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HOW MUCH DID BANKS PAY TO BECOME TOO-BIG-TO-FAIL AND TO BECOME SYSTEMICALLY IMPORTANT?

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Abstract

This paper estimates the value of the too-big-to-fail (TBTF) subsidy. Using data from the merger boom of 1991-2004, we find that banking organizations were willing to pay an added premium for mergers that would put them over the asset sizes that are commonly viewed as the thresholds for being TBTF. We estimate at least $14 billion in added premiums for the eight merger deals that brought the organizations to over $100 billion in assets. In addition, we find that both the stock and bond markets reacted positively to these deals. Our estimated TBTF subsidy is large enough to create serious concern, since recent assisted mergers have allowed TBTF organizations to become even bigger and for nonbanks to become part of TBTF banking organizations, thus extending the TBTF subsidy beyond banking.

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Key Words: bank merger, too-big-to-fail, TBTF subsidy, systemically important bank

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How Much Did Banks Pay to Become Too-Big-to-Fail and to Become Systemically Important?

I. Introduction and Background

Too-big-to-fail (TBTF) has become a heated topic of debate in the last few years (see Stern, 2009a, 2009b, Stern and Feldman, 2009, and Kaufman 1990, 1991, and 2002). Should some financial institutions get special treatment from regulators and be perceived by the public as being TBTF? How big does an institution have to be in order to be considered TBTF? Should the public be informed about which financial institutions are TBTF? In return for their special privilege, should TBTF institutions be regulated differently? How much is it worth for a financial institution to become TBTF?

Prior to the financial crisis that started in mid-2007 and extended into 2009, there were debates about whether the TBTF policy, which was introduced by bank regulators in 1984 following the Continental Illinois crisis, was completely eliminated by the implementation of the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991. The question of whether some institutions, even after FDICIA, may still be TBTF has become trivial in light of the dollars the federal government has recently poured into bailing out those banking organizations considered TBTF and/or too interconnected (e.g., Bear Stearns, American International Group [AIG], Citigroup, and Bank of America). It is evident that the TBTF policy is at work in the financial crisis, since these large financial organizations have been receiving special treatment and support.[1] An examination of the stock market's reaction to the U.S. government's Troubled Asset Relief Program's (TARP) injection of capital into 10 large banking organizations around October 14, 2008 finds that the cumulative abnormal stock returns are large, positive, and statistically significant not only for the banks included in the initial TARP

[1] Bear Stearns was given financial assistance prior to its acquisition by JPMorgan Chase. Through TARP funds, American International Group (AIG), Citigroup, and Bank of American have received $85 billion, $50 billion, and $45 billion, respectively, in capital injection from the U.S. Treasury and FRBNY

assistance but also for those large banks that were not included (see Panel A of Table 1). For the portfolio of smaller publicly traded banking organizations whose total assets' book value is between $5 billion and $10 billion, the cumulative abnormal returns are positive but indistinguishably different from zero. For the portfolio of the smallest publicly traded banking organizations whose total assets' book value is between $1 billion and $5 billion, the cumulative abnormal returns are also positive and statistically insignificant.

While FDICIA attempted to make it more difficult for the Federal Deposit Insurance Corporation (FDIC) to protect uninsured depositors and creditors at large failing banking organizations and TBTF banking organizations, it is evident that the TBTF policy still exists. In fact, one might argue that FDICIA has actually formalized the process for bailing out TBTF banking organizations by specifically allowing a TBTF bailout when the banking organization's failure "would have serious adverse effects on the economic conditions or financial stability" of the economy and by instituting a formal approval process with two-thirds of the FDIC Board, two-thirds of the Federal Reserve Board, the Secretary of the Treasury, and the President of the United States giving their backing. Kane (2000) describes these large banks as being "too-big-to-unwind" or "too-big-to-discipline-adequately (TBTDA)," suggesting that these banking organizations would be more likely to receive favorable treatment by both the market and regulators during a financial crisis.

In addition, the TBTF notion has recently been extended beyond banking institutions to cover nonbank financial institutions as well. The rescue of Bear Stearns and AIG and the various new lending programs that currently allow nonbank institutions (such as primary dealers) to have access to the discount window mark a vast expansion of the government's financial safety net (access to the Federal Reserve System's discount window lending, federal government liability guarantee programs, and access to the payment system) beyond

facility (as of September 30, 2009). See the Office of the Special Inspector General for the Troubled Asset Relief Program (2009).

depository institutions. More nonbanking institutions have come under the umbrella of TBTF banking institutions through the mergers supported by the federal government and bank regulators, for example, the regulator-assisted acquisitions of Merrill Lynch by Bank of America and Bear Stearns by JPMorganChase and Company (JPMC). For the first time in the history of the Federal Reserve System, discount window access was extended to investment banks during the financial crisis that started in the mid-2007. The value of this extension is significant and is evident from the stock market's reactions (see Panel B of Table 1). The stock market reacted positively in response to the Federal Reserve's extension of discount window access to investment banks. We examine the abnormal stock return reactions of a portfolio of investment banking organizations (Morgan Stanley, Merrill Lynch, Lehman Brothers, and Goldman Sachs) and find positive and significant abnormal returns of 17.79 percent to these investment banks on March 14, 2009 when the Federal Reserve announced that it would lend to Bear Stearns through JPMC. This extension of the safety net beyond commercial banks to large investment banks (during the rescue of Bear Stearns) created value for other investment banking organizations in the same category as Bear Stearns and had no significant abnormal returns impact on TBTF commercial banks (either the largest 11 banks or those 16 banks with total assets' book value greater than $100 billion). According to Macey (2008), "[t]he bailout of Bear Stearns creates an unfair competitive environment in U.S. financial markets that is worse than the unfairness that led to FDICIA. Not only are large firms being favored over small firms, but investment banks are getting for free a better government bailout than commercial banks receive only after paying insurance premiums to the FDIC. The result will further weaken the U.S. banking industry and lead to a wave of mergers among investment banks seeking to become too-big-to-fail."

Alan Greenspan (2001), former chairman of the Board of Governors of the Federal Reserve System, warned that policymakers must be "very cautious about purposefully or inadvertently extending the scope and reach" of the government's financial safety net. Similarly,

Charles I. Plosser (2008), president of the Federal Reserve Bank of Philadelphia, has also warned that "[p]olicy interventions in financial markets run the risks of increasing moral hazard and inhibiting efficient price discovery .... Interventions intended to quell instability can, by creating moral hazard, actually make instability more severe in the long run." And furthermore, these policy interventions could have the unintended consequences of effectively subsidizing risk-taking by systemically important financial institutions.

It should be pointed out that there is no such thing as a list of TBTF banks developed by U.S. banking supervisors or regulators. Therefore, it is not always clear which institutions are TBTF and would be rescued in the event of crisis. This was evident recently when AIG and Bear Stearns received support while Lehman Brothers did not.[2] The general perception is that relatively larger institutions are more likely to be considered TBTF, although the specific TBTF threshold has never been officially defined.

Since these TBTF benefits to banking organizations may translate to potential costs to taxpayers, there have also been concerns about how to limit these subsidies (e.g., controlling banking organizations' size and making them smaller or focusing on managing the financial spillover better). The benefits of TBTF may be captured in a number of ways. These include gaining favor with uninsured bank creditors and other market participants, operating with lower regulatory costs, and increasing the chances of receiving regulatory forbearance. Access to the federal government's safety net allows TBTF institutions to operate with less capital and a lower funding cost relative to other institutions. To the extent that the public believes that the government would protect the TBTF banking organizations, their uninsured creditors do not charge as high a price for the use of their funds as they would in the absence of this perception.

Several studies have examined the impacts of the TBTF policy, but it remains unclear how much value the TBTF and TBTDA aspects have added to bank shareholders' wealth.

Through recent merger waves, banking organizations have become larger and more complex and increased their market shares and market power. The perception is that these institutions may have become TBTF. This paper focuses on estimating the potential value of the TBTF subsidy. In other words, we focus on estimating the potential costs to taxpayers as a result of the TBTF policy. We generate estimates of the TBTF subsidy to large banking organizations, and we believe our estimates of the possible subsidies to these TBTF institutions could serve a useful purpose for future public policy discussions.

If there is a significant value in achieving TBTF size, to capture expanded safety net access, banking organizations should be willing to pay more for those acquisitions that would enable them to reach such a size. Moreover, if there are a limited number of suitable acquisitions that would allow an organization to become TBTF and if the organization has to outbid other organizations with similar motivations, the added acquisition premium could provide an indication of the overall magnitude of large bank subsidies. This added premium could also imply that banking organizations see a strong benefit in reaching a threshold size large enough to become a key player in banking and to have control of their own fate (e.g., through increases in market power and political clout).

To test the hypothesis that banking organizations perceive benefits from reaching a TBTF threshold size, we use market pricing data and other financial information from the merger boom period, 1991-2004 (after FDICIA), during which a number of banking organizations greatly expanded their size by acquiring other organizations. We find that banks have paid at least $14 billion in added merger premiums for the eight merger deals during 1991-2004 that allowed the organizations to cross the perceived TBTF size threshold of $100 billion in assets. In addition, we conduct an event study to examine how the stock returns of targets and acquiring banking organizations fare on or around the merger announcement that would enable the combined

[2] At the end of November 2007, Lehman Brothers Holding Inc. had total assets with a book value of $691.1 billion, compared with $395.4 billion for Bear Stearns (about 55 percent of the size of Lehman

organization to become TBTF after the merger, and we find that the combined portfolio returns are positive and statistically significantly different from zero, suggesting that the market perceived the combination to be value enhancing. Furthermore, our analysis of subordinated debt spreads before and after the mergers also indicates that the combined banking organizations face a lower funding cost after becoming TBTF through the merger.

Section II provides a review of the relevant literature analyzing large bank subsidies. Section III develops an empirical model for measuring the potential TBTF subsidies. Section IV discusses the empirical results, and Section V provides robustness tests of the results. The estimated dollar value of the TBTF benefits, i.e., the potential cost to taxpayers, is presented in Section VI. Finally, the conclusions and policy implications are discussed in Section VII.

II. Literature Review -- Market Evidence on Potential Large Bank Subsidies

The scope and issue of TBTF have been influenced by a number of legislative and regulatory events. These events have had an important role in determining the existence and potential size of large bank subsidies. Among the most important of these have been the FDIC's financial assistance to prevent the closure of Continental Illinois National Bank in 1984, the passage of FDICIA, the Federal Reserve's intervention in resolving the capital shortage of Long Term Capital Management in 1998, and, most recently, the Federal Reserve's intervention to rescue several large banking and nonbanking financial institutions and to extend access to the discount window to nonbanking financial institutions for the first time in Federal Reserve history.

In 1984, the Comptroller of the Currency testified before the U.S. Congress on the bailout of Continental Illinois National Banks, implying that the banking agencies did not have the means to close any of the 11 largest multinational banks without the closure having a significant impact on the U.S. financial system. This testimony thus provided an official

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Brothers).

acknowledgment of a TBTF policy, and it also indicated the type and size of banking organizations that might be considered TBTF. There have been concerns that regulatory agencies might have gone too far in protecting large banking organizations during the bank failures of the 1980s and 1990s, which led Congress to pass FDICIA in 1991. FDICIA sought to change how regulators could deal with failing banking organizations and, in particular, with TBTF banking organizations, but it obviously failed to eliminate the TBTF protection. Instead, it created a more formal and visible process for a TBTF bailout for some large U.S. banking organizations, as described earlier. It was not evident until the 2007-2009 financial crisis that the TBTF policy continued to exist after passage of FDICIA; several research studies that have examined various aspects of TBTF are summarized below.

Stock Market's Reactions to Bank Mergers and TBTF

Typically, the finance literature has established that the value of the target's stock increases relative to the acquirer's stock value on or around the merger announcement date. However, unlike in typical merger deals, Kane (2000) demonstrates that in a merger that involves very large banks (megabank mergers) stock of a megabank acquirer gains value at the announcement date. These megamerger gains arise in part from improved access to monopoly rents and regulatory subsidies, including lower funding costs and increased market capitalization.[3] Kane (2000) examines banking megamergers during the period 1991-1998 (after passage of FDICIA) and finds evidence of TBTF benefits even in the post-FDICIA period. The conclusion is that institutions engaging in megamergers hope to become so large or complex that they and their creditors will benefit from FDICIA's systemic-risk exception, and that FDICIA may not be sufficient to minimize the TBTF merger incentives, especially since the banking industry has become much more complex and globally involved.

[3] Megamerger is defined as a merger involving one of the 12 largest banks that increases the size of the merged organization by at least half the amount of assets or market capitalization As of 1998, these banks were Chase Manhattan, Citicorp, Nations, J.P. Morgan, Bank of America, First Union, Bankers Trust, Banc One, First Chicago NBD, Fleet, Wells Fargo, and Norwest.

In addition, Schmid and Walter (2006) examine the value of financial conglomerates and whether bigger and/or broader (through economies of scope) is better. They find that, overall, the negative elements present in financial conglomerates outweigh the positive elements, so that financial conglomerates generally trade at a discount relative to specialized financial firms. However, they find no conglomerate discount but a significant positive premium for firms whose total assets' book value is larger than $100 billion. They conclude that the TBTF perception exists.

Bond Market's Reactions to Bank Mergers and TBTF

Penas and Unal (2004) examine changes in adjusted bond returns at acquiring and target banking organizations in response to their merger announcements during the period 1991-1998. They also compare credit spreads (difference between the bond yield at issue and the yield on comparable U.S. Treasury securities) on bonds issued before and after the merger. They find little change in either bond returns or credit spreads when the acquiring banks are either small or already TBTF (with assets of at least 2 percent of the banking industry).[4] However, when banks in these size ranges acquire another bank, Penas and Unal find that credit spreads decline significantly after the merger. They attribute this result to the benefits banks derive from reaching or getting closer to the TBTF status and from attaining a higher degree of diversification. These results thus provide evidence that bondholders attach a value to banks becoming TBTF through mergers.

The Continental Illinois Evidence of TBTF

Using an event study methodology, O'Hara and Shaw (1990) investigate the effects of the Comptroller of the Currency's 1984 announcement that some banking organizations were TBTF. They find that banking organizations deemed to be TBTF experienced a statistically significant positive average abnormal return of 1.3 percent on the day the Comptroller's

[4] Note that the asset size of 2 percent of the banking industry ranges widely during the sample period, from $77 billion in 1991 to $142 billion in 1998.

announcement was made, with the highest returns going to the riskiest and very largest organizations. In contrast, banking organizations not regarded as TBTF had median returns of -0.22 percent that day, and the banking organizations that were hurt the most were those just under the TBTF cutoff. These results thus suggest that becoming TBTF is valued by market participants and carries a wealth effect reflective of this perceived favorable treatment.

In addition, Morgan and Stiroh (2005) find that the naming of the TBTF banking organizations by the Office of the Comptroller of the Currency (OCC) in 1984 elevated the bond ratings of those banking organizations (bank holding companies) about one notch compared to non-TBTF organizations, with subordinated note investors showing even more optimism than the rating agencies about future support for TBTF banking organizations. Morgan and Stiroh further discover that this spread and rating relation continues in the 1990s, suggesting that FDICIA had little effect on how debtholders perceived the possibility of support for TBTF banking organizations.[5]

Other Related Studies

Brickley and James (1986) analyze how access to deposit insurance affects the common stock returns of financial institutions during a period of financial distress, using savings and loan association (S&L) data from 1976 to 1983 (the pre-FDICIA period). They find that stock returns for financially distressed S&Ls were less sensitive to market movements than other S&Ls. In fact, weaker S&Ls responded to modifications in the now-defunct Federal Saving and Loan Insurance Corporation closure policy as if deposit insurance were a valuable subsidy.

Rime (2005) examines the effect of TBTF on credit ratings, using a sample of large and small banks ($1 billion to $1.1 trillion) in 21 industrialized countries during the period 1999-2003.

[5] The rating agencies have acknowledged that they consider a bank's TBTF status when issuing their ratings. According to Moody's, "Institutional support, that is, the likelihood that in case of need banks will get help from the public sector (central governments, regional governments, etc.), is a factor taken into account in the analytical mix underpinning banks' debt and deposit ratings… it is very likely that governments in developed markets, having both the capacity and the willingness to act, will continue to

Moody's and Fitch assign two types of ratings to banks: with and without consideration of other external factors (including a possible external or federal support) that would influence the bank's capacity to repay its debt. Rime finds that the TBTF status of a bank (proxied by size and market share) has a significant, positive impact on the bank's credit rating, controlling for all the other external factors, such as explicit state guarantees. The largest banks in the sample get a rating "bonus" of several notches for being TBTF.

While several recent studies have found evidence of TBTF even after FDICIA, a few studies found no evidence of TBTF. For example, Angbazo and Saunders (1997) find that the systematic risk estimate for large banking organizations declined after FDICIA was passed, presumably, in part, because of the new incentives FDICIA gave uninsured depositors to monitor banks more closely. Flannery and Sorescu (1996) examine market discipline in the subordinated debt market for banking organizations in the pre- and post-FDICIA period and find some evidence of stronger market discipline (thus, little or no TBTF effect) in the post-FDICIA period. In addition, Ennis and Malek (2005) revisited the negative empirical relation between performance and asset size, which Boyd and Gertler (1994) document as the TBTF subsidy effect based on data in the 1984-1991 (pre-FDICIA) period. Ennis and Malek find no conclusive evidence of different TBTF performance for large (more than $10 billion) vs. small banks, based on data in the 1992-2003 (post-FDICIA) period. Also, Benston, Hunter, and Wall (1995) examine the prices that acquirers were willing to bid to acquire target banks during the period 1980-1989 and find little evidence of a motive to enhance the TBTF subsidy. They conclude that most of mergers in the 1980s were motivated by earnings diversification rather than an attempt to exploit the FDIC insurance subsidy.

Our Objectives and Findings

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offer support to the country's largest financial institutions." See Moody's Investors Service: Global Credit Research, *Rating Methodology (An Analytical Framework for Banks in Developed Markets),* April 1999.

While the TBTF evidence so far has been inconclusive based on the banking literature (depending on the data, time period, and research methodology), the cost of TBTF distortions could be large.[6] The objective of our paper is to shed some light on the perceived TBTF threshold size and the magnitude of the TBTF subsidy. Following the basic model used in Benston, Hunter, and Wall (1995), we re-specify the model to incorporate the variables designed to capture TBTF subsidies. In other words, we include additional variables that would separate out the TBTF effects that may have been embedded in other factors in their model, such as the market to book value variables. Interestingly, we find evidence consistent with our TBTF subsidy hypothesis, even when using more recent data in the post-FDICIA period.

III. The Data and Research Framework

Our analysis looks at the purchase premiums (offer price at an announcement date minus market price prior to the announcement date) that acquiring banking organizations are willing to offer to buy a target organization and whether these premiums are higher when an acquisition enables an organization to reach a size that is perceived by the market as being TBTF. The analysis uses merger transactions among publicly traded banking organizations during the period 1991-2004 (post-FDICIA). These mergers and acquisitions, along with information about each transaction, are obtained from the Security Data Corporation (SDC). To be included in this study, both the acquiring and target banks must be publicly traded. In all, the data set encompasses 411 merger transactions. Stock market information is obtained from the Center for Research in Security Prices (CRSP) database, and financial data are obtained from bank holding company Y-9 reports, call reports, and thrift financial reports for the 13 quarters prior to the merger announcement date.

[6] See Stern (2009a, 2009b), Stern and Feldman (2004, 2009) and Mishkin (2006) for the various policy measures currently being discussed for reducing potential distortions induced by TBTF.

The basic framework of this study is adapted from that of Benston, Hunter and Wall (1995), which examines bank mergers in the 1980s. They have two competing hypotheses: purchase premiums in bank mergers are driven by earnings diversification (risk-reducing strategy) vs. maximization of the value of the deposit insurance put option (risk-increasing strategy). Our model relates the purchase premiums that acquiring organizations pay to whether the merged organizations will become large enough to reach TBTF status. This is in addition to the various risk factors included in Benston, Hunter, and Wall (1995). To the extent that investors place a value on TBTF banks, purchase premiums should be larger when the acquisition will help create a TBTF banking organization, provided adjustments are made for other relevant factors.[7] Conversely, purchase premiums would be expected to be smaller when the merged organizations are too small to become TBTF. Thus, our model will relate purchase premiums to the different merger scenarios regarding the TBTF status of the merging organizations while controlling for other characteristics of the acquiring and target banking organizations and for other possible merger motivations as in the following expression:

Purchase Premium = f(TBTF status, Characteristics of the Target, Characteristics of the Acquirer, Characteristics of the Merger Deal, Other Control Factors) (1)

Purchase Premiums. Following Benston, Hunter, and Wall's (1995) model, the purchase premiums (in $ million) are computed as purchase price less pre-consolidation market value. Specifically, purchase premiums are calculated by taking the difference between the announced offer price for a target organization and the market price of the target's common stock before the merger announcement. The purchase premium thus captures the dollar markup over a target's pre-acquisition stock price that the acquiring organization must pay to acquire control of the target. The target's market price is obtained for three different dates: 20, 40, and 60 business

[7] This assumes that there are a limited number of appropriate targets and that other acquiring banks are also interested in these targets as a means of becoming TBTF.

days prior to the merger announcement date. These three different dates are used as a means of capturing the most current market valuation of the target while acknowledging that many mergers may be anticipated or become known to investors before the announcement date.[8]

Merger Scenarios. Bank mergers in the data set can be divided into four categories, with the fourth category (both the acquirer and the target too small to create a TBTF bank through merging) serving as the base case to which we compare the other merger possibilities. These categories are:

Category 1: Both the acquiring banking organization and the target banking organization are not TBTF in the pre-merger period, but after the merger, their combined assets will reach or exceed the TBTF size threshold. In this case, the hypothesis would be that the acquiring organization would be willing to pay a higher purchase premium, given the potential benefits that would accrue to becoming TBTF to capture enhanced access to the federal government's safety net.[9] We construct an indicator variable ($DBECOME_{TBTF}$) to capture this hypothesized relation, and this variable takes on a value of one for each merger that creates a new TBTF organization and zero for all other mergers. A positive coefficient would be expected for $DBECOME_{TBTF}$ if the acquiring banking organizations are willing to pay more relative to those mergers that do not result in TBTF organizations to capture the benefits of TBTF.

Category 2: The acquiring banking organization is already TBTF before the merger takes place, while the target banking organization is not TBTF. In this case, the acquiring banking organization has previously captured the benefits of being TBTF, and the merger would not add the same value to the acquirer as in Case 1. In some cases, the target banking organization's stockholders and management might even be willing to accept somewhat lower premiums

[8] See Houston, James, and Ryngaert (2001) and DeLong and DeYoung (2007) for information about market anticipation of bank mergers.

[9] The shareholders of the target organization could also experience a gain from becoming TBTF if they become part of the new organization. However, we hypothesize that these stockholders are fully aware of their value to the acquirer and other organizations nearing TBTF status and know that their stock can command a higher premium.

compared to other merger possibilities, particularly if they will be continuing their role in the merged organization and will receive long-run benefits from being part of a TBTF organization. We use the indicator variable, $DACQUIRER_{TBTF}$, to represent this case. This variable takes on the value of one when the acquirer is TBTF, but the target is not, and zero otherwise. When compared to the base case, this variable would be expected to have a coefficient that is near 0 or possibly negative (as the target may be willing to accept a smaller premium or a discount in order to become part of a TBTF organization after the merger). In addition, we also construct another variable, $DACQUIRER_{TBTF} * TA_t$, which is a cross product of the indicator variable $DACQUIRER_{TBTF}$ and the target's asset size (TA_t). Since the acquirer, although already TBTF prior to the merger, would further benefit from the potential TBTF subsidy as its deposit base expands, the acquirer may be willing to pay more for the target with a larger deposit or asset base. Thus, the coefficient of this variable is expected to be positive.

Category 3: This category is for megamergers where both the acquirer and the target are already TBTF before they merge. Consequently, neither organization is likely to capture significant additional regulatory benefits. Thus, the coefficient of this indicator variable would be expected to be near zero. This variable, $DBOTH_{TBTF}$, is defined as taking on the value of one when both the acquirer and the target are already TBTF prior to the merger, and zero otherwise. In this case, while the acquirers are already TBTF, there may still be an incentive to further maximize the value of the deposit insurance put option by acquiring a TBTF target whose returns are highly correlated with theirs. This impact on the purchase premium is captured by an interactive variable $DBOTH_{TBTF} * COV_{t,a}$, which is a product of $DBOTH_{TBTF}$ and the covariance of the return on assets of the target and acquirer over the 13 quarters before the quarter of the merger announcement date ($COV_{t,a}$). In addition, the TBTF acquirer may also be willing to pay a larger purchase premium to acquire a TBTF target with a larger deposit base. This impact is captured by a variable $DBOTH_{TBTF} * TA_t$, which is a cross product of the indicator variable $DBOTH_{TBTF}$ and the target's asset size.

Category 4: Mergers assigned to this category are those in which the acquirer and the target are too small to create a TBTF banking organization after their merger, and this case provides the base case or the omitted variable to which the other merger categories will be compared.

Definition of TBTF. Before we can assign values to the indicator variables described above, we must specify a definition of the size threshold for TBTF status. Selecting this TBTF size threshold is a conceptual matter. As mentioned earlier, TBTF is not officially specified anywhere by law or regulatory policy but instead depends on the judgments of regulators about which banking organizations would be a threat to the financial stability of the economy if they were to encounter problems and "failed." An initial guide to defining TBTF comes from the announcement following the Continental Illinois crisis in 1984, when the Office of the Comptroller of the Currency (OCC) implied that 11 large multinational banking organizations were TBTF.[10] Since then, a number of these organizations have disappeared through mergers with other TBTF firms, thus leaving a smaller population of the "original" TBTF banking organizations. However, with rapid banking consolidation, a significant number of other banking organizations have reached fairly high size thresholds, and a number of these banking organizations might now be judged as TBTF by market participants. Since TBTF is not officially defined, there is no way to know with certainty what size of banking organization might be regarded by regulators as being TBTF. However, the market (including investors and uninsured depositors) form their own perceptions, and these perceptions are reflected in the prices of securities issued by the banking organizations.

Interestingly, O'Hara and Shaw (1990) find that the group of banking organizations they used to examine the market's reaction to the OCC's announcement in 1984 was that suggested by the *Wall Street Journal*, and *NOT* the actual list of firms specified by the OCC. O'Hara and

Shaw (1990) thus demonstrate that market perceptions of TBTF will influence firm values, even when those perceptions may in fact be different from that of the regulators. It is important to point this out, since no one really knows what the correct threshold size is for banks to become TBTF.

One of our objectives is to estimate a perceived TBTF threshold size based on the observed behavior of market participants during bank mergers of 1991-2004. In this study, we examine three different TBTF size thresholds: (1) banks whose total assets' book value $\geq$ \$100 billion; (2) banks that are one of the 11 largest organizations in each year; and (3) banks with market value of equity $\geq$ \$20 billion. We find that \$100 billion in total assets, \$20 billion in market capitalization, and being one of the largest 11 banks in the United States have been perceived by the market as important criteria for becoming TBTF.[11] In addition, we find that market participants seem to believe that the TBTF subsidy would gradually increase further as TBTF banking organizations continue to expand their asset base. Note that the threshold of \$100 billion book value of total assets used in this paper also provides a good dividing line for separating organizations with a national scope from regional organizations. Overall, we find that banking organizations seem to be willing to pay extra premiums in order to reach these TBTF thresholds.

Control Variables. Acquisition purchase premiums could be influenced by a variety of factors other than whether the combined organization will become TBTF. The starting point for measuring the value of the target both as a stand-alone firm and in an acquisition is its current market value and underlying riskiness as capture by the variability of profitability. These are then augmented with measures of the market value and underlying riskiness of the acquirer.

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[10] Even the OCC's statement led to confusion in the market, since some took this to mean just the 11 largest national banks, while others thought it meant the 11 largest banks in the country (with either state or national charters).

[11] Other TBTF definitions we have examined include total assets' book value of \$150 billion and \$200 billion and market capitalization thresholds from \$15 billion to \$30 billion, both unadjusted and adjusted

Further, the covariability of the acquirer's and target's earnings is included to proxy for the extent to which the acquisition would increase or reduce the variability of the acquirer's earnings. Three variables representing the variance and covariance of the acquirers' and targets' return on assets are included as proxies, as in Benston, Hunter and Wall (1995). The variances of return on assets for the target and acquirer over the 13 quarters prior to the merger announcement date are represented by $VROA_t$ and $VROA_a$, respectively. The covariance of the returns on their assets is represented by $COV_{t,a}$.

The post-merger value of the combined firms also depends on the difficulty of merging the firms and the potential for cost savings. The measure of the potential scale economies and the relative difficulty of absorbing the target into the acquirer are given by the variable *Relative*. *Relative* measures the relative size of the two banks' total assets, allowing for other size-related non-TBTF benefits to be controlled for in the regression equation.

Regional Impact. Following Benston, Hunter, and Wall (1995), we include the regional indicator variables (*East, West, and Southeast*, with the *Midwest* providing the base for comparison or the omitted indicator variable) to capture in which part of the U.S. a target was headquartered. Targets located in faster growing regions of the country or those headquartered in key financial centers or regions would be expected to command higher purchase premiums. In addition, the combined target assets in the region controls for the demand pressure in the specific region.

Another consideration in an acquisition is whether it is intra-state or inter-state. While inter-state acquisitions provide a chance to enter new markets and to achieve greater geographic diversification, in-state deals may increase market power and allow greater cost savings through the consolidation of operations and closing of duplicate offices. To test for these possible effects, we define an indicator variable (*Instate*) that takes on the value of one if

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for inflation. As would be expected, a handful of organizations shift between the various merger categories, depending on which TBTF size threshold is used.

the target and the acquirer have their headquarters in the same state and zero if they do not. Bank mergers are more likely to generate cost savings when the two banks' existing markets overlap. Following Benston, Hunter, and Wall (1995), we also include the market-to-book value ratio of the target ($MVBV_t$) as a measure of how investors view the target's prospects; the market-to-book value ratio of the acquirer ($MVBV_a$) to capture how investors view the acquirer's prospects; and the book value capital-to-total asset (leverage) ratio, $CRATIO_a$, to further capture the risk of the acquirer.

This paper expands Benston, Hunter, and Wall's (1995) specification to include several additional variables. A possible important determinant of the value of the target is its likely growth rate after the merger. A proxy for the expected growth in the target's market is GTA_t and a proxy for the influence of the acquirer on the growth rate is GTA_a. Both measures are calculated as the growth in the respective firm's total assets over the 13 quarters prior to the merger announcement. The target's stock market beta coefficient, $BETA_t$, is included to capture its systematic risk in the past year (i.e. 300 business days). A negative coefficient would be expected to reflect smaller premiums for higher risk targets. The systematic risk measure of the acquirer, $BETA_a$, is also included in the analysis.

In addition, we include an indicator variable that flags the mergers of equal deals, *MOE,* to capture the impact on the purchase premiums when the target and the acquirers are similar in terms of asset size. In a merger of equals, the target and acquirer tend to have similar bargaining powers and would likely be willing to exchange shares roughly in relation to their current market prices. The offer price compared with the prior market value would likely be much smaller than other types of acquisitions; thus a negative coefficient for this variable would be expected.

Finally, year fixed effects (*D1991 - D2003,* with 2004 serving as the base for comparison or the omitted variable) are added to the equation. Our purchase premium could depend in part on whether the mergers are announced at the beginning or end of a merger wave. The inclusion

of annual fixed effects provides a control for merger wave dynamics as well as any other effects due to the timing of the announcements.

Panel A of Table 2 presents the definition and provides the summary statistics for each of the explanatory variables, based on all 411 bank mergers that were announced during 1991-2004. Panel B of Table 2 presents summary statistics for important variables' breakdown by TBTF category. Average merger premiums are largest for those mergers that created a TBTF banking organization (Case 1) and then for those mergers between TBTF acquirer and TBTF target (Case 3). The average merger premiums for the other two categories, TBTF acquirer and non-TBTF target (Case 2) and the base case of non-TBTF (Case 4), are much smaller at about one-third of the average premiums for Cases 1 and 3. In terms of risk as measured by volatility of returns and systematic risk exposure, it is interesting to note that targets in Case 1 (Become TBTF) are most risky on average, with the highest return volatility and the highest exposures to systematic risk compared to other cases.

The empirical specification, including the indicator variables that capture the TBTF status of each merger deal, takes the following form:

$$
\begin{aligned}
PREM\ (20, 40, 60) = {} & a + b_1\ (VROA_t)\ (TA_t) + b_2\ (MVBV_t)\ (TA_t) \\
& + b_3\ (BETA_t)\ (TA_t) + b_4\ (GTA_t)\ (TA_t) + b_5\ (VROA_a)\ (TA_t) + b_6\ (MVBV_a)\ (TA_t) \\
& + b_7\ (BETA_a)\ (TA_t) + b_8\ (GTA_a)\ (TA_t) + b_9\ (CRATIO_a)\ (TA_t) \\
& + b_{10}\ (COV_{t,a})\ (TA_t) + b_{11}\ (Relative)\ (TA_t) + b_{12}\ (Instate) + b_{13}\ (MOE) \\
& + b_{14}\ (East) + b_{15}\ (West) + b_{16}\ (Southeast) + b_{17}\ (D1990) \\
& + b_{18}\ (D1991) + \ldots + b_{30}\ (D2003) \\
& + b_{31}\ (DBECOME_{TBTF}) + b_{32}\ (DACQUIRER_{TBTF}) \\
& + b_{33}\ (DACQUIRER_{TBTF} * TA_t) + b_{34}\ (DBOTH_{TBTF}) \\
& + b_{35}\ (DBOTH_{TBTF} * TA_t) + b_{36}\ (DBOTH_{TBTF} * COV_{t,a}) + \varepsilon \qquad (2)
\end{aligned}
$$

IV. The Empirical Results

Our analysis finds that the significance of the coefficients is very similar regardless of the length of window (20-day, 40-day, and 60-day) used in calculating the purchase premium. The 20-day window is likely to provide the most conservative measure of the TBTF subsidy because this shorter window is less likely to be affected by other (unrelated) events that occurred prior to the 20-day window and because the impact of the premium may be underestimated due to the market's anticipation of the merger, driving the target's share price up. Thus, if significance is found, using the 20-day window would likely underestimate the true impact. To conserve space, we report regression results only for the 20-day window, but our calculation of the total dollar subsidy is presented for all three windows.[12]

Table 3 presents the results of our regression analysis based on the most conservative 20-day window and three different TBTF definitions. All of the analysis includes the same 411 merger deals in the sample period of 1991 to 2004 (post-FDICIA period). Column 1 presents the results when using a size threshold of $100 billion book value of total assets for an organization to reach TBTF status. Columns 2 and 3 present the results when using alternative threshold sizes, asset size of the 11th largest banking organizations in each year and the $20 billion market capitalization thresholds, respectively. The year indicator variables (*D1991… D2003*) are included in all columns of the table but the coefficient estimates are not reported here.

Because the same banking organization may be involved in multiple merger transactions, the error term may be correlated across observations. According to Petersen (2009), the Rogers procedure would produce more correct standard errors than White (1980) in the presence of a firm effect. We use the Rogers procedure to correct the standard errors in our regression analysis, where the panel estimation technique used to obtain the coefficients corrects the standard errors of the coefficient estimates using the Rogers procedure (see

Rogers, 1993 and Williams, 2000). The Rogers corrected standard errors may be viewed as those of White (1980) standard errors adjusted to account for possible correlation within a cluster, and the t-statistics reported in parentheses in Table 3 are based on these standard errors.

The results are generally consistent across all the TBTF thresholds, since most of the banking organizations are repeated across these three TBTF definitions. Overall, the results for the various TBTF variables support the hypothesis that acquiring banks are willing to pay a higher price for merger deals that would take them over the TBTF thresholds.

Did Banks Pay Significant Additional Premiums to Become TBTF?

Category 1: Becoming TBTF. From Table 3, the coefficients of $DBECOME_{TBTF}$ are consistently positive and significant. The results strongly indicate that these organizations are willing to pay higher premiums for acquisitions that enable them to reach the TBTF threshold and to gain increased access to the federal safety net, controlling for other factors that are generally expected to affect the purchase premiums.

Category 2: Acquirers Already TBTF, Target Becoming TBTF. The coefficients of $DACQUIRER_{TBTF}$ are consistently negative but mostly insignificant, as expected. Some of the non-TBTF targets seem to be willing to accept purchase premiums below those on other types of transactions just for the opportunity to become part of a TBTF organization. However, the coefficients of the cross product term $DACQUIRER_{TBTF} * TA_t$ are consistently positive and mostly significant. This provides some indication that while the organizations that are already TBTF are not paying as much for their acquisitions compared to other banking organizations that are striving to reach that level, the TBTF acquiring banks are willing to pay increasing premiums according to the target's asset size. Larger targets allow TBTF acquirers greater opportunity to expand their deposit base and to increase the TBTF subsidy, thus receiving

[12] The 40-day and 60-day window results are available from the authors upon request.

larger purchase premiums. The net change in purchase premiums in this case depends on the combined effects of both coefficients.

Category 3: Both Acquirers and Targets Already TBTF. The coefficients of the stand-alone indicator variable $DBOTH_{TBTF}$ are insignificant. In addition, when taking into consideration the target's asset size, the coefficients of the cross product term $DBOTH_{TBTF} * TA_t$ are also consistently insignificant. These results suggest that TBTF acquirers have no incentive to pay excess premiums to acquire another TBTF banking organization in order to expand their asset base. From our examination of the TBTF banks' potential motivation to increase portfolio risk (to maximize the value of the deposit insurance put option), we find that the coefficients of the cross product term $DBOTH_{TBTF} * COV_{t,a}$ are consistently negative and significant, indicating that the purchase premiums are significantly smaller when a TBTF acquirer merges with a TBTF target whose returns are highly correlated with that of the acquirer. These results suggest that TBTF acquirers do not look to increase their portfolio risk by merging with another TBTF banking organization. In fact, TBTF acquirers would be willing to pay higher purchase premiums to acquire a TBTF target whose returns are less correlated with their own returns and, therefore, would help improve the portfolio diversification of the combined banking organization.

Importance of Other Characteristics

Target's Characteristics. From Table 3, the coefficients of $BETA_t$ are consistently negative and significant, suggesting that acquirers might pay smaller premiums (or possibly discounts) when acquiring a systematically risky target, whose returns are subject to greater volatility (nondiversifiable risk) than the overall market portfolio. However, we find that the coefficients of $VROA_t$ are consistently positive but insignificant, indicating that, overall, the target's idiosyncratic risk does not matter as much as the systematic risk in affecting the purchase premiums.

Although the cross product term of the covariance and the TBTF variable ($DBOTH_{TBTF}$ * $COV_{t,a}$) was significantly negative (discussed earlier), the coefficients of $COV_{t,a}$ are mixed and mostly insignificant. While the correlation between the target's returns and the acquirer's returns is mostly unimportant for non-TBTF banking organizations, it is relatively important for TBTF banks. Overall, our results suggest that portfolio diversification is generally not the primary motive for bank mergers, with an exception for mergers between TBTF banking organizations in which the opportunity to further diversify the portfolio seems to command an increased purchase premium that the acquirers would be willing to pay.

Our findings are different from those in Benston, Hunter, and Wall (1995), in which both the target's return volatility and the covariance of returns between targets and acquirers were significantly negative, suggesting that acquirers would pay larger merger premiums when there are opportunities for portfolio diversification. Their results may be driven by their model assumptions in which all bank mergers are treated in the same way (regardless of whether the banks are TBTF) and their lack of distinction for diversifiable vs. nondiversifiable risks. We take a more refined approach to improve on their model by (1) separating mergers that involve TBTF from those that do not and (2) separating out the systematic risk (nondiversifiable risk) from the overall return volatility. Our results show that the motive for mergers is not always the same across all merger transactions. Portfolio diversification is important only to those mergers between banking organizations that were already TBTF. In addition, we find that becoming part of a TBTF banking organization is one of the important factors in the mergers that involve non-TBTF banking organizations.

For other characteristics of the target, the coefficients of $MVBV_t$ are mostly insignificant, suggesting that targets with higher market-to-book value ratios are not perceived by the market to have a greater potential for earnings growth and/or be more efficient than the other targets. Note that this variable is also insignificant in Benston, Hunter, and Wall (1995). Finally, the coefficients of GTA_t are consistently negative and mostly significant, suggesting that fast-

growing targets (with high asset growth over the past 13 quarters) were not able to command a larger purchase premium. To summarize, our results indicate that while the target's current asset size (in conjunction with whether the acquirer is already TBTF) may be an important factor in bank mergers, how fast the target was growing prior to the merger made little difference in the purchase premiums, and, in fact, faster growing targets might receive a smaller purchase premium holding everything else fixed.

Acquirer Characteristics. From Table 3, the coefficients of $VROA_a$ are consistently negative and significant, suggesting that less risky acquirers (likely with better risk control and management) are more likely to offer larger merger purchase premiums, controlling for the characteristics of the targets and the merger deals. In addition, the coefficients of $MVBV_a$ are consistently positive and significant, in line with the view that more efficient acquirers are willing to pay more (as their share prices are also highly priced) in the stock market. Our results on these two characteristics of acquirers are the same as those in Benston, Hunter, and Wall (1995), and they are consistent with an argument that acquirers with higher quality management (as reflected in a larger $MVBV_a$) can benefit more from mergers and acquisitions. These acquirer-related results are also consistent with our earlier findings that the target's return volatility (poor quality of risk management) is unimportant in determining the purchase premium.

The coefficients of GTA_a are consistently negative but insignificant. The coefficients of $BETA_a$ are mixed and mostly insignificant. These results suggest that there is no strong relation between the purchase premium that the acquirer is willing to offer and the acquirer's systematic risk or the acquirer's asset growth (over the 13 quarters prior to the merger announcement date). The coefficients of $CRATIO_a$ are consistently positive and mostly significant, suggesting that well-capitalized banks may be willing to pay larger purchase premiums, and this is consistent with the findings in Benston, Hunter, and Wall (1995). Overall, we find that the amount of premiums that acquirers are willing to pay is determined by several factors, including the acquirer's capital ratio (or leverage ratio), whether the acquirer is already TBTF, and

whether the merger would allow the organization to cross the perceived TBTF threshold. In addition, the covariance of returns between the target and the acquirer (for mergers between TBTF banking organizations), the target's systematic risk (risk that cannot be diversified away), and the efficiency of the acquirer (as measured by the acquirer's overall risk, volatility of returns, and the market-to-book ratio) also play a role in determining the merger premiums.

Finally, we find that the coefficients of *Relative* are positive and significant, suggesting that the acquirers are willing to pay more to acquire targets of greater relative size, since such targets might provide greater opportunities for merger-related efficiencies. This is opposite to Benston, Hunter, and Wall (1995), who argue that relatively larger targets offer fewer opportunities for new product introduction and, thus, receive smaller purchase premiums. Again, the difference here may be driven by factors related to TBTF or systematic risk vs. overall volatility, as these variables that are measured separately in their model. Our finding of larger purchase premiums related to targets of greater relative size is consistent with our earlier argument that larger targets provide greater opportunity for TBTF banking organizations to expand their subsidy through a larger asset and deposit base.

To summarize, more efficient acquirers that are able to manage the risk well and/or operate more efficiently would be willing to pay larger purchase premiums, controlling for TBTF factors. In addition, targets with smaller systematic risks tend to receive larger premiums, and targets with larger relative size could command larger purchase premiums. Most important, we find that becoming TBTF and increasing the TBTF subsidy significantly affect the purchase premiums that the acquiring banking organizations are willing to offer.

Deal Characteristics. We find that the regional variables are not significant after controlling for other characteristics of the targets and the acquirers. The coefficients for *Instate* are consistently negative but sometimes insignificant, suggesting that there is little or no cost efficiency benefit in same state mergers. Interstate mergers may tend to provide more opportunity for the acquirers to expand their out-of-state client base. Finally, we find that the

coefficients for *MOE* are consistently statistically significantly negative, suggesting that purchase premiums may be smaller for mergers of equal deals. This finding is consistent with Brewer, Jackson, Jagtiani, and Nguyen (2000) and Brewer, Jackson, and Jagtiani (2005) in that any mergers involving two banking organizations of equal size are more likely to face problems in melding their cultures after the merger.

V. Robustness Test

We have conducted additional analysis, using stock market and bond market data, to further support our results related to the TBTF subsidies. In this section, we examine whether the markets view each merger positively or negatively based on the TBTF category of the mergers. Our overall results based on cumulative abnormal stock market returns around the merger and changes in the acquirer's funding cost (due to merger) in the bond market are consistent with our earlier findings. That is, there are significant benefits associated with being TBTF or being systemically important banking organizations.

Stock Market Reactions

This section investigates the stock market's reactions to mergers that involved TBTF and/or non-TBTF banking organizations classified by cases 1, 2, 3, and 4 as described earlier. Using stock market returns around the merger announcement date, we examine the cumulative abnormal returns to the targets, the acquirers, and the combined banking organization. This provides further understanding of the overall impact of TBTF and how the increased TBTF subsidies are divided between the target and the acquirer.

We estimate the cumulative abnormal returns (CARs) over several event windows for targets, acquirers, and portfolios of targets and acquirers around the merger announcement date over the period 1991-2004. We examine the CARs separately for each of the TBTF categories (using the threshold of $100 billion book value of total assets): (1) when both the

target and the acquirer become TBTF after the merger; (2) when the acquirer is already TBTF prior to the merger but the target is not; and (3) when both the target and the acquirer are already TBTF prior to the merger. Using standard event study methodology, we compute abnormal returns ($AR_{i,t}$) for bank i for the event day t.[13] The abnormal returns are calculated for each of the targets and for each of the acquirers. We then calculate the overall abnormal returns around the merger announcement date for the combined banking organization (referred to as portfolio abnormal returns), based on the abnormal returns of the target and the acquiring banks. Following Houston and Ryngaert (1994), we define the abnormal portfolio return for each merger as follows:

$$AR_{P_i,t} = \left[\frac{MV_{T_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] xAR_{T_i,t} + \left[\frac{MV_{A_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] xAR_{A_i,t}.$$

where the variable $MV_{T,-20}$ is the market value of the target 20 days before the merger announcement date, and the variable $MV_{A,-20}$ is the market value of the acquiring bank 20 days before the merger date. The variance of each merger i's abnormal portfolio return is given below:

$$VAR(AR_{P_i}) = \left[\frac{MV_{T_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right]^2 xVAR(AR_{T_i}) + \left[\frac{MV_{A_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right]^2 xVAR(AR_{A_i})$$
$$+2x\left[\frac{MV_{T_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] x\left[\frac{MV_{A_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] x\rho_{A,T}(n_{A_i} / n_{T_i}) x\sqrt{[VAR(AR_{A_i})xVAR(AR_{T_i})]},$$

where the variable $\rho_{A,T,}$ is the estimated correlation coefficient between acquirer and target market model residuals obtained over the estimation period, the variable n_{A_i} is the number of

[13] See Bradley, Desai, and Kim (1988) for a detail discussion of this methodology.

days in the acquirer's abnormal return window, and the variable n_{T_i} is the number of days in the target's abnormal return window. The results are presented in Table 4.

Case 1: For mergers between non-TBTF targets and non-TBTF acquirers in which the combined banking organization will become TBTF, we find that the average abnormal return to the target for this group of mergers is positive and significant (15.54 percent abnormal returns), while the average abnormal returns to the acquirer are not significantly different from zero. This result is consistent with our earlier findings that acquirers are willing to pay a higher purchase premium in mergers that would allow the combined banking organization to become TBTF. In addition, we find that average abnormal returns to the combined banking organization are positive and significant (6 percent abnormal returns), consistent with the argument that these mergers were perceived by the market to be value-added, since they allow the banking organizations increased access to the federal safety net after the merger.

Case 2: For mergers between TBTF acquirers and non-TBTF targets, we find the average abnormal return to the target to be positive and significant (close to 12 percent abnormal returns), indicating that becoming part of a TBTF banking organization through the merger has added value to the target. The average abnormal returns to the TBTF acquirer are slightly negative and significant. As expected, the average abnormal returns to the combined organization are not significantly different from zero. Again, this is consistent with our TBTF hypothesis, as the market does not perceive the mergers in this category to provide further benefits or subsidies to the combined banking organization.

Case 3: For mergers between TBTF targets and TBTF acquirers, we find positive and significant average abnormal returns to the target (10 percent abnormal returns) and insignificant or small negative abnormal returns to the acquirer. The average abnormal returns to the combined banking firm are slightly positive and significant, suggesting that the market perceived the mergers of two TBTF banking organizations to add some additional subsidy

values (increased access to the federal safety net), since the combined banking organization becomes too interconnected and important to the overall economy and the payment systems. Through these mergers, these already TBTF banking organizations were likely to have moved themselves up on the TBTF list, since the asset base and network of the combined TBTF organization have further expanded throughout the economy.

To summarize, our overall results on the abnormal returns to targets and acquirers may be considered typical: they are consistent with the previous merger literature, which generally finds positive abnormal returns to the targets and negative abnormal returns to the acquirers around merger announcement dates. In our examination of the combined abnormal returns of the portfolio, we find evidence consistent with our TBTF subsidy argument. Specifically, we find positive abnormal returns for mergers that allow the combined banking firm enhanced access to the federal safety net as the banking organizations become clearly TBTF (Case 1) or become systematically important to the overall economy (Case 3).

Bond Market Reactions

Our finding of a significant TBTF subsidy is supported not only by evidence from the stock market's reactions but also the bond market's reactions. In examining bond spreads for banking organizations, we include only subordinated bonds in order to ensure that the bonds would be priced by the market according to risk, and that they are not federally guaranteed. In addition, these bonds are straight bonds (that is, nonconvertible and noncallable). For each category of TBTF mergers, we use subordinated bonds that were issued by the acquiring banks before and after the merger. The bond data and characteristics that we use in this examination are those used in Penas and Unal (2004).[14]

We define sub-debt spread as the yield on the subordinated-bond minus the yield of a Treasury bond with a similar maturity. As in Penas and Unal (2004), these sub-debt spreads,

OfferSpread, are regressed on the various bond characteristics and the characteristics of the banking organization that issue the bonds, using the following equation:

$$OfferSpread = c_0 + c_1 MATURITY + c_2 CALL + c_3 SUB + c_4 ISSUESIZE + c_5 MARKET + \\ + c_6 VOLATILITY + c_7 FINLEV + c_8 NONPERFORM + c_9 SIZE + c_{10} MERGER + \varepsilon$$

where *MATURITY* is the natural logarithm of years of maturity; *CALL* is the natural logarithm of the years with call protection; *SUB* is a binary variable that is equal to one if the bond is subordinated, zero otherwise; *ISSUESIZE* is the natural logarithm of the size of the issue; *MARKET* is the difference between the Merrill Lynch index of bond returns for the financial sector, excluding banks, and the 10-year Treasury bond rate; *VOLATILITY* is the volatility of the banking organization's equity return one year before the issue date for the bond issued before the merger announcement date and the volatility of the portfolio of the two merging banking organizations for bonds issued after the merger announcement date; *FINLEV* is the market value of financial leverage; *NONPERFORM* is the percentage of nonperforming loans over total assets; *SIZE* is the natural logarithm of the acquirer's pre-merger total assets; *RATING* is the bond rating of each bond; and *MERGER* is a binary variable that is equal to one if issued post-merger, zero otherwise. In addition to these characteristics, we also include in the regression analysis our three TBTF indicators (*$DBECOME_{TBTF}$, $DACQUIRER_{TBTF}$, and $DBOTH_{TBTF}$)*, *each* interacted with MERGER to capture the three TBTF cases.

The results of the analysis are reported in Table 5, where the robust t-statistics (with White's correction) are reported in parentheses. Column 1 presents the regression of sub-debt spreads with bond characteristics, issuer characteristics, and other control factors. In column 2, the three additional indicators are also included in the analysis to capture the impact of being TBTF on the sub-debt spreads (the issuer's funding cost). These variables are the TBTF indicators interacting with the variable *MERGER*, so that the variable *MERGER* $DBECOME_{TBTF}$*

[14] We thank Haluk Unal for sharing these data with us.

is equal to 1 if the acquirer becomes TBTF after the merger and the observed spreads are for the subordinated bonds issued by the acquirer after the merger. We find the coefficient of this variable to be negative and significant, providing evidence that the acquirers were able to issue subordinated bonds at a significantly lower rate after becoming TBTF through the merger than they were able to prior to the merger.

As expected, the coefficient of the variable $MERGER^{*}\ DACQUIRER_{TBTF}$ is not significantly different from zero, indicating that for those acquirers who were already TBTF prior to the merger, their acquisition of a non-TBTF target does not lower their funding cost, since sub-debt spreads do not change significantly between before and after the merger. The coefficient of $MERGER^{*}\ DBOTH_{TBTF}$ is positive and weakly significant (almost missing the 10 percent level of significance), indicating that, for mergers between two TBTF banking organizations, there may be an increase in funding cost to the TBTF acquirers after merging with another TBTF banking organization, probably due to the possible complexity of combining two very large institutions with different corporate cultures. Overall, the analysis of subordinated bond spreads before and after becoming TBTF supports our finding of a significant subsidy to TBTF banking organizations.

VI. How Much Are the Potential TBTF Subsidies Worth to Banks?

Our empirical results suggest that banking organizations are willing to pay an added premium for mergers that will take them across the TBTF size thresholds. This additional amount of purchase premium could provide some indication of the overall value of the benefits an organization will get as it becomes TBTF. While the additional premiums could also be tied to something other than more favorable regulatory treatment for large banks, we have controlled for these impacts related to size and economies of scale in the regression model. Even if we use the most conservative approach of allowing for a broader range of TBTF benefits, there are

reasons why the added premiums we estimated might still understate the true value of potential subsidies to these large banks.

First, the overall benefits to large banking organizations might be expected to accrue to several parties other than just the stockholders of the target organization. A substantial portion of the benefits, for instance, could go to the stockholders of the acquiring organization and to bondholders (as suggested by the bond spread results) and uninsured depositors of both the target and the acquirer. An acquiring organization and its stockholders are likely to have the bargaining power to retain many of the TBTF benefits, particularly since this organization may be able to select from a variety of acquisition targets or combinations of targets in reaching the desired size threshold. To the extent that this is true, the value of any retained benefits should be reflected in greater investor interest and a higher market price for the acquirer's stock. The uninsured depositors and possibly the bondholders of both the target and acquiring organizations would also anticipate receiving greater protection once they become part of a TBTF organization, and the value of this protection would be an additional benefit (not accounted for in our study).

Second, another factor that could lead to our under-estimation of the TBTF benefits is that investors may try to anticipate which acquisition targets would provide a good stepping stone for organizations trying to become TBTF. These investors may bid up the price of such targets well in advance of the 20-, 40-, and 60-day windows we use to capture purchase premiums, thereby leading to lower estimated values for the additional purchase premiums.[15] Third, our estimation of the total TBTF premium that the acquiring banks have paid does not include several bank mergers that brought the combined banking organization over the TBTF threshold, since the mergers occurred prior to the start of our sample period (several merger parties were already TBTF prior to our sample period). Consequently, while acquirers may pay

greater purchase premiums to capture the expected benefits of TBTF, a number of factors suggest that these added premiums may only be a starting point or lower bound for estimating the overall TBTF subsidies.

Based on our estimation of equation (2) and the regression coefficients estimated using a 20-day purchase premium (reported in Table 3), we calculate the TBTF premiums that are associated with the coefficients on the following variables -- $DBECOME_{TBTF}$, $DACQUIRER_{TBTF}$, $DACQUIRER_{TBTF} * TA_t$, $DBOTH_{TBTF}$, $DBOTH_{TBTF} * TA_t$, and $DBOTH_{TBTF} * COV_{t,a}$ for each of the merger deals. The specification is described in equations (3), (4), and (5) below.

$$\textit{Subsidy (Become TBTF)} = b_{31} \quad (3)$$

$$\textit{Subsidy (Acquirer is already TBTF)} = b_{32} + b_{33}(TA_t) \quad (4)$$

$$\textit{Subsidy (Acquirer and Target are already TBTF)} = b_{34} + b_{35}(TA_t) + b_{36}(COV_{t,a}) \quad (5)$$

where b_{31} is the coefficient estimate on $DBECOME_{TBTF}$; b_{32} is the coefficient estimate on $DACQUIRER_{TBTF}$; b_{33} is the coefficient estimate on $DACQUIRER_{TBTF} * TA_t$; b_{34} is the coefficient estimate on $DBOTH_{TBTF}$; b_{35} is the coefficient estimate on $DBOTH_{TBTF} * TA_t$; and b_{36} is the coefficient estimate on $DBOTH_{TBTF} * COV_{t,a}$.

Table 6 presents our estimated total dollar value of the TBTF premiums for all the merger deals in our sample, which include bank mergers during 1991-2004. The dollar value of the TBTF premium is calculated for each TBTF category, based on three different TBTF thresholds: $100 billion in book value of total assets, the 11 largest banking organizations, and $20 billion market capitalization.

Becoming TBTF. The estimated TBTF premiums paid to benefit from crossing the TBTF threshold are presented in column 1 of Table 6, and they are calculated using the *Subsidy*

[15] Our results provide some support for the claim that investors may be bidding up the price of targets in advance. We find that the regressions that use 40- and 60-day windows for calculating bid premiums

(Become TBTF) in equation (3). The top panel presents the estimated TBTF premiums using the threshold of $100 billion book value of total assets, which includes eight merger deals. The combined excess purchase premiums paid by these eight acquirers to become TBTF range from $14.1 billion (60-day window) to $17.1 billion (20-day window). These becoming TBTF premiums represent a significant portion of the overall purchased premiums offered by these eight acquiring banks. Total offered premiums for these eight merger deals range from $22.4 billion (20-day window) to $30.5 billion (60-day window).[16] Specifically, our estimated becoming TBTF premiums account for 46 percent (for the 60-day window) to 76 percent (for the 20-day window) of total purchase premiums that the eight acquiring banks offered to pay.

The middle and lower panels report these becoming TBTF premiums when using other TBTF thresholds, using the $20 billion market capitalization threshold in the middle panel and using the 11 largest banking organizations threshold in the bottom panel. These premiums represent the additional TBTF value that was given to shareholders of the target bank, and by no means do they represent the total TBTF benefits that are likely to be captured by other parties, including the shareholders, bondholders, and other creditors of the targets and the acquirers. Thus, these estimates can be interpreted as a lower bound value of the TBTF subsidies.

Acquirer Already TBTF. In addition to the premiums paid to become TBTF, we also calculate those TBTF-related premiums paid by already TBTF acquirers, which could still increase their TBTF subsidies by expanding their asset base and network (column 2) and becoming clearly systematically important banking organizations (column 3).

Column 2 of Table 6 presents the purchase premiums that the TBTF acquirers paid to acquire non-TBTF targets, using *Subsidy (Acquirer is already TBTF)* in equation (4). Again, the purchased premiums are calculated for the three different TBTF thresholds, with 29, 21, and 33

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have greater explanatory power than those using just 20-day windows.

[16] Total offered premium equals the offer price times the number of shares of the target.

merger deals included for the top panel ($100 billion book value of total assets threshold), the middle panel ($20 billion market capitalization threshold), and the bottom panel (the 11 largest banking organizations threshold), respectively. These TBTF premiums are related to the size of the target banks, since larger purchase premiums are paid to acquire targets that would provide greater opportunity for the TBTF acquirers to expand their deposit base. The estimated total TBTF premiums range from about $15 billion to $25 billion.

Column 3 of Table 6 presents the calculated excess purchase premiums that already TBTF acquirers paid to acquire TBTF targets, using *Subsidy (Acquirer and Target are already TBTF*) in equation (5). The calculated purchase premiums paid to shareholders of TBTF targets range from about $5 billion to $30 billion, depending on the TBTF definition and the windows for premium calculation. Consistent with our earlier results on the stock market's reactions, which rewarded this type of merger between two TBTF banking organizations, we find that these mergers create values to the target and the combined banking organizations.

Overall TBTF Subsidies. Overall, our results indicate that significant benefits accrue to TBTF banking organizations. It is important to point out that these estimated TBTF benefits represent a lower bound estimate of the actual TBTF subsidies, since our calculation could not include the benefits that have been captured by some organizations, such as Bank of America Corporation and Citigroup, which were already TBTF prior to our study period. In addition, our calculated TBTF benefits are those that accrue to shareholders of the targets only; they do not include benefits that accrue to shareholders of the acquiring banking organization and bondholders and other creditors of the target and the acquiring banking organizations. The true value of the potential TBTF benefits, therefore, is expected to be larger than the estimates presented in this paper.

VII. Conclusions and Policy Implications

The special treatment provided to too-big-to-fail institutions during the financial crisis that started in mid-2007 has raised concerns among analysts and legislators about the consequences of this for the overall stability and riskiness of the financial system. Stern (2009a) testified before the Committee on Banking, Housing, and Urban Affairs that "TBTF arises when the uninsured creditors of systemically important financial institutions expect government protection from loss … If creditors continue to expect special protection, the moral hazard of government protection will continue. That is, creditors will continue to underprice the risk-taking of these financial institutions, overfund them, and fail to provide effective market discipline. Facing prices that are too low, systemically important firms will take on too much risk. Excessive risk-taking squanders valuable economic resources and, in the extreme, leads to financial crises that impose substantial losses on taxpayers."

It was unclear after FDICIA and before the financial crisis whether some banking organizations were TBTF. It is now evident that being viewed by the market (and regulators) as being TBTF, being too interconnected, or being systematically important to the economy could add significant value to banking firms. Since there has never been an official published list or definition of TBTF banking organizations, the value of potential TBTF benefits is determined by the market's perception. This paper attempts to examine the market's perception of the TBTF thresholds and the potential value of subsidies provided to TBTF banking institutions.

Our empirical results are consistent with the hypothesis that large banking organizations obtain advantages not available to other organizations. These advantages may include becoming TBTF and thus gaining favor with uninsured bank creditors and other market participants, operating with lower regulatory costs, and increasing the organization's chances of receiving regulatory forbearance.[17] We find that banking organizations are willing to pay an

[17] For further discussion on regulatory forbearance when the banking system is weak and when there are "too many to fail," see Brown and Dinc (2009) and Acharya and Yorulmazer (2007).

added premium for mergers that will put them over a TBTF threshold. This added premium amounted to an estimated $14 billion to $17 billion extra that eight banking organizations in our data set were willing to pay for acquisitions that enabled them to become TBTF (crossing the $100 billion book value of total assets threshold).

While these amounts are large, they are likely to underestimate the total value of the benefits that accrue to large banking organizations. Organizations seeking to obtain TBTF benefits are not likely to be forced by the marketplace to pass on anywhere near the full value of these benefits to the shareholders of their acquisition targets. In addition, these estimated benefits apply only to the organizations that became TBTF during our study period. Benefits already obtained by banking organizations that became TBTF prior to our sample period thus would not be included in our TBTF benefit calculations. As a result, the total subsidy value to TBTF banking organizations could easily be much higher than what we estimate.

These estimates provide an aggregate measure of the benefits accruing to large banking organizations from exceeding a TBTF threshold and do not indicate the relative contribution of any particular regulatory advantage or individual policy. By themselves, our results do not point out which particular policy directions would be most effective in addressing the benefits that large banking organizations may obtain once they become TBTF. However, our estimates of the benefits from exceeding a TBTF threshold appear large enough to cause increasing concerns as the megamerger trend continues in the U.S. banking industry. These trends could hinder the efficient allocation of financial resources across different sizes of institutions and, in turn, their customers and the overall macro-economy.[18]

Should these TBTF banking institutions be required to pay for the privilege? If so, should they be required to hold more capital (and contingent capital that would be converted to equity capital when needed) and/or be assessed higher FDIC insurance premiums than other banks? Since these payments could not be assessed to TBTF and systemically important

banking organizations under the current regime of constructive ambiguity, should the TBTF list be made publicly available? Should systemically important nonbank organizations also be assessed similar payments? These are policy questions for further research.[19] Our findings lead us to be concerned and cautious as the number of assisted mergers between weak TBTF financial institutions continues to grow through the financial crisis that started in mid-2007, resulting in TBTF banking organizations becoming even bigger than before the beginning of the crisis. Furthermore, a few of the recent assisted mergers were between TBTF banks and nonbank financial institutions, thus extending the federal safety net related to TBTF to cover those outside the commercial banking system.

[18] See Hoenig (1999) and Carow, Kane, and Narayanan (2006) for further discussion.
[19] See Blinder (2009), Stern (2009a and 2009b), and Stern and Feldman (2009) for the most recent policy reform discussion.

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Table 1
Recent Evidence of the Value of Having Access to the Federal Safety Net

Panel A: Cumulative abnormal returns around Treasury Secretary Henry Paulson's announcement of capital support for major U.S. banking organizations, window [-1, +1]

This table reports statistics for the cumulative abnormal returns surrounding the October 14, 2008 announcement of the United States Treasury Secretary Henry Paulson that government will use the TARP funds to injection equity capital in major U.S. banking organizations. For each portfolio of banking organizations, excess return in the event window date *k* is the coefficient $\gamma_{p,k}$ in the following model, estimated by seemingly unrelated regression:

$$R_{p,t} = \alpha_p + \beta_p R_{m,t} + \sum_{k=-1}^{1} \gamma_{p,k} D_k + \varepsilon_{p,t}$$

$R_{p,t}$ is the stock return of portfolio *p* on day *t*; α_p is the intercept coefficient for portfolio *p*; R_{mt} is the market index for day *t*; β_p is the market risk coefficient for portfolio *p*; D_k is a binary variable that equals 1 if day *t* is equal to the announcement day or window *k* ($k \in [-1,+1]$), zero otherwise; $\gamma_{p,k}$ is the event coefficient for portfolio *p*; and $\varepsilon_{p,t}$ is a random error. October 14, 2008 is defined as the event day [0]. We examine cumulative excess return over the three-day event window [-1, +1]. The row labeled "Cumulative abnormal returns over the window [-1, +1]" reports the sum of the $\gamma_{p,k}$ for each asset-size group of banking organizations. The numbers in parentheses report the p-value for statistical significant. H_0^1 tests the hypothesis that the cumulative abnormal returns are jointly equal to zero for the announcement. H_0^2 tests the hypothesis that the cumulative abnormal returns are jointly equal to each. The χ^2's statistics provide a test statistic to determine statistical significance.

The *** and ** denote significance at the 1% level and the 5% level, respectively.

	Portfolio of 10 Large Banking Org. that Received Capital Injection (TARP) on 10/14/08 (N=10)	Portfolio of Large Banking Org. (in the Largest 50) that Did Not Receive TARP (N=25)	Portfolio of Publicly Traded Banking Org. with Book Total Assets $5-$10 bill (N=34)	Portfolio of Publicly Traded Banking Org. with Book Total Assets $1-$5 bill (N=110)
Cumulative abnormal returns around the event date 10/14/2008	18.87^{***}	11.38^{**}	3.05	0.05
$H_0^1 : (\gamma_{1,-1} + \gamma_{1,0} + \gamma_{1,+1}) = (\gamma_{2,-1} + \gamma_{2,0} + \gamma_{2,+1}) = (\gamma_{3,-1} + \gamma_{3,0} + \gamma_{3,+1}) = (\gamma_{4,-1} + \gamma_{4,0} + \gamma_{4,+1}) = 0$ $\chi^2(4) = 20.37^{***}$				
$H_0^2 : (\gamma_{1,-1} + \gamma_{1,0} + \gamma_{1,+1}) = (\gamma_{2,-1} + \gamma_{2,0} + \gamma_{2,+1}) = (\gamma_{3,-1} + \gamma_{3,0} + \gamma_{3,+1}) = (\gamma_{4,-1} + \gamma_{4,0} + \gamma_{4,+1})$ $\chi^2(3) = 20.36^{***}$				

Source: Brewer and Klingenhagen (2009)

Table 1 (Cont'd)
Recent Evidence of the Value of Having Access to the Federal Safety Net

Panel B: Market Reactions to the Extension of Federal Assistance to Investment Banks

This panel reports the abnormal returns for three portfolios of organizations for three difference event dates: March 14, when the Federal Reserve System (FRS) announced that it would open the discount window to lend to investment banking firms; March 17, when JPMorgan Chase and Co. (JPMC) announced that it would acquire Bear Stearns for $2 per share with Federal assistance; and March 18, when Lehman Brothers Holdings and Goldman Sachs Group announced better than expected earnings. The three portfolios are: (1) a portfolio of 4 investment banking firms (Morgan Stanley; Merrill Lynch; Lehman Brothers Holdings; and Goldman Sachs Group); (2) a portfolio of the top 11 domestic banking organizations in the National Information Center's (NIC) 50 largest bank holding companies (BHCs) list; and (3) the remaining 16 domestic banking organizations in the NIC's top 50 BHC list. For each portfolio of banking organizations, abnormal return on the event date *k* is the coefficient $\gamma_{p,k}$ in the following model, estimated by seemingly unrelated regression:

$$R_{p,t} = \alpha_p + \beta_p R_{m,t} + \sum_{k=-1}^{3} \gamma_{p,k} D_k + \varepsilon_{p,t}$$

$R_{p,t}$ is the stock return of portfolio *p* on day *t*; α_p is the intercept coefficient for portfolio *p*; R_{mt} is the market index for day *t*; β_p is the market risk coefficient for portfolio *p*; D_k is a binary variable that equals 1 if day *t* is equal to the announcement day *k* ($k \in [1, 2, \text{and } 3]$), zero otherwise; $\gamma_{p,k}$ is the event coefficient for portfolio *p*; and $\varepsilon_{p,t}$ is a random error. The numbers in parentheses beneath the abnormal returns are the t-statistics. *** indicates statistical significance at the 1 percent level.

Event	Abnormal Returns (AR) to Investment Banks and Large Banking Organizations			Compare Investment Banks vs. Large Banking Organizations	
	Investment Bank Portfolio	Largest 11 Banking Org. with Assets > $150 billion (as of 3/31/08)	Largest 16 Banking Org. with Assets > $100 billion (as of 3/31/08)	AR Difference between Investment Bank and Largest 11 Banks	AR Difference between Investment Bank and Largest 16 Banks
	(1)	(2)	(3)	(1)-(2)	(1)-(3)
March 14: FRS would lend to Bear Stearns Cos. Through JPMC	0.1779 (7.03)***	-0.0068 (-0.17)	0.0013 (0.04)	19.31***	29.73***
March 17: Bear Stearns Cos. was being acquired by JPMC	-0.0356 (-1.38)	0.0197 (0.49)	0.0088 (0.30)	1.66	1.80
March 18: Lehman and Goldman Sachs announced better than expected earnings	0.1069 (4.20)***	-0.0157 (0.0393)	0.0013 (0.04)	8.41***	10.50***

Table 2
Descriptive Characteristics for 411 Bank Acquisitions
Announced During the Period 1991-2004

Panel A: Variable Definitions and Descriptive Statistics for the Entire Sample.

Characteristics	Mnemonic	Mean	Median	Maximum	Std. Dev.
Purchase premium over stock price 20 days before	PREM20	8.6393	6.7900	61.4150	8.0070
Purchase premium over stock price 40 days before	PREM40	9.5509	7.7000	67.3827	9.0845
Purchase premium over stock price 60 days before	PREM60	10.0055	8.2550	76.3125	9.9497
Acquirer total assets prior to offer (Million)	TA_a	$37,186	$13,428	$1,057,657	$90,350
Target total assets prior to offer (Million)	TA_t	$8,703	$1,265	$326,563	$29,887
The variance of return on assets of the target over the 13 quarters before the quarter of the merger announcement date x 10,000	$VROA_t$	0.0326	0.0084	1.2106	0.1103
The target's ratio of market value of common to the book value of common in the quarter before the quarter of the merger announcement date	$MVBV_t$	1.7333	1.6200	17.4862	1.1225
The target's Beta (measure of systematic risk) calculated from daily stock returns for the period beginning 300 days prior to the merger, using a one-factor market model	$BETA_t$	0.4760	0.4126	2.0084	0.4619
Growth rate of total assets of the target over the 13 quarters before the quarter of the merger announcement date	GTA_t	0.4427	0.3342	7.9598	0.6352
The variance of return on assets of the acquirer over the 13 quarters before the quarter of the merger announcement date x 10,000	$VROA_a$	0.0179	0.0141	0.3775	0.0242
The acquirer's ratio of market value of common to the book value of common in the quarter before the quarter of the merger announcement date	$MVBV_a$	2.2310	1.9554	37.2474	1.9801
The acquirer's Beta (measure of systematic risk) calculated from daily stock returns for the period beginning 300 days prior to the merger, using a one-factor market model	$BETA_a$	0.7859	0.8121	2.1594	0.4398
Growth rate of total assets of the acquirer over the 13 quarters before the quarter of the merger announcement date	GTA_a	0.8473	0.6171	19.9130	1.3589
The acquirer's book value of capital-to-asset ratio of the acquirer in the quarter prior to the announcement date	$CRATIO_a$	0.0819	0.0807	0.1497	0.0150

Covariance of the return on assets of the target and acquirer over the 13quarters before the quarter of the merger announcement date	$COV_{t,a}$	0.0032	0.0008	0.0313	0.0069
Target assets / Acquirer assets	*Relative*	0.2936	0.1738	1.7636	0.3442
Indicator variable equal to 1 if the acquirer and the target are in the same state, and zero otherwise	*Instate*	0.4526	0	1	0.4984
Indicator variable equal to 1 if it is a merger of equal	*MOE*	0.0487	0	1	0.2154

Panel B: Summary Statistics for Key Variables – Comparing Across TBTF Groups

	Min	Max	Mean	Std. Dev.	Median
Case 1: Become TBTF					
PREM20	0.8300	61.4150	20.0191	21.6658	13.4350
PREM40	0.5800	67.3827	27.9800	28.5683	13.2475
PREM60	-1.7950	75.1947	28.2221	29.1866	13.4350
TA_t	$35,402	$94,820	$63,104	$20,623	$58,198
TA_a	$48,051	$99,066	$73,238	$18,670	$74,318
$BETA_t$	0.7700	2.0084	1.3280	0.3644	1.2971
$BETA_a$	0.9015	1.9350	1.2532	0.3913	1.1420
$VROA_t$	0.0009	0.1816	0.0492	0.0674	0.0170
$VROA_a$	0.0053	0.0324	0.0187	0.0104	0.0173
Case 2: Acquirer Already TBTF					
PREM20	0.6850	24.3850	8.5311	6.1111	6.6025
PREM40	-9.6400	29.2600	9.2506	7.8525	7.8850
PREM60	-9.6400	29.3850	9.8845	8.3512	7.9463
TA_t	$257	$81,219	$23,574	$24,764	$16,836
TA_a	$104,554	$1,057,657	$211,442	$175,068	$182,557
$BETA_t$	-0.0918	1.9895	0.8118	0.5134	0.7580
$BETA_a$	0.7319	1.7800	1.2298	0.2679	1.2511
$VROA_t$	0.0004	0.0994	0.0131	0.0198	0.0063
$VROA_a$	0.0008	0.1097	0.0160	0.0202	0.0140

Case 3: Both Already TBTF					
PREM20	2.9250	46.3125	15.5813	16.0898	11.3550
PREM40	8.9300	62.2500	21.4153	20.4770	13.5175
PREM60	8.4250	76.3125	25.1966	25.6109	16.4985
TA_t	$114,804	$326,563	$214,732	$86,334	$230,972
TA_a	$116,862	$770,912	$418,965	$277,663	$355,274
$BETA_t$	0.9082	1.8066	1.2201	0.3287	1.0905
$BETA_a$	0.9828	1.7616	1.2504	0.2686	1.1862
$VROA_t$	0.0002	0.0521	0.0138	0.0198	0.0048
$VROA_a$	0.0054	0.0333	0.0155	0.0096	0.0140
Case 4: Base Case -- No TBTF					
PREM20	-6.0950	60.7500	8.2866	7.2525	6.7900
PREM40	-4.7200	64.0000	8.9798	7.4940	7.4400
PREM60	-30.0200	67.2500	9.3700	8.2871	8.1250
TA_t	$44	$40,136	$2,933	$5,479	$1,096
TA_a	$127	$98,640	$15,914	$17,194	$9,768
$BETA_t$	-1.0800	1.9630	0.4178	0.4201	0.3676
$BETA_a$	-0.2801	2.1594	0.7318	0.4239	0.7596
$VROA_t$	0.00002	1.2106	0.0342	0.1160	0.0085
$VROA_a$	0.0001	0.3775	0.0180	0.0249	0.0143

Table 3

Cross-sectional determinants of the 20-day purchase premium

The dependent variable in these regressions is the 20-day purchase premium of a target bank ($ million) computed as the offer price less pre-consolidation market value 20-trading days before the announcement date. The first column reports estimates using the $100 billion total assets threshold for TBTF institutions; the second column reports estimates using the 11 largest banking organizations as the threshold for TBTF; and the third column reports estimates using the $20 billion market value capitalization threshold for TBTF institutions. $DBECOME_{TBTF}$ is an indicator variable equal to one if the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger, and zero otherwise; $DACQUIRER_{TBTF}$ is an indicator variable equal to one if the acquirer is already TBTF prior to the merger but the target is not TBTF, and zero otherwise; $DBOTH_{TBTF}$ is indicator variable equal to 1 if both the acquirer and the target are already TBTF prior to the merger, and zero otherwise; $VROA_a$ ($VROA_t$) is the variance of the return on total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; $MVBV_a$ ($MVBV_t$) is the ratio of market value of common to the book value of common of the acquirer (target) in the quarter prior to the quarter of the merger announcement date; $BETA_a$ ($BETA_t$) is the acquirer's (target's) Beta (measure of systematic risk) calculated from daily stock returns for the period beginning 300 days prior to the merger, using the one-factor market model; GTA_a (GTA_t) is the growth rate of total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; TA_t is the book value total assets of the target; $CRATIO_a$ is the book value of capital-to-asset ratio of the acquirer in the quarter prior to the quarter of the merger announcement date; $COV_{t,a}$ is the covariance of the ROA of the target and acquirer over the 13 quarters prior to the quarter of the merger announcement date; *Relative* is the ratio of target's total assets to acquirer's total assets; *Instate* is an indicator variable equal to one if the acquirer and the target are in the same state, and zero otherwise; *Moe* is an indicator variable equal to one if it is a merger of equal, and zero otherwise. Sample Period: 1991-2004 (N=411). The year and regional fixed effects are also included in the estimation but are not reported. The t-statistics using heteroscedasticity consistent standard errors are reported in the parentheses. The ***, **, and * denote significance at the 1% level, the 5% level, and the 10% level, respectively.

Independent Variables	1 **Total Assets > $100 Bill**	2 **Largest 11 Banks Total Assets**	3 **Market Value of Equity > $20 Bill**
Intercept	-334.4429 (-1.51)	-155.7461 (-0.86)	-357.4950 (-1.58)
TBTF Variables:			
$DBECOME_{TBTF}$	1682.7630 (2.14)**	1166.8450 (2.35)**	1114.2510 (1.83)*
$DACQUIRER_{TBTF}$	-215.6453 (-1.74)*	-195.5032 (-1.54)	-412.7286 (-1.88)*
$DACQUIRER_{TBTF} * TA_t$	0.0352 (1.50)	0.0413 (2.18)**	0.0462 (2.01)**
$DBOTH_{TBTF}$	-2411.3700 (-0.48)	361.1923 (0.30)	4368.9430 (1.27)
$DBOTH_{TBTF} * TA_t$	0.0352 (0.94)	0.0128 (0.84)	0.0021 (0.13)

$DBOTH_{TBTF} * COV_{t,a}$	-8.2286 (-2.16)**	-8.3505 (-3.15)***	-7.2136 (-2.97)***
Target's Characteristics:			
$VROA_t$	883.5358 (0.89)	411.8025 (0.41)	716.7396 (0.87)
$MVBV_t$	-0.0112 (-1.28)	-0.0152 (-1.71)*	-0.0135 (-1.59)
$BETA_t$	-0.0385 (-2.50)**	-0.0197 (-1.73)*	-0.0245 (-2.24)**
GTA_t	-0.0369 (-1.63)	-0.0337 (-2.08)**	-0.0452 (-2.02)**
Acquirer's Characteristics:			
$VROA_a$	-3833.9920 (-1.91)*	-4632.8220 (-2.05)**	-4507.0020 (-1.88)*
$MVBV_a$	0.0154 (1.82)*	0.0284 (2.92)***	0.0163 (1.74)*
$BETA_a$	-0.0083 (-0.92)	0.0095 (1.08)	0.0062 (0.73)
GTA_a	-0.0059 (-0.76)	-0.0060 (-1.10)	-0.0049 (-0.81)
$CRATIO_a$	1.1217 (2.93)***	0.2994 (0.95)	0.7437 (1.96)*
Target-Acquirer Relation:			
$COV_{t,a}$	-1.0197 (-1.89)*	0.2072 (0.53)	-0.2193 (-0.28)
Relative	249.9452 (2.07)**	268.6950 (2.60)***	361.6351 (2.51)**
Deal Characteristics:			
MOE	-665.5772 (-2.25)**	-508.7732 (-1.79)*	-572.0590 (-1.95)*
Instate	-95.0416 (-1.68)*	-87.3338 (-1.60)	-112.7128 (-2.09)**
R-Square (Adjusted)	76.87%	79.25%	79.99%

Table 4

Cumulative abnormal returns around merger announcement date

This table reports the cumulative abnormal returns (CARs) over the event windows [-1, +1] and [-1, 0] for targets, acquirers, and portfolio of targets and acquirers around the merger announcement date over the period 1991-2004 for three TBTF cases using the $100 billion total assets threshold. The first panel provides the results for the merger combinations where the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger; the second panel provides the results for the merger combinations where the acquirer is already TBTF prior to the merger but the target is not TBTF; and the third panel provides the results for the merger combinations where both the acquirer and the target are already TBTF prior to the merger. We use standard event study methodology to compute abnormal return ($AR_{i,t}$) for event day t. See Bradley, Desai, and Kim (1988) for a discussion of this methodology. Following Houston and Ryngaert (1994), we define portfolio abnormal return for each merger as:

$$AR_{P_i,t} = \left[\frac{MV_{T_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] xAR_{T_i,t} + \left[\frac{MV_{A_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] xAR_{A_i,t}.$$

where $MV_{T,-20}$ is the market value of the target firm twenty days before the merger bid for the target, $MV_{A,-20}$ is the market value of the acquirer firm twenty days before the merger bid for the target. The variance of each merger i's portfolio abnormal return is given below:

$$VAR(AR_{P_i}) = \left[\frac{MV_{T_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right]^2 xVAR(AR_{T_i}) + \left[\frac{MV_{A_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right]^2 xVAR(AR_{A_i})$$

$$+2x\left[\frac{MV_{T_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] x\left[\frac{MV_{A_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] x\rho_{A,T}(n_{A_i} / n_{T_i}) x\sqrt{[VAR(AR_{A_i}) xVAR(AR_{T_i})]},$$

where $\rho_{A,T,}$ is the estimated correlation coefficient between acquirer and target market model residuals obtained over the estimation period, n_{A_i} is the number of days in the acquirer abnormal return window, and n_{T_i} is the number of days in the target abnormal return window. The Z-statistics are in parentheses below the abnormal returns.

Panel 1: Both targets and acquirers become TBTF after the merger – 8 observations

Year	Acquirer	Target
1991	Chemical Banking Corp.	Manufacturers Hanover Corp.
1991	NCNB Corp, Charlotte, NC	C&S/Sovran Corp.
1995	First Union Corp, Charlotte, NC	First Fidelity Bancorporation
1995	NBD Bancorp, Detroit, MI	First Chicago Corp, Illinois
1995	Wells Fargo & Co.	First Interstate Bancorp
1998	Washington Mutual Inc., Seattle	Ahmanson H.F. & Co., Irwindale, CA
1998	Norwest Corp	Wells Fargo
2000	Firstar Corp, Milwaukee	U.S. Bancorp, Minneapolis

Event window	Target	Acquirer	Combined
	15.54	-0.40	6.60
[-1, +1]	(15.69)	(0.40)	(7.79)
	14.67	1.00	6.10
[-1, 0]	(18.28)	(1.32)	(9.63)

Panel 2: Acquirers are already TBTF prior to the merger – 30 observations

Year	Acquirer	Target
1991	Bank America Corp	Valley Capital Corp
1991	Bank America Corp	Security Pacific
1992	NationsBank Corp	MNC Financial
1994	Bank America Corp	Continental Bank Corp
1994	NationsBank Corp	RHNB Corp
1995	NationsBank Corp	Intercontinental Bank
1995	NationsBank Corp	Bank South Corp
1996	First Union Corp	Home Financial Corp
1996	NationsBank Corp	Charter Bancshares Inc
1996	First Union Corp	Center Financial Corp
1996	NationsBank Corp	Boatmen's Bancshares Inc.
1997	First Union Corp	Signet Banking Corp
1997	First Union Corp	Covenant Bancorp
1997	NationsBank Corp	Barnett Banks
1997	Banc One Corp	First Commerce
1997	First Union Corp	CoreStates Financial Corp
1999	Fleet Financial Group	BankBoston
1999	Wells Fargo	National Bancorp AK
2000	Wells Fargo	First Security Corp
2000	Wells Fargo	First Commerce Bancshares
2000	Wells Fargo	Brenton Banks Inc
2000	Washington Mutual	Bank United Corp
2000	FleetBoston Financial Group	Summit Bancorp Princeton
2001	First Union Corp	Wachovia Corp
2001	Washington Mutual Inc.	Dime Bancorp NY
2002	Citigroup	Golden State Bancorp
2003	Wells Fargo	Pacific Northwest Bancorp
2004	National City Corp	Provident Financial Group
2004	SunTrust Banks Inc.	National Commerce Financial Corp
2004	Wachovia Corp	SouthTrust Corp

Event window	Target	Acquirer	Combined
	11.94	-1.87	-0.16
[-1, +1]	(21.42)	(-5.17)	(-1.23)
	10.24	-1.63	-0.07
[-1, 0]	(24.10)	(-4.92)	(-0.26)

Panel 3: Both acquirers and targets are TBTF prior to the merger – 6 observations

Year	Acquirer	Target
1995	Chemical Bank	Chase Manhattan Bank
1998	Banc One Corp (Columbus, OH)	First Chicago NBD Corp
1998	NationsBank	BankAmerica Corp
2000	Chase Manhattan Corp	J.P. Morgan & Co
2003	BankAmerica	FleetBoston Financial Corp
2004	J.P. Morgan Chase & Co	Bank One Corp (Chicago)

Event window	Target	Acquirer	Combined
	10.69	-1.72	1.73
[-1, +1]	(12.17)	(-2.24)	(2.52)
	9.45	1.17	3.23
[-1, 0]	(12.04)	(0.42)	(4.27)

Table 5
Bond market reactions to bank mergers—analysis of the offer spread

This table presents the relation between the offer spread and various bond and issuers characteristics and banking organization characteristics of the banking organization that issue the bonds, The dependent variable is defined as the difference between yield on the subordinated-bond minus the yield of a Treasury bond with a similar maturity. *MATURITY* is the natural logarithm of years of maturity; *CALL* is the natural logarithm of the years with call protection; *SUB* is a binary variable that is equal to one if the bond is subordinated, zero otherwise; *ISSUESIZE* is the natural logarithm of the size of the issue; *MARKET* is the difference between Merrill Lynch index of bond returns for the financial sector, excluding banks, and the 10-year Treasury bond rate; *VOLATILITY* is the volatility of the banking organization's equity return one year before the issue date for the bond issued before the merger announcement date and the volatility of the portfolio of the two merging banking organizations for bonds issued after the merger announcement date; *FINLEV* is the market value of financial leverage; *NONPERFORM* is the percentage of non-performing loans over total assets; *SIZE* is the natural logarithm of the acquirer's pre-merger total assets; *RATING* is the bond rating of each bond; and *MERGER* is a binary variable that is equal to one if issued post-merger, zero otherwise. In addition to these characteristics, we also include in the regression analysis our three TBTF dummy indicators (*$DBECOME_{TBTF}$, $DACQUIRER_{TBTF}$, and $DBOTH_{TBTF}$) each* interacted with MERGER to capture the three TBTF cases. *$DBECOME_{TBTF}$* is an indicator variable equal to one if the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger, and zero otherwise; *$DACQUIRER_{TBTF}$* is an indicator variable equal to one if the acquirer is already TBTF prior to the merger but the target is not TBTF, and zero otherwise; and *$DBOTH_{TBTF}$* is indicator variable equal to 1 if both the acquirer and the target are already TBTF prior to the merger, and zero otherwise. Robust t-statistics (with White's Correction) are reported in parentheses. The ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)
Intercept	-1.2903 (-1.87)*	-0.2099 (-0.28)
MATURITY	0.4827 (8.15)***	0.4980 (8.79)***
CALL	-0.3337 (-4.92)***	-0.3621 (-5.91)***
SUB	0.0664 (1.51)	0.0633 (1.50)
ISSURESIZE	0.0625 (2.21)**	0.0681 (2.64)***
MARKET	0.8252 (19.70)***	0.8105 (19.90)***
VOLATILITY	0.0282 (1.82)*	0.0228 (1.34)
FINLEV	0.0163 (3.09)***	0.0127 (2.66)***
NONPERFORM	0.1457 (5.27)***	0.1647 (5.38)***

SIZE	-0.0626 (-1.72)*	-0.1326 (-2.86)***
RATING	-0.0110 (-0.53)	-0.0038 (-0.19)
MERGER	-0.0254 (-0.88)	--
*MERGER * DBECOME*$_{TBTF}$	--	-0.1802 (-3.03)***
*MERGER * DACQUIRER*$_{TBTF}$	--	-0.0003 (-0.01)
*MERGER *DBOTH*$_{TBTF}$	--	0.1958 (1.79)*
Number of observations	172	172
R^2	79.79%	81.08%
F-statistic	62.37***	57.38***

Table 6
Estimated Dollar Value ($ Million in year 2005) of TBTF Premiums
Using Various TBTF Thresholds

The estimated TBTF premiums are calculated based on the coefficient estimates generated from estimation of our purchase premium equations for 20-, 40-, and 60-day windows. We only use those coefficients that are significant at the 10% level or higher. We calculate the TBTF premiums that are associated with the coefficients on the following variables: $DBECOME_{TBTF}$, $DACQUIRER_{TBTF}$, $D\_Acquirer\_TBTF * TA_t$, $DBOTH_{TBTF}$, $DBOTH_{TBTF} * TA_t$, and $DBOTH_{TBTF} * COV_{t,a}$ for each of the merger deals. The specifications are described in following equations:

Subsidy (Become TBTF) $= b_{31}$
Subsidy (Acquirer is already TBTF) $= b_{32} + b_{33}(TA_t)$
Subsidy (Acquirer and Target are already TBTF)
$= b_{34} + b_{35}(TA_t) + b_{36}(COV_{t,a})$

$DBECOME_{TBTF}$ is an indicator variable equal to one if the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger, and zero otherwise; $DACQUIRER_{TBTF}$ is an indicator variable equal to one if the acquirer is already TBTF prior to the merger but the target is not TBTF, and zero otherwise; $DBOTH_{TBTF}$ is an indicator variable equal to 1 if both the acquirer and the target are already TBTF prior to the merger, and zero otherwise; TA_t is the book value total assets of the target; $COV_{t,a}$ is the covariance of the ROA of the target and acquirer over the 13 quarters prior to the quarter of the merger announcement date; b_{31} is the coefficient estimate on $DBECOME_{TBTF}$; b_{32} is the coefficient estimate on $DACQUIRER_{TBTF}$; b_{33} is the coefficient estimate on $DACQUIRER_{TBTF} * TA_t$; b_{34} is the coefficient estimate on $DBOTH_{TBTF}$; b_{35} is the coefficient estimate on $DBOTH_{TBTF} * TA_t$; and b_{36} is the coefficient estimate on $DBOTH_{TBTF} * COV_{t,a}$.

	Becomes TBTF After the Merger	**Acquirer Already TBTF Prior to the Merger**	**Acquirer and Target Already TBTF Prior To the Merger**
$100 billion Book Value Total Asset:	N=8	N=30	N=6
60-Day Premium:			
Offered purchase premium	$30,500.25	$35,358.62	$66,641.75
Estimated TBTF premium	$14,131.31	$14,707.07	$15,515.64
40-day Premium:			
Offered purchase premium	$29,714.50	$32,886.61	$57,320.96
Estimated TBTF premium	$16,766.69	$16,214.29	$15,966.61
20-day Premium:			
Offered purchase premium	$22,365.81	$32,150.99	$43,849.70
Estimated TBTF premium	$17,108.53	$21,511.46	$30,567.69

$20 billion Market Capitalization:	N=7	N=21	N=6
60-Day Premium:			
Offered purchase premium	$17,231.47	$38,267.14	$72,355.41
Estimated TBTF premium	$5,339.45	$16,247.57	$10,996.46
40-day Premium:			
Offered purchase premium	$18,619.69	$35,590.55	$61,988.64
Estimated TBTF premium	$7,821.25	$19,097.30	$14,204.27
20-day Premium:			
Offered purchase premium	$17,410.86	$34,001.19	$45,152.12
Estimated TBTF premium	$8,931.87	$23,520.89	$25,049.75
Largest 11 Banking Organizations:	N=9	N=33	N=8
60-Day Premium:			
Offered purchase premium	$20,171.28	$41,823.35	$75,751.24
Estimated TBTF premium	$9,491.40	$17,080.12	$5,541.35
40-day Premium:			
Offered purchase premium	$20,415.44	$40,560.84	$65,217.01
Estimated TBTF premium	$13,197.68	$22,267.63	$10,354.63
20-day Premium:			
Offered purchase premium	$19,023.49	$39,129.13	$47,281.84
Estimated TBTF premium	$13,257.63	$25,621.21	$13,697.73