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Jeffrey R. Black

Seth A. Hoelscher

Duane Stock

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Jeffrey R. Black*
jeff.black@ou.edu

Seth A. Hoelscher*
seth.hoelscher@ou.edu

Duane Stock**
dstock@ou.edu

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Finance Division
Michael F. Price College of Business
University of Oklahoma
205A Adams Hall
Norman, OK 73019-0450

*University of Oklahoma
** Oklahoma Bankers Chair in Finance

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Abstract

Bank liability guarantees have been an important tool to help stabilize banking systems for decades. Many aspects of design and effectiveness continue to be debated. How much, if any, should liability guarantees provide a subsidy to banks? Should weaker banks be permitted to enjoy greater subsidies? A bank bond insurance program executed in 2008 and 2009 provides a special opportunity to observe and measure bank benefits during a crisis period. The opportunity is especially rich because it presents an opportunity to observe how the term structure of credit spreads can be compared to a term structure of insurance premia charged. The relationship between the two term structures provides a potential template for the design of future bank liability insurance programs and also helps test alternative theories of corporate bond credit spreads. He and Xiong (2012), suggest credit spread slopes will tend to be negative during a crisis while, in contrast, Gorton, Metrick, and Xie (2014) suggest a positive slope. Our results support the former where this finding has very important implications for the design and effectiveness of insurance premia charged by bank liability insurers. We find that the term structure of the insurance premia charged enhanced the benefits that weaker banks received and may have helped to prevent bank failures. This finding is consistent with the theory that the liability insurance program meant to stabilize the financial system was designed in the spirit of those who feared a financial accelerator effect could have led to an even more severe economic downturn.

I. **Introduction**

In order for a banking system to function well, both borrowers and lenders must be confident that the individual banks and, in general, the system are stable and ongoing. In order to provide a stable banking system, it is very common to provide guarantees (insurance) to those who provide funds to banks. The best known type of liability guarantee in many countries is deposit insurance. Demirguc-Kunt and Huizinga (2004) provide a description of deposit insurance systems of various countries. In the United States, the deposit insurance system was instituted in 1933 to prevent depositor runs.

The optimal design of bank liability guarantees has been debated for decades and will likely be debated for more decades given the complexity of design issues related to the degree of subsidy regulators and politician choose to tolerate, unpredictability of crises, and interactions with banking regulations that frequently change. A long list of questions has been raised. Should banks pay the full fair market price for the guarantees? Is the banking system sufficiently transparent to make full market pricing of guarantees acceptable? If full market pricing is not applied, due to a financial crisis or other complicating macroeconomic conditions, how much subsidy should banks receive when they underpay? [1] How can the guarantee system prevent, or at least discourage, moral hazard wherein banks acquire (overly) risky assets given the safe haven provided by a guarantee.[2]

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[1] Arping (2009) maintains that fair pricing of guarantees are desirable only if the banking sector is sufficiently transparent.

[2] Gropp, Gruendl, and Guettler (2013) show that government guarantees for German savings banks, which halted in 2001, were linked to substantial moral hazards.

Relatedly, many economists, politicians and policy makers maintain that banks with relatively weak balance sheets and lower profitability (low credit quality) should pay more for guarantees than stronger banks. If so, how much more should weaker banks pay and how should the differential payment for guarantees be determined? [3] How can guarantees be structured such that banks, especially large ones, will not be led to expect they will always be bailed out during stressful periods? How much does the credit quality of the sovereignty providing the guarantee affect the credibility of the guarantee? Should the level of accumulated reserves in the deposit insurance fund help determine how much to charge for guarantees? [4]

Most of the dollar volume of liability guarantees has been in the form of deposit insurance guarantees in the United States, as in many countries. Furthermore, most of the economic research in regard to bank liability guarantees analyzes deposit insurance. However, there has also been a significant volume of insured bank bonds (unsecured non-deposit liabilities) in the early part of this century and only a limited amount of research focuses upon insurance of bank bond issues wherein a government agency (or the sovereignty itself) stands ready to pay off bond holders in case of bank failure. The same questions posed above apply but, fortunately, there is much more evidence of the market pricing of the value of the guarantee because the guaranteed instruments are publicly traded and yields can easily be compared to comparable non-insured bonds of the same bank.

[3] Of course, differential payments may well result in differential subsidies that some may view as unfair aid to poorly managed banks.

[4] If the reserves are low, perhaps the charge for guarantees should be increased.

The purpose of this research is to answer a myriad of important questions about liability guarantees that regulators, policy makers, politicians, bank stockholders, bank bondholders, and banker management would like answered. The first set of questions concerns the liquidity provided by liability guarantee programs. We note that liquidity has a myriad of definitions where, in our case, we focus upon microstructure measures of liquidity for the bonds of particular bank.[5] Do bonds that are insured enjoy greater microstructure liquidity and thus permit banks to issue insured bonds at a lesser liquidity premium and thus enjoy lower interest costs? If so, how much more liquid are insured bonds versus non-insured bonds? Do non-insured bonds of the issuing firm realize an improvement in liquidity when insured bonds are issued, or, on the other hand, does the appeal of the insured bonds in effect reduce the demand for and the liquidity of uninsured bonds of the same firm? We frame our answers to these questions in terms of literature regarding flight to quality and flight to liquidity. In brief, bond insurance programs may be less effective in reducing bond interest costs if bond investors are more concerned with liquidity than quality. That is, instead of flocking to insured bank bonds, bond investors may seek the high liquidity of U. S. Treasury bonds.

The second set of questions addresses how the theory and empirical research on the term structure of credit spreads should affect the design of insurance premia term structure. [6] This is very fundamental because the difference between the change in credit

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[5] As an example of other banking industry liquidity measures, the Basel Committee has recommended that banks report the relation of a particular bank's volume of high quality liquid assets to expected net cash outflows for the next 30 days. The higher this ratio, the better a bank can withstand deposit runs and other liquidity crises.

[6] Of course, conservative critics of such government intervention likely maintain that any possible undercharging is an unnecessary subsidy (gift) to banks, which is effectively corporate welfare. Any subsidization is also an important issue given any present and potential future FDIC financial distress of the

spread due to insurance purchased and the insurance premium is a very reasonable measure of the benefits banks did (did not) enjoy.[7] Initially, in October 2008, the proposed insurance premium to be charged by the FDIC bond insurance program was, in addition to being independent of default risk, independent (flat) with respect to bond maturity. However, in November 2008, before any insured bonds were issued, the premium schedule was changed to increase with maturity. Did the changes in the term structure slope of insurance premia (from flat to positively sloped) allow the program to perhaps intentionally give greater aid to weaker banks that may have otherwise failed? More specifically, did weaker banks take advantage of the upward sloping term structure of insurance premium pricing and enjoy even greater short maturity insurance subsidies?[8] An important concern at the time was that potential bank failures, that may in fact been prevented by the program, could plunge the economy into a depression. That is, bank failures can be contagious and severely damage the economy. Did this extraordinary term structure- induced subsidy not exist for stronger banks? Few research papers have even

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deposit insurance fund. The designated reserve ratio of the FDIC deposit insurance fund was below a target of 1.25% even before the crisis (2006) when the FDIC announced activities to raise the ratio. Unfortunately, the subsequent financial crisis only helped reduce the ratio to a record low in December 2009. The ratio remains below the 1.35% target dictated by Dodd-Frank and is not projected to reach 1.35% until the year 2020. Although relating the insurance premium to the idea that a certain level of reserves is needed seems logical, we note that Pennacchi (2009) maintains that pricing deposit insurance to target insurance fund reserves is not wise because it may amplify economic cycles, also, and may subsidize systemic risk.

[7] As Wutkowski and Aubin (2008) explain, a group of participating banks reported to the FDIC that the initially proposed (October 2008) flat fee of 75 basis points was too high and would not accomplish the goal of the DGP program. The FDIC obliged and created a fee scale that started at 50 basis points and increased the premia with maturity of the debt. However, as the data collected in this research pertaining to the bonds issued under the program indicates, the initial proposed flat fee would have actually benefited issuers in many cases.

[8] Or, alternatively, did the disadvantages of issuing and rolling over short term debt described by He and Xiong (2012) dominate these term structure considerations. That is, rollover costs, which are not acknowledged in classic credit spread theory, are high for short term debt and thus discourages issuance of short term in favor of longer term debt.

acknowledged the bank bonds issued under the FDIC's DGP program, much less analyzed the implications of the issuance.[9] Finally, did bank stockholders enjoy abnormal returns if their bank issued insured bonds?

The importance of this research is enhanced by the fact that the U.S. is not the only country to respond to a financial crisis by offering a program that insured bank bonds. The bond guarantees that were adopted by many other nations in response to the financial crisis were thought likely helpful in preventing bank failures and a more severe credit crisis. For example, see Grande, Levy, Panetta, and Zaghini (2011). Schick (2009) finds that guarantees of other countries were useful in curbing the deterioration of the public confidence in the banking system. Levy and Schich (2010) analyze the design of the different bank bond guarantee programs across different countries. Levy and Zaghini (2010) investigate the determinants of yield spread differences between guaranteed bonds in different countries.

The following section describes the bond insurance (guarantee) program in greater detail than above. Then we describe the theory of credit spread term structure applicable to the above questions, the term structure of insurance premiums charged by the FDIC, and the term structure of benefits potentially received by insured bond issuers. Next, we present hypotheses that address the benefits banks may have received according to differential liquidity of insured bonds, maturity, credit quality, and issuance timing. Then,

[9] Veronesi and Zingales (2010) analyze the impact of TARP on bank valuation but only briefly acknowledge the existence of the DGP program. They do not examine the yields of specific insured and noninsured bank bonds issued subsequent to the announcement of the DGP program on October 14, 2008.

we describe the data as gathered from various sources and, also, the empirical results. The last section summarizes and concludes the research.

II. FDIC Debt Guarantee Program

The financial crisis of 2008 triggered numerous large U.S. government interventions into the financial sector. Perhaps the best known intervention was the Troubled Asset Relief Program, TARP, wherein the U.S. Treasury purchased preferred stock of numerous banks.[10] Separate from TARP, the FDIC executed a program called the Temporary Liquidity Guarantee Program (TLGP) which consisted of two components. The first part and most widely known portion of TLGP was the Transaction Account Guarantee Program (TAGP) wherein the FDIC fully guaranteed non-interest bearing transaction accounts. The second portion of TLGP was the Debt Guarantee Program (DGP). This research focuses on the second component, in which the FDIC insured senior unsecured debt issued under the DGP in return for an insurance premium. Morrison and Foerster (2009) estimate that about two-thirds of senior unsecured bank debt issued, after the peak of the crisis, was insured under the DGP program. The novelty of this program was it was the first instance of a government guarantee of corporate bonds in the United States.

Initially, all eligible financial institutions were automatically enrolled into both TAGP and DGP programs with coverage beginning at the approximate peak of the crisis on October 14, 2008. The enrolled firms had until December 5, 2008 to decide whether or not the entity would choose to participate in the programs. In contrast to TARP, the FDIC

[10] See Kim and Stock (2012) and Veronesi and Zingales (2010) for analysis of how preferred stockholders, bondholders, and common stockholders were affected by TARP issuances.

published the banks that decided to opt-out of any part of the program, leaving the names of those that chose to stay in the program unannounced with no regard to whether they desired to issue bonds or simply ignore the program. Due to this procedure, we are able to use the banks' first announcements of a guaranteed bond issue as the public's first confirmed knowledge of the bank's participation in the DGP.

The principal function of DGP was to provide a guarantee on new issues of senior unsecured debt offered by the financial institution. The FDIC (2008) cites the purpose of this program is "to strengthen confidence and encourage liquidity in the banking system by guaranteeing newly issued senior unsecured debt of banks, thrifts, and certain holding companies, and by providing full coverage of non-interest bearing deposit transaction accounts, regardless of dollar amount" (FDIC, 2008). The debt guarantee limit was restricted to 125 percent of the face value of senior unsecured debt that was outstanding as of September 30, 2008 and scheduled to reach maturity on or before June 30, 2009 (FDIC, 2008). Financial entities with no senior unsecured debt within the specified time period were provided a limit for bond guarantees of two percent of the total consolidated liabilities as of September 30, 2008. The last day to issue debt under the DGP was October 31, 2009 and the debt guarantee expired either at maturity or on December 31, 2012, whichever came first. The DGP applied to a very large proportion of bank funding and thus allowed for a maximum of approximately $1.75 trillion of insured debt to potentially be issued[11], wherein approximately $618 billion was actually issued. The insurance premia applicable to the DGP are outlined in Panels A and B of Table 1 where Panel A describes premia for earlier issues and Panel B describes additional premia for issuances after April

[11] According to Morrison and Foerster (2009) there was 1.4 trillion of eligible debt outstanding at the end of September 2008. Thus, firms could have used 1.75 trillion of insured debt (125% of 1.4 trillion).

1, 2009. For Panel A, the insurance premia increased from 50 to 100 basis points as maturity increased. Later insurance premia could be as high as 150 basis points if the bonds were issued after June 30, 2009.

III. Theories of Credit Spreads Applied to Alternative Financial Policies for Bond Insurance Pricing and Realized Benefits of Bond Insurance

We feel that many of the important questions and theory concerning both the ex-ante design and ex post realized benefits (to both participating banks and the financial system) of bank liability guarantees (liability insurance) can be best framed in the context of normative and positive economics. Of course, normative economics usually concerns value judgments about what should be. In general, what is the most appealing policy? What policy is best for the economy at large and what policy is the most fair to all parties involved? More specifically in our case, what policy is the most beneficial for the economy at large, the U.S. (and global) financial system, participating banks, and others affected by the liability insurance program.

When the insuring agency attempts to make these challenging decisions, they should realize that the success of their program at least partially depends on the structure of insurance premia they charge banks purchasing the insurance. For example, if the insuring agency chooses a policy that they hope prevents lower credit quality banks from failing, they probably should not design the *term structure* of insurance premia to be neutral to lower quality banks, or, worse yet, more favorable to higher credit quality banks. Instead, the inuring agency may well want the term structure of premia to enhance the benefits for lower quality banks. In this context, our work strongly suggests that a flat or negative term structure of insurance premia would be counterproductive for achieving the primary objectives of the program.

In contrast, positive economics concerns what is, in fact, the case, i.e. the realization of a policy (program) that was, in fact, executed. In the context of positive economics, did certain banks receive more benefit from the program than others? If so, what kinds of banks received the most benefit? Did banks with weaker credit quality receive greater benefit, and, if so, how much greater benefit? Did the term structure of insurance premia charged help explain differential benefits among banks? How may certain banks have exploited the term structure of premia charged? We leave the positive economics to be later reported in our empirical results section.

What are the basic alternative normative statements (policies) for the structure of insurance premia that should be charged by insuring agencies such as the FDIC and those of other nations? We call our first normative statement the no subsidy, maturity-independent policy. That is, there should be no subsidy to the banks purchasing liability insurance. In other words, fair market pricing of liability insurance should be applied where the insurance premia charged is equal to the credit spread. Furthermore, a simplistic flat term structure is assumed. We define credit spread as in He and Xiong (2012) where, recognizing the important interdependence of liquidity and default risk, *credit spread* is the interactive result of both (sum of) default risk and liquidity risk. More specifically, CS(M) is the market determined credit spread (default spread plus liquidity spread) for debt with maturity M; that is, the yield for the debt issued by the bank less the yield on an equal maturity, default -risk free debt instrument. For an uninsured (noninsured) bond with yield NY(M), the CSN(M) is given below where TY(M) is equal maturity U.S. Treasury debt.

$$CSN(M) = NY(M) – TY(M)$$

For debt insured by the FDIC, or some other strong insurer, the expression is given below where CSI(M) is the spread on the insured bond and IY(M) is the yield on the insured bond.

$$CSI(M) = IY(M) – TY(M) .$$

Assuming the insuring agent can credibly cover insurance claims, this latter spread is much less than the CSN(M) spread due to the insurance against default. Nonetheless, the CSI(M) spread is likely positive due to the greater liquidity one expects in U.S. Treasury (and other sovereign) debt markets compared to bank-issued bonds.

As a baseline description of credit spread term structure and insurance premia term structure, please see Figure 1. The vertical axis measures both a generic credit spread (neither insured nor uninsured) and the insurance premium, IP(M), charged. If the market for a bank's uninsured bonds demanded, say, a 50 basis point credit spread for all maturities of the bank's debt, then the credit spread is flat at 50 basis points.

A no subsidy policy would charge a fair market premium of 50 basis points. That is, if the credit spread and insurance premium charged are equal, there is no subsidy where CS(M) = IP(M). Many conservative economists and policy makers may well subscribe to such a structure, especially during periods where the banking system is not operating under particularly stressful conditions, i.e. does not need help. In fact, Gorton, Metrick, and Xie (2014) find that the term structure of credit spreads for many debt instruments was flat before the financial crisis of 2008. This representation is thus empirically correct for at least some time periods and, also, useful for its simplicity as a baseline case. Furthermore, we note that the FDIC's initial term structure of insurance premia was, in fact, the same for all credit qualities, and, also, flat with respect to maturity at 50 basis points. Then, the FDIC later changed it to have a positive slope.

A no subsidy policy is generally consistent with the attitude of those warning that moral hazard accompanies government subsidies of banks and bank “bail-outs”. Poole (2009) suggests that continuous government subsidies and bail-outs lead to excessive risk-taking in the financial sector. Dam and Koetter (2012) provide evidence of moral hazard in German banks as well as evidence that it was fueled by government bailouts and intervention. Furthermore, Hryckiewicz (2014) finds government interventions have a negative impact on banking sector stability.

Our second normative statement concerning structure of insurance premia is called the weak form subsidy, maturity- independent case. That is, insurance premia charged can be structured to so as to provide a subsidy to participating banks but there should be no obvious excess benefits to banks with material differences in credit quality. To illustrate this case, refer to Figure 2 where credit spreads are again assumed flat with respect to maturity. However, different banks are recognized as having different credit qualities. Assume bank AAA has very high credit quality and its flat CS(M) is 60 basis points whereas bank BBB has lower credit quality and a flat CS(M) of 80 basis points. Assume that AAA bank pays 50 basis points and thus enjoys a 10 basis point subsidy. Furthermore, BBB bank pays 70 basis points, due to greater default risk, and thus also enjoys an equal subsidy of (only)10 basis points. Very importantly, we note that many urged the FDIC to adopt a risk-based program insurance premium in the DGP bond insurance program that they offered in 2008 and 2009. Specifically, according to the group advocating a risk- based program, guarantee (insurance) fees should range from 10 to 50 basis points depending on CAMEL rating.[12]

Our next normative statement is a variation of the second wherein we allow for and even encourage a differential subsidy to occur for banks of differing credit quality. We call this the strong form subsidy, maturity-independent case. For this situation, in Figure 3, the IP(M) is the same for both bank AAA (high credit quality) and BBB (low credit quality). Therefore, bank BBB receives a greater subsidy.

The economic rationale for the strong form subsidy, maturity-independent case can be drawn from the theory of the financial accelerator as developed by Bernanke, Gertler, and Gilchrist (1996) and others. The brief theory of the financial accelerator is that the firm's ability to borrow depends on the market value of assets less that of liabilities where, if asset value only modestly declines, lenders become very hesitant to continue lending. If the financially stressed firm cannot borrow funds as desired, it logically reduces investment by the firm. The resulting general decline in economic activity, in turn, diminishes asset values which generates a feedback cycle to generate ever- falling asset prices and ever -greater illiquidity for the financial system. In summary, a small (modest) change in valuation of assets by the financial markets is capable of producing a severe decline in the economy

One way to break the continuing cycle of reduced asset value generating large declines in economic activity is for the government to purchase assets if asset prices fall below a certain level. In fact, the first plan for the famous TARP bank rescue program executed in 2008 was for the government to purchase bank assets that had suffered dramatic declines

[12] See the Federal Register, Part VII, FDIC, 12, CFR Part 370.

in value; such an operation may be viewed as a way of subsidizing distressed banks.[13] A similar concept is for the government (FDIC) to provide insurance at less than fair market price in order to help prevent the economy from a severe downward spiral. Such subsidized liability insurance is a very defendable policy in the context of preventing stressed banks in urgent need of liquidity from failing. More specifically, assume the above stressed firm is a bank with a weak balance sheet due to falling asset prices where the outstanding example of falling asset prices in the crisis was that of subprime real estate loans. If stressed banks invest less (make fewer loans) because of extremely high funding costs, the supply of credit to the economy shrinks dramatically thus encouraging an even more severe recession or even a depression.[14]

The above are fundamental baseline normative liability insurance statements, i.e. alternative policies. However, we maintain it is critical to recognize that term structures of credit spreads and insurance premia are not, in fact, always flat and thus independent of maturity. Furthermore, we subscribe to the theory and policy that there are occasional, perhaps rare, periods of severe systemic stress where it is probably necessary to allow some weaker banks to potentially enjoy greater subsidies than other banks. In fact, strong believers in the financial accelerator may well suggest that, given the consequences, greater subsidies of weaker banks are a necessary, even if distasteful, feature. Of course, this attitude is most consistent with a strong form subsidy case described above. To continue

[13] In fact, the government later changed plans where the government, instead, purchased preferred stock of banks needing to be rescued.

[14]Another reason to support subsidies to banks is that the moral hazard concern, wherein banks take on risky assets in the belief that will bailed out if losses occur, does not apply very well in this case. Banks who buy bond insurance must still pay for the insurance and the banking firm is still subject to default even though insured bond holders will be made whole upon firm failure. Furthermore, the guaranteed bonds are typically relatively short- term in nature where any opportunity for moral hazard problems due to insurance is relatively short-lived.

our analysis of liability guarantees and related insurance premia, we briefly describe the complex theory and empirical evidence of how credit spread term structures (CSTS) behave. We first discuss important classic theory concerning CSTS and then discuss more recent theory and evidence which specifically incorporates the effect of financial crises upon CSTS.

Research on credit spread term structure has a long history which begins with Merton (1974) where, in the first structural model of credit spreads, he gives arbitrage- free solutions for CSTS His classic results, later refined and corrected by Lee (1981), are that lower credit quality bonds may well have a negative CSTS slope but the slope for high grade bonds is qualitatively different. That is, higher credit quality bonds have a hump shaped CSTS where the credit spread first increases with maturity, peaks at some maturity, and then declines. See Figure 4 for qualitatively representative plots of Merton's (1974) theoretical results.

In another classic theoretical paper, Longstaff and Schwartz (1995) give CSTS plots using alternative measures of credit quality such as A) value of the firm relative to a (low) threshold firm value where default occurs and, B) volatility of firm value. The qualitative results are broadly similar to Merton (1974) where, for example, high quality firms have a positive slope throughout or, alternatively, a humped shape where the negatively sloped portion has only a mild negative slope.[15] In Figure 4 we show a high grade term structure qualitatively representative of Longstaff and Schwartz (1995). In summary, classic theory strongly suggests that the CSTS is complex and certainly varies with firm credit quality.

[15] Longstaff and Schwartz (1995) do not illustrate a CSTS that is negative throughout for low quality firms. The low quality cases have humped shaped CSTS where the hump occurs at shorter maturities for the lowest quality firms.

Empirical tests of CSTS typically use nonfinancial firms as the sample. Among these many empirical tests of CSTS, Sarig and Warga (1989) and Fons (1994) find a negative CSTS. However, Helwege and Turner (1999) disagree and find the CSTS tends to have a positive slope. More recently, Covitz (2007) supports a positively sloped CSTS.

In contrast to the above empirical studies, Krishnan, Ritchken, and Thomson (2006) find that, on average, the credit spread for banks, including strong banks, is negatively sloped. However, the negative slope is much stronger and much more statistically significant for low credit quality banks compared to higher credit quality banks.[16] More specifically, they compute different slopes for different maturity ranges: three year versus one year maturities, seven versus three year, ten versus five year and ten versus three year.[17] The negative slope values of the higher quality bonds are less than half that of the higher quality.[18] The average negative slope found by Krishnan, Ritchken, and Thomson (2006) is qualitatively represented in Figure 4.

Note that Figure 4 is not meant to represent specific solutions or observations about CSTS but merely to clearly illustrate the potentially strong qualitative differences about CSTS shape (slope) for different credit qualities. Again, the general, qualitative shape of the CSTS has important implications for both ex ante policy on how government guarantees should be priced and, also, ex post measurements of realized benefits to banks.

In summary, classic theory suggests many alternative shapes and slopes of CSTS. Furthermore, the empirical testing of CSTS slopes does not yield clear answers; some find

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[16] They find that the CSTS of nonrated debt is positive. Of course, the credit quality of such debt is unclear.

[17] That is, they subtract the one year credit spread from the three year spread, the three year spread from the seven year spread, etc.

[18] See Table 2 of Krishnan, Ritchken and Thomson (2006).

more evidence supporting a positive slope than a negative slope while others find greater evidence for a negative slope. However, we stress that there seems to be very credible theory that the shape of the slope may well depend upon the credit quality of the firm; in other words, different credit qualities likely have different shapes.

Financial Crises and Credit Spread Term Structure

It is not surprising that more recent research addressing CSTS includes how financial crises may impact CSTS. Of course, such research is especially interesting and potentially useful in light of the fact that special guarantee programs quite likely take place during times of financial system crisis. Again, He and Xiong (2012) define a corporate bond's yield spread over risk free rates as the *credit spread* where the credit spread reflects both (the sum of) a default premium and an illiquidity premium which are interactive. They maintain that the financial crisis of 2008 strongly illustrated how deterioration in liquidity interacted with and increased default risk thus increasing credit spread. As they suggest, their theory is particularly applicable to financial institutions. In brief, during periods when liquidity is deteriorating, equity holders are willing to absorb losses from paying off the maturing bond holders in full (rolling over the debt) only if they perceive their equity value as being positive. That is, equity holders make an endogenous decision to rollover debt or, alternatively, default on the debt. The greater the rollover loss, the greater the likelihood they will choose to default.[19] Importantly, and intuitively, rollover losses are greater with shorter maturities because rollovers occur more frequently for shorter maturities. In this context, He and Xiong (2012) conduct simulations where, logically, shorter maturities

[19] In other words, the firm may well default at a higher fundamental boundary of firm value.

mean that there is a greater cost of keeping the firm alive; that is, equity holders are more likely to default if numerous short maturities are frequently rolled over. In turn, this process leads to greater default risk for shorter maturities than for longer maturities. Hence, rollover cost considerations, when added to other numerous factors affecting CSTS slope, encourage the CSTS to be negatively sloped as is portrayed in their computations. If one assumes the previously noted observed flat term structure in many instruments just before the 2008 crisis[20], and then suspects the He and Xiong (2012) effect is quite strong given the large liquidity shocks of the crisis, the result is given in Figure 5.

Separately, Gorton, Metrick, and Xie (2014) propose a theory of CSTS during financial crisis. Instead of stressing the impact of endogenous decisions of equity holders upon default risk, they stress the impact of lender behavior. That is, during a crisis, lenders wish to lend short to protect themselves in the panic of the crisis; in contrast, borrowers (banks) wish to borrow long to avoid rollover risk.[21] The logical result is that lenders will only lend for longer periods if they are awarded a greater yield for the greater risk they perceive to be taking. That is, if this effect dominates, the CSTS will be positive. Gorton, Metrick, and Xie (2014) give numerous tables and graphs of realized crisis period CSTS on various types of instruments to support their case. Again, it is important to note that they observe that the CSTS just before the crisis was very close to being perfectly flat for many money market instruments. However, after the crisis began they find that the CSTS for fed funds, commercial paper, commercial mortgage-backed securities, collateralized loan obligations and other instruments became positive sloped. See Figure 6.

[20] The flat CSTS was observed, as mentioned above, for many instruments by Gorton, Metrick, and Xie (2014).

[21] Lenders want to lend short because want to be first in line if firm failure is looming.

In summary, if one assumes an initially flat term structure just before the 2008 crisis, as, in fact, observed by Gorton, Metrick, and Xie (2014), and then adds their effect, the basic result is given in Figure 7 where a positive CSTS is encouraged to occur. We note that their samples of CSTS were almost totally BBB and above credit quality; furthermore, their maturities typically did go beyond three months. Bond guarantee programs may well include much longer maturities and could include some bonds of lower credit quality.[22]

Maturity dependent normative liability insurance statements

In light of the above, we briefly present the weak form subsidy, maturity- dependent CS(M) case. That is, insurance premia charged can be structured to so as to provide a subsidy, where CS(M) >IP(M), to participating banks. However, in this view, there should be no excess benefit to banks with lower credit quality. In this case, the IP(M) charged should be parallel and below the perceived CS(M) of the particular firm where the distance from the IP(M) to CS(M) is the same for all firms. The distance below the CSTM is a judgment of how much the subsidy should be where it is nonetheless equal for all firms and maturities. Figure 8 a illustrates a negative CSTS for weaker credit qualities and Figure 8 b illustrates a flat CSTS which may hold for high quality firms. In both cases the subsidy is the same. Many economists who encourage relatively low subsidy, market-priced solutions to problems may well subscribe to such an equal-benefit structure. However, estimating

[22] We think that He and Xiong (2012) and Gorton, Metrick, and Xie (2014) are two important views concerning maturity choice and yields in crisis conditions where the first emphasizes the role of equity holders and the second emphasizes the role of lender preference for maturities. Of course, any observed interest rate for maturity M is the result of a long list of very complex factors and behaviors of market participants where different researchers stress particular factors and participants. As another example of the role that maturity plays in debt markets, Brunnermeier and Oehmke (2013) often stress the role of the borrower who has an incentive to shorten maturity when interim information received at rollover dates is predominantly information concerning probability of default. Under certain conditions, the maturity structure becomes a race to very short maturities.

different CS(M) schedules from which to base IP(M) schedules is a very daunting task; in fact, the difficulty of the task may discourage such a structure.

The strong form subsidy, maturity-dependent CS(M) case allows for greater subsidies for weaker banks as encouraged by those believing that the financial accelerator is a very real threat. In this case, we move forward by using the actual schedule of IP(M) charged by the FDIC during the financial crisis. This IP(M) schedule is generally positively sloped although it is a step function; i.e. it is flat in certain limited ranges. We maintain the general structure is consistent with the idea of a positive slope. In this context, consider Figure 9 where the various possible shapes of CS(M) discussed above are included with comments about assumed benefits ,CS(M) less IP(M), to the banking firm. First assume a negative CS(M) for low credit quality firms where this is represented by Firm 1. Given the FDIC step-function insurance premium, such firms would capture greater benefit from issuing shorter maturities as opposed to longer maturities. The FDIC premia charged for different maturity ranges are shown as the three different flat lines. In fact, Figure 9 illustrates a case where the net benefit would be negative for longer maturities (Firm 1). Thus firms such as Firm 1 would not even issue any long term insured bonds, only short term, where, in fact, there clearly are greater net benefits the shorter the maturity. Next consider Firm 2, which is of higher credit quality and has a positively shaped credit term structure. In this particular case, the insurance would seem underpriced for all maturities where the greatest net benefit would seem to be for longer maturities. For Firm 3, with a gently sloping positive credit spread structure, FDIC insurance would have a positive net benefit for shorter maturities but a negative net benefit for the longest FDIC step. This firm would realize no benefit from long term issuances but positive benefits from short term. Finally, consider

Firm 4, a very sound bank, where the credit spread is both low and flat. Here the firm would not find a positive net benefit for any maturity and thus not participate in the FDIC program.

The policy choice of an agency insuring bank liabilities is very difficult where this figure illustrates some of the difficulties. Where should the schedule of insurance premia be placed relative to the myriad of CS(M) schedules for different banks? What is the CSTS of the banks they wish to help most and how should the insurance premia term structure be designed to help these particular banks? At what credit quality (BB or B or C) does the negative CSTS occur? As time passes, and conditions change (crisis subsides or worsens), how will the shapes of each category of credit quality change? Should insurance premia with both different slopes and levels should be applied to different rating classes.

To carry the analysis one step further, consider Figure 10 a. Assume a positive sloping insurance premium structure and a negative credit spread slope. If IP(M1) is in effect, the benefits to insurance decrease with maturity and no maturities greater than M1* will be insured. In contrast, Figure 10b. b uses a positive credit spread slope and a negative IP(M) slope; if IP(M1) is in effect, only maturities greater than M1* will be insured. The maturities which would adopt insurance are drastically different in these graphs. If the government wished to encourage long term debt, this could be way to do it. Such encouragement of somewhat longer maturities could be called for during the “maturity rat race” described by Brunnermeier and Oehmke (2013). More specifically, they maintain that borrowers may well have an incentive to shorten the maturity of creditor’s debt contracts because shortening dilutes other creditors. Subsequently, other lenders also bargain for short contracts. The result is that financial institutions adopt a maturity structure that is very short, inefficient and overly fragile.

In summary of this section, government insurance of bank liabilities is an especially important topic when banking systems are under severe stress. It follows that how to price and structure the insurance program is also important. Government agencies may or may not wish to subsidize weaker banks more than others. If they do, or even if they do not, the government agencies should be aware of CSTS theories, empirical tests of CSTS, and, the observed CSTS at the time of program execution. The next section will utilize data from the U.S. bond guarantee program instituted in 2008 to analyze what actually happened in terms of the impact on CS(M) and CSTS. What are the obvious important questions and hypotheses regarding the effectiveness of the DGP program? Did the DGP program enhance bank bond liquidity? If so, how strong was the resultant reduction in bank interest costs? Was any liquidity enhancement only evident through observed yields on insured bonds, or, did pre-existing bonds of the issuing firms also become more liquid? Here we utilize a microstructure measure of liquidity—the bid-ask spread. Did the guarantee program tend to benefit weaker banks more than strong banks? If so, how did the term structure of credit spreads and insurance premia affect the differential benefit between weak and strong banks?

IV. Hypotheses

The prior sections have shown that a considerable amount of financial theory concerning liquidity and credit risk can be applied to the structure of bank liability guarantees (insurance). Of course, the government (agency) selling the liability insurance should attempt to structure the insurance premia to meet its primary objectives. One obvious objective is to stabilize the banking system even though certain banks may receive greater benefits than others. We now use bond prices and yields in the months immediately after the FDIC DGP program of 2008 was implemented to examine the impact of the program. Given the alternative theories, what were the realized effects? We also consider the impact on the bank's pre-existing bonds and its equity holders.

Government guarantees allow firms to issue default free bonds that are in high demand during crisis conditions. Default free bonds are likely in high demand during a crisis because flights to quality, wherein investors become more risk averse and prefer to invest in high quality debt, commonly occur during such times. [23] A debt guarantee from a credit-worthy government agency, such as the U. S. FDIC, may well help create bonds that are very high credit quality and thus display much greater liquidity than non-guaranteed bonds. This leads to our first hypothesis.

Hypothesis 1a: *Government-guaranteed (insured) bonds were significantly more microstructure liquid than their uninsured counterparts. Microstructure liquidity may be measured by natural logarithm of the bid-ask spread. Uninsured counterparts include bonds issued by the same banking firm. Greater microstructure liquidity may lead to a large reduction in credit spread where the reduction in credit spread more than compensates for the insurance premium paid for the guarantee.*

On the other hand, Krishnamurthy and Vissing-Jorgensen (2012) maintain that investors demand *both* quality and liquidity. Using European sovereign bond market data, Beber, Brandt, and Kavajecz (2009) find that credit quality indeed matters for bond valuation but, in times of market stress, investors chase liquidity more so than credit

[23] By comparing spreads of assets with different safety but similar liquidity, as well as different liquidity but the similar safety, Krishnamurthy and Vissing-Jorgensen (2012) show that investors demand both the liquidity and the safety (quality) of US Treasuries.

quality. This suggests an effort to distinguish between flight-to-quality and flight-to-liquidity episodes. Longstaff (2004) defines a flight-to-liquidity as an episode when some market participants suddenly prefer to hold highly liquid securities rather than less liquid securities.

If a financial crisis leads to a flight to liquidity more than a flight to quality, then an improvement in credit quality from a government guarantee will not necessarily materially improve liquidity of bank debt if superior liquidity is readily available in other debt instruments such as U. S. Treasury bonds. Any hoped for liquidity benefit may be nonexistent or quite weak. Thus, we give our next hypothesis.

Hypothesis 1b: *The microstructure liquidity of government-guaranteed bonds was not significantly greater than their uninsured counterparts and any reduced credit spread due greater liquidity was weak.*

Firms with relatively less liquid bonds likely derived greater benefit from participating in the DGP program. Consider Bank A which had uninsured (nonguaranteed) bonds that enjoyed a relatively liquid market versus Bank B which had uninsured bonds that were much less liquid. [24] If both banks subsequently issue guaranteed/insured bonds, the liquidity-related benefit to bank B will be greater and reflected in a greater relative reduction in credit spread. Thus, our next hypothesis follows.

Hypothesis 2: *In comparison to bond issuers with high microstructure liquidity, bond issuers with lower microstructure debt liquidity will receive a greater reduction in their credit spread from issuing a bond with a government guarantee.*

The FDIC considered charging more risky banks a greater insurance premium. That is, banks with a greater risk according to a CAMEL assessment would pay a greater premium.

[24] Bank A likely has much higher credit quality than Bank B.

[25] However, the final decision was not to charge risky banks more. As given before, such a decision is consistent with those subscribing to the idea of a financial accelerator. In this view, greater help for weaker banks was justified to prevent the economic downturn from accelerating. Thus, our next hypothesis is given.

Hypothesis 3: *Bond issuances of lower credit quality firms received a greater reduction in credit spread from a government guarantee than bond issuances of higher quality firms.*

Our next hypothesis suggests that government guarantees are more beneficial the greater the stress and volatility in the financial markets.

Hypothesis 4: *Reductions in credit spread due to bond guarantees/insurance are greater under more stressful market conditions. Stressful market conditions are represented by such things as VIX and the Baa – Aaa yield spread.*

As discussed above, the FDIC insurance premium increased with the maturity of the debt. If credit spreads for the majority of participating firms were negatively sloped, as commonly found in Krishnan, Ritchken, and Thomson, (2006), the difference in credit spreads due to insurance should generally be greater for short term bonds. Therefore, we present this hypothesis.

Hypothesis 5a: *Shorter-term government guaranteed debt issuances for all banks received a greater reduction in credit spread (difference in credit spread from uninsured) than longer-term debt.*

In contrast to Krishnan, Ritchken, and Thomson (2006), Helwege and Turner (1999) and Covitz and Downing (2007) find a positive term structure of credit spreads. Such a term structure of credit spreads combined with a positive term structure of insurance premia tends to neutralize any maturity specific benefit.

[25] CAMEL refers to risk assessment according to capital adequacy, quality of assets, management capability, earnings, liquidity, and sensitivity to market risk.

Hypothesis 5b: *Reductions in credit spreads (difference in credit spread from uninsured) due to insurance were not maturity dependent.*

An earlier section described how different firms with differing credit quality may well have different shapes to their credit spread term structures (CSTS). There is considerable evidence that lower quality firms have a negative CSTS slope whereas, in contrast, higher quality firms may have a mildly positive or flat slope for CSTS.[26] Thus, we offer this hypothesis.

Hypothesis 5c: *For lower quality, shorter-term government guaranteed debt issuances receive a greater reduction in cost of debt (difference in credit spread from uninsured) than longer-term debt. However, for higher quality firms, the reduction in cost of debt (difference in credit spread) due to a government guarantee does not vary by maturity.*

It is important to recognize that the benefit to participating banks depended on not only how much the insurance reduced the credit spread for that particular maturity but, additionally, on the interaction of the credit spread for maturity M and the insurance premium for maturity M.

Hypothesis 5d: *The FDIC policy change to a positive term structure of insurance premia, as opposed to the originally planned flat term structure of insurance premia, resulted in an enhanced benefit for the banks most needing help. This benefit was over and above the more general policy benefit due to not charging weaker banks greater insurance premia according to their CAMEL risk rating.*

Clearly a government debt guarantee will lead to lesser default risk for insured bonds compared to uninsured bonds. However, for a government intervention to be successful in mitigating contagion risk, default risk of banks must be reduced on a firm level – not only for specific, guaranteed issuances.

He and Xiong (2012) develop a theory in which a firm's default risk is dependent on debt market liquidity. The dependence of default risk on liquidity is a result of endogenous

[26] Additionally, higher credit quality firms may have humped- shaped CSTS. Given that the maturity of DGP bonds was relatively short (maximum of four years), the positively sloped part of the humped shape may well be more applicable than the negative part.

decisions of equity holders. In brief, equity holders are more (less) willing to continue rolling over debt (default) when the bonds being rolled over enjoy a liquid (illiquid) market. He and Milbradt (2014) extend their work by theorizing an endogenous loop in which default risk and debt market liquidity are dependent on one another.

Because guaranteed debt issuances are assumedly more liquid than nonguaranteed issuances and, also have a lower interest cost of debt,[27] overall firm default risk reflected in other, or even all, debt issued by the firm may decline if a firm participated in a government debt guarantee program. We use CDS contracts to measure changes in default risk. Our hypothesis is given below.

Hypothesis 6: *Participation in a government debt guarantee leads to a decrease in default risk at the firm level.*

It is very natural to ask the impact of DGP participation upon equity holders. One reaction by equity holders may be that a firm announcing participation is revealing that it is in bad shape and needs government help. In this context, we refer to market interpretations of the TARP program. During the TARP bank rescue program, some banks would boast that they did not need government help. Other banks that took TARP money may have been perceived as need help and thus revealing weakness.

Hypothesis 7a: *Bank equity holders experienced abnormally negative returns after it became public that the bank participated in TARP.*

On the other hand, participation in DGP had obvious benefits. The benefits in terms of reduced default risk and enhanced liquidity of debt were potentially quite significant. It is

[27] Of course, firms would not participate if there was not a net positive benefit to buying the guarantee. Thus, we think the assumption of lower interest cost of debt is justified. Furthermore, our empirical results strongly support this assumption.

likely that these benefits were greater than the insurance premium paid. Thus one could expect equity holders to experience a positive reaction.

Hypothesis 7b: *Bank equity holders experienced abnormally positive returns after it became public that the bank participated in TARP.*

As stated previously, He and Milbradt (2014) maintain that corporate default decisions interact with endogenous secondary market liquidity via a rollover channel. Their theory is quite appealing but empirical testing is quite difficult. However, participation in a government debt guarantee creates a pseudo natural experiment by exogenously reducing default risk of the firm (and therefore *all* of its bonds) without directly affecting the liquidity of non-guaranteed bonds on an *ex ante* basis. Therefore, when observing the change in the bid-ask spreads of the noninsured bonds of participants in a government debt guarantee, one would expect to see noninsured liquidity improve relative to the rest of the bond market. Our hypothesis follows.

Hypothesis 8a: *Noninsured debt previously issued by participants in the government debt guarantee experienced an improvement in liquidity upon issuance of insured bonds.*

On the other hand, some investors seeking bank bonds for their portfolio may have very much favored insured bonds relative to the uninsured bonds of the same bank. If so, this could lead to reduced demand and liquidity for the uninsured bonds of the same bank. Thus we present an alternative hypothesis.

Hypothesis 8b: *Noninsured debt previously issued by participants in the government debt guarantee experienced reduced liquidity upon issuance of insured bonds.*

V. Data Description and Empirical Results

Data Description

The data we use to conduct the research is comprised of all bond trades from the Trade Reporting and Compliance Engine (TRACE) database from 2008 through 2009. We use this time frame because bonds insured under the DGP needed to be issued between October 14, 2008 and November 1, 2009. The earliest issuance date was November 25, 2008 and the latest maturity date is December 28, 2012, which is three days before the FDIC guarantee was set to expire. Thus, the maximum maturity of the bonds was less than four years. Mergent Fixed Investment Securities Database (FISD) lists 82 fixed-coupon DGP bond issuances. These bonds are listed in Appendix I.

To eliminate erroneous entries in the TRACE data, the transactions are filtered according to the methods outlined by Dick-Nielsen (2009). The data are then processed further using a 10% median filter as described in Friewald, Jankowitsch, and Subrahmanyam (2012). Following Bessembinder, Kahle, Maxwell, and Xu (2009), daily yields are obtained by weighting individual trade prices by volume and finding the yield from the resulting price. In our analyses which incorporate yields, we eliminate observations with yields less than 0 and greater than 100 to remove erroneous entries. Because insured bonds do not have any embedded calls, puts, or convertibility options, only non-insured bonds without these embedded options are used in the sample.

We use TRACE for trade-level data, Mergent FISD for bond-level data, and COMPUSTAT for firm-level data. We also use VIX data from the Chicago Board Options Exchange (CBOE), the Baa-Aaa spread and treasury yields from the St. Louis Federal Reserve Electronic Database (FRED). Furthermore we hand collected information about the earliest public confirmation of DGP participation for each firm from Factiva, Bloomberg, and other various news sources. If we are unable to find any public confirmation of DGP participation, then we assume that the issuance date of the first guaranteed bond is the first public knowledge that a firm is positively a DGP participant. Treasury yields are linearly interpolated from the FRED data according to maturity.

We construct several variables from the data. First, we construct the *Rating* variable which increases with firm risk. AAA rated firms are assigned a value of zero, AA+ firms are assigned a value of 1, AA firms a value of 2, and so on with each rating downgrade increasing the variable by 1. We also construct *Ln(Bid-Ask Spread)* by estimating the bid-ask spread using the methodology of Hong and Warga (2000); that is, we subtract the average sell price from the average buy price and divide by the mid-point for each bond-day, and take the natural log. We also define *Ln(Issue Size)* and *Ln(Firm size)* as the natural log of issue size and firm assets scaled by one million dollars. Finally, we construct *Post Announcement* as a binary variable. For DGP-participating firms, this equals 1 for observations after the firm announces its DGP participation, and 0 prior to the announcement date. For nonparticipants, this variable equals 1 after October 20, 2008 (the earliest DGP participation announcement – American Express), and 0 before.

Table 2, Panels A and B, provides daily descriptive statistics for the bonds from October 1, 2008 through October 31, 2009. Panel A displays statistics for the full sample, while Panel B is limited to only guaranteed bonds. We see that 27 percent of the bond-days in the sample are issued by firms participating in the DGP, while only 1.6 percent of the observations in the sample are from guaranteed bonds. The credit ratings of the issuing firms ranged from AAA to CCC. It is important to note that while all guaranteed bonds were rated AAA, we use the credit rating of the issuing firm rather than the bond itself, so we can conduct ceteris paribus analysis when comparing guaranteed and nonguaranteed bonds of the same firm. Standard & Poor's debt ratings were acquired from COMPUSTAT.

Bid-Ask Spread Regressions

Our empirical analysis begins with regression specifications that allow testing of the microstructure liquidity hypotheses and credit spread hypotheses. The dependent variable in our first set of regressions is the natural logarithm of the Bid-Ask spread for bond i at time t, Ln(Bid-Ask Spread)$_{it}$. The full specification is

$$\text{Ln (Bid-Ask spread)}_{it} = \alpha + \beta_1 (G_i) + \beta_2 (G_i * M_{it}) + \beta_3 (G_i * R_{it}) + \beta_4 (G_i * \text{Ln (Issue Size)}_{it})$$
$$+ \beta_5 (G_i * \text{Ln (Firm Size)}_{it}) + \beta_6 (M)_{it} + \Sigma_j C_j * X_{jit} + \varepsilon_{it}$$

We use the logarithm of bid-ask spread because of severe skewness in our sample of bid-ask spreads and do not want outliers to unduly bias our estimation of coefficients. The definition of all variables used in this research and how they were computed is in an appendix.

The bank insurance guarantee, G_i, is a dummy variable which is 1 if the bond is guaranteed and zero if not. The guarantee variable is interacted with maturity (M), rating (R), logarithm of issue size and logarithm of firm size. Of course rating reflects credit quality where AAA bonds are assigned 0, AA+ are assigned 1, AA are assigned 2 and so on. Furthermore we include control variables (X_{jit}) that may affect Ln(Bid-Ask Spread) but are not interactive with the guarantee; the estimated coefficient for control variable j is C_j. Guarantee interactive variables are also separately included as control variables in order to capture effects that are independent of the guarantee. In this context, as in Chakravarty and Sarkar (2003), the square of maturity is included to capture the potentially nonlinear effect of maturity. Bonds that have been outstanding for a longer time, greater age, may be less liquid. We note that Bao, Pan, and Wang (2011) found that age has an effect upon their bond liquidity measure. The Baa-Aaa spread proxies for the general level of stress in the financial system where a greater Baa-Aaa spread generally results in greater BAS spreads for all debt instruments.[28] We include a dummy for floating rate bonds; that is, 1 for floating zero and zero if not floating. Floating rate bonds have little price volatility (low duration) and thus holding them in inventory involves little risk. As a result, floating rate bonds tend to be quite liquid with small bid-ask spreads. The junk dummy variable is meant to capture differential liquidity of low grade bonds.

Table 3 contains regression results where the first column does not include interactions and is thus the shortest specification. The guarantee (G) variable is clearly strongly significant indicating that a guarantee sizably reduces the Ln(Bid-Ask Spread). Control variables generally behave as expected although not all are statistically significant. Ln(Issue Size) is negative, suggesting larger issues enjoy a more liquid market whereas, on the other hand, Ln(Firm Size) is not significant. Lower credit quality, greater R, increases Ln(Bid-Ask Spread) spread although the significance level is marginal. Greater maturity clearly increases Ln(Bid-Ask Spread) spread but we note that the effect is not linear as the square of maturity has a significant negative coefficient.[29] The greater the age of the bond and the greater the Baa-Aaa spread, the greater the Ln(Bid-Ask Spread) . Floating rate bonds have a lesser Ln(Bid-Ask Spread). The junk dummy is negative where its effect must be

[28] See Chen, Collin-Dufresne, and Goldstein (2009) for further analysis of how the Baa-Aaa spread reflects macroeconomic conditions.

[29] The large positive coefficient on the M coefficient dominates the much smaller negative coefficient on M^2 .

simultaneously considered with the rating dummy; that is, the impact of lower ratings tends to be concave as credit quality declines. [30]

The four succeeding columns of the table individually add guarantee interaction with maturity, rating, Ln (Issue Size) and Ln(Firm Size). The coefficients of the control variables change very little in these regressions. Guarantee interaction with maturity clearly increases Ln(Bid-Ask Spread) where the increase is likely due to the greater risk of holding longer maturities in inventory. Guarantee interaction with rating and Ln(Issue Size) is not significant but guarantee interaction with Ln(Firm Size) is significantly negative.

The last column includes all guarantee interactions where guarantee times maturity and guarantee times Ln(Firm Size) are significant. The guarantee dummy itself it not significant but this is because the interaction variables are strongly correlated with the guarantee dummy and the interaction variables explain the same variation in the dependent variable. The control variables in the last column behave similarly to the previous columns. In summary, the results given in Table 3 clearly support the hypothesis that guaranteed bonds were more liquid than those without guarantees.

Credit Spread Regressions

The dependent variable in our next set of regressions is the credit spread for bond i of maturity M at time t, $CS(M)_{it}$. The specification is

$$CS(M)_{it} = \alpha + \beta_1 (G_i) + \beta_2 (G_i * M_{it}) + \beta_3 (G_i * R_{it}) + \beta_4 (G_i * \text{Ln (Bid-Ask spread}_{it})) + \beta_5 (G_i * VIX_{it}) + \beta_6 (G_i * Junk_{it}) + \beta_7 M_{it} + \Sigma j Cj * X_{jit} + \varepsilon_{it}$$

[30] If the rating variable is high, reflecting a low credit quality, the sum of the rating dummy effect and junk dummy effect is a positive number that increases relatively slowly as credit quality declines past a certain rating.

The credit spreads represent the interest costs above the risk free rate for bond i at time t. Additionally, we recognize that a bank participating in the program had to pay an insurance premium of $IP(M)_{it}$. Thus, we include the insurance premium as part of the left hand side in an alternative specification. $IP(M)_{it}$ is the insurance premium charge in force for bond i at time t. In results reported below, the structure of the estimated coefficients is very similar to that when $CS(M)_{it}$ is the sole term on the right hand side.

$$CS(M)_{it} + IP(M)_{it} = \alpha + \beta_1 (G_i) + \beta_2 (G_i * M_{it}) + \beta_3 (G_i * R_{it}) + \beta_4 (G_i * \text{Ln (Bid-Ask spread}_{it})) + \beta_5 (G_i * VIX_{it}) + \beta_6 (G_i * Junk_{it}) + \beta_7 M_{it} + \Sigma_j C_j * X_{jit} + \varepsilon_{it}$$

Of course, the guarantee and its interaction are included as in prior regression specifications because interactions help address hypotheses and control for other effects. Now we also include the Ln (Bid-Ask spread) as an explanatory variable because such a liquidity measure potentially affects CS(M) where greater liquidity may reduce the credit spread. We generally include the same control variables as before but furthermore, include the three month Treasury bill rate, coupon rate and leverage as new control variables. The Treasury bill rate is included because Longstaff and Schwartz (1995) suggest short-term risk free interest rates broadly represent the expected growth rate of firm assets. In support of this theory, the level of interest rates has been shown to have a negative impact on credit spreads in numerous studies such as Dick-Nielsen (2012), Longstaff and Schwartz (1995), and Kim and Stock (2014). The coupon rate has been included to potentially control for taxes on coupons as in Campbell and Taksler (2003) and Balasubramnian and

Cyree (2011). [31] Leverage is included, as in Balasubramnian and Cyree (2011), to capture and financial risk not captured in bond rating.

We run separate regressions for both our total sample, and, also, for financial services firms only (SIC code 6000). This is done because financial services firms include banks and financial services firms may well have been under greater financial stress than nonfinancial firms in 2008 and 2009.

The credit spread regression results are in Table 4 where the first column does not include interactions and is thus the shortest specification. The guarantee dummy materially reduces the credit spread. The control variables generally have the expected effect where rating, Ln (Bid-Ask spread), VIX, the Junk dummy, and leverage all have positive coefficients. Ln(Issue Size) has a negative sign suggesting larger issues are more liquid. Coupon rate is not significant.

The impact of maturity is very important where the coefficient is negative on maturity but positive on maturity squared. Given the small magnitude of the coefficient on maturity squared, the dominant effect is negative where the squared maturity coefficient makes the combined effect convex. Thus, during the time period of our sample of credit spreads, the CSTS tended to be negative for the total sample. Such an observation is consistent with hypotheses that benefits due to a guarantee were greater for shorter maturities given that insurance premia charged had a positive term structure.

The next column reports the same regression where, in contrast, the sample includes only financial services firms (SIC 6000). As one might expect, the guarantee dummy is even

[31] Greater coupon rates suggest a greater tax burden.

larger and more significant given the severe stress many financial firms suffered. In general, the results are quite similar to the previous column.

The next column interacts the guarantee dummy with rating, Ln(Bid-Ask spread), VIX, maturity and a junk dummy for the total sample of corporate bonds which includes both non-financial and financial firms. Of course, when the guarantee is interacted with numerous variables, the guarantee becomes much less unique and may well decline in magnitude and significance; in fact, this occurs in our sample. The guarantee interacted with rating has a negative coefficient which, as one should expect, shows that the guarantee has a stronger negative effect on credit spread the lower the credit quality. This supports our hypothesis about lower credit quality bonds enjoying more benefits. Guarantee interacted with Ln(Bid-Ask spread) is negative; that is, bonds with lesser liquidity receive greater benefit from the guarantee than bonds of greater liquidity. In other words, banks that were least liquid received the most benefit; this is consistent with a policy that would intend to help banks with the greatest liquidity needs. Furthermore, it is consistent with our hypothesis that such more illiquid issuers would reap greater benefits in the form of greater reduction in credit spreads. Guarantee interacted with VIX is clearly negative which strongly suggests guarantees were more beneficial during the most stressful times and, also, supports our above hypothesis that suggested such.

Guarantee interacted with maturity has a positive coefficient. Thus, for guaranteed bonds, the term structure of credit spreads tends to be positive because this coefficient is greater than the non-interacted maturity term. The spread on guaranteed bonds is the liquidity spread over U. S. Treasuries because the guaranteed bonds are, in fact, backed by the full faith and credit of the U.S. Treasury and have no default risk. This coefficient suggests the term structure of *liquidity premia only* has positive slope. The last interaction term is guarantee interacted with the junk dummy. Junk bonds enjoy an enhanced reduction in credit spread apparently because they enjoy a greater enhancement in credit quality. [32]

The next column uses the same interaction variables for a sample which includes only financial firms. The results are quite similar where the guarantee dummy has a more negative coefficient than for the total sample. In some contrast, the guarantee interacted with junk is not significant and the leverage coefficient is not significant.

The last four columns include the insurance premium as part of the dependent variable $(CS(M)_{it} + IP(M)_{it})$. Of course, this reduces the benefit of the guarantee and the guarantee dummy is thus smaller. The structure of results for other variable is quite similar to the previous columns. This means that even after a positive sloping term structure of insurance premia was imposed, the behavior of the expanded dependent variable with respect to maturity and other explanatory variables remains.[33]

In summary, this table supports multiple hypotheses. Bond issuers with lower microstructure liquidity and lower credit quality enjoy a greater reduction in credit spread when purchasing an insurance guarantee. Reductions in credit spread are stronger under more volatile market (high VIX). Furthermore, reductions in credit spreads are maturity

[32] Of course, the total effect for junk firms issuing guaranteed bonds is the sum of the junk interaction and the junk control variable.

[33] The regression results for both CS(M) and CS(M) + IP(M) as dependent variables are nearly identical because, by coincidence, all low rated insured paid a premium of 100 basis points.

dependent; more specifically, shorter maturities seem to enjoy greater reductions in credit spread.

Split Sample Credit Spread Regressions

A crucial factor in designing liability guarantees and, also, examining ex post benefits to participants, is the insurance fee for different maturities. The insuring agency should be fully aware of the CSTS. The above analysis made a preliminary attempt at estimating the CSTS and resulting benefits. However, a more detailed analysis is needed because both theories suggests that the CSTS slope varies with credit quality of the participating firm. We therefore split the sample into two default risk-based groups: high-rated firms (with a Standard & Poor's credit rating no lower than AA-), and low-rated firms (with a Standard & Poor's credit rating of BBB+ or lower). [34] The results for these regressions are presented in Table 5a.

The first column represents credit spreads for higher credit quality bonds whereas the third is for lower credit quality. (The second and fourth columns include the insurance premium in the dependent variable.) The impact of maturity is very different for high quality versus lower quality in that the maturity and maturity squared coefficients in the first column (high quality) are very small land not significant which suggests that a flat slope cannot be rejected. [35] In contrast, the third column (low credit quality) shows maturity is has as strong negative impact on spread and maturity squared has a significant positive impact. This clearly supports the hypothesis that lower credit quality bonds

[34] While we would prefer to use BB or lower, to align with speculative grade bonds, we extend the low rated group in order to have a meaningful sample size in the split-sample regressions.

[35] Maturity coefficients are negative but very small magnitude.

receive a greater benefit for shorter maturities but higher credit quality bonds do not. As expected, the effect of the guarantee is stronger in the lower credit quality sample (third column). Importantly, outside of the guarantee effects, Ln (Bid-Ask Spread) has a much stronger effect the lower credit quality regression.

In order to test robustness and, also, more thoroughly examine the impact of guarantees under differing conditions, Table 5b segregates the sample into lowest and highest quartile VIX observations. For the lowest (highest) quartile sample, the coefficient of guarantee interacted with Ln(Bid-Ask Spread) is a much smaller (larger) magnitude than that of the total sample. We feel these latter samples better estimate and, also, better illustrate the strong impact of a bond guarantee under varying conditions.

The results of Table 5 support the hypothesis that the benefits to purchasers of bond insurance are clearly maturity dependent. High grade have credit spread term structure that is flat whereas lower grade have a negative credit spread term structure. Benefits to short term low grade issuers are thus much greater than that of high grade issuers.

The difference in credit slopes is an important finding and thus we produce Figure 11 to represent slope differences given in Tables 4 and 5. Assuming the means of the variables of these tables, CS(M) is plotted against maturity. In the first panel, non-guaranteed bonds have a negative slope while guaranteed have a positive slope. From this, one might assume that all non-guaranteed bonds have a negative slope. However this is not correct where Panel B shows that high grade bonds have flat slope and Panel C shows that lower grade have a negative slope.

CDS and Default Risk of the Firm

We next test whether the government guarantee actually translated into lower default risk for participating banks. To do this, we perform an event study on the participating firms' credit default swap (CDS) returns, using a one-factor index model with the percentage change in the Markit CDX index – collected from Bloomberg – as the single factor. Unfortunately, most of the banks which issued debt under the DGP were either private institutions or public institutions too small to have a liquid market for CDS contracts. Therefore, there are limited observations that include both observations before and after the announcement. For the (0,0) and (-1+1) event windows surrounding the announcement of DGP participation we have sample sizes of only 9 and 13, respectively. We therefore extend the event window to incorporate 15 available CDS observations in our study. Table 6 details the results of the event study. We use the J1 and J2 test statistics as recommended by Campbell, Lo, and MacKinnley (1996).

While our results are limited in power due to the small sample size, we are able to document a significant 7.96% abnormal rise in sample credit default swap spreads in the 9 days, the (-10,-1) window, preceding announcement of DGP participation. This suggests that bank default risk was rising excessively relative to the market level risk prior to announcement the banks' DGP participation. We then find spreads decline in the(0,+5) and (0,+10) event windows. That is, following the banks' announcement of DGP participation, the abnormal increase of default risk subsided, and was even marginally reduced. While these results are not statistically conclusive, they at least suggest that announcement in the DGP led to a reduction in default risk (or at least put an end to abnormal increases). This is evidence in support of the hypothesis that default risk declined and thus consistent with the theory given by He and Xiong (2012) and He and Milbradt (2014). More specifically, the evidence supports the idea that exogenous liquidity improvement provided by the insured bonds reduced debt rollover costs, lowering the optimal default threshold, and ultimately lowered default risk.

Impact on Existing Claims on the Firm

Next, we attempt to quantify the effect that DGP participation had on firm equity returns. Although we presented alternative effects in our hypotheses, the previous findings that participation reduced default risk, reduced the cost of debt, and improved liquidity, we expect a positive market reaction to the announcement of DGP participation.[36] We perform an event study on the 26 banks participating in the DGP that had public equity outstanding. The event analysis is done in two ways; in the first, we use a one-factor market model. In the second, we use a four-factor model utilizing the Fama and French (1993) three factor model and, additionally, the Carhart (1997) momentum factor. Both are done with a (-300,-46) estimation window. As shown in the panels of Table 7, we find significant positive abnormal returns surrounding the announcement of DGP participation in both specifications. The significance is strongly inferred from both the J1 and J2 test statistics promoted by Campbell, et al. (1996).

Focusing on the four-factor model, we see that on the announcement day, participating firms received a positive 1.58 percent abnormal return. We also see that preceding the DGP announcement, the equity value for these firms was in a downward slide, with a negative 6.4 (8.81) percent cumulative abnormal return in the week (two weeks) before the various

[36] Ambrose, et al. (2013) use each bond issue date as an event date. However, the market impact of participation in the FDIC's Debt Guarantee Program should have been on the market's first knowledge of the participation and subsequent issues should have relatively no informational impact.

firms announce their participation in the DGP. Not only did the announcement of DGP participation help mitigate the loss of firm value, but in the week (two weeks) following the firms' announcements, participating entities received a positive 3.89 (2.97) percent cumulative abnormal return. Figure 12 provides visual evidence of shareholder cumulative abnormal returns surrounding the thirty days prior and following the event date as well as the abnormal changes in credit default swaps (default risk). It is apparent that equity value was deteriorating in excess of the downward market movement for at least a month prior to firms' respective announcements of DGP participation. Immediately upon and following the announcements there is an abnormal boost to equity value, followed by a leveling off in terms of cumulative abnormal return. These results are evidence that DGP participation was significantly beneficial to shareholders.

Thus far, we have shown that government debt guarantees – specifically the FDIC's Debt Guarantee Program – increase the liquidity of guaranteed bonds, reduce the cost of debt, reduce default risk, and increase equity value. He and Milbradt (2014) suggest that liquidity decreases (increases) as default risk rises (decreases). This is consistent with a flight-to-quality episode. Therefore, we hypothesize that the decreased default risk of the banks receiving a government guarantee should improve the liquidity of their pre-existing, nonguaranteed bonds. We test this hypothesis using a difference-in-differences approach to examine the effect of a DGP participation announcement on bid-ask spreads relative to the market. To do this we regress the natural logarithm of bid-ask spreads on a binary variable indicating DGP participation, another binary indicating whether the observation was before or after the announcement of DGP participation[37], and the interaction of the two indicator variables.

$$Ln\ (Bid\text{-}Ask\ spread)_{it} = \alpha + \beta 1\ (DGP_i) + \beta 2\ (PostAnnouncement_{it})$$
$$+ \beta 3\ (DGPi*PostAnnouncement_{it}) + \Sigma jCj*X_{jit} + \varepsilon_{it}$$

We limit the sample to bond-day observations of nonguaranteed bonds between September 1, 2008 and December 31, 2008 in order to capture the escalated uncertainty surrounding the peak of the financial crisis, but also limit the noise around in the mean bid-ask spreads. The results of this test are presented in Table 8.

As in previous regressions, we use two samples: one with all firms and one using only financial firms (SIC code in the 6000s). As shown in the first column of Table 8, prior to DGP announcement, bonds of DGP participants had 75 percent larger bid-ask spreads than nonparticipants.[38] However, following announcement of participation, bid-ask spreads declined by 16 percent, consistent with the hypothesis that the liquidity of pre-existing bonds of the participating firms improved.[39] When controlling for the determinants of bid-ask spreads, we find that the DGP participants received an 11.3 percent reduction in the bid-ask spreads of uninsured bonds upon announcing their participation in the guarantee program (significant at the 1 and 10 percent levels in columns 3 and 4, respectively).[40]

[37] If the issuing firm did not participate in DGP, then we use an event date of October 28, 2008 – the first confirmation of DGP participation.

[38] The computation is exp(0.559) - 1 = 0.7489.

[39] The computation is exp(-0.177) -1 = -0.1622.

The last two columns include control variables as used by Chakravarty and Sarkar (2003). Here we find that the DGP participants received an 11.3 percent reduction in their bid-ask spreads upon announcing their participation in the guarantee program (significant at the 1 and 10 percent levels in columns 3 and 4, respectively). [41] This offers evidence that the liquidity of previously-issued, nonguaranteed bonds improved relative to the market after the announcement of DGP participation.

VI. Conclusion

Governments frequently try to stabilize financial systems during a crisis. It is crucial that the any government intervention reflect all useful financial theory and related empirical evidence that helps them best design the intervention. Poorly designed intervention can be disastrous and could intensify the crisis instead of alleviate the crisis.

We examine a government intervention into the banking systems that is especially rich in the opportunity to study optimal design, structure also, measure differential realized benefits. More specifically, the United States (through the FDIC), along with several other countries, executed a program where bonds issued by banks were insured by the federal government.

A primary purpose of a debt guarantee was to reduce the risk of financial system failure. The evidence in this study provides strong support that the government bond guarantees accomplished this by reducing default risk and, also, increasing bank bond liquidity. Furthermore, holders of bank equity enjoyed strong increases in wealth. It is very important that the insuring agency be aware of how credit spread term structures behave

[41] The computation is exp(0.105) -1 = 0.1107

in a crisis. If the primary purpose of the program is to prevent bank failures and thus allow weaker banks to enjoy greater benefits, the design of the insurance premia charged should permit and even encourage weaker banks to receive greater benefits. In this context, we show that the original flat term structure of insurance premia would have been inferior to the positive term structure later implemented; this is because the credit spread term structure was negatively sloped for weaker banks. We note that the theory of credit spread term structure shape provided by He and Xiong (2012) was supported more than that of Gorton, Metrick and Xie (2014). For better or worse, strong banks received relative less benefit for two reasons. First, insurance premia were independent of credit quality, and, furthermore, credit spread term structures of strong banks were not negatively sloped.

It is also important to note that the bond insurance program clearly increased the microstructure bond liquidity of participating banks. That is, the liquidity of the insured bonds was many times greater than that of uninsured bonds. Furthermore, the liquidity of previously issued, uninsured issued bonds of the participating banks also improved upon bank issuance of insured bonds. The enhanced liquidity supports the theory of He and Xiong (2012) and He and Milbradt (2014) who provide a framework for analyzing how an exogenous shock to liquidity should affect bond markets. In summary, the bond insurance program served as an important natural experiment in how to conduct and assess a program for insuring bank liabilities.

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Appendix I: Variable Descriptions

Variable	Description
3 Mo. Treasury Yld	The 3 month treasury yield is gathered directly from Federal Reserve Electronic Data (FRED).
Baa-Aaa Spread	The Baa-Aaa spread is calculated as the difference in Moody's Seasoned Baa bonds' and Aaa bonds' yields, both gathered from the FRED.
Bond Age	The bond age is calculated as the difference in the trade execution date from TRACE and the offering date from Mergent FISD, scaled by 365 days.
Coupon Rate	The coupon rate is gathered from Mergent FISD for all fixed-coupon bonds, and assigned a 0 for all zero coupon bonds. This value is missing for all floating-rate bonds.
DGP Firm Dummy	The DGP Firm dummy is a binary variable equal to 1 if the issuing parent firm is a DGP-particpating firm, and 0 otherwise.
Floating Dummy	The Floating Dummy is a binary variable equal to 1 for variable rate bond issuances and 0 otherwise.
Guaranteed Dummy	The Guaranteed Dummy is a binary variable equal to 1 for a bond issuance guaranteed by the FDIC under the Debt Guarantee Program and 0 otherwise.
Leverage	Leverage of the issuing firm is calculated from COMPUSTAT as the sum of total current liabilities (DLC) and total long term liabilities (DLTT), scaled by total assets (AT).
Ln(Bid-Ask Spread)	Following Hong and Warga (2000), the bid-ask spread is estimated using TRACE data each day, by finding the volume-weighted average buy price and sell price, and then finding the difference in the buy and sell prices, scaled by the mid-point of the two prices. The bid-ask spreads are then winsorized at the 1st and 99th percentiles. We then take the natural log of the estimated bid-ask spread.
Ln(Firm Size)	Ln(Firm Size) is calculated from COMPUSTAT as the natural log of total assets (AT).
Ln(Issue Size)	Ln(Issue Size) is the natural log of the size of the bond issue (defined as the sum of the offering amount and action amount per Mergent FISD) scaled by $1 million.
Maturity	The maturity is defined as the maturity date (from Mergent FISD) minus the trade execution date (from TRACE), scaled by 365.
Maturity^2	Maturity^2 is defined as the square of Maturity.
Post Announcement Dummy	The Post Announcement Dummy is binary variable. For DGP participating firms, the variable is equal to 1 if the bond-day observation is on or after the issuing firm has previously announced their participation in the DGP Program, and 0 if the bond-day observation occurs prior to the firm's participation announcement. For non-DGP participants, the variable equals 1 on or after October 20, 2008 (the earliest DGP participation announcement), and 0 before that date.
Premium	Premium is the insurance premium the issuing firm paid to the FDIC in exchange for the guarantee. This is calculated according to Table 1.
Price	The daily price of the bond is calculated as the volume weighted average of the bond price from trades over the day, following Bessembinder, Kahle, Maxwell, and Xu (2009).

(Continued on next page)

Rating	The credit rating of the issuing firm is gathered from COMPUSTAT Ratings (SPLTICRM) and matched for each bond-day observation. The discrete ratings are then converted to a cardinal variable. In this process, all AAA ratings are given a value of 0, all AA+ ratings are given a value of 1, AA ratings a value of 2, and so on, up to a 20 for a D rating and 21 for an SD rating. It is important to note that while all guaranteed issuances were technically rated AAA, we maintain the issuing firm's rating in all observations, including those of guaranteed bonds.
SIC Code	The SIC Code of the firm is gathered from COMPUSTAT using the "SICH" variable.
Speculative Dummy	The Speculative Dummy is a binary variable equal to 1 for all ratings BB+ and worse (a cardinal rating variable 10 or higher).
Total Cost	The total cost of debt issuance is calculated as the sum of the yield spread and the insurance premium.
Treasury Yield	Treasury Yield is calculated from the H15 par-bond Treasury yields collected from the FRED and linearly interpolated between the given maturities.
VIX	The daily VIX level is gathered through the CBOE Indicies via Wharton Research Data Services (WRDS).
Yield	The yield is calculated for each bond-day observation of fixed- or zero-coupon bonds using the interest frequency, coupon, and maturity from Mergent FISD, the settlement date (three business days after the trade date) and the weighted average daily bond price gathered from TRACE. The decimal yield is finally multiplied by 100.
Yield Spread	The yield spread is calculated as the difference in the yield of a bond and the interpolated treasury yield, based on maturity.

Figure 1: Flat Credit Spread and Flat Insurance premium

No differential insurance premium due to differential default risk. No subsidy because CS(M) equals IP(M).

Figure 2: Flat Credit Spread and Flat Insurance premium

Differential insurance premia due to differential default risk. The flat term structures of credit spread are unlikely to occur for banks with low credit quality. However, flat credit spreads may occur for higher grade banks.

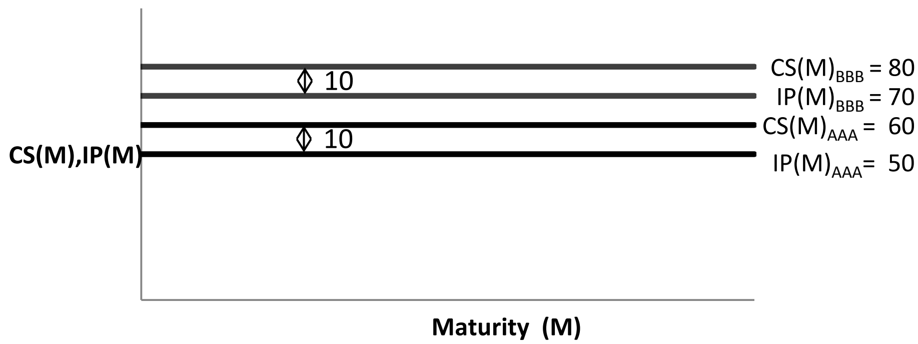


Figure 3: Flat Term Structures
Equal IP(M) for both banks.

Figure 4: Theoretical Bank Term Structures

The shape of the term structure of credit spreads is quite complex. Various authors have found contrasting shapes dependent upon credit quality of the firm, underlying parameters, and economic conditions. Merton (1974) and Longstaff and Schwartz (1995) are two of the most cited theoretical papers and their qualitative results are partially reported below. Krishnan, Ritchken, and Thomson (2006) provide empirical analysis of bank credit spreads where on average, they had a negative slope.

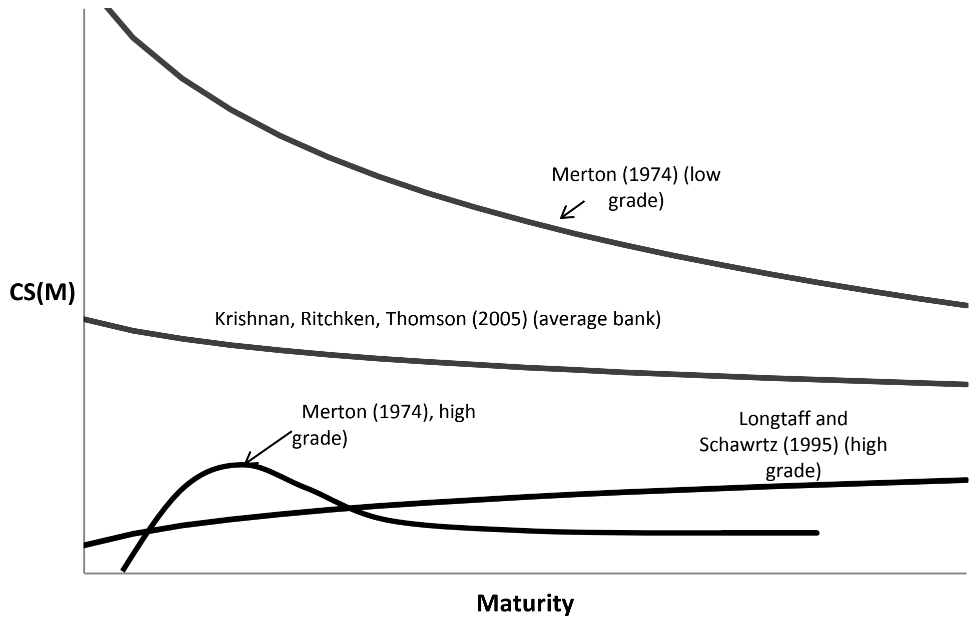


Figure 5: Effect of Rollover Risk on Term Structures

Assume the credit spread, CS(M), is flat in early 2007. He and Xiong (2012) find when liquidity shocks occur, equity holders are inclined to default at higher fundamental values (due to greater rollover risk) thus increasing default risk. He and Xiong (2012) find this effect stronger for short maturities versus longer maturities.

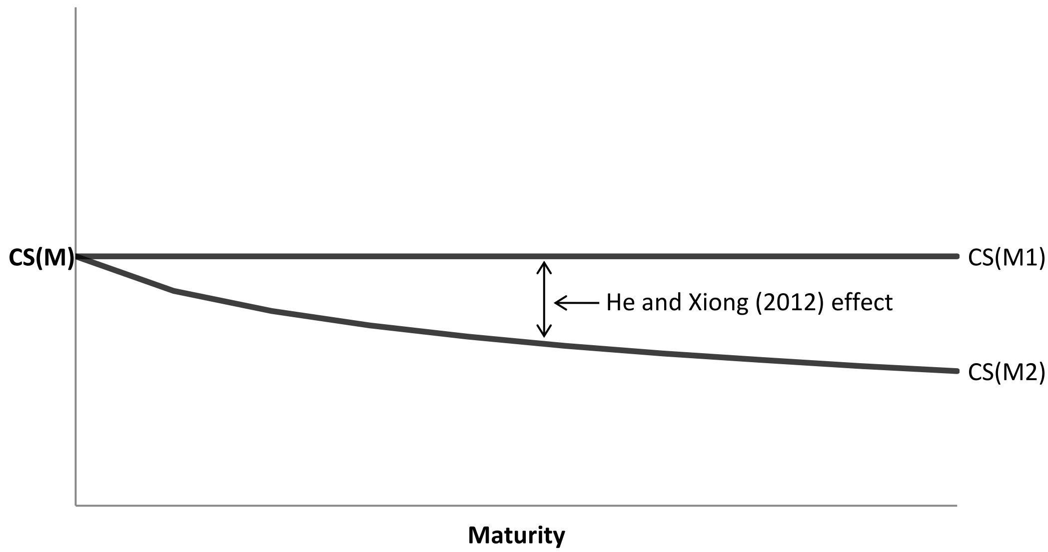


Figure 6: RMBS Term Structures

Term Structure of asset backed securities, residential mortgage backed securities, commercial mortgage backed securities from Gorton, Metrick, Xie (2014).

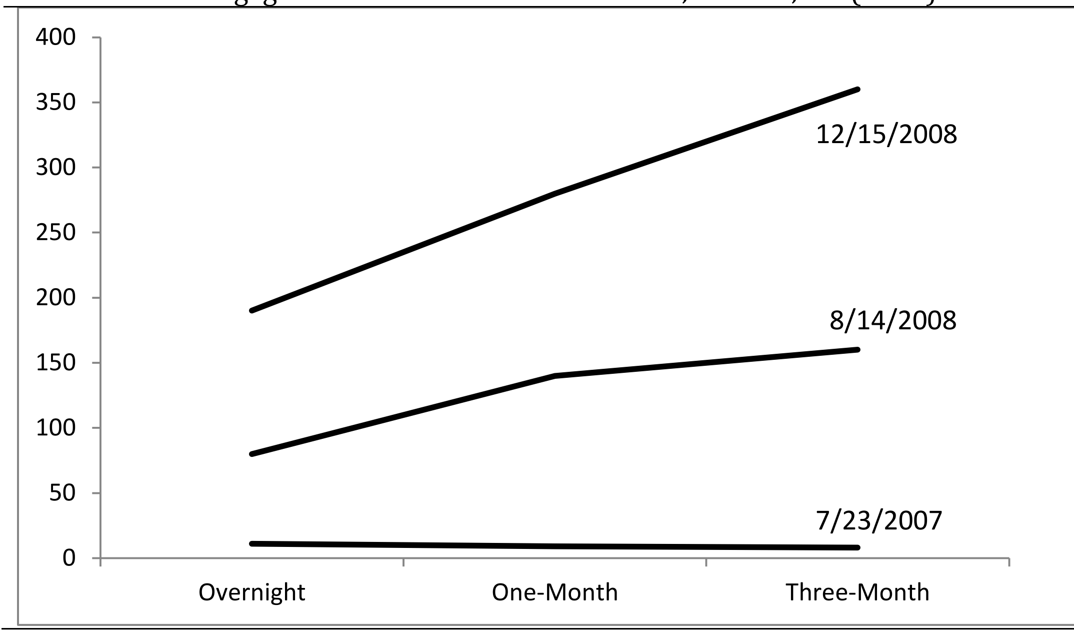


Figure 7: Effect of Lender Behavior on Term Structure
Assume that the credit spread CS(M) is flat as in early 2007. Gorton, Metrick, and Xie (2014) find that lender behavior led to a positive sloping CS(M) in 2008..

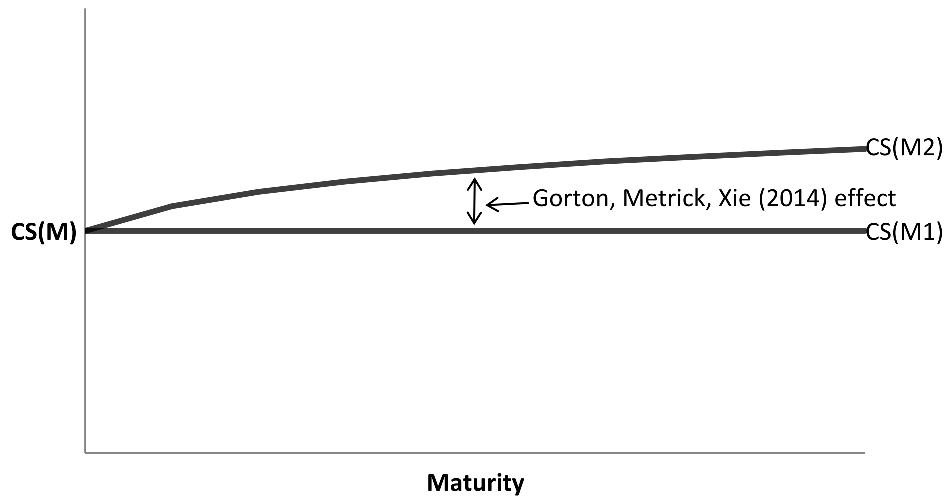
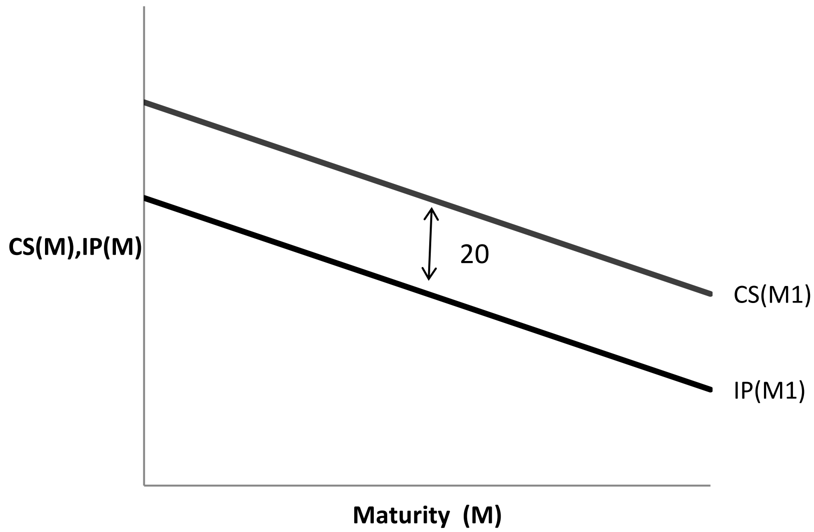


Figure 8

Panel A

20 basis point benefit for negative CS term structure slopes.



Panel B

20 basis point benefit for flat CS TS slopes.

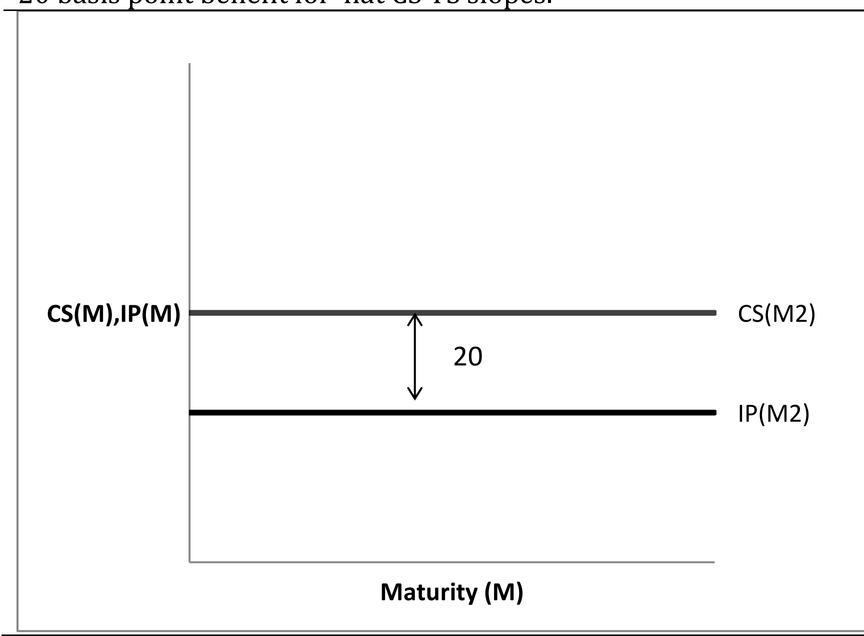


Figure 9: Alternative Term Structures of Credit Risk Compared to Insurance Maturity Premium Schedules

Firm 1 is a lower credit quality issuer and obtains a large benefit from only issuing short-term maturities. Firm 2 is a higher credit quality issuer, who receives underpriced insurance from the FDIC for all maturities. Firm 3 experiences insurance underpricing for shorter maturities and overpricing for longer maturities. Firm 4 finds that insurance is overpriced for all maturities. The horizontal lines represent the FDIC step-function insurance premiums.

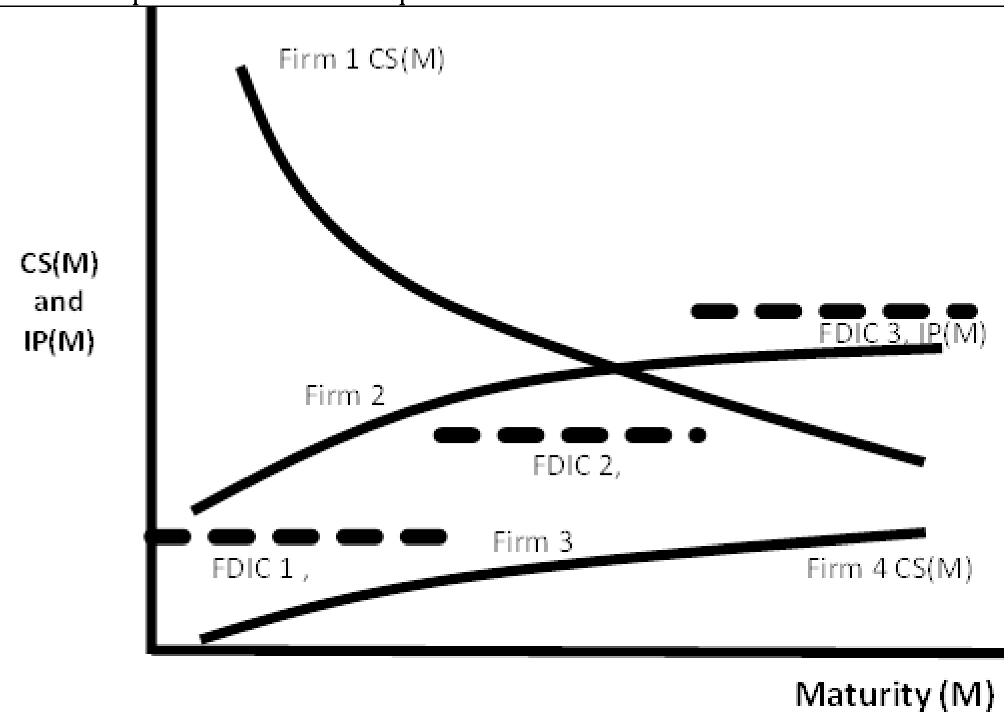
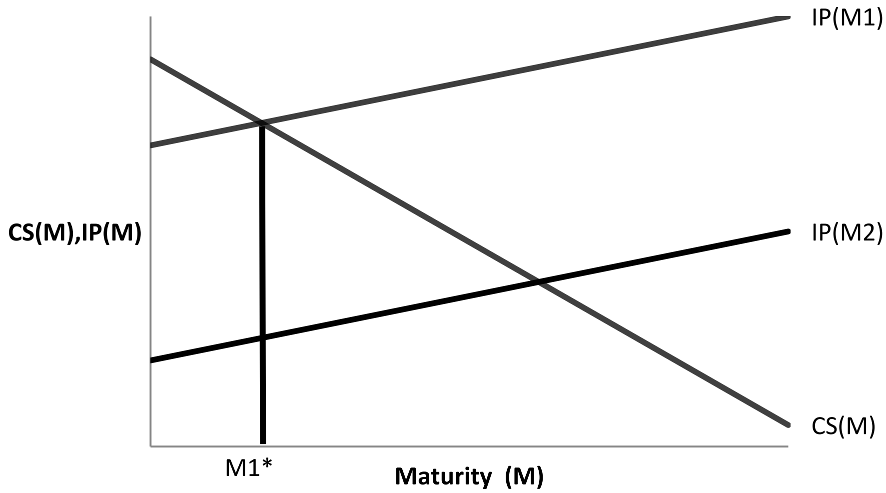


Figure 10

Panel A

Alternative insurance premia schedules. Negative credit spread slope and positive insurance premium slope. No differential insurance premium due to differential default risk. Shorter maturities will realize greater net benefits. Longer maturities will realize lesser net benefits. If IP(M1) is in effect, only maturities <M1*will be insured.



Panel B

Alternative insurance premia schedules. Positive sloping credit spread and negative sloping insurance premium. No differential insurance premium due to differential default risk. Longer maturities will realize greater net benefits. Shorter maturities will realize lesser net benefits. If IP(M1) is in effect, no bonds with maturity less than M1* maturity will be insured.

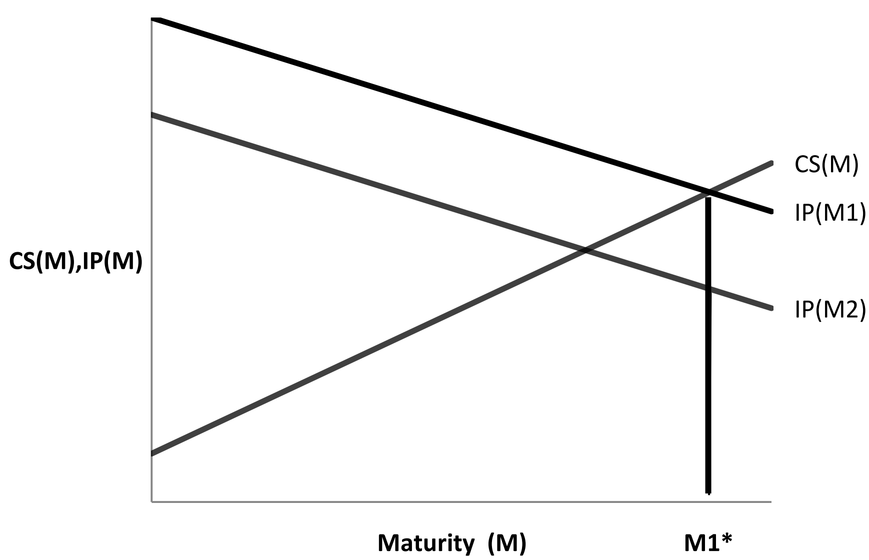
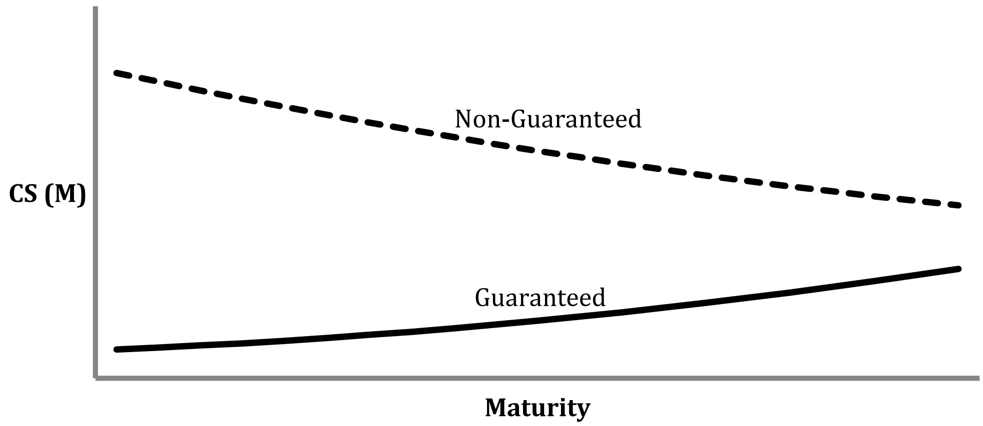
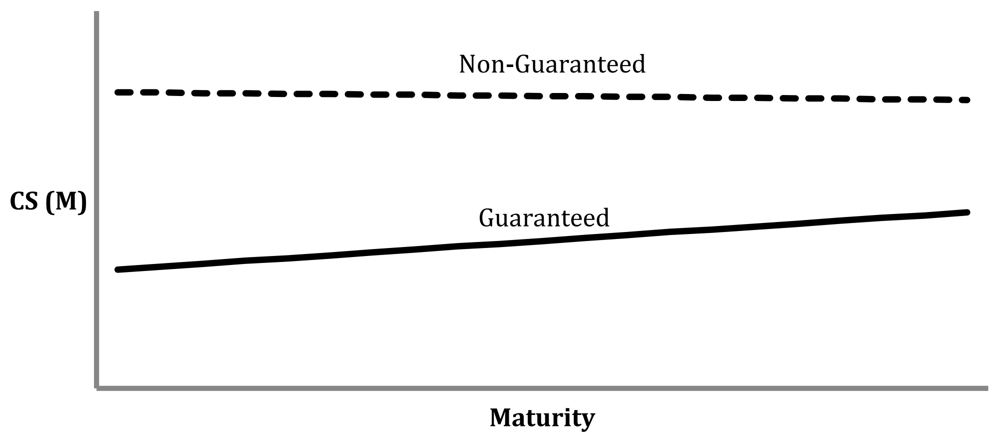


Figure 11: Maturity Impact on CS (M)
These figures show the variation in credit spreads for the non-guaranteed and guaranteed bonds dependent upon maturity. Panel A is reflective of the full sample of bonds reported in Table 4 using Model 4 regression coefficients. The bond term structure modeled in Panel A is assumed to not be of speculative grade. Panel B is reflective of the high credit rating sub-sample of bonds reported in Table 5 using Model 1. Panel C is reflective of the low credit rating sub-sample of bonds reported in Table 5 using Model 3. All bond estimates are reflective of the means of the sample as reported in Table XX Descriptive Statistics.

Panel A: Full Sample of Bonds – Table 4, Model 4



Panel B: High Rating Sub-Sample of Bonds – Table 5, Model 1



(Continued on Next page)

Panel C: Low Rating Sub-Sample of Bonds – Table 5, Model 3

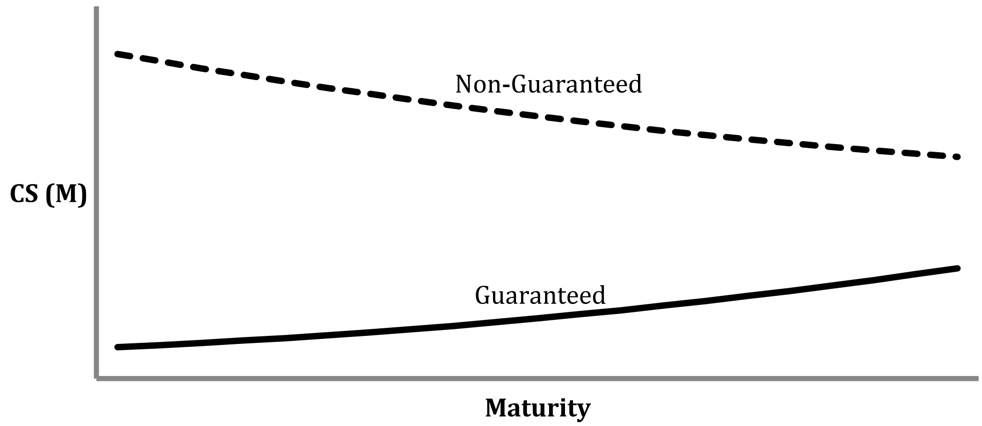


Figure 12 Cumulative Mean Abnormal Change

This figure illustrates the abnormal changes in DGP-participating firms' equity value and default risk, relative to 31 days prior to their participation announcement. The benchmarks used in these event studies were the CRSP Value-Weighted Index and CDX, for the equity and CDS event studies, respectively.

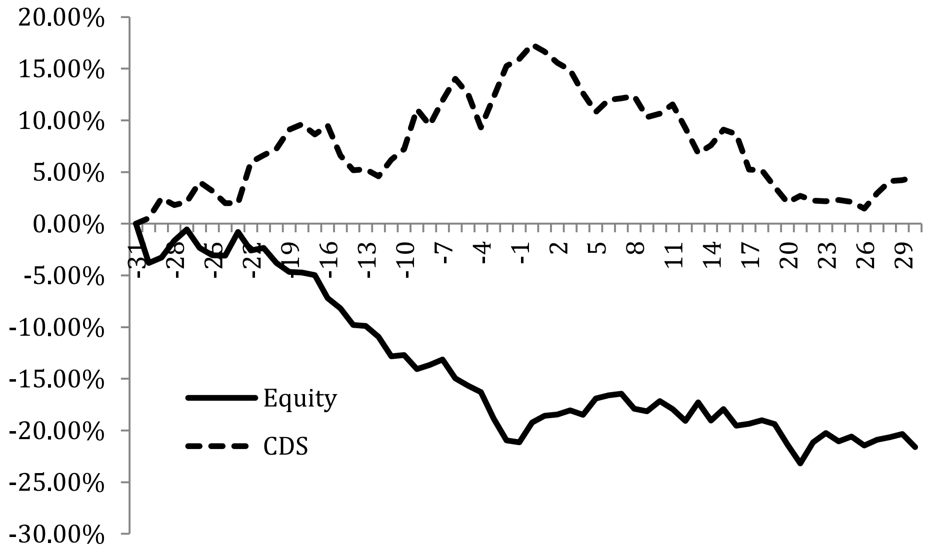


Table 1: FDIC Debt Guarantee Program Fees

This table provides the premiums charged by the FDIC for bonds issued under the Debt Guarantee Program. Panel A is representative of the fees charged based on the maturity of the issue. These rates increased by 10 basis points for senior unsecured debt issued by an entity that is not an insured depository institution if, as of September 30, 2008, the combined assets of all insured depository institutions affiliated with such entity constitute less than 50 percent of consolidated holding company assets. Panel B reports the additional premiums charged by the FDIC to those listed in Panel A for bonds issued under the Debt Guarantee Program after April 1, 2009.

Panel A: Fee Schedule A

For debt with a maturity of:	The annualized assessment rate (in basis points) is:
180 days or less (excluding overnight debt)	50
181 to 364 days	75
365 days or greater	100

Panel B: Fee Schedule B

Description	Insured Depository Institution (basis points)	Non-Insured Depository Institution (basis points)
Issued between April 1, 2009 and June 30, 2009 and Maturing by June 30, 2012	10	20
Issued on or after April 1, 2009 and maturing after June 30, 2012	25	50
Issued after June 30, 2009	25	50

Table 2: Descriptive Statistics

This table provides descriptive statistics over the entire sample (Panel A) and guaranteed bonds only (Panel B). Observations are on a bond-day basis. All variables are defined in Appendix I.

Panel A - Full Sample

Variable	N	Mean	SD	Min	Med	Max
Rating	518,208	6.5708	3.9819	0	6	21
Coupon	517,821	5.8562	1.7925	0	5.9500	15.0000
Bond Age (Years)	518,208	3.9787	3.5423	0.0000	3.0767	72.4164
Leverage	517,582	0.3672	0.2066	0	0.3353	1.5661
Ln(Issue Size)	518,208	-1.0110	1.6428	-13.8155	-0.6931	1.9530
Ln(Firm Size)	518,208	11.2689	2.0024	5.1708	11.0026	15.0714
Ln(Bid-Ask Spread)	191,227	-4.6310	1.2370	-20.2333	-4.4341	-2.7914
Price	518,208	93.0628	21.1973	0	98.3291	1298.810
Maturity (Years)	518,208	8.9523	9.4299	0	5.6301	96.0685
Maturity^2	518,208	169.0661	423.7741	0	31.6984	9229.155
Baa-Aaa Spread	517,136	2.2371	0.8037	1.1100	2.4000	3.5000
VIX	518,208	37.3516	13.6652	20.6900	32.4500	80.8600
Yield	189,090	8.2509	8.1279	0	6.4342	99.9779
Treasury Yield	510,861	2.3450	1.2020	0.0000	2.3211	4.7600
3 Mo. Treasury Yield	510,861	0.2014	0.1750	0.01	0.18	1.24
DGP Firm Dummy	518,208	0.2702	0.4440	0	0	1
Floating Dummy	518,208	0.0596	0.2368	0	0	1
Guaranteed Dummy	518,208	0.0162	0.1263	0	0	1
Junk Dummy	518,208	0.1499	0.3570	0	0	1

Panel B - Guaranteed Sample

Variable	N	Mean	SD	Min	Med	Max
Rating	8,406	4.1475	2.0591	0	5	21
Coupon	8,406	2.0650	0.8339	0.2305	2.1250	3.2500
Bond Age (Years)	8,406	0.3818	0.2416	0.0000	0.3589	0.9288
Leverage	8,406	0.4209	0.1822	0.0609	0.3433	0.8076
Ln(Issue Size)	8,406	0.6982	0.7280	-7.4186	0.6931	1.9095
Ln(Firm Size)	8,406	13.5682	1.0229	10.5645	13.5694	14.6145
Ln(Bid-Ask Spread)	3,537	-6.8139	1.2168	-14.0016	-6.6824	-2.7914
Premium	8,406	0.8568	0.4320	0	1.0000	1.6000
Price	8,406	101.5725	1.3187	96.0000	101.1868	106.0200
Maturity (Years)	8,406	2.4994	0.6323	0.6110	2.6658	3.7342
Maturity^2	8,406	6.6466	3.0112	0.3733	7.1062	13.9446
Baa-Aaa Spread	8,406	2.0389	0.7718	1.1100	1.8000	3.5000
VIX	8,406	32.0703	8.7047	20.6900	29.0000	68.5100
Yield	2,658	1.6266	0.4228	0.2519	1.6922	3.2232
Treasury Yield	8,406	1.2021	0.3277	0.2210	1.2416	2.2629
3 Mo. Treasury Yield	8,406	0.1675	0.0597	0.01	0.18	0.32
Floating Dummy	8,406	0.1927	0.3945	0	0	1
Junk Dummy	8,406	0.0067	0.0814	0	0	1

Table 3: Effect of Government Guarantee on Bid-Ask Spreads

This table displays results for the multivariate analysis testing the improvement of liquidity for guaranteed bonds using the following regression model:

$$\text{Ln}(Bid - Ask\ spread)_{it} = \alpha + \beta_1(G_i) + \beta_2(G_i \times M_{it}) + \beta_3(G_i \times R_{it}) + \beta_4(G_i \times \ln(Issue\ Size)_{it}) + \beta_5(G_i \times \ln(Firm\ Size)_{it}) + \beta_6(M_{it}) + \sum_j (C_j \times X_{jit}) + \varepsilon_{it}$$

Guaranteed Dummy equals 1 if the bond issuance is guaranteed and 0 otherwise. This variable is then interacted with other variables to analyze the effect of the guarantee on the determinants of bond liquidity. Control variables concerning the determinants of bid-ask spreads follow Chakravarty, and Sarkar (2003) and are defined in Appendix I. The sample for this unbalanced panel regression consists of bonds issued by DGP participants trading within 180 days of the first confirmation of DGP participation. Standard errors are clustered by bond and date. T-statistics are in parenthesis. ***, **, and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

Dependent Variable	**Ln(Bid-Ask Spread)**					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Guaranteed Dummy	-1.824***	-2.648***	-1.820***	-1.918***	-0.473	-0.538
	(-25.72)	(-17.37)	(-13.53)	(-17.61)	(-0.93)	(-0.90)
Guaranteed * Maturity		0.301***				0.223***
		(5.33)				(3.10)
Guaranteed * Rating			-0.001			-0.021
			(-0.03)			(-0.83)
Guaranteed * Ln(Issue Size)				0.101		0.157*
				(1.25)		(1.66)
Guaranteed * Ln(Firm Size)					-0.100***	-0.145***
					(-2.59)	(-3.53)
Ln(Issue Size)	-0.080***	-0.082***	-0.080***	-0.081***	-0.080***	-0.082***
	(-7.41)	(-7.52)	(-7.40)	(-7.46)	(-7.34)	(-7.54)
Ln(Firm Size)	0.008	0.008	0.008	0.007	0.011	0.012
	(0.71)	(0.79)	(0.71)	(0.64)	(0.97)	(1.06)
Rating	0.016*	0.015*	0.016*	0.016*	0.016*	0.017*
	(1.74)	(1.71)	(1.69)	(1.76)	(1.76)	(1.81)
Maturity	0.065***	0.065***	0.065***	0.065***	0.066***	0.065***
	(13.87)	(13.74)	(13.87)	(13.84)	(13.87)	(13.75)
Maturity^2	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(-7.05)	(-6.97)	(-7.05)	(-7.04)	-7.07)	-7.00)
Bond Age	0.039***	0.039***	0.039***	0.039***	0.040***	0.039***
	(5.27)	(5.25)	(5.27)	(5.27)	(5.28)	(5.25)
Baa-Aaa Spread	0.235***	0.231***	0.235***	0.234***	0.234***	0.231***
	(7.14)	(7.03)	(7.14)	(7.11)	(7.13)	(7.03)
Floating Dummy	-0.203***	-0.204***	-0.203***	-0.198***	-0.199***	-0.190***
	(-2.77)	(-2.78)	(-2.77)	(-2.71)	(-2.72)	(-2.60)
Junk Dummy	-0.278***	-0.281***	-0.278***	-0.283***	-0.271***	-0.282***
	(-3.79)	(-3.79)	(-3.74)	(-3.83)	(-3.69)	(-3.74)
Constant	-5.658***	-5.656***	-5.659***	-5.647***	-5.701***	-5.706***
	(-30.16)	(-30.18)	(-30.00)	(-30.10)	(-29.98)	(-29.70)
Adj. R^2	0.408	0.410	0.408	0.409	0.409	0.410
T	232	232	232	232	232	232
N	1,966	1,966	1,966	1,966	1,966	1,966
Obs.	26,267	26,267	26,267	26,267	26,267	26,267

Table 4: Effect of Government Guarantee on Credit Spreads

This table displays results for the multivariate analysis of the cost of debt reduction for guaranteed bonds using the following regression model:

$$CS(M)_{it} = \alpha + \beta_1(G_i) + \beta_2(G_i \times M_{it}) + \beta_3(G_i \times R_{it}) + \beta_4(G_i \times \ln(Bid - Ask\ Spread)_{it}) + \beta_5(G_i \times VIX_{it}) + \beta_5(G_i \times Junk_{it}) + \beta_7(M_{it}) + \sum_j (C_j \times X_{jit}) + \varepsilon_{it}$$

The sample for this unbalanced panel regression consists of bond-day observations between Oct. 1, 2008 and Oct. 31, 2009. Standard errors are clustered by bond and date. T-statistics are in parenthesis. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

SIC Codes	All	6000s	All	6000s	All	6000s	All	6000s
Dependent Variable	**Yield Spread [CS(M)]**				**Total Cost [CS(M) + IP(M)]**			
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Guaranteed Dummy	-2.105***	-3.762***	-0.866	-1.845*	-1.054**	-2.732***	0.210	-0.873
	(-4.83)	(-6.13)	(-1.25)	(-1.95)	(-2.40)	(-4.45)	(0.30)	(-0.92)
Guaranteed * Rating			-0.878***	-1.047***			-0.901***	-1.042***
			(-10.40)	(-9.84)			(-10.79)	(-9.93)
Guaranteed * Ln(Bid-Ask Spread)			-0.661***	-0.723***			-0.669***	-0.728***
			(-11.34)	(-7.93)			(-11.50)	(-7.98)
Guaranteed * VIX			-0.095***	-0.104***			-0.098***	-0.106***
			(-11.11)	(-10.51)			(-11.57)	(-10.76)
Guaranteed * Maturity			0.446**	0.686***			0.492***	0.713***
			(2.46)	(6.85)			(2.76)	(7.27)
Guaranteed * Junk			-2.749***	-1.608			-2.400**	-1.721
			(-2.48)	(-1.03)			(-2.19)	(-1.12)
Rating	1.003***	1.129***	1.013***	1.147***	1.003***	1.129***	1.013***	1.147***
	(15.49)	(9.84)	(15.52)	(9.86)	(15.49)	(9.84)	(15.52)	(9.86)
Ln(Bid-Ask Spread)	0.691***	0.690***	0.704***	0.728***	0.691***	0.690***	0.704***	0.728***
	(12.39)	(8.17)	(12.37)	(8.14)	(12.38)	(8.16)	(12.36)	(8.14)
VIX	0.116***	0.123***	0.117***	0.126***	0.116***	0.123***	0.117***	0.126***
	(15.69)	(13.75)	(15.52)	(13.48)	(15.69)	(13.75)	(15.52)	(13.48)
Maturity	-0.303***	-0.575***	-0.303***	-0.576***	-0.303***	-0.575***	-0.303***	-0.576***
	(-7.07)	(-7.79)	(-7.05)	(-7.78)	(-7.07)	(-7.79)	(-7.05)	(-7.78)
Maturity^2	0.008***	0.015***	0.008***	0.015***	0.008***	0.015***	0.008***	0.015***
	(6.42)	(7.06)	(6.40)	(7.06)	(6.42)	(7.06)	(6.40)	(7.06)
3 Mo. Treasury Yld	-0.159	1.553**	-0.173	1.520**	-0.159	1.554**	-0.174	1.519**
	(-0.36)	(2.56)	(-0.38)	(2.47)	(-0.36)	(2.57)	(-0.38)	(2.47)
Ln(Firm Size)	0.661***	0.224**	0.663***	0.216**	0.661***	0.224**	0.663***	0.216**
	(9.85)	(2.45)	(9.88)	(2.36)	(9.85)	(2.45)	(9.88)	(2.36)
Ln(Issue Size)	-0.123**	-0.250***	-0.122**	-0.247***	-0.124**	-0.250***	-0.122**	-0.247***
	(-2.33)	(-4.55)	(-2.30)	(-4.46)	(-2.33)	(-4.55)	(-2.30)	(-4.46)
Junk Dummy	1.933***	0.703	1.886***	0.515	1.934***	0.700	1.885***	0.513
	(5.57)	(0.46)	(5.44)	(0.33)	(5.57)	(0.46)	(5.43)	(0.33)
Coupon Rate	0.108	-0.093	0.105	-0.091	0.108	-0.094	0.105	-0.092
	(1.23)	(-0.58)	(1.19)	(-0.57)	(1.23)	(-0.58)	(1.19)	(-0.57)
Leverage	1.208*	-0.090	1.152*	-0.069	1.212*	-0.086	1.155*	-0.065
	(1.96)	(-0.12)	(1.86)	(-0.09)	(1.96)	(-0.11)	(1.86)	(-0.08)
Constant	-9.699***	-2.064	-9.719***	-1.991	-9.697***	-2.067	-9.719***	-1.993
	(-9.74)	(-1.18)	(-9.72)	(-1.13)	(-9.74)	(-1.19)	(-9.72)	(-1.13)
Adj. R^2	0.439	0.461	0.441	0.465	0.437	0.455	0.439	0.459
T	105	105	105	105	105	105	105	105
N	5,904	2,029	5,904	2,029	5,904	2,029	5,904	2,029
Obs.	71,830	23,273	71,830	23,273	71,830	23,273	71,830	23,273

Table 5: Effect of Government Guarantee on Credit Spreads by Rating, VIX, and Maturity
This table displays results for the multivariate analysis of credit spreads for guaranteed bonds. The sample for this unbalanced panel regression consists of bond-day observations between Oct. 1, 2008 and Oct. 31, 2009. Standard errors are clustered by bond and date. T-statistics are in parenthesis. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively. The regressions in Panel A uses a subsample of bonds rated higher than A and a separate subsample of bonds rated lower than A. Panel B uses two subsamples of observations – those in the top quartile of VIX levels and those in the bottom quartile.

Panel A: Split on Credit Rating

Bond Rating	(AAA, AA-)		(BBB+,NR)	
Dependent Variable	**Yield Spread**	**Total Cost**	**Yield Spread**	**Total Cost**
	(1)	**(2)**	**(3)**	**(4)**
Guaranteed Dummy	-2.033***	-0.974**	7.206***	8.206***
	(-4.91)	(-2.33)	(8.04)	(9.16)
Maturity	-0.010	-0.010	-0.509***	-0.509***
	(-0.45)	(-0.46)	(-6.52)	(-6.52)
Maturity^2	0.000	0.000	0.015***	0.015***
	(-0.28)	(-0.27)	(6.42)	(6.42)
Guaranteed * Maturity	0.086	0.218***	0.634***	0.634***
	(1.62)	(3.92)	(5.16)	(5.16)
Guaranteed * Rating	0.014	-0.067	-1.524***	-1.524***
	(0.29)	(-1.42)	(-15.10)	(-15.10)
Guaranteed * Ln(Bid-Ask Spread)	-0.167***	-0.178***	-1.075***	-1.075***
	(-5.23)	(-5.57)	(-8.99)	(-8.99)
Guaranteed * VIX	-0.027***	-0.035***	-0.199***	-0.199***
	(-5.36)	(-6.89)	(-9.87)	(-9.87)
Rating	0.204***	0.204***	1.714***	1.714***
	(4.04)	(4.05)	(12.05)	(12.05)
Ln(Bid-Ask Spread)	0.174***	0.174***	0.980***	0.980***
	(5.69)	(5.68)	(9.82)	(9.82)
VIX	0.054***	0.054***	0.191***	0.191***
	(12.61)	(12.61)	(12.86)	(12.86)
3 Mo. Treasury Yield	0.285**	0.285**	-1.796**	-1.796**
	(1.30)	(1.30)	(-2.23)	(-2.23)
Ln(Firm Size)	0.378***	0.378***	0.257**	0.257**
	(10.54)	(10.53)	(2.48)	(2.48)
Ln(Issue Size)	-0.085***	-0.085***	0.248	0.248
	(-3.44)	(-3.45)	(1.62)	(1.62)
Coupon Rate	0.127*	0.127*	0.337**	0.337***
	(1.70)	(1.70)	(2.43)	(2.43)
Leverage	1.492***	1.495***	-3.219**	-3.219**
	(5.27)	(5.28)	(-2.09)	(-2.09)
Constant	-5.093***	-5.090***	-12.272***	-12.272***
	(-9.27)	(-9.27)	(-6.86)	(-6.86)
Adj. R^2	0.473	0.459	0.464	0.464
Days	105	105	105	105
Bonds	1349	1349	2675	2675
Obs.	13321	13321	26556	26556
Slope of Guaranteed Term Structure	0.076	0.208***	0.124	0.124
	(1.40)	(3.67)	(0.97)	(0.97)

Panel B: Split on VIX Level

VIX Level	Bottom Quartile		Upper Quartile	
Dependent Variable	**Yield Spread**	**Total Cost**	**Yield Spread**	**Total Cost**
	(1)	**(2)**	**(3)**	**(4)**
Guaranteed Dummy	0.173	1.280	-5.532***	-4.512***
	(0.13)	(0.93)	(-3.74)	(-3.10)
Maturity	-0.227***	-0.227***	-0.516***	-0.516***
	(-4.39)	(-4.39)	(-8.27)	(-8.27)
Maturity^2	0.006***	0.006***	0.013***	0.013***
	(4.03)	(4.03)	(7.22)	(7.22)
Guaranteed * Maturity	0.329**	0.406***	1.018**	1.026**
	(2.20)	(2.82)	(2.41)	(2.45)
Guaranteed * Rating	-0.863***	-0.879***	-1.174***	-1.188***
	(-13.23)	(-13.88)	(-7.92)	(-8.09)
Guaranteed * Ln(Bid-Ask Spread)	-0.449***	-0.461***	-0.825***	-0.829***
	(-7.77)	(-7.77)	(-7.79)	(-7.78)
Guaranteed * VIX	-0.100**	-0.110**	-0.049**	-0.049**
	(-1.99)	(-2.15)	(-2.48)	(-2.48)
Rating	0.961***	0.961***	1.541***	1.541***
	(15.04)	(15.04)	(15.43)	(15.43)
Ln(Bid-Ask Spread)	0.465***	0.465***	0.938***	0.938***
	(7.54)	(7.54)	(9.02)	(9.02)
VIX	-0.030	-0.030	0.059***	0.059***
	(-0.43)	(-0.43)	(5.02)	(5.02)
3 Mo. Treasury Yield	8.152***	8.140***	-0.157	-0.157
	(3.25)	(3.25)	(-0.56)	(-0.56)
Ln(Firm Size)	0.534***	0.533***	1.055***	1.055***
	(10.43)	(10.42)	(9.28)	(9.28)
Ln(Issue Size)	-0.235***	-0.236***	-0.201***	-0.201***
	(-3.89)	(-3.89)	(-3.35)	(-3.35)
Coupon Rate	-0.121	-0.122	-0.049	-0.049
	(-1.26)	(-1.26)	(-0.38)	(-0.38)
Leverage	1.007*	1.011*	5.245***	5.246***
	(1.77)	(1.78)	(7.19)	(7.19)
Constant	-5.647***	-5.651***	-12.499***	-12.498***
	(-3.76)	(-3.77)	(-7.89)	(-7.89)
Adj. R^2	0.525	0.523	0.454	0.453
Days	22	22	31	31
Bonds	3,987	3,987	3,605	3,605
Obs.	18,146	18,146	17,753	17,753

Table 6: Effect of DGP Participation Announcement on Default Risk

This table reports mean cumulative abnormal changes in credit default swap prices for announcement of participation in the FDIC's Debt Guarantee Program. The abnormal returns are calculated using the CDX index in a one-factor model. *J1* is the test statistic using the cumulative abnormal return and *J2* is the test statistic using the standardized cumulative abnormal return. Both are calculated according to Campbell, Lo, and MacKinlay (1997). ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

Days	N	Mean CAR	*J1*	*J2*
(0,0)	9	1.88%	0.674	0.945
(-1,+1)	13	1.58%	0.706	0.692
(-10,-1)	15	7.96%	3.909**	1.766*
(-5,-1)	15	3.26%	1.601	1.028
(0,+5)	15	-2.59%	1.272	0.901
(0,+10)	15	-2.69%	1.323	0.633

Table 7: Effect of DGP Participation Announcement on Equity Returns

Panels A and B report mean cumulative abnormal stock returns for all announcements participation in the FDIC's Debt Guarantee Program. In Panel A the abnormal returns are calculated using a one-factor model using the CRSP value weighted index. In Panel B the abnormal returns are calculated using a four-factor model which includes the Fama-French (1993) factors of SMB and HML along with the Carhart (1997) momentum factor to the aforementioned one factor model. *J1* is the test statistic using the cumulative abnormal return and *J2* is the test statistic using the standardized cumulative abnormal return. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Equity Market Reactions to FDIC DGP Participation Announcement (1 Factor Model)

Days	N	Mean CAR	*J1*	*J2*
(0,0)	26	1.95%	2.030*	3.008***
(-1,+1)	26	2.44%	2.542**	2.867***
(-10,-1)	26	-8.23%	8.563***	3.646***
(-5,-1)	26	-6.12%	6.371***	4.632***
(0,+5)	26	4.27%	4.438***	4.559***
(0,+10)	26	4.07%	4.236***	2.357**

Panel B: Equity Market Reactions to FDIC DGP Participation Announcement (4 Factor Model)

Days	N	Mean CAR	*J1*	*J2*
(0,0)	26	1.58%	1.975*	2.569**
(-1,+1)	26	1.48%	1.845*	1.235
(-10,-1)	26	-8.81%	11.011***	5.024***
(-5,-1)	26	-6.40%	7.997***	6.390***
(0,+5)	26	3.89%	4.870***	4.240***
(0,+10)	26	2.97%	3.711***	1.546

Table 8: Effect of DGP Participation Announcement on Nonguaranteed Bond Liquidity

This table presents a difference-in-differences analysis of the effect of DGP participation announcements on bid-ask spreads of nonguaranteed bonds using the following regression model:

$$\mathrm{Ln}(Bid - Ask\ spread)_{it} = \alpha + \beta_1(DGP_i) + \beta_2(Post\ Announcement_{it}) + \beta_3(DGP_i \times Post\ Announcement_{it}) + \textstyle\sum_j (C_j \times X_{jit}) + \varepsilon_{it}$$

Control variables concerning the determinants of bid-ask spreads follow Chakravarty, and Sarkar (2003). All variables are defined in Appendix IThe sample for these regressions consists of bond-day observations between Sept. 1, 2008 and Dec. 31, 2008. The standard errors are clustered by bond and date. T-statistics are in parenthesis. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

SIC Codes	All	6000s	All	6000s
Dependent Variable	**Ln(Bid-Ask Spread)**			
	(1)	**(2)**	**(3)**	**(4)**
DGP Firm Dummy	0.559***	0.151***	0.184***	0.067
	(13.41)	(2.56)	(3.36)	(0.88)
Post Announcement Dummy	0.105**	-0.111*	-0.017	0.040
	(2.31)	(-1.95)	(-0.30)	(0.65)
DGP Firm * Post Announcement	-0.177***	0.016	-0.120***	-0.120*
	(-4.45)	(0.26)	(-2.82)	(-1.74)
Ln(Firm Size)			0.089***	0.067***
			(7.53)	(3.20)
Ln(Issue Size)			-0.051***	-0.044***
			(-6.30)	(-3.40)
Rating			0.040***	0.053**
			(5.90)	(2.04)
Maturity			0.065***	0.050***
			(18.05)	(10.34)
Maturity^2			-0.001***	-0.001***
			(-9.77)	(-5.36)
Bond Age			0.025***	0.015*
			(7.25)	(1.78)
Baa-Aaa Spread			0.101**	-0.016
			(2.05)	(-0.31)
Floating Dummy			-0.305***	-0.607***
			(-4.40)	(-5.07)
Junk Dummy			-0.586***	-0.891***
			(-7.99)	(-4.14)
Constant	-4.590***	-4.166***	-6.416***	-5.649***
	(-100.15)	(-79.07)	(-32.31)	(-15.22)
Adj. R^2	0.038	0.008	0.178	0.151
T	85	85	83	83
N	5,143	1,677	5,143	1,677
Obs.	42,367	12,923	42,305	12,911