX	23-dec-2008		100.000
Parke Bancorp	NASDAQ	30-jan-2009		16.288
Parkvale Financial Corp	NASDAQ	23-dec-2008		31.762
Pathfinder Bancorp, Inc.	NASDAQ	11-sep-2009		6.771
Peapack-Gladstone Financial	NASDAQ	9-jan-2009		28.685
Peoples Bancorp Inc.	NASDAQ	30-jan-2009		39.000
Peoples Bancorp of North Carolina	NASDAQ	23-dec-2008		25.054
Pinnacle Financial	NASDAQ	12-dec-2008		95.000
Plumas Bancorp	NASDAQ	30-jan-2009		11.949
PNC Financial Services	NYSE	31-dec-2008	10-feb-2010	7.579.200
Popular, Inc.	NASDAQ	5-dec-2008		935.000
Porter Bancorp	NASDAQ	21-nov-2008		35.000
Premier Financial Bancorp, Inc.	NASDAQ	2-okt-2009		22.252
PremierWest Bancorp	NASDAQ	13-feb-2009		41.400
Princeton National Bancorp	NASDAQ	23-jan-2009		25.083
PrivateBancorp	NASDAQ	30-jan-2009		243.815
Provident Community Bancshares	NASDAQ	13-mrt-2009		9.266
Pulaski Financial Corp	NASDAQ	16-jan-2009		32.538
QCR Holdings	NASDAQ	13-feb-2009		38.237
Regions Financial Corp.	NYSE	14-nov-2008		3.500.000

Name	Stock Exchange	Received	Returned	Amount received ($ thousands)
Royal Bancshares of Pennsylvania	NASDAQ	20-feb-2009		30.407
S&T Bancorp	NASDAQ	16-jan-2009		108.676
Salisbury Bancorp	AMEX	13-mrt-2009		8.816
Sandy Spring Bancorp	NASDAQ	5-dec-2008		83.094
SCBT Financial Corp	NASDAQ	16-jan-2009	20-mei-2009	64.779
Seacoast Banking Corp	NASDAQ	19-dec-2008		50.000
Severn Bancorp	NASDAQ	21-nov-2008		23.393
Shore Bancshares	NASDAQ	9-jan-2009	15-apr-2009	25.000
Signature Bank	NASDAQ	12-dec-2008	31-mrt-2009	120.000
Somerset Hills Bancorp	NASDAQ	16-jan-2009	20-mei-2009	7.414
South Financial Group	NASDAQ	5-dec-2008		347.000
Southern Community Financial	NASDAQ	5-dec-2008		42.750
Southern First Bancshares	NASDAQ	27-feb-2009		17.299
Southern Missouri Bancorp	NASDAQ	5-dec-2008		9.550
Southwest Bancorp	NASDAQ	5-dec-2008		70.000
State Bancorp	NASDAQ	5-dec-2008		36.842
State Street	NYSE	28-okt-2008	9-jun-2009	2.000.000
StellarOne Corp	NASDAQ	19-dec-2008		30.000
Sterling Bancorp	NYSE	23-dec-2008		42.000
Sterling Bancshares	NASDAQ	12-dec-2008	5-mei-2009	125.198
Sterling Financial Corp	NASDAQ	5-dec-2008		303.000
Stewardship Financial Corp	NASDAQ	30-jan-2009		10.000
Summit State Bank	NASDAQ	19-dec-2008		8.500
Sun Bancorp	NASDAQ	9-jan-2009	8-apr-2009	89.310
SunTrust	NYSE	14-nov-2008		3.500.000
Superior Bancorp	NASDAQ	5-dec-2008		69.000
Susquehanna Bancshares	NASDAQ	12-dec-2008		300.000
SVB Financial Group	NASDAQ	12-dec-2008	23-dec-2009	235.000
Synovus Financial Corp.	NYSE	19-dec-2008		967.870
Taylor Capital	NASDAQ	21-nov-2008		104.823
TCF Financial	NYSE	14-nov-2008	22-apr-2009	361.172
Tennessee Commerce Bancorp	NASDAQ	19-dec-2008		30.000
Texas Capital Bancshares	NASDAQ	16-jan-2009	13-mei-2009	75.000
The Bancorp	NASDAQ	12-dec-2008		45.220
The Bank of Kentucky	NASDAQ	13-feb-2009		34.000
The First Bancorp	NASDAQ	9-jan-2009		25.000
The First Bancshares	NASDAQ	6-feb-2009		5.000
TIB Financial Corp	NASDAQ	5-dec-2008		37.000
Tidelands Bancshares	NASDAQ	19-dec-2008		14.448
Timberland Bancorp	NASDAQ	23-dec-2008		16.641
TowneBank	NASDAQ	12-dec-2008		76.458
Trustmark Corp	NASDAQ	21-nov-2008	9-dec-2009	215.000
U.S. Bancorp	NYSE	14-nov-2008	9-jun-2009	6.599.000
Umpqua	NASDAQ	14-nov-2008	17-feb-2010	214.181
Union Bankshares	NASDAQ	19-dec-2008		59.000
United Bancorp	NASDAQ	16-jan-2009		20.600
United Community Banks	NASDAQ	5-dec-2008		180.000
Unity Bancorp	NASDAQ	5-dec-2008		20.649
Valley Financial Corp	NASDAQ	12-dec-2008		16.019

Name	Stock Exchange	Received	Returned	Amount received ($ thousands)
Wainwright Bank & Trust	NASDAQ	19-dec-2008	24-nov-2009	22.000
Washington Banking Company	NASDAQ	16-jan-2009		26.380
Washington Federal Inc.	NASDAQ	14-nov-2008	27-mei-2009	200.000
Webster Financial	NYSE	21-nov-2008		400.000
Wells Fargo	NYSE	28-okt-2008	23-dec-2009	25.000.000
WesBanco	NASDAQ	5-dec-2008	9-sep-2009	75.000
West Bancorporation	NASDAQ	31-dec-2008		36.000
Westamerica Bancorporation	NASDAQ	13-feb-2009	2-sep-2009	83.726
Western Alliance Bancorporation	NYSE	21-nov-2008		140.000
Whitney Holding Corp	NASDAQ	19-dec-2008		300.000
Wilmington Trust Corporation	NYSE	12-dec-2008		330.000
Wilshire Bancorp	NASDAQ	12-dec-2008		62.158
Wintrust Financial Corp	NASDAQ	19-dec-2008		250.000
WSFS Financial	NASDAQ	23-jan-2009		52.625
Yadkin Valley Financial Corp	NASDAQ	16-jan-2009		36.000
Zions Bancorp	NASDAQ	14-nov-2008		1.400.000

Table B.3. Banks that repaid their TARP funds

This Table shows all public banks that repaid their TARP funds on the respective dates with the respective amounts repaid. Panel A shows all banks that repaid their funds during the year 2009. Panel B shows the banks that repaid their funds on the first repayment date, 31 March, 2009. Last, panel C shows the nine large banks that repaid the fund on June 9, 2009. Note that these banks repaid almost 60% of the total amount repaid on that date.

Panel A: All banks that repaid their funds during 2009

Name	Received	Returned	Amount returned ($ millions)
Alliance Financial Corp	Dec. 19, 2008	May 13, 2009	26.918
Bancorp Rhode Island	Dec. 19, 2008	Aug. 5, 2009	30.000
Bank of America	Oct. 28, 2008	Dec. 9, 2009	15.000.000
Bank of Marin Bancorp	Dec. 5, 2008	Mar. 31, 2009	28.000
Bank of New York Mellon	Oct. 28, 2008	Jun. 9, 2009	3.000.000
Bank of the Ozarks	Dec. 12, 2008	Nov. 4, 2009	75.000
BB&T	Nov. 14, 2008	Jun. 9, 2009	3.133.640
Berkshire Hills Bancorp	Dec. 19, 2008	May 27, 2009	40.000
Capital One Financial Corp.	Nov. 14, 2008	Jun. 9, 2009	3.555.199
CenterState Banks of Florida, Inc.	Nov. 21, 2008	Sep. 30, 2009	27.875
City National	Nov. 21, 2008	Dec. 30, 2009	400.000
CVB Financial	Dec. 5, 2008	Aug. 26, 2009	130.000
F.N.B. Corporation	Jan. 9, 2009	Sep. 9, 2009	100.000
First Community Bancshares	Nov. 21, 2008	Jul. 8, 2009	41.500
First Niagara	Nov. 21, 2008	May 27, 2009	184.011
FirstMerit Corp	Jan. 9, 2009	Apr. 22, 2009	125.000
Flushing Financial Corp	Dec. 19, 2008	Oct. 28, 2009	70.000
Goldman Sachs	Oct. 28, 2008	Jun. 9, 2009	10.000.000
HF Financial Corp	Nov. 21, 2008	Jun. 3, 2009	25.000
IBERIABANK Corp	Dec. 5, 2008	Mar. 31, 2009	90.000
Independent Bank Corp	Jan. 9, 2009	Apr. 22, 2009	78.158
JPMorgan Chase	Oct. 28, 2008	Jun. 9, 2009	25.000.000
LSB Corp	Dec. 12, 2008	Nov. 18, 2009	15.000
Middleburg Financial Corp	Jan. 30, 2009	Dec. 23, 2009	22.000
Monarch Financial Holdings	Dec. 19, 2008	Dec. 23, 2009	14.700
Morgan Stanley	Oct. 28, 2008	Jun. 9, 2009	10.000.000
Northern Trust	Nov. 14, 2008	Jun. 9, 2009	1.567.000
OceanFirst Financial Corp	Jan. 16, 2009	Dec. 30, 2009	38.263
Old Line Bancshares	Dec. 5, 2008	Jul. 15, 2009	7.000
Old National Bancorp	Dec. 12, 2008	Mar. 31, 2009	100.000
SCBT Financial Corp	Jan. 16, 2009	May 20, 2009	64.779
Shore Bancshares	Jan. 9, 2009	Apr. 15, 2009	25.000
Signature Bank	Dec. 12, 2008	Mar. 31, 2009	120.000
Somerset Hills Bancorp	Jan. 16, 2009	May 20, 2009	7.414
State Street	Oct. 28, 2008	Jun. 9, 2009	2.000.000
Sterling Bancshares	Dec. 12, 2008	May 5, 2009	125.198
Sun Bancorp	Jan. 9, 2009	Apr. 8, 2009	89.310
SVB Financial Group	Dec. 12, 2008	Dec. 23, 2009	235.000
TCF Financial	Nov. 14, 2008	Apr. 22, 2009	361.172
Texas Capital Bancshares	Jan. 16, 2009	May 13, 2009	75.000
Trustmark Corp	Nov. 21, 2008	Dec. 9, 2009	215.000
U.S. Bancorp	Nov. 14, 2008	Jun. 9, 2009	6.599.000
Valley National	Nov. 14, 2008	Jun. 3, 2009	300.000
Wainwright Bank & Trust	Dec. 19, 2008	Nov. 24, 2009	22.000
Washington Federal Inc.	Nov. 14, 2008	May 27, 2009	200.000
Wells Fargo	Oct. 28, 2008	Dec. 23, 2009	25.000.000
WesBanco	Dec. 5, 2008	Sep. 9, 2009	75.000
Westamerica Bancorporation	Feb. 13, 2009	Sep. 2, 2009	83.726
		Total	108.521.863
		Mean	2.260.872
		Median	95.000

Panel B: The banks that were among the first to repay TARP funds on March 31, 2009

Name	Received	Returned	Amount returned ($ millions)
Bank of Marin Bancorp	Dec. 5, 2008	Mar. 31, 2009	28.000
IBERIABANK Corp	Dec. 5, 2008	Mar. 31, 2009	90.000
Old National Bancorp	Dec. 12, 2008	Mar. 31, 2009	100.000
Signature Bank	Dec. 12, 2008	Mar. 31, 2009	120.000
		Total	338.000
		Mean	84.500
		Median	95.000

Panel C: The nine banks that announced to repay their funds on June 9, 2009

Name	Received	Returned	Amount returned ($ millions)
Bank of New York Mellon	Oct. 28, 2008	Jun. 9, 2009	3.000.000
BB&T	Nov. 14, 2008	Jun. 9, 2009	3.133.640
Capital One Financial Corp.	Nov. 14, 2008	Jun. 9, 2009	3.555.199
Goldman Sachs	Oct. 28, 2008	Jun. 9, 2009	10.000.000
JPMorgan Chase	Oct. 28, 2008	Jun. 9, 2009	25.000.000
Morgan Stanley	Oct. 28, 2008	Jun. 9, 2009	10.000.000
Northern Trust	Nov. 14, 2008	Jun. 9, 2009	1.567.000
State Street	Oct. 28, 2008	Jun. 9, 2009	2.000.000
U.S. Bancorp	Nov. 14, 2008	Jun. 9, 2009	6.599.000
		Total	64.854.839
		Mean	7.206.093
		Median	3.555.199

Table B.4. Linear regression model of CAMELS rating

This table gives the outcomes of an OLS regression model with the CAR [0,1] as dependent variable. The explanatory variables are given by the six components of the CAMELS rating, namely Tier 1 ratio, loans-to-assets ratio, age of a bank, return on assets (ROA), cash-to-assets ratio and loans-to-deposits ratio. In the parentheses the T-statistics are given. None of the results are significant, therefore no stars are added in the table. The adjusted R^2 represents the overall fit of the model.

VARIABLES	All banks (N = 254)
Intercept	-0.023
	(-0.663)
Tier 1 ratio (%)	-0.001
	(0.535)
Loans / Assets (%)	-0.000
	(-0.113)
Age of bank (years)	-0.000
	(-0.124)
ROA (%)	-0.002
	(-0.618)
Cash / Assets (%)	0.000
	(-0.122)
Loans / Depostis (%)	0.000
	(0.420)
Adjusted R Square	-0.021

Appendix C. Example Logit Model

In this example, two sample firms will be used to explain how the logit regression model can be interpreted. Remember, the general regression model for a logit regression looks like:

$$ln\left(\frac{\hat{P}_i}{(1-\hat{P}_i)}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots \beta_n X_n \quad \text{(C.1)}$$

Once the logit regression of section ..... was performed for the entire sample of 259 banking firms, the following regression equation was the result:

$$Repayment\ 09_i = \alpha + \beta_1 \text{ Tier } 1_i + \beta_2 L/A_i + \beta_3 Age_i + \beta_4 ROA_i + \beta_5 C/A_i + \beta_6 LTD_i \quad \text{(C.2)}$$

Or:

$$Repayment\ 09_i = 0.5689 + 0.058 \text{ Tier } 1_i - 0.061\ L/A_i - 0.002 Age_i + 2.648\ ROA_i + 0.033\ C/A_i + 0.005\ LTD_i$$

To fully understand the meaning of the logit model, we can construct a probability out of the logit model's coefficients. This is done using the following probability formula, which is equal to equation 9 in the paper:

$$\hat{P}_{i=1} = \frac{e^{(\alpha+\beta_1 X_1+\beta_2 X_2+\ldots\beta_n X_n)}}{e^{(\alpha+\beta_1 X_1+\beta_2 X_2+\ldots\beta_n X_n)}+1} \quad \text{(C.3)}$$

To fill in this formula, values of the CAMELS variables are needed. For example, the values of JP Morgan Chase are used, as can be seen in Table C.1. The result, using equation C.2 is that the probability of repayment for JP Morgan Chase (JPM) is 56%. Obviously, this does not say anything unless it is put into perspective. Therefore, a comparable bank is also inserted, only now one that did not repay its funds during 2009, namely First Bancorp (FBNC). Nevertheless, I calculate the probability of FBNC to repay its funds during 2009. By using the same procedure as for JPM, the probability of FBNC to repay its funds is only 26%, which is much lower than the 56 % probability for JPM.

Table C.1 Input values

VARIABLES	Values	
	JPM	FBNC
Tier 1 ratio (%)	10.90	9.40
Loans / Assets (%)	33.87	80.75
Age of bank (years)	40	82
ROA (%)	0.30	0.87
Cash / Assets (%)	1.24	3.21
Loans / Depostis (%)	72.98	106.58

Appendix D. Testing the difference between two means

To test the difference in means between the two subsamples, an independent samples *t*-test is used. The following two subsamples were identified: banks that repaid their TARP funds during 2009 (N = 48) and banks that did not repay their TARP funds during 2009 (N = 208). It seems that the two sample sizes, N, differ substantially. As a result, the variances of the two samples could also differ substantially, which could lead to pollution of the test results, if the equal-variances test is used only. Therefore, it is important to first test whether the sample variances are equal or unequal. This is done using an F-test, since "statisticians have shown that the ratio of two independent chi-squared variables divided by their degrees of freedom is *F* distributed" (Keller, 2005, p. 447). Second, the equal-variances or unequal-variances *t*-test can be used to test the difference in means. These two steps can be explained in more detail as follows:

I. For each of the six CAMELS rating variables, an 'F-test Two-Sample for Variances' is used in Excel to determine if the variances of the two subsamples are equal. The null-hypothesis is expressed as:

$$H_0 : \frac{\sigma_1^2}{\sigma_2^2} = 1 \tag{D.1}$$

And the test-statistic is as follows:

$$F = \frac{s_1^2}{s_2^2} \tag{D.2}$$

II. In case the null-hypothesis in step I holds, the equal variances *t*-test is applied. The appropriate test-statistic is:

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\bar{\mu}_1 - \bar{\mu}_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \tag{D.3}$$

In case the null-hypothesis of step I is rejected, the unequal-variances *t*-test is applied. The appropriate test-statistic in this case is:

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\bar{\mu}_1 - \bar{\mu}_2)}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}} \tag{D.4}$$

The result of the preceding two-step method is that Tier 1 ratio, Age and loans-to-deposits ratio are assumed to have equal variances. Cash-to-assets ratio, ROA and loans-to-assets ratio are assumed to have unequal variances. The results of the *t*-tests be seen in Table 6 of section 5.4.