Analysis of the FHFA's Proposal on Enterprise Capital

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Capital standards for single-family residential mortgages are important. Too much capital raises mortgage rates and reduces homeownership, and too little capital results in insolvency and financial crises. The Federal Housing Finance Agency (FHFA) recently issued a proposed capital standard for the government-sponsored enterprises (GSEs), Freddie Mac and Fannie Mae.[1] This capital standard was intended to provide a framework to think about business decisions while the GSEs remain in conservatorship and to communicate the FHFA's view of capital as the GSE reform discussion continues.

In this brief, we analyze two questions:

1. How well does the rule align risk and capital across the various mortgage attributes?
2. How does the capital requirement vary across the business cycle?

By addressing these two questions, we can begin to understand whether the capital standards are appropriately calibrated.

Even though the GSEs are in conservatorship, these capital standards are more than an academic exercise. The expectation is that the standards will be used to govern pricing for the duration of the GSEs' conservatorship. And given the deep divisions in Congress, conservatorship could last a long time.

To answer the first question, we compute the capital requirements for a large variety of mortgages. To answer the second, we compute the capital requirements at various times over the business cycle. As the rule is complex, this requires a good deal of computation and various assumptions.

Our principal observations are these:

1. In general, the FHFA has captured the most important risk attributes and has directionally aligned capital with risk.
2. For high-risk mortgages, especially products used by first-time homebuyers and for many low- and moderate-income households, the proposal overpenalizes risk—that is, allocates more capital than the data would support.
3. The standard is procyclical, with capital standards either doubling or halving in a two-year period.

The remainder of this brief is organized as follows. Section 1 (Methodology) describes our computations; section 2 (Capital by Mortgage Attribute) presents our loan-level findings, largely in tables; and section 3 (Capital and the Business Cycle) puts this capital standard into a broader framework. In section 4 (Discussion), we discuss what features of the proposal drive the above results and address alternative formulations that may improve the proposal. We confine our discussion to the single-family part of the GSE business and do not address the multifamily discussion.

1. Methodology

The FHFA proposal details the capital requirement on a one-to-four-family mortgage depending on mortgage attributes at origination (table 1), updated attributes for current loan-to-value (LTV) ratios and FICO scores, the age of the mortgage, and delinquency status over the past three years. For the empirical work, we used Fannie Mae loan-level credit data published as part of its credit risk transfer (CRT) bond programs. This database contains information on fixed-rate, fully amortizing mortgages and does not include adjustable-rate mortgages or mortgages with nontraditional features (e.g., interest-only, negative-amortization, or 40-year mortgages). We used 30-year mortgages only (terms of 241 months or more). The database includes loan age, loan purpose, loan type, property type, loan amount, performance history, original FICO score, original LTV ratio, original debt-to-income (DTI) ratio, and geographic information at the three-digit zip code level.

TABLE 1

Mortgage Attributes

Attribute	Description
Loan age	Loan age at the time of measurement
Pay performance	36 months of pay history
FICO score	Refreshed FICO score
MTMLTV	Mark-to-market loan-to-value ratio
Property type	One unit, risk multiplier = 1.0 Two to four units, risk multiplier = 1.4 Condominium, risk multiplier = 1.1 Manufactured home, risk multiplier = 1.3
Loan purpose	Purchase loan, risk multiplier = 1.0 Cash-out refinance, risk multiplier = 1.4 Rate refinance, risk multiplier = 1.3
Occupancy type	Owner-occupied or second home, risk multiplier = 1.0 Investment, risk multiplier = 1.2
Number of borrowers	One borrower, risk multiplier = 1.5 Multiple borrowers, risk multiplier = 1.0
Debt-to-income (DTI) ratio	DTI ratio ≤ 25%, risk multiplier = 0.8 DTI ratio 25–40%, risk multiplier = 1.0 DTI ratio > 40%, risk multiplier = 1.2
Loan size	Unpaid principal balance < $50,000, risk multiplier = 2.0 Unpaid principal balance $50,000–$100,000, risk multiplier = 1.4 Unpaid principal balance > $100,000, risk multiplier = 1.0

The proposal uses loan age and pay history to partition the single-family universe into five loan segments, and we partitioned the loans in the same manner:

1. New originations. Loans that were originated within 5 months of the capital calculation date and have never been 30 days delinquent (D30).
2. Performing seasoned. Loans that were originated at least 5 months before the capital calculation date and have been neither D30 nor modified within 36 months of the capital calculation date with some additional delinquency history requirement.
3. Nonmodified reperforming. Loans that are currently performing and have had a prior 30-day delinquency but not a prior modification.
4. Modified reperforming. Loans that are currently performing and have had a prior 30-day delinquency and a prior modification.
5. Nonperforming. Loans that are currently at least D30.

For each segment, the proposal uses a two-dimensional grid: mark-to-market loan-to-value (MTMLTV) ratio and refreshed credit score. For this study, we do not have the updated FICO scores, so we use FICO scores at origination for all our calculations. As a result, we likely overestimate the capital standard in good times, as FICO scores tend to improve with the economy, and we likely underestimate

the capital standard in bad times. On average, this is a conservative assumption because the capital requirements go up more in bad times than they come down in good times. We use the state-level CoreLogic Home Price Index to calculate the MTMLTV ratios.

After we calculate the base credit risk requirement for each loan, we adjust this number to account for additional characteristics, defined as risk multipliers in the proposal. The proposal and our adjustments include risk multipliers such as loan purpose, occupancy type, property type, number of borrowers, DTI ratio, loan size, and loan age.

In the proposal, the risk multipliers are applied to adjust the base credit risk capital. Mortgages with LTV ratios above 95 percent are capped at a risk multiplier of 3. We follow suit in our calculations.

Finally, we need to account for credit enhancement through mortgage insurance (MI). We use the origination LTV ratio and loan age to determine the credit enhancement, assuming cancellable MI with guide-level coverage. Based on the proposal, we also consider the counterparty credit risk. To account for this exposure, the credit enhancement would be reduced to incorporate the risk that counterparties cannot meet the claim obligations. We assumed the counterparty rating of 3 with high mortgage concentration risk. Under this assumption, for nonperforming loans, we use a 3.9 percent haircut, and for new originations, performing seasoned loans, and reperforming loans, the number is 8.3 percent. Using new originations with LTV ratios from 85 to 90 percent as an example, the net capital requirement because of the credit enhancement would be (1–((1–0.551))*(1–0.83), or 50.5 percent of the gross capital requirement.

With all the information at hand, we compute the net credit capital requirement for each mortgage in the dataset at the end of each exposure year from 2002 to 2016. The capital standard applies a different model depending on whether the mortgage is a newly originated mortgage, a performing seasoned mortgage, a delinquent mortgage, or a reperforming mortgage. At any point, the percentage in each bucket will vary. Therefore, we analyze the GSE portfolio at various times over the business cycle. It would be a mistake to look only at the capital standard of newly originated mortgages to draw conclusions about the proposal, as these mortgages tend to represent less than 10 percent of the GSEs' portfolio.

We focus on the credit risk component of the proposed capital standard. As the FHFA reports (based on calculations for September 2017), this is the largest single risk ($112 billion before credit risk transfers, $90.5 billion after), and, even after CRTs, accounts for about half the capital ($180.9 billion) required of the GSEs as of September 30, 2017. But the proposal also includes a going-concern buffer ($39.9 billion), an operational risk charge ($4.3 billion), and a market risk component ($19.4 billion) (table 2).

TABLE 2

Fannie Mae and Freddie Mac Estimated Risk-Based Capital Requirements as of September 30, 2017, by Risk Category

	Fannie Mae capital requirement			Freddie Mac capital requirement			Enterprises' combined capital requirement		
	$billions	bps	Share (%)	$billions	bps	Share (%)	$billions	bps	Share (%)
Net credit risk	70.5			41.5			112.0		
Credit risk transferred	(11.5)			(10.0)			(21.5)		
Post-CRT net credit risk	59.0	176	51	31.5	142	48	90.5	162	50
Market risk	9.5	28	8	9.9	44	15	19.4	35	11
Going-concern buffer	24.0	72	21	15.9	71	24	39.9	72	22
Operational risk	2.6	8	2	1.7	8	3	4.3	8	2
Other (DTA)	19.9	59	17	6.8	31	10	26.8	48	15
Total capital requirement	115.0	343	100	65.9	296	100	180.9	324	100
Total assets and off–balance sheet guarantees	3,353.1			2,226.0			5,579.0		

Source: Reproduced from "Enterprise Capital Requirements," 83 Fed. Reg., 33312 (July 17, 2018), table 5.
Notes: bps = basis points; CRT = credit risk transfer; DTA = deferred tax asset. The DTA capital requirement is a function of core capital. Both enterprises have negative core capital as of September 30, 2017. To calculate the DTA capital requirement, we assume core capital is equal to the risk-based capital requirement without consideration of the DTA capital requirement. Both enterprises' DTAs were reduced in December 2017 because of the change in the corporate tax rate. The risk-based capital requirement for DTAs as of December 31, 2017, would be $10.0 billion, or 30 basis points, for Fannie Mae and $1.2 billion, or 5 basis points, for Freddie Mac.

2. Capital by Mortgage Attribute

LTV Ratio and FICO Score

The two primary risk attributes for a 30-year fixed-rate mortgage are the LTV ratio at origination and the FICO score at origination. The FHFA capital requirements vary significantly by these two attributes. Using the methodology outlined above, we computed the capital requirement in table 3 by FICO score and LTV ratio for Fannie Mae purchase money mortgages as of December 31, 2016.

TABLE 3

Capital Requirement as of December 31, 2016

Basis points

	Loan-to-value ratio									
FICO score	**≤30%**	**30–60%**	**60–70%**	**70–75%**	**75–80%**	**80–85%**	**85–90%**	**90–95%**	**95–97%**	**All**
<620	399	418	647	807	832	904	1,006	1,132	1,176	898
620–640	153	217	366	513	621	750	754	755	907	632
640–660	136	168	291	426	515	654	613	606	707	525
660–680	89	132	229	313	415	540	500	470	594	424
680–700	66	100	170	253	343	433	398	389	503	356
700–720	55	76	140	194	260	337	309	304	427	277
720–740	32	64	109	154	209	274	246	250	351	227
740–760	35	49	87	120	163	215	195	197	277	177
760–780	23	37	62	91	124	160	148	153	217	132
≥780	17	25	44	63	87	114	105	109	156	87
All	33	49	93	126	173	231	210	225	321	186

Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

To determine if these capital charges are appropriate, we need to compare the capital requirement with the stressed losses. We believe it is important to compare the capital charges with the stressed losses, not the losses over the course of the cycle, as these capital requirements aim to make sure the institution has enough capital to withstand a crisis. Some of the loans that have a lower probability of default in good times might actually perform comparatively worse in bad times. We used originations from 2007, a stressed year, to run this comparison.

More precisely, we restricted the database to purchase loans originated in 2007, tracked their performance through the end of 2016, and tabulated losses as of the end of 2016. We sorted these loans into FICO score and LTV ratio buckets and calculated the loss rate for each bucket. For liquidated loans, we have actual losses. For active loans, we calculate the D180 rates (loans delinquent for 180 days or more). We then assume 65 percent liquidation given 180-day delinquency and 50 percent loss severity given liquidation. Table 4 shows the loss rate for 2007 loans by FICO score and LTV ratio. To compare with the numbers in table 3, we re-weighted these buckets to reflect the current business mix (as 2007 had a larger share of borrowers with low FICO scores). Our results show we would have needed 170 basis points (bps) of capital if each loan on the books today went through the 2007 experience. This is similar to the 186 bps of required capital we calculated in table 3. Thus, on average, these capital requirements are high enough for the GSEs to have survived the Great Recession.

TABLE 4

Loss Rate Calculation for 2007 Originations

Basis points

	Loan-to-value ratio									
FICO score	**≤30%**	**30–60%**	**60–70%**	**70–75%**	**75–80%**	**80–85%**	**85–90%**	**90–95%**	**95–97%**	**All**
<620	95	242	602	558	604	527	518	594	1,223	575
620–640	4	135	210	395	547	657	480	523	464	479
640–660	67	39	170	305	405	463	341	460	489	377
660–680	58	43	178	236	328	334	350	419	597	327
680–700	0	26	113	187	274	282	270	345	442	261
700–720	0	12	85	213	223	234	249	337	434	218
720–740	0	19	64	133	166	142	208	236	276	159
740–760	0	13	40	96	131	115	185	215	347	130
760–780	0	2	26	58	98	130	159	159	295	92
≥780	0	5	15	43	71	66	97	120	130	57
All	4	17	65	122	171	215	237	301	448	170

Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

While we have shown the aggregate required capital is correct, does this proposal correctly allocate capital across FICO score and LTV ratio buckets? To analyze this, we compare the slope of the required capital with the slope of the actual losses for different FICO scores and LTV ratios. We first compare the capital requirements on loans with FICO scores from 640 to 660 with those on loans with FICO scores from 740 to 760 at two different LTV levels: from 75 to 80 percent (low LTV ratios) and from 90 to 95 percent (high LTV ratios). For loans with LTV ratios from 75 to 80 percent and FICO scores from 640 to 660, table 3 shows that the capital requirement is 515, and for loans with LTV ratios from 75 to 80 percent and FICO scores from 740 to 760, the requirement is 163, resulting a slope of 3.16 (515/163). Roughly speaking, a mortgage with a 660 FICO score needs three times the capital of a mortgage with the same LTV ratio but a 760 FICO score. Now, we calculate the slopes for the loss rate. Table 4 shows the losses for mortgages with LTV ratios between 75 and 80 percent and FICO scores from 640 to 660 were 3.08 times (405/131) that of mortgages with LTV ratios between 75 and 80 percent and FICO scores from 740 to 760. Thus, the FICO slope for capital is in line with the FICO slope for loss for low-LTV loans. This is summarized in the top line of table 5.

But for high-LTV loans (e.g., 90 to 95 percent), there is a disparity in the two slopes (table 5). The losses for low-FICO mortgages (e.g., 640 to 660) were about two times that of high-FICO mortgages (e.g., 740 to 760). At the same time, the capital slope is three times. Thus, the proposal overcapitalizes low-FICO, high-LTV loans.

Consider another example in which we look across the LTV dimension. A mortgage with a 95 percent LTV ratio and 700 to 720 FICO score needs 1.57 times the capital of a mortgage with the same FICO score but a 70 percent LTV ratio (304/194). This is close to the 1.51 that actual losses would suggest.

Our conclusion is that low-FICO, high-LTV mortgages require more capital than is necessary relative to their less risky brethren. These results stem from the fact that in a stress scenario, all

mortgages perform worse, but the relative differential between mortgages with weaker credit scores and those with stronger credit scores is less than during normal periods. Because the FHFA is attempting to model a stress scenario, this should be taken into account in the framework's next revision.

Our results on the extent of the biases may be understated. The FHFA did not "count" guarantee fees (g-fees), as it thought the g-fees would cover expected losses and the capital requirements would cover the unexpected losses. Our calculations include all losses, both expected and unexpected. If we had subtracted out expected losses, the slopes reported in table 5 would have been even lower, strengthening our conclusion that the proposal overpenalizes high-risk mortgages.

TABLE 5

Slope Calculation

Slope	Description	Capital	Loss
FICO slope with low LTV	75–80% LTV; 640–660 FICO/740–760 FICO	515/163=3.16	405/131=3.08
FICO slope with high LTV	90–95% LTV; 640–660 FICO/740–760 FICO	606/196=3.08	460/215=2.14
LTV slope	700–720 FICO; 90–95% LTV/75–80% LTV	304/194=1.57	337/223=1.51

Source: Urban Institute calculations from Fannie Mae single-family loan performance data.
Note: LTV = loan-to-value ratio.

Layered Risk

While LTV ratios and FICO scores are the principal risk factors, there are other factors that when combined or "layered" into one mortgage can increase risk. These factors include being a single borrower, loans for manufactured housing, rate or term refinancing, high DTI ratios, and small loan size. The FHFA has incorporated these through risk multipliers. The analysis in the previous section included these multipliers, and in this section, we will further explore them. Table 6 shows the average risk multipliers by FICO score and LTV ratio bucket. Although the average risk multiplier in the sample is about 1.18, low-FICO and high-LTV loans have higher risk multipliers.

TABLE 6

Risk Multipliers

	Loan-to-value ratio									
FICO score	**≤30%**	**30–60%**	**60–70%**	**70–75%**	**75–80%**	**80–85%**	**85–90%**	**90–95%**	**95–97%**	**All**
<620	2.15	1.84	1.74	1.79	1.66	1.64	1.65	1.74	1.93	1.72
620–640	1.75	1.51	1.48	1.46	1.44	1.44	1.45	1.46	1.87	1.47
640–660	1.56	1.41	1.40	1.40	1.36	1.39	1.37	1.38	1.79	1.39
660–680	1.44	1.31	1.33	1.31	1.29	1.35	1.32	1.32	1.79	1.33
680–700	1.46	1.27	1.27	1.27	1.26	1.30	1.29	1.31	1.78	1.32
700–720	1.38	1.20	1.20	1.20	1.19	1.22	1.22	1.25	1.80	1.26
720–740	1.28	1.17	1.16	1.16	1.15	1.19	1.19	1.23	1.74	1.23
740–760	1.27	1.14	1.14	1.13	1.12	1.16	1.16	1.20	1.70	1.19
760–780	1.20	1.09	1.09	1.09	1.09	1.12	1.12	1.17	1.69	1.15
≥780	1.19	1.08	1.07	1.07	1.06	1.08	1.09	1.14	1.64	1.10
All	1.25	1.13	1.13	1.13	1.12	1.16	1.16	1.21	1.72	1.18

Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

Under the Conservatorship Capital Framework (CCF), the FHFA has chosen to cap risk multipliers at 3 for loans with LTV ratios above 95 percent to encourage "affordable" lending. But the bulk of the lending (anything below 95 percent) is uncapped. In table 7, we give an example of when the capital level can be high. In this example, the multiplier is 6.1, so the gross capital requirement would increase from a base of 240 bps to 1,464 bps.

TABLE 7

An Example for the Risk Factors

720 FICO score, 80% loan-to-value ratio, base capital	240 basis points
	Risk multipliers
Single borrower	1.5
Manufactured housing	1.3
Rate refinance	1.3
41% debt-to-income ratio	1.2
$50,000 loan	2.0
Total multiplier	6.1
Gross capital	1,464 basis points

Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

To compare the capital requirement and actual loss, we extract loans as of December 31, 2016, to single borrowers with a rate refinance, a DTI ratio above 41 percent, and a loan amount up to $50,000. Table 8 shows the calculation on these 1,811 loans. The average base capital is 128 bps. The average risk multiplier is 3.5, resulting in gross capital of 385 bps. The actual loss is 239 bps (using the methodology outlined above for loans still on the books). Thus, the risk multiplier that the CCF applies to the base capital requirement is higher than the actual losses would suggest. Loans with layered risk are more risky, but the question is whether a multiplicative approach to using these risk factors produces capital requirements consistent with this risk. We have not done an exhaustive review of the consequences of this risk layering but urge the FHFA to do so.

There are also public policy implications of these capital charges. Many of these risk multipliers are loans to populations that would otherwise be driven to the Federal Housing Administration, where there is no risk-based pricing. If the goal is to protect taxpayers, it is not clear that it is being accomplished by overpenalizing these borrowers.

Some of these risk factors, such as being a single borrower, are more prevalent for certain borrowers (unmarried black women, for example), so improper calibration of these factors may raise fair lending issues.

TABLE 8

Capital and Loss Calculation for a Subsample

Sample requirement	Rate refinance, ≥41% debt-to-income ratio, ≤$50,000 loan, single borrower
N	1,811
Base capital	128
Risk capital	3.5
Gross capital	385
Loss	239

Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

Mortgage Insurance and Credit Risk Transfers

The FHFA reduces capital requirements when a third party assumes some credit risk. We believe the reductions in capital requirements because of mortgage insurance are less than they should be given the post-crisis changes in the business.

The capital reduction because of MI is determined by LTV ratio and loan age. For a 71-to-84-month-old loan with an LTV ratio from 90 to 95 percent, cancellable MI loans are given capital credit of 15.5 percent (1.000–0.845) of the total capital charge; the credit is higher on a new loan. There is a further haircut because of counterparty risks. For a 3-rated nondiversified insurer, the haircut would be 0.083. Thus, the capital is only reduced 14 percent (1.000–0.845)*(1.000–0.083).

We calculated that the average reduction in capital for mortgages with MI is 37 percent. Based on Urban Institute calculations for 2007 originations, the average severity for GSE MI loans is 34 percent, with 21 percent MI recovery. This implies a 38 percent (21/(34+21)) MI effectiveness (Goodman et al. 2017).

It suggests that the proposed MI capital reduction is in line with actual historical MI effectiveness. But this is not the right metric, as it does not account for industry changes. During the crisis, losses were incurred by the GSEs when some mortgage insurers could not pay their claims in full. Private mortgage insurance eligibility requirements have sharply increased MI capital requirements. If the Great Recession were to repeat with these standards in place, we would expect higher MI effectiveness. Moreover, the updated master policies have made it more difficult for mortgage insurers to curtail their insurance payouts. Given these enhancements, the proposal does not give enough credit for MI as a credit enhancer.

Similarly, the FHFA's calculations show credit risk transfers reduced the required capital by $21.5 billion as of September 2017. Based on outstanding bonds of $50 billion, this 42 percent effectiveness (21.5/40) seems in line with research by Mark Zandi and coauthors (2017).

There are two places where CRT is treated more generously than MI. First, under the CCF, the reduction in the required capital because of CRT does not diminish as the bonds near maturity, but rather the formula is based on the bonds' original maturity. This seems counterintuitive, as a bond with only 1 year remaining maturity provides less protection than a bond with a 10-year maturity. The FHFA recognizes this in its treatment of cancellable MI. Second, the GSEs cede premium income for CRT credit enhancement but do not foot the bill for MI. Under the CCF, there is no credit given for g-fee revenues, no ding if those revenues are not present.

In addition, under this CCF, there is no credit given for additional credit enhancement above the capital attachment point. That is, if the expected loss was 25 bps, and the net credit risk capital on the loans underlying the transaction is 275 bps, the capital attachment point is 3 percent. If the GSE chooses to lay off most of the bottom 4 percent of the risk, it receives zero capital relief for the additional risk laid off between the 3 percent attachment point and the 4 percent that was laid off.

Refinances

In general, the FHFA proposal has a multiplier of 1.3 for rate- and term-refinanced mortgages and 1.4 for cash-out-refinanced mortgages. Refinanced mortgages tend to perform worse than purchase loans, largely because the appraised LTV estimate in a refinancing is not as accurate as the LTV ratio in an arm's-length purchase transaction. Cash-out refinances tend perform worse, both because of an inaccurate LTV ratio and because these borrowers are more likely to be cash constrained.

Table 9 shows the capital requirement and loss rate by FICO score and LTV ratio for both purchase and refinance mortgages. The loss numbers in this analysis were based on the 2007 vintage and represent stressed losses. Even with the multiplier, refinances have 76 percent of the required capital levels of purchase loans (143/186). This is because refinances tend to have lower LTV ratios, as equity has built up in the house since the original purchase. But our loss estimates suggest that rather than for the current book, rather than 76 percent, the capital charges should be less than 50 percent (81/170).

TABLE 9

Capital and Loss for Purchase, Rate-Refinance, and Cash-Out-Refinance Loans

Basis points

Loan-to-value ratio	FICO score	Capital			Loss		
		Purchase	Rate refi.	Cash-out refi.	Purchase	Rate-refi.	Cash-out refi.
75–80%	640–660	515	638	812	405	616	814
90–95%	640–660	606	1,030	1,134	460	1,160	943
75–80%	740–760	131	170	233	405	68	131
90–95%	740–760	197	222	294	131	64	173
Average as of Dec. 2016		186	143	241	170	81	241

Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

Recent Urban Institute research shows that, particularly in the precrisis years, the behavior of low-LTV refinanced mortgages was poor, suggesting that the LTV ratio was understated (Goodman and Zhu 2018). With improvements in the appraisal process instituted by the industry and the GSEs, appraisals are now more accurate. This would argue for a lower multiplier.

A look at the data confirms this. Table 10 shows "vintage effects." In 2011 and earlier, the actual loss rates for purchase loans are lower than for rate or term refinances. In more recent years, the loss rates are similar for purchase and rate-refinance loans because of improvements in the appraisal process and in automated valuation models. We believe that by using historical data only and failing to better account for recent history by increasing its weight in the analysis can cause the capital levels on rate and term refinances to be unnecessarily high.

TABLE 10

Vintage Effects

Origination year	Purchase	Rate refinance	Cash-out refinance	All
1999	0.15%	0.33%	0.51%	0.25%
2000	0.15%	0.59%	0.78%	0.27%
2001	0.24%	0.47%	0.58%	0.40%
2002	0.42%	0.61%	0.76%	0.59%
2003	0.74%	0.71%	0.93%	0.78%
2004	1.22%	1.48%	2.00%	1.51%
2005	2.55%	2.76%	3.86%	3.08%
2006	3.18%	4.60%	5.99%	4.43%
2007	2.78%	5.58%	6.02%	4.50%
2008	1.28%	2.28%	3.14%	2.10%
2009	0.20%	0.22%	0.40%	0.27%
2010	0.06%	0.09%	0.25%	0.12%
2011	0.03%	0.05%	0.15%	0.06%
2012	0.02%	0.02%	0.05%	0.02%
2013	0.01%	0.01%	0.04%	0.01%
2014	0.01%	0.01%	0.03%	0.01%
2015	0.00%	0.00%	0.00%	0.00%
2016	0.00%	0.00%	0.00%	0.00%
All	0.72%	0.83%	1.74%	1.02%

Source: Laurie Goodman and Jun Zhu, "What Fueled the Financial Crisis? An Analysis of the Performance of Purchase and Refinance Loans" (Washington, DC: Urban Institute, 2018).

Delinquency Status

Table 11 shows the capital requirement by delinquency status as of each exposure year. Using 2016 as an example, the performing loans have a low requirement because of several years of robust house price appreciation. But modified loans and delinquent loans have a high requirement of 834 bps and 919 bps, in line with historical experience.

TABLE 11

Capital by Exposure Year

Basis points

Year	New origination loan	Performing seasoned loan	Nonmodified reperforming loan	Modified reperforming loan	Nonperforming loan	Capital
2002	312	211	413	784	896	300
2003	306	196	403	732	895	271
2004	289	152	338	649	853	215
2005	265	123	282	612	830	180
2006	273	137	296	615	877	186
2007	270	215	421	781	1,056	262
2008	232	449	768	1,103	1,418	478
2009	193	472	890	1,555	1,583	547
2010	187	458	997	1,841	1,569	567
2011	205	408	995	1,936	1,623	539
2012	215	239	726	1,716	1,437	383
2013	251	145	459	1,326	1,385	255
2014	241	136	344	1,134	1,163	216
2015	248	129	285	971	1,060	196
2016	249	125	257	834	919	186

Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

Table 11 also shows that the capital requirements for the modified reperforming and nonperforming categories tend to be stable over time, even though cure rates vary significantly.

Our one suggestion is to consider modifying the definition of nonperforming loan to be a loan that is 60 or 90 days delinquent. For this capital standard, a nonperforming loan is one that is D30 in the reporting quarter. This D30 definition introduces unnecessary volatility because seasonality plays a larger role in D30 loans than in D60 or D90 loans. Moreover, months that end on a Sunday tend to have more 30-day delinquencies.

To illustrate the higher volatility, we calculate the share of loans in the nonperforming category for each quarter from 2002 to 2016 for D30, D60, and D90 loans. We then calculate the standard deviation for these three time series. The standard deviation is 1.02 percent for D30 loans, 0.9 percent for D60 loans, and 0.8 percent for D90 loans. As expected, defining nonperforming as D30 introduces more volatility than for the other two definitions. This imposes more of a penalty on borrowers with low FICO scores and may contribute to the overcapitalization we observed earlier, as these borrowers are more likely than their counterparts with higher scores to miss a payment.

To reduce volatility and simplify the proposal, an alternative would be to use a key delinquency of 90 days. Table 12 shows the new capital requirement using a D90 instead of a D30 definition for nonperforming loans. The average capital requirement is similar to what we had before. But the requirement would have less volatility and would be less likely to penalize borrowers who occasionally miss a payment.

TABLE 12

Changing the Delinquency Definition from a 30-Day Delinquency to a 90-Day Delinquency

	Loan-to-value ratio									
FICO score	**≤30%**	**30–60%**	**60–70%**	**70–75%**	**75–80%**	**80–85%**	**85–90%**	**90–95%**	**95–97%**	**All**
<620	349	385	603	767	782	858	959	1,084	1,120	851
620–640	132	194	334	470	582	709	721	726	879	598
640–660	114	156	274	394	487	630	589	587	690	502
660–680	78	122	215	293	390	517	480	453	581	404
680–700	59	94	161	239	328	418	385	379	494	344
700–720	47	71	132	184	249	329	299	297	420	268
720–740	30	60	105	148	203	267	241	245	347	221
740–760	33	47	85	116	158	211	191	193	274	174
760–780	22	35	61	89	121	158	145	151	215	130
≥780	17	24	43	63	87	114	104	108	155	86
All	30	47	89	121	167	225	205	220	316	181

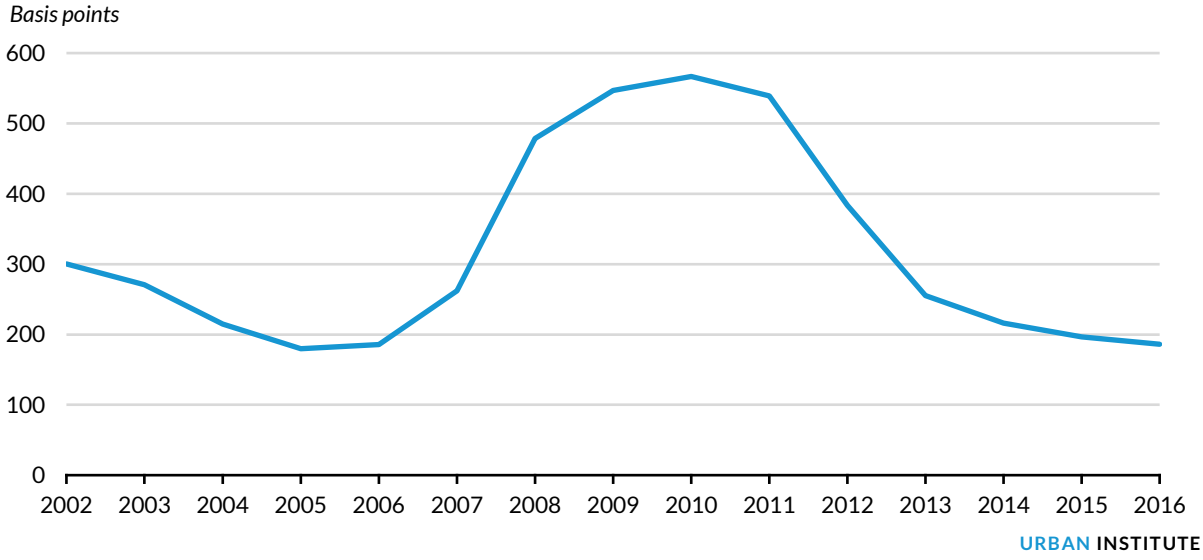
Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

3. Capital and the Business Cycle

Most of the results in section 3 focused on the capital requirement as of 2016. But the housing environment was benign at that time, with house price appreciation averaging 7 percent a year. Yet when a GSE is purchasing a mortgage, it cannot count on such a benign environment. To illustrate, we compute the capital requirement for each year since 2002 (figure 1). The capital requirement ranges from 2 percent to 6 percent. And the requirement can double in as little as two years (between 2006 and 2008). This procyclicality is dramatic.

FIGURE 1

Capital Requirement by Exposure Year



Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

It is difficult for the GSEs to plan for this. As a simple exercise, assume that the average (capital requirement is 3 percent) occurs half the time, bad times (6 percent) occur a quarter of the time, and good times (2 percent) occur a quarter of the time. The expected capital requirement and what a GSE might plan on would be 3.5 percent, higher than today's 2 percent. And this is just one component of the capital when the GSEs purchase a mortgage. The operational risk and going-concern buffer adds another 0.82 percent, bringing the total capital requirement to 4.3 percent. Add on another operational cushion, and the GSEs might have to operate around 5 percent or more under this capital standard. The capital standard can be lowered with CRTs. Currently, the GSEs reduce the capital standard half a percent, and we estimate that this could increase to 1 percent. But CRTs are not cost-free, as they give up g-fee income.

The procyclicality issue is not just that the GSEs would have trouble managing capital, particularly once they are out of conservatorship. The more important issue is that, to the extent it is reflected in pricing, g-fees decline at the wrong time. Figure 1 shows that the lowest capital was required to be held in 2005 and 2006. Assuming g-fees price in the cost of capital, the g-fees would have been lowest in the run-up to the crisis. This is the wrong result from a policy perspective.

4. Discussion

The capital proposal is detailed and aligns capital with risk in many aspects. For certain high-risk mortgages, the proposal is overly conservative. In particular, mortgages with low FICO scores, with mortgage insurance (high-LTV mortgages), and with layered risk are likely to result in too high a capital charge. These issues are further exacerbated by the requirement's procyclical nature. It will be difficult for a GSE to manage a requirement that can double in two years. And this issue hits high-risk mortgages more, as doubling from a 1 percent requirement to a 2 percent requirement for a low-risk loan is not as problematic as doubling from 4 percent to 8 percent. Consequently, we are concerned that this proposal will limit access to credit for potential homebuyers who, on average, are higher-risk but still creditworthy borrowers. And we are concerned that it will extend credit at the wrong point in the cycle.

Three modeling assumptions may have driven some of these results. First, the FHFA decided not to incorporate g-fees into the analysis. Most regulators do not include future income, as it is difficult to forecast and often disappears in times of stress. G-fee income is different in that it is an interest-only strip on GSE-owned mortgages. It is unreasonable to assume 100 percent of these mortgages default or prepay immediately. So why not include a conservative estimate of future g-fee income? Doing so would disproportionately benefit high-risk mortgages that pay higher g-fees. Put another way, if the GSEs are going to implement more granular risk-based pricing to more finely assess price for perceived risk, high-risk mortgagees should at least get the benefit of what they are paying for.

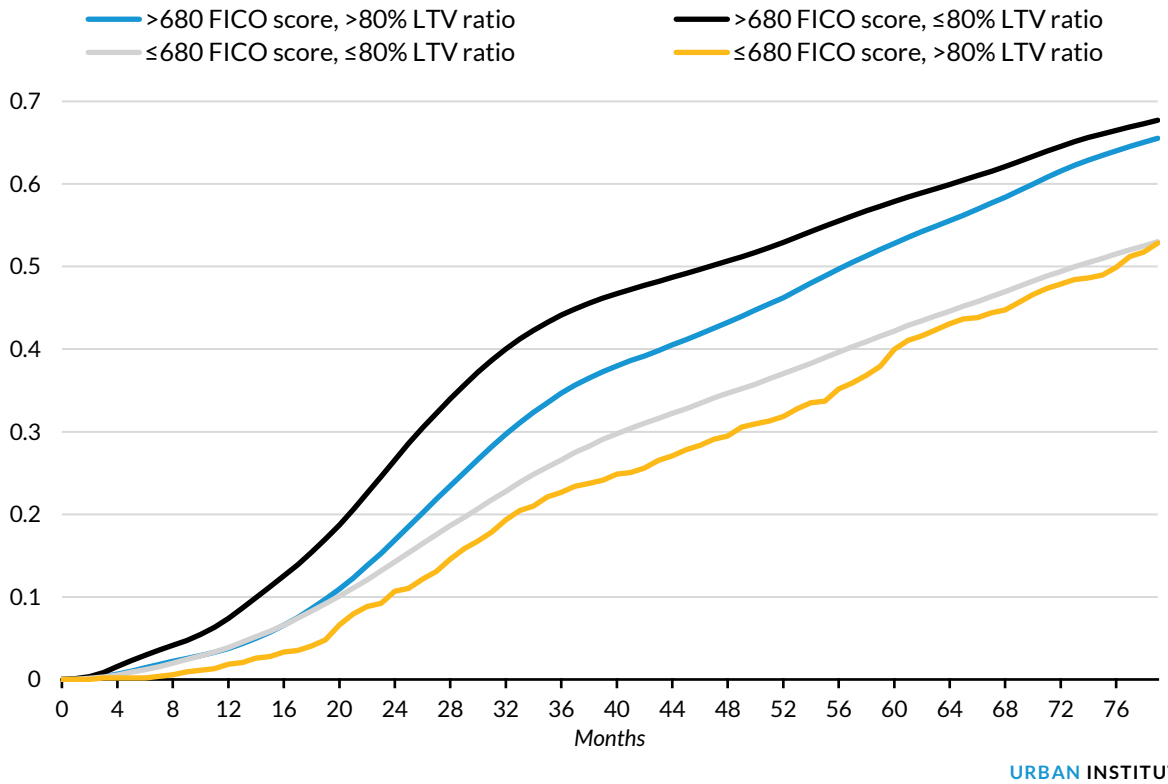
Second, the FHFA did not incorporate post–Great Recession mortgage market improvements into their modeling. From improved appraisals, to verification of income, to stronger capitalization of mortgage insurers, there have been significant improvements in mortgage origination and underwriting. These improvements show up in lower early payment defaults and can be tracked. Understandably,

regulators are reluctant to incorporate improvements that can evaporate quickly into capital standards. But again, giving no credit penalizes high-risk mortgages more.

Third, the FHFA used a granular risk-based approach on credit risk but imposed a flat capital charge for prepayment risk. Prepayment risk affects not only the debt-funded mortgages in the GSE portfolios but also aspects of the securitization business, such as future g-fee income, float, and security performance. Mortgages with higher credit risk (low FICO scores and high LTV ratios) are less likely to prepay and are less likely to create prepayment risk for the GSEs (figure 2). This means that the g-fee income from these mortgages is a longer and more stable cash flow stream. A fuller risk-based approach to prepayment risk would modify this proposal to reflect higher capital charges on mortgages with low credit risk and lower capital charges for mortgages with higher credit risk.

FIGURE 2

Prepayment Figures for 2010 Purchase Originations (Share of Unpaid Principal Balance Paid Off)



Source: Urban Institute calculations from Fannie Mae single-family loan performance data.

Incorporating these three factors into the risk-based capital standards would better align capital with risk and would meet the policy objective of providing creditworthy borrowers with affordable homeownership opportunities.

Besides better aligning capital with risk, the FHFA should also consider ways to reduce the requirement's volatility over the cycle, while giving the market certainty. The FHFA can exercise

discretion under the Federal Housing Enterprises Financial Safety and Soundness Act of 1992; it can alter any of the capital components. But it is not always obvious ex ante when that discretion should be employed, and it is hard for the market to gauge when it would be employed. Simple approaches to address the requirement's volatility would be to set minimums and maximums on the risk-based requirement. The FHFA can impose capital directives if risk was unreasonable. Another approach would be to have the risk-based requirement (as a share of the assets) be a moving average of the model results for the past two years. Relying on the original LTV ratio is another possibility. In short, something needs to limit the effects of the standard's cyclical nature while preserving its ability to align capital with risk.

While the FHFA proposal is a step forward, our analysis suggests improvements could be made to protect taxpayers and promote sustainable homeownership.

Notes

[1] Federal Housing Finance Agency, "FHFA Issues Proposed Rule on Enterprise Capital," news release, June 12, 2018, https://www.fhfa.gov/Media/PublicAffairs/Pages/FHFA-Issues-Proposed-Rule-on-Enterprise-Capital.aspx.

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