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EVIDENCE ON THE TROUBLED ASSETS RELIEF PROGRAM, BAILOUT SIZE, RETURNS AND TAIL RISK

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ABSTRACT

The US government launched the Troubled Assets Relief Program (TARP) in mid-September 2008. This article analyzes the market response to the TARP launch. We reject the null hypothesis that the bailout size has no effect on the firm's value. Banks receiving large bailouts endure significantly larger stock price declines than banks receiving small bailouts. The average buy-and-hold return from 2008 Q4 to 2009 Q1 is 42.68% for the 293 sampled banks. Bailout banks perform 5.8% worse than non-bailout banks. The banks' losses increase significantly from the pre-TARP period to TARP initiation period, suggesting greater tail risk from 2008 Q4 to 2009 Q1. Bailout banks contribute much more to the overall systematic risk than non-bailout banks. TARP helped restore investors' confidence, and closed December 19, 2014 with $15.3 billion profit. Finally some causal effects of bank bailouts are considered.

JEL: G18, G21, G28

KEYWORDS: TARP Bailout, Abnormal Returns, Tail Risk, Financial Crisis, Counterfactual

INTRODUCTION

In an earlier article Ncube and Hausken (2019) consider the impact of the Troubled Assets Relief Program (TARP) on stock returns. TARP was initiated after the Lehman Brothers collapse and the AIG rescue in mid-September 2008, due to fear of further collapses. TARP was passed September 20-October 14, 2008, and closed December 19, 2014 (Isidore, 2014). This article considers TARP bailout size, buy and hold returns, and tail risk. Three challenges and how to address these are as follows. First, both VaR (the value of risk) and CoVaR (the conditional value at risk) are generated variables, thus giving rise to bias in any two-stage approach. Second, disentangling systemic from more mundane systematic risk is challenging, despite the former being an accepted measure in the literature. Third, and more conceptually, we should assess whether we do justice to the policy makers who launched TARP when assessing the systemic failure avoidance that capital market based systemic risk measures of TARP banks that did not decline. By design, these gauges of system-wide instability are confined to firms (banks) that are listed on equity markets. However, many U.S. banks – especially those catering to agents in the periphery – are not listed, and many TARP banks were small (Bayazitova & Shivdasani, 2012).

This raises the issue of whether we should draw a strong policy conclusion about whether (or not) TARP helped or hampered to stabilize the U.S. banking market. TARP funding has been analyzed e.g. by Bayazitova and Shivdasani (2012) and Veronesi and Zingales (2010) among others. This article analyzes the market's response to TARP funding and the valuation effect of the size of the bailout. We furthermore evaluate the buy-and-hold returns of bailout and non-bailout banks over the TARP capital injection period, and the impact of TARP bailout on systemic tail risk. Non-random selection into the TARP bailout program is assumed through propensity score matching methods, thus allowing a counterfactual interpretation of the data. This provides robust credible empirical evidence that no bailouts would have caused greater tail risk and more negative abnormal returns than bailouts did cause. The literature struggles to determine empirical evidence for the causality between TARP bailouts and the subsequent outcomes. Since each bank self-selects into bailout or no bailout, differences between the two groups may be systematic. Bailout choice and other determinants of bank outcomes may interact in complex manners, as attempted disentangled in this article. The article is organized as follows. The next section provides a brief literature review. The section thereafter briefly describes the data and methodology. The section thereafter presents the results including the valuation effect of bailout size, the buy-and-hold returns of bailout and non-bailout banks over the TARP capital injection period, and the impact of TARP bailout on systemic tail risk. The final section concludes.

LITERATURE REVIEW

As the 2008 global financial crisis spread worldwide, the impact of the US TARP program was watched and analyzed globally. Ding, Wu, and Chang (2013) assess TARP's impact on banks' performance in other major economies. Coates and Scharfstein (2009), Harvey (2008), and Bebchuk (2009) and criticize the TARP design and discuss its various inefficiencies. Cadman, Carter, and Lynch (2012) find that bank compensation was positively correlated with banks being more unwilling to accept TARP bailouts. Somewhat related, Wilson and Wu (2012) find that higher CEO salaries were positively correlated with banks being significantly more likely to avoid substantial impact by TARP. Also related, Li (2013) finds that early TARP exit was positively correlated with resumption of financial health. Aït-Sahalia, Andritzky, Jobst, Nowak, and Tamirisa (2012) do not find strong evidence that macroeconomic or financial policies calmed interbank markets during the global financial crisis.

Bayazitova and Shivdasani (2012) analyze which banks were selected to receive TARP bailouts. They determine a positive announcement effect. Duchin and Sosyura (2012) find that political connections enhanced the likelihood of banks receiving TARP bailouts. Li (2013) find that there is not much to support the hypothesis that loans made by banks receiving bailouts have lower quality than loans made by banks not receiving bailout. Furthermore, Cornett, Li, and Tehranian (2012) suggest that TARP 'underachievers' have some inconsistent income production weaknesses, whereas 'overachievers' have liquidity challenges impacting their ability to continue lending. Taliaferro (2009) studies how banks used their bailout funds. He finds that banks receiving bailouts used ca. 13% to support new lending, and ca. 60% to increase their capital ratios. Ivashina and Scharfstein (2010) show a relationship between credit line commitments and loan growth during the 2008 crisis. Estimating benefits and costs, Veronesi and Zingales (2010) show that TARP increased the value of banks' financial claims by US $130 billion, with a net benefit between $86–109 billion, and at a taxpayers' cost of $21–44 billion. For methods assessing the causal inference of the impact of a policy, program or treatment, see J. J. Heckman (1979); J. Heckman (1990); Angrist, Imbens, and Rubin (1996); Abadie, Angrist, and Imbens (2002); and Angrist (2004). See Ncube and Hausken (2019) for further literature review and TARP background.

DATA AND METHODOLOGY

Ncube and Hausken (2019) construct a sample based on data available at bank holding company level from the Bank Holding Company Database provided by Federal Reserve Bank of Chicago. Two sub-samples are created, bank holding companies (BHCs) that accepted TARP bailout funds, and those that did not. Banks are classified into four groups based on period-end book value of assets greater than $10 billion, $3-10 billion, $1-3 billion, and less than $1 billion. Table 1 shows the definition of the main variables and data sources. Ncube and Hausken's (2019) Table 3 provides summary statistics of the main variables for bailout banks. Their Table 4 provides the correlation among the main variables, and their Figure 1 provides the TED spread (perceived credit risk), LIBOR-OIS spread (disparity between the overnight indexed swap rate and LIBOR), the VIX index (the ticker symbol for the Chicago Board Options Exchange Market Volatility Index), and a Noise Measure

Table 1: Definition of Main Variables and Data Sources

Variable	Definition	Source
Bailout amount (*BA*)	Amount of TARP funds received by a bailout bank ($billions)	Eye on the Bailout
Bailout ratio (*BR*)	Ratio of the amount of TARP funds received by a bailout bank to the bank's Tier 1 capital (%)	Eye on the Bailout; BHC Data (BHCK 8274)
Capital adequacy (*CA*)	Ratio of Tier 1 capital to total risk-weighted assets (%)	BHC Data (BHCK 8274 A223)
Asset quality (*AQ*)	Ratio of noncurrent loans and leases (90 days or more past due or in nonaccrual status) to total loans and leases (%)	BHC Data (BHCK 5525 5526 5369 B529)
Management quality (*MQ*)	Ratio of annualized total non-interest expense to annualized net operating income (%, net operating income is measured as the sum of net interest income and non-interest income)	BHC Data (BHCK 4093 4074 4079)
Earnings (*EAR*)	Ratio of annualized net income to average total assets (%)	BHC Data (BHCK 4340 2170)
Liquidity (*LIQ*)	Ratio of cash and balances due from depository institutions to deposits (%)	BHC Data (BHCK 0081 0395 0397 BHDM 6631 6636 BHFN 6631 6636)
Sensitivity (*SEN*)	Ratio of the absolute difference between earning assets that are repricable within one year and interest-bearing deposit liabilities that are repricable within one year to total assets (% as a measure of sensitivity to interest rate risk)	BHC Data (BHCK 3197 3296 2170)
Bank size (*SZ*)	Natural log of the book value of BHC's total assets (in thousands of US dollar) at quarter-end	BHC Data (BHCK 2170)
Bank age (*AGE*)	Number of years since the entity's general ledger was opened for the first time and/or the date on which the entity became active (years)	BHC Data (RSSD 9950)
Stock return (*R*)	Daily percentage change in stock price (%)	CRSP US Stock
Index return (*MKT*)	Daily return of the CRSP value-weighted index of all NYSE, AMEX, and NASDAQ firms (%)	CRSP US Stock

Notes: Reported are the main variables used in the study along with their definitions and the sources of data. The bailout data is obtained from "Eye on the Bailout" database provided by ProPublica (http://bailout.propublica.org/main/list/index). Accounting information at bank holding company level is collected from Bank Holding Company Database provided by Federal Reserve Bank of Chicago (http://www.chicagofed.org/webpages/banking/financial_institution_reports/bhc_data.cfm). Income and expense attributed to each quarter is annualized and compared to average asset or liability balances for the corresponding quarter. Stock return data is retrieved from CRSP US Stock Database.

RESULTS

The Impact of Bailout Size on Stock Returns

Empirical Strategy

To answer the question of whether the size of the bailout had an effect on bank abnormal returns, we calculate the cumulative abnormal differential return (CADR) between banks that accepted a "large" amount of bailout funds relative to banks that accepted a "small" amount. The way in which we define the size of the bailout (large versus small) will be given a precise quantitative definition below. The abnormal returns of bank *i* at time t, $\hat{\varepsilon}_{it}$, are computed as the deviation of the actual returns from those predicted by the Markowitz market model in a window of $2T$+1 days around the bailout event (the event window is the day of the receipt of TARP funds). If the size of the bailout is not an important determinant, then the average abnormal returns of banks with large and small bailouts should not be sufficiently different following the bailout event. This hypothesis can be formally tested by estimating the parameters of the regression

$$\hat{\varepsilon}_t = \sum_{\tau=t^*-T}^{t^*+T} (\delta_{0\tau} + B_i\delta_{1\tau} + X_i'\delta_{2\tau}) \times D_{\tau t} + \xi_{it} \quad (1)$$

where $D_{\tau t}$ is an event time-dummy that takes the value 1 when $t = \tau$ and zero otherwise, and $\delta_{0\tau}$ is the average abnormal return at event time τ among all banks included in the regression. The variable B_i measures the amount of bailout funds that a bank accepted, which in the preferred specification is a continuous variable that is increasing in a bank's acceptance of bailout funds. We use the amount of TARP funds (US dollar in billions) actually received by the bailout banks in the sample as the measure of B_i. The parameters $\delta_{1\tau}$ are the key coefficients, since they are estimates of the average increase (decrease) in abnormal returns at event time τ resulting from a larger acceptance. The vector X_i' includes several bank characteristics that may be related to the banks' propensity to accept bailout funds such as size, age, leverage, ownership and type of bank. Equation (1) is essentially estimated by regressing the abnormal return of a bailout bank on the amount of TARP funds it received and other bank characteristics for each trading day in the event window of 10 days before and after the acceptance of bailout funds. In other words, the cross-sectional regression is repeatedly estimated 21 times for the 21 trading days in the event window. Under the hypothesis that the size of the bailout has no effect on firm value, the $\delta_{1\tau}$ coefficients should not be significantly different from zero. In contrast, under the alternative hypothesis that the size of the of bailout is important for firm value, these coefficients should be significantly negative around or immediately after the event and the cumulative abnormal differential return (*CADR*) defined as

$$CADR_t = \left(B^{Large} - B^{Small}\right) \times \sum_{\tau=t^*-T}^{t} \hat{\delta}_{1\tau}\, , t \in [t^* - T, t^* + T] \quad (2)$$

should also decrease significantly immediately after the bailout (or announcement) event. The variables B^{Large} and B^{Small} are the 75th and 25th percentile values of B_i in the sample, so the *CADR* is scaled by the interquartile range of bailout amount and captures the difference in cumulative abnormal returns between a bank with a large bailout (75th percentile) and a bank with a small bailout (25th percentile). In addition to the CADR, we will also report and provide statistics for the relative cumulative abnormal differential returns (*R-CADR*), which are simply the CADR relative to the pre-bailout event average differential returns $\bar{\delta}_{1PRE}$, i.e.

$$R - CADR_t = \left(B^{Large} - B^{Small}\right) \times \sum_{\tau=t^*-T}^{t} \left(\hat{\delta}_{1\tau} - \bar{\delta}_{1PRE}\right), t \in [t^* - T, t^* + T] \quad (3)$$

$$\bar{\delta}_{1PRE} = \frac{1}{T} \sum_{\tau=t^*-T}^{t^*-1} \bar{\delta}_{1\tau} \quad (4)$$

These relative CADRs clean for possible pre-event trends in the average abnormal returns of banks with different amounts of bailout funds and provide sharper evidence that the findings are driven by post bailout event differences. The analysis estimates and characterizes the evolution of these coefficients during a 10 (trading) day window following either the bailout (or announcement) event. Since the identification of the $\delta_{1\tau}$ coefficients comes across exclusively from the across-banks differences in abnormal returns, testing whether they differ from zero provides a sharp test of the hypothesis that the size of the bailout.

Bailout Size and Abnormal Return

To formally test the hypothesis that the size of the bailout has an effect on firm abnormal return, we first estimate a simple version of Equation (1) that includes only the amount of bailout funds that a bank received (in $ billion). The estimation results are reported in Table 2 and Figure 1. According to the results presented in Table 2, we can firmly reject the null hypothesis that the size of the bailout has no effect on firm value. The scaled abnormal differential returns of banks with large and small bailout (i.e. $\left(B^{Large} - B^{Small}\right) \times$

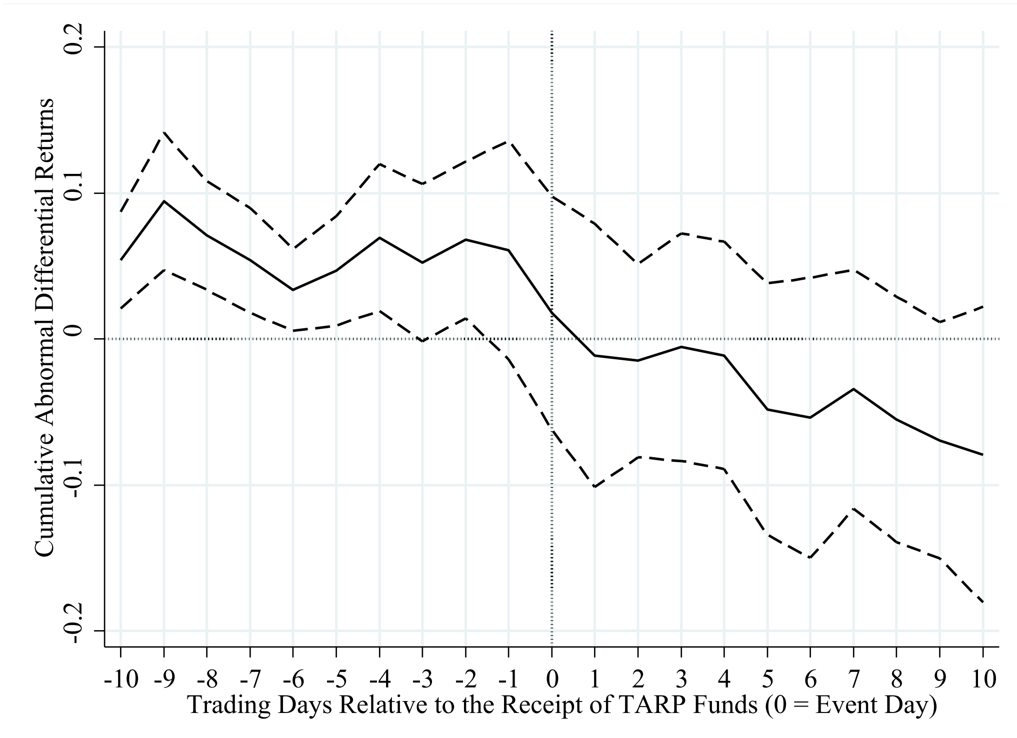
$\hat{\delta}_{1\tau}$, where B^{Large} and B^{Small} are \$0.125 billion and \$0.02 billion respectively) are positive on average before the event day, suggesting that the banks with large bailout performed relatively better than those with small bailout before they actually received the funds. However, the scaled abnormal differential returns turned out to be negative immediately after the banks received their bailout funds (except for day 3 and day 7), which means that the banks with large bailouts experienced a significantly larger stock price decline than those with small bailouts after the event. It seems that market penalized banks with large bailouts. See Appendix 1 for further results. If we take into account their relatively good pre-event performance, the negative abnormal returns experienced by banks with large bailouts become even more significant as shown in Table 3 and Figure 2. See Appendix 2 for further results.

Table 2: Point and Cumulative Abnormal Differential Returns of Banks with Large and Small Bailouts (Simple Specification)

Event Day	Point Estimation (Scaled)		CAR Estimation	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
–10	0.0541***	0.0201	0.0541***	0.0201
–9	0.0402***	0.0145	0.0944***	0.0286
–8	–0.0235***	0.0077	0.0708***	0.0226
–7	–0.0170**	0.0065	0.0539**	0.0217
–6	–0.0202**	0.0083	0.0337**	0.0170
–5	0.0130	0.0086	0.0467**	0.0227
–4	0.0227**	0.0106	0.0694**	0.0304
–3	–0.0171**	0.0077	0.0523	0.0326
–2	0.0156***	0.0055	0.0679**	0.0325
–1	–0.0071	0.0168	0.0608	0.0453
0	–0.0430***	0.0106	0.0178	0.0484
1	–0.0291***	0.0102	–0.0113	0.0546
2	–0.0036	0.0182	–0.0149	0.0401
3	0.0093	0.0101	–0.0056	0.0472
4	–0.0057	0.0152	–0.0112	0.0471
5	–0.0370***	0.0098	–0.0482	0.0522
6	–0.0059	0.0132	–0.0540	0.0582
7	0.0197	0.0170	–0.0344	0.0496
8	–0.0206**	0.0087	–0.0550	0.0509
9	–0.0145	0.0123	–0.0695	0.0490
10	–0.0098	0.0154	–0.0793	0.0614

Notes: The table shows the point and cumulative abnormal returns estimated using Markowitz's market model in a window of ten days before and ten days after the day of the receipt of TARP funds (the event day is specific to each bailout bank). The point and cumulative estimate of the average returns for the event are reported along their standard error. Standard errors are adjusted for heteroskedasticity. The return variables are defined in the text. The scaled point estimates are defined as $(B^{Large} - B^{Small}) \times \hat{\delta}_{1\tau}$. **, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively*

Figure 1: Cumulative Abnormal Differential Returns (CADR) Around the Receipt of TARP Funds



Notes: The figure shows the cumulative abnormal differential returns of the banks with large and small bailout (25th and 75th percentile of the amount of bailout funds that a bank accepted in the sample) in a window ten days before and after the bailout banks in the sample received the TARP funds (the event day is specific to each bank), along their 90% confidence bands. CADRs plotted in this figure are estimated using a simple version of Ncube and Hausken's (2019) Equation (10) that includes only a bank's bailout size B_i.

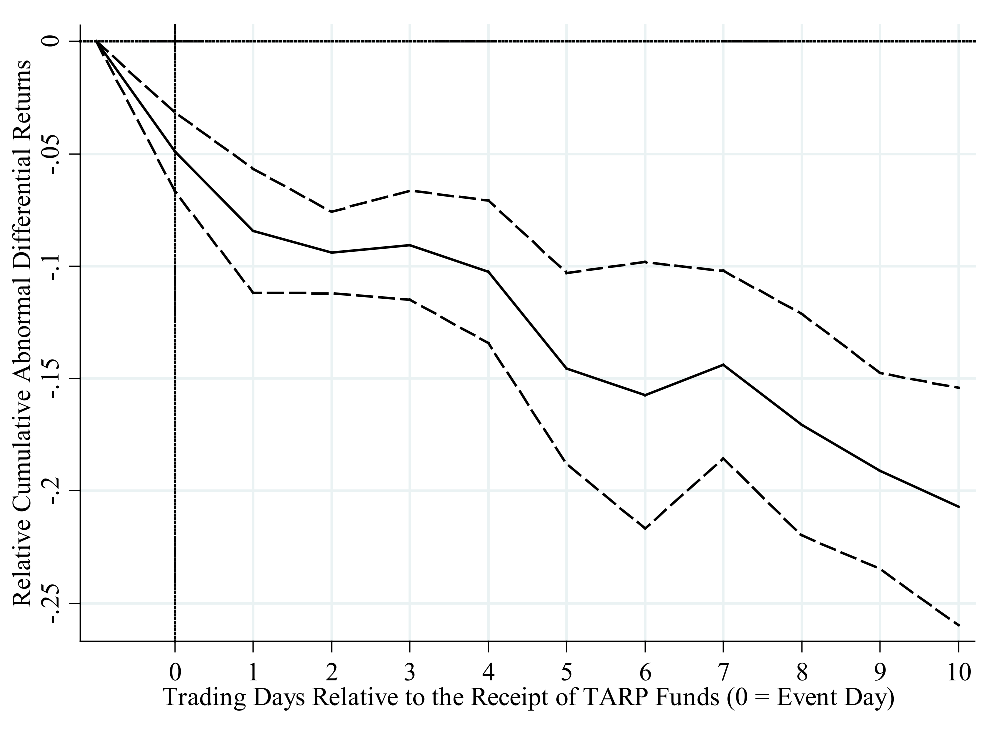
Table 3 and Figure 2 report the point and cumulative estimates of the differential abnormal return relative to the pre-event trends.

Table 3: Point and Cumulative Relative Abnormal Differential Returns of Banks with Large and Small Bailouts (Simple Specification)

Event Day	**Relative Point Estimation (Scaled)**		**CAR Estimation**	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
0	–0.0491***	0.0106	–0.0491***	0.0106
1	–0.0352***	0.0102	–0.0843***	0.0167
2	–0.0097	0.0182	–0.0939***	0.0110
3	0.0032	0.0101	–0.0907***	0.0147
4	–0.0118	0.0152	–0.1024***	0.0192
5	–0.0430***	0.0098	–0.1455***	0.0258
6	–0.0119	0.0132	–0.1574***	0.0359
7	0.0136	0.0170	–0.1438***	0.0253
8	–0.0267***	0.0087	–0.1705***	0.0299
9	–0.0206*	0.0123	–0.1911***	0.0264
10	–0.0159	0.0154	–0.2070***	0.0320

Notes: The table shows the point and cumulative relative abnormal returns estimated using Markowitz' market model in a window of ten days after the day of the receipt of TARP funds (the event day is specific to each bailout bank). The point and cumulative estimate of the average returns for the event are reported along their standard error. Standard errors are adjusted for heteroskedasticity. The return variables are defined in the text. The scaled relative point estimates are defined as $(B^{Large} - B^{Small}) \times (\hat{\delta}_{1\tau} - \bar{\delta}_{1PRE})$. **, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

Figure 2: Cumulative Abnormal Differential Returns Relative to Pre-Event Trend (Simple Specification)

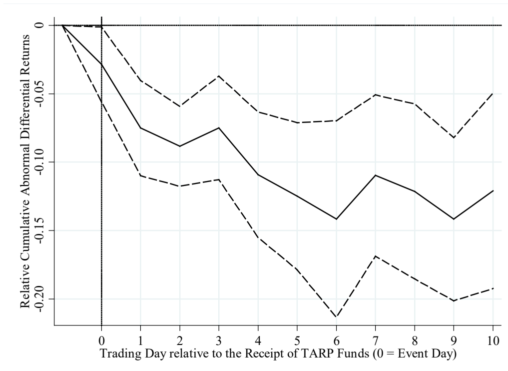


Notes: The figure shows the cumulative abnormal differential returns of the banks with large and small bailout (25th and 75th percentile of the amount of bailout funds that a bank accepted in the sample) relative to the pre-event trend in a window ten days after the bailout banks in the sample received the TARP funds (the event day is specific to each bank), along their 90% confidence bands. R-CADRs plotted in this figure are estimated using a simple version of Ncube and Hausken's (2019) Equation (10) that includes only a bank's bailout size B_i.

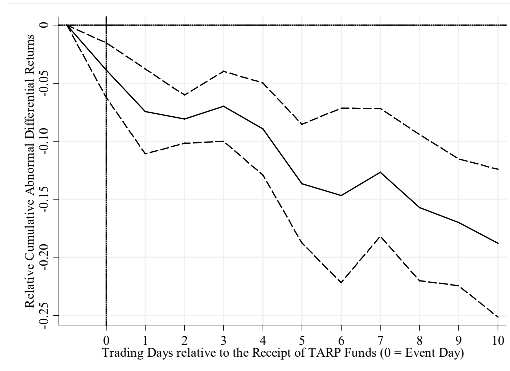
The concern with the results obtained from the simple specification of Equation (1) is that banks with different size of bailout funds may be systematically different in other characteristics that are the true determinants of their differential response to the event. To discard this possibility, we include in X_i' several important bank level characteristics that could be the differential response of banks to the receipt of TARP funds. The results, presented in Figure 3, control for the potential role of a bank's size, age, capital adequacy, asset quality, management quality, earnings, liquidity, and sensitivity to market risk, respectively. Bank size is defined as the natural logarithm of total asset at the end of the corresponding quarter; age is the number of years since establishment; capital adequacy is the ratio of tier 1 capital to total risk-weighted assets; asset quality is the ratio of noncurrent loans and leases to total loans and leases; management quality is the ratio of non-interest cost to net income; earnings is the ratio of net income to total assets; liquidity is the ratio of cash to deposits; and sensitivity to market (interest rate) risk is defined as the absolute difference (gap) between earning assets and interest-bearing deposit liabilities that are repriceable within one year or mature within one year. The results presented in Figure 2 provide a graphical view that the relative cumulative abnormal differential returns remain uniformly and significantly negative after controlling for the potential role of bank's size, age, and other characteristics such as CAMELS.

Figure 3: Cumulative Abnormal Differential Returns Relative to Pre-Event Trend Controlling for Bank Characteristics (Baseline Results)

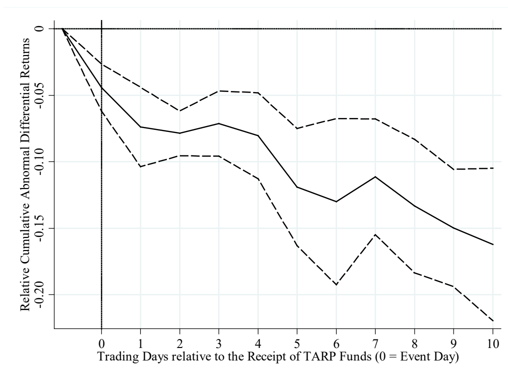
Panel A: Controlling for Size



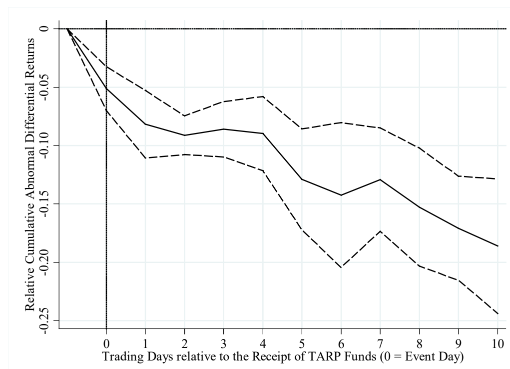
Panel B: Controlling for Age



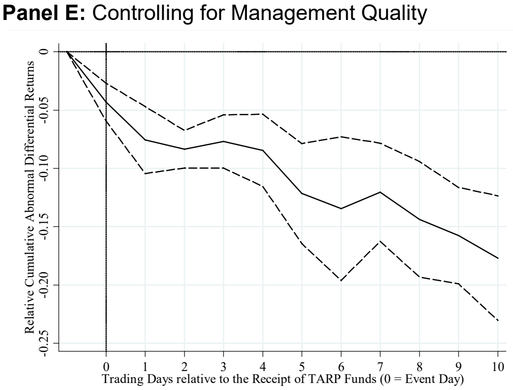
Panel C: Controlling for Capital Adequacy



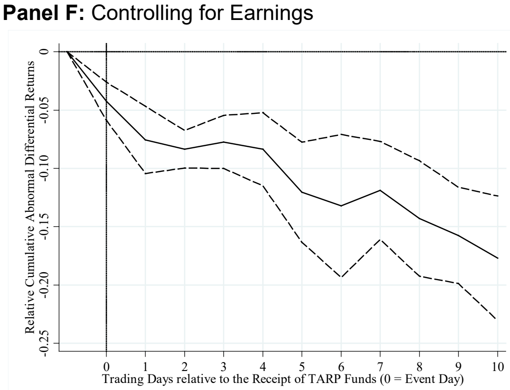
Panel D: Controlling for Asset Quality



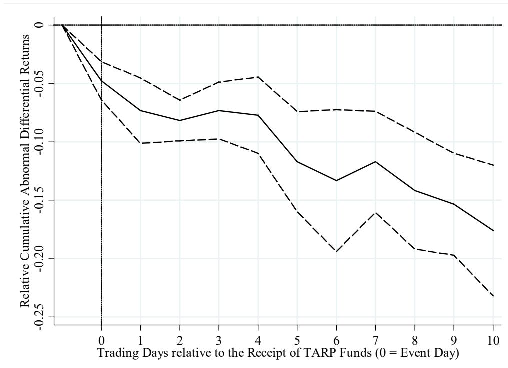
Panel E: Controlling for Management Quality



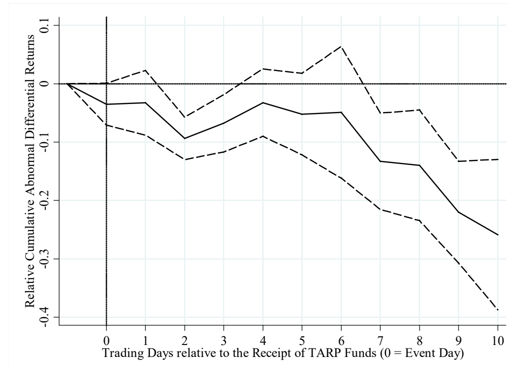
Panel F: Controlling for Earnings



Panel G: Controlling for Liquidity



Panel H: Controlling for Sensitivity



Notes: The figure shows the cumulative abnormal differential returns of the banks with large and small bailout (25th and 75th percentile of the amount of bailout funds that a bank accepted in the sample) in a window ten days after the bailout banks in the sample received the TARP funds (this event day is specific to each bank), along their 90% confidence bands. R-CADRs plotted in this figure are estimated using Ncube and Hausken's (2019) Equation (10) and controlling for each bank's size, age, capital adequacy, asset quality, management quality, earnings, liquidity, and sensitivity to market risk, respectively. Bank characteristics are defined in the text.

We also use the ratio of the amount of bailout funds received by a bank to the bank's tier 1 capital before the receipt as an alternative measure of bailout to estimate *CADR* and *R-CADR*, in order to investigate whether the absolute amount or the relative size of bailout funds had effect on banks' abnormal returns. The results are presented in Appendices 6 and 7. The scaled abnormal differential returns of banks with high and low bailout to tier 1 capital ratio BA_i is defined as $\left(BA^{High} - BA^{Low}\right) \times \hat{\delta}_{1\tau}$, where BA^{High} and BA^{Low} are 32.19% and 24.5% respectively. The estimated *CADR*s and *R-CADR*s suggest that there is no statistically significant evidence that banks at 75th percentile of bailout to tier 1 capital ratio performed differently from banks at the 25th percentile of bailout to tier 1 capital ratio within the event window of 10 days before and after they received their bailout funds.

<u>Buy-And-Hold Returns of Bailout and Non-bailout Banks</u>

In this section, we investigate the stock return performance of bailout banks relative to the non-bailout banks during the period from October 1, 2008 to March 31, 2009 (vast majority of the bailout banks received TARP funds during this period). The buy-and-hold returns (BHR) are computed in a manner used in Ng, Vasvari, and Wittenberg-Moerman (2015). More specifically, we compute buy-and-hold returns on the portfolios of bailout and non-bailout banks based on the daily returns from the first day of the period to the last day of the period (equally weighted). The percentage buy-and-hold return is calculated for bank *i* over the six calendar months as

$$BHR_i = \prod_{t=1}^{T}(1 + R_{it}) - 1 \tag{5}$$

Table 4 Panel A presents descriptive statistics for the full sample of banks and for each of the two bank portfolios. We start with a univariate analysis of the buy-and-hold returns on the bailout bank portfolio relative to the return on the non-bailout bank portfolio. This comparison is equivalent to an analysis of industry-adjusted returns of the bailout bank portfolio. We find that the buy-and-hold returns of both bank groups are highly negative during the period from October 1, 2008 to March 31, 2009. For all 293 banks in the sample, the average buy-and-hold return is -42.68%, with bailout banks performing worse relative to non-bailout banks. For this period of six months, the buy-and-hold return on the bailout banks is 5.8% lower than that on the non-bailout banks on average. The difference in buy-and-hold returns on bailout and non-bailout banks is statistically significant at 5% significance level. The univariate results confirm that accepting the TARP bailout funds could have signaled to the market that the bailout banks admitted to larger future losses than they had previously disclosed (see Hoshi and Kashyap, 2010).

Table 4: Buy-and-Hold Returns of Bailout and Non-bailout Banks

Panel A: Summary Statistics						
Variable	**Mean**	**Std. Dev.**	**Bailout**	**Non-Bailout**	**Difference**	***t*- statistic**
BHR	–0.4268	0.0141	–0.4557	–0.3977	–0.0580	–2.0656**
Beta	1.2240	0.3248	1.0633	1.3858	–0.3225	–0.4958
Size	12.5937	0.1069	12.9859	12.1989	0.7869	3.7608***
BTM	1.1650	0.0640	1.0310	1.3017	–0.2707	–2.1259**
Bailout-Dummy	0.5017	0.0293	1.0000	0.0000	N.A.	N.A.
Bailout-Amount	0.4997	0.1590	0.9960	0.0000	N.A.	N.A.
Bailout-ln(Amount)	9.2562	0.5444	18.4494	0.0000	N.A.	N.A.
Bailout-Ratio	0.1163	0.0084	0.2319	0.0000	N.A.	N.A.
No. of Obs.	293	0.0141	147	146	N.A.	N.A.

Panel B: Stock Performance from 2008 Q4 to 2009 Q1				
	(1)	**(2)**	**(3)**	**(4)**
Constant	–0.1470 (–1.41)	–0.2496** (–2.09)	–0.1750* (-1.67)	–0.1401 (–1.34)
Beta	0.0017 (0.69)	0.0019 (0.77)	0.0017 (0.68)	0.0018 (0.73)
Size	–0.0148* (–1.86)	–0.0093 (–1.01)	–0.0122 (–1.50)	–0.0164** (–2.07)
BTM	–0.0518*** (–3.96)	–0.0469*** (–3.56)	–0.0514*** (–3.95)	–0.0511*** (–3.90)
Bailout-Dummy	–0.0648** (–2.30)			
Bailout-Amount		–0.0115* (–1.95)		
Bailout-ln(Amount)			–0.0041*** (–2.64)	
Bailout-Ratio				–0.1777* (–1.83)
R-squared	0.0723	0.0675	0.0777	0.0660
F-statistic	5.57***	5.18***	6.02***	5.06***

*Notes: The table shows the buy-and-hold returns of bailout banks relative to non-bailout banks, during the period from October 1, 2008 to March 31, 2009. Bailout banks are the banks that received TARP fund by March 31, 2009. Panel A provides summary statistics and a univariate analysis of the difference in the buy-and-hold stock returns between bailout banks and non-bailout banks. Panel B provides the results of regressions that examine the differences in the returns during the same period of time. More specifically, buy-and-hold return is regressed on a bailout variable and Fama-French (1992) risk factors. Beta is market beta from regression of daily stock returns on daily market return over the period from September 17, 2007 to September 17, 2008. Size is the logarithm of the market capitalization of the bank, and BTM is the ratio of the book value of equity to the market value of equity at the end of September 2008. In our primary specification presented in Column (1), Bailout is a dummy variable that is equal to 1 if the bank received TARP funds, and zero otherwise. In the alternative specifications, we substitute the bailout dummy variable by the amount of bailout funds (in $billion) that received by the banks, the logarithm of the amount of bailout funds that received by the banks, or the ratio of the amount of bailout funds received by a bank to the bank's tier 1 capital. The alternative measure of Bailout take value of zero for non-bailout banks. The alternative specifications are presented in Columns (2) to (4) respectively as robustness analyses. t-statistic are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

In Table 4 Panel B, we estimate multivariate regressions that control for the Fama-French (1992) risk factors. Specifically, the regression model is specified as

$$BHR_i = \alpha_0 + \alpha_1 Bailout_i + \alpha_2 Beta_i + \alpha_3 Size_i + \alpha_4 BTM_i \tag{6}$$

where *Beta* is market beta from regression of daily stock returns on daily market return over the period from September 17, 2007 to September 17, 2008 (i.e. the normal period), *Size* is the logarithm of the market capitalization of the bank, and *BTM* is the ratio of the book value of equity to the market value of equity at the end of September 2008. In our primary specification presented in Column (1), the variable of interest, *Bailout*, is a dummy variable that is equal to 1 if the bank received TARP funds, and zero otherwise (Bailout-Dummy). The coefficient on the bailout indicator can be interpreted as the difference in the risk-adjusted returns between bailout and non-bailout bank portfolios. In the alternative specifications, we substitute the bailout dummy variable by the amount of bailout funds (in $ billion) that received by the banks (*Bailout*-Amount), the logarithm of the amount of bailout funds that received by the banks (*Bailout* - ln(Amount)), or the ratio of the amount of bailout funds received by a bank to the bank's tier 1 capital (*Bailout*-Ratio). The alternative measures of Bailout take value of zero for non-bailout banks. The alternative specifications are presented in Columns (2) to (4) as robustness analyses. Our primary specification is presented in Column (1). We find that, controlling for market beta, bank size, and book-to-market ratio, the bailout banks on average significantly under-performed the non-bailout bank by 6.48%. The robustness analyses results presented in Columns (2) to (4) suggest that banks that received greater amount of bailout funds are likely to be associated with more negative returns. The coefficients on the bailout variables are uniformly negative and statistically significant across all the specifications.

The Impact of TARP Bailout on Tail Risk

Empirical Strategy

In this section, we examine whether the changes in tail risk are different between bailout and non-bailout banks. Our analysis is based on the tail risk measures proposed by Adrian and Brunnermeier (2016), i.e. VaR and $CoVaR$. See also Engle, Jondeau, and Rockinger (2015). Value at risk, VaR , is the most common measure of risk used by financial institutions. Other measures of systemic risk (Brunnermeier, Dong, & Palia, 2012) could have been considered such as the Marginal Expected Shortfall (MES) which measures the decline in a stock per day if the whole markets declines by some percentage or the SRISK measure which measures the contribution of the institution to systemic risk. However, the VaR and $CoVaR$ approach seems adequate in assessing systemic risk as posited by Adrian and Brunnermeier (2016). Following Adrian and Brunnermeier (2016), we estimate VaR for both individual institution i and $CoVaR$ for the financial system as a whole via quantile regressions. More specifically, we run the following quantile regressions using weekly data from 2005 Q1 to 2010 Q4 (302 weeks), i.e.

$$X_{it} = \alpha_i + \gamma_i M_{t-1} + \varepsilon_{it} \quad (7)$$
$$X_{system,t} = \alpha_{system,t} + \beta_{system,t} X_{it} + \gamma_{system,t} M_{t-1} + \varepsilon_{system,t} \quad (8)$$

where X_{it} is the change in the assets value of bank i at time t as perceived by the market, i.e. $X_{it} = (A_{it} - A_{it-1})/A_{it-1}$, where A_{it} is the market value of the bank's total assets which is defined as product of the bank's market capitalization and the bank's asset-to-equity ratio, i.e. $A_{it} = ME_{it} \times LEV_{it}$, and M_{t-1} is a vector of lagged state variables, including VIX, liquidity spread, 3-month Treasury change, term spread change, credit spread change, equity return, and real estate excess return. The market capitalization makes use of the stock price of the institution. The detailed definitions and the descriptive statistics for the state variables are provided in Table A.1. Similarly, $X_{system,t}$ is the change in the asset value of the financial system, i.e. $X_{system,t} = \left(A_{system,t} - A_{system,t-1}\right)/A_{system,t-1}$, where $A_{system,t} = \sum_{i=1}^{N} A_{it}$. The parameters in Equations (9) and (10) are estimated by running a q^{th}-quantile regression. We then obtain the measures of VaR and $CoVaR$ by generating the predicted values from the quantile regressions, i.e.

$$VaR_{it}^{q} = \hat{\alpha}_i^{q} + \hat{\gamma}_i^{q} M_{t-1} \quad (9)$$
$$CoVaR_{it}^{q} = \hat{\alpha}_{system,t}^{q} + \hat{\beta}_{system,t}^{q} VaR_{it}^{q} + \hat{\gamma}_{system,t}^{q} M_{t-1} \quad (10)$$

Since VaR_{it}^{q} and $CoVaR_{it}^{q}$ are estimated as functions of a vector of lagged state variables M_{t-1}, they are time-varying as indicated by a subscript *t*. Throughout our analysis, we focus on the 1st-quantile which corresponds to the 1% *VaR* and *CoVaR*. The 1%-VaR of institution *i* at time *t*, $VaR_{it}^{1\%}$, is the maximum loss of the individual institution within the 1%-confidence interval, and thus $VaR_{it}^{1\%}$ is typically a negative number. $CoVaR_{it}^{1\%}$ is the 1% *VaR* of the whole financial sector conditional on institution *i* being in distress at time *t*. Therefore, 1%-quantile regression of the financial system returns are run on the financial institution i's asset returns and the lagged state variables to obtain $CoVaR_{it}^{1\%}$. Finally, we compute the Delta-CoVar for each institution as

$$\Delta CoVaR_{it}^{q} = CoVaR_{it}^{q} - CoVaR_{it}^{50\%} = \hat{\beta}_{system,t}^{q}\left(VaR_{it}^{q} - VaR_{it}^{50\%}\right) \tag{11}$$

$\Delta CoVaR_{it}^{q}$ measures the difference between VaR of the financial system conditional on the distress of a particular financial institution *i* and the *VaR* of the financial system conditional on the median state of the institution *i*. In other words, $\Delta CoVaR_{it}^{1\%}$ is the percentage point change in the financial system's 1% VaR when a particular institution i realizes its own 1% VaR at time *t*. Therefore, $\Delta CoVaR_{it}^{1\%}$ captures the marginal contribution of the particular institution *i* to the overall systemic risk.

Changes in Tail Risk of Bailout and Non-bailout Banks

The summary statistics for the estimated risk measures are presented in Table 5. It provides the weekly measures of risk we obtained from estimating 1%-quantile regressions. On average, the weekly market-valued total asset return (X_{it}) for the sample financial institutions is -0.05% during the period from 2005 Q1 to 2010 Q4, with a standard deviation of 6.64%. The mean of the maximum loss of the individual institutions within the 1% interval ($VaR_{it}^{1\%}$) is -11.99% with the standard deviation of 8.12%, while those for the financial system as a whole are 6.27% and 6.92% respectively. The mean marginal contribution of the individual institutions to the overall systemic risk ($\Delta CoVaR_{it}^{1\%}$) is -0.69%, and its standard deviation is 1.56%.

Table 5: Summary Statistics for Estimated Risk Measures

Variable	Mean	Std. Dev.	Observation
X_{it}	–0.0464	6.6387	97002
$VaR_{it}^{1\%}$	–11.9855	8.1200	100288
$\Delta CoVaR_{it}^{1\%}$	–0.6861	1.5566	100288
$VaR_{system,t}^{1\%}$	–6.2683	6.9202	302

Notes: The table reports summary statistics for the asset returns and 1% risk measures of the bank holding companies for weekly data from 2005 Q1 to 2010 Q4. X_{it} denotes the weekly market-valued assets return for bank i, where market-valued total assets is defined as $ME_{it} \times LEV_{it}$, i.e. the product of market capitalization and the ratio of book total asset to book equity. The individual firm risk measures VaR_{it} and the system risk measure VaR_{system} are obtained by running 1% quantile regressions of returns on the one-week lag of the state variables and by computing the predicted value of the regression. The quantile regression is specified as $X_{it} = \alpha_i + \gamma_i M_{t-1} + \varepsilon_{it}$ (Equation (7)), where M_{t-1} is a vector of lagged state variables. The risk measure Var_{it} is obtained from the predicted value of the quantile regression $VaR_{it} = \hat{\alpha}_i + \hat{\gamma}_i M_{t-1}$. $\Delta CoVaR_{it}$ is the difference between $1\% - CoVaR_{it}$ and $50\% - CoVaR_{it}$, where $q\% - CoVaR_{it}$ is the predicted value from a q% quantile regression of the financial system asset returns on the institution assets returns and on the lagged state variable, i.e. $X_{system,t} = \alpha_{system,t} + \beta_{system,t}X_{it} + \gamma_{system,t}M_{t-1} + \varepsilon_{system,t}$ (Equation (8)). We clean the weekly returns data by winsorising weekly returns at both top and bottom 1st percentile to correct for the unusual volatility that is caused by mergers, recapitalizations and other structural changes that is unrelated to the market perception of asset value. All quantities are expressed in units of weekly percentage returns.

To compare the changes in the tail risk of bailout and non-bailout banks, we calculate the changes in 1%-VaR and $\Delta CoVaR$ before and after the bailout banks received their TARP funds. We measure the change in 1-VaR, *Ch_*VaR, as the difference between the average of 1%-VaR before TARP initiation period (i.e.

2008Q3) and the average of 1%-VaR after the TARP initiation period (i.e. 2009Q2). Similarly, we measure the change in $\Delta CoVaR$, $Ch\_\Delta CoVaR$, as the difference between the average of $\Delta CoVaR$ in the quarter before the TARP initiation (i.e. 2008Q3) and the average of $\Delta CoVaR$ in the quarter after the TARP initiation (i.e. 2009Q2). More specifically, changes in the tail risk are computed as

$$Ch\_VaR_i^{1\%} = VaR_{i,2009Q2}^{1\%} - VaR_{i,2008Q3}^{1\%} \tag{12}$$

$$Ch\_\Delta CoVaR_i^{1\%} = \Delta CoVaR_{i,2009Q2}^{1\%} - \Delta CoVaR_{i,2008Q3}^{1\%} \tag{13}$$

Note that we define the TARP initiation period as 2008Q4 and 2009Q1 because only 3 bailout banks received their TARP funds after March 31, 2009. Table 6 Panel A provides univariate evidence on the changes in the two tail risk measures before and after the TARP initiation period for the full sample as well as the bailout and non-bailout bank partitions. We also provide the statistics for both $VaR_{it}^{1\%}$ and $\Delta CoVaR_{it}^{1\%}$ during different time periods, in order to show the movements in the two risk measures. It shows that, for both bailout and non-bailout banks, the average of the maximum loss of individual institutions ($VaR_i^{1\%}$) increases significantly in absolute value from the pre-TARP period to TARP initiation period, suggesting that the sample banks experience a greater tail risk from 2008Q4 to 2009Q1. $VaR_i^{1\%}$ then becomes less negative in the post-TARP period.

In each of the three periods, the difference in $VaR_i^{1\%}$ between bailout and non-bailout banks is statistically insignificant. On average, the changes in $VaR_i^{1\%}$ before and after TARP initiation ($Ch\_VaR_i^{1\%}$) is -4.08% with no significant difference between bailout and non-bailout banks, although the point estimates indicate that there is a greater increase in the tail risk of the bailout banks.

However, the marginal contribution of the individual institution to the overall systematic risk as measured by $\Delta CoVaR_i^{1\%}$ is significantly different between bailout and non-bailout banks for all the three periods. The bailout banks contribute much more to the overall systematic risk than the non-bailout banks do. Although $\Delta CoVaR_i^{1\%}$ for both bailout and non-bailout banks drop during the TARP initiation period, bailout banks experience a much more significant drop relative to non-bailout banks. The absolute difference in $\Delta CoVaR_i^{1\%}$ between bailout and non-bailout banks increases from 0.76% in the pre-TARP period to 1.31% in the TARP initiation period. Even though the absolute difference in $\Delta CoVaR_i^{1\%}$ reduces to 1.11%, it remains highly significant at the 1% significance level. The changes in the marginal contribution to the systematic risk before and after TARP initiation is also statistically significant. The mean $Ch\_\Delta CoVaR_i^{1\%}$ for bailout banks is -0.48%, and that for non-bailout banks is -0.13%, which means the increase in marginal contribution to systematic risk is much more substantial for the banks who received TARP bailout fund during the period from 2008Q4 to 2009Q1.

Table 6: Difference in Changes in Tail Risk Between Bailout and Non-bailout Banks

Panel A: Summary Statistics						
Variable	**Mean**	**Std. Dev.**	**Bailout**	**Non-bailout**	**Difference**	***t*- statistic**
Pre-TARP Period (2008 Q3)						
$VaR_{it}^{1\%}$	–13.7152	0.2410	–13.8335	–13.5960	-0.2375	–0.4922
$\Delta CoVaR_{it}^{1\%}$	–0.8138	0.0942	–1.1933	–0.4316	-0.7617	–4.1561***
TARP Initiation Period (2008 Q4–2009 Q1)						
$VaR_{it}^{1\%}$	–23.6542	0.4938	–24.3023	–22.9833	–1.3190	–1.3372
$\Delta CoVaR_{it}^{1\%}$	–1.2062	0.1543	–1.8492	–0.5406	–1.3086	–4.3714***
Post-TARP Period (2009 Q2)						
$VaR_{it}^{1\%}$	–17.7430	0.4385	–17.9631	–17.4959	–0.4673	–0.5313
$\Delta CoVaR_{it}^{1\%}$	–1.1451	0.1330	–1.6702	–0.5559	–1.1143	–4.3111***
Difference Before and After TARP Initiation						
$Ch\_VaR_{it}^{1\%}$	–4.0770	0.3904	–4.1296	–4.0179	–0.1117	–0.1426
$Ch\_\Delta CoVaR_{it}^{1\%}$	–0.3141	0.0584	–0.4768	–0.1314	–0.3454	–2.9963***
No. of Obs.	293		147	146		

Panel B: Change in $VaR_{it}^{1\%}$ Before and After TARP Initiation				
	(1)	**(2)**	**(3)**	**(4)**
Constant	–7.0305** (–2.31)	–7.3675** (–2.07)	–7.1676** (–2.33)	–7.0718** (–2.33)
Beta	–0.0280 (–0.42)	–0.0275 (–0.41)	–0.0284 (–0.42)	–0.0293 (–0.44)
Size	0.2579 (1.12)	0.2782 (1.03)	0.2738 (1.15)	0.2774 (1.21)
BTM	–0.2539 (–0.65)	–0.2402 (–0.61)	–0.2514 (–0.64)	–0.2584 (–0.66)
Bailout-Dummy	–0.1572 (–0.20)			
Bailout-Amount		–0.0332 (–0.20)		
Bailout-ln(Amount)			–0.0152 (–0.35)	
Bailout-Ratio				–2.2778 (–0.85)
R-squared	0.0089	0.0089	0.0092	0.0114
F-statistic	0.61	0.61	0.63	0.78

Table 7: Difference in Changes in Tail Risk Between Bailout and Non-bailout Banks (Continued)

Panel C: Change in $\Delta CoVaR_{it}^{1\%}$ Before and After TARP Initiation				
	(1)	(2)	(3)	(4)
Constant	2.0978*** (4.82)	2.2386*** (4.39)	2.0140*** (4.58)	2.1198*** (4.88)
Beta	0.0023 (0.24)	0.0031 (0.32)	0.0024 (0.24)	0.0025 (0.26)
Size	–0.1826*** (–5.53)	–0.2026*** (–5.22)	–0.1759*** (–5.18)	–0.1861*** (–5.70)
BTM	–0.0042 (–0.07)	–0.0057 (–0.10)	–0.0016 (–0.03)	–0.0043 (–0.08)
Bailout-Dummy	–0.2011* (–1.78)			
Bailout-Amount		0.0085 (0.36)		
Bailout-ln(Amount)			–0.0114* (–1.82)	
Bailout-Ratio				–0.6883* (–1.79)
R-squared	0.1379	0.1282	0.1384	0.1380
F-statistic	10.84***	9.96***	10.88***	10.85***

*Notes: The table shows the changes in tail risk of bailout banks relative to non-bailout banks, before and after the TARP initiation period. Bailout banks are the banks that received TARP fund by March 31, 2009. Panel A provides summary statistics and a univariate analysis of the difference in the buy-and-hold stock returns between bailout banks and non-bailout banks. Panel B provides the results of regressions that examine the differences in the returns during the same period of time. The four columns have the same interpretation as in Table 4 Panel B. More specifically, buy-and-hold return is regressed on a bailout variable and Fama-French (1992) risk factors. Beta is market beta from regression of daily stock returns on daily market return over the period from September 17, 2007 to September 17, 2008. Size is the logarithm of the market capitalization of the bank, and BTM is the ratio of the book value of equity to the market value of equity at the end of September 2008. In our primary specification presented in Column (1), Bailout is a dummy variable that is equal to 1 if the bank received TARP funds, and zero otherwise. In the alternative specifications, we substitute the bailout dummy variable by the amount of bailout funds (in $billion) that received by the banks, the logarithm of the amount of bailout funds that received by the banks, or the ratio of the amount of bailout funds received by a bank to the bank's tier 1 capital. The alternative measure of Bailout takes value of zero for non-bailout banks. The alternative specifications are presented in Columns (2) to (4) respectively as robustness analyses. t-statistic are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

Table 6 Panels B and C provide multivariate regression analysis of the changes in tail risk measures before and after TARP initiation. We regress the changes in tail risk measures on bailout variables and control for the Fama-French (1992) risk factors. In the model on the market risk, book-to-market ratio, bank size, bailout dummy, bailout amount, bailout ratio were included. Other factors such as bank non-interest income, reliance on short-term funding, and other macroeconomic factors, have not been included. The control variables are the Fama-French risk factors in the form of market risk(beta), book-to-market ratio and size of the bank. Specifically, the regression models are

$$Ch\_VaR_i^{1\%} = \alpha_0 + \alpha_1 Bailout_i + \alpha_2 Beta_i + \alpha_3 Size_i + \alpha_4 BTM_i \quad (14)$$

$$Ch\_\Delta CoVaR_i^{1\%} = \alpha_0 + \alpha_1 Bailout_i + \alpha_2 Beta_i + \alpha_3 Size_i + \alpha_4 BTM_i \quad (15)$$

where *Beta* is market beta from regression of daily stock returns on daily market return over the period from September 17, 2007 to September 17, 2008 (i.e. the normal period), *Size* is the logarithm of the market capitalization of the bank, and BTM is the ratio of the book value of equity to the market value of equity at the end of September 2008. In our primary specification presented in Column (1), the variable of interest, *Bailout*, is a dummy variable that is equal to 1 if the bank received TARP funds, and zero otherwise

(*Bailout*-Dummy). In the alternative specifications, we substitute the bailout dummy variable by the amount of bailout funds (in $ billion) that received by the banks (*Bailout*-Amount), the logarithm of the amount of bailout funds that received by the banks (*Bailout*-ln(Amount)), or the ratio of the amount of bailout funds received by a bank to the bank's tier 1 capital (*Bailout*-Ratio). The alternative measures of Bailout take value of zero for non-bailout banks. The alternative specifications are presented in Columns (2) to (4) as robustness analyses. Table 6 Panel B presents the regression analysis of the changes in $VaR_i^{1\%}$ before and after the TARP initiation period. The coefficients on the bailout variables are not statistically significant, but they are uniformly negative, suggesting a greater increase in the maximum loss within 1% confidence interval for the bailout banks relative to the non-bailout banks. In general, none of the regressions in Panel B are statistically significant, as indicated by the low R-squared and insignificant *F*-statistic.

Table 6 Panel C presents the regression analysis of the changes in $\Delta CoVaR_i^{1\%}$ before and after the TARP initiation period. The bailout variables turn out to be negative and significant at 10% level, except *Bailout*-Amount in specification (2). Relative to the non-bailout banks, bailout banks contribute more to the overall systemic risk after they received their TARP funds. Besides, the coefficients Size are negative and highly significant across all the specifications, showing that there is a substantial increase in the marginal contribution to the systemic risk of large banks. The regressions presented in Panel C are statistically significant at 1% significance level. Our findings suggest that the changes in the maximum loss of the individual institutions ($Ch\_VaR_i^{1\%}$) are unlikely to be caused by the initiation of TARP, while the increases in the marginal contribution of individual institution to the overall systemic risk as indicated by $Ch\_\Delta CoVaR_i^{1\%}$ are more substantial for the banks that received TARP funds.

CONCLUDING COMMENTS

In mid-September 2008 the US government launched the Troubled Assets Relief Program (TARP), the largest government bailout in US history, to stabilize the financial system. TARP was publicly unpopular, controversial among pundits, and closed December 19, 2014 with $15.3 billion profit (Isidore, 2014). This article analyzes the market response to the launch of TARP. We reject the null hypothesis that the bailout size has no effect on the firm's value. Banks receiving large bailouts experience a significantly larger stock price decline than banks receiving small bailouts. Bank level characteristics are incorporated into the analysis to account for large banks being systematically different from small banks which may impact results such as stock price. For the 293 banks in the sample, the average buy-and-hold return from October 1, 2008 to March 31, 2009 is 42.68%, with bailout banks performing 5.8% worse than non-bailout banks. Controlling for market beta, bank size, and book-to-market ratio, the bailout banks under-perform the non-bailout banks by 6.48%. For both bailout and non-bailout banks, the average maximum loss increases significantly in absolute value from the pre-TARP period to TARP initiation period, suggesting greater tail risk from 2008 Q4 to 2009 Q1. However, the bailout banks contribute much more to the overall systematic risk than the non-bailout banks do. The article shows that TARP helped restore investors' confidence, but did not make any meaningful change in tail risk.

Much evidence exists that indicators of governance and effective risk management in banks during times of financial stress are positively viewed by the market (Aebi, Sabato, & Schmid, 2012; Bayazitova & Shivdasani, 2012). It is clear also that TARP recipients have benefitted from competitive advantages increasing their market share and power (Berger & Roman, 2015). Ng et al (2016) confirm that TARP banks enjoyed lower equity returns when the program began but later benefitted from increased valuations. Our results along with the related literature emerging on TARP points to relevant policy implications. How far governments and central banks bail out banks should take account of risk taking, effect on competition, market share and market power, and the significance of maintaining investor confidence. The receipt of bailout funds can drive adverse market and investor sentiment. Such factors are critical to consider but need assessment of the specific socio-economic climate and political environment prevailing.

Appendix 1: Point and Cumulative Abnormal Differential Returns of Banks with High and Low Bailout Ratios (Simple Specification)

Event Day	Point Estimation (Scaled)		CAR Estimation	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
–10	–0.4698***	0.1367	–0.4698***	0.1367
–9	–0.0316	0.1482	–0.5014**	0.2420
–8	0.2412**	0.1168	–0.2603	0.2649
–7	–0.0857	0.1586	–0.3460	0.2100
–6	0.2471**	0.1141	–0.0989	0.2582
–5	–0.1609	0.0992	–0.2599	0.2339
–4	0.1552	0.1583	–0.1046	0.2991
–3	0.1403	0.1260	0.0356	0.3952
–2	0.0093	0.1430	0.0449	0.3909
–1	0.0764	0.1872	0.1213	0.3691
0	0.1066	0.2071	0.2279	0.4147
1	–0.0908	0.1589	0.1371	0.4352
2	0.0115	0.2330	0.1487	0.2687
3	–0.0379	0.1431	0.1108	0.3540
4	0.0791	0.0988	0.1899	0.3916
5	0.0810	0.1147	0.2709	0.4564
6	–0.0470	0.1025	0.2239	0.5158
7	–0.2758**	0.1101	–0.0519	0.4978
8	0.2721***	0.0997	0.2201	0.5504
9	0.1337	0.0858	0.3538	0.5690
10	0.2180	0.1543	0.5718	0.5088

Notes: The table shows the point and cumulative abnormal returns between banks with high and low bailout to tier 1 capital ratio BA in a window of ten days before and ten days after the day of the receipt of TARP funds (the event day is specific to each bailout bank). The point and cumulative estimate of the average returns for the event are reported along their standard error. Standard errors are adjusted for heteroskedasticity. The return variables are defined in the text. The scaled point estimates are defined as $(B^{Large} - B^{Small}) \times \hat{\delta}_{1\tau}$. **, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

Appendix 2: Point and Cumulative Abnormal Differential Returns of Banks with High and Low Bailout Ratios (Simple Specification)

Event Day	Point Estimation (Scaled)		CAR Estimation	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
0	–0.4698***	0.1367	–0.4698***	0.1367
1	–0.0908	0.1589	0.1371	0.4352
2	0.0115	0.2330	0.1487	0.2687
3	–0.0379	0.1431	0.1108	0.3540
4	0.0791	0.0988	0.1899	0.3916
5	0.0810	0.1147	0.2709	0.4564
6	–0.0470	0.1025	0.2239	0.5158
7	–0.2758**	0.1101	–0.0519	0.4978
8	0.2721***	0.0997	0.2201	0.5504
9	0.1337	0.0858	0.3538	0.5690
10	0.2180	0.1543	0.5718	0.5088

Notes: The table shows the point and cumulative relative abnormal returns between banks with high and low bailout to tier 1 capital ratios BA in a window of ten days after the day of the receipt of TARP funds (the event day is specific to each bailout bank). The point and cumulative estimate of the average returns for the event are reported along their standard error. Standard errors are adjusted for heteroskedasticity. The return variables are defined in the text. The scaled relative point estimates are defined as $(B^{Large} - B^{Small}) \times (\hat{\delta}_{1\tau} - \bar{\delta}_{1PRE})$. **, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.*

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