

## **TBTF Subsidy for Large Banks--Literature Review**

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**Prepared for:**

**Thomas Hoenig, Vice Chair - Federal Deposit Insurance Corporation**

### **Findings of Studies on the TBTF Subsidy:**

Acharya, Anginer and Warburton:

- Funding cost advantage of 28 basis points annually for the period of 1990-2010; the cost advantage peaked at over 120 basis points in 2009. The authors estimate that the 2009 estimate represents a subsidy of \$100 billion.

Baker and MacArthur:

- Average funding cost advantage increased to 78 basis points for 2008:4-2009:2 implying a subsidy of \$34 billion per year to the 18 BHCs with more than \$100B in assets in 2009:1

Brewer and Jagtiani:

- Acquirers paid more than \$15 billion in added premiums in 8 merger deals that brought the combined organization to over \$100B in assets

Ghandi and Lustig:

- The largest commercial banks receive a subsidy of 3.10 percent of their market capitalization, which amounts to \$4.7 billion per bank in 2005 dollars

Haldane:

- The average annual subsidy for the top five U.K. banks from 2007-2009 was over £50 billion.

Jacewitz and Pogash:

- The largest banks pay approximately 45 basis points lower in risk premiums for uninsured deposits.

Kelly et al:

- The value of the government guarantee extended to the financial sector during the crisis peaked at over \$150 billion.

Li et al:

- CDS spreads are reduced by 23 basis points pre-crisis and 56 basis points post-crisis due to a TBTF subsidy for the 20 largest institutions.

Noss and Sowerbutts:

- Using three methodologies the authors find TBTF subsidies of approximately £40 billion, £30 billion, and £120 billion for U.K. banks.

Oxera (prepared for RBS):

- The value of state support for a financial system with total assets of approximately £7 trillion and volatility of about 4 percent, the subsidy is about £5.9 billion per year.

Stogin, Steve, Amanda Hindlian, Sandra Lawson, Jorge Murillo, Koby Sadan, and Balakrishna Subramanian (Goldman Sachs Global Markets Institute Report).

- Within a subset of bond-issuing banks, the six largest banks enjoyed a slight funding advantage of 6bps on average from 1999 to 2007.
- The funding advantage increased during the crisis but has since reversed to a funding *disadvantage* of 10 bps on average.

Tsesmelidakis, Zoe and Robert C. Merton:

- Wealth transfers to investors amount to \$365 billion (\$129 billion to shareholders and \$236 billion to bondholders) during the crisis (2007-2010)
- Bondholders realized massive wealth transfers in 2008 and 2009, but no subsidies were recorded for 2010
- Results apply to financial institutions with banks a subset of this

Ueda and Weder di Mauro:

- Banks in major countries enjoyed an estimated funding cost advantage of 60 basis points in 2007, rising to 80 basis points in 2009.

#### Additional Calculations of a TBTF Subsidy Based on Prior Study Findings:

Bloomberg editorial (based on a study by Ueda and Weder di Mauro cited below):

- The 10 largest U.S. banks receive a subsidy of \$83 billion per year

Bloomberg (forthcoming in Bloomberg Markets):

- At the request of Bloomberg Markets, Anginer (of Acharya, Anginer and Warburton) calculated that bondholders of the six biggest U.S. banks are willing to accept lower returns—amounting to \$82 billion from 2009 to 2011 (\$37.3 billion in 2009 after TARP, \$29.9 billion in 2010, and \$14.6 billion in 2011)
- When other breaks are added in Bloomberg calculates that the amount of the subsidy jumps to \$102 billion since 2009

**Bibliography, Findings and Methodological Summaries of TBTF Subsidy Studies and Additional Calculations:**

**Acharya, Viral V., Deniz Anginer, and A. Joseph Warburton. "The End of Market Discipline? Investor Expectations of Implicit State Guarantees." March 2013.**

Findings:

- An annual funding cost advantage of 20 basis points from 1990-2010, representing approximately \$20 billion per year.
- The cost advantage peaked at over 120 basis points in 2009, representing a funding advantage of \$100 billion.

Methodology:

Using data for the period 1990-2010, the authors find that investors' expectations of government support are embedded in the credit spreads on bonds issued by major U.S. financial institutions. To calculate the amount of the subsidy that results from the assumption of government support, the authors compute the credit spread on each financial institution's bonds as the difference between the yield on its bonds and the corresponding maturity-matched Treasury bond. The authors find a significant negative relationship between spreads and systemic importance. In particular, they find that size—as a measure of systemic importance—has a negative effect on spreads. A test of the effect of size on the relationship between spread and risk shows that for institutions that achieve systemically important status, spreads are less sensitive to risk. The authors quantify the value of the funding subsidy in basis points; this amount is then calculated as a dollar value by multiplying the annual reduction in funding costs by the institution's total uninsured liabilities.

**Baker, Dean, and Travis MacArthur. "The Value of the "Too Big to Fail" Big Bank Subsidy." Issue Brief, The Center for Economic Policy Research, September 2009.**

Findings:

- An average funding cost advantage of 29 basis points for institutions with more than \$100 billion in assets for the period 2000-2007. This advantage increased to 78 basis points for the period from the fourth quarter of 2008 through the second quarter of 2009.
- The increase—of 49 basis points—is estimated to imply a subsidy of \$34 billion per year to the 18 bank holding companies with more than \$100 billion in assets in the first quarter of 2009.

Methodology:

The authors calculate the difference between the average quarterly cost of funds for institutions with less than \$100 billion in assets to the average quarterly cost of funds for institutions with more than \$100 billion in assets for the periods 2000-2007 and 2008:4-2009:1. The authors then calculate the difference in the differences between the two time periods to determine if there was a TBTF subsidy. The authors acknowledge that there could be multiple explanations for growth in the difference between the costs of funds for the two groups of banks in the 2008:4 – 2009:2 period, but after adjusting for other possible explanations, the authors find that the spread between large and smaller

banks could have increased by 9 basis points following the crisis. For the TBTF banks, this represents an annual subsidy of \$6.3 billion. The authors caution that this subsidy may only be temporary and that spreads may return to more normal levels once financial markets settle. The authors use data on U.S. banks provided by the FDIC.

**Bloomberg, editors. "Why Should Taxpayers Give Big Banks \$83 Billion a Year?" February 20, 2013.**

Findings:

- The 10 largest banks in the United States by assets, receive a taxpayer subsidy of \$83 billion a year. The top 5 banks account for \$64 billion of this total—an amount roughly equal to their typical annual profits.

Methodology:

Using the findings of Ueda and Weder di Mauro (below), Bloomberg multiplies the total liabilities of the 10 largest U.S. banks to calculate a subsidy of \$83 billion.

**Bloomberg (forthcoming in Bloomberg Markets). Ivry, Bob, "No Lehman Moments as Biggest Banks Deemed Too Big to Fail." May 10, 2013.**

Findings:

- Bondholders of the six biggest U.S. banks are willing to accept lower returns, which amounted to \$82 billion from 2009 to 2011. (\$37.3 billion in 2009 after TARP, \$29.9 billion in 2010, and \$14.6 billion in 2011.)
- Adding in other breaks, the amount of the subsidy jumps to \$102 billion since 2009.

Methodology:

- At the request of Bloomberg Markets, Deniz Anginer (Acharya, Anginer, and Warburton) calculated the subsidy received by six U.S. banks as a result of bondholders accepting lower returns (because bondholders believe these institutions will be bailed out).
- Bloomberg takes the Anginer estimate and adds tax breaks and additional income from the Federal Reserve's mortgage-bond purchases and the interest it pays for bank deposits and calculates that the amount of the subsidy jumps to \$102 billion since 2009.

**Brewer, Elijah III and Julapa Jagtiani. "How Much Did Banks Pay to Become Too-Big-To-Fail and to Become Systemically Important?" Working paper No. 11-37. Federal Reserve Bank of Philadelphia. 2 September 2011.**

Findings:

- Acquirers paid at least \$15.3 billion in added premiums in the eight merger deals that brought the combined organizations to over \$100 billion in assets (the TBTF threshold).

Methodology:

Using data from the merger boom of 1991-2004, Brewer and Jagtiani analyze the differences in market reactions to bank acquisitions depending on whether the acquisition caused the acquiring organization to cross the threshold from being too small to warrant government support in the event of failure to

becoming too big to fail. The authors use OLS regressions to estimate the effect of crossing the TBTF threshold on the cost of the acquisition, the abnormal stock market returns, and the cost of funds measured as bond spreads. They show that when banks cross the TBTF threshold they pay an acquisition premium, that abnormal returns increase, and that banks face a lower cost of funds. The authors use the estimated coefficients from the OLS results to predict the value of the government subsidy. The data sample is restricted to U.S. banks.

**Ghandi, Priyank and Hanno Lustig. "Size Anomalies in U.S. Bank Stock Returns: A Fiscal Explanation." April 18, 2011.**

Findings:

- The authors find a subsidy of 3.10 percent for the largest commercial banks and a 3.25 percent tax on the smallest banks. This translates into an annual subsidy to the largest commercial banks of \$4.71 billion per bank in 2005 dollars.

Methodology:

Ghandi and Lustig show that a long position in the stock portfolio of the largest U.S. banks and a short position in the stock portfolio of the smallest banks underperforms an equally risky portfolio of all non-bank stocks and government and corporate bonds by nearly 8 percent per year over 39 years. The authors interpret this difference as the ex-ante distortion of an implicit government guarantee for the largest financial firms. The authors then build a general equilibrium model of asset prices and calibrate it to match the subsidy. The authors decompose the subsidy into a 3.10 percent subsidy to the largest banks and a 3.25 percent disaster tax on the smallest banks. In the absence of the subsidy, all banks would pay a 3.25 percent disaster tax. The authors multiply the subsidy by the average market cap of the largest banks to calculate the annual subsidy. The data cover U.S. financial institutions.

**Haldane, Andrew. "The \$100 billion question." Comments by Mr. Andrew G Haldane, Executive Director, Financial Stability, Bank of England, at the Institute of Regulation & Risk, Hong Kong, 30 March 2010.**

Findings:

- The average annual subsidy for the top five UK banks from 2007-2009 was over £50 billion.

Methodology:

The author calculates the value of a TBTF subsidy by employing the difference in bank credit ratings that include the credit rating agency's judgment of expected government support and the ratings that exclude that support. He finds the average rating difference is higher for large banks than for small ones. The monetary measure of the subsidy is estimated by "mapping from the ratings to the yields paid on bank's bonds; and then by scaling the yield difference by the value of each bank's ratings-sensitive liabilities." The sample includes banks and building societies in the UK as well as global banks over the period 2007 - 2009.

**Haldane, Andrew. "On being the right size." Speech given by Andrew G. Haldane, Institute of Economic Affairs' 22nd Annual Series, The 2012 Beesley Lectures, 25 October 2012.**

Findings:

- A subsidy of \$70 billion per year for the period 2002-2007. By 2009, the subsidy reached over \$700 billion per year.

Methodology:

The author estimates the subsidy with the ratings-based measure used in Haldane (2010). The sample includes the 29 world's largest banks (as defined by the Financial Stability Board).

**Jacowitz, Stefan, and Jonathan Pogach. "Deposit rate advantages at the largest banks." FDIC Working Paper, 2012.**

Findings:

- The largest banks pay approximately 45 basis points in lower risk premiums for uninsured deposits.

Methodology:

This study makes use of the fact that the difference in interest rates banks pay on insured and uninsured deposits in part reflects the risk of the bank as perceived by the market. The authors use money market deposit accounts with a minimum deposit of \$100,000 as their measure of uninsured deposits and money market deposit accounts with \$25,000 as their proxy for insured deposits. The authors calculate the difference in the interest rates offered on uninsured and insured money market deposit accounts at all banks for the period 2005-2010. The authors interpret the differences in interest rates across these two accounts as the market perceived risk of the bank.

The authors then calculate the difference-in-difference of these rates between large and small banks. Using this methodology, the authors find that large banks pay a lower risk premium than small banks. Finally, the authors use OLS regressions to explore what part of the lower risk premium paid by larger banks cannot be explained by observable differences in risk across those banks. The authors find an unexplained residual difference in risky deposit rates between large and small banks of approximately 45 bps. They conclude that this unexplained difference in interest rates is consistent with a TBTF subsidy.

**Kelly, Bryan, Hanno Lustig, and Stijn van Nieuwerburgh. "Too-Systemic-To-Fail: What Option Markets Imply About Sector-Wide Government Guarantees." Working Paper No. 11-12 Fama-Miller Paper Series University of Chicago Booth School of Business. 2011.**

Findings:

- The authors find that the anticipation of future government intervention during a financial sector collapse lowers the market price of financial sector crash insurance (measured by index put options on the sector) in essence creating crash insurance subsidies.

- Specifically, the authors find that the market was not initially reassured by TARP as the funds would be used to purchase preferred shares that would dilute shareholders. However, once programs were announced for the purchase of toxic assets the collective bailout guarantee became valuable.
- The estimated dollar value of the guarantee extended to the financial sector is calculated to have peaked at over \$150 billion.

**Methodology:**

The authors use the difference between the price of a basket of put options on individual financial firms and the price of a put option on the financial sector index as the basis for measuring the size of a collective bailout guarantee to the financial sector. The authors use an asset pricing model with rare events to study the impact of sector-wide bailout guarantees on option prices. The model is able to explain financial sector joint stock and option moments only when it incorporates a government bailout guarantee of the sector. The authors use the parameters of the model to infer the effect of the bailout guarantee on a firm's expected return and cost of capital as well as the overall dollar size of the government subsidy. The sample period covers January 2003 – June 2009.

**Li, Zan, Shisheng Qu, and Jing Zhang. "Quantifying the value of implicit government guarantees for large financial institutions." Modeling Methodology, Moody's Analytics, January 2011.**

**Findings:**

- The authors calculate that CDS spreads were reduced by 23 basis points pre-crisis and 56 basis points post-crisis due to a TBTF subsidy for the 20 largest institutions.

**Methodology:**

The study explores differences in funding costs between large and all other banks in two stages for the period November 2001 through May 2010. The authors first calculate the difference between an observed CDS spread to an estimated 'fair market' CDS spread using information from the equities market for all institutions in the sample. The authors then compare the observed and estimated fair market CDS spreads between the largest banks and smaller institutions. The data used include information on the 20 largest and 63 other U.S. financial institutions that have CDS spreads and other market information available. (The authors also perform analysis on European data but the estimates in this summary include only U.S. institutions.)

**Noss, Joseph and Rhiannon Sowerbutts. "The implicit subsidy of banks." Financial Stability Paper No. 15. Bank of England. May 2012.**

**Findings:**

- The funding advantage, historical-price contingent claims, and options-price contingent claims approaches produce estimates of approximately £40 billion, £30 billion, and £120 billion, respectively, in TBTF subsidies.

## Methodology:

The authors use three methodologies to estimate values of a TBTF subsidy—a funding advantage approach, a historical-price contingent claims approach, and an options-price contingent claims approach.

- The funding advantage approach mirrors that of Haldane (2010) and (2012).
- The contingent claims models estimate the subsidy as the expected annual payment from the government to banks needed to prevent their default. This requires estimation of the distribution of banks' future asset values.
  - The options-price contingent claims approach mirrors that of Oxera (2011), except the authors "value the subsidy as a look-back option discounted at a rate of 1.2 percent, calibrated to the distribution of bank equity prices during 2010."
  - The historical-price contingent claims approach estimates the distribution of banks' future asset values based on historical prices of bank equity. To account for rare but large downward movements in asset prices, the authors use statistical techniques to predict extreme asset returns. They use an empirical density function to model the distribution of equity prices, fitted to the center of the distribution. They then add a Generalized Pareto distribution to the lower tail of returns, to capture the rare events for which there are a lower number of observations.

The authors use data from UK banks in 2010 in their study.

**Oxera (prepared for The Royal Bank of Scotland). "Assessing state support to the UK banking sector." March 2011.**

## Findings:

- Estimates show the value of state support for a financial system with total asset values of approximately £7 trillion and volatility of about 4 percent, is about £5.9 billion per year.

## Methodology:

The report estimates the value of state support using data from 2010 in three steps: determining the magnitude of systemic shocks that would require the government to provide support, calculating the probability that such a shock would occur, and estimating the expected government payment that would be needed in the event of such shock. The authors use various shares of bank Tier 1 capital as the proxy for the "systemic threshold" - the amount of asset value loss the system could withstand without requiring government intervention. They estimate the risk of such a shock using the variance in the equity prices of banks in the UK and the ratio of equity to assets. Lastly, the authors employ a Black-Scholes model to estimate the value of a European put option on the system's assets as a proxy for the level of state support necessary in the event of a shock. The study focuses on the U.K. banking sector.

**Stogin, Steve, Amanda Hindlian, Sandra Lawson, Jorge Murillo, Koby Sadan, and Balakrishna Subramanian. 2013. "Measuring the TBTF effect on bond pricing," Goldman Sachs Global Markets Institute Report, May.**

Findings:

- Within a subset of bond-issuing banks, the six largest banks enjoyed a slight funding advantage of 6bps on average from 1999 to 2007.
- The funding advantage increased during the crisis but has since reversed to a funding *disadvantage* of 10 bps on average.

Methodology:

The authors compare bank bond spreads over maturity-matched Treasuries for a subset of U.S. banks. The set of banks are drawn from institutions that are included in the IBOXX Investment Grade Index, which contains daily pricing information for investment grade bonds from January 1999 to March 2013. Banks are defined as all firms that have at least one FDIC-insured affiliate. The average number of banks included in the index over all years is 24. The authors calculate the median spread of the bank bond on a daily basis. Next, the authors rank the bank by assets and compare the average spread of the six largest banks to the average spread of the remaining banks in their data.

**Tsemelidakis, Zoe and Robert C. Merton, "The Value of Implicit Guarantees." Working Paper, September 2012.**

Findings:

- Wealth transfers to shareholders and debt holders amount to \$129 billion and \$236 billion, respectively.
- Debt holders realized massive wealth transfers in 2008 and 2009, but no subsidies were recorded for 2010.
- Most subsidies accrue to the banking subsector; the period from October 2008 to June 2009 accounts for most of the subsidies.
- The determinants of the subsidies are highly related to proxy variables for company size, default correlation, and systemic risk.

Methodology:

Calculates how firms considered too-big-to-fail benefit from access to cheaper funding during crises by combining a structural-model-based methodology for estimating a TBTF premium with a comprehensive data set of bond characteristics and prices in the primary and secondary markets for a sample of 74 U.S. financial institutions. Data are for the years 2007-2010. Separate benefits are calculated for shareholders and debt holders. Shareholder benefits are calculated as of time of issuance while debt holder benefits are calculated over the life of the bond.

Authors estimate that actual subsidies could be twice as high as other forms of debt financing are ignored.

**Ueda, Kenichi and Beatrice Weder di Mauro. "Quantifying structural subsidy values for systemically important financial institutions." IMF Working Paper WP/12/128, May 2012.**

Findings:

- Banks in major countries enjoyed an estimated funding cost advantage of 60 basis points in 2007 and 80 basis points in 2009.

Methodology:

In calculating the credit default ratings of financial institutions, Fitch Ratings estimates a measure of external support that reflects both the probability of parent company and government support. The authors use this information as a proxy for the likelihood of government intervention on behalf of a financial institution. The authors then estimate the effect of the government support on the long-term rating of the financial institution. The data include information on 895 banks rated by Fitch in 2007 and 2009.

As a point of reference when considering the magnitude of the TBTF subsidy calculations, the following table reports the net income of the top 10 BHCs for 2008-2012.

Net income of top 10 BHCs, 2008-2012	
Year	Net Income (\$Bs)
2008	-\$19.5
2009	\$37.5
2010	\$56.4
2011	\$69.0
2012	\$68.9