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An Analysis of the Systemic Risks Posed by Fannie Mae and Freddie Mac and an Evaluation of the Policy Options for Reducing Those Risks

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Abstract: Fannie Mae and Freddie Mac are government-sponsored enterprises that are central players in U.S. secondary mortgage markets. Over the past decade, these institutions have amassed enormous mortgage- and non-mortgage-oriented investment portfolios that pose significant interest-rate risks to the companies and a systemic risk to the financial system. This paper describes the nature of these risks and systemic concerns and then evaluates several policy options for reducing the institutions' investment portfolios. We conclude that limits on portfolio size (assets or liabilities) would be the most desirable approach to mitigating the systemic risk posed by Fannie Mae and Freddie Mac.

JEL classification: G21, G28

Key words: government-sponsored enterprises, systemic risk, portfolio limits

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An Analysis of the Systemic Risks Posed by Fannie Mae and Freddie Mac and an Evaluation of the Policy Options for Reducing Those Risks

I. Introduction

Fannie Mae and Freddie Mac are government-sponsored enterprises (GSEs) that operate with unique Congressional charters in the secondary conforming residential mortgage market.[1] These charters bestow a number of rights and responsibilities on the two shareholder-owned companies, which were created to increase liquidity in the residential mortgage market and promote access to mortgage credit throughout the country.[2] In pursuing these goals, Fannie Mae and Freddie Mac engage in two principal activities. They guarantee the timely payment of principal and interest on mortgage-backed securities (MBS) ("mortgage securitization business") and invest in portfolios of financial assets, largely comprised of MBS issued by each other and other market participants ("investment portfolio business").

The investment portfolios maintained by Fannie Mae and Freddie Mac have become increasingly controversial both because of their size and how they are managed. Over the past decade, the companies have amassed the two largest portfolios of U.S. residential mortgage debt.

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[1] The nicknames "Fannie Mae" and "Freddie Mac" originated among securities traders, and the two companies are now far better known by these names than by their formal corporate titles: the Federal National Mortgage Association and the Federal Home Loan Mortgage Corporation, respectively (Frame and White, 2005).

Conforming single-family residential mortgages are those with balances below the legal limits on the size of mortgages that Fannie Mae and Freddie Mac can buy. For single-family mortgage loans, the conforming loan limit is $359,650 in 2005 and will be $417,000 in 2006.

[2] Specifically, the purposes of Fannie Mae's and Freddie Mac's charter acts are to: 1) provide stability in the secondary market for residential mortgages, 2) respond appropriately to the private capital market, 3) provide ongoing assistance to the secondary market for residential mortgages (including activities relating to mortgages on housing for low- and moderate-income families involving a reasonable economic return that may be less than the return earned on other activities) by increasing the liquidity of mortgage investments and improving the distribution of investment capital available for residential mortgage financing, and 4) promote access to mortgage credit throughout the U.S. (including central cities, rural areas, and underserved areas) by increasing the liquidity of mortgage investments and improving the distribution of investment capital available for residential mortgage financing (12 U.S.C. § 1716; 12 U.S.C. § 1451 [Note]).

Together, they accounted for about 20 percent of that $7.7 trillion market as of year-end 2003. The build up of Fannie Mae and Freddie Mac's investment portfolios has been made possible by provisions in their Congressional charters which create a perception in financial markets that the companies' financial obligations are guaranteed by the federal government. As a consequence, the GSEs enjoy more favorable funding costs in financial markets and face very low minimum capital requirements.

As Fannie Mae and Freddie Mac have grown there have been increasing concerns raised by policymakers, practitioners, and academics about the systemic implications of their large investment portfolios. These portfolios are highly leveraged, subject to little market discipline, and concentrate the responsibility to manage a large amount of mortgage-related interest rate risk in only two institutions. One argument in favor of these large portfolios is that GSE investment activity reduces mortgage interest rates and increases the availability of funds. However, the best empirical evidence suggests that it is the GSEs' mortgage securitization businesses, rather than their investment portfolio businesses, generate these social benefits. So, perhaps not surprisingly, the purpose and function of Freddie Mac and Fannie Mae's investment portfolios has become a central policy issue in recent Congressional debate about the safety and soundness supervision and regulation of housing GSEs.

The purpose of this paper is to describe the various dimensions of the systemic risks that Fannie Mae's and Freddie Mac's enormous mortgage-related investment portfolios pose and to evaluate the policy options for reducing these risks. This paper begins by describing Fannie Mae and Freddie Mac: their history, unique federal charters, business lines, and the risks that they manage. We then summarize how the GSEs' pose a systemic risk to the financial system. Next, we evaluate the empirical evidence concerning the perceived public benefits associated with

Fannie Mae's and Freddie Mac's investment portfolios. Finally, given that analysis, we evaluate the merits of various approaches to portfolio limitation.

II. Background

Fannie Mae's origins go back to the National Housing Act of 1934, which created the Federal Housing Authority (FHA) to operate a mortgage insurance program and also provided for the chartering of national mortgage associations as entities within the federal government. The only association ever formed was the National Mortgage Association of Washington in 1938, which eventually became the Federal National Mortgage Association – now known as Fannie Mae. Over the years, Fannie Mae was able to expand the available pool of finance to support housing and to provide a degree of unification to mortgage markets by issuing debt and purchasing and holding FHA-insured residential mortgages from mortgage banks. Then, in 1968, Fannie Mae was converted into a private corporation, with publicly traded shares listed on the New York Stock Exchange (NYSE), although it retained a unique federal charter.[3]

The Federal Home Loan Mortgage Corporation, or Freddie Mac, by contrast, was created by Congress in 1970 to support mortgage markets by securitizing mortgages originated by thrift institutions. During the 1970s and 1980s, Freddie Mac was technically a private company; although its equity shares were held solely by the 12 Federal Home Loan Banks (FHLBs) and their thrift members. Freddie Mac's board of directors then consisted of the three board members of the Federal Home Loan Bank Board, which regulated the FHLBs and the thrift industry during that

[3] According to Frame and White (2005), the apparent reason for the privatization was that until 1968, Fannie Mae's debt was part of the federal debt; but when Fannie Mae became a publicly traded company, that debt (which stayed with the company) was removed from the national debt total. Fannie Mae was replaced within the federal government by the Government National Mortgage Association (which became known as "Ginnie Mae"), an agency within the Department of Housing and Urban Development (HUD) that guarantees mortgage-backed securities that have as their underlying assets residential mortgages that are insured primarily by the FHA or by the Department of Veterans Affairs (formerly the Veterans Administration, or VA).

time.[4] Freddie Mac was converted in 1989 into a publicly traded company listed on the NYSE; but with a unique federal charter like that of Fannie Mae.[5]

By law, Fannie Mae's and Freddie Mac's activities are limited to the secondary conforming mortgage market.[6] Their securitization businesses involves the issuance of MBS, which includes a guarantee to investors of the timely payment of principal and interest on the underlying mortgages, less an annual "guarantee fee" of about 20 basis points on the remaining principal.[7] MBS are most often created by Fannie Mae and Freddie Mac through their respective "swap programs." Mortgage originators select and pool groups of mortgages and then exchange them for MBS that represent an interest in the same pool. The GSEs' investment portfolios largely consist of MBS that they have purchased in the open market, some whole mortgages (purchased from originators under their "cash programs"), and some liquid fixed-income investment securities.[8] Fannie Mae and Freddie Mac fund these assets largely by issuing debt.

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[4] The FHLB System is a third housing-related GSE that is comprised of 12 wholesale banks that are cooperatively owned by depository institutions (banks, thrifts, and credit unions) and insurance companies.

[5] According to Frame and White (2005), a major motivation for the conversion of Freddie Mac to a publicly traded company was the belief that a wider potential share-holding public would raise the price of the shares held by the then ailing thrift industry and thus improve the balance sheets of the latter.

[6] See 12 U.S.C. 1719 (Fannie Mae) and 12 U.S.C. 1454 (Freddie Mac).

As noted earlier, conforming single-family residential mortgages are those with balances below the legal limits on the size of mortgages that Fannie Mae and Freddie Mac can buy. For single-family mortgage loans, the conforming loan limit is $417,000 in 2006. The limit is adjusted annually, based on the change in the national single-family house price as determined by the Federal Housing Finance Board from its Monthly Interest Rate Survey.

By law, Fannie Mae and Freddie Mac must also meet percent-of-business housing finance goals. For 2005, 52 percent of their business must benefit low- and moderate-income families, 37 percent must benefit underserved areas, and 22 percent must serve "special affordable" needs. Research suggests, however, that the two GSEs underperform the primary conventional conforming market in funding mortgages for low-income borrowers and underserved areas (e.g., Bunce 2002).

[7] Lenders can also continue to service the loans (i.e., collect and forward the borrowers' monthly payments and deal with any delinquencies) and earn an additional 25 basis points for this service.

[8] As of year-end 2003, Fannie Mae's investment portfolio composition was: 57.9 percent their own MBS, 11.1 percent other MBS, 24.4 percent whole mortgages, and 6.2 percent non-mortgage investments. At the same time, Freddie Mac's composition was: 55.1 percent their own MBS, 26.9 percent other MBS, 8.4 percent whole

The two GSEs are highly leveraged with total accounting (book) equity that is less than four percent of total assets.

While Fannie Mae's and Freddie Mac's federal charters limit their business lines, they also provide them with a number of advantages that result in lower operating and funding costs (see U.S. Congressional Budget Office, 1996, 2001). First, they are exempt from state and local income taxes. Second, the Secretary of the Treasury has the authority to purchase up to $2.25 billion of Fannie Mae's and Freddie Mac's securities which is often referred to as their federal line-of-credit. Third, they issue "government securities," as classified under the Securities Exchange Act of 1934, which in practice means that their securities are eligible for use as collateral for public deposits, for purchase by the Federal Reserve in open-market operations, and for unlimited investment by federally insured depository institutions. A further implication is that they are exempt from the provisions of many state investor protection laws and the registration and reporting requirements and fees of the Securities and Exchange Commission (SEC), although Fannie Mae voluntarily registered its stock with the SEC in March 2003. Fourth, they use the Federal Reserve as their fiscal agent, which means that their securities are issued and transferred using the same system as U.S. Treasury borrowings.[9]

Taken together, the features of Fannie Mae's and Freddie Mac's federal charters have served to create a perception in financial markets that the federal government "implicitly

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mortgages, and 7.4 percent non-mortgage investments. The numbers for each company don't quite add up to 100.0 percent and this residual amount reflects "unamortized premiums, discounts, deferred adjustment, and unrealized gains/losses on available-for-sale securities".

[9] In 2004, the Federal Reserve amended its policy statement on payments system risk to eliminate a temporary exemption on daylight overdraft fees (granted in 1994) related to the release of principal and interest payments on mortgage-backed securities. The change is effective on July 20, 2006. The revised policy statement is available at: <http://www.federalreserve.gov/boarddocs/press/other/2004/20040923/default.htm>.

guarantees" the companies' financial obligations.[10] This belief, in turn, allows Fannie Mae and Freddie Mac to issue debt at interest rates that are far more favorable (better than AAA) than their stand-alone financial rating (around AA-) would justify.[11] This borrowing advantage has been estimated empirically to be about 40 basis points, although these estimates vary significantly depending upon the maturity and credit rating of the benchmark comparison bonds that were used.[12] The perceived implied guarantee also affects the interest rates on MBS that Fannie Mae and Freddie Mac issue; although this advantage is very difficult to estimate precisely because of the different credit enhancement structures utilized in "private-label" MBS relative to the GSEs' corporate guarantee.[13]

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[10] This perception arises despite explicit language on each GSEs' securities that they are not obligations of the federal government. This conundrum may be resolved if one looks at past government actions to assisted troubled GSEs. During the late 1970s and early 1980s, Fannie Mae was insolvent on a market value basis and benefited from supervisory forbearance. Also, in the late 1980s, the Farm Credit System (another GSE) required a taxpayer bailout totaling $4 billion. The U.S. General Accounting Office (1990, 90–91) discusses both of these episodes, and Kane and Foster (1986) provide estimates of the degree of insolvency for Fannie Mae during its financial distress.

The perception also arises because of public statements made by members of Congress. For example, House Financial Services Committee's Minority Leader Barney Frank (2005) recently noted on the House floor that:

> "Fannie Mae and Freddie Mac's profits by everybody's agreement are increased by a series of associations they have with the Federal Government. Everyone acknowledges Fannie Mae and Freddie Mac can borrow money from the public more cheaply than other entities, and we have said that in return for the arrangements that allow that to happen, we will impose certain restrictions on them."

[11] Fannie Mae and Freddie Mac receive AA- ratings from Standard and Poor's in terms of their "risk to the government". However, such ratings incorporate whatever government support or intervention the entity typically enjoys during the normal course of business. See Frame and Wall (2002a) for a discussion.

Moody's produces "bank financial strength" ratings for the companies which stood at B+ (Fannie Mae) and A- (Freddie Mac) as of November 2005. These ratings, which are on an A-E scale, are intended to measure the likelihood that a financial institution will require financial assistance from third parties, such as the government or shareholders. Importantly, in the case of Fannie Mae and Freddie Mac, the bank financial strength ratings consider (among other things) the companies' GSE status.

[12] See Ambrose and Warga (1996, 2002), Nothaft, Pearce, and Stevanovic (2002), and Passmore, Sherlund, and Burgess (2005).

[13] U.S. Congressional Budget Office (1996, 2001) reported an advantage of 30 basis points. Passmore (2005, p. 9) critiques the approach that generates this estimate and assumes for purposes of his analysis (and based on some simple calculations) that the advantage ranges from 0-6 basis points. See also Passmore, Sparks, and Ingpen (2002) for a theoretical analysis and simulation of the effect of GSE securitization on mortgage interest rates.

Fannie Mae and Freddie Mac are largely free from market constraints on their size and risk because investors perceive that their credit guarantees and debt are backed by the federal government.[14] As a result, Fannie Mae and Freddie Mac have become very large financial firms both in absolute terms and relative to the mortgage market as a whole. This growth has occurred despite market innovations that, over time, have reduced the need for special purpose GSEs to support a national mortgage finance market. Indeed, deregulation and financial innovation over the past couple decades have resulted in highly competitive national markets for mortgage origination, better geographic diversification for lenders, and well-functioning secondary mortgage markets, including those for "jumbo" and "subprime" loans.[15]

As of year-end 2003, Fannie Mae had $1,010 billion in assets and Freddie Mac had $803 billion in assets, making them the second and third largest U.S. companies, respectively, in terms of asset size. As shown in Table 1, almost $1.6 trillion of these $1.8 trillion in combined total assets were mortgage-related investments (whole mortgages and MBS). At that time Fannie Mae and Freddie Mac also had significant quantities of MBS outstanding, i.e., net of those carried on their own balance sheets. As of year-end 2003, Fannie Mae had $1,300 billion in net outstanding mortgage-backed securities while Freddie Mac had another $769 billion. Both Fannie Mae and Freddie Mac have grown more rapidly over the past three decades than the residential mortgage market as a whole. Table 1 shows that in 1980, the residential mortgage market consisted of $1.1

[14] Although the holders of Fannie Mae's and Freddie Mac's liabilities and contingent liabilities may exert little discipline, the GSEs' risk exposure may still be constrained by their desire to maintain the value of their charters for their shareholders. The notion that bank charter value (i.e., positive future expected economic profits) may serve to offset some of the moral hazard effects of deposit insurance was first explored in papers by Marcus (1984) and Keeley (1990). Frame and White (forthcoming) discuss these cross-cutting risk-taking incentives in the case of Fannie Mae and Freddie Mac and identify emerging sources of competition that may encourage greater risk-taking in the near future as the GSEs' charter value is eroded.

[15] The jumbo market refers to mortgages that exceed the size limits on GSE-eligible, or conforming, mortgages. Subprime mortgages are those with greater credit risk than most GSE-related loans, like those to borrowers with low credit scores or low down payments.

trillion in obligations, of which Fannie Mae and Freddie Mac held or securitized only $78 billion, or about 7 percent. By 2003, these companies accounted for over $3.6 trillion of the $7.6 trillion in residential mortgage debt, or about 48 percent.

[Insert Table 1 about here.]

In recognition of the increased risk taking incentives created by market expectations that the government would bail out creditors of a failing GSE (moral hazard), Congress formally established a safety-and-soundness regulatory and supervisory regime for Fannie Mae and Freddie Mac in 1992. The Office of Federal Housing Enterprise Oversight (OFHEO) is charged with the legislative mandate to impose both explicit minimum capital requirements and limitations on the GSEs' activities.[16]

Unfortunately, the establishment of OFHEO has not resolved the moral hazard problem for several reasons. First, the creation of a safety-and-soundness regulator to protect taxpayers from a perceived risk that the government at least formally disavows has, not surprisingly, strengthened the market's perception of an implied guarantee (e.g., Frame and White, 2004). Second, as noted by Treasury Secretary John Snow (2003), there is a general recognition that the supervisory system for the housing GSEs lacks both the stature and the tools to effectively deal with the current size, complexity, and importance of these institutions. OFHEO supervises only two institutions and is hence particularly prone to regulatory capture. The agency is located as an independent arm of the

[16] The Federal Housing Enterprises Financial Safety and Soundness Act of 1992 established OFHEO as an independent agency in the U.S. Department of Housing and Urban Development (HUD). Prior to this, HUD maintained exclusive regulatory oversight responsibilities over Fannie Mae and (for 1989-1992) Freddie Mac. Prior to the passage of the Financial Institutions Reform, Recovery and Enforcement Act (FIRREA) of 1989, Freddie Mac was the responsibility of the Federal Home Loan Bank Board (FHLBB).

Department of Housing and Urban Development (HUD), which is more focused on promoting the nation's housing goals than contending with GSE safety-and-soundness. OFHEO is subject to Congress' annual appropriations process and is therefore victim to political meddling from time to time.[17] With respect to supervisory tools, OFHEO lacks the authority both to adjust minimum capital standards and, should it become necessary, to close and resolve a failure of either Fannie Mae or Freddie Mac.

Legislative activity relating to the reorganization of housing GSE oversight is active in both chambers of Congress. In 2005, the House of Representatives passed legislation and the Senate Committee on Banking, Housing, and Urban Affairs has also moved a bill that is awaiting floor action.[18] The Senate bill appears to go much farther than the House bill in terms of addressing the aforementioned regulatory shortcomings relating to minimum capital standards, prompt corrective action, and receivership authorities. The Senate bill also directs the new regulator to establish criteria regarding the assets that Fannie Mae and Freddie Mac may hold considering the institutions' statutory missions and safety-and-soundness and the systemic risk

[17] For example, the Senate Appropriations Committee report on Senate Bill 2825 to fund the Department of Housing and Urban Development suggested a large increase in OFHEOs budget for 2005, but tied the availability of US$ 10 million to the appointment of a new director for the agency. This report is available at: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108 cong reports&docid=f:sr353.108.pdf. Kopecki (2004) subsequently reports that this provision was ultimately removed from the bill but that the conference report calls for "swift action" in replacing the OFHEO director.

[18] The Federal Housing Finance Reform Act of 2005 (H.R. 1461) was passed by the House of Representatives on October 26, 2005. The text of the bill is available at: <http://thomas.loc.gov/cgi-bin/query/z?c109:H.R.1461:>. The Federal Housing Enterprise Regulatory Reform Act of 2005 (S. 190) was reported out of committee on July 28, 2005. The text of the bill is available at: <http://thomas.loc.gov/cgi-bin/query/z?c109:S.+190:>.

Note that the risk of regulatory capture would remain because the new supervisory agency would oversee a small number of institutions. This, in turn, raises concerns about the potential for regulatory forbearance in the event of financial distress. The addition of the FHLB System to the supervisor's portfolio, however, should marginally reduce such tendencies, especially to the extent that those institutions' interests diverge from those of Fannie Mae and Freddie Mac.

posed by the size and nature of these asset holdings.[19] This last provision is quite controversial because it would likely result in a marked reduction in the size and scope of the housing GSE balance sheets. We next explore the important financial linkages between Fannie Mae and Freddie Mac and the rest of the financial system in an attempt to understand better the systemic risks and expected social costs that could result from a housing GSE failure.

III. Risk Management and the Social Costs of a GSE Failure

The failure of either Fannie Mae or Freddie Mac would not only generate private losses to their shareholders' and creditors, but also could impose certain social costs or negative externalities on the financial system. The expected social costs associated with such a failure are equal to the product of the likelihood of a GSE failure and the expected costs of any spillovers to either financial markets or to the real economy in the event of that failure. This chain of events leading from financial institution failure to reduced real economic activity is what is meant by the phrase "systemic risk."

Both the probability of failure and any related spillover costs depend upon the risks associated with the GSEs' securitization activities and mortgage investment portfolios and the disruptions that might occur to those and related markets.[20] Fannie Mae and Freddie Mac face both credit risk and interest rate risk with respect to their mortgage-related portfolio investments, whereas their securitization activities largely involve only credit risk. The credit risk is that

[19] The Senate bill would require the regulator to prohibit the institutions from acquiring or holding assets other than: 1) mortgages and MBS for the purposes of securitization, 2) mortgages acquired to meet affordable housing goals, 3) a limited inventory of mortgages solely for the purpose of supporting mortgage securitization, 4) cash, 5) real estate acquired through foreclosure, 6) U.S. Treasury securities (held for liquidity purposes), 7) real estate, intellectual property, fixtures and equipment for use in business operations.

[20] Fannie Mae and Freddie Mac are also subject to operational risk relating to financial reporting, people, processes, technology, and external events. This risk, while very real, is difficult to quantify empirically because events are rarely reported to outsiders and those that are tend to be extreme and emanate from various sources.

Notably, the accounting scandals that have recently plagued both housing GSEs can be viewed as a manifestation of operational risk or even moral hazard. For a discussion of the accounting problems at Fannie Mae and Freddie Mac, see the special examination reports released by OFHEO at http://www.ofheo.gov/OFHEOReports.asp.

mortgage borrowers will not repay their debt and hence a lender, or credit guarantor, will incur losses to the extent that this debt exceeds any recoveries from the sale of the mortgaged property. The interest rate risk arises from the fact that the companies largely hold long-term, fixed-rate mortgage-related assets that can be prepaid at any time without penalty on their balance sheets.

In the remainder of this section, we discuss the risks managed by Fannie Mae and Freddie Mac, the techniques employed by the GSEs to control those risks, and expected social costs that might result should one of the institutions fail. For simplicity, we first discuss the social costs as if the risks and returns across the two business lines are largely uncorrelated and managed independently and also under the assumption that the federal government would not bail out the failed housing enterprises' creditors. The implications of these assumptions are addressed at the close of the section.

A. Mortgage Securitization Risks and the Social Costs of GSE Failure

Credit risk, or losses resulting from nonpayment by mortgage borrowers, is the most important risk facing Fannie Mae and Freddie Mac in their mortgage securitization businesses. This risk is limited in several ways. First, the GSEs are restricted, by law, to guarantees on first mortgages and a requirement that the borrower have either at least a 20 percent equity stake (minimum 80 percent loan-to-value) or private mortgage insurance. Second, most mortgages backing their MBS are to "prime" borrowers with good or excellent credit histories, although both Freddie Mae and Fannie Mac have been increasingly moving down the credit spectrum. Finally, the companies securitize mortgages originated throughout the United States. This geographical diversification makes them less vulnerable to negative local and regional shocks that have, at times, rocked less-diversified mortgage portfolio lenders.[21]

[21] For example, see Federal Deposit Insurance Corporation (1997) for a discussion and analysis of various U.S. banking crises that occurred in the 1980s and early 1990s, including their effect on regional housing markets.

As the result of their risk management efforts, mortgage credit losses suffered annually by the housing GSEs have been extremely low over the past five years – around 0.01 percent (one basis point) – although they have been greater in the past. According to the U.S. Office of Federal Housing Enterprise Oversight (2005), the largest loss incurred by Fannie Mae between 1971 and 2003 was 13 basis points on the outstanding principal balance of their securitized mortgage pools in 1985; and for Freddie Mac it was 11 basis points in both 1993 and 1995 (based on data from 1987 to 2004). Expected credit losses are explicitly priced by Fannie Mae and Freddie Mac in their guarantee fees, and the losses have been estimated by OFHEO to be in the 3-5 basis point range (Inside Mortgage Finance 2005a). In contrast, guarantee fees average about 20 basis points on the outstanding principal balance of the mortgage pool.[22] This suggests that unexpected credit losses would have to be extremely large in order to sink the securitization business since an additional cushion is imposed on both companies. A minimum regulatory capital requirement of 45 basis points of net MBS outstanding is mandated by statute.

The historical data on losses makes clear that the probability of Fannie Mae or Freddie Mac being driven to the brink of failure by mortgage credit losses is very small. Indeed, because of the geographical diversification of their mortgage credit risk exposure, it would likely take a large unexpected nationwide reduction in housing values to cause either of them to fail due to their mortgage securitization business or to result in significant expected social costs.[23]

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[22] In addition to expected credit losses, the guarantee fees reflect various operational costs and the bargaining position of the mortgage originator.

[23] While we see this as unlikely, it is worth noting that house price appreciation has been rapid in recent years and arguably inconsistent with economic fundamentals, at least in some parts of the country. For differing views on whether house price appreciation is consistent with fundamentals, see Peach and McCarthy (2004) and Gallin (2005). Del Negro and Otrok (2005) also find that US house price changes are increasingly correlated across the nation.

Nevertheless, we will mention two sources of systemic concerns related to GSE mortgage securitization business.

First, a housing GSE failure would reduce or eliminate the value of the institution's guarantee of any credit losses on its outstanding MBS. Who would bear these losses is uncertain. MBS holders would presumably still be entitled to the cash flows on the mortgages underlying their securities. However, the priority of MBS holders' claim on any credit losses is unclear because no predefined resolution mechanism currently applies to either Fannie Mae or Freddie Mac (e.g., Carnell, 2005; Wall, Eisenbeis, and Frame, 2005). This uncertainty could result in a temporary reduction in the flow of funds to the mortgage market.

Second, the failure of a housing GSE would force it to stop guaranteeing new mortgages or creating new MBS. U.S. Office of Federal Housing Enterprise Oversight (2003, p. 98) suggests that a failure would not have major adverse impacts on housing activity assuming that the other GSE is financially healthy and could absorb the failed institutions' business volume. However, given that both Fannie Mae and Freddie Mac hold very similar credit risk portfolios, it could be conjectured that if one GSE failed due to credit losses resulting from a broad shock to the housing sector that the other likely would also be severely distressed. If the surviving GSE could not quickly expand its activities, disruptions could occur (U.S. Office of Federal Housing Enterprise Oversight, 2003; p. 98). We believe that these disruptions would likely be short-lived and would not involve significant social costs because alternative sources of funding are readily available from depository institutions and through structured private-label securitizations offered by investment banks.

B. Mortgage Investment Risks and the Social Costs of GSE Failure

Fannie Mae and Freddie Mac are exposed to additional risks beyond those created by their mortgage guarantee business as a result of their investment portfolios. One type of incremental risk is the credit risk on investments other than their own MBS, like whole mortgages, MBS issued by other institutions, and non-mortgage-related securities held in their portfolios.[24] However, a more important incremental risk is interest rate risk.

The interest rate risk associated with GSE mortgage investments manifests itself in two ways: through "funding risk" resulting from maturity mismatches between assets and liabilities and through "prepayment risk" due to the effects of interest rate changes on borrower prepayment behavior. For example, in the case of rising interest rates, the interest rate risk associated with mortgages results in both a capital loss on the fixed-rate debt instrument and a lengthening of the expected maturity of the instruments because of decelerated mortgage repayments. In a falling rate environment, capital gains on fixed-rate instruments are offset to some degree by the shortening of the expected maturity of the instruments due to accelerated repayments. The relationship between changes in interest rates, prepayment risk, and capital gains and losses is non-linear and gives rise to the so-called "negative convexity" of fixed-rate mortgage assets.

In theory, Fannie Mae's and Freddie Mac's mortgage-related interest rate risk could be passed on to their respective shareholders in the form of highly variable net income streams, including periods of large losses and associated reductions in the firms' equity. However, in practice, the levels of equity capital maintained by the GSEs are far too small to absorb the

[24] No additional credit risk is created when a GSE invests in its own mortgage backed securities because the GSE has already absorbed that risk when it guaranteed the security against loss as a part of the securitization process.

periodic losses associated with movements in interest rates.[25] Hence, the companies transfer a great deal of their interest rate risk to other investors through their risk management (i.e., hedging) practices. Any residual risk remaining after hedging is borne first by Fannie Mae's and Freddie Mac's equity holders. The remainder is borne either by the government (if market expectations of a bailout are realized) or the companies' liability holders and derivatives counterparties (if these expectations are not realized).

1. GSE Interest Rate Risk Management

A number of tools exist that allow Fannie Mae and Freddie Mac to transfer interest rate risks to other market participants, mostly through the over-the-counter (OTC) derivatives markets. The GSEs use a variety of hedging strategies, with the relative importance of each varying over time for each institution.[26] Importantly, Fannie Mae and Freddie Mac account for a large share of U.S. dollar interest rate derivatives markets (for options, swaps, collars and swaptions) which are their main hedging instruments. Their net positions tend to be one sided, purchasing options and paying fixed-rate in the swaps market.

Fannie Mae and Freddie Mac can control their desired funding risk by how they chose to balance the effective durations of their assets and liabilities. In practice, these GSEs tend to issue debt with a shorter duration than that of their assets and then use interest rate swaps to extend the effective duration of these liabilities. This approach does leave Fannie Mae and Freddie Mac exposed to basis risk since the institutions' short-term debt is priced relative to Treasuries while the swap payments are calculated relative to the London Interbank Offer Rate

[25] Posner and Brown (2005) estimate that, in order to earn a credit rating in the AA/A range, an unhedged Fannie Mae or Freddie Mac would need equity capital equal to 8 percent of assets just to cover their duration and convexity risk (ignoring other risks such as operations risk). In contrast, these two GSEs tend to operate with capital levels close to their minimum capital standard which is 2.5 percent of on-balance sheet assets.

[26] See U.S. Office of Federal Housing Enterprise Oversight (2003) and Jaffee (2003) for a more detailed discussion of interest-rate risk management practices at Fannie Mae and Freddie Mac.

(LIBOR).[27] The basis risk arises because the rates on these two types of instruments do not always move together in predictable ways.

Hedging prepayment risk is complicated because it requires the use of sophisticated models of the term structure of interest rates and borrower prepayment to estimate how the value of the mortgage-oriented investment portfolio would change for a given change in the interest rates. Like all economic forecasting models, these models are subject to error and these errors can be significant.

The GSEs could offset the prepayment options in their mortgage portfolios by issuing bonds with call (prepayment) options which effectively transfer the prepayment risk to bondholders. Alternatively, this risk could be hedged by purchasing interest rate options (mostly options on swaps, called swaptions) in the OTC derivatives market. In this case, most of the prepayment risk is transferred to derivatives dealers who, in turn, will often hedge the risk themselves and thereby transfer it to other investors. However, fully hedging prepayment risk with callable debt and swaptions (sometimes called "static hedging") is very expensive and hence the GSEs tend to be only partially hedged against prepayment risk by options.

Another alternative for hedging prepayment risk is to employ "dynamic hedging." In this case, the GSE replicates the returns that would be earned by an option holder using more liquid instruments, especially interest rate swaps. A limitation of dynamic hedging is that it only replicates the option for small changes in interest rates and, thus, the positions taken provide less protection against larger rate moves. More complete protection may be obtained by rebalancing the dynamic hedge in response to changes in the term structure of interest rates. A weakness of dynamic hedging is that the hedger may suffer losses if interest rates turn out to be more volatile

[27] See Poole (2004) for a discussion.

than was assumed in constructing the hedge, something called vega risk.[28] The appeal of dynamic hedging is that it is generally less costly than static hedging.[29]

A problem with static and dynamic hedging of prepayment risk is that they rely on being able to execute timely adjustments to positions to compensate for modeling error related to prepayments and changes in the level and shape of the term structure of interest rates. Dynamic hedging additionally requires market access to respond to movements in the level and volatility of the term structure and the passage of time. There are several reasons why a GSE may be unable to execute timely adjustments.

One type of adjustment problem can arise in the event that an OTC derivatives dealer fails. Dealers commonly limit their credit exposure on OTC derivatives by simply imposing a dollar limit on the size of their current and potential exposure to any single counterparty and these limits may vary based on both the financial condition (credit standing) of the counterparty and the amount of collateral pledged.

Fannie Mae and Freddie Mac both have collateral agreements with their counterparties. As an example of how this reduces their credit risk, as of year-end 2003, Freddie Mac had over $1 trillion in derivatives (notional amount) with a net fair value exposure of just over $17 billion, of which only $904 million, or 5.3 percent, was uncollateralized.[30] This suggests that the failure of an OTC derivatives dealer is unlikely to impart substantial direct credit losses on Fannie Mae

[28] See Posner and Brown (2005) for a discussion of GSE hedging generally and exposure to vega risk in particular.

[29] Jaffee (2003) explains that buying options to hedge against all possible outcomes requires the purchase of many options with a low probability of occurring. However, he notes that each of these options purchases entails transactions costs, and the costs are especially high for larger shocks and distant dates. Dynamic hedging avoids these costs because it requires hedging only as events become more likely and the underlying derivative markets become more liquid.

[30] Fannie Mae and Freddie Mac have a vast amount of marketable collateral on their balance sheets in the form of MBS, although this collateral may become less liquid if one of them were in financial distress. Importantly, if derivatives dealers did claim collateral in the event of a GSEs' insolvency, this would simply serve to increase the expected losses to general creditors or taxpayers.

and Freddie Mac because of netting and collateral. However, there are two important caveats. First, the presence of collateral does not totally ameliorate credit risk.[31] Second, a GSE might experience short term liquidity problems because surviving dealers may be limited in their ability to quickly replace the failed dealer's book of derivatives. This form of liquidity risk (i.e., rollover risk) is a larger potential problem for the GSEs' in their use of OTC options to create static hedges than for their use of interest rate swaps since the swaps market is substantially deeper (Federal Reserve Board of Governors, 2005).

A second type of adjustment problem can arise in the event that a market-wide liquidity shock results in a sudden jump in liquidity premiums.[32] Such episodes present a temptation for financial institutions to speculate and defer their hedging activities, especially if such movements are not thought to reflect long-term fundamentals. However, failing to adjust the hedges in accordance with the models opens the institution to the risk that market prices will continue to rise (or fall), exposing it to even greater losses. Even if the institution would like to hedge the position at the higher prices, there is a risk that it cannot do so in the required quantity due to credit concentration limits or the inability of the derivatives dealer to intermediate the risk to another investor (or the dealer's unwillingness to take-on the risk itself).

The GSEs significant participation in U.S. dollar interest rate derivatives markets on a single-side of the market suggests that they are particularly vulnerable to market-wide liquidity shocks and that their activities could have pervasive effects on their derivatives market counter parties during such stressful periods. One example of this occurred during the summer of 2003,

[31] For example, in the context of discussing various credit enhancements, the Office of the Comptroller of the Currency (1997, p. 183) notes that the existence of credit enhancements does not transform a poor credit risk into a good one.

[32] Some recent periods of market turmoil include the fall of 1998 (Asian financial crisis and the Russian default crisis) and September 2001 (World Trade Center attacks).

which has been described by several interest rate derivatives dealers as the most stressful period in memory (Federal Reserve Board of Governors, 2005). This period was characterized by massive mortgage-related hedging demands by investors as long-term Treasury yields began to rise and consumers rushed to refinance/prepay their mortgages.[33] Ultimately, long-term Treasury yields rose by 150 basis points in eight weeks. One explanation for the large run-up in interest rates was a so-called "feedback effect" running from derivatives markets to spot markets as a result of the markedly increased hedging demands.[34] Two recent papers, Kambhu and Mosser (2001) and Perli and Sack (2003), find support for this feedback effect from the mortgage market to interest rates in the Treasury and interest rate swap markets.[35] The significant amount of hedging demands by Fannie Mae and Freddie Mac for their investment portfolios likely contributed to this phenomenon.

2. Social Costs of GSE Failure

Because of the sheer size of Fannie Mae's and Freddie Mac's investment portfolios and the massive hedging they require insolvency due to interest rate risk management could impose substantial social costs on OTC derivatives and fixed-income markets. First, in the event of a failure, the one-sided nature of their derivatives activities could create an enormous rebalancing

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[33] Goodman and Ho (2004) construct a "mortgage misery index" and illustrate how hedging demands rose during this period and how the distribution of those needs changed over time beginning with mortgage originators and ending with mortgage investors. Also, according to Chang, McManus, and Ramagopal (2005), during 2003, 40 to 45 percent of total residential mortgage debt outstanding refinanced.

[34] The intuition here is that a significant increase in market interest rates would greatly increase the expected duration of mortgage-related assets which would lead to sales of long-term fixed-income securities (to maintain the original duration of the portfolio). Such a large-scale decrease in demand for long-term securities would reduce their price and further push up their yields.

[35] A rejoinder to the Perli and Sack paper by Chang, McManus, and Ramagopal (2005) replicates these results, but argues that they are largely driven by outliers – specifically the time periods around the failure of Long Term Capital Management and the September 11, 2001 terrorist attacks. This should not be surprising, however, since the questions raised about feedback pertain largely to exactly these types of stressful market events which affect liquidity.

problem for derivatives dealers. How this would unfold, however, is unclear given legal uncertainties about how such a failure would be resolved. OFHEO currently lacks regulatory receivership authority. Therefore, an unwinding of the failure would depend upon the response of Congress. Furthermore, because there is no clearly established priority of claims in the case of default, the dealers would be exposed to loss if derivatives transactions were to be terminated until they could rebalance their books.

Second, the failure of either Fannie Mae or Freddie Mac due to losses in their investment portfolio business would have the same disruptive impact to their securitization business as failure due to losses in that line. The only mitigating factor might be that the other GSE may not have made the same risk management errors and, hence, may be able to continue in operation and pick up any market slack that may result.

Third, the failure of a GSE would also result in credit losses to holders of its debt. The GSEs' MBS holders would retain a claim on the underlying mortgages as well as a claim on the GSE for the credit loses on the underlying mortgages. By contrast, holders of the debt issued to finance the GSE's mortgage portfolio would only have a claim on a proportionate share of the GSE's assets. Thus, the losses to creditors on the debt used to finance the investment portfolio would be likely both higher and more difficult to estimate (relative to MBS losses) at the time of failure. The short-term result would be that the market for the failed GSE's debt securities may become more illiquid than their MBS. The longer term consequence may be greater exposure to losses for the GSE's debt holders, which include a large number of depository institutions.[36] The amount of risk and its incidence, however, would depend on each individual depository institution's holdings and the expected loss in the event of default. Nevertheless, should an

[36] See Frame and Wall (2002b) and Kulp (2004) for data and analysis of commercial bank holdings of GSE debt and mortgage-backed securities.

insolvency occur, holders of the failed GSEs' debt securities would suffer some losses unless Congress appropriates sufficient funds to cover those losses.[37]

C. Net Social Costs from Mortgage Securitization and Investment

To this point, we treated Fannie Mae's and Freddie Mac's securitization and investment portfolio businesses in isolation and identified the attendant risks, the potential for systemic risks, and resulting expected social costs. In reality, the GSEs operate both businesses, which may provide some diversification benefit to the extent that one business is profitable at the time when the other is not. However, the empirical correlation of the performance of the two business lines is unclear and would likely depend on the path of macroeconomic variables like aggregate income, long-term interest rates, and house prices.

Our analysis suggests that a GSE failure is much more likely to result from realizations of the interest rate risk inherent in the companies' investment portfolios than the credit risk absorbed in the securitization businesses. In terms of profitability, the bulk of Fannie Mae's and Freddie Mac's returns come from their investment portfolios.[38] Thus, positive net cash flows from the securitization business would be of only marginal value in reducing the probability of failure or lessening the costs of financial distress emanating from a GSE investment portfolio. In the less likely event of a problem in the securitization business, positive net cash flow from the investment portfolio would provide a buffer. Because this probability is already small, there would actually be very little (absolute) reduction in the overall probability of failure. Furthermore, it is not clear that the cash flow correlations would be negative, thereby generating unambiguous

[37] The amount of loss would depend upon how negative net worth was. Because of the lack of receivership authority and the uncertainties of how a resolution would proceed, an insolvent institution might be kept afloat for a considerable period of time through forbearance, and this would only serve to increase likely losses to creditors.

[38] For example, U.S. Office of Federal Housing Enterprise Oversight (2005) reports that for 2003, net interest income from the investment portfolio totaled $23.1 billion, while gross credit guarantee fee income was $4.1 billion. However, the OFHEO figures do not appear to incorporate all of the gains or losses from the GSE's financing of their investment portfolios, such as the cost of purchased options.

diversification benefits. This follows since a problem in the securitization business would most likely come from credit losses due to an adverse shock to housing. Thus, similar problems would also be observed in the investment portfolio.

The above analysis does not consider the effects of a government bailout of a troubled GSE which is consistent with the official position that GSE obligations are not backed by the federal government. However, there is ample evidence from market pricing of their obligations that debt investors believe that a bailout would take place. In the event of a bailout, the large size of GSEs' investment portfolios would markedly increase the expected cost to the Treasury Department due to the likely declines in asset values, the enormous volume of debt issued to finance the portfolios, and the derivatives used to hedge the portfolio. Such a bailout would represent a substantial reapportionment/transfer of losses from financial markets and institutions to taxpayers.

IV. Social Benefits of GSE Investment Portfolios

While there are clear private benefits to Fannie Mae and Freddie Mac from the profits on their investment portfolios, it is less clear whether there are important social benefits or positive externalities for U.S. mortgage markets sufficient to justify their existence and large size.[39] Financial economists usually give two reasons why a financial intermediary should hold a portfolio of assets: (1) the intermediary is able to obtain diversification benefits which the investor could not achieve on his own, and (2) an intermediary should retain at least part of the

[39] While some of the profits associated with these portfolios may be associated with cost efficiency and skillful risk management, studies have shown that a significant proportion is derived through the debt funding advantage arising from the market perception of an implied guarantee of these obligations. U.S. Congressional Budget Office (2004) estimates that, for 2003, the gross charter benefits accruing to Fannie Mae and Freddie Mac were $19.6 billion; with $9.3 billion of this arising from debt funding cost savings. Even more striking, Passmore (2005) estimates the average present discounted value of Fannie Mae's and Freddie Mac's gross federal subsidy at $151 billion; with the debt funding advantage accounting for $126 billion (83.4 percent). The difference between the Congressional Budget Office analysis and Passmore's analysis is that the former focuses on a particular point in time, while the latter projects out over a long horizon (25 years) and then discounts back to the present.

claims it originates to give it an incentive to optimally provide valuable credit risk screening and monitoring services. Neither of these benefits applies to the GSEs' investment portfolios. Large investors can already hold a diversified portfolio of MBS on their own account and small investors can purchase shares in mutual funds specializing in MBS. Moreover, Fannie Mae and Freddie Mac cannot reduce the credit risk of the mortgages they purchase in the secondary market because, by law, the loans are originated and serviced by other financial institutions.[40]

A third possible benefit of portfolios is that it allows funding and risk-bearing to be more efficiently distributed in financial markets. Mudd (2005) and Syron (2005a) argue, for example, that GSE intermediation is beneficial insofar as the institutions' mortgage-related portfolios: 1) allow foreign capital to flow into the market, increasing the supply of mortgage finance, 2) lower long-term mortgage interest rates, and 3) ensure the availability of the 30-year fixed-rate mortgage. The evidence related to each of these claims is reviewed below.

A. Foreign Capital

There is a perception that foreign investors are less willing to purchase financial instruments with embedded options, like MBS and callable debt. Roll (2003), for example, argues that this occurs because the management of option risk in general is highly specialized and expensive, and in the case of mortgage-related instruments this is especially true since consumers are less likely to optimally exercise prepayment options. This perceived aversion has been further used as a justification for Fannie Mae's and Freddie Mac's investment portfolios.

[40] Fannie Mae and Freddie Mac do, of course, hold a great deal of mortgage credit risk through their securitization activities. Furthermore, a large number of these securitized loans were underwritten by originators using the GSEs automated underwriting systems. This potentially suggests some advantage for the GSEs in computer-based screening and monitoring activities given their central role in the market. However, any benefits (and costs) arising from this role arises due to their role in providing credit guarantees and would remain even if they did not hold mortgages as investments.

Foreign purchasers buy GSE debt and those funds are used to fund the institutions' purchase of mortgage investments, thereby avoiding the need to mange prepayment risk themselves.

Fannie Mae and Freddie Mac have unquestionably increased their visibility in international capital markets over the past decade and offer some debt with features particularly attractive to foreign investors (e.g., LIBOR-based floating rate and foreign currency denominated).[41] Further, a recent study shows that the share of foreign holdings of long-term "federal agency" securities outstanding (both debt and MBS together) increased from 5.4 percent in December 1994 to 10.5 percent in June 2004 (U.S. Department of the Treasury, Federal Reserve Bank of New York, and Board of Governors of the Federal Reserve System, 2005, p. 5). These flows are consistent with a rise in international capital flows to the U.S. mortgage market.[42] Table 2 presents some data from that study which suggests that a non-trivial portion of these foreign account holdings are in MBS. In particular, foreign investors held $623 billion of long-term "federal agency" paper as of mid-year 2004 and that 28.3 percent of that ($176 billion) was comprised of MBS.[43] Further, some individual countries (Canada, Cayman Islands, Luxembourg, and Netherlands) actually have greater holdings of "federal agency" MBS than debt. China, which was the largest holder of "federal agency" securities as of June 30, 2004, held only $15 billion in MBS (13.0 percent of their federal agency holdings). This amount grew substantially, however, from the previous year's $3 billion (3.3 percent of total federal agency holdings).

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[41] Concise descriptions of the various debt instruments offered by Fannie Mae, for example, can be found at: <http://www.fanniemae.com/markets/debt/understanding_fm_debt/understanding_debt.jhtml?p=Debt+Securities&s=Understanding+Fannie+Mae+Debt&t=Introduction+to+Fannie+Mae+Debt+Securities>.

[42] These "federal agency" holdings are likely to consist almost exclusively of securities issued by Fannie Mae, Freddie Mac, and the Federal Home Loan Bank System.

[43] The study also reports holdings of short-term "federal agency" securities to be $124 billion although these amounts are not broken-down by either security type or country holding.

Overall, the data imply that foreign investors have become more comfortable with GSE debt securities over time – and most recently this comfort has expanded to include MBS. Indeed, it is not obvious why foreign investors would avoid MBS once they understood the asset class since the net change in their portfolio risk may be rather small if the U.S. MBS provide some diversification gains. Nevertheless, even if foreign investors were averse to prepayment risk, they could purchase senior tranches of collateralized mortgage obligations (CMOs) which are less exposed to this risk and have a pay-off structure more closely resembling straight debt. In any event, the GSEs' investment portfolios are not necessary to intermediate between foreign investors and U.S. mortgage markets. These investors could simply purchase other securities (e.g., Treasuries) which would have the effect of pushing down their relative yields which, in turn, would induce domestic investors to substitute into holding more MBS.

B. Mortgage Interest Rates

It is well accepted that Fannie Mae's and Freddie Mac's participation in the secondary mortgage market results in "conforming" mortgages' carrying lower interest rates than "jumbo" mortgages. A large number of econometric studies have estimated this effect and most found the interest rate differential to be about 20-25 basis points; with significant variation in the estimates depending on the empirical specification, data sample, and time period studied.[44] A closely related study by Passmore, Sherlund, and Burgess (2005) finds that only around seven basis points of the jumbo-conforming spread can be directly attributed to housing GSE activity as measured by their funding advantage. Since Fannie Mae and Freddie Mac conduct both securitization and investment portfolio businesses, it is also natural to ask how each contributes

[44] See McKenzie (2002) for a review of this literature and Ambrose, LaCour-Little, and Sanders (2004) for a recent contribution.

to the observed mortgage interest rate reductions. Closely related to this is the question of whether the volume of activity in these business lines matters in terms of the effects on the aggregate supply of mortgage funding. Below, we discuss the evidence related to whether the volume of housing GSE investment activity influences conforming mortgage interest rates.

When Fannie Mae and Freddie Mac buy mortgages for their investment portfolios they, in effect, convince investors to give up GSE-guaranteed MBS in exchange for GSE-guaranteed corporate bonds. In principle, such an exchange could lower mortgage interest rates if it added to the overall demand for mortgage assets by tapping a new pool of investors. However, as noted earlier, it is unclear that GSE corporate debt entices much additional foreign capital. Furthermore, while the GSE bonds can carry less prepayment risk than MBS, such protection is provided by many other financial structures. Although the conceptual case that GSE investment portfolios can lower mortgage interest rates is tenuous, there have been efforts to evaluate this question empirically. Before surveying the results, however, we provide a brief overview of important methodological issues that one must consider.

The main issue is that, while GSE portfolio purchases may influence mortgage spreads, the spreads themselves obviously influence GSE portfolio purchase decisions (as well as purchases by all other mortgage investors).[45] That is, as mortgage yield spreads widen, mortgage investors will view these investments as "cheap" and hence have an incentive to purchase more of these assets. This incentive alone would cause portfolio purchases and mortgage spreads to move together, confounding attempts to estimate the direct effect of purchases on spreads. Thus, a proper empirical examination of GSE portfolio purchases and mortgage spreads will account for the jointly determined nature of these realized outcomes. Once such a joint statistical

[45] As a technical matter, researchers should use mortgage spreads that control in some way for prepayment and credit risk.

relationship has been specified, standard econometric techniques for dealing with the time-series properties of the data series' can be then utilized (e.g., determining appropriate lag lengths, accounting for unit roots, etc...).

To this point, only a statistical characterization of the data would have occurred, reflecting the correlations between contemporaneous and past values of GSE purchases and mortgage yield spreads. Importantly, these correlations cannot be interpreted as reflecting causality. In order to identify causal relationships, one must impose restrictions that are grounded in economic theory. Of course, these restrictions themselves can be controversial in the sense that they might unduly affect the results. Hence, it is important for researchers to justify the restrictions imposed on the data, and demonstrate that the results are robust to alternative identification strategies.

Given an empirical model that imposes plausible restrictions on the joint relationship between GSE portfolio purchases and mortgage spreads, one can begin to make economic inferences. In a "structural relationship" that relates GSE portfolio purchases to mortgage yield spreads, one would be tempted to interpret the coefficient estimates for GSE purchases as causing some part of the observed mortgage yield spread. (For example, for every $X billion of GSE portfolio purchases, mortgage yield spreads are affected by Y basis points.) However, this would appear to be a violation of efficient markets insofar as it requires that contemporaneous mortgage spreads do not reflect investors' expectations about GSE purchases. Put another way, in an efficient market, only unexpected GSE portfolio purchases can have an effect on mortgage interest rate spreads. To examine the effect of such "shocks", researchers compute so-called "impulse response functions" (and associated standard errors) in order to draw economic inferences.

Only one of the three studies examining the relationship between GSE portfolio purchases and mortgage interest rate yield spreads follow the approach we have outlined.[46] Lehnert, Passmore, and Sherlund (2005) conclude that unanticipated GSE actions (gross portfolio purchases or gross MBS issuance) have no effect on mortgage interest rate yield spreads for either the primary or secondary markets. In addition, the authors test for the effect of *anticipated* purchases by the GSEs. The efficient markets hypothesis might not hold, especially in times of market turmoil such as the liquidity crisis of 1998. The authors find that, even had GSE portfolio purchases been held to zero during this period, mortgages rates would have evolved no differently than they actually did. This illustrates just how deep and liquid U.S. mortgage markets really are.

Gonzalez-Rivera (2001) investigates the joint relationship between GSE portfolio purchases and mortgage spreads, with a particular emphasis on the reaction of GSE portfolio purchases to spreads. She finds that GSE portfolio purchases increase when spreads are wide, and that mortgage spreads revert to their mean without requiring special GSE intervention. Although Gonzalez-Rivera's focus and methodology are different from Lehnert, Passmore, and Sherlund (2005), her results are broadly consistent with theirs.

Naranjo and Toevs (2002) argue that portfolio purchases strongly affect spreads. Methodologically, however, they do not account for joint relationship between GSE portfolio purchases and mortgage spreads. Further, unlike the other two studies, Naranjo and Toevs use proprietary data from Fannie Mae and hence ignore the effects of purchases by Freddie Mac. Their data also extend back to the 1980s, a time when the mortgage market was very different.

[46] All three of the papers discussed here utilize monthly data on mortgage interest rate yield spreads and changes in GSE activity. The mortgage interest rate series are for the primary and/or secondary market and come from various sources; the risk-free rates are generally relative to 10-year Treasury rates; and GSE activity is measured by securitization volume or portfolio purchases (gross or net).

Finally, Lehnert, Passmore and Sherlund also report (in an appendix to a revised version of their paper) that they were unable to replicate Naranjo and Toevs' results using publicly available data from Fannie Mae and Freddie Mac. Overall, we believe that the evidence provided in Naranjo and Toevs (2002) should be given little weight.

C. The 30-Fixed Rate Mortgage

Long-term, self-amortizing, fixed-rate mortgages with "free" prepayment options are ubiquitous in the U.S.[47] These instruments are often described as being "consumer friendly" relative to housing finance systems in other countries, which rely much more heavily on mortgages with adjustable-rates, balloon payments, and prepayment penalties.[48] The perceived virtue of the fixed rate mortgage rests on the notion that mortgage investors (lenders) are in a better position to manage the attendant interest rate risk than borrowers.

U.S. mortgage markets were markedly altered in the wake of the Great Depression by a series of federal initiatives.[49] The creation of the Home Owner's Loan Corporation, the Federal Housing Administration, and the Federal National Mortgage Association each played a part in the transition to long-term, fixed-rate mortgages. And the product expanded greatly with the housing construction boom following World War II.

Technology, financial innovation, deregulation, and consumer awareness have greatly enhanced the efficiency of the U.S. mortgage market over time through reduced lender costs and more informed choices on the part of mortgage lenders and borrowers. Nevertheless, some

[47] Of course, the prepayment option is not actually free, as is often claimed. Rather than being separately priced, the cost of the option is impounded into the mortgage interest rate at origination and varies based on expectations of future interest rates and house prices as well as borrower characteristics.

[48] For a discussion and analysis of non-US mortgage markets, especially those in Europe, see International Union for Housing Finance (2001), Merrill Lynch (2003), Mercer Oliver Wyman and European Mortgage Federation (2003), and Green and Wachter (2005).

[49] See Green and Wachter (2005), for example.

believe that Fannie Mae and Freddie Mac still have an important role to play in mortgage markets and, therefore, government intervention in private markets through GSEs remains desirable. One argument is that their presence makes mortgage markets more equitable to borrowers by creating a situation where relatively lower-risk and higher-risk borrowers (up to some minimum credit quality cut-off point) are offered the same mortgage contract and hence pooled together (e.g., Green and Wachter, 2005). Of course, this implies the existence of an indirect income transfer from the lower-risk to the higher-risk households that may not be economically efficient or equitable to those incurring the transfer tax. Some have even suggested that, without such intervention, the availability of long-term, self-amortizing, fixed-rate mortgages with "free" prepayment options could be jeopardized. As evidence, they cite the paucity of such an instrument in foreign mortgage finance markets and our own historical experience (e.g., Green 2005; Mudd 2005; and Wachter 2005).

These claims are clearly misplaced for at least two reasons. First, the evidence is that long-term, fixed-rate mortgages were widely available to borrowers prior to Fannie Mae's and Freddie Mac's massive investment portfolio build-up since the early 1990s. Second, we observe these same mortgages in parts of the market in which Fannie Mae and Freddie Mac do not operate. For example, in the jumbo market, a majority of loan contacts carry fixed rates of interest.[50]

In summary, it does not appear that the mortgage-oriented investment portfolios of Fannie Mae and Freddie Mac provide much in the way of social benefits in the form of increased credit availability or lower mortgage interest rates. First, while foreign investors are significant purchasers of GSE debt, these same investors increasingly hold a non-trivial amount of MBS,

[50] Estimates provided in Hancock, Lehnert, Passmore, and Sherlund (2005) indicate that over 68 percent of jumbo mortgages outstanding carried fixed rates as of the end of the third quarter of 2003.

suggesting that they have increasingly become willing to channel funds into U.S. housing instruments without having to purchase Fannie Mae and Freddie Mac debt securities. Second, the best evidence concerning the effect of Fannie Mae's and Freddie Mac's portfolio purchases suggests that they have no effect on mortgage interest rates. Finally, there is no evidence that the portfolios are necessary to ensure the continued availability of long-term, fixed-rate, pre-payable mortgages.

Given the potential negative externalities of Fannie Mae's and Freddie Mac's investment portfolios to the financial system (systemic risks) identified in Section III and the lack of any clear and significant positive externalities identified here in Section IV, it would appear desirable to significantly reduce the size of such investments. The consequences of restricting the size of GSE investment portfolios are considered in the next subsection and the question of how best to do this is examined in Section V.

V. Methods of Limiting GSE Systemic Risk Exposure

The previous two sections have reviewed the evidence and found that: 1) the size of Fannie Mae's and Freddie Mac's portfolios, including their related hedging operations, creates the potential for a GSE failure to have an adverse effect on the real economy; and 2) the size of these portfolios generates little or no benefit to the mortgage markets. In light of this, some have called for directly limiting GSE portfolio size. This could be done through the imposition of strict portfolio dollar caps or by limiting portfolio activity to that required to support the GSEs' securitization businesses and affordable housing missions. There are other ways to constrain GSE risk-taking that may also ultimately lead to smaller portfolios, such as increasing capital requirements or imposing user fees on debt issuance. Like portfolio limits, these methods reduce GSE returns to invested capital by imposing additional costs, although each has different

implications for GSE risk taking incentives, portfolio composition, and optimal size. Before discussing the details of all of these risk-limiting options, however, we first provide an analytic framework which can be used to dissect the issues and problems associated with each option.

A. Analytic Issues Involved in Controlling Financial Institution Risk Taking

In a series of papers, Merton and several co-authors have outlined the conceptual issues in assessing financial institution risk taking. Their analysis helps to illuminate the issues that must be dealt with in designing effective mechanisms for limiting GSE moral hazard and risk taking incentives.

Merton and Perold (1993) show the principal financial management problem facing any financial institution is the management of its costly net risk capital. The authors define net risk capital, which they carefully distinguish from accounting, regulatory or cash capital, as "…the smallest amount that can be invested to insure the value of the firm's net assets against a loss in value relative to a risk-free investment" (Merton and Perold 1993, p. 217). They suggest that if one thinks of a firm's risky assets as being funded by risky liabilities, the relevant question is how much risk capital must be held (i.e., risky assets held in excess of risky liabilities) so that the payoff structure makes liability holders indifferent between holding risky liabilities and ones that are risk free. Such capital could either be provided by equity holders, or equivalently, the firm could purchase asset insurance in the market to make up the difference. Because of the insurance analogy, the cost of this additional capital can be valued as a European put option whose value is increasing in the variance of net assets.[51] Furthermore, since the variance of net

[51] This option has an exercise price of $(A_0 - L_0)e^{rT}$, where $(A_0 - L_0)$ is the value of net assets at time zero discounted for T periods at the riskless rate r. Under the assumption that the values of both assets and liabilities follow geometric Brownian motion, then risk capital equals $A_0F(1,1,0,T,\sigma)$ where F is the Black-Scholes (1973) option value of a European call option with an initial value of 1, an exercise price of 1, the riskless rate set equal to 0, a time interval from 0 to T, and σ equals is the volatility of the ratio of assets to liabilities.

risk capital is a function of both the riskiness of assets and liabilities (including both contingent liabilities and derivative contracts), it is important to consider the covariances of changes in values among these various instruments in determining the amount of risk capital required.[52]

There are several important assumptions underlying this framework that are important to understand before using it as a reference to determine whether an institution's risk capital is adequate. The first is that the framework focuses on market value measures, rather than book value measures, of equity.[53] The market value equity is more important for risk control because it reflects the values of assets that can be realized to payoff claimants. Financial institutions may be solvent on a book value basis but insolvent on a market value basis and keeping such an institution open only encourages moral hazard behavior on the part of its equity holders and managers. A second underlying assumption is that the amount of risk capital is being determined by an accurate measure of the institution's risk exposure. A third is the length of time between monitoring periods. The longer the maturity of the option, the more likely it is that portfolio changes can take place such that the institution might experience a large negative shock to net worth and institutions with negative equity values face a powerful incentive to take on additional risk. Thus, timely monitoring by liability holders (or their agent) is critical to accurately determining when an institution becomes insolvent. Fourth, the framework assumes that an institution will be closed if its risk capital at the end of any monitoring period is not positive so that asset values are sufficient to meet promised liability payments. Failure to do so has the same effect as extending the maturity of the option. Finally, Merton and Perold focus exclusively on the risk capital needed to cover the difference between the value of the institutions' assets and

[52] It is also shown by extension that this same issue also carries over to institutions with more complex corporate structures such as bank holding companies.

[53] Models of fairly priced deposit insurance also rely upon market values instead of book values.

liabilities and hence it implicitly assumes that efficient liquidation occurs and that there are no additional social costs related to the failure.

As noted above, Fannie Mae and Freddie Mac are default risky but issue debt that is treated as virtually default-risk free by investors even though the two GSEs have not purchased liability insurance. The way to reconcile this apparent contradiction in the Merton and Perold model is to understand that investors believe the government is the residual supplier of net risk capital.[54] To the extent that this is true, the model suggests that there are two general policy options for reducing the amount of net risk capital supplied by the government: 1.) require the GSEs to supply more of the net risk capital, or 2.) require the GSEs to take less risk.[55] The GSEs could be required to supply more of the net risk capital either by requiring them to hold more equity capital, or by having the federal government charge the GSEs a fee (effectively an insurance premium). The GSEs could be required to take less risk via the imposition of limits on the size or composition of their portfolios. These policy options are discussed in the following subsection with an eye toward eliminating systemic risk. Subsection C then outlines some additional reforms for housing GSE safety and soundness oversight intended to further reduce taxpayer exposure.

B. Policy Options

Merton and Perold's risk capital framework can be used to assess various policy options for controlling GSEs risk and thereby limit the government's (taxpayer's) exposure. The approaches we consider below include adjusting capital requirements, debt issuance user fees,

[54] That is, the government implicitly supplies the net risk capital in excess of that provided by the GSEs' shareholders (e.g., Kane 1985).

[55] See, for example, Merton and Bodie (1992, 1993).

and portfolio limits. We also discuss the important role of monitoring and compliance in risk control.

1. Capital Requirements.

A common approach in the regulation of insured depository financial institutions is to impose a minimum capital requirement either in the form of an overall leverage constraint or in the form of risk-based capital requirements geared to the perceived riskiness of individual asset categories. Fannie Mae and Freddie Mac are subject to both leverage and risk-based capital requirements, which are monitored and enforced by OFHEO. One way of controlling GSE risk would be to increase their minimum capital requirements. Currently, the GSEs' leverage requirement is equal to the sum of 2.50 percent of the book value of on-balance sheet assets plus 0.45 percent of off-balance sheet guarantees; and their risk-based capital requirement is based on a stress test of the credit and interest rate risks inherent on and off the balance sheet plus another 30 percent of this sum for management and operations risk.[56] The GSEs tend to hold capital just above these minimums.

Current GSE capital requirements fall well short of those required in the context of the Merton and Perold model to guarantee that the institutions obligations are riskless.[57] First, the GSEs' minimum leverage requirements are set at very low levels, even when an institution can be deemed to be "critically undercapitalized" and potentially subject to conservatorship. Second, these leverage requirements are based on book values of equity capital, rather than more relevant market values. Third, OFHEO evaluates GSE capital adequacy on a quarterly basis, which may

[56] The risk-based standard is based an OFHEO-developed stress test model, the broad parameters of which (including the 30 percent add-on) are dictated by statute.

[57] An upper bound on Fannie Mae's and Freddie Mac's credit standing is AA- which is the "risk to the government" rating that the GSEs receive from Standard and Poor's. This rating incorporates whatever government support or intervention the entity typically enjoys during the normal course of business.

be too long of a time, especially during periods when interest rates are highly variable. Finally, in the event of insolvency, the GSEs are not subject to the Bankruptcy Code or receivership provisions to ensure timely resolution through sale, reorganization, or liquidation. Ironically, taken together, the current GSE capital regime may actually be counter-productive by actually reinforcing investor's belief in an implied federal government guarantee of the institutions' obligations and encourage regulatory forbearance.

Current legislative discussion would create a new housing GSE regulator with greater latitude in setting capital requirements. Nevertheless, capital requirements alone are unlikely to be an effective method of extinguishing the systemic risk posed by Fannie Mae and Freddie Mac. The problem is that the portfolios' exposure to a single risk factor (changes in the term structure of interest rates) implies that a large shock could overwhelm a GSE before its supervisor has time to intervene effectively. Such a failure, in turn, could have systemic implications given the enormous scale of the GSE investment portfolios and the attendant hedging demands.

The systemic concerns could be mitigated if capital requirements were used to markedly shrink the investment portfolios. However, this would require lifting the requirements to at least the level that the marketplace would require of a fully private firm operating with a similar portfolio to essentially guarantee that the firm's obligations were riskless. Doing so would likely require the GSEs to hold some multiple of the amount of capital that they hold today, which would be essentially equivalent to complete privatization. Even if OFHEO were willing to impose such high capital requirements, the GSEs would likely lobby Congress to have the requirements reduced.

Even if capital requirements could be adjusted freely, one should keep in mind that significantly increasing them will create an incentive for the institutions to take-on greater

amounts of risk. Indeed, GSE capital requirements can only be efficient (i.e., non-distorting to institution portfolio composition) if they perfectly mimic the capital that the market would impose in the absence of the implicit guarantee. If not, inefficiencies will manifest themselves as asset allocation is directed away form categories whose capital charges are set too high toward those classes that are where the charges are set too low.

2. User Fees on Liability Issuance.

A possible alternative to capital requirements as a means to limit GSE risk-taking incentives would be to institute user fees against GSE debt issuance. These fees could be a fixed percentage of debt or be on a sliding scale that increased with the volume of debt issuance. Such fees would reduce the incremental net return to portfolio size and presumably reduce the attractiveness of becoming larger. The fee approach may be attractive to some policy makers, since the Treasury (taxpayer) does not currently receive any compensation for the implicit guarantee that it provides. That said, the imposition of a user fee, like the safety-and-soundness regulation of GSEs generally, would almost surely further strengthen of investors' perceptions of an implied federal guarantee of GSE obligations. This, in turn, would have the effect of increasing the debt funding subsidy and an investment portfolio that remained greater than the socially desirable level (although smaller than observed today).

There are, however, additional critical shortcomings with imposing user fees on GSE liability issuance. First, because the surcharge would be based upon size, rather than portfolio risk, the reduction in net return could, like capital requirements, create an incentive for the GSEs to avoid investing in low risk—low return assets and may also, by reducing charter value, create an incentive to reduce hedging.[58] Thus, the user fee proposal could accentuate the moral hazard

[58] Imposing a user fee on issuing liabilities creates the same risk taking incentive as imposing a higher capital to asset ratio. However, higher capital requirements may increase the share of the losses borne by equity holders,

associated with the implicit guarantee on GSE debt and potentially increase taxpayer exposure if GSE management can increase the value of the implicit guarantee by taking on more risk. The only way to offset this incentive would be to gear the user fee to net asset risk, which means that the surcharge would have to mimic the risk premium the market would charge in the absence of the implicit guarantee. In that case, the implementation problems in determining the appropriate incremental surcharges are similar to, but potentially more difficult than, the problems associated with proper application of net asset risk-based capital standards.

3. Portfolio Limits.

Capital requirements and user fees on liability issuance are both indirect and inefficient ways to shrink Fannie Mae's and Freddie Mac's investment portfolios. Hence, much of the current policy discussion has centered on straightforward portfolio limits that could be imposed on either the asset side or the liability side of the GSEs' balance sheets. While the former would require legislation, it appears that the Secretary of the Treasury already has the authority to limit the GSEs' debt issuance.[59]

Portfolio limits would be simpler and more effective than regulatory capital surcharges or user fees on liability issuance since there would be no need to equal or exceed market prices as a way of offsetting the moral hazard or risk shifting incentives associated with the perceived implicit government guarantee. In this way, the kinds of mortgage risks that can be assumed are controlled, regardless of the value of any implicit guarantees. GSEs could only benefit from the subsidy accruing to their respective investment portfolios up to the amount of liabilities used to

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which at least partially offset the incentive to take more risk. A user fee provides no such offset. Moreover, the direct effect of a higher fee is to reduce earnings and, thereby, increase the probability of failure.

[59] According to Rehm (2004), both the Justice Department and Congressional Research Service have concluded that the Secretary of the Treasury has the statutory authority the approve debt sales by Fannie Mae and Freddie Mac.

fund the portfolios. To be sure, GSEs could increase the riskiness of net assets taken on within the portfolio limits; however, the limits will work to dramatically reduce the total amount of risk that the institutions may take. Portfolio limits would also result in a *de facto* limit on the amount of hedging through derivatives markets that would be necessary and thereby contribute to diversifying the exposure of OTC derivatives dealers.

Given the case for portfolio limits, the natural next questions relate to what the optimal limit on portfolio size should be, who should set that limit, and over what time period? While we don't have specific recommendations, we offer the following thoughts.

First, as pointed out by Jaffee (2005), the optimal long-run portfolio GSE size is not zero because it may be desirable to allow the institutions to hold certain mortgages that are awaiting securitization or that can't be easily securitized as part of their market making activities.[60] Further, given the GSEs' public mission, the overall limits could also be refined to consider loans meeting the institutions' statutory housing goals. For example, there may be some affordable housing mortgages that are difficult to securitize for which GSE investment would be socially beneficial. In order to control risk-shifting and the size of the subsidy, there should also be concurrent explicit restrictions on the size of the non-mortgage-related portion of the investment portfolios. Since the justification for such investments are based on liquidity, limits on GSE non-mortgage-related investments should probably be expressed as a fraction of their mortgage-related investments.

Second, there is an important question of whether limits should be embedded in statute or left to regulatory discretion. If by "limits" one simply means how long a GSE should be allowed to hold a mortgage before securitizing it out, then regulatory discretion may be most

[60] Jaffe (2005) also suggests that there may be some liquidity benefits to allow the GSEs to deal in MBS in special circumstances.

appropriate. Congress generally establishes broad policy goals for regulatory agencies and then directs the agencies to set the specific details of regulatory standards. An important reason for this is that agency personnel are better versed in the minutia of specific issues and are better suited to adapt regulatory standards as theory and practice evolves. In this case, Congress could impose a maximum limit on the holding period for mortgage investments that provides more than sufficient time to securitize the assets but is short enough to clearly limit the size of the retained portfolio (say, six months). Then the regulator would set the holding period for mortgages awaiting securitization to jointly minimize the retained portfolio and any adverse effects on the securitization process based on a more detailed market assessment.

If by "limits" one means putting a cap on the overall size of the retained portfolio it may not be best to leave this decision to regulatory discretion. Whether the GSEs can hold a large retained portfolio as their primary business line does not comes down to the "minutia of specific issues" that are better suited to regulatory judgment. This is a fundamental policy question about whether the gains to society from housing GSE investment portfolios are greater than the systemic risks they pose to the financial system and the potential cost to taxpayers. Furthermore, relying on regulatory discretion would create an incentive for the politically powerful GSEs to continuously lobby the regulator and influential members of Congressional oversight committees to bring pressure to weaken portfolio constraints. Given that the regulator would have only Fannie Mae, Freddie Mac, and possibly the Federal Home Loan Bank System as constituents, the regulator could have a tendency to identify with the GSEs and be less apt to hold a hard line.

Regulatory discretion would also essentially put the supervisor into the housing policy business, which might, at times, conflict with its safety and soundness responsibilities.[61]

A middle ground, perhaps, would be for the Congress to spell out the principles of the portfolio limits and require the regulator to promulgate specific regulations. In this case, the Congress would detail how the limits should be crafted, what factors should be considered, and the deadline(s) for the regulator and GSEs to comply with the statutory mandate. Mandatory Congressional review of the limits would also take some of the pressure that might be exerted on the regulator to expand the limits which is more properly a legislative rather than regulatory decision. Even this division of responsibility, however, is potentially subject to intense lobbying when the reviews take place, and is not without its associated risks.

Finally, there is concern about the timing of any transition to regime with portfolio limits, should they be imposed. The issue centers on whether an immediate liquidation of a large fraction of the two portfolios would be unnecessarily disruptive to mortgage markets. One approach to consider is that advocated by Jaffee (2005) who suggests allowing normal run-off to occur (via maturity and prepayment) with the goal of reaching a new equilibrium over the course of a few years.

C. The Need for Effective Monitoring and Compliance

Fixing the weaknesses in the housing GSEs' supervisory system is an important complement to requiring Fannie Mae and Freddie Mac to supply the required amount of net risk capital suggested by the Merton and Perold model. Critical to any of the possible regulatory attempts to limit systemic risk and control GSE risk taking is for the regulator to regularly

[61] Wall and Eisenbeis (1999) provide an in depth discussion of how one should structure regulatory processes when regulators are confronted with conflicting goals. They argue that an explicit decision must be made on whether the conflicts should be externalized or left to internal resolution.

monitor each institutions portfolio structure and to ensure compliance with capital requirements and any portfolio limitations. In addition, the regulator should have expanded prompt corrective action (PCA) authorities to intervene as GSE capital positions deteriorate and also to fully resolve an institutions' insolvency, should it occur.

OFHEO currently monitors the risk positions of Fannie Mae and Freddie Mac through on-site examination and the collection and analysis of financial information. The regulator also has a hybrid PCA system in place built around both minimum leverage requirements and risk based capital requirements. OFHEO's PCA authorities are significantly hampered in two respects. First, even in the unlikely event that OFHEOs risk-based capital requirement perfectly reflects the GSEs underlying condition, an institution is not considered "critically undercapitalized" and subject to conservatorship until its book value capital ratio falls below 1.25 percent of total assets. Such book value measures of capital generally lag market value measures of capital for distressed financial institutions. OFHEO conducts its risk-based capital stress test on a quarterly basis. Second, neither OFHEO nor the courts has the authority to fully resolve an insolvent GSE and instead Congressional action is required. As a result, the current GSE-PCA regime may actually encourage both moral hazard behavior and forbearance, thereby exposing the taxpayer to large losses.

If OFHEO's PCA continues to depend on book values, the trigger points for PCA intervention should be set at higher levels of capital to reflect the measurement error in using book values as proxies for the more relevant market values. Moreover, even if higher book value trigger points are adopted, OFHEO should use fair values as a trigger for increased supervisory scrutiny to further reduce insolvency risk. The GSEs do disclose quarterly estimates of their respective fair value balance sheets to the regulator. However, given the speed with which

interest rate risk may manifest itself, it would be useful for OFHEO to have this information on a much more frequent basis. At first blush, this would seem feasible since the vast majority of Fannie Mae's and Freddie Mac's assets and liabilities are traded in liquid markets.

Combining portfolio limits with higher PCA triggers would likely make GSE-PCA more effective. PCA requires that the supervisors have time to recognize that a problem exists, and to effectively intervene before the financial firm because insolvent. Such a situation is most likely when the risks in the portfolio are small and have a relatively low correlation—as is likely to be the case with the credit risk on residential mortgages inherent in the securitization businesses. However, as we have argued earlier, interest rate risk is likely to be a more important source of losses. Portfolio limits would reduce the size and complexity of the GSEs' interest rate risk management processes and the smaller scope of operations would make the monitoring and measurements of the underlying risks easier. Thus, reducing the interest rate risk associated with the mortgage-oriented portfolios would substantially improve the probability that PCA would work as intended.

Finally, in order to enhance the quality and timeliness of this information, it is critically important that the incentives of the GSEs and their regulator be aligned. To that end, we would recommend that the institutions be explicitly and separately charged for the costs of monitoring.[62] This would create incentives for institutions to consider carefully the benefits of engaging in costly-to-monitor activities and would also provide incentives for the institution to be forthcoming with the regulator in revealing the true nature and values associated with its activities.[63]

[62] Flannery (1991) in considering the role of monitoring costs as part of a deposit insurance system suggests that the institutions be charged explicitly for the time and costs of monitoring the riskiness of financial institutions.

D. A Reduction in Systemic Risk?

One issue raised by the GSEs is that, if their mortgage portfolios were markedly reduced, these assets would simply migrate to the very largest banks, which hold large amounts of residential mortgage assets. Freddie Mac CEO Richard Syron (2005b), for example, argues that a migration of mortgage-related interest rate risk and its management away from the GSEs and toward to large banks may actually increase systemic risk because it would reduce use of the GSE mortgage finance model that links mortgage originators with the capital markets. In response, a number of things come to mind here.

First, it is not at all clear that all divested GSE mortgage-related assets would necessarily migrate to depository institutions. Taken together as of year-end 2003, the 9,182 commercial banks and thrifts held $3.1 trillion in residential mortgage debt (whole loans, lines of credit, and MBS), or about 40.8 percent of the $7.6 trillion market.[64] By contrast, the two GSEs' investment portfolios alone accounted for 20.6 percent. The remaining one-third of residential mortgage debt is held by other types of U.S. and foreign investors like mutual funds, pension funds, and insurance companies.

Second, for those divested GSE assets that would migrate to depository institution portfolios, we would add that these portfolios are generally much more diversified (across asset classes) and have larger equity cushions than GSE portfolios. For example, the book equity-to-assets ratio for the entire mortgage-oriented thrift industry was 11.18 percent as of year-end 2004 -- representing an equity cushion almost three times as large as that maintained by Fannie Mae or Freddie Mac.

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[63] It is critical to minimizing agency problems, however, that the responsible regulator not be solely dependant upon fees to fund the agency. See Eisenbeis and Wall (2002).

[64] In addition, 9,369 credit unions were in operation as of year-end 2003. Their aggregate holdings of residential mortgages and MBS totaled $196 billion.

Third, among the divested GSE assets that do move to depository institution portfolios, it is reasonable to expect that much of this would be absorbed into the largest portfolios. As of year-end 2003, the 50 largest banks and thrifts held $1.7 trillion in mortgage debt; slightly more than the $1.6 controlled together by Fannie Mae and Freddie Mac. Furthermore, the movement of the divested assets to the very largest banks is unlikely to have much effect on those banks' risk-bearing. This is because, as discussed earlier, the GSEs already pass much of their interest risk through these banks in those institutions' role as OTC derivatives dealers to investors.[65]

Finally, reducing the GSEs investment mortgage-oriented portfolios would not hamper use of the GSE mortgage finance model since the securitization business would remain intact. Furthermore, the volume and broad range of asset-backed securities deals in the market today suggest that the originator-capital market link is not one held exclusively by the GSEs – all sorts of financial institutions are capable of this. In the residential mortgage arena alone, so-called "non-agency" MBS accounted for 23 percent of residential MBS outstanding as of year-end 2004 (Inside Mortgage Finance 2005b).

VI. Conclusion

In the wake of recent accounting scandals at both Fannie Mae and Freddie Mac, the Congress has been considering sweeping changes to the GSEs' federal safety-and-soundness and mission oversight. In the course of legislative discussion, a number of important issues have largely been resolved, although one contentious issue remains: whether to limit the institutions' enormous mortgage-oriented investment portfolios.

[65] The only change in the bank's risk management problem if they held the mortgage assets, rather than supplying the interest rate derivatives used to hedge them, is that the banks would face prepayment modeling risk. Shifting the risk of modeling prepayments to banks could increase overall risk if the GSEs have superior models. However, to the extent this is true, similar gains could be obtained without the GSEs having a retained portfolio if Fannie Mae and Freddie Mac sold the output of their models to the banks, as the consumer credit rating agencies and Moody's KMV currently do for credit risk.

This paper has provided a detailed discussion and analysis of the principal arguments both for and against such portfolio limitation. We conclude that there is reason to be seriously concerned about potential future social costs associated with the systemic risk emanating from Fannie Mae and Freddie Mac and that this risk largely arises from the institutions' highly-leveraged investment portfolios. We also find the social benefits of these portfolios to be minimal to non-existent. From these considerations, we conclude that a large reduction in the size of these portfolios would be socially desirable. After reviewing alternatives, we conclude that limits on portfolio size (assets or liabilities) would be the most effective approach to mitigating the systemic risk posed by Fannie Mae and Freddie Mac.

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Table 1
Fannie Mae's and Freddie Mac's Mortgage Investments and Mortgage-Backed Securities (MBS)
Relative to the U.S. Residential Mortgage Market
(Dollars in billions, includes single- and multi-family mortgages)

Year	U.S. Residential Mortgage Market	Fannie Mae		Freddie Mac		Together ($)		Together (% of U.S. Residential Mortgage Market)	
		Mortgage Investments[a]	MBS Outstanding[b]	Mortgage Investments[a]	MBS Outstanding[b]	Mortgage Investments[a]	MBS Outstanding[b]	Mortgage Investments	MBS Outstanding
1980	$1,105	$55.6	$0.0	$5.0	$17.0	$60.6	$17.0	5.5%	1.5%
1985	1,730	94.1	54.6	13.5	99.9	$107.6	$154.5	6.2%	8.9%
1990	2,966	114.1	288.1	21.5	316.4	$135.6	$604.5	4.6%	20.4%
1995	3,784	252.9	513.2	107.7	459.0	$360.6	$972.2	9.5%	25.7%
2000	5,481	607.7	706.7	385.5	576.1	$993.2	$1,282.8	18.1%	23.4%
2001	6,019	706.8	859.0	503.8	653.1	$1,210.6	$1,512.1	20.1%	25.1%
2002	6,731	801.1	1,029.5	589.9	749.3	$1391.0	$1,778.8	20.7%	26.4%
2003	7,583	901.9	1,300.2	660.4	768.9	$1,562.3	$2,069.1	20.6%	27.3%

[a] Includes repurchased mortgage-backed securities.
[b] Excludes own mortgage-backed securities that are held in portfolio

Sources: OFHEO, Federal Reserve, and Freddie Mac.

Table 2: Foreign Holdings of Long-Term Federal Agency Securities

Data as of June 30, 2004; Billions of Dollars

Country	MBS	Long-Term Debt	Total
China	$15	$100	$115
Japan	$34	$66	$100
Belgium	$2	$47	$49
Cayman Islands	$22	$11	$33
Luxembourg	$12	$19	$31
United Kingdom	$10	$13	$23
Germany	$8	$13	$21
Netherlands	$11	$5	$16
Canada	$9*	$6	$15
Switzerland	$5	$7	$12
Country Unknown	$1	$1	$2
Rest of World	$56	$159	$215
Total	$176	$447	$623

Source: U.S. Department of the Treasury, Federal Reserve Bank of New York, and Board of Governors of the Federal Reserve System, 2005, 12).

* Holdings of Federal Agency MBS by Canadian residents is not available in the mid-year 2004 data. This $9 billion figure is for mid-year 2003. Canadian long-term federal agency debt holdings were $7 billion at that time.