CATASTROPHIC MORTGAGE INSURANCE AND THE REFORM OF FANNIE MAE AND FREDDIE MAC

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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 consider three interrelated questions: (1) Why is mortgage securitization fragile? (2) Would government provision of catastrophic insurance for mortgage credit likely improve financial stability? (3) Is there a potential role for Fannie Mae and Freddie Mac to provide government-backed insurance for mortgage-backed instruments?

With regard to mortgage securitization fragility, our analysis of mortgage market equilibriums shows that the additional liquidity provided by securitization may (or may not) lower primary mortgage rates, but such liquidity comes at a cost of a potential "run." More specifically, if guarantee-sensitive investors doubt the credit quality of mortgage-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 mortgages as the only source of credit. This abrupt increase in lending standards can tighten credit, exacerbate home 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 mortgage-backed instruments using risk-based premiums. 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 mortgage-backed instruments 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 mortgage 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.

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1. EVIDENCE OF MORTGAGE SECURITIZATION FRAGILITY

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 mortgage securitization markets go awry.[5]

The recent US experience with mortgage securitization is no exception. During the credit boom in the early 2000s, the portion of the mortgage-backed securitization market not backed by the government-sponsored agencies, Fannie Mae and Freddie Mac, expanded at a rapid pace (left panel of figure 1). Indeed, in 2005 and 2006, non-agency mortgage-backed security (MBS) issuance exceeded agency MBS issuance for the first time. During this period, there is mounting evidence that the inherent risks associated with high-risk mortgage products, such as "no money down" and "stated income" mortgages, were not controlled through sound underwriting practices.[6] But in the presence of rapidly rising house prices, lax underwriting was masked by the ability of the borrower to refinance or quickly re-sell the property prior to defaulting on the

[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."

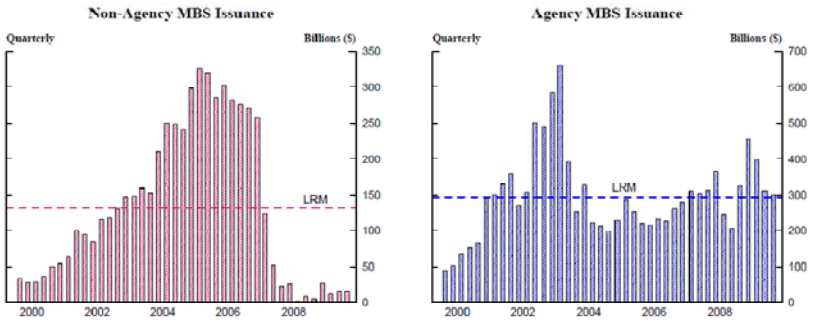
[4] Snowden (2010) describes the Federal Home Loan Bank System and the Home Owners' Loan Act that represented the federal response in the 1930s. More recently, Congress passed the Hope for Homeowners Act of 2008, the Housing and Economic Recovery Act of 2008, and the Dodd-Frank Wall Street Reform and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

[6] See, for example, Costello, Kelsch, and Pendley (2007) and Keys, Mukherjee, Seru, and Vig (2010).

mortgage. When house prices stalled or declined, however, there were much earlier defaults than was initially expected on mortgages that backed many non-agency MBS. Spreads on non-agency MBS "blew out," and reached very high levels before all non-agency MBS issuance ceased.[7]

Figure 1
Mortgage-Backed Securities (MBS) Issuance
(Quarterly Data, 2000:Q1 - 2010:Q2)



LRM = Long-run-mean (2000:Q1 - 2010:Q2)
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Mortgages with principal amounts less than the conforming loan limit are eligible for purchase by Fannie Mae and Freddie Mac so long as such mortgages meet or exceed the underwriting criteria set by these government-sponsored enterprises (GSEs).[8] In turn, the GSEs guarantee the timely payment of principal and interest on agency MBS that are backed by the conforming mortgages that they purchase. As of 2009, there was about $5.5 trillion of agency MBS outstanding of which $1 trillion was held by Fannie Mae and Freddie Mac in their portfolios.

As is now well understood, Fannie Mae and Freddie Mac posed a systemic risk to the US financial system.[9] This risk mainly arose because the debt securities they issued to fund their respective portfolios was viewed by market participants as "implicitly guaranteed" by the US government. That is, investors assumed that the government would back the debt regardless of

[7] The private-label MBS market essentially disappeared except for "re-securitizations," which combined previously issued non-agency MBS into new securities.

[8] 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.

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

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.

In July 2008, short-term bondholders' concerns about the credit quality of mortgages backed by the GSEs as well as the credit quality of private-label MBS 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. On July 13, 2008, the Department of the Treasury and the Federal Reserve took actions to provide such reassurance until Congress could pass new GSE legislation.[10]

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 GSE portfolios and that the quality of capital held by the GSEs 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, these agencies would still 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. Perhaps, the GSEs could have been able to raise private capital to support their mortgage securitization operations had they not incurred the losses on the whole mortgages and the non-agency mortgage-backed securities that

[10] "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.

were held in their portfolios (and had there not been the uncertainty and lack of transparency surrounding potential losses on such assets).[11]

Despite the insolvency of Fannie Mae and Freddie Mac, agency-backed mortgage securitization was fairly robust during the financial crisis with the GSEs under conservatorship of their regulator and with US Department of Treasury preferred stock agreements in place. As shown in the right panel of figure 1, agency MBS issuance remained strong, falling only somewhat below its long-run mean (LRM) of $300 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 financial crisis (with the notable exception of some periods during the summer and fall of 2008). The different outcomes in the non-agency and agency MBS markets during the recent credit boom and bust suggests that the credibility of the guarantee provided by the securitizer (i.e., the MBS issuer) is instrumental to realizing the benefits of securitization.

2. SUMMARY OF ANALYSIS AND PROPOSED SOLUTION

In this paper, we consider three interrelated questions: (1) Why is mortgage securitization fragile? (2) Would government provision of catastrophic insurance for mortgage credit likely improve financial stability? (3) Is there a potential role for Fannie Mae and Freddie Mac to provide government-backed insurance for mortgage-backed instruments?

To address the first question on the fragility of securitization, we consider the mechanics of securitization and the behavior of investors that results in the greater liquidity of mortgage-backed bonds compared to whole mortgage loans during credit booms. Our analysis of loan market equilibriums shows that the additional liquidity provided by securitization may (or may not) lower primary mortgage rates, but such liquidity comes at a cost. More specifically, if guarantee-sensitive investors doubt the credit quality of mortgage-backed bonds, significant risk premiums can develop.[12] If a financial crisis ensues, mortgage securitization can disappear from the market entirely, leaving banks that originate just the highest quality mortgages as the only source of credit. This abrupt increase in lending standards can tighten credit, exacerbate home price declines, and impinge on economic growth.

[11] 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.

[12] Hancock and Passmore (2010b) argue that the same logic applies to asset-backed securitization more generally.

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.[13] 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 mortgage-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. [14, 15] Such actions simultaneously drive down security prices and build up liquidity premiums, regardless of the fundamental values for the assets (e.g., mortgages and homes) that back the securities. In such circumstances, the issuance of mortgage-backed securities can abruptly cease as did occur in the fall of 2008.

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[13] 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.

[14] 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).

[15] 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.

With regard tackling the second question on the provision of catastrophic insurance for mortgage-backed instruments to cover extreme tail-risks in housing markets, we contend that only the government can credibly provide such insurance. First, a private insurance market for mortgage-backed instruments would have to solve an inter-temporal problem to match a smooth flow of annual premium receipts to a highly non-smooth flow of annual payouts (i.e., losses).[16] Second, aggregate US home prices are likely to be correlated with the price of a global market index, so insurance payouts on mortgage-backed instruments are likely to be undiversifiable. This suggests that tapping capital markets to cover payouts will be expensive. Third, a private provider of catastrophic insurance for mortgage-backed instruments would be constrained by its reserves in the scale of unconditional guarantees which it can offer. These three features of the catastrophic risks related to mortgage-backed instruments suggest that the private-provision of guarantees associated with mortgage-backed instruments would not be credible in a severe housing downturn. Accordingly, guarantees for mortgage-related instruments provided by private entities would not stem a "run" by guarantee-sensitive investors and the market failure we identify would remain.

Turning to the potential role for Fannie and Freddie Mac, we argue that an institutional structure for stemming "runs," analogous to the current set up for the Federal Deposit Insurance Corporation (FDIC), could be deployed to insure catastrophic risks associated with pre-specified mortgage-backed instruments (e.g., mortgage-backed securities and covered bonds). Such an insurer would likely benefit from the accumulated information on mortgage default, the credit risk modeling expertise, the securitization know-how, and the infrastructure (e.g., work-out processes and other real estate owned management) that is embodied in the Fannie Mae and Freddie Mac organizations. With regard to mortgage-backed securitizations, the process would be similar to what is currently in place with Fannie Mae and Freddie Mac, except the minimum underwriting criteria for mortgages eligible for purchase by these entities would be changed from mortgage borrowers with a good credit history and a loan-to-value ratio of 80 percent or less to mortgage borrowers with a good credit history and a very low loan-to-value (e.g., 60 percent or less). Such a strict underwriting standard would make it unlikely for the loan-to-value ratio to become greater than one except under catastrophic circumstances (e.g., a 40 percent or more drop in home prices). Moreover, such a strict underwriting standard would

[16] See Jaffee and Russell (1997).

also ensure that there would be substantial private sector involvement in the mortgage market and in mortgage pricing, as well as make certain that mortgage borrowers, private mortgage insurers, and/or financial institutions that provide credit enhancements on mortgages would have considerable "skin-in-the game."[17]

With regard to covered bonds, prudently operated financial institutions could potentially purchase catastrophic risk insurance on mortgage pools that meet or exceed the new stringent underwriting standards. In either case, the catastrophic risk insurer would only guarantee the performance of securities backed by the cash flows of mortgages that met or exceeded the very conservative underwriting criteria outlined above, and not the performance of the mortgage originator or the covered bond issuer. As is the case with the FDIC, the full faith and credit of the United States government would stand behind the catastrophic insurer of mortgage instruments and the insurer would have access to a line of credit. With such reforms, the provision of federally-backed insurance on pre-specified mortgage-backed instruments provided at risk-based premiums could provide a rationale for restructuring the housing-related GSEs towards a public purpose.[18]

Regardless of its institutional structure, a federally-backed insurer for pre-specified mortgage-backed instruments would provide greater financial stability and ensure that mortgage credit is provided at reasonable cost both in times of prosperity and during downturns.[19] The *explicit* pricing of the government-backed guarantee would mitigate the market distortions that have been created by *implicit* government guarantees during prosperity.[20] 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

[17] Davidson (2009) has proposed a senior mortgage bond, subordinated mortgage bond, structure with government insurance only on the senior bond.

[18] 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 Bernanke (2008a), Geithner (2009 and 2010) and Paulson (2009).

[19] 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).

[20] 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.

the mortgage securitization process during times of turmoil" with "one possible approach being to create a bond insurer."[21] This paper spells out the rationale for and details of such an approach.

The remainder of this paper is structured as follows: Section 3 considers why mortgage securitization is fragile. Section 4 provides a scheme for government-backed catastrophic insurance for pre-specified mortgage-backed instruments. Section 5 describes how Fannie Mae and Freddie Mac could be restructured to provide such catastrophic insurance. Section 6 presents the conclusion.

3. WHY IS MORTGAGE SECURITIZATION FRAGILE?

To understand who bears the credit risks of mortgage securitization during normal economic times in the United States, one must consider the roles of mortgage originators, typically depository institutions, and mortgage-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.

3.1 THE MECHANICS OF MORTGAGE SECURITIZATION

In the United States, mortgage securitization is segmented by loan-type, loan-size, and the riskiness of the borrower. Each market segment (e.g., conforming mortgages, subprime mortgages, and "prime jumbo" mortgages) 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.[22] Moreover, uniform pricing may lead an originator who has the option of holding a mortgage in its own portfolio to withhold safer mortgages from a pool.

[21] See Bernanke (2008a). This idea is briefly described in Hancock and Passmore (2009). See also Hancock and Passmore (2010b).

[22] 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.

By "cherry picking" the safer mortgages, the originator avoids paying a securitizer (or an insurer) the guarantee fee, which is often an average fee for a pool.[23]

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.[24] 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 mortgage securitization.[25] 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 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 mortgage and simultaneously swaps the mortgage for a guaranteed MBS. Then, these MBS 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 associated with the mortgage, and swaps the mortgage for a guaranteed MBS that it simultaneously sells into the secondary market (where guarantee-sensitive investors fund the mortgage). The second and third strategies are securitization-based strategies.

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[23] 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.

[24] 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).

[25] 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).

In principle, one might separate the guarantee provided for a mortgage from the conversion of the mortgage into MBS. 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 MBS because if the guarantee is credible, the MBS 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 mortgages liquid; that is, the holders of the securities know—without performing substantial due diligence on the underlying mortgages—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 mortgage securitization rather than simply to the pricing of mortgage guarantees.

3.2. The Decision Problem for Financial Institutions (FIs)

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

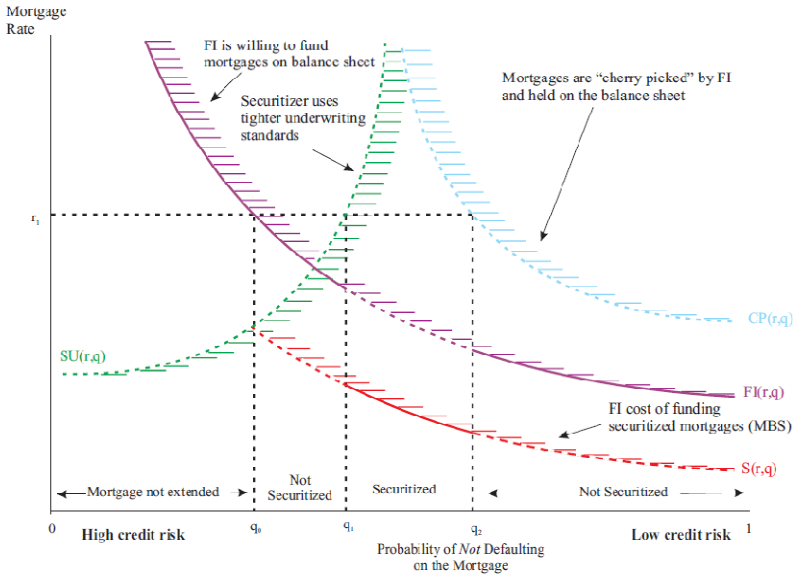
Figure 2 provides a graphical representation of the industry supply curve for a given mortgage market segment (e.g., the "prime conforming mortgage" market segment).[26] On the vertical axis of the figure is the interest rate for the mortgage extended to the household. On the horizontal axis is the probability that a borrower will *not* default, q, in the mortgage 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 mortgage rises. [27]

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

[27] 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

The purple line *FI(r,q)*—solid and dashed—represents the locus of zero economic profit combinations of mortgage rates (r) and credit risks (q) from using liabilities (including insured deposits and FHLB advances) to fund mortgages using the "originate-and-hold" strategy.[28] At any given interest rate, the FI is willing to use its liabilities to fund all mortgages 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).

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



An important part of this economic profit is the illiquidity premium embedded in whole mortgages. If the FI needs to sell or finance a whole mortgage, it requires due diligence from a sophisticated investor. This process is costly and time consuming, meaning that whole mortgages are often sold at a substantial discount if the FI needs to raise funds quickly. Similarly, if the whole mortgage 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 mortgage rates and credit risks if the FI uses the "swap-and-hold" strategy. In this case, the FI

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function for mortgages is decreasing in q and r_d, but increasing in r_f. See Heuson, Passmore, and Sparks (2001, p. 340).

[28] 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).

is willing to fund all MBS 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 2, the MBS 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 mortgages are easily transacted and can be sold to guarantee-sensitive investors. The FI would prefer to use its liabilities to fund MBS, all things equal, rather than mortgages.

The mortgages 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 mortgages that are "cherry picked") are represented by movements of *CP*(*r,q*) line.

In the course of maximizing profits, a mortgage securitizer must offset the mortgage 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 mortgage 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 mortgages because the originator can pool the "lemons" (mortgages that have a higher credit risk than allowed under the securitizer's underwriting standards) and the "cherries" (mortgages that are very low-risk and that are not sold to the securitizer).[29]

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, mortgages with credit risks equal to, or less than, those represented by this line. That is, only mortgages 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" mortgages when mortgage 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 mortgage 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 mortgages into the pools of collateral backing a securitization, the securitizer has to tighten its lending standards to

[29] See Hancock, Lehnert, Passmore and Sherlund (2005) for a discussion of this pooling equilibrium in the context of meeting FI capital requirements.

guard against adverse selection when taking mortgages out of the remaining pool of mortgages. These actions reduce the gap between the green and blue lines.[30]

When the mortgage 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.[31] Moreover, because of this cherry picking activity, the mortgage securitizer wants to avoid "lemons" and only wants to guarantee mortgages with credit risks between q_1 and 1 to create marketable securities. High quality mortgages originated by an FI (i.e., mortgages 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 mortgage 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.[32]

3.3. 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 (e.g., mortgages) 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 "guarantee-sensitive" investors are willing to buy a financial instrument, the liquidity of the instrument is greatly enhanced. Such investors, however, are likely to reason that they can quickly dispose of their holdings in a liquid market if they smell trouble ahead.

"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

[30] 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.

[31] 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.

[32] 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.

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.[33] Financial turmoil results in real economic effects since otherwise productive investments are not made because money cannot be re-allocated.

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.[34] Let (1-α) denote the share of a bank's liabilities sold to sophisticated investors (which is very small), and α be the proportion sold to 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 FI 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

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

[34] 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 conjunction 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.

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.[35]

Similarly, MBS 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 MBS is:

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

where c is the coupon offered on the MBS 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 MBS market, then the spread of MBS to the bank's cost of funds is:

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

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:

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

[35] The supply-demand imbalance for safe assets (i.e., 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).

where the average cost of funds to the TBTF institution is $\omega_s + w_{G-S}$, 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).[36] As the average credit risk of the activity acceptable to the guarantee-sensitive investors decline, a breakpoint is reached where such investors are unwilling to fund the TBTF financial 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 MBS—as guarantee-sensitive investors perceive the risk of the MBS guaranteed by the credit guarantee of the MBS securitizer is increasing, a breakpoint is reached where no guarantee-sensitive investors are willing to hold the MBS and only sophisticated investors who extract the maximum possible return are willing to hold the financial institution's MBS.

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:

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

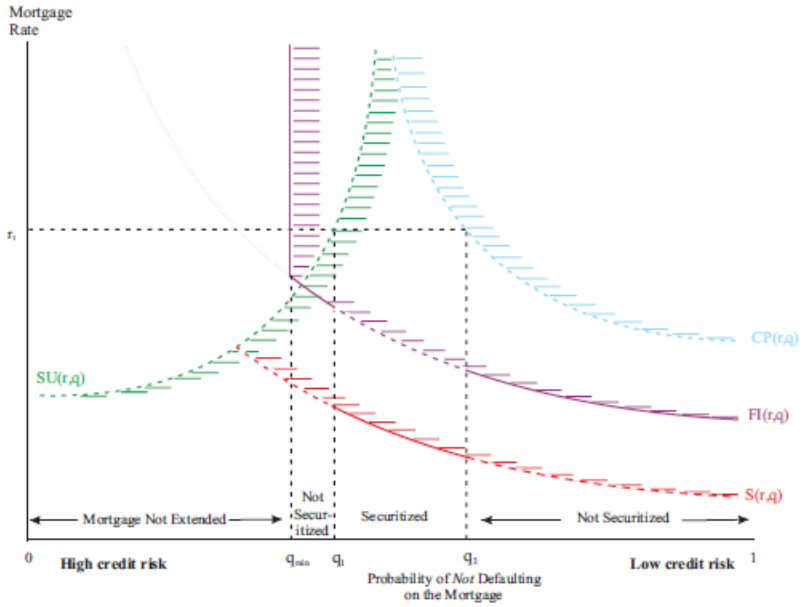
With the discontinuity, the TBTF institution's average credit risk, shown in figure 3, is:

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

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).

[36] 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.

Figure 3
Financial Institution (FI) Funding with Guarantee-Sensitive Funding

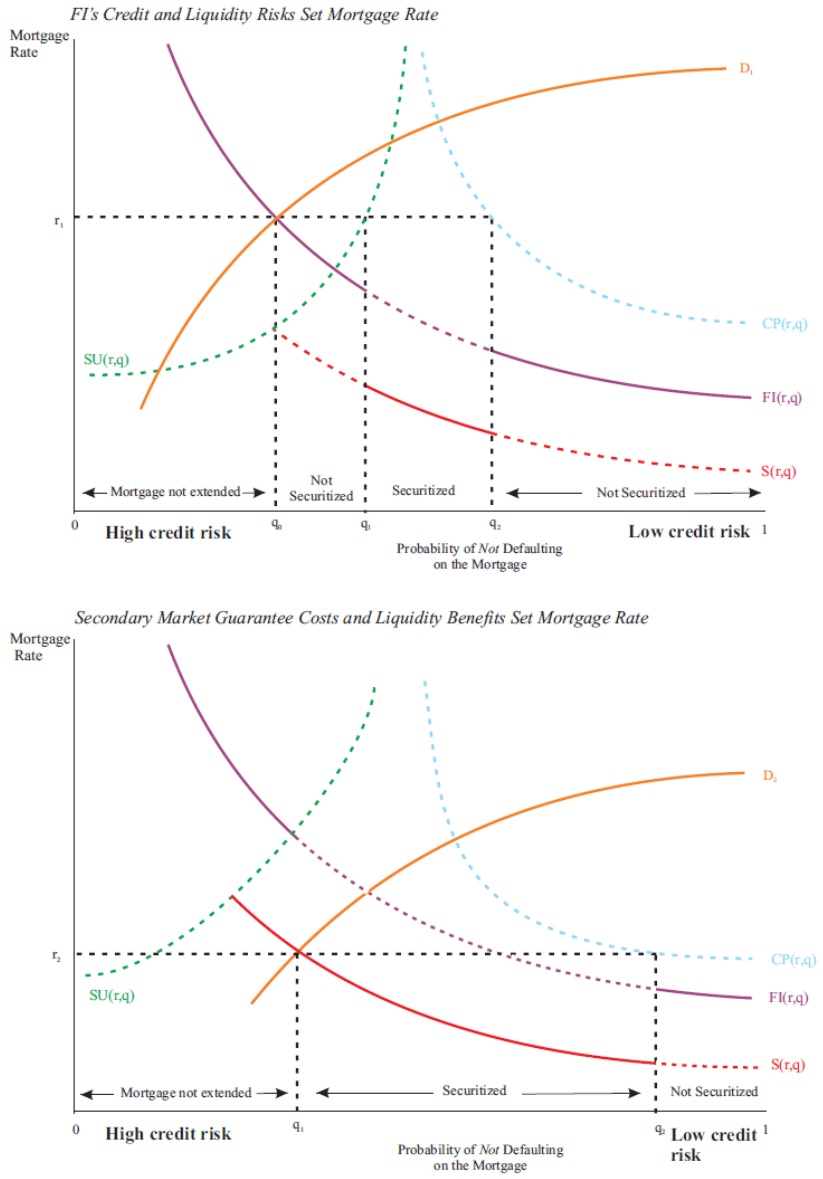


3.4 Loan Market Equilibriums without Guarantee-sensitive Investors

We first examine potential mortgage market equilibriums assuming that all providers of funds to FIs are either sophisticated investors or insured depositors. As a result, there is no "kink" in the FI's cost of funds. The top and bottom panels of figure 4 show demand curves, D_1 in the top panel (D_2 in the bottom panel), that rank borrowers in each mortgage market segment by the maximum interest rate they are willing to pay for a loan. Because mortgage default is costly for borrowers, when high interest rates prevail, only borrowers with high odds of not defaulting stay in the loan applicant pool.[37] This means that the demand curve slopes upward. (Note that the probability of *not* defaulting on a loan is on the horizontal axis.)

[37] 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.

Figure 4
Equilibrium Mortgage Rates Without Guarantee-Sensitive Investor Funding



The equilibrium mortgage rate for a mortgage market segment is determined by where the demand curve for that segment crosses the industry supply curve.[38] In the top panel of figure 4, the FI's marginal cost of covering the credit and liquidity risks associated with mortgages (for the lowest quality borrower) sets the mortgage rate in the primary loan market. In the bottom

[38] 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.

panel of figure 4, the marginal borrower had his or her mortgage securitized. In this case, the securitizer's cost of guaranteeing mortgages, combined with the liquidity benefits associated with such securitization, sets the interest rate in the primary mortgage 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 mortgage rates.*[39]

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

Once guarantee-sensitive investors become part of the investor base, significant funding risk premiums can arise in the primary mortgage market that reflect the conditions underlying the financing of mortgages and not the liquidity of the mortgages 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 deposits or repurchase agreements, repos) should the average credit quality of the FI's mortgage 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 mortgage market rise from r_1 to r_R and the credit quality of the marginal mortgage 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.

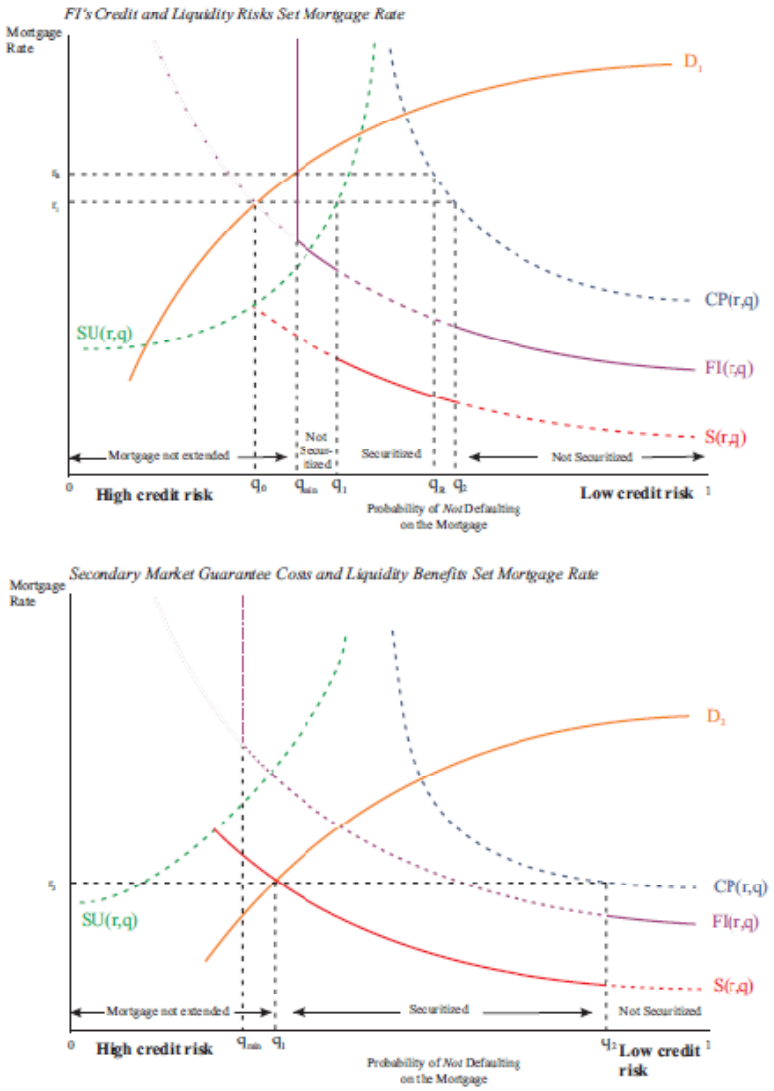
Such funding risk premiums might be mitigated by securitization. As shown in the bottom panel in figure 5, the mortgage extended to the marginal borrower is swapped for an MBS. If guarantee-sensitive investors distinguish between the credit quality of the underlying mortgages and the credit quality of the securitizer, then the average credit risks of the FI might be viewed as significantly lower when it holds MBSs. (This is the case shown in the bottom panel.) However, if the credibility of the mortgage securitizer is called into question, then the guarantee-sensitive investors might view the average risk of the FI as equal to, or perhaps even

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

greater than, the risk of its underlying mortgage portfolio. This suggests the following proposition:

PROPOSITION 2*: Securitization has the potential to remove significant funding risk premiums from the primary mortgage 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.*

Figure 5
Equilibrium Mortgage Rates With Guarantee-Sensitive Investor Funding



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 mortgages 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 a mortgage quickly, and not the funding cost advantages.

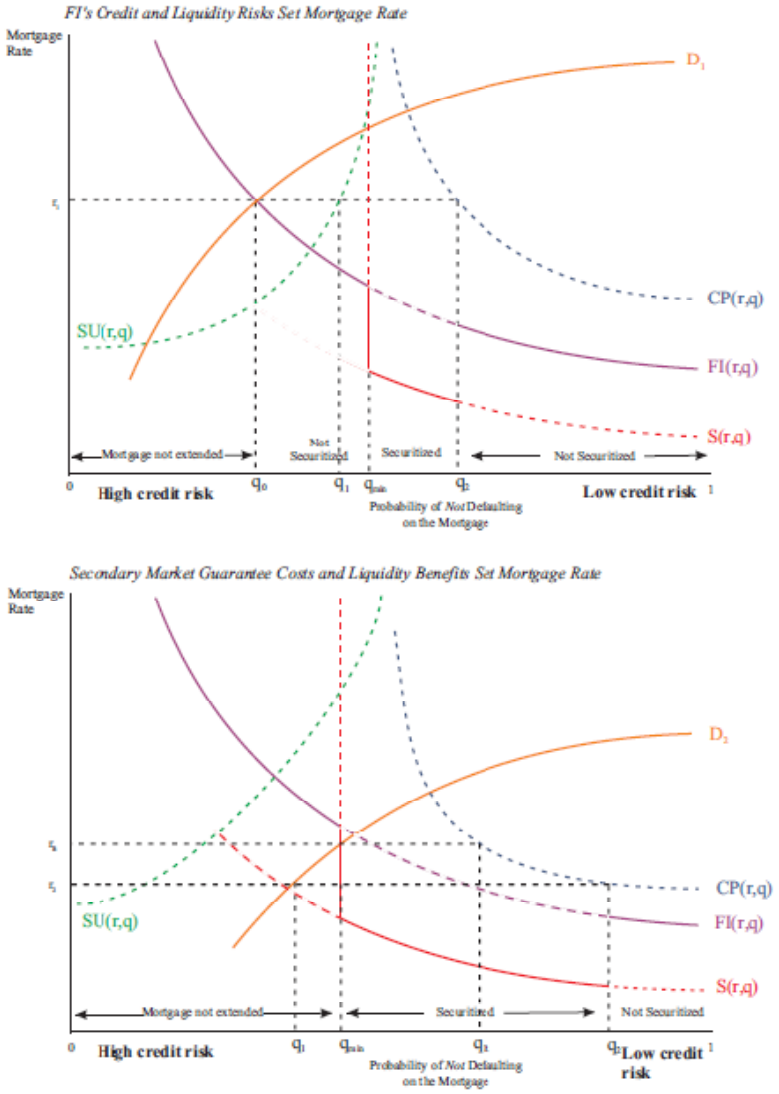
3.6 Originate-and-Hold Versus Swap-and-Sell Strategies

Guarantee-sensitive investors can also influence an FI's ability to sell a mortgage asset quickly. Indeed, the credibility of the securitizer's guarantee is instrumental to quickly selling a MBS into a deep and liquid market. To illustrate the guarantee-sensitive investor's influence on the investor base for MBS, 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).

Suppose MBS are sold into a secondary market and purchased by investors—some of whom are guarantee-sensitive investors. These MBS investors rely on the securitizer's guarantee. If the average credit risk of the securitizer's guaranteed mortgages falls below the guarantee-sensitive investors' tolerance for risk, then these investors "run." In the top and bottom panels of figure 6, $S(r,q)$ has a "kink" that reflects the possibility of a guarantee-sensitive investor "run." In these panels, $FI(r,q)$ represents funding costs when whole mortgages are funded using the FI's insured deposits, while $S(r,q)$ represents funding costs when MBS are funded by the FI. The liquidity advantage of securitization raises the return from holding MBS so long as the securitizer's guarantee is credible, but securitizing the mortgage 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 mortgage, 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 mortgage by the FI, there is no funding risk premium embedded in the mortgage rate since funding is provided by only insured depositors.

Figure 6
Equilibrium Mortgage Rates With Deposit Insurance and Guarantee-Sensitive Investor MBS Purchases



In contrast, if the marginal borrower's mortgage is securitized, then the FI gains a liquidity premium by holding the mortgage as an MBS (bottom panel). But the presence of guarantee-sensitive investors creates an offsetting liquidity risk premium that raises the mortgage 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 mortgage 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 mortgage market segment is securitized. As was the case when the FI was funded by uninsured retail investors directly, in the case of insured FI funding of MBS, 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 MBS into secondary markets will deteriorate quickly can increase mortgage rates in primary mortgage markets and decrease the extent of securitization.*

3.7 FINANCIAL CRISIS AND SECURITIZATION

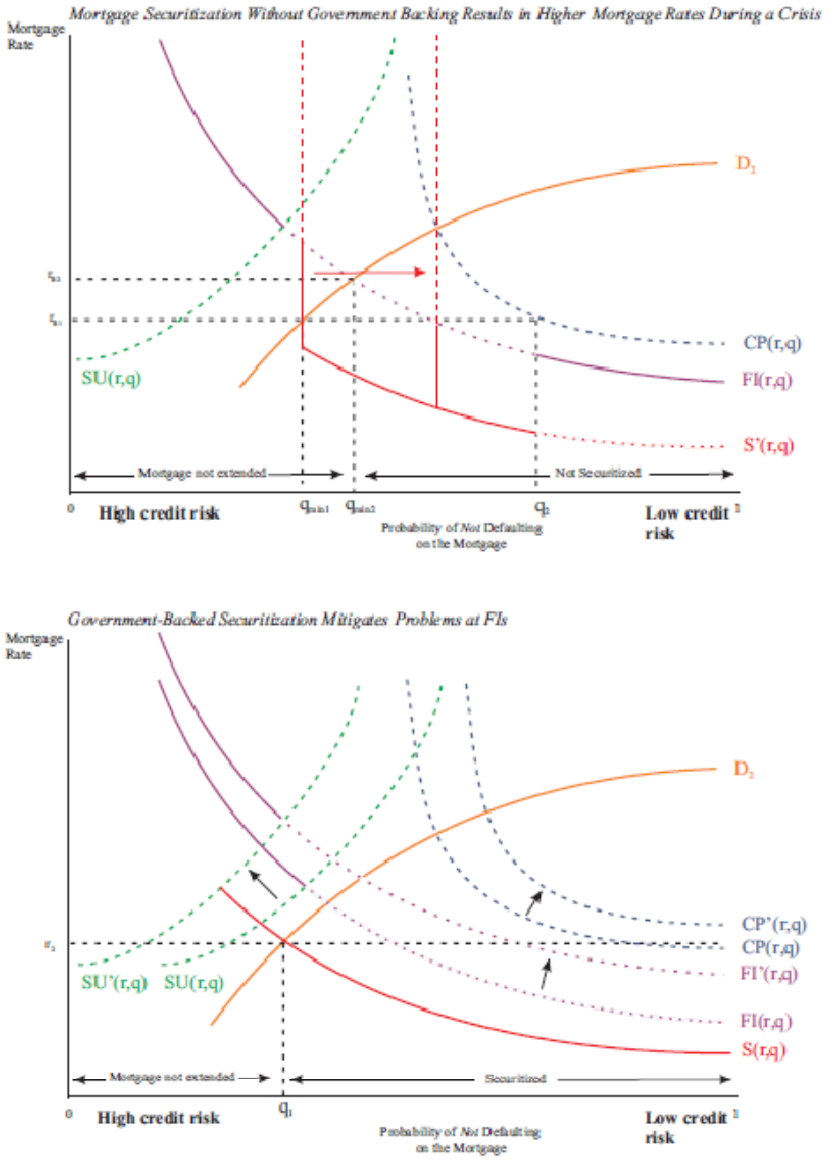
The shifting of the risk tolerance of guarantee-sensitive investors and of the average risk of mortgage portfolios provides a way to characterize a financial crisis. All things equal, as guarantee-sensitive investors' average risk tolerance decreases—represented by a shift of the vertical portion of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

Prior to the recent financial crisis, many dubious financial structures for non-agency MBS 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 non-agency mortgage credit extended during this panic consisted of low-risk mortgages 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 mortgage borrower increases from q_{min1} to q_{min2}. When a "run" occurs, securitization disappears from the mortgage market.

Our model can also describe the strength of government-backed mortgage securitization during the crisis. The GSE MBS guarantee was generally 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 mortgages and private-label MBS, 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 MBS were eventually sold into the secondary market.[40]

Figure 7
Description of the Financial Crisis



[40] 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.

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

PROPOSITION 4B*: As the uncertainty about the credit quality of mortgages and MBS in FI portfolios increases, mortgages for which there remains a credible (e.g., government-backed) secondary market securitizer are more likely to be securitized and primary mortgage rates on such mortgages remain stable.*

4. WOULD GOVERNMENT PROVISION OF CATASTROPHIC INSURANCE FOR MORTGAGE CREDIT LIKELY IMPROVE FINANCIAL STABILITY?

Our analysis of loan market equilibriums shows that the additional liquidity provided by securitization may (or may not) lower primary mortgage rates, but such liquidity comes at a cost. More specifically, if guarantee-sensitive investors doubt the credit quality of MBS, then significant risk premiums can develop.[41] If a financial crisis ensues, securitization can disappear from the mortgage market entirely, leaving banks that originate just the highest quality mortgages as the only source of credit. This abrupt increase in lending standards can tighten mortgage credit, exacerbate house price declines, and impinge on economic growth.

4.1 CREDIBILITY OF PRIVATE CATASTROPHIC MORTGAGE-BACKED INSTRUMENT INSURANCE

A private provider of catastrophic insurance for mortgage-backed instruments would have to solve an inter-temporal problem to match a smooth flow of annual premium receipts to a highly non-smooth flow of annual loss payments.[42] With a highly variable and lumpy payout

[41] 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).

[42] See Jaffee and Russell (1997).

pattern, it is not feasible for an insurer to pay today's losses out of today's premiums. By its nature, the contract of catastrophic insurance requires the seller to have access to a large pool of (liquid) capital to cover potential losses in every year in which the insurance contract stands.[43]

Market participants deem some catastrophic risks as uninsurable. Because aggregate US home prices are likely to be correlated with the price of a global market index, insurance payouts on mortgage-backed instruments are not likely to be diversifiable. Because of the un-diversifiable nature of expected payouts, the risk premiums necessary to induce investors to hold even a small fraction of their portfolio in catastrophic bonds that are designed to provide liquid capital to a private-provider of catastrophic insurance for mortgage credit would likely be large. The magnitude of the US housing market compared to other financial markets suggests that a capital market solution that would provide sufficient (liquid) capital to the catastrophic insurer would be expensive and lack credibility.

The government has a comparative advantage at providing catastrophic insurance for mortgage-backed instruments because private providers of insurance that guarantee payment of principle and interest do not have the power of taxation.[44] A private provider of guarantees (e.g., MBS insurance) is constrained by its access to capital and its accumulated reserves in the scale of unconditional guarantees which it can offer.

The foregoing features of the catastrophic risks related to mortgage-backed instruments suggest that the private-provision of guarantees associated with mortgage-backed instruments would not be credible in a severe housing downturn. Accordingly, guarantees for mortgage-related instruments provided by private entities would not necessarily stem a "run" by guarantee-sensitive investors and the market failure we have identified would remain. Consequently, catastrophic risk insurance provided by the government (and financed using an explicit optimal risk-based premium) would allow for guaranteed mortgage-backed instruments that dominate the best that can be offered without such insurance and never do worse.[45] In

[43] Jaffee and Russell (1997) argue that a private insurer with a large accumulation of liquid capital to cover potential payouts can become a hostile takeover target. Such takeovers may reflect either the myopic behavior of stock market investors or the agency-cost aspects of surplus cash reserves.

[44] 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.

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

addition, the government provision of catastrophic insurance for mortgage-backed instruments avoids the "sudden stop" in the provision of mortgage credit that can exacerbate a severe housing downturn. Hence, government-backed insurance for mortgage instruments resolves some of the problems associated with systemic risk and implicit government guarantees and thus enhances financial stability.

4.2 Other Potential Benefits Associated with Government-Backed Catastrophic Insurance for Mortgage Instruments

Explicit, Rather than Implicit, Guarantees Lowers Competitive Advantage of Size. "Too-big-to-fail" perceptions can lower the funding costs for the largest FIs because guarantee-sensitive investors in FI debt (including MBS) presume that the government will not let a very large FI fail. Because the government would provide catastrophic insurance on mortgage instruments to all FIs on equal terms (that is, at the same risk-based prices), one of the competitive advantages that result from size would be removed. Indeed, the proposed government-backed catastrophic insurer of mortgage-backed instruments would substitute the (limited) market oversight by guarantee-sensitive investors with government risk management and oversight.

Like deposit insurance, government-backed catastrophic insurance on mortgage instruments would encourage guarantee-sensitive investors to be involved in financing a wide variety of mortgage-backed instruments, rather than simply focusing on financial products provided by institutions that are perceived as implicitly backed by the government.

Long-maturity Debt Issuance and Hedging Is Facilitated. Government-insured mortgage-backed instruments would enhance the ability of FIs to issue and hedge long-term debt.[46] Government-backed MBS (and also government-backed covered bonds) of long duration could be issued to guarantee-sensitive investors in almost all financial market conditions. Such instruments would be absent of credit risk and could be more easily hedged against interest risk, thereby resolving some of the problems associated with the interest rate risks of mortgage contracts (particularly the 30-year mortgage contract).

[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. The government-backed insurer of catastrophic risks associated with mortgage-backed instruments 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.

Like the current MBS market, mortgage-backed instruments with government catastrophic mortgage insurance could potentially be distributed using a "to-be-announced," the so-called "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.

Greater Flexibility to Respond in a Financial Crisis. FIs may prefer to employ government-backed assets for short-term financing, such as repo transactions, and to have the option to readily sell a government-backed asset to raise cash. For example, it may be less costly to de-lever an FI that holds guaranteed assets than to de-lever an FI that uses guaranteed liabilities to fund illiquid loans. If this is the case, debt overhang problems are less costly in an environment with greater availability of government-backed assets.

While not related to "runs" by guarantee-sensitive investors directly, another potential advantage of government-backed mortgage instruments is that the scope of bonds that could be purchased by the Federal Reserve would remain similar to what it is now. Currently, the Federal Reserve can purchase Treasury securities and government agency debt and MBS. Creating explicitly-guaranteed government MBS would continue to provide the Federal Reserve with more options to deal with a liquidity crisis. Such options may be valuable in that asset purchases by the Federal Reserve—much like the MBS purchase program that was conducted during January 5, 2009 through March 31, 2010—can potentially reassure guarantee-sensitive investors (e.g., insured depositors) more broadly and also provide needed liquidity to the financial system.

5. IS THERE A POTENTIAL ROLE FOR FANNIE MAE AND FREDDIE MAC TO PROVIDE GOVERNMENT-BACKED INSURANCE FOR MORTGAGE-BACKED INSTRUMENTS?

An institutional structure for stemming "runs" analogous to the current set up for the Federal Deposit Insurance Corporation could be deployed to insure catastrophic risks associated with pre-specified mortgage-backed instruments (e.g., MBS and covered bonds). The Federal Deposit Insurance Corporation—an independent government agency that provides deposit insurance to US banks—is generally funded by insurance 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.[47] This line of credit is available in the event of an emergency or

[47] 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

other unforeseen event that requires an unexpected cash outflow. Like other insurance providers, the Federal Deposit Insurance Corporation (FDIC) 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 lost a penny of insured deposits.

A government-backed catastrophic insurer for mortgage instruments would likely benefit from the accumulated information on mortgage default, the credit risk modeling expertise, the securitization know-how, and the infrastructure (e.g., work-out processes and other real estate owned management) that is currently embodied in the Fannie Mae and Freddie Mac organizations. Moreover, these entities have substantial experience in actively managing the creation and maintenance of their MBS pools of mortgages that would be useful to a catastrophic insurer of MBS and of covered bonds issued by FIs.

As we described earlier, to narrow the government's role to a catastrophic insurance provider for mortgage-backed instruments, the minimum underwriting criteria for mortgages eligible for purchase by Fannie Mae and Freddie Mac (or a combined restructured entity) could be ratcheted down from mortgage borrowers with a good credit history and loan-to-value ratio of 80 percent or less to mortgage borrowers with a good credit history and a very low loan-to-value (e.g., 60 percent or less). Analogously, government insurance for covered bonds issued by prudently managed FIs could be provided only for pools of mortgages to borrowers with a good credit history and with a very low loan-to-value (e.g., 60 percent or less). [48] Regardless of the underlying mortgage instrument, the catastrophic risk insurer would only guarantee the performance of MBS or covered bonds backed by mortgages that met or exceeded the strict underwriting criteria, not the performance of the mortgage originator or the covered bond issuer.

Strict underwriting standards on mortgages that are based on a very low loan-to-value ratio test would also ensure that mortgage borrowers, private mortgage insurers, and/or financial institutions that provide credit enhancements on mortgages would have considerable "skin-in-

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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.

[48] A primary difference between agency MBS and some other types of asset-backed securities (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 the loan defaults. Instead, the guarantor makes the investors in the securities whole by purchasing the defaulted mortgage at par. In contrast, in the case of other types of structures the loan in the pool may be replaced by the issuer of the securities when a loan defaults. In other words, in the case of agency MBS, the pool is static and managed under a trust agreement, but in other cases the pool is actively managed by the security issuer.

the game."[49] Like Fannie Mae and Freddie Mac currently do for conforming mortgages, the government-backed catastrophic insurer for mortgage instruments would determine how down-payments, private mortgage insurance and credit enhancements could be used separately or together to create the very low loan-to-value ratio that would be needed to qualify for a guarantee.

The provision of "tail-risk" mortgage insurance by the government would also allow it to set standards and determine best practices for mortgage origination, for mortgage data, for mortgage servicing, and for the "too be announced" market. Much like the GSEs have done in the past, the ability to guarantee the performance of mortgages is the key to managing risks and practices in the primary and secondary mortgage markets. Moreover, the provision of catastrophic insurance would afford the government a tool to manage its risk associated with a severe housing downturn. Using the information garnered from underwriting insurance, it would be better able to monitor emerging risks in housing and mortgage markets, both idiosyncratic and systemic. For example, it could consider the distributions of debt-burdens across US homeowners in different geographic regions to assess risks of a housing contraction. It could also monitor new types of credit enhancements and other innovations used to facilitate the provision of high-risk mortgages, so as to both consider their potential to inflate home prices or to pose a threat to the financial system.

If the GSEs were restructured into a FDIC-like catastrophic insurer for mortgage-backed instruments, they would strictly be an insurer and would not be permitted to issue debt directly to the public for the purpose of purchasing asset portfolios.[50] That said, the government-backed insurer would be able to invest the (risk-based) insurance premiums it receives in cash, cash equivalents, Treasury bills, and Treasury Notes.

The risk-based premiums and fund size of the government-backed catastrophic insurer of mortgage instruments would be based on the expectation of losses in market conditions that prevail in all but the most extreme circumstances. This information could potentially be used by both unsecured senior and subordinated debt investors to assess their risks. However, determining how the government would set risk-based insurance premiums is a much-debated

[49] Davidson (2009) has proposed a senior mortgage bond, subordinated mortgage bond, structure with government insurance only on the senior bond.

[50] Under the conservatorship and preferred stock agreements, Fannie Mae and Freddie Mac are each required to reduce their portfolio to as little as $250 billion over time.

topic, particularly since the government might be prone to misprice systemic risk.[51] With the explicit pricing of such guarantees, such debates can occur and potentially reduce the misallocation of resources that most certainly results from implicit guarantees that are not priced at all.

As is the case with the FDIC, the full faith and credit of the United States government would stand behind the proposed catastrophic insurer of mortgage instruments and the insurer would have access to a line of credit. With the foregoing reforms, the provision of federally-backed insurance on pre-specified mortgage-backed instruments provided at risk-based premiums could provide a rationale for restructuring the housing-related GSEs towards a public purpose.[52]

8. CONCLUSION

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

During a credit boom, particularly when home prices are rising, there are many guarantee-sensitive investors who will purchase the debt issued, or mortgage-backed securities guaranteed, by large financial institutions. 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

[51] See Pennacchi (2000, 2005 and 2006).

[52] 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 Bernanke (2008a), Geithner (2009 and 2010) and Paulson (2009).

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 (e.g., mortgages and homes) that back the securities. In such circumstances, the issuance of (private-label) mortgage-backed securities can abruptly cease as did occur in the fall of 2008.

Catastrophic risk insurance provided by the government (and financed using explicit optimal risk-based premiums) would allow for guaranteed mortgage-backed instruments that would likely dominate mortgage-backed instruments that can be offered without such insurance. Moreover, such insurance could be structured to enforce prudent underwriting standards for mortgage-backed instruments 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. Such insurance would also allow for the continuation of a "to be announced" market for mortgage-backed instruments.

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 mortgage-backed instruments (e.g., MBS and covered bonds) using risk-based premiums. Such an insurer would, of course, likely benefit from the accumulated information on mortgage default, the credit risk modeling expertise, the securitization know-how, and the 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 mortgage-backed instruments provided at risk-based premiums to stem potential "runs" by guarantee-sensitive investors could provide a rationale for restructuring the housing-related GSEs towards a public purpose.

Regardless of its institutional structure, a government-backed catastrophic insurer of mortgage-backed instruments would provide greater financial stability and ensure that credit is provided at reasonable cost both in times of prosperity and during downturns. The *explicit* pricing of the government-backed guarantee would mitigate the market distortions that have been created by *implicit* premiums during prosperity in the past. Indeed, *explicit* government provision of catastrophic insurance for mortgage instruments would limit the moral hazard created by *implicit* government guarantees that would likely arise in its absence.

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