



PENN IUR WHITE PAPER

GSEs: Their Viability as Public Utilities

Forthcoming in *Housing Policy Debate*

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Introduction

Despite the devastating economic impact of the COVID-19 crisis, the mortgage market is stable, for now. The resilience of the mortgage market amid economic adversity is a testament to the reforms made in the aftermath of the 2008 financial crisis, the current standards of mortgage underwriting in the U.S., and the prominent role of Fannie Mae, Freddie Mac, and Ginnie Mae. In the face of all-time highs in unemployment, forbearance granted to borrowers through these three entities, and expanded under the CARES Act, has prevented a surge in defaults. Together with intervention by the Federal Reserve Board to keep Treasury rates and MBS spreads low, these efforts have stabilized the mortgage market. Fannie Mae and Freddie Mac, the government sponsored enterprises (GSEs) that are now in conservatorship,¹ are operating as de facto utilities in providing support to the mortgage market. This support contrasts with the private mortgage securitization market that disappeared within weeks of the crisis onset.² The Covid-19 pandemic's private market dislocation puts into stark relief the importance of these entities' market-stabilizing function.

The current Administration is planning to privatize the GSEs, allowing them to retain earnings under a re-proposed capital rule that lays out capital requirements to prepare for an initial private stock offering (IPO). The stated objective of the proposed rule is to ensure sufficient capital to protect taxpayers and provide the stability and liquidity to withstand future financial crises. Treasury Secretary Mnuchin has also made clear that housing finance reform must maintain access to the 30-year fixed-rate mortgage.³ Hence, there is some consensus and clarity about the future status and role of the GSEs.⁴

There are, however, substantial unresolved issues. Can the GSEs operate as private for-profit entities and serve a public mission? For either purely private or quasi-privately/publicly owned entities, are revenues sufficient to fund capital and pay for costs, including those that are mission related? The entities' mission according to their charters is to marshal a steady supply of mortgage credit for a broad swath of homebuyers, including underserved borrowers, and to maintain access to credit markets in times of stress. Foremost among the unresolved issues in this dual mandate is the existential question: will these entities be able both to be profitable enough to pay for sufficient capital to protect the taxpayer and to do so at mortgage rates low enough to maintain broad access to the 30-year fixed-rate mortgage?

In a utility model, the goal of regulatory design would be to structure these entities so that they could in fact serve their public mission while having sufficient capital in place to protect the taxpayer. The question is, can a utility model, with capitalized entities, whether purely privately or quasi-privately/publicly owned, be the basis for a safe-and-sound and accessible housing finance system. In short, is a utility model viable?

Here, we consider this question. We discuss the past failures of competitive housing finance markets to deliver financial stability and examine the viability of a utility regulatory framework as a market design to maintain stability in financial markets that offer the 30-year fixed mortgage.

Section 1 of the paper provides background on the utility model as a framework for regulating the GSEs. Section 2 examines the industrial organization of housing finance, the GSEs' market share, and the extent of their market pricing power. Section 3 analyzes the impact of a utility framework on the entities' cost of capital and ability to pay out dividends in good times and bad. Section 4 discusses implementation and governance for a utility model. Section 5 addresses the capital rule and its impact on the viability of the GSEs.

1 President George W. Bush signed Public Law 110-289, the Housing and Economic Recovery Act of 2008 (HERA). On July 30, 2008, establishing FHFA and granting the agency the authority to place the GSEs into conservatorship (which occurred on September 6, 2008).

2 The Federal Reserve purchased GSE but not private label MBS to stabilize rates (Goodman, et al. 2020).

3 Treasury Secretary Steven Mnuchin expressed his belief that "the 30-year mortgage has been a fundamental part of our mortgage finance for as long as people can possibly remember." (<https://money.cnn.com/2017/05/18/news/economy/mnuchin-housing-finance-trump/index.html>)

4 Alternative models for GSE reform include a government owned corporation, or a hybrid of public and private shareholder ownership. See Parrott, J. et al. (2016) and DeMarco, E. and Bright, M. (2016). The proposed capital rule recommends that Congress charter additional entities to compete with the GSEs.

Section 1: The Utility Model: Background

In contemplation of the ending of conservatorship, researchers have proposed a range of GSE reform alternatives, from the return to their former status as private entities, with or without additional competitors, to government ownership. In 2019, NAR proposed a plan for housing finance reform in which the Enterprises would transition into privately run market utilities, or more specifically, systemically important financial market utilities (SIFMUs).⁵ Retaining their mission and charters from Congress, the primary responsibility of the Enterprises as utilities would be to manage the infrastructure of the conventional conforming secondary mortgage market, including providing transparency through standardization and information on the market. This infrastructure would maximize standardization and minimize counterparty risk, enabling private capital to price credit risk and interest rate risk through competitive markets.

As the 2008 financial crisis demonstrated, the housing finance system is prone to boom and bust cycles. In the financial crisis, a race to the bottom for market share led to a decline in underwriting standards and an underpricing of risk (Levitin and Wachter, 2020). Markets failed to price default risk, in part due to the complexity and non-transparency of mortgage backed securitization. The deterioration of lending standards, and the lack of information on this fueled a housing price bubble and an inevitable bust. The Enterprises were far from the worst offenders, and, in the debacle, they helped rescue the market. Nonetheless, the Enterprises' practices contributed to systemic risk. Hence the need for regulatory oversight.

The purpose of the SIFMU designation, as proposed by Cooperstein et al. (2019), is to provide this oversight and to support transparent markets for the trading of mortgage interest rate and default risks. This differs from traditional utility regulation. SIFMU status does not require elaborate rate setting by a regulator or board to determine investors' required returns as, for example, in the case of electric utilities. Private markets price Enterprise credit risk and interest rate risk, which makes it easier to determine appropriate guarantee fees and mortgage rates. Private markets also determine the equity cost of capital. Essentially these three costs set the required levels of guarantee fees.

The FHFA would need to establish a band of returns for SIFMU investors with a reasonable cap and floor on GSE guarantee fees based on the market-derived information gleaned from MBS and CRT markets. The pricing floor would prevent the SIFMU from underpricing competitors (with dangerously low levels of implied capital resulting) in order to gain market share. Conversely, the GSEs could raise guarantee fees, for example, during a crisis, to exploit decreased competition as they benefit from the Treasury's debt support and potentially asset purchase programs from the Federal Reserve, as is the case now. In theory, the GSEs' charter duty to support liquidity for mortgage investment in a crisis would curb such behavior, but a SIFMU status and new powers provided by congress would clarify this duty and power of FHFA to set a reasonable floor and cap on rates.

Private markets currently invest in about 90 percent of the interest rate risk and 50 percent of the credit risk of the GSEs (Goodman, L. et al. 2019). As discussed below, current guarantee fee levels cover payments to private capital markets to invest in asset-backed debt, expected losses, and the shadow equity that the GSEs estimate would be required to fund default losses and survive stress events like the 2008 financial crisis. The key risks to the GSEs and to the taxpayer are interest rate risk and default risk, and private markets price both of these currently.

In the market for credit risk transfers (CRTs) and reinsurance, hundreds of investors compete to price default risk (Wachter, 2018). Similarly, the TBA market trades and prices interest rate risk, which is critical to lowering

⁵ The FSOC designates SIFMUs under Title VII of the Dodd-Frank Act. They are distinct from Systemically Important Financial Institutions (SIFI), also designated by the DFA. SIFMUs are entities that, through their operations, are critical to the continued functioning of capital markets. Specifically, the FSOC decides to designate an entity as a SIFMU based on its determination that a failure or disruption to the financial market utility (FMU) increases the risk of systemic liquidity or credit problems.

the cost of the 30-year fixed mortgage (Vickrey and Wright, 2014). The scale economies of these markets lowers the costs to the borrower of interest rate risk and default risk. Uniform mortgage standards allow the TBA market to trade interest rate risk. These standards together with national risk pooling help to minimize expected default risk (Pavlov et al., 2016). The key to the relatively low-cost financing of the 30-year fixed-rate mortgage is the separate pricing of interest rate risk and the trading of interest rate and default risk in two separate markets.

Through economies of scale, minimized manufacture risk, and these submarkets, the GSEs obtain a natural cost advantage in insuring the 30-year fixed-rate mortgage. The implicit government guarantee, now explicit in conservatorship, reduces tail risk in the MBS market in periods of stress and lowers funding costs overall. Together with these advantages, this lowers the cost of the 30-year fixed-rate mortgage and enables expansion of markets for mortgage lending and homeownership.

Crucial objectives of regulating these entities as utilities are to assure the operation of these submarkets and to assure that the GSEs have sufficient capital to support mortgage lending through the cycle. Hence, beyond the responsibility to maintain these submarkets, the first significant difference between the Enterprises as privately capitalized, for-profit firms (recap and release, as it is termed) and as SIFMUs is the setting of guarantee fees (g-fees) over the cycle. Doing so eliminates problematic tendencies inherent to privatizing the GSEs: on one hand, the tendency to cut g-fees or standards to win market share in boom times causing systemic risk, and, on the other hand, raising g-fees in a crisis undermining their public policy mission to maintain stable markets.

The second significant difference between recap and release and the utility model concerns the dispersal of profits. Some of the excess equity returns earned in booming housing markets would be reserved for periods of contraction and invested to support the public mission and the Enterprises' countercyclical role, as determined by the regulator for safety and soundness over the cycle. Only if the GSEs as SIFMUs build these capital buffers will they be able to ensure orderly markets during times of stress and improve their ability to expand credit to well underwritten borrowers in underserved communities.

Generally, g-fees would be set to be in line with market pricing of risk as revealed through the market pricing of credit risk transfers, except in a crisis when CRTs may be subject to excess volatility and illiquidity. The Enterprises can hold the risk until spreads stabilize so that g-fees can be set to price risk over the cycle and avoid downward spirals in home prices due to surging mortgage rates that can cause housing prices to fall and defaults to rise, leading to even higher CRT rates and depressed home prices during a stress event.⁶ To support the rest of their mission, the Enterprises could accept a lower return on mission-related lending to support a national market and underserved communities, with dividends paid to equity investors at market rates of return, with a wedge of excess returns reserved for adverse periods and supporting the public mission.

The question remains, however, whether there is an equilibrium in which the GSEs can support the mission and the market for the 30-year fixed-rate mortgage over the long run and generate market returns for equity investors. Is the g-fee level that mortgage borrowers are willing to pay sufficient to fund the GSEs' costs, including the costs of sufficient capital, to cover losses in good times and bad? We address this in Section 3. We turn in the following section to the question of whether scale economies translate into market pricing power over the cycle.

Section 2: The Market Structure - Are the GSEs a Duopoly?

Congress chartered Fannie Mae in 1938 to provide liquidity for banks by securitizing loans off their balance sheets, while Freddie Mac was set up in 1970, originally to support the same mission for Savings and Loans.

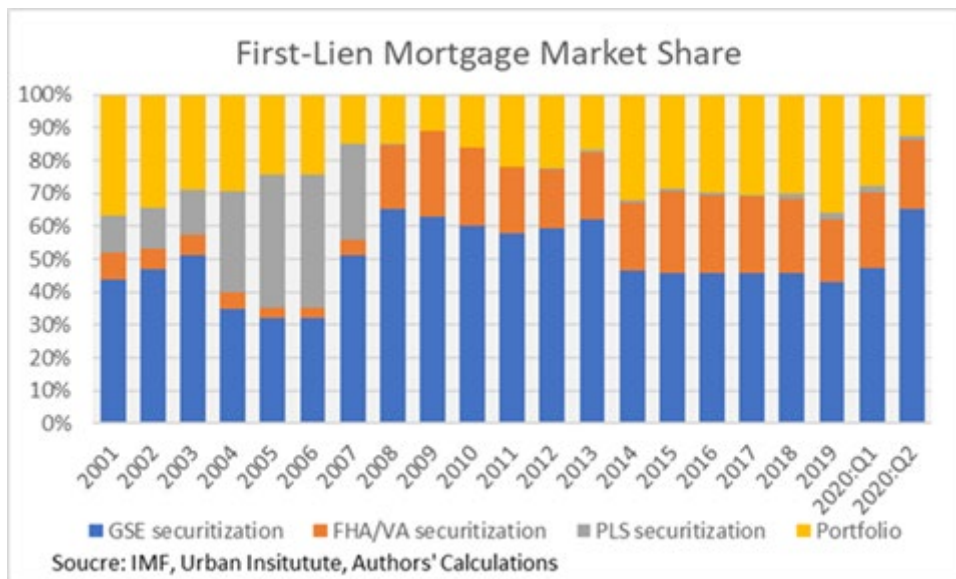
⁶ For example, CRT markets are impacted by natural disasters and, recently, by COVID-19, with mortgage forbearance threatening losses to holders of CRT under the terms of technical default. For a discussion of disaster impact, see Gete, P., et al. (2020).

The Enterprises as a sector compete with banks and other portfolio lenders, FHA and VA, and PLS issuers in the market to finance mortgages and, as shown by the g-fee decline to 20 basis points prior to the Global Financial Crisis, they also have competed with each other. The GSEs are a duopoly if we define the market as that for government guaranteed mortgages. However, evaluating their share of the larger market in which they operate, the answer to whether they are a duopoly is not obvious.

If the GSEs are duopolies, all that is needed is rate regulation; but as this section shows, they are better defined as contested duopolies. Their market share has and will vary with the state of the market and regulation. We show in this section how the structuring of the market matters for the GSEs' viability as public utilities.

From 1995 through 2005, Enterprise-combined market share averaged 40 percent and was at similar levels in the early 1990s (CBO, December 2014). This fell to 32 percent in 2005 during the height of the private label subprime market, as shown in Table 1. The decline in market share was due to an increased volume of affordable product, often via teaser rate adjustable-rate mortgages, lower lending standards, and underpriced risk (Levitin et al. 2020). Defaults and losses spiked, especially, in the private label mortgage-backed security sector, which backed most of these loans.⁷ With the implosion of the private label market in 2007, Enterprise market share increased and peaked in 2009 at 73 percent, amid the Great Recession. The GSE share has been in the mid- to high 40s since 2014 with guarantee fees having risen from 22 bps in 2009 to 55 in 2018.⁸ Similarly, private label outcompeted FHA guaranteed loans, with the FHA share declining to less than 3% and then rising sharply to a peak of 19.7% in 2009, and declining to 10.2%. With the onset of Covid-19, the GSEs' and FHA's market share has increased again. It is evident that the GSEs' market share, as that of FHA, is contestable depending on capital markets' acceptance of alternative sources of mortgage finance and the regulatory environment.

TABLE 1:
Market Share



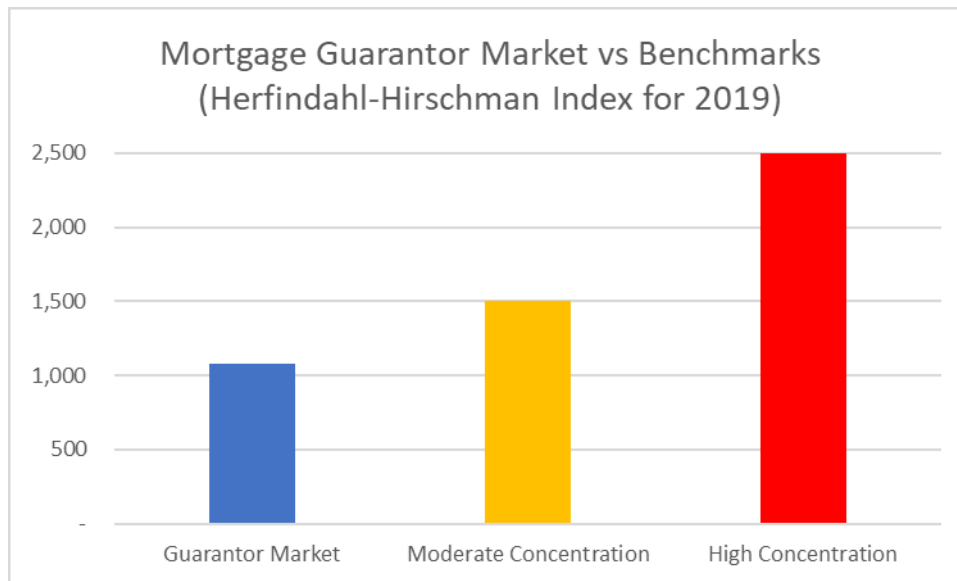
7 Approximately 50% of losses were borne by PLS and 25% by depositories, with losses on the GSE portfolios at 14%. See Zandi, M. et al. (2017). About half of the GSE losses were due to GSE expansion into the Alt-A market; with price declines and job losses even well underwritten mortgages went into default (Federal Housing Finance Agency (2012). See Conservator's Report on the Enterprises Financial Performance, https://www.fhfa.gov/AboutUs/Reports/ReportDocuments/2012-4Q_ConservatorsRpt_508.pdf), and

8 Federal Housing Finance Agency. "Fannie Mae and Freddie Mac Single Family Guarantee Fees in 2013". December, 2014, and "Fannie Mae and Freddie Mac Single Family Guarantee Fees in 2018" December, 2019

Enterprise market share is cited frequently as evidence of the GSEs' duopoly status. However, conventional measures of market concentration such as the Herfindahl index do not support this, as shown in Table 2. We estimate the Herfindahl–Hirschman Index (HHI)⁹ for the guarantor market to be roughly 1,075, well below 1,500 to 2,500, which the Department of Justice (DOJ) cites as moderate concentration. The DOJ cites high concentration as an HHI above 2,500.¹⁰ It is tempting to argue that at nearly 43 percent of the market in 2019, the Enterprises' pricing power must be significant. The GSEs' pricing under conservatorship has more than doubled guarantee fees without a loss in market share since 2013, which is also suggestive of market power. The higher fees support implied required capital levels as detailed above. The higher fee structure also prevents the GSEs from lowering fees to increase their market share. However, the question remains whether the GSEs could raise their g-fees substantially more without losing market share.

TABLE 2:

Mortgage Guarantor Market versus Benchmarks



G-fees are now at levels approximately equal to implied returns from competitive markets for CRT and reinsurance, and thus, the current level of g-fees now approximates what private markets would require for similar product. At the same time, the GSEs charge less than the private market would for mission-related lending, using internally generated profits to cross-subsidize the insuring of these loans.

In other words, the GSEs are paying a return for credit risk that the private market requires, which implies that the private market could offer such risk insurance to competing entities. What would be the impact of raising g-fees further? Monopolies and oligopolies with market power can price above their marginal cost because of entry barriers and earn excess profits at the expense of borrowers. Demand is inelastic for monopolies because

⁹ The HHI index is calculated as the sum of the squared market shares of all market participants. Dollar volume estimates for Fannie Mae and Freddie Mac and the top 25 PLS issuers came from Inside Mortgage Finance (IMF), while data for FHA and VA came from the agencies. RHS' dollar volume was calculated as the residual of the FHA and VA figures subtracted from the IMF's estimates for total Ginnie Mae volume. The estimates for portfolio guarantors (banks, credit unions, REITs, etc.) were derived from the home mortgage disclosure act database MDA data based on tabulations of entities not selling their first-lien mortgages. All figures are for 2019. Some analysts estimate the market shares based on aggregate data for the GSEs, GNMA, PLS, and a residual for portfolio, but that approach would not allow for the HHI used here.

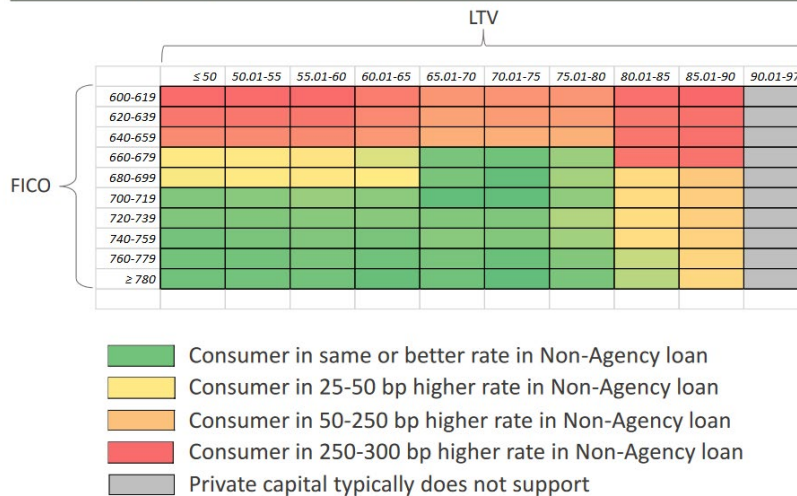
¹⁰ If this exercise was extended to measure the degree of risk exposure held by different parties, including the CRT, PMI, reinsurance, or the Veterans Administration's risk sharing program, the degree of concentration would be lower. However, the Enterprises set the guarantee fee charged to consumers, so the current shown here is more appropriate. Freddie Mac notes on its webpage for investors in CRT that more than 250 investors are active in the space, evidence of a deep and competitive market. See <https://crt.freddie.com/about-crt.aspx>

of the lack of alternatives except at significantly higher prices, so market share is insensitive to price rises to that point. However, raising g-fees would likely drive GSE volumes to either the FHA or portfolios indicating a lack of monopolistic pricing power.

The GSE market share prior to Covid-19, some argue, can be attributed in part to the ability-to-repay rule (ATR) and “patch” qualified mortgage (QM) exemption to it, along with the Qualified Residential Mortgage (QRM) rule. However, the patch was granted in recognition of the GSEs’ strong underwriting practices and the standard setting function of their regulator, neither of which will end when the patch expires. The CFPB’s recent proposal errs by assuming that “patch” status confers liquidity and not the GSEs’ robust standards; thus the proposal opens the door for a delusion of the QM standard if investors migrate away from GSE production to lower quality QM underwriting.¹¹ In addition, in the wake of the subprime crisis and again in the midst of Covid-19, the Federal Reserve Board provided assistance to the mortgage market in the form of purchases of GSE MBS, besides lowering Treasury rates. The decline in GSE MBS and mortgage rates increased their market share in the second quarter of 2020 to 65%.^{12 13.}

TABLE 3:
Pricing Power

GSE versus Redwood Rate Comparison: Non-Agency “QM” & Agency “QM”



Disclaimer: GSE versus Redwood rate comparisons and agency production distributions are based on aggregated observations, estimates, and assumptions, including observations of residential mortgage loan market pricing, estimates of loan pricing derived from Fannie Mae and Freddie Mac “TBA” securities, and other industry data. Pricing inputs and loan characteristics were obtained, estimated, or derived from sources which we believe are reliable, but we do not warrant or guarantee the completeness or accuracy of this information. This information involves many assumptions and limitations, and you are cautioned not to give undue weight to these estimates. The information displayed regarding Redwood is not a solicitation or an offer to buy or sell securities and is not investment advice or a recommendation to purchase or sell any security.

11 The CFPB has proposed removing the patch. See McCoy and Wachter (2020 a and b).
 12 In response to the subprime crisis, the Dodd Frank Act set stringent requirements for a general QM standard, requiring among other conditions that debt-to-income ratios not exceed 43%. However, the CFPB was concerned that lenders and investors might have difficulties adapting to the new environment and created a temporary “patch” which made all mortgages eligible for GSE backing QM. QM loans provide protection to lenders against borrower claims in default, while the QRM rule made investors responsible for originators’ errors. Thus, the QM “patch” makes all GSE loans QM loans and very attractive to both originators and investors, which supports the GSEs’ market share. In fact, a rise in the g-fee for refinancing, imposed to cover Covid-19 related losses, which was enacted and then postponed until the end of 2020, appears likely to have done little to decrease this market share. <https://www.fhfa.gov/Media/PublicAffairs/Pages/Adverse-Market-Refinance-Fee-Implementation-Now-December-1.aspx>
 13 At the onset of the crisis in late March, the Fed announced its intention to buy unlimited amounts of Treasuries and Agency MBS – see <https://www.housingwire.com/articles/fed-announces-unlimited-purchases-of-mbs-and-treasuries-adds-multifamily-mortgages/>

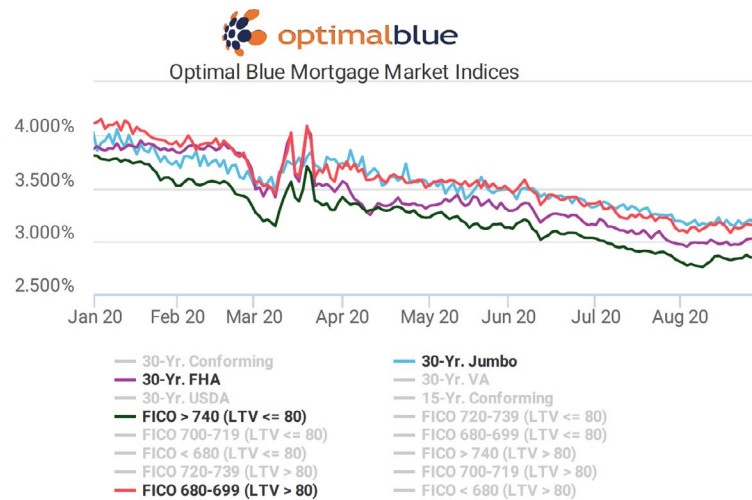


However, in a more competitive setting, if the Enterprises were to raise their guarantee fees, this would result in a likely shift of borrowers to the FHA, PLS, and portfolio sectors, with a consequent decrease in market share, economies of scale, and a decrease in the ability to expand the market through cross-subsidization.

When FHA reduced its annual mortgage insurance premium by 50 basis points in January of 2015, its market share surged from 33% in 2014 to 40% in 2015. Likewise, the PMIs cut premiums for less risky borrowers and raised them for more risky borrowers in April of 2016, resulting in a change of mix to the GSEs and FHA.¹⁴ As depicted above in Table 3, PLS issuers have also demonstrated their ability to compete for the lower risk portion of the GSEs market.¹⁵ This behavior is typical of contestable markets, not of an oligopoly or duopoly, with high “moats” precluding market contests.

This suggests that the scale of the Enterprises, along with federal backing in the case of tail risk, is crucial to achieving the mission because they need adequate scale to reduce their costs and enable cross-subsidies for mission-related insuring. Unlike private firms, the Enterprises have a federally mandated mission that is not profit-maximizing in exchange for their federal franchise. GSEs are required to offer credit in all markets at all times, supporting mortgage secondary markets, and expand access for mortgage credit at lower rates of return. These obligations are only possible to the extent of the value of the federal franchise and the economies of scale it induces. Optimal Blue data show that recent Jumbo mortgage rates (prior to Covid-19) are within 20 basis points of GSE mortgage pricing for low-risk loans, as shown in Figure 2. If g-fees and therefore mortgage rates were more than 20 basis points higher, jumbo loans would be competitive with these GSE loans. If forced to raise g-fees for low-risk borrowers, the GSEs could lose these borrowers to a cheaper source of funding, undermining their ability to support their charter duties through internal cross-subsidization.

FIGURE 1



In the following empirical analysis, we turn to the question of whether and under what circumstances the current level of g-fees is sufficient to provide a market required rate of return, with or without a utility structure.

¹⁴ Kaul, Karen. "Why the surge in PMI activity won't force FHA to cut premiums anytime soon". Urban Institute. September 14, 2016. Or Bhutta, Neil and Ringo, Daniel "The Effect of Interest Rates on Home Buying: Evidence from a Discontinuity in Mortgage Insurance Premiums". Federal Reserve Board, Washington, D.C. 2017-086

¹⁵ Redwood Trust. "Perspectives on Private Capital and the "QM Patch"" May 2019.

Section 3: The Cost of Capital and Viability of the GSEs

A utility structure is desirable because it may result in a lower cost of capital. This is important because the largest component of the GSEs' costs is the cost of capital. The required rate of return commanded by regulated utilities is generally lower than that of other entities given utilities' more stable and predictable earnings. The cost of capital is higher if earnings are less stable, as they would be with more competitors.

G-fees and the associated loan level pricing adjustments (LLPAs) must cover the cost of holding capital, as well as all other costs. Here we discuss the question of whether g-fees at the current level are sufficient to cover the costs of holding capital. We assume that the Enterprises need sufficient capital to withstand losses at the level of the financial crisis. Zandi et al. estimate these losses to be about 1.85% of their book of business (Zandi, M. et al. 2017). We then estimate the likely distribution of these losses over time to determine what levels of capital are necessary to provide sufficient capital to cover the payout of losses over most predicted states of the economy.

As a simplified example of the impact of the cost of funds and required amount of capital on the viability of the Enterprises, consider a single enterprise with a \$5 trillion pool of mortgages (the Enterprises currently guarantee a pool of about \$5.5 trillion of mortgages). This enterprise holds 2% of capital (to cover the 1.85% of losses during the financial crisis) or \$100 billion and has a required return of 10% (annual funding cost of return requirement of \$10 billion) on these capital holdings of \$100 billion (with an assumed 4% growth in dividends over time). The \$5 trillion pool of mortgages has an annual average loss rate of 0.10%¹⁶ translating to a \$5 billion annual average loss and an overhead of 8 basis points (Cooperstein, 2019) totaling \$4 billion. Currently the GSEs are required to pay the Treasury ten basis points, or \$5 billion.¹⁷ These costs sum to \$24 billion. A 50 basis point g-fee would generate \$25 billion in revenues and would cover these costs.

We use the above case to illustrate the impact of requiring the Enterprise to hold excess capital. For example, if FHFA requires the enterprises to hold 4% capital, the minimum called for in the FHFA's newly proposed capital rule,¹⁸ at a 10% return, the enterprise would need to return an extra \$10 billion to investors annually. As such, the enterprises would need to increase the g-fee by 20 basis points to meet the incremental capital costs. While the current g-fee structure cannot support this now without a significant rise in g-fees, a 4% capitalization level is possible through earnings growth and retention over time, as discussed below.

The GSEs currently charge a g-fee closer to 55 basis points. This enables them to slightly more than break even under an assumed 9% shadow required rate of return (12% before taxes) holding an implied 3% of their \$5 trillion pool of mortgages or \$150 billion in shadow capital,¹⁹ with \$13.5 billion of required payments to (shadow) investors, together with the other costs.

A 12 percent cost of funds (COF) is reasonable for firms in competitive markets but is probably excessive for limited franchises. Utility franchises in markets where competition is limited can more reliably price for adequate returns and have much lower stock price volatility than members of the S&P 500. This translates into lower required returns for equity investors.

How much difference would a utility structure make in the cost of funds versus the cost of funds assumed in the setting of current g-fees? Answering this question requires knowing three things: the amount of credit losses

¹⁶ The cumulative default rate for the life of the loan is 1.5%. Average losses for the life of the loan are .50%; annualized this is 10 basis points or \$5 billion. See Cooperstein and Stegman (October 2019).

¹⁷ The tax may be double a fairly priced catastrophe insurance fee. See Cooperstein and Stegman, *op. cit.*

¹⁸ The 4% is a minimum leverage ratio. See Enterprise Regulatory Capital Framework, 85 Fed. Reg. 39274 (proposed June 30, 2020) (to be codified at 12 CFR pt. 1240)

¹⁹ A cost of funds is implied by the current g-fee structure, annual costs, and the 3% shadow capital holdings that the GSEs are assuming. The FHFA's LLPAs across the single-family business are balanced (a net zero subsidy) with an implied pre-tax cost of funds of 12 percent. Stegman and Cooperstein, *op. cit.*



the GSEs are likely to experience under stress, which determines the amount of capital that is required; the cost of funds implied by the current GSE pricing structure, and the cost of funds implied by a regulated utility.

The return on capital that Enterprise investors require depends on the volatility of their future returns and losses and therefore future liabilities. This return is market-determined but influenced by policy. For instance, a limited market franchise granted by the government will attract equity at lower required returns than firms that have to fight other competitors for share and profits.

Duff and Phelps calculate large cap equity cost as normalized 20-year Treasury rates of 3.5 to 4% from January 2008 to December 2018, plus a risk premium that ranges from 5 to 6% over this same period for an equity cost of 8.5 to 10%. Duff and Phelps estimate that utilities historically have lower equity costs ranging from 5 to 7%.²⁰

While we will not know what return investors on privatized GSEs will require until an IPO is issued, the required returns under a SIFMU structure could be lower than the 12% currently assumed by the GSEs.²¹ This suggests that a SIFMU pricing between the private market and FHA could generate profits in excess of those needed to support optimized utility returns, whether they be 12%, 9%, or even as low as 6%. This excess profit could be used in a number of ways to support the enterprises' public mission, including reducing fees, expanding duty to serve activities, or infrastructure investment. To illustrate this point, the Enterprises could adjust the current pricing structure to maintain g-fees and reduce LLPAs.²² This is but one potential use of the excess profits generated by a well-structured utility.

The cost of capital depends on the required rate of return *and* the amount of capital necessary to hold to absorb losses. The question of what is a sufficient return for investors given different levels of equity requires evaluating the volatility of returns across a variety of scenarios, including a capital buffer and thus a buffered yield to ensure the GSEs have the extra liquidity to continue securitizing through business cycles.²³ We show the results of the exercise in Figure 1. We first model the distribution of potential returns for investors using the current GSE portfolio and AD&Co's Capital Charge Method. Recall that AD&Co's modeled stress losses align with FHFA's published results and are regularly benchmarked to CRT prices.²⁴ Next, equity capital is raised to 2% (composed of a 1.0% risk-based capital requirement and a 1.0% capital buffer), 3%, and 4% and the exercise is replicated. Returns are based on the assumed levels of capital, a guarantee fee fixed at the start of the simulation, and the realized losses for each scenario. Finally, the same distribution is created for a 4% level of capital and 12% ROE.

Figure 1 depicts returns for about 95 percent of the total outcomes and shows that returns are positive about 98 percent of the time (see Appendix table A.2). The distribution of returns when a 1% buffer is added to the 1% capital is displayed in green and demonstrates that investors would receive a positive return in nearly all scenarios. A similar distribution is drawn light blue for a 6% cost of funds and the current 3% implied capitalization, while the yellow line depicts a utility style 6% cost of funds with 4% capital. This stability of dividends should

²⁰ Return reflects risk and the return for a particular investment is derived from the capital asset pricing model and stated as a "beta" as measured in proportion to market risk. For example, a beta of one indicates that the investment is as risky as the market. Duff and Phelps- and Bloomberg-collected data on S&P and utility returns suggest that the beta for utilities is half that of large caps. Hence the 5-7% estimate (e.g. 3.5-4% + .5*5-6%). <https://www.duffandphelps.com/-/media/assets/pdfs/publications/valuation/coc/erp-risk-free-rates-jan-2008-present.ashx?la=en&hash=657FB892EB3EF4D7003993F90EAB8BD7FC83AB7A>

²¹ Investors in SIFI banks may also be investors in the GSEs. Some have posited that the GSEs would need to offer an even higher return than SIFI banks provide to investors as the GSEs would be rate of return regulated and are monolines. While we will not know the required yield until execution, the risk of the GSEs as monolines is contained by their required dispersion of risk into CRT and mortgage insurance markets. Moreover, they are regulated for over the cycle returns, which dampens volatility and enhances investor protection.

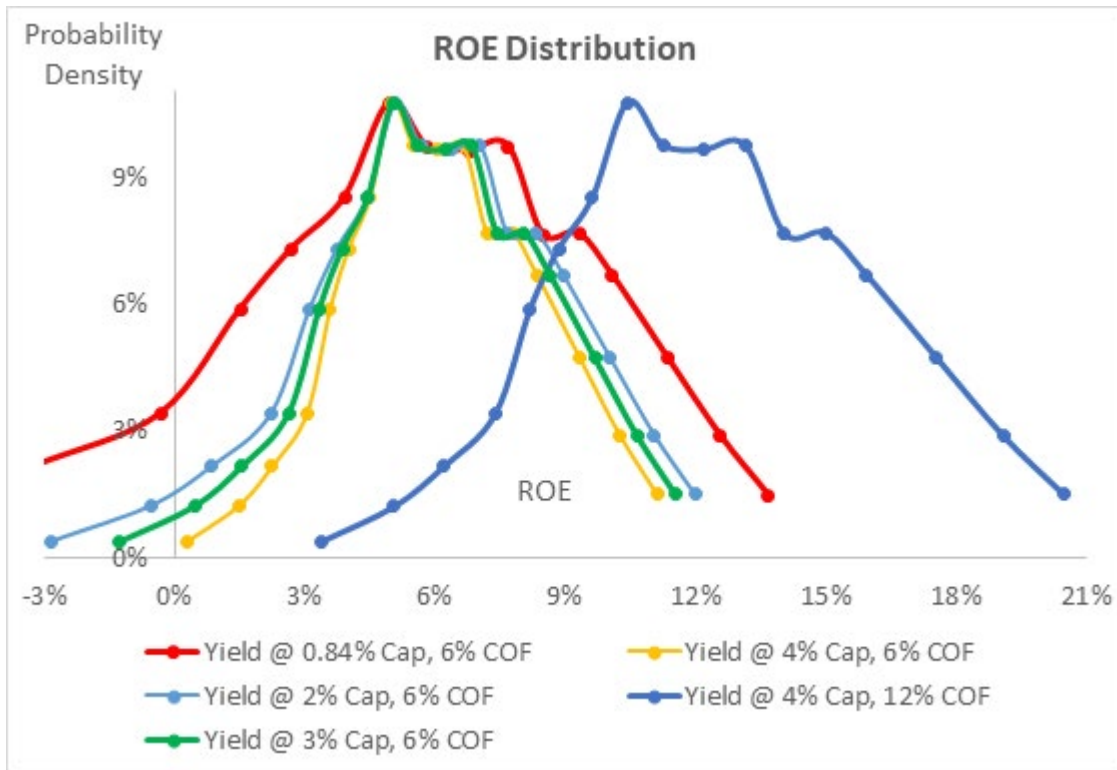
²² Appendix table A.1. shows the decline in LLPAs using a 6% rather than a 12% cost of funds.

²³ A higher capital base reduces the volatility of returns. The optimal level of capital is that which is necessary to cover the losses over the life of the loan." See Morgan et al.(2020) for empirical results that show that requiring capital in excess of this increases risk taking. **Also see** Levin, A. (January 2008). Valuation Modeling Lessons of 2007. Andrew Davidson & Co., Inc

²⁴ Previous work has assessed stress losses. Andrew Davidson and Company's (AD&Co) modeling (Levin, Storms, & Gao, 2018; Levin 2008; Levin, 2009), CRT market pricing, and FHFA projections all generate consistently estimated losses for the Federal Reserve's Severely Adverse Scenario for Comprehensive Capital Analysis and Review (CCAR). The CCAR framework is useful because it provides a consistent method to evaluate the necessary mortgage capital for banks and the GSEs. Both AD&Co and FHFA estimate losses under stress for the single-family portfolio at about 2 percent, similar to stress losses estimated by Zandi et al.

help to entice private investors at utility-like returns. However, as shown in red, raising capital to 4% provides a minimum return of 6% in the extreme event, a high return when other markets are likely collapsing.

FIGURE 2



Section 4: Utility Oversight and Governance

The design of utility regulation influences the stability of returns. An empowered FHFA, with strong regulatory oversight of the GSEs as SIFMUs, would be helpful in supporting return stability. The FHFA would need to provide high-level direction allowing the Enterprises to decide how best to achieve societal objectives, monitoring their progress and sharing information with the markets so that the markets and the regulator can respond to curb bad behavior. In sharing information with the market on the portfolios and its risks, as well as on the operations of the Enterprises and their counterparties, the regulator would help assure that agents in the submarkets for risk can respond to bad behavior by the Enterprises, rewarding and punishing them as a free market would.

The FHFA would not stand alone as a regulator. The SIFMU regulatory construct would establish a backup structure to prevent the regulator from failing. The Financial Stability Oversight Counsel (FSOC) designates SIFMUs and also a secondary regulator for SIFMUs in case the primary regulator was to fail. The FHFA would remain the primary regulator with a backup in the Federal Reserve. This structure helps to prevent the issue of regulatory capture and political influence, safeguarding both the public mission and investor returns.

Forging an effective and enduring pathway to housing finance reform requires efficient and intentional oversight. Governance of the Enterprises must align the interests of investors, regulators, debt holders, taxpayers and borrowers to serve the broader mission, as stated in the Enterprises' charters. *Section 301* of both Fannie Mae and Freddie Mac's charter acts states that:

“The Congress declares that the purposes of this title are to establish secondary market facilities for residential mortgages, to provide that the operations thereof shall be financed by private capital to the maximum extent feasible, and to authorize such facilities 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;*
- 4. promote access to mortgage credit throughout the Nation (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.”²⁵*

To enable this mission, the effort to reform the GSEs should align the interests of taxpayers, homebuyers, and investors, and those efforts may need to include both Congress and the Administration. To accomplish this alignment, establishing regulatory oversight of the Enterprises as SIFMUs is optimal with Congress acting to accomplish this in concert with FSOC.

If privatized, there must be agreement on the regulatory structure under which the entities will operate after sufficient capital is in place. This is to assure that the taxpayer is not at risk and that equity investors understand their obligations (which will affect their expected ROE) in the future system. It is important to codify a consensus agreement on the role of the GSEs going forward to advance iteratively towards a utility model with rules put forth by FHFA, as they recapitalize, that are consistent with this framework. These rules would document the utility requirements, with confirming Congressional (and later FSOC) codification, as the GSEs gradually attract a new reserve of investors with long-term return expectations, understanding the new rules of these entities. Even if this does not fully translate into a utility framework with Congressional action, the move to clarify and codify the regulator’s role in containing the GSEs’ risk will bond the Enterprises to a better regulatory framework, an improvement over the uncertainty of the status quo.

The Administration has stated that in the absence of action by Congress, it would proceed on its own and take the necessary steps to privatize the Enterprises. To do so, the FHFA and Treasury amended the preferred stock purchase agreements (PSPA) in September of 2019,²⁶ to allow the Enterprises to retain earnings and build capital, and stated that they would allow them to exit conservatorship and enable the Enterprises to raise capital through the issuance of an IPO.²⁷ FHFA (as discussed above) re-proposed a capital rule in advance of this to elicit public comments.²⁸ A capital rule for the GSEs should reflect a resilient framework that requires stable earnings and a counter-cyclical capital buffer, although the recent proposal falls short, as further discussed below.²⁹

²⁵ Federal National Mortgage Association Charter Act, Title III of National Housing Act, 12 U.S.C. 1716 *et seq.*, amended May 24, 2018, available at https://www.fhfa.gov/SupervisionRegulation/FannieMaeandFreddieMac/Documents/Fannie_Mae_charter_Act_N508.pdf Federal Home Loan Mortgage Corporation Act, Public Law No. 91-351, 84 Stat. 450, amended July 21, 2010, available at <http://www.freddiemac.com/governance/pdf/charter.pdf>

²⁶ <https://www.fhfa.gov/Media/PublicAffairs/Pages/Statement-from-FHFA-Director-Mark-Calabria-on-Letter-Agreement-with-Treasury-to-Increase-Fannie-Freddie-Capital-Retention.aspx>

²⁷ <https://www.foxbusiness.com/markets/fannie-freddie-ipo-could-come-in-2020-fhfa-mark-calabria>

²⁸ <https://www.fhfa.gov/Media/PublicAffairs/Pages/FHFA-Will-Re-propose-Enterprise-Capital-Rule-in-2020.aspx>

²⁹ <https://www.fhfa.gov/SupervisionRegulation/Rules/Pages/Comment-Detail.aspx?CommentId=15264> A minimum 4% capital requirement would necessitate the GSEs to decrease their market share, decreasing earnings, which would be inconsistent with a low utility level rate of return, as we discuss in Section 5.

In August of 2020, the Congressional Budget Office (CBO)³⁰ provided estimates of how many years it may take to build capital to meet regulatory capital requirements under various assumptions. CBO uses the combination of retained earnings and proceeds from a common stock offering to determine if and when these summed together would be sufficient to a) meet the capital requirements, b) redeem the outstanding senior³¹ and junior preferred shares and c) provide the Treasury with some value upon exercising its holdings of warrants for purchase of common stock.

As shown in the appendix table, the CBO analysis presents these findings in scenarios in which the Enterprises retain earnings prior to a common stock offering in 2023 or 2025. For each year, the CBO report presents three scenarios. In scenario one, the capital requirement is 3%, the required rate of return on capital is 8%, and the annual earnings growth rate is 8%. In scenario two, the capital requirement is 4.5%, the required rate of return on capital is 10%, and the annual earnings growth rate is 4%. In scenario three, the capital requirement is 6%, the required rate of return on capital is 12%, and the annual earnings growth rate is 0%.

In only one scenario is it possible for the GSEs to fully recapitalize themselves and redeem senior and junior preferred shares at full market value: that is, within five years under scenario one, with an 8% earnings growth. If the government accepts a “haircut” on its senior preferred shares, full capitalization and full redemption of junior preferred shares is possible with either an 8% or 10% required return on capital within three (or five) years assuming a 4% (or 8%) annual rate of earnings growth. Hence, with a utility-like required rate of returns, it is possible to build sufficient capital to meet the requirements of the capital rule based on earnings retention and a common stock offering for the GSEs to return to private ownership as a public utility. Alternatively, the government could retain partial or controlling ownership of the Enterprises.³² Earnings, beyond the need for retention to build or rebuild capital (and infrastructure), could support mission goals or lower g-fees.³³ However, as discussed in more detail in Cooperstein et al. (2019), a government corporation does not benefit from private market incentives.

Regardless of how they recapitalize, the durable governance of the GSEs as SIFMUs would require a proactive and dynamic regulator that can respond to new challenges and enforce rules including the abilities to see through the regulated utilities and to share that information with the market, and set bounds on g-fees on both the upside and the downside. The regulator must evaluate and respond to changes in counterparty risk and withstand and prevent mission creep and regulatory capture. In addition, the broader market in which the GSEs operate must be subject to FSOC oversight. The setting in which the GSEs operate matters: if other entities securitize mortgages without a need for capitalization at the level required for the GSEs and without the mission requirements, this will also erode the GSEs market share and ability to compete over the cycle.³⁴

If Congress does not act, binding requirements must be in place if the goal is to enable the FHFA to regulate the Enterprises as utilities after release from their conservatorships. To date, amendments to the PSPAs and consent decrees have been discussed as means of curbing future behavior by the GSEs. Consent decrees or consent orders are written with wide latitude for future regulators.³⁵ Investors may prefer durable rules to this

30 Congressional Budget Office (2020). Effects of Recapitalizing Fannie Mae and Freddie Mac Through Administrative Actions. <https://www.cbo.gov/system/files/2020-08/56496-GSE.pdf>

31 Treasury holds the senior preferred shares.

32 Congress could accomplish the conversion of the GSEs into a quasi or wholly owned government corporation, through ownership of the common stock, funding this through retained earnings, with Congressional (or Presidential) appointment of members of the board(s) of directors. The Treasury could exchange its holdings of senior preferred stock for common stock, and by exercising the warrants it holds, Treasury would be able to obtain additional common stock that would be deposited into this newly-created entity. Moreover, in an offering, the entity could raise external capital to remain fully-capitalized, and also offer stock in order to fund its continued mission. The CBO’s analysis addresses the redemption of the outstanding senior and junior preferred shares of the GSEs. The redemption value of junior preferred shares is in litigation brought by their private shareholder owners. The resolution will matter in terms of building capital reserves for privatization, as will the determination by the Treasury whether to accept a haircut on the value of its senior preferred shares.

33 As discussed in Cooperstein (2019) a utility with partial or full private ownership benefits from private market efficiencies, incentives, and is free from regulatory or administrative capture.

34 If market competitors undercut the GSEs’ g-fees in good times only to exit in bad times, maintenance of g-fees at levels consistent with stable profits over the cycle may not be possible. See McCoy and Wachter (2019a, 2019b)

35 Ryan, Bob and Stein, Eric. “Treat Fannie and Freddie as Utilities”. Center for Responsible Lending, March 2020.



latitude. Likewise, administrative changes without Congressional agreement present the same uncertainty for investors. Both of these layers of uncertainty may concern potential equity investors, dissuading them from investing or leading them to require higher returns than under a SIFMU structure.

The argument has been made³⁶ that the PSPAs and consent decrees can serve as a framework for effective regulation. In this approach, in return for a Treasury guarantee of the current line of credit, the Enterprises would agree to be regulated as utilities. It is argued that this would be a continuation of the current status, with the important addition of shareholders insulating taxpayers from losses, and who would receive dividends out of current income. Guarantee fees would continue to be subject to approval of FHFA. However, proponents of this view must first demonstrate to investors and taxpayers that the oversight and governance structure that they propose would satisfy the preconditions to merit a lower ROE, while maintaining market stability and oversight that FHFA has provided along with protections against regulatory capture and mission creep. The alternative of substantial public ownership would help guard against these potential conflicts but would require Congressional action.

Another alternative, some argue, is to maintain the status quo. The argument is that the GSEs are currently operating as public utilities and achieving the associated goals. That is, they are delivering long-term fixed-rate mortgages through all market conditions, as is being demonstrated in the current pandemic, to a wide array of borrowers, including underserved communities. Guarantee fees have not changed, and the GSEs have been used effectively by policymakers to provide support to the broader economy via mortgage forbearance and foreclosure moratorium. The Federal Reserve has also been able to keep mortgage rates low by direct purchases of the GSEs' MBS and debt. The current GSEs also continue to disperse interest rate and credit risk to private investors, albeit waiting for the appropriate market conditions to do so. And the GSEs continue to compete with each other on various levels, providing benefits to mortgage market stakeholders.

Why change this? The reason to change the status quo is to eliminate uncertainty about the future of the GSEs. With privatization in process, it is particularly important to clarify the GSEs future status, and to eliminate uncertainty over whether they might return to their pre-Global Financial Crisis status as for-profit entities with risky portfolios, without the discipline of CRT markets, and with no or minimal limits on profit dispersal and rate competition. Moving towards a public utility framework will preserve the ad hoc reforms that are in place now.

Section 5: FHFA's Capital Proposal

In June of 2020, the FHFA re-proposed its capital rule for the Enterprises. The proposed rule takes as its foundation the former rule proposed under former Director Watt but makes a number of significant changes. At its core, it would require the enterprises to hold a capital level that is the greater of a risk-based rule, roughly the 2018 level plus a significant buffer, or a minimum leverage ratio equal to 4%. Simultaneously, the FHFA would limit the GSEs' ability to distribute dividends if their prescribed stress, stability, and countercyclical buffers fell below minimum thresholds. In addition, the rule would limit the role of CRTs and undermine their use as market mechanisms to reveal and offload risk.³⁷

As noted, the Enterprises' current guarantee fees are consistent with roughly a 12% ROE and 2% capital (and an additional 1% capital buffer). The proposed capital rule introduces changes that may undermine the economies of scale of the GSEs and their ability to profit and support the public mission, specifically through

³⁶ Jaret Sieberg, an analyst with Cowen Washington Research Group, and others have made this point. See the Cowen Policy Note on Friday, November 11, 2019, "Housing Finance Friday: Evaluating the Paths Forward for Recap and Release". <https://cowen.bluematrix.com/sellside/EmailDocViewer?encrypt=dc3d7fc4-827b-4ba5-9950-9be090e31f96&mime=pdf&co=cowen&id=kfears@realtors.org&source=mail>

³⁷ The proposal makes strides in limiting the counter-cyclicality of the proposal from 2018 through the use of collars on price growth to limit market-to-market practices. Furthermore, the rule reduces the burden on single borrowers and those using small-dollar loans. However, the minimum capital level of 4% that is invariant to risk and excessive discounting of revenue (capital is determined in the context of a run-off portfolio) and elimination of the regulatory capital value of CRT will have an adverse impact to the market and finance system.

a substantial increase in capital, a forgoing of products that are more profitable, and a reduction in the economic value of CRT.

The 4% leverage ratio called for in the proposed rule is likely a minimum, as the Enterprises would seek to maintain a level above that to prevent falling below the prescribed buffer. For example, if complying with the 4% minimum resulted in an additional buffer of 1%, a 4% capital ratio would in effect require 5% capital or an extra \$10 billion to investors annually on a portfolio of \$5 trillion.³⁸ As such, the enterprises would need to increase the g-fee by approximately 20 basis points to meet the incremental capital costs. As fees rise, the Enterprises' share of these loans will likely decline, not immediately, but over the long run. In addition, the GSEs currently charge lower risk borrowers a fee higher than the market rate. These excess fees are used to offset the below-market fees for mission-oriented loans for higher risk borrowers. Forgoing these loans cuts into the Enterprises' ability to support underserved borrowers.

These changes could force the GSEs to transition from broad market utilities with government support to niche players in the higher risk market and competitors to FHA, making them less valuable franchises that would require higher rates of return to attract investors. The GSEs' footprint and MBS outstanding would shrink, perhaps to half its current share of the market. If GSE penetration shrinks by \$2 or \$3 trillion, where will these loans go? Currently, investors hold \$5.5 trillion of MBS debt and the CRT market bears about \$80 billion of credit risk. It is likely that some of this could migrate to PLS or portfolios, but Basel rules discourage investors from purchasing private MBS or holding whole loans versus Enterprise MBS. Furthermore, to offset risk, PLS and portfolios are likely to shift production to adjustable rate products and not 30-year fixed-rate mortgages, thus shifting interest rate risk to borrowers. It is also likely that liquidity in the CRT and/or TBA markets will decline. These changes would incentivize the GSEs to hold onto credit risk rather than distribute this risk into capital markets and would result in a higher share of FHA mortgages, increasing risk to taxpayers.

Lastly, the FHFA has requested from Congress the ability to charter additional enterprises. Enacting this would reduce the franchise value of the GSEs, as their returns would be less stable. In turn, this would result in higher costs and/or less excess revenue, undermining the ability to fund mission activities as discussed above. To be clear, this franchise is not a subsidy. Where the GSEs are and would remain subsidized is in their access to the Treasury's support. However, if adequately capitalized GSEs enforce prudent lending standards (maintained effectively over the cycle) and pay a risk-based fee to the Treasury for the federal guarantee, the subsidy may be effectively zero. In effect, the GSEs create their own subsidies through their market efficiencies and national risk pooling, which they leverage to make low-cost credit available everywhere across the Nation.

Conclusion

The Enterprises in combination with their regulator, FHFA, have already achieved many of the benefits of a regulated utility: liquid capital markets, scale, and credit standards. What remains to be done is to set a capital standard, to establish a system of ROE and price setting, transparency, counter-party oversight, and to raise equity. With proper governance, the cost of equity should reflect utility-returns, which can support the Enterprises' chartered mission of a liquid national mortgage market, support for underserved communities, a countercyclical role, and potentially provide a lower cost to consumers.

³⁸ 2% of \$5 trillion multiplied by an assumed rate of return of approximately 10%, using the example detailed above.

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Appendix

APPENDIX TABLE A.1

G'fees go down

99% Confidence: G'Fee @ 12% ROE - G'Fee @ 6% ROE									
	50	65	75	80	85	90	95	97	Avg
600	3.4	12.2	23.2	29.7	34.9	37.8	42.3	43.2	27.1
630	2.5	9.4	18.2	23.5	28.0	30.7	34.7	35.6	22.8
650	2.1	7.6	15.1	19.7	23.7	26.2	30.0	30.8	20.0
670	1.6	6.2	12.5	16.5	20.0	22.3	25.6	26.5	17.3
690	1.3	5.0	10.3	13.7	16.7	18.8	21.8	22.6	14.4
710	1.1	4.1	8.4	11.3	13.9	15.8	18.4	19.1	12.0
730	0.8	3.2	6.6	8.9	11.0	12.6	14.8	15.4	9.5
750	0.5	1.8	3.7	5.0	6.2	7.2	8.5	8.9	4.3
Avg	0.7	2.8	6.2	8.5	10.9	12.6	15.3	15.9	8.3

Source: Authors' calculations.

Appendix Table A.1 shows how much fees could go down if the required rate of return falls from 12% to 6%. For example, consider the 95% LTV / 679 FICO bucket. The stress loss for this bucket is 5.30% which is independent of corporate cost of funds, however the combination of capital and fees are not (). Using 12% COF and 99% confidence results in paid in capital of 2.75%, and a loan level capital charge of 2.55% or about 50 bps in guarantee fee. Using 6% COF raises capital to 3.85% and the loan level price required to pay capital costs falls to 1.45%. This reduces “breakeven” credit cost to consumers by about 25 bps in guarantee fee. See Cooperstein and Stegman (2020).

Appendix Table A.2 illustrates the details of the major cash flow components for the entire simulation of loan losses on a hypothetical pool of mortgages. Returns are positive up to 98% confidence. The simulation assumes a 2.00% capital requirement (“Cap”) and incorporates 2-year house price appreciation outcomes (‘2YrHPA%’) ranging from -22.1% to 34.1%. The g-fee is constant, and as such, so is its present value (‘PV G’Fee’). The present value of income (‘PV Income’) is the present value of income generated from the g-fees less the present value of any losses (‘PV Loss’), which is a function of the house price appreciation variance. In 98.2% of the probability distribution, returns (‘ROE’) are positive because the PV of losses is less than or equal to the PV of the g-fee.

APPENDIX TABLE A.2

2YrHPA %	Cum Prob	PV Loss	PV G'Fee	PV Income	Cap	ROE
34.1	0.0	0.00	0.62	0.62	2.00	13.2%
29.5	3.9	0.01	0.62	0.62	2.00	12.2%
25.1	10.2	0.01	0.62	0.62	2.00	11.1%
21.9	17.0	0.01	0.62	0.62	2.00	10.0%
18.1	24.3	0.02	0.62	0.61	2.00	9.3%
14.4	32.8	0.03	0.62	0.61	2.00	8.7%
11.8	40.3	0.03	0.62	0.60	2.00	8.0%
8.3	50.0	0.05	0.62	0.59	2.00	7.3%
4.9	60.2	0.07	0.62	0.57	2.00	6.5%
2.6	68.1	0.10	0.62	0.55	2.00	5.9%
-0.6	77.0	0.14	0.62	0.52	2.00	5.2%
-3.7	85.1	0.20	0.62	0.47	2.00	4.4%
-5.9	90.3	0.27	0.62	0.41	2.00	3.7%
-8.9	95.0	0.40	0.62	0.31	2.00	2.6%
-12.0	98.2	0.62	0.62	0.13	2.00	1.0%
-14.2	99.3	0.88	0.62	-0.08	2.00	-0.6%
-17.2	99.87	1.32	0.62	-0.43	2.00	-3.4%
-20.0	99.99	1.94	0.62	-0.93	2.00	-7.1%
-22.1	100.00	2.62	0.62	-1.47	2.00	-11.1%

Source: Authors' calculations.

APPENDIX TABLE A.3A:

CBO Scenarios for Recapitalization with a Common-Stock Offering in 2023

	Scenario 1	Scenario 2	Scenario 3
Parameters			
Earnings Retention Period (Years)	3	3	3
Capital Requirement (% of unadjusted assets)	3.0%	4.5%	6.0%
Investors' Required Return on Capital	8.0%	10.0%	12.0%
Annual Earnings Growth for 5 Years Post-Recap	8.0%	4.0%	0.0%
Results (\$bn)			
Amount of Capital Required	\$185.0	\$278.0	\$370.0
Less: Capital on Hand at the End of 2022	(\$78.0)	(\$78.0)	(\$78.0)
Capital Shortfall at the End of 2022	\$107.0	\$200.0	\$292.0
GSEs' Total Equity Value (from common stock offering)	\$402.0	\$283.0	\$224.0
Residual After Capital Shortfall	\$294.0	\$83.0	(\$69.0)
Senior preferred shares redeemed (face value \$190bn)	\$190.0	\$48.0	\$0.0
Junior preferred shares redeemed (face value \$35bn)	\$35.0	\$35.0	\$0.0
Value of Treasury's warrants	\$55.0	\$0.1	\$0.0

Source: CBO Report, authors' summary.

APPENDIX TABLE A.3B:
CBO Scenarios for Recapitalization with a Common-Stock Offering in 2025

	Scenario 1	Scenario 2	Scenario 3
Parameters			
Earnings Retention Period (Years)	5	5	5
Capital Requirement (% of unadjusted assets)	3.0%	4.5%	6.0%
Investors' Required Return on Capital	8.0%	10.0%	12.0%
Annual Earnings Growth for 5 Years Post-Recap	8.0%	4.0%	0.0%
Results (\$bn)			
Amount of Capital Required	\$200.0	\$300.0	\$400.0
Less: Capital on Hand at the End of 2024	(\$128.0)	(\$128.0)	(\$128.0)
Capital Shortfall at the End of 2024	\$72.0	\$172.0	\$273.0
GSEs' Total Equity Value (from common stock offering)	\$434.0	\$306.0	\$242.0
Residual After Capital Shortfall	\$362.0	\$133.0	(\$31.0)
Senior preferred shares redeemed (face value \$190bn)	\$190.0	\$98.0	\$0.0
Junior preferred shares redeemed (face value \$35bn)	\$35.0	\$35.0	\$0.0
Value of Treasury's warrants	\$110.0	\$0.1	\$0.0

Source: CBO Report, authors' summary.