Certification Effects in the Equity Market Response to TARP Injections

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This study examines the stock market response to TARP injections provided to banks. We find that the abnormal returns of recipient banks at the time of the TARP injection and the subsequent year are significantly negative. Abnormal returns for recipients at the time of injection exhibit a positive relationship with the size of the injection, subsequent cumulative abnormal returns, decreases in volatility, increases in four-factor alpha, and relative profitability. During the year following the injection, TARP banks consistently rank below their non-TARP peers in asset quality, liquidity, capital adequacy, and profitability. In aggregate, our findings do not suggest that the market response to TARP injections is driven by sentiment. Rather, the findings suggest that the TARP injections serve as certification regarding the importance of the recipients to the national financial infrastructure.

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1. Introduction

Securitization of banks loans increased substantially following the repeal of the Glass-Steagall Act in 1999 (see Veronesi and Zingales, 2010). Securitization allows banks to convert their loans (home, auto, etc.) into marketable securities thereby reducing the need for liquidity (Loustakina, 2011). Plus, these securitized loans are removed from the banks' balance sheet. However, since loan securitization is done primarily via repo contracts, banks are still responsible for the loans if they sour and so the bursting of the housing bubble triggered a run on the repo market which eliminated this source of bank (see Gorton and Metrick, 2012). At this time, there was also a run by bank borrowers as they exhausted their credit lines (Ivashina and Scharfstein, 2010). Consequently, bank failures spiked in 2008 and the credit markets froze.[1] In response to this, the U. S. Government injected over 200 billion dollars of taxpayer money into banks under the Troubled Asset Relief Program (TARP) passed in October 2008. This banking crisis, unlike previous ones, was primarily associated with the exponential growth in the securitization of loans. The bailout generated significant debate about whether financial markets are prone to bubbles and become disconnected from valuation fundamentals (Ball, 2011). This study responds to that debate and examines whether the equity market reaction to the TARP injections is driven by sentiment rather than the fundamentals underlying bank valuation.

The 2008 financial crisis was a perfect storm with a deluge of negative news. Real GDP declined during the last two quarters of 2008 and the first quarter of 2009 by 3.5%, 8.9% and 6.7% respectively. The unemployment rate rose relentlessly from 4.9% in April 2008 to 10% by October 2009. Foreclosures jumped by 64% in 2008. Shares of banks and related companies were under so much negative pressure that in October 2008 the SEC temporarily halted short selling in the shares of all finance companies.

A negative market reaction towards banks in general and those receiving TARP injections in particular would obviously be consistent with the view that market is driven by negative sentiment

[1] According to FDIC reports, while the number of bank failures was zero in 2005 and 2006, it rose to 25 in 2008 and exploded to over 140 cases in 2009.

about the bailout. However, as described in the preceding paragraph, there was substantial deterioration in economic fundamentals during 2008. Therefore, the need for bailout via TARP injections could serve as confirmation about deterioration in the prospects of banks in general and TARP recipients in particular. Hence, an adverse market reaction towards banks might be due to fundamentals rather than sentiment. Another possibility is that receipt of a TARP injection might serve to certify the importance of the recipient to the stability of the banking system (Bayazitova and Shivdasani, 2009). Consequently, higher injection levels might imply a stronger certification effect, with a more muted market reaction. In this study, we examine whether the market's response to the TARP injections can distinguish from among these possibilities.

Given the gravity of the 2008 crisis, there was substantial debate about the need for increased regulation and restrictions on banks to prevent a repeat of it. This debate eventually manifested itself in the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, which includes the Volcker rule restricting banks from making certain types of speculative investments. Any expected changes in the risk profiles of banks, as perceived by the equity market, are likely to appear via changes in the sensitivity of returns for bank stocks to common factors in stock returns. For assessing these sensitivities, we use the one-factor market model as well as the four-factor Fama-French model. These factors are the market, book to market, size and momentum.

Our sample is drawn from the intersection of CRSP and FinGlobe's *Listed 800 Product* database for banks. This latter database provides performance data on the top 800 U.S. publicly traded banks. For each bank in this sample that receives a TARP injection, we choose another bank from the sample (without replacement) closest in size that did not receive any TARP assistance. We thus form two groups of banks for our examination of TARP and non-TARP banks. We assess changes in the fundamentals of TARP banks after the injections, across four quarters following the injection. More specifically, we rank all the top 800 publicly traded banks along the standard dimensions of bank analysis: asset quality, liquidity, capital adequacy, and profitability and then examine the changes in these variables between TARP and non-TARP banks.

Our findings indicate that after the injections the average daily return increases while the volatility decreases for both TARP and non-TARP banks. The loadings of TARP banks on the market factor, SMB, and HML are significantly higher than that for non-TARP banks prior to the injection. But one year after the injection only the loading on HML is higher for TARP banks than non-TARP banks. The loading on the momentum factor is zero for both groups of banks prior to the injections, but the loading is negative during the post-injection period for both groups. Thus, our findings indicate that loadings of TARP banks on common factors in stock returns change substantially after the injections.

The market reaction is negative towards TARP banks at the time of injections. By contrast, the average CAR for non-TARP banks is either zero (if we use pre-injection parameters) or positive (if we use post-injection parameters). Irrespective of whether we use pre or post injection parameters, the average CAR during the year after the injection is negative for both TARP and non-TARP banks. The average for TARP banks is more negative than that for non-TARP banks. Thus, there is robust evidence that the market reacts more unfavorably towards TARP than non-TARP banks at the time of injections, with the unfavorable reaction continuing even during the year after the injection.

For each of the four quarters after the injections, TARP banks rank lower than the non-TARP banks based on asset quality, capital adequacy, profitability, and liquidity. Thus, the unfavorable market reaction towards TARP banks relative to non-TARP banks is consistent with differences in their fundamentals. Furthermore, in cross-sectional regressions, the market reaction towards TARP banks at the time of injections exhibits a positive relationship with their post-injection average CAR, subsequent decrease in their volatility, subsequent improvement in their four-factor alpha, and their profitability ranking relative to non-TARP banks four quarters after the injections. In aggregate, the evidence fails to suggest that the market reaction towards TARP injections is driven by sentiment rather than fundamentals. In fact, our findings suggest that at the time of injections the market forms reasonable expectation about what turns out to be subsequent changes in the risk, returns, and

profitability of the recipients. Finally, we find that the market reaction of TARP banks at the time of injection exhibits a positive relationship with the size of the dosage (i.e., TARP assistance) received by the banks. This evidence is consistent with the argument that TARP injections serve as certification regarding the importance of these banks to the national financial infrastructure.

2. Development of Hypotheses

2.1. Certification Effect Hypothesis

The banking industry was clearly in trouble during 2008 and 2009 with ongoing uncertainty about the worth of their securitized loans. Stiglitz (1993) and Ng, Vasvari, and Moerman (2010) contend that during a crisis, a bank critical to system stability is more likely to receive governmental assistance. Thus, the receipt of TARP injections might confirm that the bank is in distress, but simultaneously certify that the recipient is critical to the national banking system. Further, Duchin and Sosyura (2010) report that banks with strong political connections aree more likely to get assistance under TARP and so receiving TARP injection can also indicate the political connectedness of the troubled bank.

The above arguments are consistent with the view that a bailout via TARP injections is an indication that the banking industry in general is in trouble. The market's reaction might therefore be more unfavorable towards recipients relative to non-recipients. If the injections for TARP banks, however, an implied certification about the relative importance of the recipient to system stability or its political connectedness, then any negative market reaction must be more muted. The certification effect does not provide any clear implication about the effect of the injection on non-recipients. Having no need for TARP injections might signal that the bank is sound. Alternatively, the failure to receive such funds might suggest that the bank is unimportant to the national financial system or is without political connections. Thus recipient banks mioght gain at the expense of non-recipients. Overall, one cannot hypothesize any systematic effect of the TARP injections on non-recipient institutions.

2.2. Adverse Signal Hypothesis

If there is deluge of negative news, the failure of a few banks might start a cascading erosion in investor confidence regarding the surviving banks, resulting in a run on even healthy banks. To prevent this, government might attempt to prop up weak banks to prevent a domino effect from occurring within the entire banking sector. This implies that recipient of a TARP injection is an adverse signal regarding the recipient's prospects (Hoshi and Kashyap, 2010). Conversely, the absence of a TARP infusion could be viewed as good news about the bank. If so, the larger the infusion received by a bank, the more adverse the signal about the recipient.

The adverse signal argument does not preclude the possibility that TARP injections might confirm that the prospects for the entire banking industry are in jeopardy. This implies that the market reaction towards non-recipients is negative and unfavorable relative to non-recipients. It also implies for TARP banks that the larger the infusion they receive, the more unfavorable is the market reaction. For non-recipient banks, the larger the dosage required by a competitor bank, the more favorable the market's view of the non-recipient. One would therefore expect a non-negative relation between the market's announcement period reaction towards non-TARP banks and the infusion provided to comparable banks.

2.3. Negative Sentiment Hypothesis

As discussed in section 1, during the 2008 banking crisis the financial markets were being bombarded with negative information. Furthermore, the financial and popular press as well as government reporting questioned whether financial markets were efficient and if security prices were reflective of underlying fundamentals.[2] It is likely then that the market's reaction towards TARP injections are driven by negative sentiment and/or outrage towards banks in general. Further,

[2] See the report to the U. K. Chancellor of the Exchequer (The Turner Review: A Regulatory Response to the Global Banking Crisis, 2009).

the larger the infusion needed to save a bank, the more negative might be the market sentiment. Consequently, one expects that after the initial sentiment cools, the market would reassess its initial reaction.

The above arguments are consistent with the market's reaction at the time of the TARP injections being negative towards banks in general and the recipients in particular. Across TARP recipient banks, the higher the level of TARP assistance the more negative is the likely market reaction. Non-TARP banks, however, might exhibit a non-negative relation with the level of TARP assistance provided to their peers. Finally, this negative sentiment argument implies that the post-injection market reaction towards TARP recipients exhibits a negative relation with the market's response reaction at the time of injection.

While the negative sentiment hypothesis implies a negative relation between the event-period and the post-event abnormal returns, the other two hypotheses (i.e., certification and adverse signal) do not imply any systematic relationship between the two. During the 2008 banking crisis, however, the SEC temporarily banned short selling of finance company stocks, including banks, on September 19, 2008 to curb "manipulation" of the market. Even after the ban was lifted, however, the SEC continued to require institutional investment managers to report their short positions in these stocks until August 1, 2009. Therefore, investors with bearish views about banks might have been deterred from taking short positions in bank shares. Rathher, they might have submitted their trading into multiple smaller short positions spread over time to avoid SEC scrutiny. This might induce negative momentum in the returns on bank shares, especially for those in trouble and in need of TARP assistance.

The above hypotheses regarding average cumulative abnormal returns (CAR) of TARP and non-TARP banks around the date of TARP injection can be summarized as follows:

Certification Effect	Adverse Signal	Negative Sentiment
$CAR_{TARP} < 0$ $CAR_{TARP} < CAR_{non\text{-}TARP}$	$CAR_{TARP} < 0$ $CAR_{TARP} < CAR_{non\text{-}TARP}$	$CAR_{TARP} < 0$ $CAR_{TARP} < CAR_{non\text{-}TARP}$
Cross–sectional relationship between CAR and level of TARP assistance		
CAR_{TARP} : positive	CAR_{TARP} : negative	CAR_{TARP} : negative
$CAR_{non\text{-}TARP}$: non-positive	$CAR_{non\text{-}TARP}$: non-negative	$CAR_{non\text{-}TARP}$: non-negative
Cross–sectional relationship between event-period and post-event CAR		
CAR_{TARP} : positive	CAR_{TARP} : positive	CAR_{TARP} : non-positive

There are at least three issues that could have confounding effects on the above arguments. One, there is substantial uncertainty about the worth of the securitized loans. The act of receiving the TARP injection and its size might resolve some of the uncertainty about the value of securitized loans and so the net effect for the recipient (non-recipient) could be positive or negative. Two, TARP was re-adjusted soon after its passage to retroactively curtail executive compensation of the recipient banks. The prevailing thinking behind it was that the compensation structure of banks had become excessive. Thus the acceptance of TARP assistance along with its transparency and disclosure requirements could potentially resolve uncertainty future executive compensation and related agency problems of the bank. Thus, the net effect could be positive or negative for the shareholders. Lastly, the monitoring of the banking industry in general, but TARP recipients in particular, was likely to increase to prevent a repeat occurrence of the crisis (Mehran and Thakore, 2010). This aspect could potentially impact the operating freedom of recipients compared to non-recipients (e.g., recipients might be unable to make as many risky loans as previously) and so could alter the risk characteristics of TARP banks relative to non-TARP banks. The net effect could be positive or negative for shareholders of TARP banks. Despite these issues, it seems unlikely that the net effect of

these confounding issues could systemically reverse the cross-sectional implications of the preceding three hypotheses.

What is evident from the above tables is that the testable implications based on the adverse signal hypothesis (which assumes the market reaction to be driven by fundamentals factors) and the negative sentiment hypothesis (which assumes that the market reaction is driven by sentiment rather than fundamentals) are identical except the last one. We therefore formulate additional tests to discriminate between the hypotheses.

The Negative Sentiment Hypothesis, unlike the Adverse Signal Hypothesis and the Certification Effect Hypothesis, assumes that the market reaction to TARP injections is driven by sentiment rather than fundamentals. In such a case, the market reaction to TARP injections is not capable of correctly discriminating between banks on the basis of ensuing changes in their fundamentals. Therefore, one would not expect the abnormal returns around the date of the TARP injection to be capable of differentiating between banks on the basis of the subsequent decrease in their total risk (volatility of returns), the increase in their risk-adjusted returns (alpha), or the improvement in their fundamental ratios (asset quality, capital adequacy, liquidity, and profitability). Noise in the data might prevent obtaining clear empirical evidence one way or the other. However, if the findings indicate that the market makes systematic mistakes in identifying subsequent improvement in fundamentals then it clearly indicates that the market is not in sync with bank fundamentals. Conversely, if the abnormal returns are aligned with a subsequent improvement in fundamentals, then one would be challenged to claim that the market is driven by sentiment rather than fundamentals.

These additional tests discussed above are summarized as follows:

	Certification Effect	Adverse Signal	Negative Sentiment
Cross-sectional relationship between CAR_{TARP} and subsequent improvement in:			
1. Volatility of returns	Positive	Positive	Non-Positive
2. Alpha	Positive	Positive	Non-Positive
3. Fundamental Ratios	Positive	Positive	Non-Positive

3. Data and Methodology

The data used in this study comes from the intersection of FinGlobe's *Listed 800 Product* database for banks and the CRSP database. The FinGlobe database provides performance and other data for the largest 800 U.S. publicly traded banks. The intersection of the two databases provides a sample of 217 banks that received TARP injections. It covers the entire period of TARP injections to banks: October 28, 2009 to December 31, 2009. The sample size is comparable to that of other TARP studies such as Wilson and Wu (2010), and Bayazitova and Shivdasani (2010). For each TARP recipient bank, another bank that did not receive any TARP assistance and is the closest in the market value of equity to the recipient bank (as of the end of the quarter prior to receiving TARP injection) is chosen without replacement as the non-TARP peer.[3]

[3] We compare banks based on their market value of equity rather than book value of assets because this banking crisis centered on bank securitization (i.e. off balance sheet assets) and it is hard to gauge from book value of assets the exposure of a given bank to securitization. Securitized loans were likely to be of poorer quality compared to traditional loans and were serviced differently (Piskosrksi, Seru, and Vig, 2010) and such differences are more likely to be reflected in market value of equity rather than book value of assets. During and after the crisis, although the market value of equity declined for most banks, the book values of assets grew because repo contracts used for securitization of loans forced the banks to take back their bad loans (see Veronesi and Zingales, 2010). Another reason for the growth in assets was that borrowers of some banks started using up their credit lines during the crisis (see Ivashina and Scharfstein, 2010) and these perhaps were not bad loans. Such differences are more likely to be reflected via changes in market value of equity rather than book value of assets. Price discovery about the troubled assets continued during the crisis and was reliable (Longstaff, 2010) and so market value of equity is likely to be a reasonable measure of size in comparing TARP and non-TARP banks during the crisis period. Finally, Huizinga and Laeven (2012) draw attention to the fact that during the 2008 crisis, distressed banks

TARP banks are simply too large compared to non-TARP peers (the average market value of equity, ME, for TARP banks is over ten times that of non-TARP banks). We therefore eliminate some of the large TARP banks from our sample to make the two groups comparable (so that at least the median ME for the two groups is not statistically different). This reduces the sample size to 145. Since some of the very large banks were requested by the Federal Reserve Bank to accept TARP assistance, our smaller sample (n=145) provides a cleaner look at the market response to TARP injections that were voluntarily received by banks. For robustness, we repeat the entire analysis using the larger sample (n=217), but the important inferences drawn from the findings based on the smaller sample remain robust.

For assessing changes in the fundamentals of banks subsequent to the TARP injections, we examine changes in four important dimensions that are standard in bank analysis: asset quality, capital adequacy, liquidity, and profitability. Consider the case of asset quality of banks. For each of the four quarters after a bank receives TARP assistance, we rank the entire universe of 800 banks from the FinGlobe database using five different asset quality ratios (the ratios are listed in Appendix A). A composite asset quality ranking is then assigned for each of the 800 banks (1 best, 800 worst).[4] For assessing how a given TARP bank performs relative to its non-TARP peer on the asset quality dimension, we compute the difference between the ranking of the non-TARP peer and the TARP bank and divide it by 800. A negative ratio indicates underperformance of TARP bank relative to its non-TARP peer.[5] For example, if this ratio is estimated at -0.10, then it means that the TARP bank is ranked 80 spots below its non-TARP peer. We repeat this process for the other dimensions. Five separate ratios are used for assessing each dimension. Therefore, we examine twenty different ratios which are listed in the appendix. The same process is used to construct a composite "overall" rank for each bank based on its composite ranking for asset quality, liquidity, capital adequacy, and profitability.[6]

In our opinion, the above process of assessing the performance of TARP banks relative to their non-TARP peers provides a cleaner picture about changes in the fundamentals of banks that can be associated with the TARP injections. It makes a reasonable adjustment for bypassing the possibility that any change exhibited by a bank along a given dimension after the TARP injection relative to where it was prior to the injection might not be due to the injection, but simply be an artifact of an overall banking trend along that dimension. Also, matching TARP and non-TARP banks on the basis of size provides a reasonable adjustment for any greater portfolio diversification and access to loan securitization markets enjoyed by larger banks. More importantly, our method examines post-injection changes in the fundamentals of TARP banks relative to non-TARP banks rather than relative to their own fundamentals prior to the injections. This approach makes a reasonable adjustment for the possibility that improvement along a given dimension is likely to be more feasible for banks that were weaker originally.

There is substantial variation in the size and market-to-book equity ratios of TARP banks. For the smaller sample, the market value of equity of banks ranges from five million dollars to over fifty billion dollars, while the market-to-book ratio ranges from 0.14 to 3.6. We therefore consider the Fama-French model to be more appropriate for assessing cross-sectional differences in abnormal

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used discretion in the accounting treatment of some of the assets in order to inflate their books and so bank balance sheets offer a misleading view of their true financial health. For these reasons, we use market value of equity as a measure of size rather than book value of assets (Loutskina, 2011, uses this measure as a proxy for size).

[4] Based on each of the five ratios five separate rankings are drawn from 1 (best) to 800 (worst). The five rankings are then added up and the composite score is then used for ranking the banks from 1 (best) to 800 (worst).

[5] According to this approach, two banks A and B with initial ranking of 100 and 500 that are ranked below their respective peer non-TARP bank by say eight spots would be considered as exhibiting 10% underperformance relative to their non-TARP peer. Alternatively if we were to standardize the underperformance by using the ranking of the non-TARP peer bank then bank A would appear to exhibit much higher underperformance (-8/108) than bank B (-8/508) simply because A is ranked much higher than B.

[6] Based on each of the dimension we draw four separate rankings ranging from 1(best) to 800 (worst). The four rankings are then added up and the composite score is then used for ranking the banks from 1 (best) to 800 (worst).

returns of TARP and non-TARP banks rather than the one-factor market model. The market value of bank equity was experiencing a downward momentum prior to the announcement of any bailout. Therefore, it is appropriate to augment the Fama-French model (1993) Carhart's (1993) momentum factor. Furthermore, during the 2008 crisis, the SEC had stated that it would aggressively monitor short selling activity in the shares of financial companies. Hence, it is likely that bearish investors might have decomposed their short positions into smaller sizes to avoid SEC scrutiny. Thus, price momentum might have continued even over the post injection period. This adds further justification for augmenting the Fama French model with momentum.

While previous studies focus on the stock price reaction of banks to the announcement of TARP funding, we analyze the stock market's response when a bank actually receives the TARP money. We refer to this as day zero in our analysis. For most banks, there is no prior public information available regarding their attitudes toward TARP funding. We use the hundred trading day period (day -51 through day +150) prior to the actual date of receiving the TARP injection for estimating the parameters of the four-factor Fama French model, four-factor alpha, and the first two moments of daily returns for TARP banks and their non-TARP peers.[7] Similarly, we use the hundred day period (+251, +350) after the TARP injection for estimating post-TARP parameters of the Fama French model, post-TARP four-factor alpha, and first and second moments of daily returns.

For assessing the market reaction at the time of the injection, we compute abnormal returns based on the augmented four-factor Fama-French model cumulated over different windows spanning day -1 and day 20. We are also interested in assessing whether the market exhibits remorse after the initial reaction, that is, whether the market subsequently reverses its initial reaction at the time of injection. We therefore also compute the abnormal returns cumulated over the period day (+21, +250) after the day of injection. Usually two hundred and fifty trading days span a calendar year and so the post-injection period is sufficiently long to capture remorse in the market reaction. Our choice of a one-year post-injection period for capturing market remorse is admittedly ad hoc. We did not want this period to be too long because then it could be contaminated by other events but neither did we want it to be too limited and miss the ability of the market to respond as the crisis evolved.

To shed light on the testable implications about the cross-sectional differences in the market reaction at the time of injections, the study employs standard ordinary linear regressions (with White's 1980 adjustment for heteroskedasticity). Here, we control for differences among the size of TARP banks since size might serve as a proxy for geographical diversity and hence for the diversity of troubled assets resulting from the bursting of the housing bubble. We also control for the debt ratio as a proxy for the debt overhang across banks since capital injections would benefit debt holders more than stock holders depending on the severity of the overhang. Finally, given that the regulatory environment and the prospects of banks are likely to change after the bailout, the loadings of banks shares on the Fama-French factors could change after the injections and the market could have anticipated these changes at the time of the injections. We therefore control for changes in these loadings after the injections. The regressions intend to determine if the market reaction at the time of injections exhibits any anticipation regarding the subsequent changes in bank fundamentals, changes in risk of banks, changes in risk-adjusted returns of banks, the relative dosage of the injection and the market reaction during the post-injection period.

4. Findings

4.1. Differences between TARP and non-TARP banks surrounding TARP injections

Table 1 provides differences in some of the important characteristics of TARP and non-TARP

[7] Our choice of hundred trading period for estimating the pre-TARP parameters is ad hoc. Our concern was that securitization of bank loans was rampant before the housing bubble burst and so using data much prior to the actual crisis or using longer period of data prior to the crisis would not be reflective of parameters appropriate for estimating abnormal market reaction at the time of injections. For robustness, we therefore also use parameters based on the post-injection period.

banks prior to the injection (panel A) and one year following the injection (panel B). We observe that the TARP banks are larger than their non-TARP peers whether size is measured as the market value of equity, book value of equity, book value of debt, or book value of total assets.[8] TARP banks also have a higher debt-to-market equity ratio than non-TARP banks, but their market-to-book equity ratio is lower. Thus, we find that TARP injections are given to large banks that had higher debt ratios and lower growth prospects compared to their peers.

Table 1
Differences between TARP and Non-TARP banks

Panel A	**Mean (Median) differences prior to receiving TARP injections**	
	TARP (n=145)	Non-TARP (n=145)
Market Value of Equity, ME ($ m)	590.17 μ (82.66)	189.56 (77.07)
Book value of Equity, BE ($ m)	477.88 μ (122.03 Φ)	145.35 (70.40)
Book value of Total Debt, TD, ($ m)	878.53 μ (221.21 Φ)	286.34 (119.35)
Book value of Total Assets, TA, ($ m)	5,069.13 μ (1463.74 Φ)	1292.18 (761.22)
ME/BE Ratio (Market-to-Book)	0.99 μ (0.87 Φ)	1.22 (0.99)
TD/ME Ratio (Debt-to-Equity)	2.7 μ (2.14 Φ)	1.87 (1.27)
Panel B	**Mean (Median) differences four quarters after TARP injections**	
	TARP (n=145)	Non-TARP (n=145)
Market Value of Equity ($ m)	499.21 μ, Γ (49.22)	137.27 Γ (58.70)
Book value of Equity ($ m)	496.12 μ (107.46 Φ)	141.86 (69.34)
Book value of Total Debt ($ m)	613.40 μ, Γ (165.45 Φ)	201.27 Γ (88.98)
Book value of Total Assets ($ m)	4921.13 μ (1542.06 Φ)	1304.12 (791.33)
ME/BE Ratio (Market-to-Book)	0.71 μ, Γ (0.58 Φ)	0.93 Γ (0.87)
TD/ME Ratio (Debt-to-Equity)	4.24 μ, Γ (2.24 Φ)	2.25 (1.28)

Notes: Banks that receive TARP injection are matched with those that did not receive TARP assistance based on the market value of equity as of the quarter prior to the date of the injection. The differences are as of the end of the quarter prior to the quarter of TARP injection or four quarters after the quarter of the TARP injection. Symbols are used to indicate statistical significance at the 5% level or lower in two-tailed tests.
μ = mean for TARP banks is different than non-TARP banks based on both parametric and non-parametric tests
Φ = median for TARP and Non-TARP banks is different based on parametric and non-parametric tests
Γ = mean for the pre and post TARP periods are different based on both parametric and non-parametric tests

The findings in panel B show that after the injections, the book value of assets and equity for the TARP and non-TARP banks are about the same as before, but the level of debt declines by about the same proportion for the two groups. This decline in the proportion of the market value of equity, however, is much larger for TARP than non-TARP banks, perhaps because bearish investors staggered their trading due to the SEC scrutiny of short selling. In any case, the consequence is that the debt-to-market equity ratio of TARP banks increases and their market-to-book equity ratio declines substantially after the injection. Both the market value of equity and the market-to-book equity ratio are known to track cross-sectional differences in expected returns (Fama and French, 1992). Moreover, the disproportionate decline in the market value of equity suggests that the momentum effect in returns is likely to be different for TARP and non-TARP banks after the injections. The empirical evidence in Table 1 therefore adds credibility to the view that the Fama French model augmented with the momentum factor as in Carhart (1993) is more appropriate for assessing differences in the market reaction to the TARP injections between the recipients and non-recipients rather than the one-factor market model.

Table 2 reports findings pertaining to differences between TARP and non-TARP banks before

[8] Recall that by design we choose non-TARP banks that are closest in market value of equity to TARP banks and we have retained TARP banks in our sample with the intention of keeping the median market value of equity to be not statistically different for the two groups.

and after the injections based on their equity returns and the sensitivity of their equity returns to common factors in equity returns. Here we examine the equity returns and their sensitivities during the hundred trading days before the date of the injection and the hundred trading days after one year has elapsed from the date of the injection.

The findings in Table 2 indicate that the mean daily return after an injection is significantly higher and the volatility of daily returns is significantly lower for both group of banks than prior to the injections. Before these injections, the volatility of returns is higher for TARP (5.93%) than non-TARP banks (5.03%), but after the injections the volatility of daily returns for the two groups (3.73% and 3.36% respectively) is not significantly different. The volatility of daily returns for both groups, however, is higher than that for the average firm in both the pre and post-injection periods. Thus, although the riskiness of bank shares declines after the injections, the riskiness continues to be higher relative to the shares of the average firm.

Table 2
Differences in mean, volatility, alpha, and factor loadings of TARP and Non-TARP banks

Panel A	**TARP and Non-TARP differences based on pre-event window (-51, -150)**	
	TARP (n=145)	Non-TARP (n=145)
Mean daily return, %	-0.05	-0.01
Std. Dev. of daily returns, %	5.93 $^{\mu}$	5.03
Mean daily return, CRSP VW Index, %	-0.34	-0.34
Std. Dev of daily return, CRSP VW Index, %	2.97	2.97
Four-factor Alpha, %	0.10	0.12
β_{Rm-Rf}	0.56 $^{\mu}$	0.44
β_{SMB}	0.76 $^{\mu}$	0.40
β_{HML}	0.77 $^{\mu}$	0.33
β_{UMD}	-0.07	0.02
β_m , one-factor market model	0.19 $^{\mu}$	0.16
Panel B	**TARP and Non-TARP differences Based on post-event window (251, 350)**	
	TARP (n=145)	Non-TARP (n=145)
Mean daily return, %	0.31 $^{\Gamma}$	0.18 $^{\Gamma}$
Std. deviation of daily returns, %	3.73 $^{\Gamma}$	3.36 $^{\Gamma}$
Mean daily return, CRSP Index, %	0.05	0.05
Std. Dev of daily return, CRSP VW Index, %	1.09	1.09
Four-factor Alpha, %	0.19 $^{\mu, \Gamma}$	0.11
β_{Rm-Rf}	0.60	0.52
β_{SMB}	0.80	0.64 $^{\Gamma}$
β_{HML}	0.51 $^{\mu, \Gamma}$	0.22
β_{UMD}	-0.51 $^{\Gamma}$	-0.42 $^{\Gamma}$
β_m , one-factor market model	0.34 $^{\Gamma}$	0.31 $^{\Gamma}$

Notes: Augmented Fama French four-factor model is used for computing the alphas and loadings on Rm-Rf, SMB, HML, and UMD for TARP and non-TARP banks. The day of receiving TARP funding is determined to be day zero.
μ = mean for TARP banks is different from non-TARP banks based on both parametric and non-parametric tests
Γ = pre and post event results are different based on parametric and non-parametric tests

Before the injections, TARP banks exhibit significant differences in sensitivities to common factors in stock returns compared to their non-TARP peers – their loadings on the market factor

(Rm-Rf), size factor (SMB), as well as the value-growth factor (HML) are significantly higher than that for non-TARP banks (0.56, 0.76, and 0.77 compared to 0.44, 0.40, and 0.33, respectively). After the injections, the loading on HML declines substantially for both sets of banks (it declines from 0.76 to 0.51 for TARP banks and from 0.40 to 0.22 for non-TARP banks), but is still significantly higher for TARP banks relative to their non-TARP peers. The loadings on the market factor and the size factor are higher after the injections for both sets of banks (the increase on SMB for non-TARP banks is statistically significant).

The loading on the momentum factor is about the same for TARP and non-TARP banks before as well as after the injections. For both sets of banks, it is not different from zero prior to the injections (-0.07 and 0.02 for TARP and non-TARP banks) and negative after the injections (-0.51 and -0.42 respectively). This evidence indicates that prior to the injections, winners and losers among banks fail to demonstrate any momentum, but during the aftermath there is momentum reversal. As discussed previously in this study, the SEC stated that it would monitor short-selling if it resulted in the shares of financial companies to fall in value. Investors would be bearish about banks once the crisis unfolded, especially concerning those that had experienced a run-up prior to the crisis. Therefore, these winners might have experienced greater negative momentum post-crisis.

Evidence based on the one-factor market model suggests that prior to the injections the average beta of TARP banks is higher than that of non-TARP banks. After the injections, the betas increase significantly for both sets of banks, but more so for non-TARP banks and so the difference in the average beta for the two groups of banks is not significant. In aggregate, the findings in Table 2 indicate that the total risk of TARP and non-TARP banks declines after the TARP injections. Their sensitivities, however, to common factors in stock returns somewhat increased after the injections.

The intercepts in the four-factor Fama-French model (i.e., alphas) for TARP banks and non-TARP banks are positive both during the pre-injection estimation period (day -51, -150) and post-injection estimation period (251, 350). The average alpha for TARP banks shows significant increase in the post-injection period (0.19%) relative to the pre-injection level (0.10%). For non-TARP banks the change is insignificant (from 0.12% to 0.11%). Thus, it is interesting to examine whether the market reaction towards TARP banks around the date of injection is capable of identifying those that subsequently provide superior risk-adjusted returns.

4.2. Abnormal returns to TARP and non-TARP banks

Given that the parameters of the Fama French model are significantly different before and after the injections for both TARP and non-TARP banks, we report in Table 3 the cumulative abnormal returns of TARP and non-TARP banks based on both sets of parameters (panels A and B). The findings in panel A show that the market responds negatively on the day that banks receive TARP injections. The average abnormal returns for day 1 is -1.48% and for the three day window (day -1 through + 3) is -1.48%. The average abnormal returns to non-TARP banks is not significantly negative on day 1 and for the three-day window (day -1 through +3) it is negative, but not statistically significant. The average cumulative abnormal returns spanning the year after the injection, window (day +21 through + 250), is significantly negative for TARP banks (-47.17%) as well as for the non-TARP banks (-24.22%). The realized returns, however are positive for both sets of banks. The differences in the average cumulative abnormal returns and the realized returns for the window (day +21 through + 250) between the TARP and non-TARP banks are statistically significant. This evidence shows that there is substantial resolution of uncertainty on the day TARP injection is provided to a bank.

The evidence in panel B suggests that if the abnormal returns are computed based on the post-event estimation period (i.e., day +251 through day +350), then the abnormal returns are significantly different from those in panel A based on a pre-event estimation period (day -51 through day +150)]. The average abnormal return for day 1 and for the window (day -1 through day +3) for TARP banks are both reliably negative (-2.09%, and -2.51%, respectively) and significantly worse (more negative) than those based on pre-injection parameters reported in panel A. However, for

non-TARP banks, the average abnormal return for day 1 and the average CAR for window (day -1 through day +3) based on post-injection parameters.

Table 3
Abnormal returns around the day of TARP injection and over the year subsequent to the injection

Panel A	**Abnormal returns based on pre–event parameters**					
	TARP Banks (n=145)			Non – TARP Banks (n=145)		
Day	Abnormal Return %	Raw Return %	Proportion Positive	Abnormal Return %	Raw Return %	Percent Positive
-1	0.50	-0.98	0.55	0.10	-0.85	0.49
0	0.63	1.38	0.48	-0.59	0.11	0.44
1	-1.40*, μ	-0.83	0.41<	-0.30	0.04	0.48
(-1, 3)	-1.48*	0.09	0.40<	-1.19	-0.14	0.44
(0, 3)	-1.92*	1.07	0.37<	-1.30*	0.71	0.40<
(0, 20)	-3.59*	1.72	0.38<	-5.89*	-1.51	0.45
(21, 250)	-47.17*, μ	12.94*, μ	0.40<	-24.22*	24.60	0.44
Panel B	**Abnormal returns based on post–event parameters**					
	TARP Banks (n=145)			Non – TARP Banks (n=145)		
Day	Abnormal Return %	Raw Return %	Proportion Positive	Abnormal Return %	Raw Return %	Proportion Positive
-1	1.47	-0.98	0.55	0.09	-0.85	0.53
0	0.21	1.38	0.43	-0.18	0.11	0.48
1	-2.09*, μ	-0.83	0.50	1.29*	0.04	0.59>
(-1, 3)	-2.51*, μ	0.09	0.43	1.54*, Γ	-0.14	0.56
(0, 3)	-3.98*, μ	1.07	0.46	1.45*, Γ	0.71	0.54
(0, 20)	-10.21*, Γ	1.72	0.35<	-6.56*	-1.51	0.40<
(21, 250)	-94.51*, μ, Γ	12.94*, μ	0.25<	-52.74*, Γ	24.60	0.31<
Panel C	**Correlations between abnormal returns computed using Pre and Post period parameters**					
			TARP (n=145)		Non-TARP (n=145)	
CAR (0,3)			0.60$		0.43$	
CAR (0, 20)			0.59$		0.41$	
CAR (21, 250)			0.44$		0.22$	

Notes: Abnormal returns are based on the Fama-French four factor model. Day 0 is the day a bank receives TARP funding. Non-TARP banks are those banks closest in market value of equity to TARP banks as of the quarter end prior to day 0. Pre-event estimation is based on the window (day -51 through day -150) and post-event estimation is based on the window (day + 251 through day + 350). Symbols are used to indicate significance levels of 5% or lower.

* = statistically significant based on parametric, non-parametric, and non-parametric bootstrap two-tailed tests at 55 level or lower

μ = Tarp and Non-TARP means are significantly different based on parametric and non-parametric tests

Γ = pre and post event averages are significantly different based on parametric and non-parametric tests

$ = correlations are significantly different from zero

< = proportions significantly less than 50%

< = proportions significantly less than 50%

The cumulative abnormal returns spanning the period (day+20 through day +251) following the date of injection based on post-event parameters are not only significantly negative for TARP (-94.51%) as well as non-TARP banks (-52.74%), but also are respectively statistically more worse than those based on pre-event parameters (in panel A).

To allay the concern about which sets of abnormal returns are more reflective of the true market reaction towards the injections and hence more appropriate for cross-sectional analysis, we examine the correlations (panel C) between the abnormal returns reported in panels A and B. All the correlations are significantly positive. The correlations are high for smaller windows and are

especially high for TARP relative to non-TARP banks. This suggests that inferences based on either set of abnormal returns for TARP banks are likely to be similar and more reliable, but one would need to be cautious in drawing inferences based on either set of abnormal returns for non-TARP banks.

Despite these concerns, the findings in Table 3 show that at the time banks receive TARP injections the market responds negatively towards the recipients and considers them to be inferior compared to non-recipients. Moreover, in the year after the injection, the market demonstrates no remorse for its an unfavorable reaction to TARP banks at the time of the injection. In fact, in the year after the injections, the market continues to consider their prospects to be much grimmer than their non-TARP peers.

4.3. Differences in the fundamentals of TARP and non-TARP banks after the injections

Table 4 displays findings pertaining to differences between the fundamentals of TARP and non-TARP banks for the quarter in which TARP banks receive the injection (quarter zero) and for each of the subsequent four quarters. Panel A reports the percentage by which TARP banks are ranked below their non-TARP peer along the dimensions of asset quality, capital adequacy, liquidity, and profitability. To better understand the percentage rankings displayed in panel A consider the average asset quality ranking of TARP banks for quarter zero (-10.38%). This indicates that in the universe of 800 largest publicly traded banks, TARP banks are, on average, 83 spots below their respective peers.

Table 4
Differences in fundamentals of TARP and non-TARP banks

Panel A	**Average ranking of TARP banks relative to Non-TARP banks (%)**				
n = 145	Asset Quality	Capital Adequacy	Liquidity	Profitability	Overall
Quarter 0	-10.38*	-3.01	-18.64*	-7.13*	-17.48*
Quarter 1	-11.59*	-6.95*	-17.96*	-7.57*	-19.15*
Quarter 2	-11.73*	-9.03*	-15.37*	-10.67*	-20.33*
Quarter 3	-11.17*	-6.33	-12.88*	-10.60*	-17.55*
Quarter 4	-9.90*	-6.13	-12.45*	-7.17*	-16.11*
Panel B	**Proportion of TARP banks with rankings below that of Non-TARP banks**				
n = 145	Asset Quality	Capital Adequacy	Liquidity	Profitability	Overall
Quarter 0	0.59*	0.55	0.68*	0.52	0.68*
Quarter 1	0.61*	0.57	0.70*	0.55	0.70*
Quarter 2	0.63*	0.57	0.66*	0.59*	0.68*
Quarter 3	0.60*	0.56	0.62*	0.58	0.64*
Quarter 4	0.59*	0.55	0.66*	0.55	0.68*

Notes: 800 largest publicly traded banks are ranked based on each of the four categories: asset quality, capital adequacy, liquidity, and profitability, using five different ratios for each category. An overall composite ranking is estimated based on all the categories. This is done separately for the quarter in which the TARP injection is given (quarter zero) and for each of the four quarters following the injection. For each bank that receives TARP injection, a bank that is closest in market value of equity (as of the quarter end prior to receiving TARP assistance) that did not receive TARP injection is used as the benchmark Non-TARP peer. Panel A reports the ranking of TARP banks relative to non-TARP banks on scale of 1-800. The quarter in which the TARP injection is received is quarter zero. Panel B reports the proportion of TARP banks ranked below benchmark Non-TARP banks. * indicates that the difference in the TARP and non-TARP bank is statistically significant (panel A) or that the proportion by which TARP bank is ranked below the non-TARP bank is different from fifty percent (panel b) at a 5% significance level or lower.

What is evident from panel A is that TARP banks rank lower than non-TARP banks for each of the four quarters following the injection for each of the dimensions of bank fundamentals. When the

four dimensions are considered individually, the best relative ranking of TARP banks is on the basis of capital adequacy and yet they rank below the non-TARP peers by an average of 50 spots. The worst dimension for these banks is liquidity. Based on liquidity, they rank at least 95 spots below the non-TARP banks following the injections. When these four dimensions of fundamental performance are considered simultaneously, the relative underperformance of TARP banks is at least 125 spots even four quarters after the injections.

The findings in panel B indicate that those in panel A are not driven by outliers. They indicate that at least fifty percent of the TARP banks rank lower than non-TARP banks on any of the fundamental dimensions in any of the four quarters after the injections. However, if we consider the dimensions in aggregate, sixty-eight percent of the TARP banks rank lower than non-TARP banks four quarters following the injections. Furthermore, untabulated results indicate that over fifty five percent of the TARP banks rank lower than their non-TARP peers for each of the 4 individual quarters following the injection.

How much do the fundamentals change after the injections? The findings in panel A and B show that the under-performance of TARP banks relative to non-TARP banks deteriorates over the first two quarters and then starts to improve. However, even four quarters after the injections the improvement is not large. The liquidity of TARP banks exhibits the greatest improvement, but their relative profitability is unchanged. In aggregate, TARP banks gain 10 spots relative to their non-TARP peers in the rankings of 800 banks after four quarters, but the proportion that underperform their non-TARP peers remains unchanged at 68%.

In short, the assessment of the recipient banks at the end of each of the four quarters following the injection is that they are weaker than their non-TARP peers. This assessment is even more grim when we assess the four fundamentals in aggregate rather than separately.

4.4 Cross sectional differences in market reaction towards TARP and non-TARP banks

The evidence so far indicates that, on average, the market reacts negatively at the time of injections and during the following year continues to take a pessimistic view of their prospects relative to non-TARP banks. This view is consistent with the average differences in the fundamentals of TARP and non-TARP banks during the four quarters following the injections. At an aggregate level, the market response to TARP injections is consistent with differences in the financial fundamentals between recipients and non-recipients observed in the year following the injection. We now examine cross-sectional differences in the market reaction towards TARP and non-TARP banks.

The cross-sectional regressions in Table 5 provide several important and insightful findings. First, the regressions reliably and consistently demonstrate that larger TARP injections are associated with a more favorable market response to the injection. This evidence contradicts the negative sentiment and adverse signal hypotheses, but is consistent with the certification effect hypothesis. Second, regression (2) shows that across the TARP recipients, the market response to injections is positively related to their cumulative abnormal returns for the subsequent year.[9] This suggests market confirmation about its initial reaction towards the TARP injections. It is also consistent with the notion that bearish investors might have staggered their actions due to the SEC monitoring of short selling of bank shares over the TARP injection period. Given that growing wave of negative information about banks at the time of TARP injections and the popular claims of banker irresponsibility, it seems unlikely that markets were lenient in their valuation of banking equity.

Third, across TARP banks, the market response to the federal injections is positively related to the increase in four-factor alpha and inversely related to the increase in return uncertainty between the pre and post injection periods (regressions 3 and 5). These findings suggest that even in the midst of a banking crisis, the market forms reasonable expectation about cross-sectional differences among TARP recipient banks and their ability to reduce risk and to provide higher returns. Regressions (4) and (5) reveal that the market's response to TARP injections is positively related to the profitability of

[9] The correlation between CAR (0, 3) and CAR (21, 250) is significantly positive (p-value < 0.01) irrespective of whether we use the pre-event or post-event parameters for estimating either of these CARs (results not in tables).

TARP banks relative to their non-TARP peers four quarters after the injection. This evidence also suggests that the market forms expectations at the time of TARP injection regarding cross-sectional differences in the profitability of recipients likely to exist four quarters following the injection.

Lastly, the findings in regressions 3 and 4 indicate that the market reacts less favorably to TARP injections in the case of banks that exhibit subsequent increases in the sensitivities to the common factors in stocks returns (i.e., market, size, and market-to-book). The exception is the sensitivity to the size factor. One reason for this exception could be that during the post-injection period the loading on the size factor is significant for non-TARP banks, but not for non-TARP banks (see Table 2). Perhaps because of the unique situations faced by all banks during the banking crisis, the market does not penalize TARP banks for increases in their sensitivity towards size.

Table 5
Event period cross-sectional differences in abnormal returns of banks receiving TARP injection

Sample size =145	Dependent Variable = CAR (0, 3) for banks receiving TARP assistance				
	1	2	3	4	5
Intercept	0.0252	-0.0001	-0.0224	0.0162	-0.0252
Log(ME)	-0.0096*	-0.0024	-0.0072	-0.0064	-0.0060
Debt/Asset	0.1140	-0.1408	-0.1076	-0.1492	-0.1382
Tarp/Equity	0.0733*		0.1015**	0.0816**	0.1058***
CAR(21, 250)		0.0221*			
Increase in α			5.2107**		4.7408**
Increase in β_{Rm-Rf}			-0.0400***		-0.0387***
Increase in β_{SMB}			0.01192*		0.0107
Increase in β_{HML}			-0.0112*		-0.0115*
Increase in β_{UMD}			-0.0217***		-0.0206***
Increase in Std. Deviation			-0.6954*		-0.6880*
Relative Asset Quality Ratio				-0.0160	-0.0106
Relative Capital Adequacy Ratio				-0.0306	-0.0311
Relative Liquidity Ratio				0.0235	0.0202
Relative Profitability Ratio				0.0533**	0.0403*
Adjusted R^2	0.0240*	0.0600*	0.1240***	0.0320	0.1230***

Notes: Day 0 represents the day TARP assistance is received by the banks in the sample. Cumulative abnormal returns, CAR (0, 3) are computed according to the Fama French four factor model using the window (-51, -150) for estimating parameters. Post event cumulative abnormal returns, CAR (21, 250), are computed using the window (251, 350) as the parameter estimation period. Market value of equity, the ratio of total debt to total assets, and the book value of equity used for normalizing the amount of TARP assistance received are as of the end of the quarter prior to the date of TARP assistance. Increases in slopes (betas) of the Fama French model, increases in alpha (intercept), and increases in standard deviations are computed as the post-event parameters minus the respective pre-event parameters. The relative asset quality ratio, capital adequacy, liquidity, and profitability ratios indicate how TARP banks compare with the benchmark Non-TARP banks at the end of the fourth quarter post receipt of TARP assistance. ***, **, * represent significance levels of 1%, 5%, and 10% respectively

Taken together, the evidence shows that the market's reaction at the time of TARP injections is less favorable if the subsequent sensitivities of the recipients to common factors in stock returns increases. Overall, the findings in Table 5 reveal that the market is able to distinguish which TARP banks are more likely to exhibit superior risk-adjusted returns, less risk and more likely to match the

profitability of their peers. It is hard to infer from these results that the market is driven by sentiment rather than fundamentals.

Table 6
Event period cross-sectional differences in abnormal returns of Non-TARP banks

Sample size =145	Dependent Variable = CAR (0, 3) for Non-Tarp Banks				
	1	2	3	4	5
Intercept	-0.0099	-0.0102	-0.0100	-0.0066	0.0044
Log(ME)	-0.0044	-0.0074	-0.0067	-0.0041	-0.0078
Debt/Asset	0.1425*	0.1577*	0.1539*	0.1209	0.1354*
Tarp/Equity	-0.0251		-0.0299	-0.0297	-0.0329
CAR(21, 250)		-0.0094			
Increase in α			1.0851		1.1401
Increase in β_{Rm-Rf}			0.0054		0.0039
Increase in β_{SMB}			-0.0003		-0.0025
Increase in β_{HML}			-0.0033		-0.0032
Increase in β_{UMD}			-0.0114		-0.0134*
Increase in Std. Deviation			0.2958		0.2313
Relative Asset Quality Ratio				-0.0249*	-0.0289**
Relative Capital Adequacy Ratio				-0.0247	-0.0255
Relative Liquidity Ratio				0.0203	0.0187
Relative Profitability Ratio				0.0228	0.0183
Adjusted R^2	0.0110	0.0230*	0.0140	0.0100	0.0130

Notes: Day 0 represents the day TARP assistance is received by banks in the sample. For each such bank, a bank that did not receive TARP assistance but is closest in market value of equity (as of the quarter end prior to day 0) is chosen as the comparable Non-TARP bank. Abnormal returns are computed according to the Fama-French four factor model using the window (day -51 through -150) as the parameter estimation period. Post event abnormal returns, CAR (day 21 through 250), are computed using the window (day 251 through day 350) as the parameter estimation period. Market value of equity, the ratio of debt to assets, and the book value of equity (used for normalizing TARP assistance) are as of the end of the quarter prior to the date of receiving TARP assistance. Increases in the slopes (betas) of the Fama French model, the intercept (alpha), and standard deviation of daily returns are computed as the post-event parameter minus the respective pre-event parameter. The relative asset quality, capital adequacy, liquidity, and the profitability ratios indicate how TARP banks compare with benchmark Non-TARP banks at the end of the fourth quarter after receiving TARP assistance. ***,**, * represent significance levels of 1%, 5%, and 10% respectively

In Table 6 we examine the cross-sectional market response towards non-TARP banks when their peer banks receive TARP injections. Most of the variables that are significant in the cross-sectional regressions of TARP recipients (Table 5) are not significant for non-TARP banks. Other variables, however, demonstrate statistical significance in these regressions. For example, the abnormal returns of non-TARP banks exhibit a reliably positive relationship with their leverage ratio. This might occur if a bank with high debt ratio does not need TARP assistance when a comparable peer does, then that is likely to be good news about its debt overhang problem. This then yields a positive relationship with the bank's leverage ratio. It is also consistent with the view that a larger debt ratio might result in the better monitoring of managers and subsequently lower agency costs.

The other noteworthy finding from Table 6 is that the market response to non-TARP banks is inversely related to the relative ranking of the TARP recipients four quarters after the injection. This suggests that when banks receive TARP injections the market reacts less favorably towards their

non-TARP peers if subsequent to the injection the asset-quality of TARP recipients is closer to the non-TARP banks.

There is consistent evidence across all the regressions that larger TARP dosages produce less favorable market reactions towards non-TARP banks. This finding is consistent with the notion that the amount of the TARP injection might serve as positive certification about the systemic importance of the recipient, thereby enhancing its ability to compete with non-recipients. This result also shows that when banks receive TARP injections, the market does not consider the effect those injections are likely to have on non-recipient peers. Thus it does not seem appropriate to claim that the market is driven by sentiment rather than fundamentals.

Table 7 presents findings based on cross-sectional regressions of the cumulative abnormal returns of TARP banks during the year after the injection. If the market is driven by sentiment rather than fundamentals, then market remorse is likely to be manifested in sign reversal for select coefficients. We fail to observe such evidence. Alternatively, it is likely that because of SEC scrutiny of short selling, there might be pent up reaction from the market.

Table 7
Cross-sectional differences in long-term abnormal returns of TARP banks

sample size =145	Dependent Variable = CAR (21, 250) for banks receiving TARP assistance				
	1	2	3	4	5
Intercept	2.0721***	1.8764***	0.8635*	1.9023***	0.8261
Log(ME)	-0.5773***	-0.5610***	-0.4200***	-0.5416***	-0.4098*
Debt/Asset	2.8875	2.7205	1.9070	2.5614	1.7446
Tarp/Equity	-0.7463		-0.2959	-0.6049	-0.2200
CAR (0, 3)		2.6837***			
Increase in α			149.6000***		144.5000***
Increase in β_{Rm-Rf}			0.1471		0.1552
Increase in β_{SMB}			0.0862		0.0687
Increase in β_{HML}			-0.0300		-0.0372
Increase in β_{UMD}			-0.0745		-0.0716
Increase in Std. Deviation			-13.1710***		-12.3040**
Relative Asset Quality Ratio				-0.5084*	-0.3958*
Relative Capital Adequacy Ratio				0.0469	0.0829
Relative Liquidity Ratio				-0.0329	-0.0426
Relative Profitability Ratio				0.5604*	0.3050
Adjusted R^2	0.3100 **	0.3470 ***	0.5580***	0.3190***	0.5590 ***

Notes: Day 0 represents the day TARP assistance is received by the banks in the sample. Cumulative abnormal returns (day 21 through day 250) are computed according to the Fama French four-factor model using the window (day -51 through day -150) as the parameter estimation period. Pre-event abnormal returns, CAR (day 0 through day 3), are computed using the window (-51, -150) as the parameter estimation period. Market value of equity, the ratio of total debt to total assets, and the book value of equity used for normalizing the amount of TARP assistance received are as of the end of the quarter prior to the date of receiving TARP assistance. Increases in slopes (betas) of the Fama French model are computed as the post-event betas minus the respective pre-event betas. The relative asset quality, , capital adequacy, liquidity, and the profitability ratios indicate how TARP banks compare with benchmark Non-TARP banks at the end of the fourth quarter after receiving TARP assistance. ***,**,* represent significance levels of 1%, 5%, and 10% respectively

The findings in Table 7 for TARP banks again demonstrate the market reaction is favorable towards banks the exhibit a decline in risk and an increase in risk-adjusted returns (Regressions 3 and 5). There is also weak evidence that the market reacts favorably towards banks whose profitability is closer to their non-TARP peers. These findings fail to suggest that the market response to TARP injections is driven by sentiment rather than fundamentals during the banking crisis. Here we also find that larger banks undergo a greater abnormal decline in the market value of equity after the injection. As discussed previously, the SEC monitored the short selling of bank shares during the banking crisis, implying that it would be especially vigilant in the case of large banks. Bearish investors might therefore have spread their trading activity more in the case of large banks, consequently producing more negative abnormal returns during the year following injection.

Table 8
Cross-sectional differences in long-term abnormal returns of Non-TARP banks

Sample size =145	Dependent Variable = CAR (21, 250) for Non-Tarp Banks				
	1	2	3	4	5
Intercept	2.1189***	2.1624***	0.8984***	2.2294***	0.9754***
Log(ME)	-0.5562***	-0.5681***	-0.2732***	-0.5754***	-0.2884***
Debt/Asset	2.1078***	1.4154	1.0772*	2.0940***	1.0548*
Tarp/Equity	-0.4792*		-0.1975	-0.5364**	-0.2431
CAR(0, 3)		0.5059			
Increase in α			128.75***		127.38***
Increase in β_{Rm-Rf}			0.0652		0.0642
Increase in β_{SMB}			0.0202		0.0133
Increase in β_{HML}			-0.0435		-0.0433
Increase in β_{UMD}			0.0862		0.0761
Increase in Std. Deviation			-3.4260		-2.611
Relative Asset Quality Ratio				-0.1454	-0.1257
Relative Capital Adequacy Ratio				0.2125	0.0394
Relative Liquidity Ratio				0.1642	0.0672
Relative Profitability Ratio				-0.1673	0.0316
Adjusted R^2	0.3080 **	0.3070***	0.6020***	0.3190 ***	0.5930 ***

Notes: Day 0 represents the day TARP assistance is received by banks in the sample. For each such bank, a bank that did not receive TARP assistance, but is closest in market value of equity (as of the quarter end prior to day 0) is chosen as the comparable Non-TARP bank. Cumulative abnormal returns (day 21 through day 250) are computed according to the Fama French four-factor model using the window (-51, -150) for estimating the parameters. CAR (day 0 through day 3), are based on the parameters estimated over the window (day -150, -51). Market value of equity, the ratio of debt to assets, and the book value of equity used for normalizing the amount of TARP assistance received are as of the end of the quarter prior to the date of receiving TARP assistance. Increases in slopes (betas) of the Fama French model, the intercept (alpha), and standard deviation of daily returns is computed as the post-event parameter minus the respective pre-event parameter. The relative asset quality, capital adequacy, liquidity, and the profitability ratios indicate how TARP banks compare with benchmark Non-TARP banks at the end of the fourth quarter after receiving TARP assistance. ***,**,* represent significance levels of 1%, 5%, and 10% respectively

Surprisingly, regressions (4) and (5) show that the asset quality of TARP banks relative to non-TARP banks four quarters after the injection is inversely related to the corresponding cumulative abnormal returns. That is, during the year following the injection, the market reacts more

negatively towards those TARP banks that have better asset quality ratios relative to their non-TARP peers. A possible explanation of these results is that is that the market was reacting more on sentiments, i.e., any bank that needs TARP funds is a "bad" investment. This was later corrected as information became more available as per our primary finding.[10]

The findings pertaining to cross-sectional regressions of CAR (21, 250) for non-TARP banks are in Table 8. Size, likewise presents with a negative sign. This finding is consistent with our earlier conjecture that bearish investors might have perceived the SEC to be extra vigilant regarding the short selling of large banks shares. Therefore, bearish investors might have spread their short selling activity over time for larger than smaller banks. The debt ratio also exhibits a positive sign in these cross-sectional regressions. This finding is consistent with our conjecture that high debt ratios might be a positive indication about the ability of the bank to survive during the crisis despite high levels of debt and its agency problems. Therefore, the market might react more favorably to firms with higher debt ratios. There is also weak evidence about the abnormal returns of non-TARP banks during the year after the injection being inversely related to the TARP dosage received by peers. Such a result is consistent with the notion that TARP injections might serve as certification about the systemic importance of the recipients and their ability to compete against non-recipient institutions. It is therefore supportive of a certification effect associated with TARP infusions.

Finally, there is strong evidence that the increase in the four-factor alpha of non-TARP banks is positively related with their cumulative abnormal returns in the year following injection. This finding shows that the market responds favorably towards banks that are likely to provide greater risk-adjusted returns in the future. These findings do not suggest that the market response during the year after the TARP injection was driven by sentiment rather than fundamentals.

5. Conclusion

This study examines the stock market response to capital injections given to banks under the Troubled Asset Relief Program (TARP) between October 2008 and December 2009. Event studies are common in financial economics and they assume that the stock market response to an event is driven by economic and financial fundamentals rather than sentiment. In a sense, the magnitude of the 2008 banking crisis and the pervasiveness of stressful economic conditions prevailing at the time provides an occasion to stress test this assumption. The analysis reveals several important and interesting finings.

The study finds that the Fama-French four-factor abnormal returns at the time banks receive TARP injections and the cumulative abnormal returns in the year following the injection are significantly negative and lower than those for comparable non-recipient banks. Across TARP banks, the abnormal returns at the time of the injection are positively related to a subsequent decrease in riskiness, improvement in risk-adjusted returns, and increased relative profitability. Other findings suggest that TARP banks exhibit significant weaker fundamentals (i.e., asset quality, capital adequacy, profitability, and liquidity) relative to non-TARP banks for each of the four quarters following the injections. In combination, these findings fail to support the notion that the market's response to TARP injections is driven by sentiment rather than fundamentals. In fact, they suggest otherwise.

The abnormal returns to TARP banks at the time of receiving TARP injections are positively related to the cumulative abnormal returns over the subsequent year, that is, the market exhibits no remorse about its initial reaction to the injections. This positive relationship is understandable because the SEC was actively monitoring short selling activity in bank shares. In fact, the SEC had banned the short selling of finance company shares for a short period around the time of the crisis, and so bearish investors might have staggered their trading to avoid regulatory scrutiny. Furthermore, since the SEC might have been more vigilant in the case of large banks it is not surprising that we find large banks, both TARP and non-TARP, have poor post-injection abnormal

[10] We gratefully acknowledge that this possible explanation was suggested by a helpful, but anonymous referee.

returns. These findings suggest that banning short selling activity might have delayed market prices from reaching equilibrium.

Other findings further indicate that, although the average abnormal return of TARP banks at the time of receiving the injection is negative, the larger the TARP dosage, the greater is the abnormal return to the TARP recipients. The abnormal returns of non-TARP banks exhibit an inverse relationship with the size of the dosage given to TARP banks. Lastly, the market reaction is zero when TARP banks return the assistance received. Thus, our evidence does not support the view that TARP injections might have served as an adverse signal about the prospects of the recipients, thereby preventing some of the ailing banks from obtaining TARP injections. Rather, our evidence suggests that the TARP injections serve as certification about the systemic importance and/or political connectedness of the receiving banks.

The importance of these findings reside in their insights regarding the design of effective public policy for stabilization of an economy during a financial crisis. More specifically, these findings provide a useful assessment of the ability of government support programs and subsidies to provide stability to a country's banking sector when it is stressed during a cascading crisis of confidence.

Appendix

List of Bank Performamnce Ratios

Asset Quality

1. Coverage Ratio (Allowance for Loan Losses/Nonperforming loans)
2. Real Estate Loan Losses / Total Real Estate Loans
3. Other Real Estate Owned (OREO) / Total Assets
4. 30 Days or more Past Due (PD) Loans / Total Loans
5. (90 Days or more PD Loans + Nonaccrual Loans + OREO) / (Total Loans + OREO)

Capital Adequacy

1. Total Equity / Total Assets
2. Leverage Ratio
3. Total Risk-Based Capital (RBC) / Total Risk-Weighted Assets
4. Tier 1 RBC / Total Risk-Weighted Assets
5. Tangible Common Equity / Tangible Assets

Liquidity

1. Net Short-Term Noncore Funding Dependence = ST Noncore Funding Less ST Investments / LT Earning Assets
2. Total Loans & Leases / Total Deposits
3. Liquid Assets / Total Assets
4. Short-Term Investments / Total Assets
5. Core Deposits / Total Assets

Profitability

1. Net Interest Margin
2. Overhead Expense Less Noninterest Income / Average Assets
3. Pre-Tax Return on Assets
4. Interest Income / Average Earning Assets
5. Average Earning Assets / Average Assets

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