Finance and Economics Discussion Series
Divisions of Research & Statistics and Monetary Affairs
Federal Reserve Board, Washington, D.C.

An Analysis of Government Guarantees and the Functioning of Asset-Backed Securities Markets

Diana Hancock and Wayne Passmore

2010-46

AN ANALYSIS OF GOVERNMENT GUARANTEES AND THE FUNCTIONING OF ASSET-BACKED SECURITIES MARKETS

DIANA HANCOCK AND WAYNE PASSMORE[r]

ABSTRACT

Mortgage securitization has been tried several times in the United States and each time it has failed amid a credit bust. In what is now a familiar recurring history, during the credit boom, underwriting standards are violated and guarantees are inadequately funded; subsequently, defaults increase and investors in mortgage-backed securities attempt to dump their investments.

We focus on a specific market failure that is associated with asset-backed securitization and propose a tailored government remedy. Our analysis of loan market equilibriums shows that the additional liquidity provided by securitization may (or may not) lower primary loan rates, but such liquidity comes at a cost. More specifically, if guarantee-sensitive investors doubt the credit quality of asset-backed bonds, significant risk premiums can develop. If a financial crisis ensues, securitization can disappear from the market entirely, leaving banks that originate just the highest quality loans as the only source of credit. This abrupt increase in lending standards can tighten credit, exacerbate asset price declines, and impinge on economic growth.

We argue that an institutional structure for stemming "runs," analogous to the current set up for the Federal Deposit Insurance Corporation, could be deployed to insure pre-specified asset-backed instruments. Such an insurer would likely benefit from the accumulated information and infrastructure that is embodied in the Fannie Mae and Freddie Mac organizations. Hence, the provision of federally-backed catastrophic insurance on pre-specified asset-backed instruments provided at risk-based premiums could provide a rationale for restructuring the housing-related GSEs towards a public purpose. Regardless of its institutional structure, a federally-backed catastrophic bond insurer would provide greater financial stability and ensure that credit is provided at reasonable cost both in times of prosperity and during downturns. Moreover, the *explicit* pricing of the government-backed guarantee would mitigate the market distortions that have been created by *implicit* government guarantees during prosperity.

[r] Diana Hancock is a Deputy Associate Director and Wayne Passmore is an Associate Director both in the Division of Research and Statistics at the Board of Governors of the Federal Reserve System. The results in this paper are preliminary materials circulated to stimulate discussion and critical comment. The analysis and conclusions are those of the authors and do not indicate concurrence by other members of the research staff or the Board of Governors. We thank Andrew Davidson, Karen Dynan, Skander Van den Heuvel, Trish Mosser, Richard Roll, David Torregros, Lawrence White, and various participants at the UC Berkeley–UCLA Symposium on "The Mortgage Meltdown, the Economy, and Public Policy" for helpful comments.

1. INTRODUCTION

Mortgage securitization has been tried several times in the United States and each time it has failed amid a credit bust.[1] In what is now a familiar recurring history, during the credit boom, underwriting standards are violated and guarantees are inadequately funded; subsequently, defaults increase and investors in mortgage-backed securities attempt to dump their investments.[2] *Ex post*, the securitizers are taken to task for the methods they used to originate and sell bonds and for not looking out for the interests of bondholders.[3] In the most severe cases, a federal emergency response to a mortgage crisis is mounted.[4] In effect, the government is "on the hook" to provide catastrophic insurance *ex post* when securitization markets go awry.[5]

In this paper, we focus on a specific market failure that is associated with asset-backed securitization and propose a tailored government remedy that is time-consistent. Our analysis of loan market equilibriums shows that the additional liquidity provided by securitization may (or may not) lower primary loan rates, but such liquidity comes at a cost. More specifically, if guarantee-sensitive investors doubt the credit quality of asset-backed bonds, significant risk premiums can develop. If a financial crisis ensues, securitization can disappear from the market entirely, leaving banks that originate just the highest quality loans as the only source of credit. This abrupt increase in lending standards can tighten credit, exacerbate asset price declines, and impinge on economic growth.

---

[1] For example, Snowden (1995 and 2007) describes the farm mortgage debenture movement of the 1880s and Snowden (2010) describes two types of mortgage-backed securities that were developed by mortgage guarantee companies and real estate bond houses in the 1920s.

[2] White (2009) argues that investors purchased mortgage-backed bonds in the 1920s because they were reassured by the legalization of private mortgage insurance, approval of regulators, and favorable assessments by rating agencies.

[3] In describing the situation during the mid-1920s, Snowden (2010, p. 19) indicates that "Real estate bond houses were excoriated for the methods they used to originate bonds and sell securities, and for abusing their position as fiscal agents for the bondholders."

[4] Snowden (2010) describes the Federal Home Loan Bank System and the Home Owners' Loan Act that represented the federal response in the 1930s. More recently, Congress passed the Hope for Homeowners Act of 2008, the Housing and Economic Recovery Act of 2008, and the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010.

[5] As Hank Paulson, Secretary of the Treasury, told Congress during hearings about the government's bailout plan: "You're angry and I'm angry that taxpayers are on the hook. But guess what: they are already on the hook for the system we all let happen." See "When Fortune Frowned," *The Economist,* October 11, 2008, p. 7.

During a credit boom, particularly when asset prices are rising, there are many guarantee-sensitive investors who will purchase the debt issued, or securities guaranteed, by large financial institutions.[6] These investors typically reason that some entities are so central that their failure would have substantial macroeconomic effects, and therefore, the government or the central bank will take actions to protect the debt holders of such institutions. Analogously, these investors are more likely to rely on implicit government guarantees when purchasing the asset-backed securities issued by large financial institutions, rather than to conduct a painstaking quantitative analysis of the underlying collateral.

Since there is a broader range of investors who purchase and sell the debt issued, or securities guaranteed, by large financial institutions, the liquidity of such instruments is greatly enhanced. However, as was seen just prior to when Fannie Mae and Freddie Mac were placed into conservatorships (as well as when some notable investment banks were on the verge of collapsing), such liquidity can suddenly dry up when the implicit government guarantee comes into doubt. Indeed, guarantee-sensitive investors are prone to "run" in a manner similar to what retail depositors did before the establishment of government-provided deposit insurance.[7, 8] Such actions simultaneously drive down security prices and build up liquidity premiums, regardless of the fundamental values for the assets that back the securities. In such circumstances, the issuance of asset-backed securities can abruptly cease as did occur in the fall of 2008.

---

[6] Our analysis is similar in spirit to Gorton (2009) and Gorton and Merrick (2009) who develop the analogy that investor "runs" in the shadow banking industry are similar to retail depositor "runs" in the banking era prior to the creation of the Federal Reserve. In their view, banks create "informationally-insensitive" debt (e.g., deposits) that appeals to retail depositors because there is no need to invest in due diligence. In the shadow banking system, investment banks use repurchase (repo) transactions, which use short maturities, collateral, and haircuts to appeal to a broad range of investors. Similarly, Shleifer and Vishny (2009) show how banks cater to uniformed "investor sentiment" using securitization, but the net result is a less stable financial system.

[7] Uninformed investors often play an instrumental role in models of liquidity "runs." For example, uniformed investors may rely on past price movements to infer asset volatilities and thereby induce "liquidity runs" (Brunnermeir and Pedersen, 2008).

[8] The idea that during 2007 and 2008 the "shadow banking system" experienced a run similar to that of a banking panic and that additional government involvement is needed to avoid such panics has been advanced by a variety of observers. See Bernanke (2008b), Gorton (2009), Kashyap, Rajan, and Stein (2008), and He and Xiong (2009). As emphasized by Hanson, Kashyap, and Stein (2010), the current theories of runs on financial institutions (based on asset-fire sales and credit crunches) are based on socially excessive balance-sheet shrinkage and on the existence of deposit insurance. As pointed out by Pozsar, Adrian, Ashcraft, and Boesky (2010), one of the main contributors to financial stress in the shadow banking system is its lack of access to public sources of insurance. Covitz, Liang, and Suarez (2009) examine the structure of special purpose vehicles and their reliance on short-term funding and argue that the problems in these markets resemble a bank-like run. Our insurance framework would address and resolve one of the primary channels through which this excess shrinkage occurs.

A private provider of guarantees (e.g., ABS insurance) is constrained by its reserves in the scale of unconditional guarantees which it can offer. Consequently, catastrophic risk insurance provided by the government (and financed using an explicit optimal risk-based tax) would allow for guaranteed financial instruments that dominate the best that can be offered without such insurance and never do worse.[9] Moreover, such insurance could be structured to enforce prudent underwriting standards for asset-backed securities and for collateralized debt contracts, and to require parties (e.g., homeowners, private insurance providers, and loan originators) to put their own capital on the line in front of taxpayers.

The government has a comparative advantage at providing catastrophic insurance because private providers of insurance that guarantee payment of principle and interest do not have the power of taxation.[10] For example, the Federal Deposit Insurance Corporation—an independent agency that provides deposit insurance to US banks—is generally funded by premiums and from earnings on investments in Treasury securities, but it has a statutory line of credit with the United States Treasury equal to $100 billion.[11] This line of credit is available in the event of an emergency or other unforeseen event that requires an unexpected cash outflow. Like other insurance providers, the Federal Deposit Insurance Corporation identifies, monitors, and addresses risks to its fund and it charges risk-based premiums. Unlike other insurance providers, the deposit insurance guarantee is backed by the full faith and credit of the United States government. No depositor ever has or ever will lose a penny of insured deposits.

We argue that an institutional structure for stemming "runs," analogous to the current set up for the Federal Deposit Insurance Corporation, could be deployed to insure pre-specified asset-backed instruments (e.g., mortgage-backed securities, covered bonds, and other forms of secured lending). Indeed, such an insurer would likely benefit from the accumulated information on mortgage default, credit risk modeling expertise, and the securitization know-

[9] See Diamond and Dybvig (1983) for a discussion of government deposit insurance in a Nash equilibrium context.

[10] For a discussion of the US experience with government provision of catastrophic insurance, see Dwight Jaffee (2008) "Catastrophe Insurance and Regulatory Reform After the Subprime Crisis," University of California, Berkeley, Working Paper, November 27. If the government does not charge risk-based premiums for catastrophic insurance, then subsidies are created.

[11] The Federal Deposit Insurance Corporation (FDIC) is managed by a 5-person board of Directors, all of whom are appointed by the President and confirmed by the Senate, with no more than three being from the same political party. In the Helping Families Save Their Home Act (enacted on May 20, 2009) the statutory line of credit for the FDIC was increased from $30 billion to $100 billion, and increased to $500 billion through the end of 2010 if certain conditions are met.

how and infrastructure (e.g., work-out processes and other real estate owned management) that is embodied in the Fannie Mae and Freddie Mac organizations. Hence, the provision of federally-backed insurance on pre-specified asset-backed instruments provided at risk-based premiums could provide a rationale for restructuring the housing-related GSEs towards a public purpose.[12] Regardless of its institutional structure, a federally-backed bond insurer would provide greater financial stability and ensure that credit is provided at reasonable cost both in times of prosperity and during downturns.[13] The *explicit* pricing of the government-backed guarantee would mitigate the market distortions that have been created by *implicit* government guarantees during prosperity.[14] Moreover, guarantee-sensitive investors would not engage in a "run" if they were certain that their money would be repaid with interest. For such reasons, Chairman Bernanke has argued that "if the GSEs were privatized, it would seem advisable to retain some means of providing government support to the mortgage securitization process during times of turmoil" with "one possible approach being to create a bond insurer."[15] This paper spells out the rationale for and details of such an approach. The same logic applies to asset-backed securitization more generally.

The remainder of this paper is structured as follows: Section 2 provides a discussion of Fannie Mae, Freddie Mac, and asset securitization more generally during the recent financial turmoil. Section 3 describes the behavior of guarantee-sensitive investors and the role of government guarantees; sections 4 and 5 present a partial equilibrium model of lending markets with securitization when guarantee-sensitive investors participate, and when they do not

[12] In recent speeches and testimony, Federal Reserve Chairman Bernanke, Secretary of the Treasury Timothy Geithner, and former Secretary of the Treasury Hank Paulson have highlighted the need to reform Fannie Mae and Freddie Mac. See Ben S. Bernanke (2008a) "The Future of Mortgage Finance in the United States," at the UC Berkeley/UCLA Symposium on "The Mortgage Meltdown, the Economy, and Public Policy," October 31; Timothy F. Geithner, "Opening Statement, Senate Committee on Appropriations, Subcommittee on Financial Services and General Government," June 9, 2009 and "Written Testimony to the House Committee on Financial Services," March 23, 2010; and Henry M. Paulson (2009) "The Role of GSEs in Supporting the Housing Recovery," at the Economic Club of Washington, Washington, DC, January 7. See also U.S. Government Accountability Office (2009) "Fannie Mae and Freddie Mac: Analysis of Options for Revising the Housing Enterprises Long-Term Structures," September.

[13] To avoid repeating the mistakes of the past, GSE portfolios of mortgages and of asset-backed securities would be eliminated and the bond insurer would not be allowed to issue unsecured debt (see Bernanke, 2007 and Passmore, 2003 and 2005).

[14] For example, both small and large financial institutions would have access to the same government guarantee, which would depend only on the quality of the asset originated and not on the size of the originator. In this manner, government provided bond insurance mitigates one too-big-to-fail competitive advantage and reduces moral hazard.

[15] See Bernanke (2008a). This idea is briefly described in Hancock and Passmore (2009).

participate. Section 6 discusses our proposal for a government bond insurer and its implications. Section 7 provides the conclusion.

2. CASE STUDY: GSES AND SECURITIZATION DURING THE FINANCIAL CRISIS

Fannie Mae and Freddie Mac are government-sponsored enterprises (GSEs) that provide government-backed insurance for one type of secured debt, mortgage-backed securities (MBS).[16] If a mortgage satisfies the GSEs' underwriting criteria and has a principal amount less than the conforming loan limit, it is eligible for purchase by Fannie Mae or Freddie Mac.[17] In turn, the GSEs guarantee the timely payment of principal and interest on MBS that are backed by the conforming mortgages that they purchase. In practice, the GSE usually swaps the MBS for the mortgage and the mortgage originator either retains the MBS or sells it into the secondary market. The $5.2 trillion of MBS guaranteed by these GSEs are held by a broad range of investors, although Fannie Mae and Freddie Mac hold somewhat less than $1 trillion directly in their portfolios.

THE CONSERVATORSHIPS OF FANNIE MAE AND FREDDIE MAC AND MORTGAGE SECURITIZATION

As is now well understood, Fannie Mae and Freddie Mac posed a systemic risk to the US financial system.[18] This risk mainly arose because the debt they issued to fund their portfolio purchases were viewed by the market as "implicitly guaranteed." That is, investors assumed that the government would back the debt regardless of the financial condition of the GSEs. With this implicit government guarantee, the GSEs issued debt at a relatively low cost, operated without bondholder market discipline, and undertook excessive risks within their portfolios.

[16] The government-backed insurance was only implicitly backed prior to conservatorship in September 2008. Market investors assumed government backing existed, but the government denied that it did. After conservatorships, the insurance became "effectively backed" because the law still prohibits explicit backing by the government. However, with the senior preferred stock agreements in place and the GSEs in conservatorship, few market participants doubt that the government stands behind these institutions and their obligations. For an overview of the Federal government's budgetary treatment of the GSEs' debt, see Congressional Budget Office (2010).

[17] The maximum growth in the conforming loan limit each year is set either by a formula related to the growth in average house prices or by Congress. The underwriting criteria is less well defined, but is generally taken to mean that the mortgage must have the same credit risk as an 80 percent loan-to-value mortgage made to a borrower with a good credit history. The GSEs, within some limits, risk-adjust their guarantee fees.

[18] For descriptions of the systemic risk posed by the GSEs, see Bernanke (2007) and Greenspan (2004, 2005).

In July 2008, short-term bondholders' concerns about the credit quality of mortgages as well as the credit quality of private mortgage-backed securities held in the portfolios of Fannie Mae and Freddie Mac led to difficulties in rolling over GSE debt. As a result, bondholders needed reassurance that the government stood behind Fannie Mae and Freddie Mac, and the Department of the Treasury and the Federal Reserve took actions to provide such reassurance until Congress could pass new GSE legislation.[19]

The new regulator created by Congress at the end of July—the Federal Housing Finance Agency (FHFA)—began an intensive examination of Fannie Mae and Freddie Mac. By September 2008, it determined that there were significant credit losses embedded in the GSEs' portfolios and that the quality of the GSEs' capital was poor. The interaction of significant credit losses, of poor control over credit underwriting for the mortgages held in the portfolios, of bond investors' uncertainties about the quality of the portfolios, and of the razor thin capitalization of Fannie Mae and Freddie Mac led to the establishment of the GSE conservatorships on September 7, 2008.

If Fannie Mae and Freddie Mac had been only mortgage securitizers and had not held portfolios, they still would have likely suffered from inadequate (and poor quality) capital reserves relative to the credit losses suffered during the housing downturn and financial crisis (like most other financial institutions). However, it was the opaqueness of the on-balance sheet portfolio and the difficulty of rolling over the short-term GSE debt that led to the need for more immediate government actions during the summer of 2008. Moreover, the GSEs may have been able to raise private capital to support their mortgage securitization operations had they not incurred the losses on the whole mortgages and non-agency mortgage-backed securities held in their portfolios (and had there not been the uncertainty and lack of transparency surrounding these losses).[20]

---

[19] "GSE debt is held by financial institutions around the world. Its continued strength is important to maintaining confidence and stability in our financial system and our financial markets. Therefore we must take steps to address the current situation as we move to a stronger regulatory structure." Secretary of the Treasury Henry Paulson, Department of Treasury Statement HP-1079, July 13, 2008. See www.ustreas.gov/press/releases/hp1079.htm.
On July 13, the Board of Governors granted the Federal Reserve Bank of New York the authority to lend to Fannie Mae and Freddie Mac should such lending prove necessary. See www.federalreserve.gov/newsevents/press/other/20080713a.htm.

[20] During a financial crisis, capital is "slow moving" and time is needed for equity investors to assess the value of possible investors (see Acharya, Shin, and Yorulmazer, 2009). Runs by short-term debt investors deprive financial firms of this needed time.

ASSET-BACKED SECURITIZATION DURING THE FINANCIAL CRISIS

Despite the insolvency of Fannie Mae and Freddie Mac, GSE-backed mortgage securitization has been fairly robust during the current financial crisis. As shown in figure 1 in the top left panel, GSE MBS issuance remained robust, falling only somewhat below its long-run mean (LRM) of $100 billon per quarter in the second half of 2008. The GSEs were also generally successful in keeping MBS spreads (not shown) somewhat reasonable throughout the crisis (with the notable exception of some periods during the summer and fall of 2008).

In contrast, the portion of the mortgage-backed securitization market not backed by the GSEs collapsed during the financial crisis (as shown in the upper right panel). The private-label market has essentially disappeared except for "re-securitizations," which combined previously issued non-agency MBS into new securities. The spreads on non-agency MBS "blew out," reaching very high levels before all non-agency MBS issuance ceased.

As shown in the remaining four panels of the figure, issuance of asset-backed securities (ABS) backed by credit cards (middle left), autos (middle right), student loans (lower left), and commercial real estate mortgages (lower right) fell sharply, and at times disappeared entirely in 2008. During this period, ABS spreads noticeably widened. Credit cards, auto and student loans securitizations were revived only through extraordinary actions taken by the Federal Reserve, which established a Term Asset Liquidity Facility (TALF) and made non-recourse loans available to investors for the purchase of some classes of ABS (essentially all new issuance of ABS, with the exception of securities backed by commercial real estate). Only recently have substantial "non-TALF" securitizations reappeared in credit cards and autos.

3. ASSET-BACKED SECURITIZATION

To understand who bears the credit risks of asset securitization during normal economic times in the United States, one must consider the roles of credit originators, typically depository institutions, and asset-backed securitizers. We build on the model of Heuson, Passmore, and Sparks (2001), who use their model to describe GSE mortgage-backed securitization, and on Hancock, Lehnert, Passmore, and Sherlund (2005), who customized the model for bank capital requirements.

In the United States, securitization is segmented by loan-type, loan-size, and the riskiness of the borrower. Each market segment (e.g., conforming mortgages, subprime mortgages, credit cards, and auto) is typically characterized by uniform pricing; that is, risk-based pricing usually

occurs across market segments, but only to a limited extent within market segments. Originators generally do not further segment the market because it involves significant underwriting expense.[21] Moreover, uniform pricing may lead an originator who has the option of holding a loan in its own portfolio to withhold safer loans from a pool. By "cherry picking" the safer loans, the originator avoids paying a securitizer (or an insurer) the guarantee fee, which is often an average fee for a pool.[22]

For mortgage-backed securitization, Heuson, Passmore, and Sparks (2001) show that the securitizer must guard against buying a relatively high proportion of higher-risk mortgages from originators who have a "first-mover" advantage. This means that the mortgage securitizer will set a tougher underwriting standard than will mortgage originators, who can both underwrite and hold mortgage credit risk.[23] Moreover, Cutts, Van Order, and Zorn (2001) note that the practice of uniform pricing and the resulting concern over adverse selection cause mortgage guarantors, such as Freddie Mac and Fannie Mae, to set a maximum level of risk they are willing to accept and to enforce it through tighter underwriting standards.

Adverse selection is a concern in all lending markets, and the first-mover advantage for originators holds true for all forms of loan securitization.[24] When securitization is an option, financial institutions, FIs, such as banks, have three strategies. The first is an "originate-and-hold" strategy, where the FI bears the credit risk of an asset and funds its loans on the balance

[21] Steinback (1998) argues that mortgage pricing maintains an element of cross-subsidization (and thus uniform pricing) because collateral risk is more dominant than credit risk and collateral risk cannot be forecast with precision. In GSE mortgage securitization, the recent advent of the GSEs' loan level pricing adjustments (LLPAs) suggests that for more extreme FICO scores and LTV ratios, the GSEs feel that they can further divide the conforming loan market segment. However, part of this price differentiation might reflect the demise of the private-label securitizers, who in the past had been in a position to "cream skim" any perceived mispricing of loans by the GSEs. In addition, the recent financial turmoil has perhaps made the dispersion of risks within the market for prime conforming borrowers more distinct and measurable.

[22] Calem, Henderson, and Liles (2010) find substantial evidence of "cream-skimming" in subprime mortgage securitizations. They attribute their results to asymmetric information, but also believe that a breakdown of due diligence—an explanation consistent with the model presented here—is also a possibility.

[23] A "first-mover" argument is distinct from an argument that relies on information asymmetries. The former reflects market structure (i.e., the originator has the right to pick first), whereas the latter represents information (i.e., the originator has better knowledge of the underlying risks than the securitizer). Passmore and Sparks (1996) show that a situation where the originator has better information than the mortgage securitizer has can also lead to tighter underwriting standards by the securitizer. The tradeoff between the selection advantages of mortgage originators because of information asymmetries and the lower costs of financing and controlling risks in the secondary mortgage market is also discussed in Van Order (2000).

[24] The examples provided are taken from the mortgage markets. For a description of secondary market financing and the automobile market, and the important role of a government backstop (more specifically, the Term Asset-Backed Securities Loan Facility, TALF), see Johnson, Pence and Vine (2010).

sheet (using a mix of deposits, Federal Home Loan Bank (FHLB) advances, and perhaps covered bonds). The second is a "swap-and-hold" strategy, where the FI purchases a guarantee to cover the credit risk of the asset and simultaneously swaps the asset for a guaranteed ABS. Then, these ABS are funded using the FI's balance sheet. Finally, the FI might employ a "swap-and-sell" strategy, where it purchases a guarantee to cover the credit risks of the asset, and swaps the asset for a guaranteed ABS that it simultaneously sells into the secondary market (where guarantee-sensitive investors fund the asset). The second and third strategies are securitization-based strategies.

In principle, one might separate the guarantee provided for an asset from the conversion of the asset into ABS. For example, in US mortgage markets, the Federal Housing Administration (FHA) guarantees a mortgage and the Government National Mortgage Association (GNMA or Ginnie Mae) may or may not convert the mortgage into a security. The FI has the option of either holding the guaranteed FHA mortgages in its portfolio or holding the Ginnie Mae securities in its portfolio.

However, in the model below, the value of a securitizer's guarantee is that it provides liquidity for ABS because if the guarantee is credible, the ABS can be sold to and traded among guarantee-sensitive investors in all market conditions—good and bad. At its best, securitization is the process of making illiquid assets liquid; that is, the holders of the securities know—without performing substantial due diligence on the underlying assets—that such securities can be readily traded in active secondary markets at fair market values over the lives of the securities. Therefore, our model applies directly to asset securitization rather than simply to the pricing of government guarantees.

4. A MODEL OF INVESTORS AND ASSET SECURITIZATION

We begin with a comparison of the "originate-and-hold" strategy (where the FI holds the loan on its balance sheet) with the "swap-and-hold" strategy (where the FI holds the ABS on its balance sheet). In either case, the FI will use the same mix of liabilities to fund the asset on its balance sheet.

Figure 2 provides a graphical representation of the industry supply curve for a given loan market segment (e.g., the "prime conforming mortgage" loan market).[25] On the vertical axis of the figure is the interest rate for the loan extended to the household. On the horizontal axis is the

[25] As discussed earlier, risk-based pricing occurs across loan segments but not within a loan segment.

probability that a borrower will *not* default, q, in the loan market segment, which ranges from 0 to 1. Borrowers with higher probabilities of *not* defaulting (i.e., those closer to 1 in the right corner of the figure) have the *lowest* credit risks. The marginal cost of bearing borrower credit risks declines as q increases, so the lowest rate that a lender is willing to accept falls as the probability of *not* defaulting on a loan rises. [26]

The purple line *FI(r,q)*—solid and dashed—represents the locus of zero economic profit combinations of loan rates (r) and credit risks (q) from using liabilities (including insured deposits and FHLB advances) to fund loans using the "originate-and-hold" strategy.[27] At any given interest rate, the FI is willing to use its liabilities to fund all loans with credit risk equal to, or less than, the credit risks represented by this line (denoted as the set of all points to the right of *FI(r,q*), indicated by the purple cross-hatches).

An important part of this economic profit is the illiquidity premium embedded in whole loans. If the FI needs to sell or finance a whole loan, it requires due diligence from a sophisticated investor. This process is costly and time consuming, meaning that whole loans are often sold at a substantial discount if the FI needs to raise funds quickly. Similarly, if the whole loan is pledged for a repo transaction, the financing is only available with a substantial haircut.

The red line *S(r,q)*—solid and dashed—is the locus of zero economic profit combinations of loan rates and credit risks if the FI uses the "swap-and-hold" strategy. In this case, the FI is willing to fund all ABS with credit risks equal to, or less than, the credit risks represented by this line (indicated by the red cross-hatches). As portrayed in figure 1, the asset-backed securities yield a liquidity benefit to the FI; measured by the distance between *FI(r,q*) and *S(r,q)*. If the guarantee offered by a securitizer is *credible* among market participants, then the securities backed by the whole loans are easily transacted and can be sold to guarantee-sensitive investors. The FI would prefer to use its liabilities to fund asset-backed securities, all things equal, rather than loans.

---

[26] Focusing on the portfolio decision in the absence of capital requirements, a risk-neutral originator will offer a loan if $qr+(1-q)r_d \geq r_f$ where r is the interest rate received by the lender if the borrower does not default, r_d is the expected return to the lender if the borrower does default, and r_f is the expected return on an alternative investment. Rewriting this expression in terms of an equality and solving for r, it can be demonstrated that the inverse supply function for mortgages is decreasing in q and r_d, but increasing in r_f. See Heuson, Passmore, and Sparks (2001, p. 340).

[27] The purple line incorporates the market's risk-sensitive capital requirement, which covers credit risks of the funding institution. This marginal cost curve with respect to credit risk implicitly assumes that other marginal costs of loan financing do not vary with respect to credit risk. Thus, the curvature simply reflects the effective cost of capital to back the credit risk (or an equivalent credit guarantee).

The loans that an FI will keep in portfolio are all those with credit risks that are equal to, or less than, those to the right of the blue dashed line $CP(r,q)$, indicated by blue cross-hatches. Changes in an institution's underwriting standards (i.e., the quality of loans that are "cherry picked") are represented by movements of $CP(r,q)$ line.

In the course of maximizing profits, a loan securitizer must offset the loan originators' first-mover advantage (the "cherry picking") to earn a target rate of return and to not be stuck with "lemons." Thus, the securitizer generally sets a higher credit risk standard than does the loan originator. This higher standard does not necessarily ensure that the securitizer's average credit risk is lower than the originator's average credit risk on the loans because the originator can pool the "lemons" (loans that have a higher credit risk than allowed under the securitizer's underwriting standards) and the "cherries" (loans that are very low-risk and are not sold to the securitizer).

In figure 2, the credit standard of the securitizer is represented by the green line $SU(r,q)$. The securitizer will only purchase, securitize, or rate, loans with credit risks equal to, or less than, those represented by this line. That is, only loans to the right of $SU(r,q)$—indicated by green cross-hatches—are securitized. The line $SU(r,q)$ slopes upward because the originator is more likely to "cherry pick" loans when loan rates are higher, which provides an incentive to the securitizer to tighten its underwriting standards.

Changes in underwriting standards by the securitizer, other than those due to changes in loan rates, are represented by shifts of the $SU(r,q)$ line. (The line shifts to the right when the underwriting standard is tightened.) Such changes are, of course, linked to the FI's underwriting standards, as well as to any exogenous events that change the securitizer's target rate of return on its equity. As the originator removes more low-risk loans from the flow of loans into the pools of collateral backing a securitization, the securitizer has to tighten its lending standards to guard against adverse selection when taking loans out of the remaining pool of loans. These actions reduce the gap between the green and blue lines.[28]

[28] During 2005 through 2007, mortgage originators' underwriting standards fell and Fannie Mae and Freddie Mac did not respond by tightening underwriting standards. Despite misgivings of the risk managers at the GSEs, Fannie Mae and Freddie Mac both bought into the view that mortgage risks were more manageable than they had been in the past.

When the loan rate is r_1, loan originators (FIs) only want to *sell* loans with credit risks between 0 and q_2 because they are engaging in "cherry picking" vis-à-vis the securitizers.[29] Moreover, because of this cherry picking activity, the loan securitizer wants to avoid "lemons" and only wants to guarantee loans with credit risks between q_1 and 1 to create marketable securities. High quality loans originated by an FI (i.e., loans with credit risks lower than q_2, and therefore to the right of q_2) are placed in the FI's own investment portfolio. As a result, the effective industry supply curve (used to determine r_1) for loan credit risks of a given product type is represented by the solid segments of the purple, *FI(r,q)*, and red, *S(r,q)*, lines.[30]

5. THE EFFECT OF GUARANTEE-SENSITIVE INVESTOR PARTICIPATION ON FI FUNDING COSTS

The implicit, or conjectural, government guarantees that are presumed to be present for GSEs and large FIs, sometimes referred to as "too-big-to-fail" (TBTF) status, can provide competitive advantages because a much broader range of investors—guarantee-sensitive investors—will purchase the debt issued, or the securities guaranteed, by such institutions. GSEs and large FIs can, in essence, convert loans made to borrowers into a relatively risk-free investment for a broader range of investors. The target investor is one who desires an investment that is so free of credit risk that the yields should be close to those offered on sovereign debt. If such investors are willing to buy a financial instrument, the liquidity of the instrument is greatly enhanced.

"Runs" by guarantee-sensitive investors have significant spillovers to other parts of the financial system. When credit conditions deteriorate and capital becomes dear, liquidity can dry up as uncertainty about future returns becomes pervasive. Large FIs become vulnerable to "runs" if they depend heavily on funding from guarantee-sensitive investors. As a result, very large banks, as well as other large FIs (including Fannie Mae and Freddie Mac during the most recent crisis), hoard capital even in the face of likely profitable investments because of this uncertainty.[31] Financial turmoil results in real economic effects since otherwise productive investments are not made because money cannot be re-allocated.

---

[29] The blue line at q_2 is determined by the originator's comparison of the marginal profit derived from holding the mortgage loan to the price offered by the securitizer for selling the loan.

[30] The supply curve is downward sloping because the originators and guarantors require the same risk-adjusted return on all loans. As risk falls, the nominal rate of return needed to hit the target rate of return falls.

[31] For examples of models of de-leveraging and hoarding during a financial crisis, see Adrian and Shin (2008) and Geanakoplos (2009).

Consider a model with two types of investors — (1) sophisticated investors, who are willing to invest in due diligence and (2) guarantee-sensitive investors, who are unwilling or are unable to take such actions and only hold securities they perceive as risk-free.[32] Let (1-α) denote the share of a bank's liabilities sold to sophisticated investors (which is very small), and α be the proportion of guarantee-sensitive investors. The cost of funds for a "TBTF" bank (or a GSE) would be:

$$r_f = (1-\alpha)(r_T + \varepsilon) + \alpha r_T$$

where r_f is the cost of funds and r_T is the yield on a risk-free security (e.g., a Treasury bill). Sophisticated investors charge a risk premium ε because they understand that the financial institution is not directly backed by the government. In contrast, guarantee-sensitive investors perceive that the government implicitly or explicitly guarantees the financial institution and either lack the resources, or do not want to make the investments, to undertake due diligence. FIs desire to expand the proportion of their funding that comes from guarantee-sensitive investors because it is lower cost than funding operations relying solely on more sophisticated investors.

The overall cost of funds for a TBTF financial institution is slightly higher than the risk-free rate. So long as the yield on deposits and securities offered by a TBTF bank is perceived as slightly better than a Treasury yield, the liability will attract guarantee-sensitive investors because they perceive the liability to be risk-free. As a result, the financial institution is able to attract extensive funding from a broader range of investors.[33]

---

[32] Our model assumes that the guarantee-sensitive investor is unwilling to pay others to perform due diligence as well. In principle, a credible non-government bond insurer or a credit rating agency could undertake the necessary due diligence and, in conjuction with a government bond insurer who bears the catastrophic risk, provide market discipline. However, to date, guarantee-sensitive investors are unwilling to pay (or are able to "free ride" on the work of others) for such analysis or structuring (as illustrated by the prevalence of the "issuer pays" model used by the credit rating agency). Thus, it seems likely that for guarantee-sensitive investors to bear this cost, there would have to be a legislative mandate requiring a structure for securitizations that effectively creates institutions to perform due diligence on behalf of such investors and collects funds to cover the costs. There are a variety of financial architectures that might accomplish this goal.

[33] The supply-demand imbalance for safe assets (the supply of safe assets is dwarfed by the demand for safe assets) and its role in the recent financial crisis is described in Caballero (2009).

Similarly, ABS appeal to guarantee-sensitive investors if the securitizer's guarantee is viewed as credible, and this appeal lessens the effect of the liquidity discount applied by market participants to the securities backed by the securitizer. The expected return on the ABS is:

$$r_{ABS} = (1 - \alpha)(c - \varrho) + \alpha c,$$

where c is the coupon offered on the ABS and ϱ is the credit and liquidity discount imposed by sophisticated investors.

If we assume a TBTF financial institution is the marginal investor in the ABS market, then the spread of ABS to the bank's cost of funds is:

$$r_{ABS} - r_f = c - r_T - (1 - \alpha)(\varepsilon + \varrho),$$

which implies the TBTF financial institution can raise its return by increasing the proportion of guarantee-sensitive investors in its funding mix.

We model guarantee-sensitive investors as those who can only observe the average risk of an activity. (In the model that follows, depending on the discussion, it will be either the average risk of securitization overall or of the institutions that are securitizing.) In normal times, such investors expect to earn slightly more than the Treasury rate (as described above). During a financial crisis, however, many guarantee-sensitive investors withdraw from the market *unless the asset or institution backing the asset is explicitly backed by the government.* We model this "flight to quality" by altering the cost of funds of sophisticated and guarantee-sensitive investors as the risk of the TBTF's portfolio rises, or:

$$\begin{array}{cc} If\ q > q_{min} & then\ \kappa = 0; \\ If\ q \leq q_{min} & then\ \kappa = 1; \\ \omega_S = (1 - \kappa)(1 - \alpha)(r_T + \varepsilon) + \kappa D(q_{min}) & w_{G-S} = (1 - \kappa)\alpha r_T \end{array}$$

where the average cost of funds to the TBTF institution is $\omega_{soph} + w_{G-S}$, and q_{min} is implicitly defined by the average risk of the activity (given an average credit risk, one can define the most risky borrower associated with that average, given a distribution of borrowers by level of credit risk).[34] As the average credit risk of the activity acceptable to the guarantee-sensitive investors declines, a breakpoint is reached where such investors are unwilling to fund the TBTF financial

[34] Recall that our measure of risk is the odds of not defaulting on the mortgage. Thus, when q_{min} is equal to zero, the borrower is certain to default, whereas when q_{min} is equal to one, the borrower is certain to pay back the mortgage.

institution and the cost of raising funds from sophisticated investors rises. The institution's cost of funds becomes whatever the market will bear (that is, D(q_{min}), where D is the demand for mortgages given the credit risk). The same structure can be used to model guarantee-sensitive investors in ABS—as guarantee-sensitive investors perceive the risk of the ABS guaranteed by the credit guarantee of the ABS securitizer is increasing, a breakpoint is reached where no guarantee-sensitive investors are willing to hold the ABS and only sophisticated investors who extract the maximum possible return are willing to hold the financial institution's ABS.

The potential for guarantee-sensitive investors to "run" limits the average risk of the TBTF's portfolio. The TBTF institution's average credit risk without this discontinuity in its cost of funds (as shown in figure 2) is:

$$q_A = \int_{q_0}^{q_1} qf(q) + \int_{q_2}^{1} qf(q).$$

With the discontinuity, the TBTF institution's average credit risk, shown in figure 3, is:

$$q_{A_{min}} = \int_{q_{min}}^{q_1} qf(q) + \int_{q_2}^{1} qf(q).$$

where the average credit risk is the same or smaller once the discontinuity is imposed. As the risk tolerance of the guarantee-sensitive investor decreases, q_{min} increases and the average credit risk of the FI's portfolios decreases (that is, q_{min} moves to the right in figure 3).

6. LOAN MARKET EQUILIBRIUMS

LOAN MARKET EQUILIBRIUMS WITHOUT GUARANTEE-SENSITIVE INVESTORS

We first examine the market equilibriums assuming that all providers of funds to FIs are either sophisticated investors or retail insured depositors. As a result, there is no "kink" in the FI's cost of funds. The top and bottom panels of figure 4 illustrate that the demand curve in this model, D_1 in the top panel (D_2 in the bottom panel), that ranks borrowers in each loan market segment by the maximum interest rate they are willing to pay for a loan. Because loan default is costly for borrowers, when high interest rates prevail, only borrowers with high odds of not

defaulting stay in the loan applicant pool.[35] This means that the demand curve slopes upward. (Note that it is the probability of *not* defaulting on a loan that is on the horizontal axis.)

The equilibrium loan rate for a loan market segment is determined by where the demand curve for that segment crosses the industry supply curve.[36] In the top panel of figure 4, the FI's marginal cost of covering the credit and liquidity risks associated with the loans (for the lowest quality borrower) sets the loan rate in the primary loan market. In the bottom panel of figure 4, the marginal borrower has had his or her loan securitized. In this case, the securitizer's cost of guaranteeing loans, combined with the liquidity benefits associated with such securitization, sets the interest rate in the primary loan market, instead of the liquidity premium associated with holding the whole loan directly. Assuming that the FI and the loan guarantor assess credit risk in the same manner, the difference for the FI between the "originate-and-hold" and the "swap-and-hold" strategies is the additional liquidity (and associated lower trading and funding costs) from holding the loan as an asset-backed security. This additional liquidity may or may not result in a lower interest rate for the borrower.

PROPOSITION 1*: Securitization may or may not lower primary market loan rates.*[37]

LOAN MARKET EQUILIBRIUMS WITH GUARANTEE-SENSITIVE INVESTORS; FUNDING RISK PREMIUMS

Once guarantee-sensitive investors are added to the investor base, significant funding risk premiums can arise in the primary loan market that reflect the conditions underlying the financing of loans and not the liquidity of the assets being financed. For example, if the FI relies on uninsured brokered deposits at the margin, the funding costs of the FI might be prone to increase rapidly in response to a "run" by guarantee-sensitive investors (e.g., by using brokered

[35] In an adverse selection model (such as proposed by Stiglitz and Weiss, 1981), as loan rates rise, lower-risk borrowers drop out of the pool of potential borrowers. It is assumed that borrowers with higher default risks have higher expected returns. In our model, however, the project is a household purchase and the associated benefits are not related to a household's potential to earn income (and thus its default probability), so higher rates increase household costs without any offsetting effects on household revenues.

[36] As noted earlier, the model presented here is a version of Heuson, Passmore, and Sparks (2001). More generally, the underwriting standards of market participants – depositories and securitizers alike – may change as interest rates change (i.e., the black vertical dashed lines may move to the left or the right). Also note that while the equilibrium may appear to yield positive profits for the FI, the fixed costs associated with loan underwriting activities are not explicitly accounted for, nor is the distribution of borrowers across credit risk types. Both of these factors would need to be modeled to assess the total profitability of the originator.

[37] This result was established in Heuson, Passmore, and Sparks (2001).

deposits or repurchase agreements, repos) should the average credit quality of the FI's loan portfolio fall below the guarantee-sensitive investors' tolerance for risk.

As shown in the example provided in the top panel of figure 5, interest rates in the primary loan market rise from r_1 to r_R and the credit quality of the marginal borrower rises from q_0 to q_{min} because the FI adjusts its pricing to reflect the risks of the "run" by guarantee-sensitive investors.

Such funding risk premiums might be mitigated by securitization. As shown in the bottom panel in figure 5, the loan extended to the marginal borrower is swapped for an asset-backed security. If guarantee-sensitive investors distinguish between the credit quality of the underlying loans and the credit quality of the securitizer, then the average credit risks of the FI might be viewed as significantly lower when it holds asset-backed securities. (This is the case shown in the bottom panel.) However, if the credibility of the loan securitizer is called into question, then the guarantee-sensitive investors might view the average risk of the FI as equal to, or perhaps even greater than, the risk of its underlying loan portfolio. This suggests the following proposition:

PROPOSITION 2*: Securitization has the potential to remove significant funding risk premiums from the primary loan market if (1) financial institutions rely heavily on uninsured investors for funding and (2) the guarantee against credit defaults provided by the securitizer is credible.*

In the United States, most guarantee-sensitive investors in FIs are insured depositors. In addition to insured deposits, most FIs use Federal Home Loan Bank (FHLB) advances for their funding needs. These advances are effectively backstopped by the federal government. The combination of insured deposits and FHLB advances means that for most banks in the United States, funding sources are stable regardless of changes in perceptions of credit risk. Only the largest of the FIs—including the largest banks—in the United States rely heavily on uninsured and non-guaranteed sources of funding. (Of course, these large institutions also extend the majority of loans to consumers.) Thus, except for the largest banks (which extensively use securitized assets in repurchase transactions), the primary advantage of securitization is the liquidity advantage derived from being able to sell an asset quickly, and not the funding cost advantages.

ORIGINATE-AND-HOLD VERSUS SWAP-AND-SELL STRATEGIES

Guarantee-sensitive investors can also influence an FI's ability to sell an asset quickly. Indeed, the credibility of the securitizer's guarantee is instrumental to quickly selling an asset into a deep and liquid market. To illustrate the guarantee-sensitive investor's influence on the investor base for ABS, we compare the "originate-and-hold" strategy to the "swap-and-sell" strategy, while assuming that the supply of funding for banks is stable (i.e., no "kink" in the FI's cost of funds) because it consists of only insured deposits (figure 6).

Asset-backed securities are now sold into a secondary market and purchased by investors—some of whom are guarantee-sensitive investors. ABS investors rely on the securitizer's guarantee, but if the average credit risk of the securitizer's guaranteed assets falls below the guarantee-sensitive investors' tolerance for risk, then these investors "run." *S(r,q)* now has a "kink" that reflects the possibility of a guarantee-sensitive investor "run." *FI(r,q)* represents funding costs when whole loans are funded using the FI's insured deposits, while *S(r,q)* represents funding costs when ABS are funded by the FI. The liquidity advantage of securitization raises the return from holding ABS so long as the securitizer's guarantee is credible, but securitizing the asset lowers the return sharply should the guarantee-sensitive investors come to doubt the guarantee of the securitizer.

As shown in the top panel of figure 6, if the marginal borrower is funded by the FI directly as a whole loan, then the conditions in the secondary market do not affect the interest rate in the primary loan market. Since the marginal loan is held as a whole loan by the FI, there is no funding risk premium embedded in the loan rate since funding is provided by only insured depositors. In contrast, if the marginal borrower's loan is securitized, then the FI gains a liquidity premium by holding the loan as an ABS (bottom panel). But the presence of guarantee-sensitive investors creates an offsetting liquidity risk premium that raises the loan rate in the primary market relative to what the rate would have been had such investors not been concerned about the *average* credit risk of the securitizer. The interest rate increases from r_2 to r_R and the credit quality of the marginal borrower increases from q_1 to q_{min}. As a result, a smaller portion of the market is securitized. As was the case when the FI was funded by uninsured retail investors directly, in the case of insured FI funding of ABS, the credibility of the guarantee provided by the securitizer is instrumental to realizing the benefits of securitization.

PROPOSITION 3*: If the credibility of the guarantee of a securitizer becomes questioned by guarantee-sensitive investors, then the possibility that market conditions for selling asset-backed securities into secondary markets will deteriorate quickly can increase loan rates in primary loan markets and decrease the extent of securitization.*

FINANCIAL CRISIS AND SECURITIZATION

The shifting of the risk tolerance of guarantee-sensitive investors and of the average risk of loan portfolios provides a way to characterize a financial crisis. All things equal, as guarantee-sensitive investors' average risk tolerance decreases—represented by the vertical portion of the zero profit functions shifting to the right—lending to higher-risk borrowers decreases first, the proportion of loans securitized decreases second, and finally the proportion of low-risk loans that originators "cherry pick" and keep in portfolios decreases (as demonstrated in figures 4 and 5). This process of shifting the vertical portions of the zero profit functions to the right on figures 4 and 5 is one way to represent how a guarantee-sensitive investor "run" results in the collapse of private securitizations during a financial crisis.

Prior to the current financial crisis, in the non-agency securitization markets, many dubious financial structures were created for the purpose of selling guarantee-sensitive investors highly-rated securities. As the high-risks associated with such structures were revealed through higher than expected losses, guarantee-sensitive investors fled these markets and dumped the securities. Nearly the only credit extended during this panic was low-risk loans that FIs were willing to fund and hold in their portfolios. As illustrated in the top panel of figure 7, mortgage rates increase from r_{R1} to r_{R2} and the credit quality of the marginal borrower increases from q_{min1} to q_{min2}. When a "run" occurs, securitization disappears from the loan market.

Our model can also describe the strength of GSE mortgage-backed securitization during the crisis. The GSE MBS guarantee has generally been perceived to be credible by guarantee-sensitive investors and thus GSE mortgage securitization remained robust. Indeed, during 2007 and 2008, investor uncertainty about the asset quality of whole loans and private-label securities, which were held mainly at the largest financial institutions, caused FI capital costs to rise sharply. This phenomenon is represented by the *FI(r,q)* line shifting even further up relative to *S(r,q)*. As a result, FIs found it too costly to hold even the safest mortgages (as illustrated in the bottom panel of figure 7). Thus, during the crisis almost all mortgages in the conforming prime

market were guaranteed by Fannie Mae and Freddie Mac and many of the resulting mortgage-backed securities were eventually sold into the secondary market.[38]

PROPOSITION 4A*: If the guarantees for asset-backed securities are not trusted by guarantee-sensitive investors, then the only loans that are provided during a financial crisis are low-risk loans that the FIs are willing to hold in their own portfolios. The primary loan rates become high because of a substantial funding risk premium.*

PROPOSITION 4B*: As the uncertainty about the credit quality of loans and securities in the FIs' portfolio increases, assets where there remains a credible secondary market securitizer are more likely to be securitized and primary loan rates remain stable.*

7. OUR PROPOSAL

Our analysis of loan market equilibriums shows that the additional liquidity provided by securitization may (or may not) lower primary loan rates, but such liquidity comes at a cost. More specifically, if guarantee-sensitive investors doubt the credit quality of asset-backed bonds, significant risk premiums can develop.[39] If a financial crisis ensues, securitization can disappear from the market entirely, leaving banks that originate just the highest quality loans as the only source of credit. This abrupt increase in lending standards can tighten credit, exacerbate asset price declines, and impinge on economic growth.

As discussed above, the government has a comparative advantage at providing catastrophic insurance because private providers of insurance that guarantee payment of principle and interest do not have the power of taxation. Our government bond insurer proposal

[38] According to the GSE regulator, the Federal Housing Finance Agency, Fannie Mae and Freddie Mac guaranteed about 73 percent of all new mortgage originations in 2008. Most of the mortgages not guaranteed by these entities were FHA mortgages. Mortgage originators often hold onto much of the GSE-guaranteed MBS during times of market turmoil because of liquidity concerns, but generally sell off the MBS to fund other assets during times when markets appear to be functioning normally.

[39] Government-sponsored enterprises are dominated by the government directly when it comes to providing liquidity. The government guarantee is less likely to be in doubt (unlike say Fannie Mae's and Freddie Mac's backing, which came into question in 2008.) Similarly, the portfolio of a GSE can only create liquidity during a relatively mild financial crisis because the GSE must itself issue debt to engage in asset purchases (unlike a central bank). Thus, during the financial turmoil in 1998, the GSEs purchased substantial quantities of MBS and issued a lot of debt. These strategies succeeded because it was the action that would have been undertaken by any profit-maximizing financial institution with access to an implicit government guarantee (See, Lehnert, Passmore and Sherlund, 2008).

is a tailored government remedy that is time-consistent and focused on a specific market failure that is associated with asset-backed securitization. Moreover, we recognize that such an insurer would likely benefit from the accumulated information on mortgage default, credit risk modeling expertise, and the securitization know-how and infrastructure (e.g., work-out processes and other real estate owned management) that is currently embodied in the Fannie Mae and Freddie Mac organizations. Therefore, the provision of federally-backed insurance on pre-specified asset-backed instruments provided at risk-based premiums could provide a rationale for restructuring the housing-related GSEs towards a public purpose.

More specifically, we propose that Fannie Mae and Freddie Mac would be restructured towards (1) creating government-backed MBS associated with conforming mortgages, and (2) guaranteeing debt issued by FIs that is backed by other types of loans (e.g., other types of mortgages, credit cards, or auto loans that are packaged into asset-backed securities (ABS) or, as discussed below, covered bonds), so long as the loan-to-value ratio associated with the underlying collateral was very low and unlikely to become greater than one except under catastrophic circumstances.[40] The low level of the loan-to-value could be created in a variety of ways, including borrower down-payments, private forms of insurance (such as private mortgage insurance for mortgages), and credit enhancements from FIs. Like the GSEs currently do for conforming mortgages, this new entity would determine the underwriting standards associated with the loans and the privately-provided insurance and credit enhancements that are used to create the very low loan-to-value ratio needed for a securitization to qualify for government insurance.

The assumption by bond investors that the government stood behind GSE debt has been borne out by recent events. Under our proposed financial institutions' secured asset-backed insurance fund (FINSAIF) structure, the GSEs would strictly be an insurer and would not be permitted to issue debt directly to the public for the purpose of purchasing asset portfolios.[41]

[40] A primary difference between agency MBS and some other types of ABS (or covered bonds) is that in the case of agency MBS the collateral of the pool backing the debt is not replaced by the issuer of the pool when a loan defaults (instead, the guarantor makes the investors in the securities whole by purchasing the defaulted loan at par). In contrast, in the case of other types of loans, the loan in the pool may be replaced by the issuer of the securities when a loan defaults. In other words, in the first case the loan pool is static and managed under a trust agreement, whereas in the second case it is actively managed by the securities issuer.

[41] Note that the US Treasury conservatorship agreements with Fannie Mae and with Freddie Mac require each of these entities to reduce their portfolio to as little $250 billion over time. FINSAIF, like the FDIC, would be able to invest the insurance premiums it receives in cash, cash equivalents, Treasury bills, and Treasury notes.

FINSAIF's activities would be strictly limited to guaranteeing securities backed by loans; such securities could trade either under the FINSAIF name or under the loan originator's name.[42]

There are five advantages to creating FINSAIF. First, and foremost, government bond insurance resolves some of the problems associated with systemic risk and implicit government guarantees and thus enhances financial stability. With implicit guarantees, guarantee-sensitive investors are never fully confident of government backing, but give preference to larger FIs over smaller FIs. As a consequence, when a large FI fails—which is made all the more likely without effective debt holder market discipline—the effects are widespread and severe because many skittish guarantee-sensitive investors are likely to dump the debt quickly. In contrast, credit has proven to be more readily available and more stable even during bad economic times with an *explicit* government guarantee (e.g., FDIC-backed deposit insurance).

A government bond insurer makes the government guarantee explicit. Deposit insurance successfully resolved the problem of depositor "runs" in the US and has assisted in maintaining financial stability when the banking system is under stress.[43] In essence, deposit insurance substitutes the (limited) market oversight of many small depositors with oversight by a government-backed insurer. Similarly, our proposed government asset-backed bond insurer would substitute the (limited) market oversight by guarantee-sensitive investors with government oversight. In addition, FINSAIF would charge risk-based insurance premiums in exchange for its guarantees, and thus create a reserve fund to use for fulfilling its credit guarantees when needed.[44] In our proposal, FINSAIF would be organized along the lines of the FDIC as an independent agency of the federal government with an obligation to maintain an insurance fund

[42] Like Fannie Mae and Freddie Mac, there could be FINSAIF MBS or ABS. However, some large originators of loans might want to adopt even tighter underwriting standards than FINSAIF and have their FINSAIF-guaranteed securities trade under their institution name (in a manner similar to the FDIC's Temporary Liquidity Guarantee Program (TLGP)). In the latter case, the restructured Fannie Mae and Freddie Mac would behave more like a bond insurer than a traditional securitizer.

[43] The seminal paper describing depositor "runs" is Diamond and Dybvig (1983), who rely on "impatient" investors to generate a rapid withdrawal. For a review of the literature on deposit "runs," which is extensive, see Gorton and Winton (2003). For an updated version of the Diamond and Dybvig model that incorporates some investors who have less than full information, see Goldstein and Pauzner (2005).

[44] The FINSAIF risk-based premiums and fund size would be based on the expectation of losses in market conditions that prevail in all but the most extreme circumstances. This information could be used by both unsecured senior and subordinated debt investors to assess their risks. However, determining how the government sets insurance premiums is a much-debated topic, particularly since the government might be prone to mis-pirce systemic risk (see Pennacchi, 2000, 2005 and 2006). With the explicit pricing of such guarantees, such debates can occur and potentially reduce the misallocation of resources that results from implicit guarantees that are not priced at all.

using insurance premiums imposed on the debt it would guarantee and with a substantial line-of-credit from the government to be used during a systemic crisis. This insurance fund would provide an industry "down-payment" for the purpose of covering the expected losses associated with a well-regulated and dynamic financial services industry, whereas the line-of-credit would only cover catastrophic losses.[45]

The second advantage of FINSAIF, which would oversee all types of securitizations and asset-backed bond issuance, is that it can ensure that similar risks across all FIs are treated similarly through the pricing of the bond insurance premiums. (Ideally, a similar and complementary risk-based insurance approach would also be used for federally-insured deposits.) In essence, the government provides the risk management and market discipline that retail investors cannot provide. The government's deposit insurer and bond insurer would need to work together to ensure that the multitude of financial instruments that investors perceive as backed by the government are explicitly insured in a fair and equitable manner across instruments and entities. In this manner, a broad range of loan types from FIs would remain available even during stressful financial environments.

The third advantage of FINSAIF is that it would give FIs a better ability to issue and hedge long-term debt by using government-insured asset-backed bonds.[46] A well-managed insurance fund would provide lower cost and more stable sources of funds because such government-backed bonds could be issued to retail investors under almost all financial market conditions. Moreover, such insured debt, under most circumstances, could be issued for very long maturities and could be more easily hedged against interest risk, resolving some of the problems associated with the interest rate risks of mortgage contracts (particularly the 30-year mortgage contract).

While not related to "runs" by guarantee-sensitive investors directly, a fourth advantage of FINSAIF is that it would widen the scope of bonds that can be purchased by the Federal

[45] FDIC insurance can itself lead to unwarranted expansions of the government safety net (Pennacchi, 2009). However, with an explicit government guarantee, it is possible to debate about, and alter, how the guarantee is delivered. Regardless, almost all observers agree that deposit insurance has generally stopped "runs" by insured depositors.

[46] However, as pointed out by Huberman and Repullo (2010), this ability to issue longer-term debt might undermine the market discipline imposed by shorter-term debt holders on financial institutions. FINSAIF would need to have the ability to monitor the behavior of the FIs *ex post* (similar to the monitoring currently undertaken by Fannie Mae and Freddie Mac) to ensure that the underwriting conditions for the use of the government guarantee were followed.

Reserve, giving it more options when dealing with a liquidity crisis, which would allow it to reassure retail investors (e.g., insured depositors) more broadly.

Finally, a government bond insurer like FINSAIF is consistent with a diversity of financial instruments and a wide range of institutional frameworks (including ones with "covered bonds" or with a significant role for mortgage bankers) for financing assets and for regulating financial markets. Like deposit insurance, FINSAIF would encourage guarantee-sensitve investors to be involved in the financing of a wide variety of assets and instruments, and not to simply focus on products provided by institutions that are perceived as implicitly backed by the government. Like the current MBS market, securities with a FINSAIF ABS guarantee could potentially be distributed using a "to-be-announced" or "TBA" market. Such a development would allow not only mortgage originators but also other types of loan originators to benefit from the ability to sell future commitments to deliver securities.

SHOULD FINSAIF INSURE THE UNSECURED DEBT ISSUED BY LOAN ORIGINATORS?

If FINSAIF guaranteed unsecured debt, it would have to price an explicit government guarantee that accounted for the riskiness of the FI that originated the asset. To equate the credit risk of guaranteeing asset-backed debt to guaranteeing the debt of the FI itself, FINSAIF would need to examine the characteristics of the financial firm's portfolio and not just establish underwriting standards for the loans. Under such circumstances, the FI could engage in risk arbitrage that would be more difficult for the insurer to observe (that is, arbitrage by the firm's management between the pricing of the FINSAIF premium to cover the credit and other risks associated with only the asset and the pricing of the premium to cover the risk of the firm.)

Perhaps an even stronger reason to limit FINSAIF to the insurance of well-defined loan types is that during a financial crisis, the condition of the banking system can become a major impediment in the provision of credit. As shown during the recent financial crisis, government-sponsored MBS was the only major asset category that remained liquid throughout most of the crisis. Securitization of conforming mortgages continued and mortgage credit for prime borrowers was generally available. The one exception to this generally favorable picture was when investors' doubts about the government backing of Fannie Mae and Freddie Mac themselves became significant (particularly at the beginning of September 2008, as well as during November 2008). Overall, however, the guarantees extended by Fannie Mae and Freddie Mac allowed the origination of conforming mortgages to continue during a time of substantial

financial market volatility, housing market distress, and uncertainty about the financial health of many FIs.

By insuring only asset quality (not FI quality) and by leaving "skin in the game," the FINSAIF would be a *catastrophic risk insurer* whose guarantee of the performance of financial firm assets, and thus the performance of secured financial firm debt, would reassure guarantee-sensitive bond investors during times of significant financial turmoil. Such an approach both limits the moral hazard at FIs created by conjectural government guarantees (because only the financial firm's assets, and not the firms themselves, are guaranteed) and limits the payouts by the insurance fund to only times of extreme need. [47]

FINSAIF WOULD MITIGATE "TOO-BIG-TO-FAIL" COMPETITIVE ADVANTAGES

"Too-big-to-fail" perceptions lower the funding costs of large FIs because guarantee-sensitive investors in the FI's debt assume that the government will not let the FI fail. As described by Diamond and Rajan (2005), demand deposits and short-term debt are methods that investors use to induce FIs to invest conservatively. The threat of a "run" by depositors or by short-term debt holders causes FI management to maintain high capital standards and safe portfolios. Of course, if investors doubt an FI's management decisions and withdraw their funds, and if the FI is systemically-important, then the government may be compelled to insure all of the depositors and short-term debt holders.

The FDIC provides deposit insurance so that depositors are less likely to "run" from a failing bank, creating a systemic crisis. FINSAIF would perform a similar function for secured debt holders.

Government-backed bond insurance is a two-edged sword. On one hand, like the FDIC, FINSAIF lessens the market discipline imposed on FI management because it lessens the threat of a "run" by some debt holders.[48] On the other hand, FINSAIF might actually increase market discipline because FINSAIF makes smaller FIs competitive with larger FIs (because they would have access to the same guarantee at the same risk-based price) and FINSAIF makes it more likely that the government will not bail out *unsecured* debt holders. The unsecured debt holders

[47] Even with "skin in the game," structuring securitizations in an incentive compatible manner is difficult, particularly if the government does not provide catastrophic insurance. The "gaming" problems between the originators and buyers of the securitization are difficult to control and price (Fender and Mitchell, 2009).

[48] If unsecured debt is required to convert to common equity during a systemic crisis, this problem might be resolved (see Hancock and Passmore, 2010).

would be deeply subordinated in the liability structure of the large FI because all insured depositor and FINSAIF-insured debt holders would have priority in any resolution. Such a deep subordination reinforces that the government would likely not bail out unsecured and subordinated debt holders, whose junior position in the resolution process has been made very clear by the presence of FINSAIF.

Finally, with FINSAIF, credit is more likely to continue to flow even if a relatively large FI is closed. FINSAIF can guarantee MBS and ABS directly and thus securitization markets should remain relatively robust even through a financial crisis (as in the current GSE MBS market). As a result, the government might find it easier to let a large FI fail because FINSAIF lessens the systemic consequences associated with its failure.

FINSAIF-Guaranteed Secured Debt

Under our proposal, FINSAIF would guarantee the performance of either the loan or the debt explicitly backed by the loan. Would this mean that the FI would then be indifferent between holding the guaranteed asset, or issuing guaranteed debt, and holding the non-guaranteed loan (which secures the debt)? There may be reasons to prefer using guaranteed liabilities for funding non-guaranteed loans, such as the need to transform the maturity of the loan into a maturity preferred by capital market investors. In contrast, a FI might prefer a guaranteed-asset to use for short-term financing, such as repo transactions, and to have the option to readily sell a government-guaranteed asset and raise cash. In other words, it may be less costly to "de-leverage" an FI that holds guaranteed assets than one that is using guaranteed liabilities to fund illiquid loans. Regardless, the structure of financing and securitization activities for the same well-underwritten loan should not reflect rival government guarantees or regulations. FINSAIF should have the tools to eliminate these sorts of differences so that guarantee-sensitive investors are indifferent between comparable financial instruments.

FINSAIF Might Promote Covered Bonds

FINSAIF could potentially oversee and promote the development of a covered bond market in the United States. Such a development could have substantial benefits for guarantee-sensitive investors because it would create a significant pool of asset-backed securities that are managed by a diverse set of institutions with the payment of interest and principle on such securities being guaranteed even during an extreme financial crisis.

A covered bond is a debt instrument secured by a perfected security interest in a specific pool of collateral and is a common method of funding assets in Europe. It provides funding to an FI that retains a cover pool of financial assets (usually mortgages or public sector debt) and related credit risk on its balance sheet.

Covered bonds are similar to asset-backed securities, but there are a couple of differences between the two products that make covered bonds a better "fit" with FINSAIF. First, covered bond investors have full recourse to the issuing FI as well as to the cover pool. This means that the issuing FI is liable for the repayment of the bonds so long as it is solvent. In contrast, investors in asset-backed securities only have recourse to the underlying assets and the sponsor of the asset-backed securities is not responsible for any subsequent losses on the transaction. Under our proposal, FINSAIF would stand behind the FI only as a backstop guarantor for the timely payment of principal and interest on the covered bonds should the FI fail. In this sense, covered bonds combined with a FINSAIF backstop guarantee dovetail nicely, given recent concerns about "skin-in-the-game" for loan originators and about resolving problems associated with large FIs implicitly guaranteeing their ABS.

Second, covered bonds enable the issuing FI to actively manage the underlying assets in the cover pool. The issuer is allowed to change the assets backing the covered bonds, as well as the terms on the loans backing the bonds, subject to the covenants provided to the bond holders. For example, the issuing FI can substitute performing loans for non-performing loans in the cover pool. In contrast, asset-backed security collateral pools are static and substitution is restricted. With a covered bond structure, FINSAIF would not need to become a workout specialist for defaulted loans for every type of FI asset.

Finally, all covered bonds are issued in series and rank pari passu and without priority among the covered bonds, whereas asset-backed securities are generally issued in the form of senior and subordinated tranches.[49, 50] Note that this covered bond structure is more similar to

[49] In rare circumstances, US banks have issued covered bonds using a contractual structure. The Uniform Commercial Code (UCC) provides the legal background to pledge assets through the creation of a first-priority perfected security interest. Segregation is achieved by identifying the pledged mortgages in the depository institution's books and records, and there is no sale or conveyance of ownership of the mortgages that act as collateral. This legal instrument enables US depositories to issue full-recourse debt instruments with the additional protection of assets pledged to investors in the event of an issuer's insolvency. While technically feasible using a contractual structure, the United States does not have the extensive statutory and supervisory regulation designed to protect the interests of covered bond investors that exists in European countries (where such bonds have become a major source of mortgage finance). In some European countries (Germany, France, Spain and Ireland), special legal structures have been put in place for covered bonds. First and foremost, such bonds have legal priority over all other claimants in cases where the issuer goes bankrupt. In addition, the bonds are required to have minimum levels of

GSE MBS than to the traditional non-agency asset-backed securitization in the United States. Indeed, like a covered bond pool, GSEs currently actively manage the creation and maintenance of their MBS pools of mortgages. This type of financial structure may be one of the most robust types of structure during a financial crisis. However, as demonstrated by recent events, this structure creates substantial conflicts of interest if private shareholders are given control over the government guarantee.

8. CONCLUSION

We consider a specific market failure that is associated with asset-backed securitization and propose a tailored government remedy that is time-consistent. Our analysis of loan market equilibriums demonstrates that the additional liquidity provided by securitization may (or may not) lower primary loan rates, but such liquidity comes at a cost. More specifically, if guarantee-sensitive investors doubt the credit quality of asset-backed bonds, significant risk premiums can develop. If a financial crisis ensues, securitization can disappear from the market entirely, leaving banks that originate just the highest quality loans as the only source of credit. This abrupt increase in lending standards can tighten credit, exacerbate asset price declines, and impinge on economic growth.

During a credit boom, particularly when asset prices are rising, there are many guarantee-sensitive investors who will purchase the debt issued, or securities guaranteed, by large financial institutions. Since there is a broader range of investors who purchase and sell the debt

---

collateralization and the collateral is limited to very high quality mortgages and public sector debt. Finally, the maturity of the bonds is required to be closely matched to the maturities of the underlying mortgages.

[50] On April 8, 2008, the Federal Deposit Insurance Corporation (FDIC) issued an Interim Final Covered Bond Policy Statement that reduced the automatic stay period from 90 days to 10 days for covered bond programs that meet certain conditions, including (1) the covered bond issuance must be made with the consent of the issuer's primary federal regulator, (2) mortgages eligible for covered bond funding must be performing first-lien residential mortgages on 1-to-4 family residential properties, must be underwritten at the fully indexed rate relying on documented income, and must comply with existing supervisory guidance governing the underwriting of residential mortgages, (3) substitute collateral may include cash, Treasury and Agency securities and/ or AAA-rated mortgage-backed securities backed by eligible collateral as necessary to manage the cover pool and subject to a limit of 10 percent of the cover pool, (4) the initial covered bond term must be between one and 30 years, and (5) total outstanding covered bond issuance must account for less than 4 percent of the issuing institution's total liabilities. In addition, the policy statement confirmed that, in a conservatorship or a receivership, and if the FDIC does repudiate the obligations of the financial institution, the FDIC will pay holders of covered bonds as actual compensatory damages the par value of the bonds' principal amount plus accrued interest to the date of the appointment of the FDIC as conservator or receiver up to the value of the collateral. Because the FDIC would continue to have an automatic stay period and has reserved the right to accelerate principle and interest, it is unclear whether investors will have an appetite for US covered bonds in the future with the Covered Bond Policy Statement in place.

issued, or securities guaranteed, by large financial institutions, the liquidity of such instruments is greatly enhanced. However, as was seen just prior to when Fannie Mae and Freddie Mac were placed into conservatorships (as well as when some notable investment banks were on the verge of collapsing), such liquidity can suddenly dry up when the implicit government guarantee comes into doubt. Indeed, guarantee-sensitive investors are prone to "run" in a manner similar to what retail depositors did before the establishment of government-provided deposit insurance. Such actions simultaneously drive down security prices and build up liquidity premiums, regardless of the fundamental values for the assets that back the securities. In such circumstances, the issuance of asset-backed securities can abruptly cease as did occur in the fall of 2008.

Catastrophic risk insurance provided by the government (and financed using an explicit optimal risk-based tax) would allow for guaranteed financial instruments that dominate the best that can be offered without such insurance. Moreover, such insurance could be structured to enforce prudent underwriting standards for asset-backed securities and for collateralized debt contracts, and to require parties (e.g., homeowners, private insurance providers, and loan originators) to put their own capital on the line in front of taxpayers. The *explicit* pricing of the government-backed guarantee would mitigate the market distortions that have been created by *implicit* government guarantees during prosperity.

We argue that an institutional structure for stemming "runs," analogous to the current set up for the Federal Deposit Insurance Corporation, could be deployed to insure pre-specified asset-backed instruments (e.g., mortgage-backed securities, covered bonds, and other forms of secured lending). Moreover, such an insurer would likely benefit from the accumulated information on mortgage default, credit risk modeling expertise, and the securitization know-how and infrastructure (e.g., work-out processes and other real estate owned management) that is embodied in the Fannie Mae and Freddie Mac organizations. Hence, the provision of federally-backed insurance on pre-specified asset-backed instruments provided at risk-based premiums could provide a rationale for restructuring the housing-related GSEs towards a public purpose. We refer to our proposed insurer as the "financial institutions' secured asset-backed insurance fund," FINSAIF.

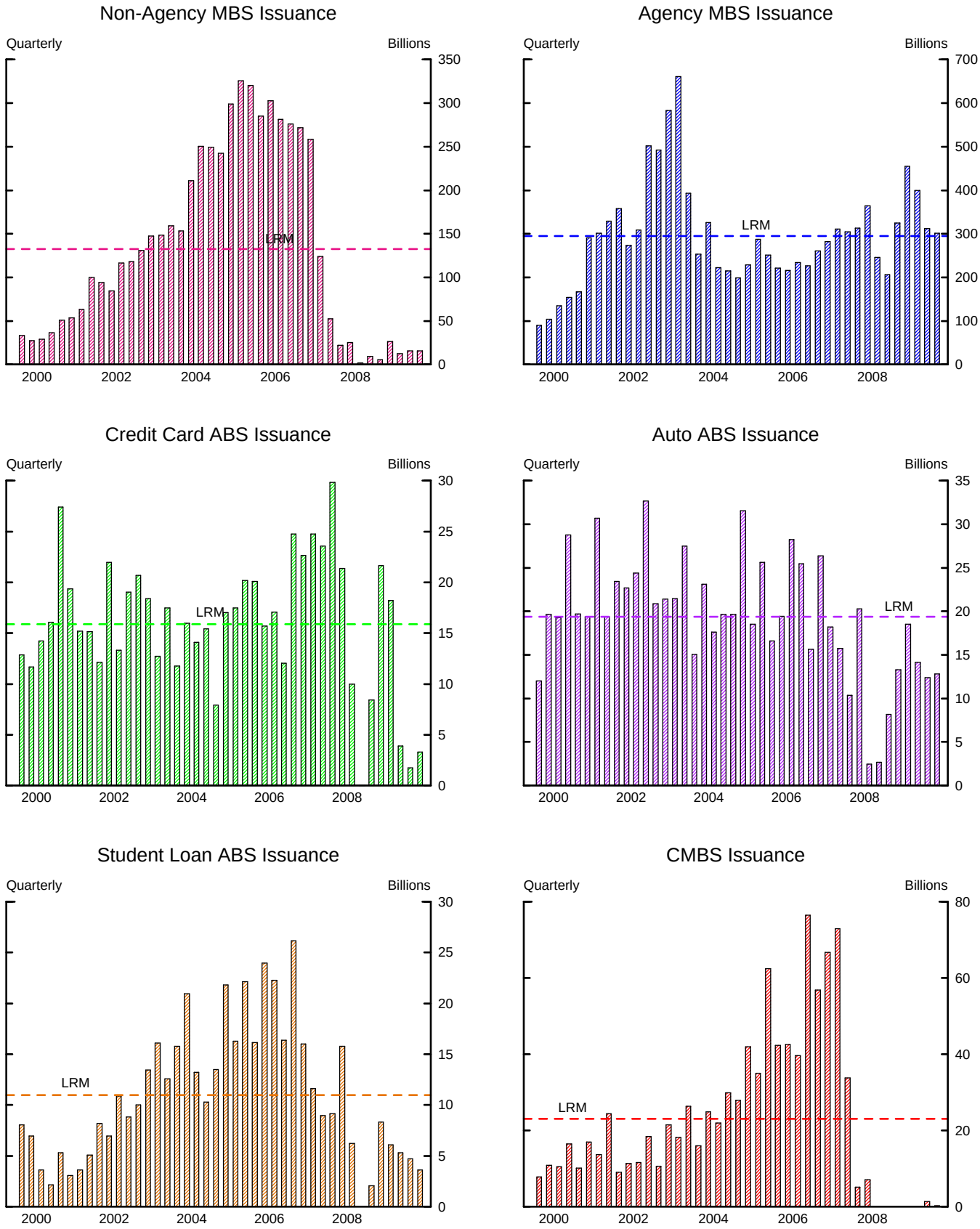
In a nutshell, our proposal would extend the GSEs' current range of authority from guaranteeing only conforming mortgages to guaranteeing a broader range of loans. In particular, the GSEs would insure against only the catastrophic risks associated with (1) a wide range of

securities that are backed by well-underwritten loans that are originated by financial institutions (FIs), and (2) debt issued by FIs that is secured by such loans. Through the explicit pricing of a government guarantee, the market distortions created by implicit government guarantees that encourage guarantee-sensitive investors to purchase securities that are perceived to be risk-free would be mitigated. At the same time, our proposal would prohibit the GSEs from building and maintaining a portfolio of ABS financed using GSE debt securities and could encourage the development of a covered bond market in the United States.

Figure 1

Asset-Backed Securities Issuance

(Quarterly Data, 2000:Q1 - 2010:Q2)



LRM = Long-run-mean (2000:Q1 - 2010:Q2)

Used with the Permission of Bloomberg

Figure 2
Financial Institution (FI) Funding of Loan Portfolios and Securitization

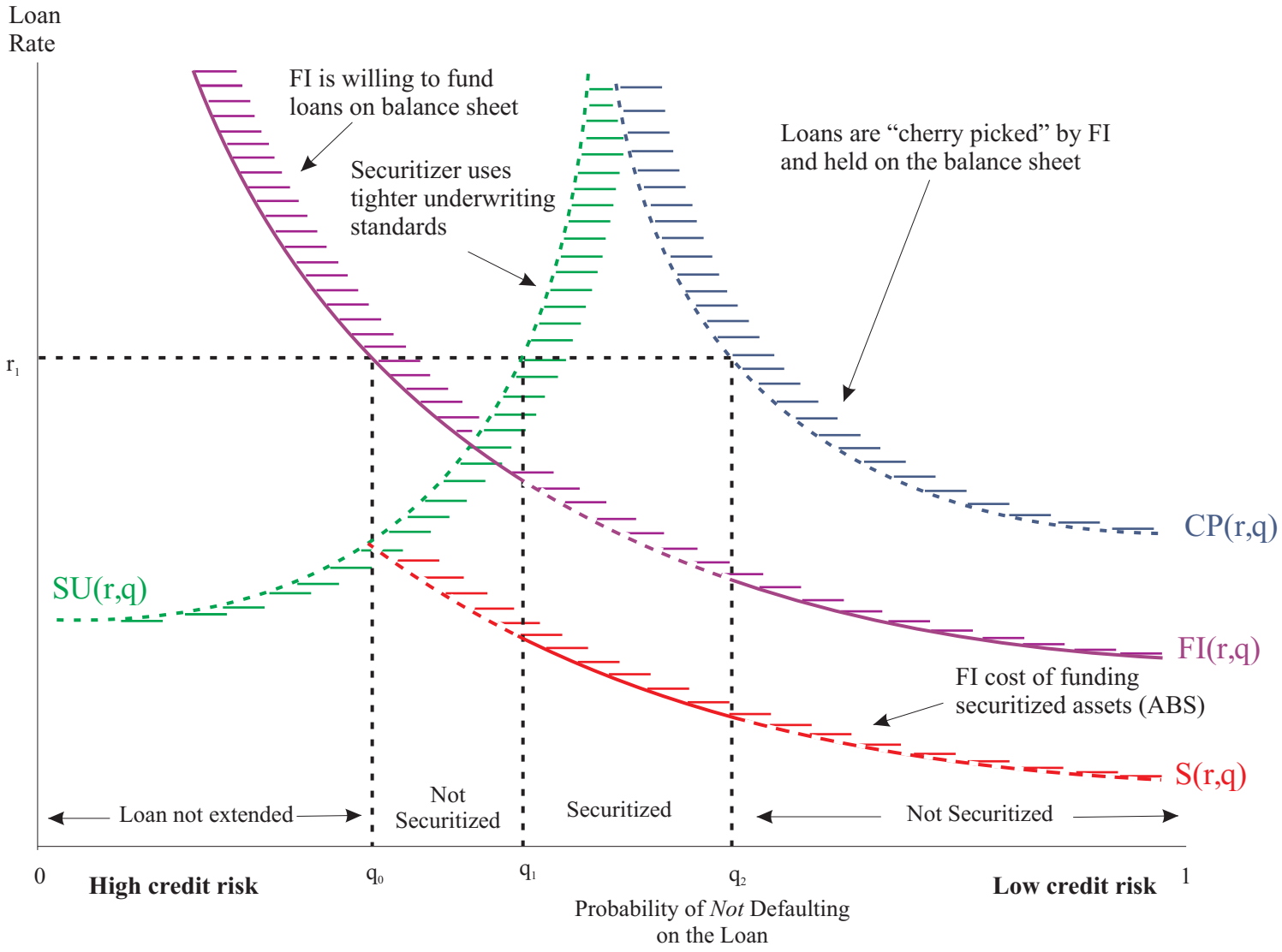


Figure 3
Financial Institution (FI) Funding with Uninsured Deposits

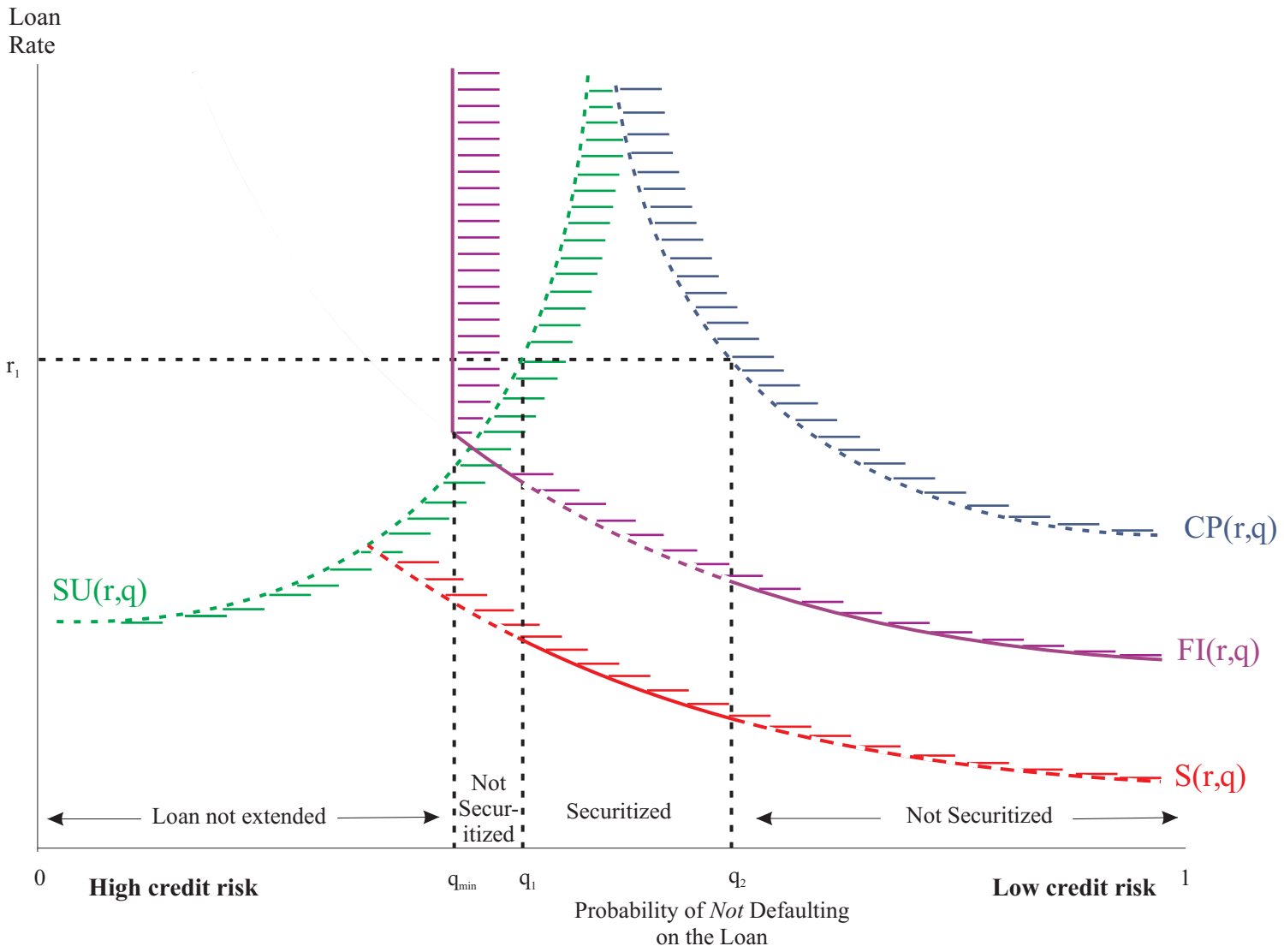
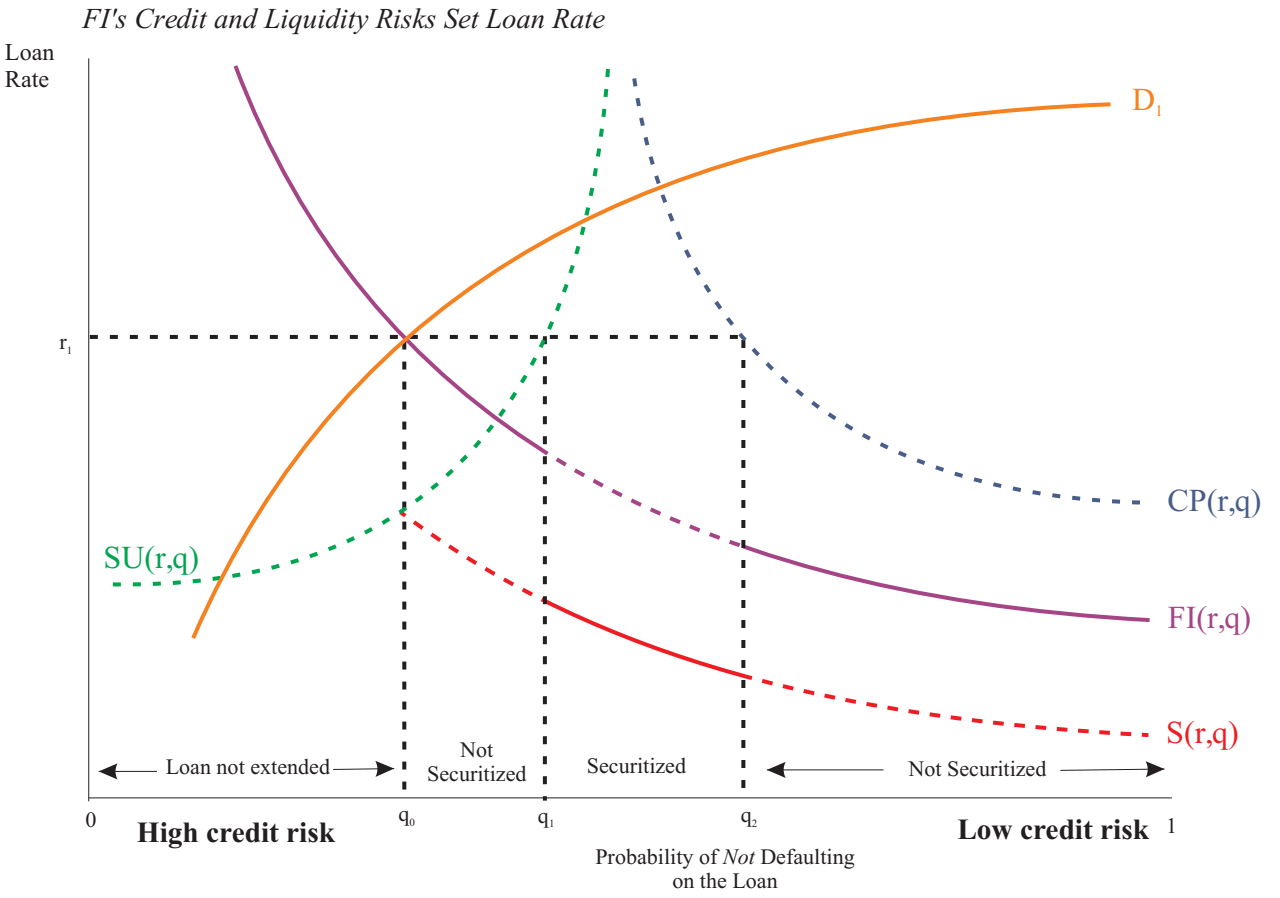


Figure 4
Equilibrium Loan Rates Without Retail Investors



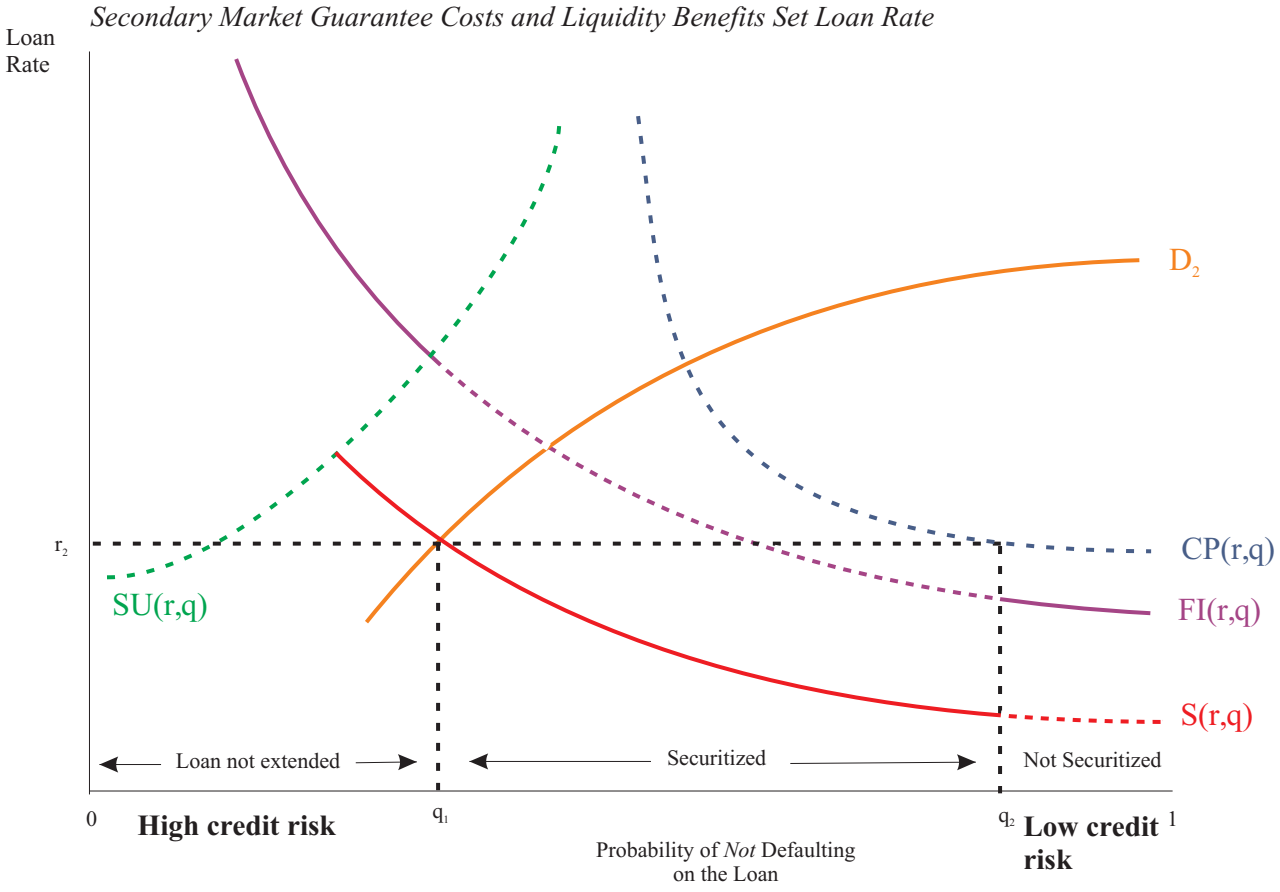
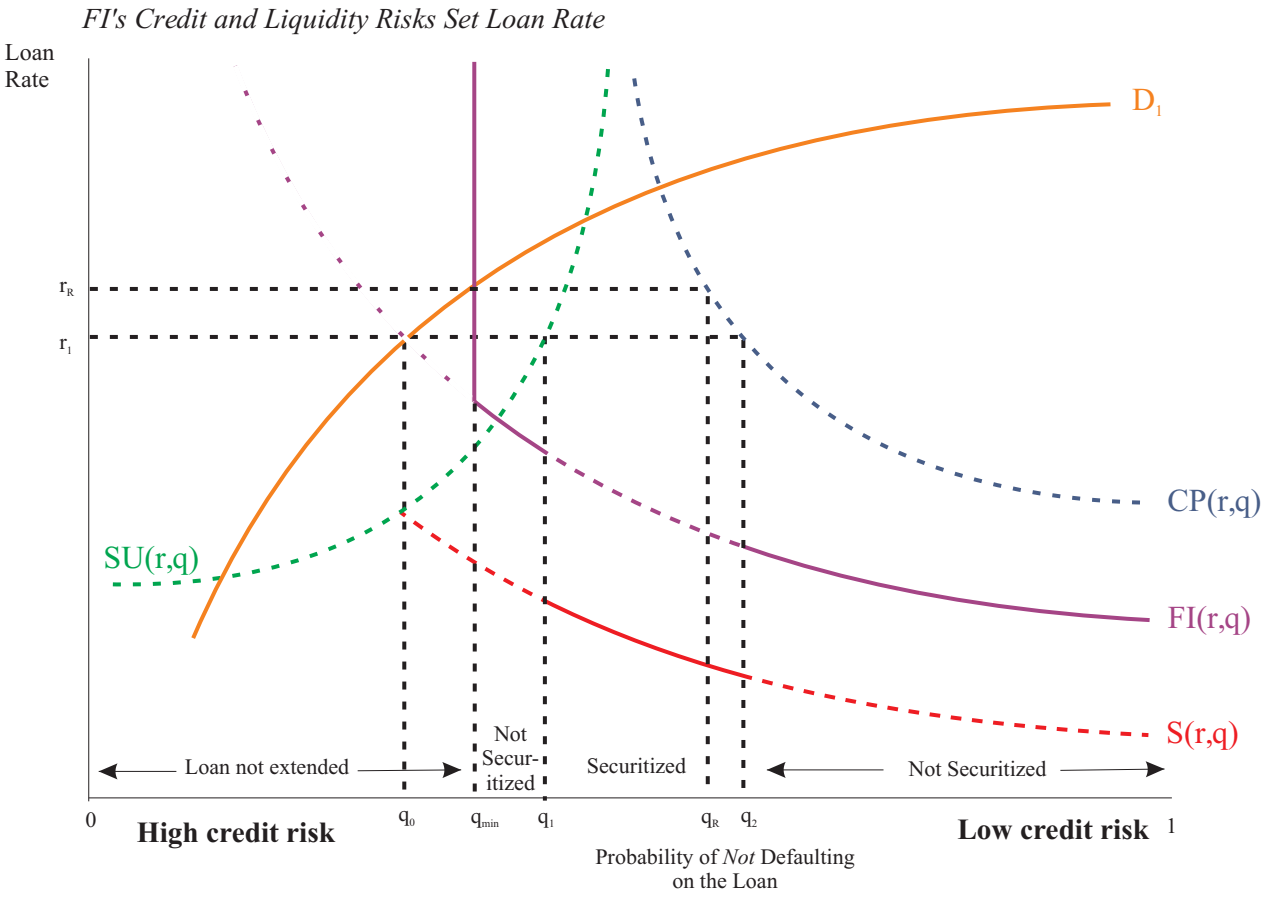


Figure 5
Equilibrium Loan Rates With Retail Investors in Financial Institutions (FIs)



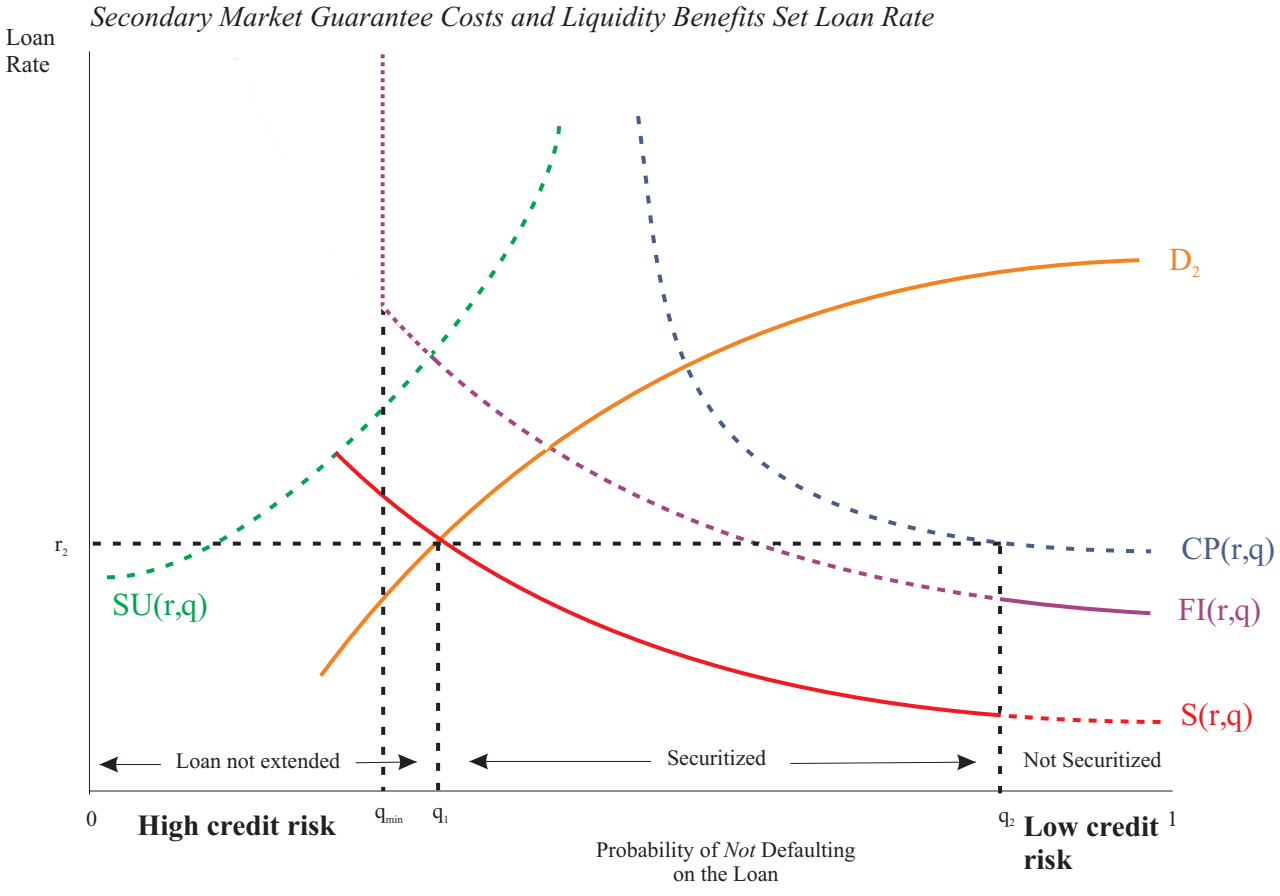
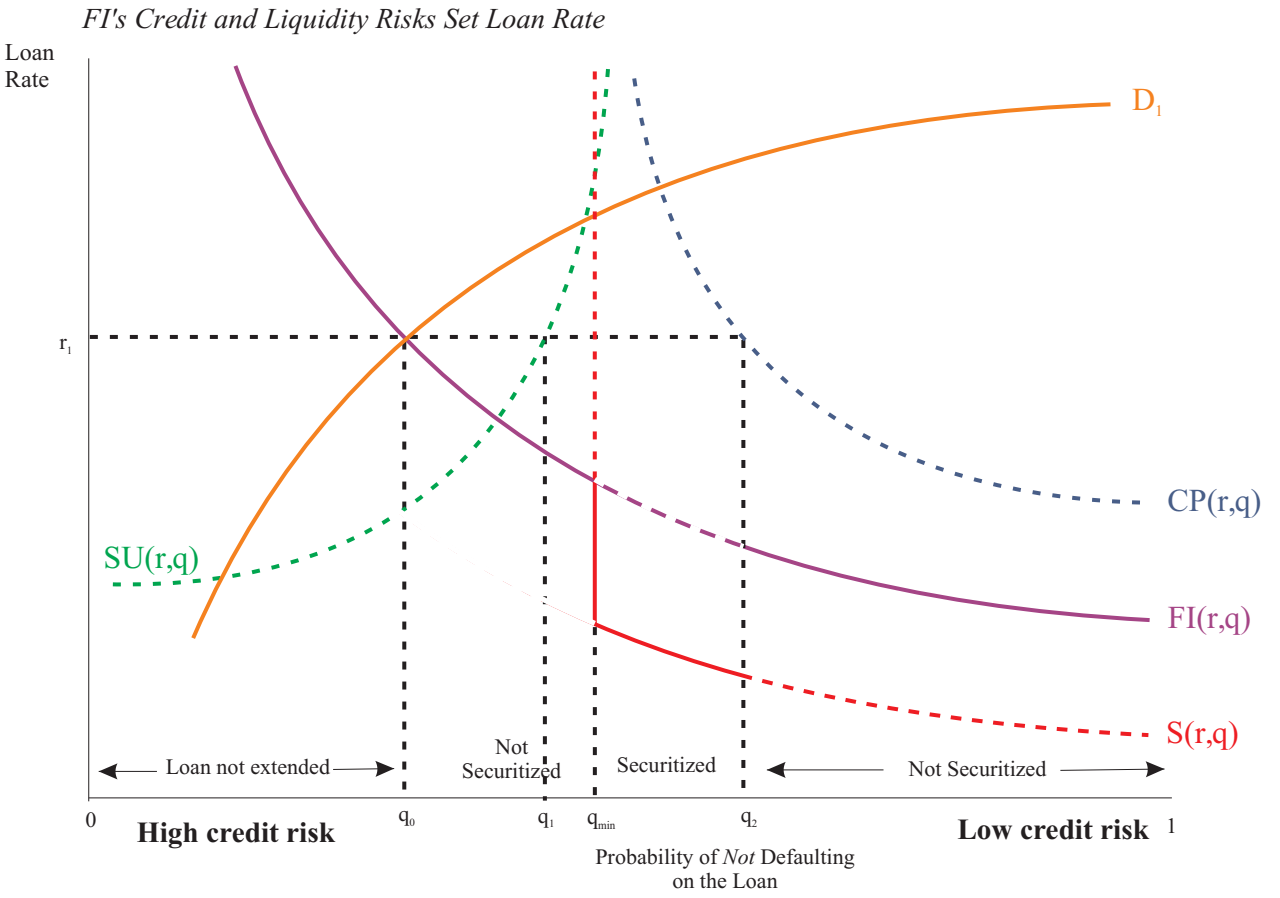


Figure 6
Equilibrium Loan Rates with Deposit Insurance and Retail Funding of Securitization



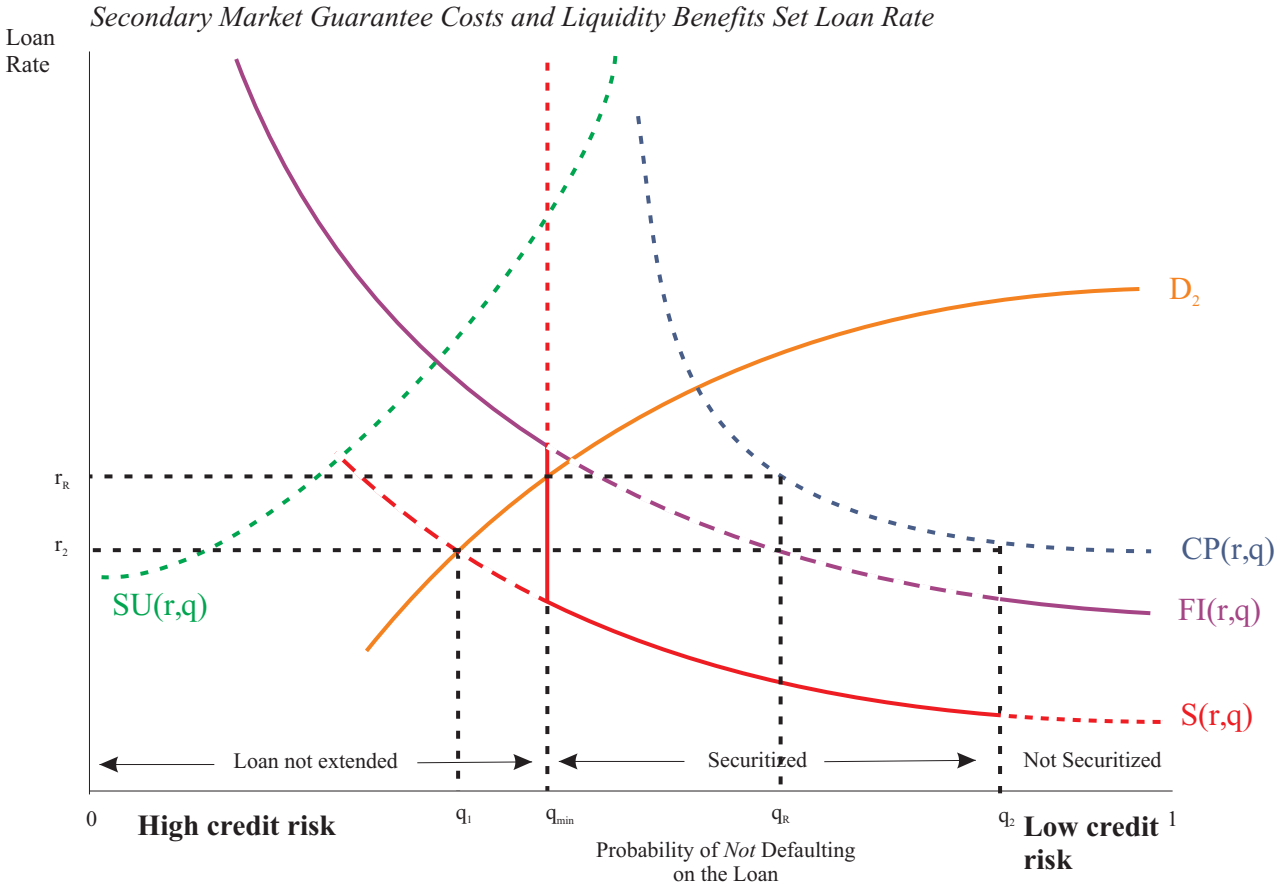
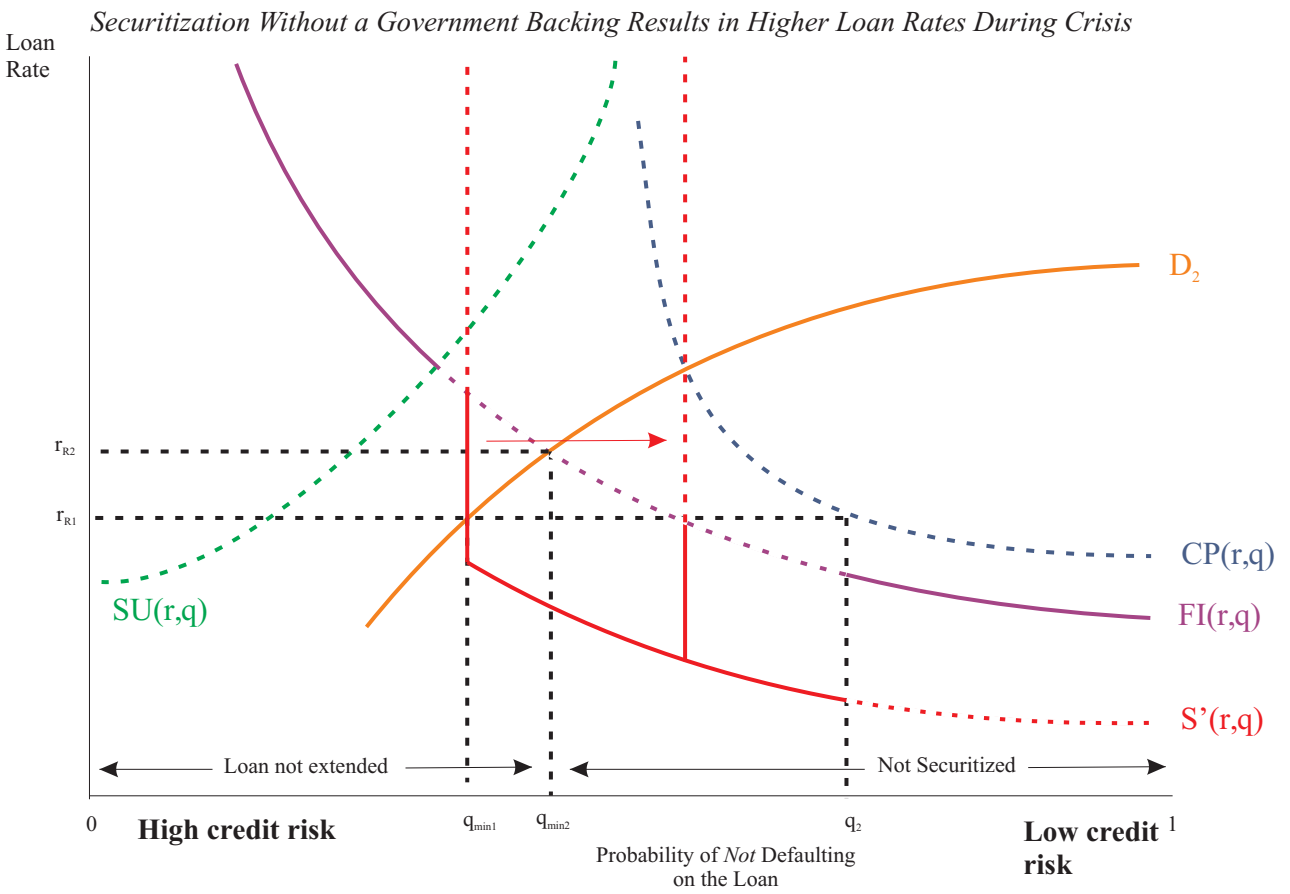
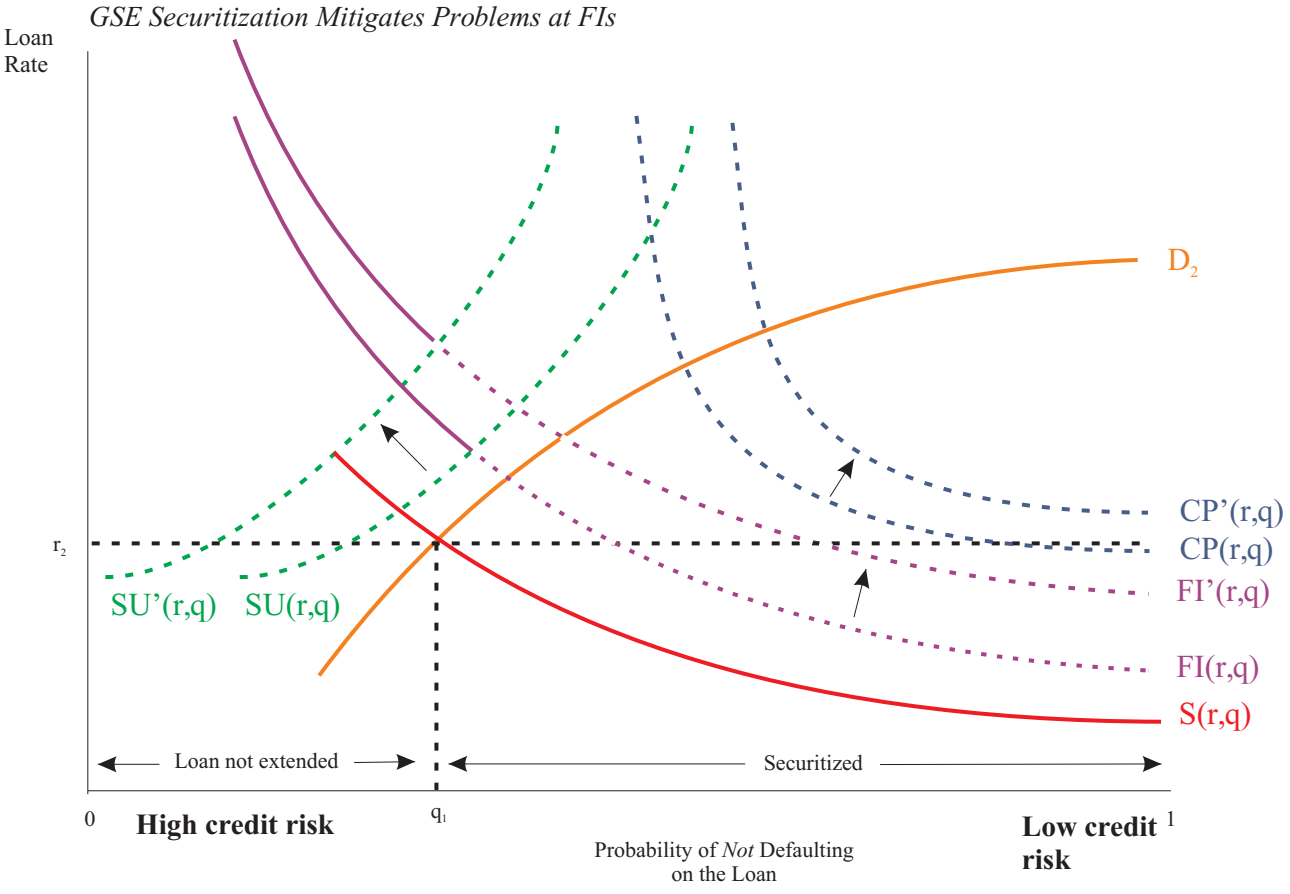


Figure 7
Graphical Description of the Financial Crisis





REFERENCES

Acharya, V.V., H.S. Shin, and T. Yorulmazer, 2009, "A Theory of Slow-Moving Capital and Contagion," Manuscript, January.

Adrian, T. and H.S. Shin, 2008, "Leverage and Value at Risk," Federal Reserve Bank of New York, Staff Report no. 338, August.

Bernanke, B.S., 2007, "GSE Portfolios, Systemic Risk, and Affordable Housing," at the Independent Community Bankers of America's Annual Convention and Techworld, March 6.

Bernanke, B.S., 2008a, "The Future of Mortgage Finance in the United States," at the UC Berkeley/UCLA Symposium on "The Mortgage Meltdown, the Economy, and Public Policy," October 31.

Bernanke, B.S, 2008b, "Liquidity Provision by the Federal Reserve," at the Risk Transfer Mechanisms and Financial Stability Workshop, Basel, Switzerland, May 29.

Brunnermeier, M.K. and L.H. Pedersen, 2008, "Market Liquidity and Funding Liquidity," *The Review of Financial Studies*, vol. 22, no. 6, pp.2201-2238.

Caballero, R. and A. Simsek, 2009, "Fire Sales in a Model of Complexity," Manuscript, August.

Caballero, R., 2009, "The "Other" Imbalance and the Financial Crisis," Manuscript, December.

Calem, P. C. Henderson, and Jonathan Liles, 2010 "'Cream-skimming' in Subprime Mortgage Securitization: Which Subprime Mortgage Loans were Sold by Depository Institutions Prior to the Crisis of 2007?", Working Paper, Federal Reserve Bank of Philadelphia, March.

Congressional Budget Office (CBO), 2010, "CBO's Budgetary Treatment of Fannie Mae and Freddie Mac," Background Paper, January.

Covitz, D., N. Liang and G.A. Suarez 2009, "The Evolution of a Financial Crisis: panic in the Asset-Backed Commercial Paper Market," Federal Reserve Board Working Paper, 2009-36, (March).

Cutts, A.C., R.A. Van Order, and M. Zorn, 2001, "Adverse Selection, Licensing, and the Role of Securitization in Financial Market Evolution and Pricing," Working Paper, Freddie Mac.

Diamond, D.W. and P.H. Dybvig, 1983, "Bank Runs, Deposit Insurance, and Liquidity," *Journal of Political Economy*, vol.91, no.5, pp. 410-419.

Diamond, D.W. and R. Rajan, 2005, "Liquidity Shortages and Banking Crisis," *Journal of Finance*, vol. 60, no 2. pp.615-647.

Fender, I. and J. Mitchell, 2009, "Incentives and Tranche Retention in Securitization: a Screening Model," BIS Working Paper No. 289, September.

Geanakoplos, J., 2009, "The Leverage Cycle," Cowles Foundation Discussion Paper no. 1715, July.

Geithner, T.F., 2009, Opening Statement, Senate Committee on Appropriations, Subcommittee on Financial Services and General Government, June 9.

Geithner, T.F., 2010, Written Testimony to the House Committee on Financial Services, March 23.

Goldstein, I. and A. Pauzner, 2005, "Demand-Deposit Contracts and the Probability of Bank Runs," *Journal of Finance*, vol. LX, no.3, pp.1293-1327.

Gorton, G., 2009, "Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007," paper prepared for the Federal Bank of Atlanta's 2009 Financial Markets Conference: Financial Innovation and Crisis, May 11-13.

Gorton, G. and A. Metrick, 2009, "Securitized Banking and the Run on the Repo," National Bureau of Economic Research Working Paper 15223, August.

Gorton, G. and A. Winton, 2003, "Financial Intermediation," *Handbook of the Economics of Finance*, North Holland, Amsterdam.

Government Accountability Office (GAO), 2009, "Fannie Mae and Freddie Mac: Analysis of Options for Revising the Housing Enterprises Long-term Structures," GAO-09-782, September.

Greenspan, A., 2004, "Government-sponsored Enterprises," Testimony before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate, February 24.

Greenspan, A., 2005, "Regulatory Reform of the Government-sponsored Enterprises," Testimony before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate, April 6.

Hancock, D., A. Lehnert, S.W. Passmore, and S. Sherlund, 2005, "An Analysis of the Potential Competitive Impacts of Basel II Capital Standards on U.S. Mortgage Rates and Mortgage Securitization," Basel II White Paper, Board of Governors of the Federal Reserve System, Washington, DC, April.

Hancock, D. and S.W. Passmore, 2009, "Three Initiatives Enhancing the Mortgage Market and Promoting Financial Stability," *The B.E. Journal of Economic Analysis & Policy*: Vol. 9: Iss. 3 (Symposium), Article 16.

Hancock, D. and S.W. Passmore, 2010, "Augmenting Capital Regulation with Contingent Capital to Limit Future Financial Crises: Financial Stability-Based Prompt Corrective Actions," mimeo, Federal Reserve Board, August.

Hanson, S., A.K. Kashyap, and J. Stein, 2010, "A Macroprudential Approach to Financial Regulation, Paper prepared for the *Journal of Economic Perspectives*.

He, Z. and W. Xiong, 2009, "Dynamic Bank Runs," working paper presented at the Federal Reserve Board, March 25.

Heuson, A., S.W. Passmore, and R. Sparks, 2001, "Credit Scoring and Mortgage Securitization: Implications for Mortgage Rates and Credit Availability," *Journal of Real Estate Finance and Economics,* Vol. 23, November, pp. 337-363.

Huberman, G. and Repullo, R., 2010, "Moral Hazard and Debt Maturity," *mimeo*, February.

Jaffee, D., 2008, "Catastrophe Insurance and Regulatory Reform After the Subprime Crisis," University of California, Berkeley, Working Paper, November 27.

Johnson, K., Pence, K. and Vine, D., 2010, "New Vehicle Sales and Credit Supply Shocks: What Happened in 2008?" Federal Reserve Board, *mimeo*.

Kashyap, A., R. Rajan, and J. Stein, 2008, "Rethinking Capital Regulation", Federal Reserve Bank of Kansas City Symposium on "Maintaining Stability in a Changing Financial System", Jackson Hole, Wyoming, August 21-23.

Lehnert, A. Passmore S. W. and S. Sherlund, 2008, "Mortgage Rates, and Secondary Market Activities," Journal of Real Estate Finance and Economics, vol. 36, no. 3, 343-63.

Passmore, S.W., 2003, "The GSE Implicit Subsidy and the Value of Government Ambiguity," Finance and Economic Discussion Series Working Paper, 2003-64, Federal Reserve Board.

Passmore, S.W., 2005, "The GSE Implicit Subsidy and the Value of Government Ambiguity," *Real Estate Economics*, vol.33, 465-486.

Passmore, S.W. and R. Sparks, 1996, "Putting the Squeeze on a Market for Lemons: Government-Sponsored Mortgage Securitization," *Journal of Real Estate Finance and Economics***,** vol. 96, no 13**,** 27-43.

Paulson, H.M., 2008, "Paulson Announces GSE Initiatives," press release, U.S. Department of the Treasury, July 13.

Paulson, H.M., 2009, "The Role of GSEs in Supporting the Housing Recovery," at the Economic Club of Washington, Washington, D.C., January 7.

Pennacchi, G., 2000, "The Effects of Setting Deposit Insurance Premiums to Target Insurance Fund Reserves," *Journal of Financial Services Research*, vol. 17, 153-180.

Pennacchi, G., 2005, "Risk-based Capital Standards, Deposit Insurance, and Procyclicality," *Journal of Financial Intermediation*, Vol. 14, 432-465.

Pennacchi, G., 2006, "Deposit Insurance, Bank Regulation, and Financial System Risks," *Journal of Monetary Economics*, vol. 53, 1-30.

Pennacchi, G., 2009,"Deposit Insurance," Paper prepared for the AEI Conference on Private Markets and Public Insurance Programs, March.

Pozsar, Z., T. Adrian, A. Ashcraft, and H. Boesky, 2010, 'Shadow Banking," Federal Reserve Bank of New York Staff Reports No. 458, July.

Shleifer, A. and R.W. Vishny, 2009, "Unstable Banking," *Journal of Financial Economics*, article in press.

Snowden, K.A., 1995, "Mortgage Securitization in the U.S.: 20th Century Developments in Historical Perspective," in M. Bordo and R. Sylla (eds), *Anglo-American Financial Systems,* New York: Irwin 261-98.

Snowden, K.A., 2007, "Mortgage Companies and Mortgage Securitization in the Late Nineteenth Century," manuscript, University of North Carolina at Greensboro, August.

Snowden, K.A., 2010, "The Anatomy of a Residential Mortgage Crisis: A Look Back to the 1930s," National Bureau of Economic Research Working Paper #16244, July.

Snowden, K.A., undated, "Mortgage Companies and Mortgage Securitization in the Late Nineteenth Century," unpublished working paper.

Steinbach, G.H., 1998, "Making Risk-Based Pricing Work," *Mortgage Banking*, vol. 58, pp.10-19.

Stiglitz, J.E. and A. Weiss, 1981, "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, Vol. 71, pp. 393-410.

Van Order, R.A., 2000, "The U.S. Mortgage Market: A Model of Dueling Charters," *Journal of Housing Research,* Volume 11, Issue 2, pp. 233-255.

Wallison, P.J., 2009, "Reinventing GSEs: Treasury's Plan for Financial Restructuring," *Financial Services Outlook*, American Enterprise Institute for Public Policy Research, March/April.

White, E., N., 2009, "Lessons from the Great American Real Estate Boom and Bust of the 1920s," National Bureau of Economic Research Working Paper #15573, December.