

The Hidden Cost of Bank Bailouts During the Recent Financial Crisis: How Much Did Taxpayers Pay?

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The objective of this paper is twofold. First, I quantify the value of moral hazard created by the problem of Too-Big-to-Fail during the recent financial crisis, which I accomplish via an examination of credit default swap (CDS) spreads. Then, I utilize the value of Too-Big-to-Fail is then utilized to compute the hidden subsidy that you – the taxpayer – shouldered in saving failing financial institutions on top of the massive bailout packages that the government implemented using your tax dollars.

Review of Literature

Financial Crisis of 2007

The Fed's performance in recent decades has been extraordinary, as it has been able to bring down inflation in the United States to the 2% level while the economy has been experiencing the longest business cycle expansion in history (Mishkin 2007). For most of this time, the Fed relied on conventional tools of monetary policy to promote a period of high economic growth by acting as an inflation fighter. Since the recent financial meltdown began, however, the Fed has had to abandon its role as an inflation fighter because it regarded "financial stability as a critical prerequisite for achieving its monetary policy objective of sustainable economic growth" (Board of Governors of the Federal Reserve System 2009). Thus, in order to mitigate the financial meltdown, the Fed, acting as the lender of last resort, undertook a series of complex unconventional actions when its conventional monetary policy tools were not enough to stabilize the economy.

In order to put a stopper during the tumultuous period in which Bear Stearns was on the verge of collapse in March 2008, the Fed established the TSLF (Term Securities Lending Facility) and the PDCF (Primary Dealer Credit Facility) to extend credit to financial institutions. At the height of the financial meltdown in September and October 2008, the Fed reacted to contain the financial spillover effects of the collapse of Lehman Brothers and AIG rescue through “credit easing.” Through this policy, the Fed purchased large amounts of Treasury securities and toxic assets like mortgage backed securities to restart specific markets and inject liquidity into faltering economy, which led the Fed’s balance sheet to double. By injecting liquidity into the market, the Fed attempted to stimulate aggregate demand and reduce widening credit spreads. Most notably, the Fed’s role has shifted from targeting interest rates to targeting credit spreads (Bernanke 2009). In order to reduce the problem of moral hazard, only financial institutions that are solvent but illiquid should have access to lender of last resort lending (Mishkin 2007). However, based on the Fed’s recent actions, it has indicated on several occasions that it would not allow too large, too complex or too interconnected firms to fail and has thus heightened the Too-Big-to-Fail (TBTF) dispute.

Credit Spreads

The existing literature investigates a multitude of relationships between corporate bond spreads and factors such as equity volatility, systemic risks, and liquidity (Zhang, B. et. al 2008; Guha & Hiris 2002; Garcia & Yang 2009). However, to my knowledge, there has been no study that has related the less transparent credit default swap market to the problem of moral hazard as I have accomplished in this paper.

Garcia and Yang (2009) examine corporate bond spreads during the recent financial crisis by decomposing yield spreads into two risks: Default and liquidity risks. They look at the yield spreads of target Canadian firms to examine the impact of three recent events – Bear Stearns liquidation of two

hedge funds in 2007, the Fed's promise to provide financing for JP Morgan to acquire Bear Stearns, and the downfall of Lehman Brothers – to liquidity and default components. Most notably, my paper differs substantially from that of Garcia and Yang because they are only interested how liquidity and default components of bond spreads have changed through the crisis, whereas I take their approach a few steps further: I relate changes in credit default swap markets to the value of Too-Big-to-Fail. Like Garcia and Yang, I pinpoint specific events during the recent financial crisis and take advantage of the information content in capital markets to investigate the changes spreads. Unlike Garcia and Yang, however, I utilize credit default spreads which were heavily traded during the recent crisis and have the relevant information that relates spreads to the value of TBTF. Unlike Garcia and Yang's decomposition of bond spreads into liquidity and default risks, I assume that CDS (credit default swap) spreads only contain default risk during the recent financial crisis.

Too Big To Fail

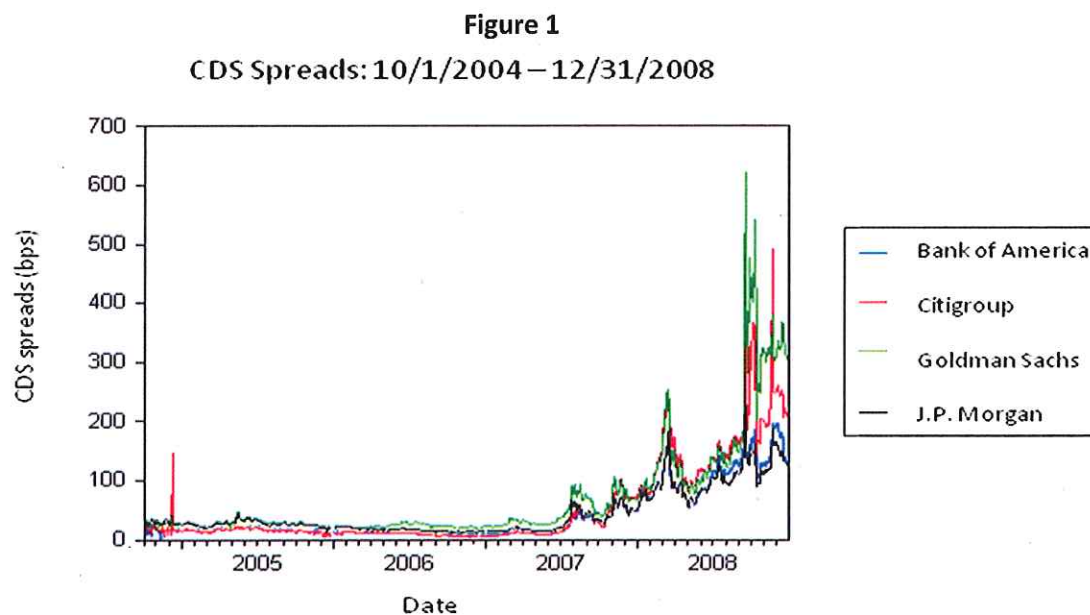
The TBTF moral hazard is not a new problem. The government bailout of Continental Illinois Bank for \$1 billion in May 1984 brought the problem of TBTF to the fore. In a hearing before a committee of financial institutions, the Comptroller of the Currency, Charles Conover, insisted that the US would not let large banks fail (Conover 1984). Later, a Wall Street Journal writer, Carrington published what he believed to be the 11 largest national US banks that Conover's testimony was referring to, and O'Hara and Shaw (1990) later find that the equity prices for the banks that were named TBTF rose 1.3% immediately after they were named. The bailouts of Bear Stearns, AIG, GM, Chrysler, Fannie, and Freddie reinforced the government's stance that they would contain financial contagion of institutions that are too interconnected that would cause spillover effects that would exacerbate systemic risk. These acts have, inevitably, expanded the safety net for banks and aggravated the TBTF phenomenon.

Baker and McArthur (2009) relate recent government bailouts during the financial crisis to interest rate spreads. They report that the spread between interest rates paid by smaller banks to obtain deposits and borrow funds and that of large banks have widened significantly since the recent financial crisis. In particular, the interest rate spreads between smaller banks and banks with assets in excess of \$100 billion averaged 0.29 percentage points from 2000 to 2007. After the government bailouts in 2008, the gap had widened to an average of 0.78 percentage points. Baker and McArthur thus examine the repercussions of the recent unprecedented government bailouts of large firms that substantiated the market's notion of Too-Big-to-Fail. In my study, I delve further into quantifying the actual *amount* of TBTF during the recent financial crisis by utilizing CDS spreads instead of interest rates spreads like Baker and McArthur. Furthermore, unlike Baker and McArthur, I take the problem of TBTF another step further: I use the value of TBTF obtained from CDS spreads to calculate the expected value that taxpayers would incur due to the problem of TBTF.

Economic Analysis

I forecast what CDS spreads should have been had there been no government intervention and compare this forecast with the actual CDS spreads in order to quantify the value of TBTF. Credit default swaps (CDSs) is a popular credit derivative contract that provides insurance against a default of a particular company. The buyer of the insurance makes payments to the seller of the contract, and will receive a payoff if the company goes into default. The spread of a CDS is the annual amount that a buyer must pay the seller of the CDS. In light of recent financial events, the CDS market has become even more crucial to understand, because they were connected with several of the bank failures that occurred – Bear and AIG were major CDS powerhouses. More importantly, CDS transactions were completed over the counter and there was little regulation and transparency in the CDS market that also contributed to the financial collapse and government bailouts (Brunnermeier 2009).

CDS spreads, by definition, quantify the cost of insuring a company against default. CDS spreads are highly liquid because they are constantly traded on the Street, and are highly responsive to market news and thus contain important information regarding the market's perceptions of a firm and the economy. CDS spreads can widen and narrow, depending on the market's perception of the stability of a company and macroeconomic conditions. Widening spreads reflect the market's perception of the default probability of the company. That is, widening spreads means that the cost of insuring a company against default increases. On the other hand, narrowing spreads mean that the cost of insuring a company against default has become cheaper because the market perceives the company to have a lower risk of default. During the recent financial crisis, CDS spreads were extremely volatile as the financial landscape of the US economy became increasingly ambiguous and tumultuous (refer to Figure 1).



The existing literature has suggested a number of firm-specific and macroeconomic factors that can affect CDS spreads. For instance, credit spreads are highly influenced by the probability of default of a firm; therefore credit rating announcements are highly scrutinized. Similarly, spreads widen with the

volatility of GDP growth, because firms are more likely to experience volatility in their cash flows during an uncertain economy and hence more likely to default. Credit spreads also widen during economic downturns due to the “flight to quality” phenomenon in which investors become more risk averse and are more likely to invest their money in less riskier projects. Macroeconomic condition accounts for approximately 6% of the overall variation in credit spreads and firm-specific factors account for a bigger portion of the overall variation of credit spreads (Tang and Yan 2009).

Although existing literature points to the possibility that CDS spreads can be decomposed into a company’s default and liquidity risk components, I assume that CDS spreads between July 2007 and December 2009 reflect purely the value of TBTF. This assumption is reasonable, because the recent financial crisis was driven primarily by a lack of liquidity in the financial market thereby making banks reluctant to provide credit in a shaky economy. Therefore, the fluctuations in CDS spreads were driven primarily by the market’s view on the probability of default of a company, which is essentially the value of Too-Big-to-Fail that the market priced a company. The value of CDS spreads in basis points (bps) that I measure can therefore be fully attributable to the default probability of firms that the market perceives.

Data

Identifying Key Institutions

This paper focuses on institutions that the government and the market believe to be TBTF. In past studies, the measure of the market size of a financial institution was utilized to evaluate whether it was TBTF. The recent financial meltdown has highlighted the fact that this methodology is insufficient in identifying Too-Big-to-Fail institutions, as it was proven early on with the bailout of Bear Stearns that an institution need not be Too-Big-to-Fail, but can instead be Too-Complex-to-Fail to land itself on the

bailout list. For this reason, data was obtained for financial institutions that a seasoned Wall Street professional would likely believe to be on the government's bailout list.

After zeroing in on the key players of interest, the institutions were restricted to only U.S. based firms: Goldman Sachs, American International Group, American Express, Bank of America, Bear Stearns, Citigroup, J.P. Morgan Chase, Lehman Brothers, Merrill Lynch, Morgan Stanley, Wachovia Bank, and Ford Motor Company.

CDS Spread Data

Five-year CDS spread data are obtained for each institution from Bloomberg, which provides the annual amount that a buyer must pay the seller of the CDS in terms of basis points (bps). The sample consists of daily trading CDS spread data for the period between October 2004 and December 2009. Data for Bear Stearns is unavailable past March 2008 and data for Lehman Brothers is unavailable past September 2008.

Control Variables

Following the prevalent practice in the existing economic literature, several variables were chosen and tested for statistical significance in forecasting the spread of CDS for each institution. Equity volatility (annualized standard deviation of 30 day daily closing stock prices for each firm) was obtained from Compustat, and the following variables were obtained from Bloomberg: The VIX Index, which is a popular measure of the implied volatility of the S&P 500 index options; return on equity of each firm (net income of the firm after tax divided by shareholder's equity), and price-to-book value of each firm (share price divided by the tangible book value per share).

Several other firm-specific and macroeconomic variables were obtained and tested for statistical significance in forecasting CDS spreads. However, in the end, a parsimonious forecast provided the best

forecast which included the VIX index, equity volatility, return on equity, and price-to-book value of each firm. This is consistent with existing literature which shows that CDS spreads are often influenced by firm-specific factors as well as macroeconomic factors.

Regime Switch

During the recent financial crisis, the Treasury and the Federal Reserve resorted to unprecedented policies in an effort to stabilize the economy. Announcements such as decreases in federal funds rates, government bailouts, and new lending facilities were plentiful and all are well documented in the Crisis Timeline obtained from the website of the New York Federal Reserve. Five event days are selected, and the econometric model is utilized to forecast what CDS spreads should have been for each institution had there not been government intervention on the specific event days.

Econometric Model

I construct a model to forecast CDS spreads had there been no government intervention during the recent financial crisis. The statistical significance of the difference between the forecasted spreads and observed spreads is assessed whether the observed spreads fall in the 5% error bands of the forecasted values of spreads. If the observed value of the spread falls within the 5% error band, then the residual (residual = forecasted spreads – actual spreads) is not significant and there is no TBTF to be measured. On the contrary, if the actual spreads fall outside the 5% error bands of the forecasts, then the residual is significant and will be the measure of the value of TBTF. Based on past literature that assess the time lag between an unexpected shock and its impact on equity prices, it is found that equity prices adjust very quickly to unexpected shocks. Similarly, I operate under the assumption that the CDS market reacts quickly to shocks; therefore, I examine the residuals on the day of the government intervention event and two days afterwards to get an aggregate measure of TBTF for a three day period.

An OLS regression is utilized to investigate the effects of firm-specific and systemic effects on the determination of CDS spreads for institutions. The following regression is utilized for each firm:

$$CDS\ Spread_{i,t} = \beta_0 + \beta_1 VIX_{i,t-1} + \beta_2 PB_{i,t-1} + \beta_3 PVol_{i,t-1} + \beta_4 ROE_{i,t-1} + \varepsilon_{i,t}$$

$$\varepsilon_{i,t} = \varphi_1 \varepsilon_{i,t-1} + \varphi_2 \varepsilon_{i,t-2} + \mu_{i,t}$$

where $\varepsilon_{i,t}$ is an error term that follows an autoregressive process of order two. VIX is the logarithm transformation of the VIX index. PB is the price-to-book value of each firm, calculated as the share price divided by the tangible book value per share. $PVol$ is the 30 day volatility of the equity of each firm, calculated as an annualized as a 30 day standard deviation of equity prices. ROE_i is the return on common equity of each firm, calculated as the net income of the firm after tax divided by shareholder's equity. ROE measures a firm's efficiency at generating profits from every unit of shareholders' equity, and shows how well a company uses its equity to generate earnings. Autoregressive functions of order one and two are included in the model in order to capture the serial correlation inherent in CDS Spreads. An AR(2) model was selected based on observing the correlogram of CDS spreads for each firm which indicated that an AR(2) would be optimal. This was further confirmed by examining the Schwarz Information Criterion that pointed to an AR(2) because it minimized the mean squared error of the regression the most.

VIX should have a positive effect on CDS spreads because economic conditions deteriorate when the market volatility is high. The price-to-book value should have a negative effect on CDS spreads because a low price-to-book value signals that equity markets expect a problem in the company. The equity volatility, $PVol$, should have a positive effect on credit spreads because higher equity

volatility often implies higher asset volatility; therefore, the market believes the firm value is more likely to hit default levels. Finally, ROE should have a negative effect on spreads because the probability of default is lower when the firm's profitability improves.

Empirical Results

The changes in CDS spreads tell a vivid story of market expectations after government intervention programs, and the following sections describe these stories in greater detail. Five events are considered in which I believe a government intervention may have aggravated Too-Big-to-Fail:

1. 3/14/2008 – J.P. Morgan receives emergency lending from the Fed to acquire Bear Stearns
2. 9/7/2008 – Fannie Mae and Freddie Mac are placed in Federal conservatorship
3. 9/15/2008 – Lehman Brothers file for Chapter 11 bankruptcy
4. 9/29/2008 – The Fed provides liquidity to Citigroup to bail out Wachovia
5. 10/14/2008 – 9 large banks get capital injection

Event 1 confirms the market's belief that the government will not allow Too-Big-to-Fail institutions to fail. Before the onset of the financial crisis during the summer 2007, credit spreads were relatively low even though scholars were calling attention to the danger of over-the-counter derivatives. Spreads before the financial crisis thus reflect the market's confidence that the government would provide a safety net for certain TBTF financial institutions even if they took on increasingly riskier projects. Event 2 illustrates how markets distinguish government owned enterprises (Fannie and Freddie) from private sector financial institutions. Evidently, investors react differently when government-owned enterprises face government intervention compared to when private sector banks face government intervention. Event 3 is an example of the government's attempt to mitigate the growing problem of Too-Big-to-Fail by letting a large institution, specifically Lehman Brothers, to fail. Event 3 also illustrates the repercussions of the government's efforts to quash TBTF on the remaining financial institutions. Event 4 examines the changes in the value of TBTF for Wachovia, which was at the center of a bidding war between Citigroup and Wells Fargo. Thus, Event 4 represents CDS spreads represent the market's

perceptions of the inherent value of a TBTF company. Finally, Event 5 is an example of the government further aggravating the problem of Too-Big-to-Fail by giving money away to nine financial institutions that need it most.

Finally, it is important to keep in mind that:

$$\text{Value of TBTF} = \text{Forecasted CDS spreads} - \text{Observed CDS spreads}$$

Event 1: March 14th, 2008. J.P. Morgan receives emergency lending from the Fed to acquire Bear Stearns

In early March 2008, word began to spread among traders that European banks had stopped trading with Bear Stearns, which led to a domino effect: US traders began to pull their cash from Bear for fear it could get locked up if it tumbled into bankruptcy. Eventually, fear amongst the financial industry intensified when The Wall Street Journal reported that firms were growing cautious about their dealings with Bear, which led its CEO, Alan Schwarz, to make a statement on CNBC to assert that the firm's "balance sheet, liquidity and capital remain strong." However, the mere mention of a liquidity crisis sparked panic, and within 24 hours of Schwarz's announcement, Bear was in a death spiral towards bankruptcy. By the morning of the 14th, the New York Fed agreed to provide financing to J.P. Morgan to aid in the acquisition of Bear. Officials knew that a bailout situation would further aggravate the moral hazard phenomenon of Too-Big-to-Fail, but letting Bear fail was potentially far worse: Bear risked defaulting on repo loans and other financial instruments that would bleed over to other financial institutions and thereby amplify the financial crisis.

The observed spreads for Bear Stearns and Goldman Sachs, a firm in the same industry as Bear, during Event 1 as well as the forecasted spreads are shown in Figures 2 and 3, respectively. As Figure 2 illustrates, the observed CDS spread for Bear Stearns plummets significantly after the announcement of

the government bailout. This is in contrast with the forecasted upward trending CDS spread that the model predicted. The forecasted upward trend is based on market information before the bailout announcement, and reflects what CDS spreads for Bear Stearns should have been had there been no government intervention. Similarly, Figure 3 showcases the forecasted and actual CDS spread for Goldman Sachs. Although Goldman Sachs was not directly involved in the government bailout of Bear Stearns, Goldman Sachs spreads decreased significantly as well after the bailout. The forecasted Goldman Sachs, on the other hand, show an upward trending CDS spread had there been no government intervention of Bear.

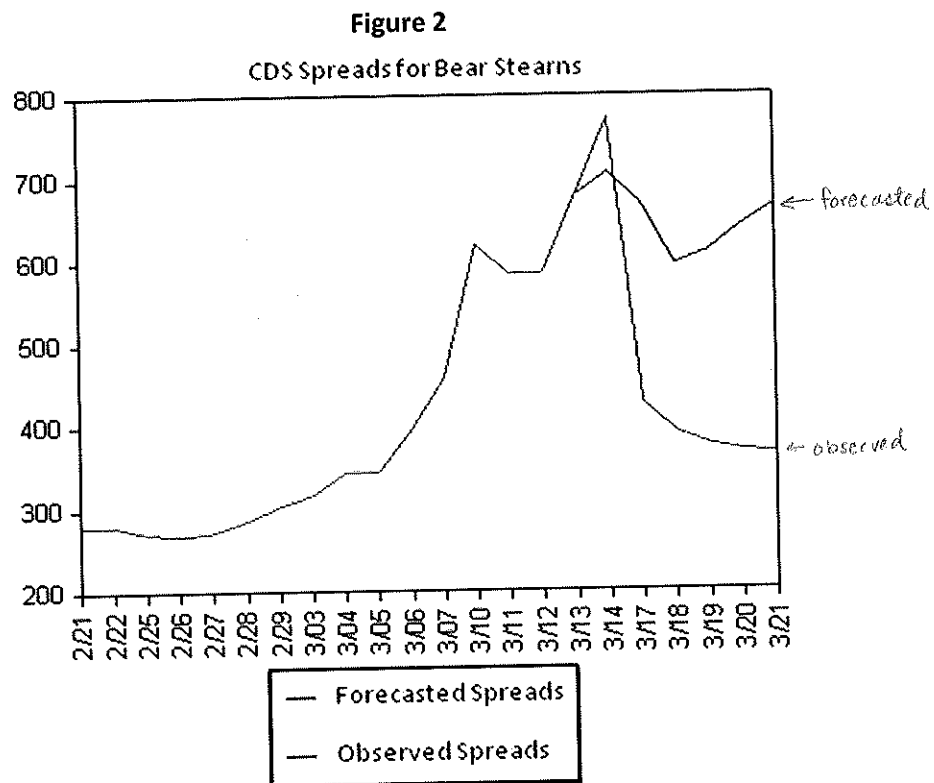
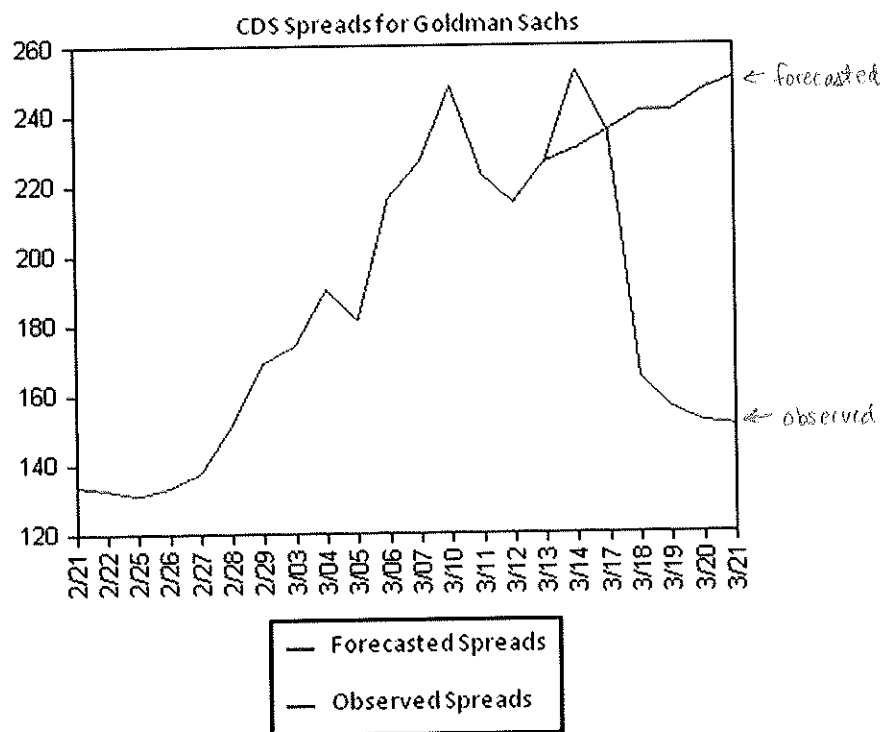


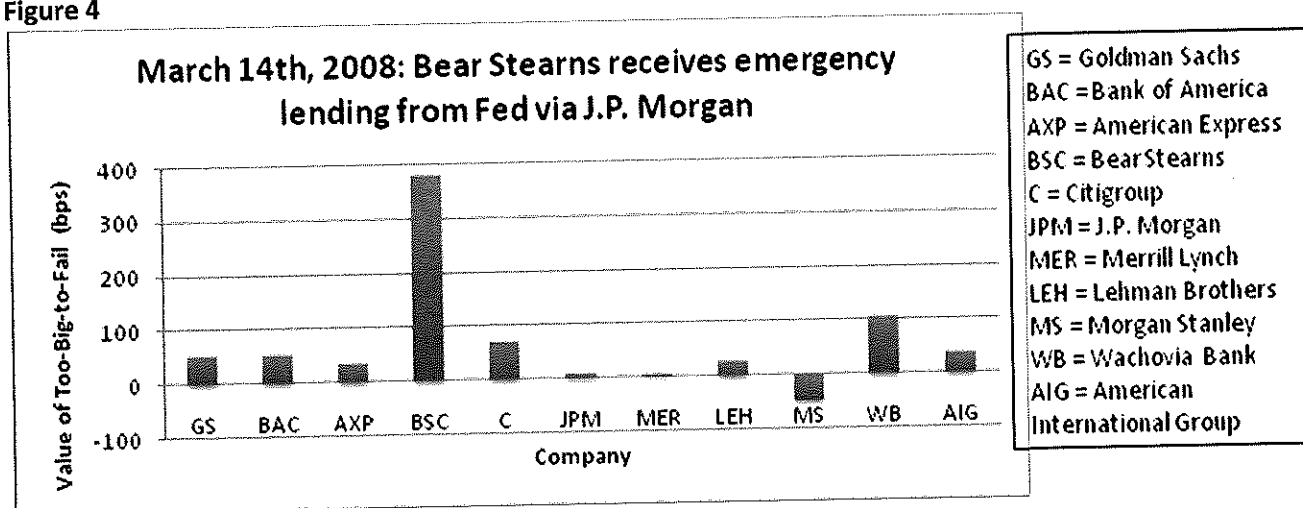
Figure 3



Prior to the collapse of Lehman Brothers on 9/15/2008, markets believed that the government would not allow TBTF institutions fail. This is substantiated by CDS spreads of 11 major financial institutions examined that are narrow during the period between October 2007 and July 2007, even though the problem of TBTF has long been recognized. After July 2007 and up to the bailout of Bear Stearns, spreads began to widen. The government bailout of Bear Stearns on 3/14/2008 is monumental: It was arguably the first intervention that directly confirmed that the government would not allow a firm that is TBTF to fail. CDS spreads, in response to the government's bailout, narrowed for 10 of the 11 financial institutions because the market perceived that these institutions had a government safety net to back their fall. The Fed's bailout aggravated the problem of TBTF, which the data reflects: The firms in Event 1 exemplified on average an increase in TBTF of 66.6 bps, with Bear Stearns as the leader in its value of TBTF with 378.136 bps (refer to Figure 4). This spike in the value of TBTF for Bear Stearns is significant because it signals the fact that investors became more confident in

the company after the government's backing. This is important because the nature of Bear's business did not miraculously change on March 14th - Bear still had toxic assets on its balance sheet and was still illiquid. However, the fact that the cost of insuring Bear Stearns was significantly reduced signals that the market believed that the company had a lower risk of default.

Figure 4

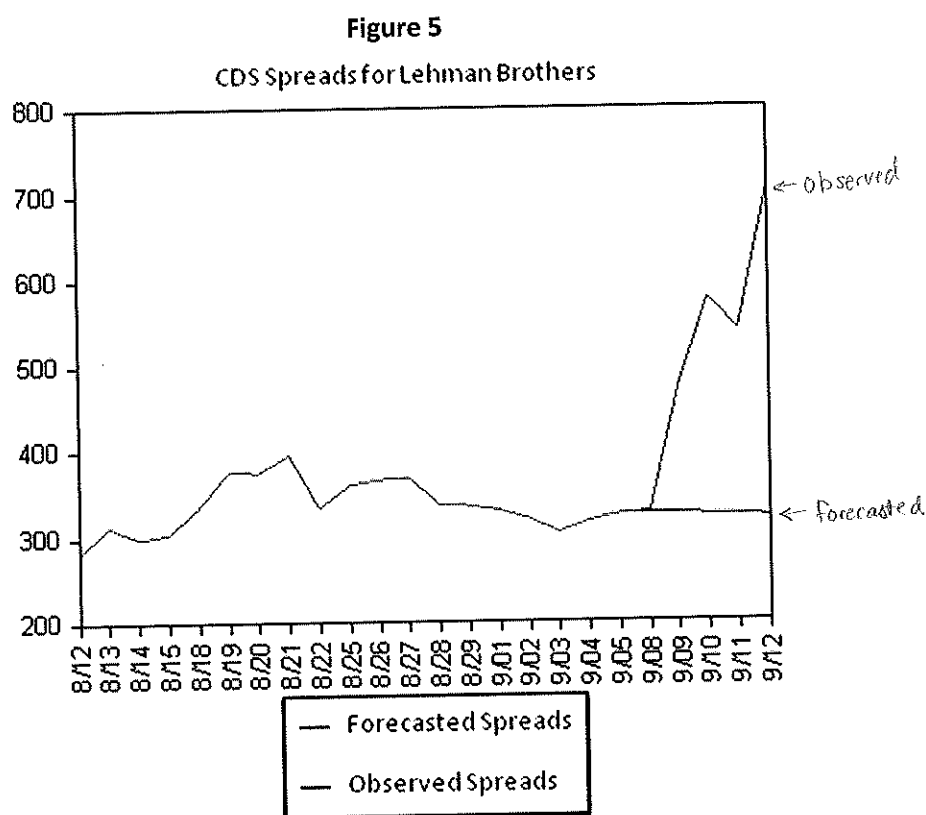


Event 2: September 7th, 2008. Fannie Mae and Freddie Mac are placed in Federal conservatorship

Fannie and Freddie were originally created as government-sponsored enterprises to ensure that financing for homes would be available and affordable to more households. The two firms buy mortgages from banks and other lenders and bundle them together into securities which are then sold to investors with a guarantee that they will be paid the money owed by homeowners. However, during July 2007 and up to September 2008, homeowners began to default on mortgages. The firms quickly reported losses of \$100 billion and were eventually placed into conservatorship by the Federal Housing Finance Agency.

The observed spreads for Lehman Brothers during Event 2 as well as the forecasted spreads are shown in Figure 5. Figure 5 illustrates the significant increase in the observed CDS spread for Lehman

increases after the announcement of the government conservatorship. This is in contrast with the forecasted credit spread which should be relatively flat. The forecasted trend is based on market information before the government intervention, and reflects what CDS spreads for Lehman should have been had there been no government intervention. In comparison to the other financial institutions examined in this event, Lehman Brothers showed the most change in the value of TBTF.

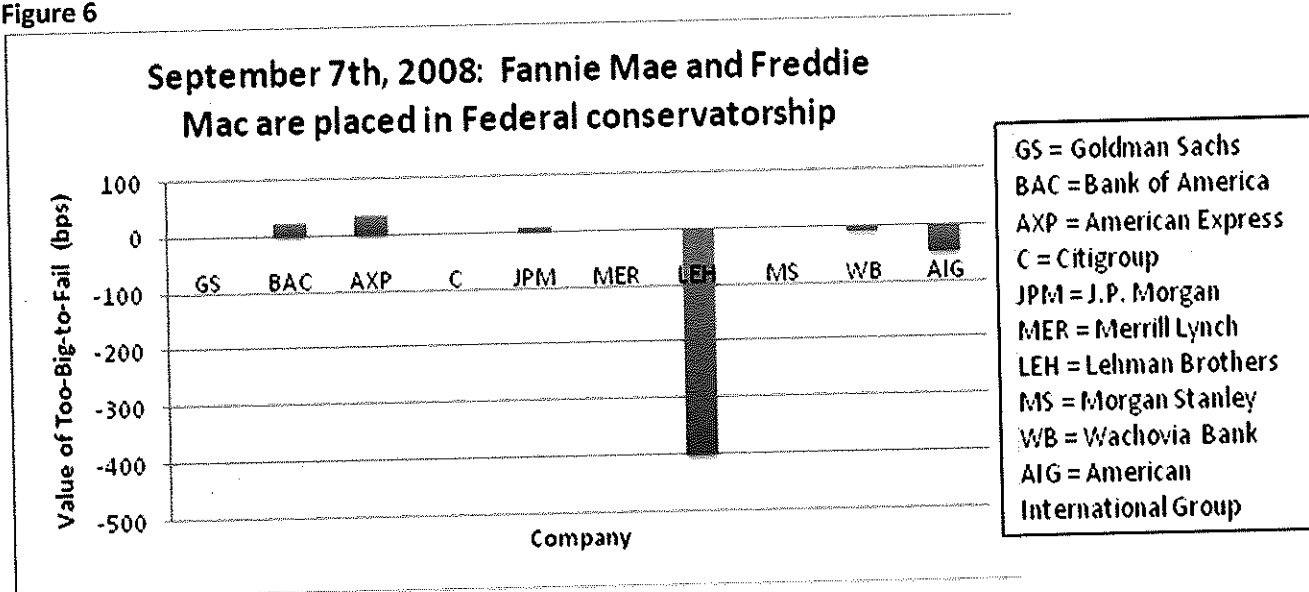


The results of the study indicate an average decline in TBTF of 39.8 bps when Fannie and Freddie were placed in the hands of the government. Amongst the five events considered, the value of TBTF is lowest during Event 2. Four banks experienced no change in the value of TBTF. The results reflect that the market considers Fannie and Freddie distinct from the private financial sector, because they always had ties to the government. Thus, government intervention in already government-sponsored entities has little effect on the market's expectation of whether the government would intervene in future financial crises for private institutions. Also, the lack of response in CDS spreads from the Fannie and

Freddie announcement may suggest that investors were wary of celebrating the government bailout too soon due to the fact that there were impending clouds of doom in the horizon surrounding the collapse of Lehman Brothers.

One data point stands significant amongst the others – the value of TBTF for Lehman Brothers was -402.5 bps (Refer to Figure 6). In other words, the CDS spreads of Lehman widened significantly more than what my model predicted, which points to the market's perception that Lehman was at an extreme risk of default. The decline in the value of TBTF for Lehman correlates with the company's announcement of a third quarter loss of \$3.9 billion on 9/10/2008. This extreme drop in the value of TBTF indicates a change in the market's perceptions that Lehman may not be a large enough firm to be bailed out, regardless of the government's previous actions that indicated that they would bail out TBTF firms.

Figure 6



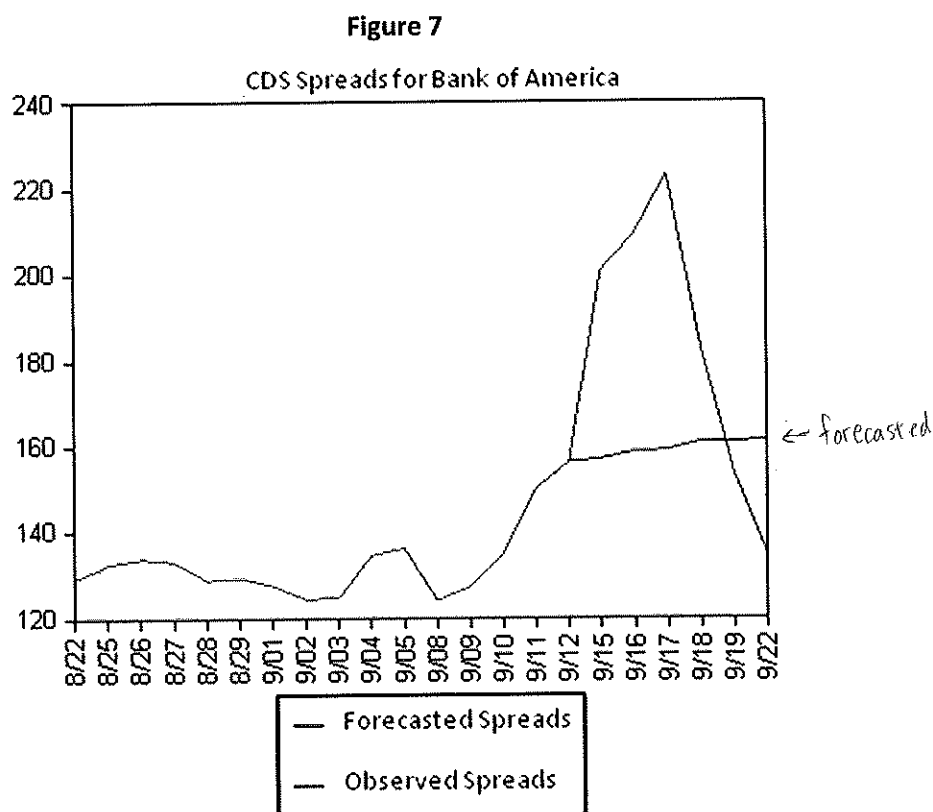
Event 3: September 15th, 2008. Lehman Brothers file for Chapter 11 Bankruptcy

After the government takeover of Fannie and Freddie, some observers wondered if Lehman would be the next financial giant to land itself on the bailout list. Lehman's declines came after the announcement that Korea Development Bank pulled out of negotiations with Lehman in August 2008. The firm's shares precipitously dropped, which reflected the nervousness in the market because shares of Lehman were heavily exposed to troubled real estate investments. As the company scrambled to raise capital and rumors of trouble mounted, its shares fell further, creating a self-fulfilling cycle in which the company had even more trouble raising capital.

On September 11th, Lehman began shopping for potential buyers even though it had insisted that it had found a way to improve its massive capital losses. This sense of urgency narrowed the list of potential buyers who were already wary about exposing themselves to potential losses that may be lurking in Lehman's balance sheet that the company had been loath to provide details about. Over the weekend, when the Treasury rescued Fannie and Freddie, Lehman executives grew heartened about potential government assistance. However, on September 15th, Lehman was forced into filing for bankruptcy.

The actual observed spreads for Bank of America during Event 3 as well as the forecasted spreads are shown in Figures 7. Figure 7 shows that the observed CDS spread for Bank of America spiked significantly. This increase in the actual spread is attributed to the market reacting to the government allowing Lehman Brothers to fail. In other words, when Lehman was allowed to fail, other financial institutions previously perceived to be TBTF were also believed to be in danger and which in turn decreased the value of TBTF. This is in contrast with the forecasted credit spread, which should be

relatively flat. The forecasted trend is based on market information before the government intervention, and reflects what CDS spreads for Bank of America should have been had there been no government intervention.



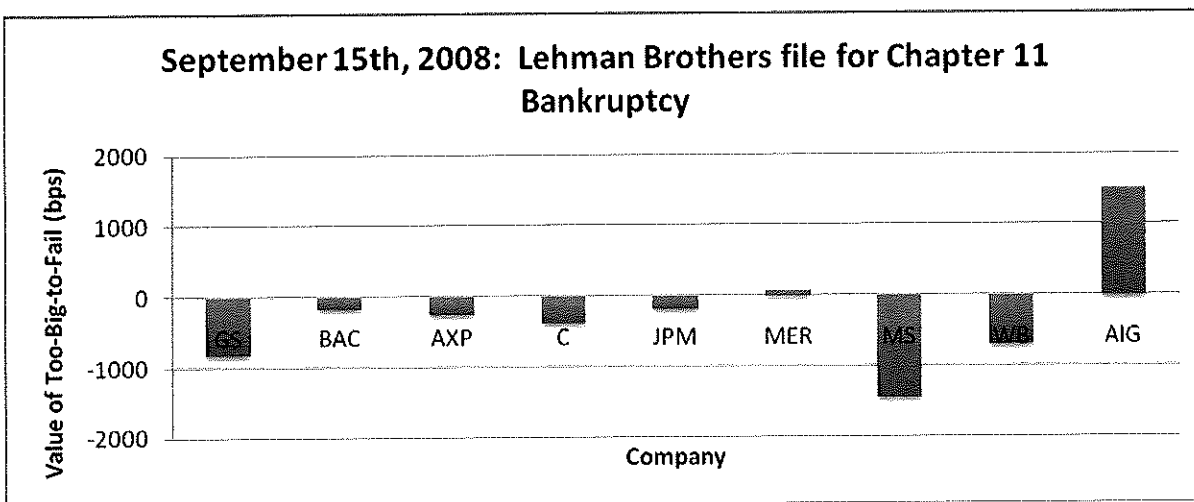
The news of Lehman's bankruptcy shattered the financial sector and significantly decreased the value of TBTF for 7 out of the 9 institutions examined in this study. That is, the data shows that the spreads of 7 institutions widened significantly relative to the forecasted spreads. Evidently, the government's decision to allow Lehman to fail signaled to the market that despite the Fed's recent track record of bailing out institutions like Bear Stearns, it will not always come to the rescue. September 15th marked the day in which banks realized that taking on too much risk could land them in the same shoes that Lehman eventually found itself. The collapse of Lehman and the decreasing value of TBTF led shaky financial institutions like Goldman Sachs and Morgan Stanley to apply to be bank holding companies six

days later. Being a bank holding company would hold them to higher regulatory standards and a lower risk of default.

It is also important to note that on 9/15/2008, Bank of America purchased Merrill Lynch. This is reflected in an increase in the value of TBTF for Merrill, which is significant amidst the decreases in the value of TBTF for all other financial institutions (Refer to Figure 8). The decrease in Merrill Lynch's credit spreads reflects that financial institutions receive substantial benefits for becoming even more large and complex, which further incentivizes "too small to save" banks to merge to elevate themselves to TBTF status. (Penas and Unal 2004). The rise in the value of TBTF for Merrill and the fact that Bank of America has the smallest decrease in the value of TBTF relative to other financial institutions show the market's perceptions that when two banks merge, they become an even larger financial institutions with a potentially larger value of TBTF. The decrease in the value of TBTF for Bank of America also signifies that the market believes that its acquisition of Merrill Lynch was overpriced. In other words, the market believes that Bank of America had become riskier with the acquisition as indicated by its widening credit spreads. If the market believed that the acquisition was fairly priced and beneficial for both companies, then Bank of America's value of TBTF should not have decreased.

In addition to Lehman's bankruptcy, 9/16/2008 marked the day in which AIG first received government bailout money of \$85 billion. Consequently, the value of TBTF for AIG was 1502.5 bps (basis points), which is significantly large in comparison to the average TBTF value of -293.22 bps.

Figure 8



Event 4: September 29th, 2008. The Fed provides liquidity to Citigroup to aid in the purchase of Wachovia

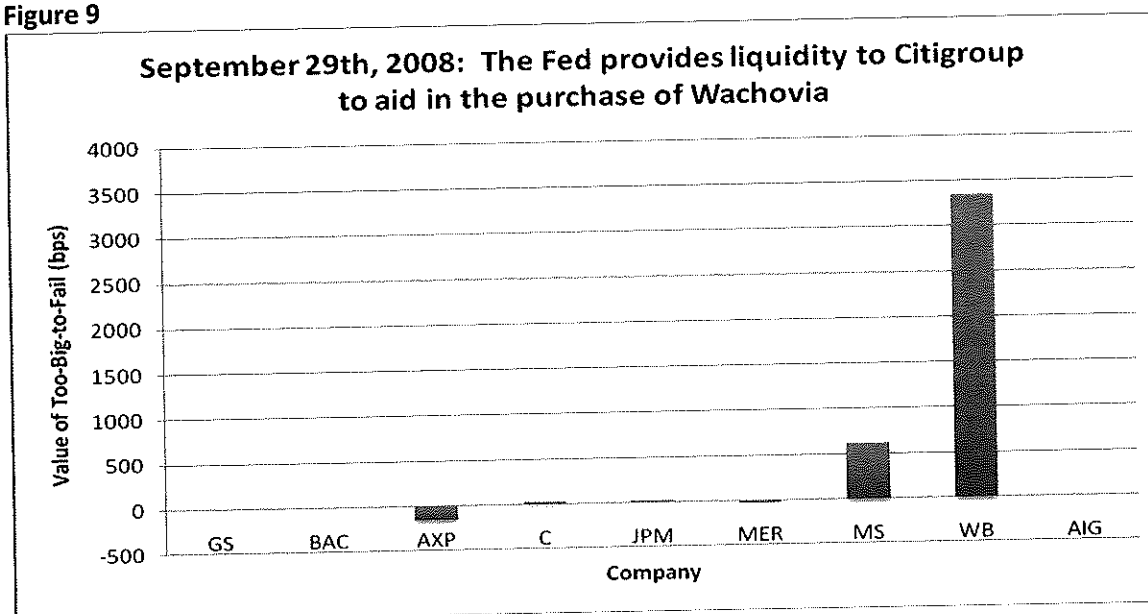
After watching Lehman Brothers go under on 9/15/2008, Wachovia executives became more serious about finding a buyer. By Monday morning, an agreement was hammered out in which Citigroup was supposed to acquire most of Wachovia for nearly \$2 billion in a government-engineered takeover. However, according to the press, Wachovia Bank was considered one of the more liquid banks at the time (Wachovia had not resorted to using any of the Fed's liquidity programs), and coupled with the fact that it had a strong presence on the east coast, a bidding war emerged between Citigroup and Wells Fargo for Wachovia's acquisition. On October 3rd, Wells Fargo won the bid by making a counteroffer that promised to purchase Wachovia without government assistance.

The announcement of Wachovia's purchase led to the highest spike in the value of TBTF amongst the five observed events: Wachovia experienced a TBTF value of 3339.97 bps, which is significantly higher than the average TBTF value of 424.4 bps (Refer to Figure 9). This tremendous spike in TBTF is due to the bidding war between two large financial institutions in acquiring Wachovia. That is, Wachovia's value of TBTF increased significantly because the market perceived that Wachovia would be safe, even if it still had toxic debts on its balance sheet. On the other hand, Citigroup experienced only

a marginal increase in its value of TBTF, which is illustrative of the fact that the market was wary of Citigroup's outcome in the bidding war. Citigroup's low value of TBTF also points to the fact that the market knew of Citigroup's financial instability (later confirmed when Citigroup received government bailout money), and even acquiring Wachovia may not have been enough to keep the bank liquid.

The data for Event 4 reports a value of TBTF of zero for three major financial institutions and relatively low values of TBTF in comparison to the values of TBTF seen before Lehman filed for bankruptcy on 9/15/2008. The relatively small changes in the value of TBTF during Event 4 are not surprising, because the government's refusal to bail out Lehman made the market believe that the financial sector was even more volatile and unsafe. Investors were unsure of how the government may act the next time a large financial institution is threatened to go under.

Figure 9



Event 5: October 14th, 2008. 9 large banks get capital injection

On October 14th, the Treasury announced that it would use \$250 billion of the \$700 billion government bailout package to inject capital into nine of the largest U.S. banks: Bank of America, Bank of New York

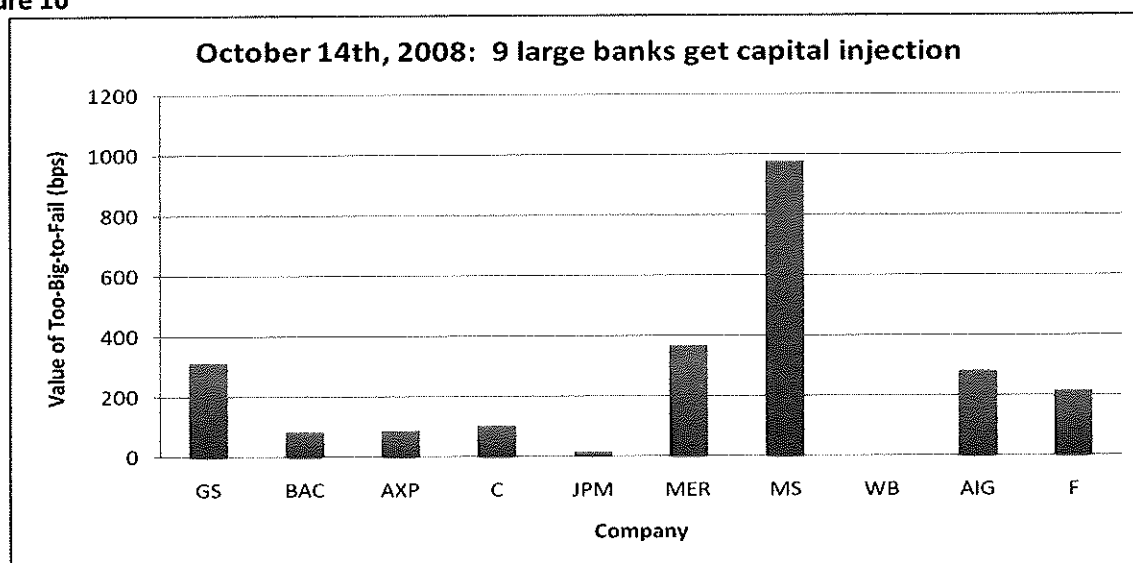
Mellon, Citigroup, Goldman Sachs, J.P. Morgan Chase, Merrill Lynch, Morgan Stanley, State Street, and Wells Fargo. Although the program is voluntary, these banks were essentially forced by the Treasury to take the loan, which subjected them to restrictions on compensation programs that encourage unnecessary risk. Thus, some experts predicted that having the government as a major shareholder would spur banks to stop engaging in risky behavior, and that the capital infusion would require companies to reform and restructure themselves until they are sound assets again. The bailout program by the Treasury was intended to apply broadly, and was not limited to financial institutions only. The availability of cash in the middle of a global credit squeeze also drew requests from other troubled institutions such as insurance firms, automakers, and transit agencies.

The results show an increase in the value of TBTF for 8 of the 9 companies examined, with the average value of TBTF across the companies equal to 279.6 bps (Refer to Figure 10). These results are reasonable, because the banks examined in this study were the ones that received most of the funding from the government bailout package. Although some believed that forcing the nine companies to take the bailout money would mitigate the problem of TBTF, the results indicate otherwise. My results indicate that even though the government intended to mitigate the problem of TBTF by becoming major shareholders of large financial institutions, this bailout package actually aggravated the problem of TBTF. The results therefore indicate that the government intervention increased the market's perceptions that these nine firms would always have a government safety net, regardless of their financial condition and toxic assets they may have on their balance sheets.

Even Ford Motor Company experienced an increase in its value of TBTF to 215.88 bps. This may be attributed to the fact that this government bailout package was not just limited to financial institutions, and other companies – especially those in the automobile industry – were told that they would receive funding. Once again, toxic assets and financial stability are inherent in the companies

that received the funds, but investors nevertheless responded in a way that decreased the cost of insuring these troubled companies purely on the basis of the fact that they believe the government would always bail them out when times are tough.

Figure 10



The evolution of the value of TBTF during five government interventions

Figure 11 showcases the progression of the average value of Too-Big-to-Fail across the 11 financial institutions examined in this study. The value of TBTF spiked after the first government intervention in which Bear Stearns was bailed out, and is reflected as Event 1 in Figure 7. Bear's bailout reflects the market's confidence in the government to bail out certain large financial institutions – a belief that was later shattered when the government allowed Lehman to collapse on 9/15/08 (Event 3). As expected, the value of TBTF plummeted to its lowest value when Lehman filed for bankruptcy due to the

government's attempt to quash the problem of TBTF. However, the government later realized that Lehman's collapse had severe repercussions on the already faltering in the economy. Therefore, after the Lehman collapse, the government signaled that it would strive to maintain the stability of financial institutions by taking the role as a safety net for the remaining (and barely functioning) companies. Soon after the Lehman collapse, the Treasury helped set up negotiations for the acquisition of Wachovia Bank, passed a bill to increase the FDIC insurance, and began paying interest on reserves. The government's strides to repair the broken financial sector eventually led to an increase in the value of TBTF, as seen in Figure 7. This gradual increase in the value of TBTF is the hot topic in current debates that highlight the problem of TBTF moral hazard and suggest ways to combat TBTF. "No bank ought to be Too-Big-to-Fail," says Charles Plosser, President of the Federal Reserve Bank of Philadelphia, and he further went on to argue that TBTF institutions should be broken into smaller divisions so that they would not have as large of an impact on our economy in the event that they fail.

Figure 12 showcases the volatility of the value of TBTF across the 11 financial institutions that were examined in this study. Prior to the Lehman collapse (Event 3), the volatility in the value of TBTF was relatively low, because the markets learned from Bear's bailout that the government would not allow TBTF institutions to fail. Similarly, markets agreed that the government's intervention in placing Fannie and Freddie in conservatorship (Event 2) was not indicative of how the government would act in cases in which the troubled company was not already a government-sponsored enterprise. Hence, the volatility for Event 2 was relatively low because the markets all agreed on meaning of the government's intervention. However, the Fed's shocked the economy by letting Lehman fail in Event 3, which is reflected by the sharp spike in volatility of the value of TBTF in Events 3 and 4. The lack of transparency in the government's actions and unforeseen surprises led the market to disagree about the safety of various financial institutions.

Figure 11

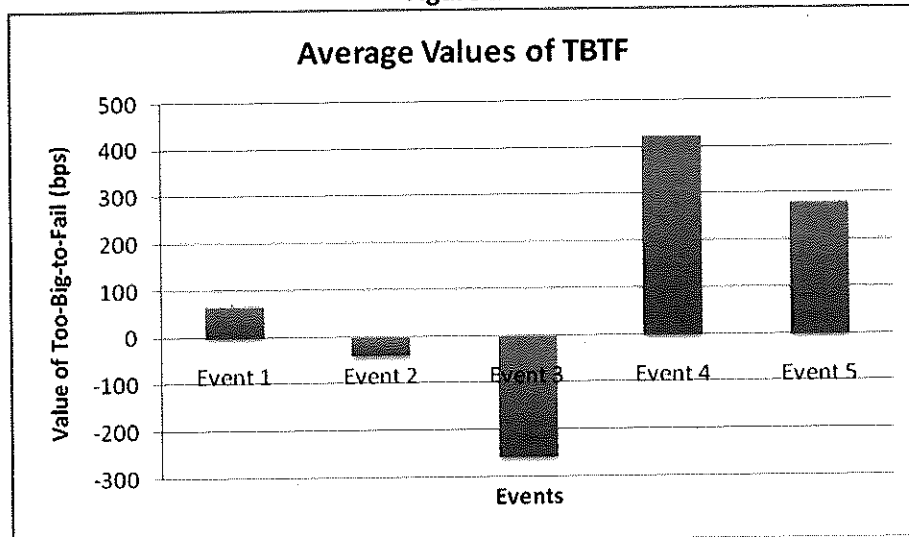
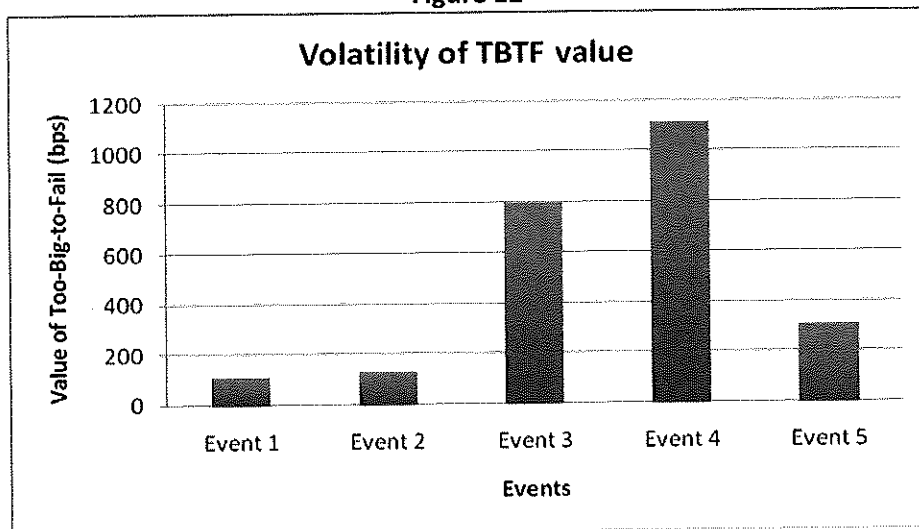


Figure 12



Conclusion

The hidden subsidy of Too-Big-to-Fail Subsidy funded by your tax dollars

Information regarding the amount of publicized government subsidies given to failing financial institutions is readily available, but the expected additional amount that your tax dollars could have

funded due to the moral hazard of TBTF can be further calculated by utilizing the value of TBTF obtained in this study.

The value of TBTF is utilized to compute the expected value of the amount of money that taxpayers would have to subsidize a TBTF institution in the event of a default. The value of TBTF is obtained in Event 5 for each company, except for Lehman and Bear, in which I use the value of TBTF for Event 3 and Event 1, respectively. The value of TBTF for Event 5 is utilized because the last event day should capture the cumulative effects of TBTF throughout the financial crisis of between October 2007 and December 2009.

This expected value of the burden that taxpayers could shoulder is calculated using the value of TBTF, which contains information about the probability of an institution being bailed out. The value of TBTF represents the amount it would cost for a TBTF company to have its total debt insured; therefore, the value of TBTF represents the percentage of debt insured due to the market's perception that a company is TBTF. In the event of default, this expected value of loss becomes an actual loss shouldered by taxpayers. In other words, taxpayers provided subsidies for two entities: First, taxpayers shouldered the burden of bailing out a company that took excessive risks because it was TBTF. This amount is readily available information documented in capital injections to banks provided by the treasury. Second, and more notably, I calculate the amount that taxpayers subsidized in bailing out debtholders, who provided the funds to allow for the TBTF institution to keep taking excessive risks.

The value of TBTF calculated in this study is in bps (basis points). Being that 100bps = 1%, I can calculate the percentage of debt that taxpayers paid to insure a Too-Big-to-Fail financial institution:

Equation 1:

$$\text{Value of TBTF (bps)} \times \frac{1\%}{100 \text{ bps}} \times \text{Total debt (millions \$)} = \text{Expected value of taxpayer burden (millions \$)}$$

The amount it costs to protect the debtholders of a shaky financial company is the amount of taxpayer burden. This makes sense because if a company were not Too-Big-to-Fail, then the taxpayer burden would be zero because the total debt would not be secured, and debtholders would be the ones to shoulder the company's debt.

Table 1 displays the expected value of the cost of TBTF for each financial institution, calculated utilizing Equation 1. It is important to note that the amount of taxpayer burden is positive for ten out of the eleven institutions. Only Lehman Brothers has a negative value of TBTF, which means that taxpayers actually saved money when Lehman was allowed to fail and instead the debtholders shouldered all of the company's debt.

Table 1

Company	Value of TBTF (bps)	Total Debt (in millions \$)	Taxpayer burden (in millions \$)
Goldman Sachs	313.6543	498416	15633.03
Bank of America	82.89361	632946	5246.72
American Express	87.77198	69034	605.93
J.P. Morgan	17.55458	633474	1112.04
Morgan Stanley	977.6304	395266	38642.41
Citigroup	105.0802	720317	7569.11
Wachovia Bank	3339.971	251217	83905.75
Merrill Lynch	87.22296	601354	5245.19
Lehman Brothers	-402.475	457493	(475905)
Bear Stearns	378.1361	237885	8995.29
American International Group	1502.507	203765	30615.83

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