1. STRESS TEST ECONOMIC ENVIRONMENT

A. Yield Curve Specification[1]

Introduction

The 1992 Act directs OFHEO to specify the shape of the yield curve by requiring that "Yields of Treasury instruments with other terms to maturity will change relative to the ten-year constant maturity Treasury yield in patterns and for durations that are reasonably related to historical experience and are judged reasonable by the Director."[2] OFHEO's proposal is that, in the up-rate test, the yield curve transition to a flat yield curve and remain flat for the remaining nine years of the test.[3] For the down-rate test, OFHEO is proposing that the yield curve transition to a steep upward slope over the first year, and maintain that slope throughout the remaining nine years.[4]

Fannie Mae's analysis suggests that OFHEO's yield curve specification is not consistent with historical evidence, not consistent with the interest rate moves specified in statute, and, in the up-rate test, causes the maximum rate changes explicit in statute to be the minimum amounts by which rates increase for all instruments with maturities shorter than ten-years.

OFHEO's yield curve proposal appears to be somewhat arbitrary in that the historical evidence used to support it is incorrectly measured and inconsistently applied.[5] For example, OFHEO measures changes in rates from a nine-month average to a nine-year average, and yield curves based on a ratio of nine-year averages. Thus, rather than determining whether or not the yield curve would be expected to change during the last nine years of the stress test, OFHEO simply assumes it would not and develops its historical evidence based on predetermined constructs of that evidence. The problem is compounded by faulty econometrics. In addition, the evidence is inconsistently applied. While OFHEO looks at the biggest rate increase and the subsequent nine-year yield curve, the down rate yield curve is not tied to the biggest rate decline in a similar fashion. Instead, OFHEO simply chose to use the steepest yield curve ever observed, at least according to its methodology. Congress specified that the yield curve shapes be reasonably related to historical experience, not the worst ever.

OFHEO's specification of the yield curve is extreme in that it introduces stress well outside the bounds of those specified by the statute. For example, Congress specified maximum rate movements in the ten-year CMT. It will almost always be the case that OFHEO's specification of a flat yield curve in the up-rate test will cause the maximum rate move specified by Congress actually to be the minimum amount by which the most

[1] NPR 2 § 3.3.3.3 at 18,233-4.
[2] 12 U.S.C. § 4611(a)(2)(D).
[3] NPR 2 § 3.3.3.3.2.
[4] NPR 2 § 3.3.3.3.1.
[5] See NPR 2 at 18,146.

important rates will increase in this test. For example, in the June 1997 test run by OFHEO, the ten-year CMT rate increases by 495 basis points, the maximum rate stress according to the statute, yet the 3-month CMT increases 638 basis points based solely on OFHEO's assumptions. The fact that the rates on all instruments with maturities less than 10 years climb by amounts larger than those specified by Congress, and remain at those levels for nine years, must be recognized as an extreme interpretation that is not reasonable and therefore inconsistent with the 1992 Act.

Fannie Mae suggests that OFHEO maintain its proposed flat yield curve in the up-rate scenario at the end of the first year, but that the yield curve transition to a moderate upward slope by the end of the second or third year. In the down-rate test, the yield curve specification appears to be more reasonable. In addition, the yield curve slopes should be in constant basis points relative to the ten-year CMT, rather than in ratios as specified by OFHEO.

I. The data supporting OFHEO's approach are constructed to reflect assumptions and predetermined specifications of the problem, are not consistent with approaches used in industry and academia, and thus give misleading results.

OFHEO states: "The proposed yield curves for both interest rate scenarios correspond to historical experience."[6] Fannie Mae disagrees with this statement because of the way in which the historical evidence was constructed. The fundamental problem with the evidence is that it was constructed using an assumption about the share of the yield curve, that is, that the yield curve would remain unchanged after the first year of the stress test. Thus, the yield curve historical evidence was all constructed in terms of nine-year moving averages rather than more standard point in time measures. Fannie Mae believes this method of constructing the historical evidence lead OFHEO to the wrong conclusions about the shape of the yield curve in the stress test.

The issue of the shape of the yield curve in the stress test is really two questions: What is the shape of the curve when rates change rapidly, and what is the shape of the curve when rates do not change? Rather than address these two questions separately, the proposed regulation combines them by asking instead what is the shape of the yield curve as rates move up or down to a nine-year average level. Instead of examining and reporting the historical evidence that would tie separate yield curve shapes first to rapid rate moves and then to a complete absence of rate movement, the proposed regulation misdefines the problem by assuming that the yield curve would change only once and would then be constant after the end of the first year of the stress test.

The rest of this section is divided into three parts. The first part deals with the flaws in the approach to using nine-year yield curve averages. The second part shows how using nine-year averaged yield curves results in the historical evidence supporting its down-rate yield curve assumption to encompass two separate interest rate cycles. The third part

[6] NPR 2 at 18,147.

discusses particular problems and flaws in the regression analyses used to support the yield curve assumption in the up-rate scenario.

A. Problems with using nine-year averages

The method of constructing the evidence used to support the yield curve specification in the proposed regulation blurs the distinctions between two fundamentally different drivers of the yield curve in the stress test: the slope of the yield curve in rapidly changing interest rate environments and the slope of the yield curve in static rate environments. For example, the proposed regulation states:

> "At no time during the past 40 years have ten-year CMTs changed as greatly as required in the stress test. The largest comparable increase was 56.3 percent from the nine-month average of 6.04 percent during November 1971 to July 1972 to the nine-year average of 9.44 percent during August 1973 to July 1982. The ratio of six-month to ten-year yields during the later period was 0.98." [7]

OFHEO measures the increase (or decrease) from a nine-month average of the ten-year rate to a nine-year average of the ten-year rate. In contrast, the rate movement specified in the statute is over one year to a single point in time, not to a nine-year average. In other words, the statute specifies an increase (or decrease) over 12 months to a new level in month 12, not to a new average between months 12 and 120. Thus in order to see what kinds of yield curve shapes would result from rate increases or decreases, it is necessary to look at point to point increases or decreases, not point to average as in done in the proposed regulation. It may be argued that this is appropriate because the ten-year CMT rate remains fixed after the first year, the rate in month 12 and the nine-year average between month 12 and month 120 are the same thing. While this is true within the artificial construct of the stress test, applying such an artificial construct to history of dynamic interest rate movements has the effect of obscuring the historical evidence which would argue for different yield curve specifications.

For example, the methodology in the proposed regulation gives the result that the largest one-year increase in rates as being between roughly July 1972 and a period beginning in July 1973. Other safety and soundness regulators such as the Federal Reserve, the OCC, the FDIC who were required to deal with the severe problems caused in the financial services industry by the large rate increases in late 1979 and the early 1980s might have selected a different period. In fact the largest percentage increase between the nine-month average ten-year CMT and the ten-year CMT one year later was the 45% increase which occurred between March 1979 and March 1980. It might be argued that it is more appropriate to look at one-year increases or decreases in the ten-year CMT, rather than between a nine-month average of the ten-year CMT and the ten-year rate one year later. It is clear that Congress based the stress test interest rate movements off the nine-month average ten-year year rate to prevent Fannie Mae's capital requirements from being whipsawed by short-term transient movements in rates, but such concerns are immaterial

[7] NPR 2 at 18,148.

to and should not constrain the historical analysis. If the change is measured between the monthly rates, rather than from the nine-month average rate, the largest percentage increase in the ten-year CMT occurred between October 1993 and October 1994 when the ten-year CMT increased 45% from 5.33% to 7.74%. It should be noted that Fannie Mae not only survived this rate increase but, due to its risk management practices, saw its earnings and capital increase during this record rate jump.

The inconsistency with which the methodology is applied illustrates why this approach may be inconsistent with the statute. In selecting the period to benchmark the yield curve in the down-rate scenario, OFHEO states: "The largest comparable decrease was 38.9 percent from the nine-month average of 12.74 percent during February to October 1984 to the nine-year average of 7.78 percent during November 1985 to October 1994. That change was associated with a slope of 0.77 during the nine-year period."[8] However, the regulation proposes a different benchmark period for the down-rate yield curve, the period between May 1986 and April 1995,[9] without further explanation. Upon examination, it appears the reason for the shift in the benchmark region is that this period produces the lowest nine-year ratio of the 6-month to ten-year CMTs, that is, the steepest yield curve, for the period for which data is available. Thus, the proposed regulation does not establish an antecedent rate drop for this benchmark period, but uses it only because it was the most extreme yield curve as measured by the nine-year averaging methodology employed.

The benchmarking of the yield curve to the worst possible historical experience is inconsistent with the thrust of the statute. The statute reads: "Yields of Treasury instruments with other terms to maturity will change relative to the 10-year constant maturity Treasury yield in patterns and for durations that are reasonably related to historical experience and are judged reasonable by the Director."[10] Unlike the language which clearly benchmarks the credit loss experience to the worst regional loss experience, the statute specifically does not benchmark the yield curve to the worst experience. The better reading of the 1992 Act is that the yield curves should not be benchmarked to extreme positions.

Thus, the evidence presented in the proposed regulation to justify the yield curves specifications is misleading because it is based on predetermined notions of the behavior of the yield curve. Instead, the proposed shapes of the yield curve should be based on historical evidence of what yield curve is appropriate during for the one-year rise (or fall) in interest rates, what yield curve is appropriate for static interest rates, and what is the appropriate transition period between the two curves.

[8] Id.
[9] NPR 2 § 3.3.3.3.1.
[10] 12 U.S.C. § 4611(a)(2)(D).

B. Use of nine-year averages mixes disparate economic environments

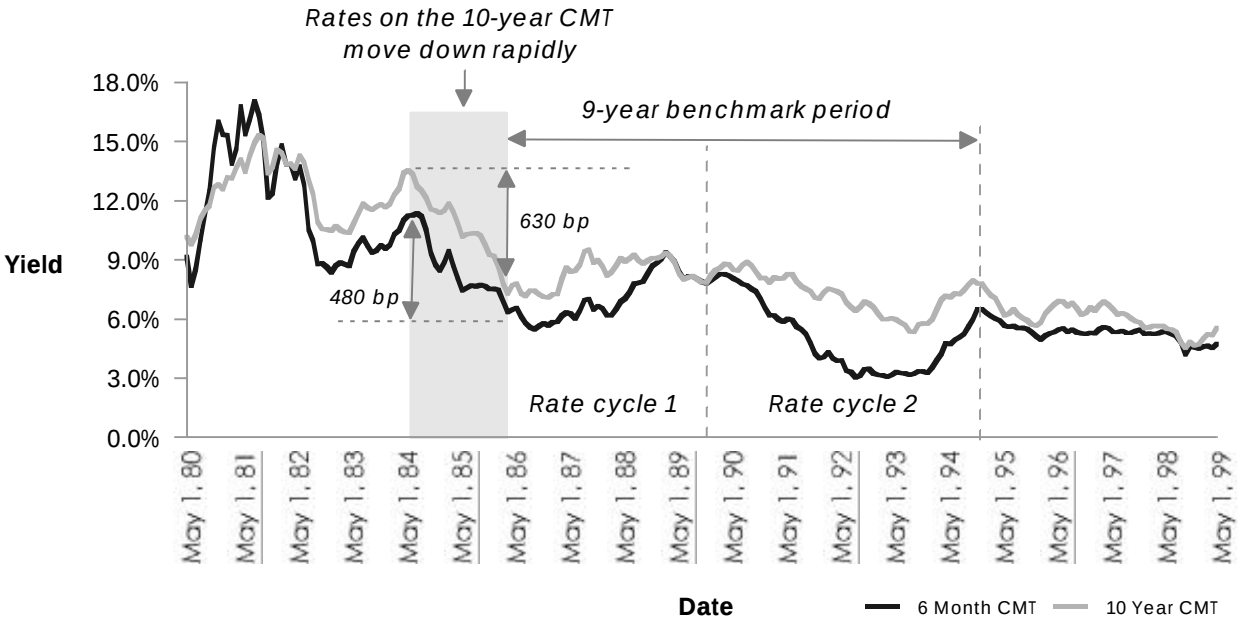
The use of nine-year averages to support the yield curve specifications in the proposed regulation causes inferences to be drawn from data averaged over disparate rate environments, economic cycles, and inflation regimes. In particular, the data supporting the yield curve assumption in the down-rate scenario encompass two separate, unrelated interest rate/economic cycles. In particular, the nine-year period cited as the steepest decline in rates encompasses a major portion of a period of unprecedented economic expansion, not the economic recession envisioned in the stress test.

As the justification for the yield curve selected in the down-rate scenario, the proposed regulation cites the period of time with the maximum decrease between a nine-month average of the ten-year CMT and a nine-year average of ten-year rates beginning one year later. This period had a nine-month average ten-year CMT rate of 12.74% calculated between February and October 1984. The nine-year average was calculated between November 1985 and October 1994 and equaled 7.78%, for a drop of 38.9%.

The first comment concerns the nine-month period chosen to represent the initial rate before the drop. While the average ten-year CMT rate was indeed 12.74% during this period, those particular nine-months were a period of extreme rate volatility. Rates first shot up 172 basis points and then fell by 140 basis points by the end of the averaging period. Thus any conjecture about the slope of the yield curve should take into account the volatility of rates during this period as well as the level.

Of even more importance is the assumption that the drop in rates during 1984 in any way influenced the shape of the yield curve during all of the following nine-year period. Any such assumption can be a form of *post hoc ergo propter hoc* logic, that is, that a yield curve slope years after a change in interest rates is assumed to have been caused by that change in rates. The chart below illustrates the pattern of interest rates before, during, and after OFHEO's benchmark period for the yield curve in the down-rate scenario:

6 Month And 10 Year CMT Yields (May 1980 – June 1999)



However, a cursory cataloguing of the major economic events during this period produces the following:

Before the benchmarking period:

1979 Paul Volcker replaces G. William Miller as Federal Reserve Chairman and shifts Fed operating procedures from targeting interest rates to targeting money supply and inflation

1981 Federal Reserve raises the discount rate to 14%

1981 Reagan administration cuts taxes by 30%

1982 Mexican economy collapses

1982 Bankruptcy and unemployment rates reach levels not seen since the Depression

Rate Cycle 1

1986 Continuing the 1984 rebound from the 1981-82 recession, strong economy with 2% inflation

1987 U.S. stock market drops, Dow Jones 30 Industrials drop 500 points

1988 U.S. unemployment rate drops to 5.2%

1989 Collapse of communism, Berlin Wall falls, increased German borrowing to pay for reunification efforts affects rates

Rate cycle 2

1990 Invasion of Kuwait, oil price shock and inflation expectation lead to steep yield curve

1990 Onset of recession in July, lasts until March 1991

1993 Higher rates from inflation fears associated with uncertainty surrounding proposals of new administration

1994 Election of new majority in Congress is followed by drop in interest rates and long-term stock market rally

The point is that each of these events had its own influence on interest rates, expectations of inflation, responses from the Federal Reserve, and the yield curve. Averaging across this period and relating the resulting average yield curve back to a rate drop in the early 1980s is not the best approach to looking at the historical evidence.

C. The econometrics supporting the yield curve proposal appear to be either incorrect or incorrectly explained

A third problem deals with the specific regression analysis cited in the proposed regulation to support the yield curve assumption. OFHEO supports its position of a slope of 1.0 between the 6-month CMT and the ten-year CMT in the up-rate test and .76697 in the down rate test using one of two almost identical regression equations.[11]

$Y_t = 0.86 + 0.19\ X_t$, where

Y_t is the 6-month CMT rate divided by the ten-year CMT

X_t is the ratio between the terminal stress test value of the ten-year CMT and the nine-month moving average of the 10 year CMT before the start of the stress test.

While this section is somewhat vague, the proposed regulation appears to state that increasing X_t by 75% results in the value of 1.00 for the ratio of the 6-month CMT to the ten-year CMT used in the up-rate test. Similarly, decreasing X_t by 50% results in the value of .76 for the ratio used in the down-rate test. Assigning a value of .75 or -.50 does in fact achieve values of 1.0 and .77 respectively.

However, it appears that the application of the regression results may be incorrect. The proposed regulation states: "Results of an ordinary least squares regression imply that a sustained 75 percent increase in the ten-year CMT would likely result in a CMT yield curve slope of 1.00, while a sustained 50 percent decline provides an expected slope of 0.77."[12] This does not follow from the regression equation as published. An increase in the X value of the regression by 75 percent implies a slope of about 1.14, not 1.00. According to the way the regression was defined, X is not a percentage increase but the ratio of the ending level of the ten-year rate to the beginning level. The problem is that the increase in the value of X rather than the new value of X may have plugged into the equation, .75 rather than 1.75. The slope in the down rate test would be .96 using the X value of .50 rather than percentage change of -.50 used by OFHEO to get .77. In addition, the regression coefficients appear to be incorrect. Replication of the OLS model in the proposed regulation, based on the description of that model and data, does not produce the coefficients published.[13] Thus, the regression published cannot not be used to justify the specification of the yield curve.

Irrespective of the calculated coefficients, the published regression has three fundamental flaws. First, the variable definitions in its regression are inappropriate. The dependent variable in the OLS regression is defined as the average of the six-month CMT rates for

[11] NPR 2 at 18,148 n.148.
[12] NPR 2 at 18,148.
[13] Our attempt at replication produced the following model: $Y_t = 0.68 + 0.18\ X_t$.

the 9 years preceding month t, divided by the average of the ten-year CMT rates for the same nine-year period. The independent variable is the average of the ten-year CMT rates for the 9 years preceding month t, divided by the average ten-year rates for the nine-month period ending 10 years before month t. The assumed rationale for this model structure is that: (a) the nine-month moving average of the ten-year CMT is known, (b) the increase to the terminal ten-year CMT rate in the stress test is a given, (c) the terminal rate is equal to the nine-year average rate by definition, and (d) with the assumption that the yield curve relationships are fixed after the first year, by definition, the terminal ratio of the six-month CMT to the ten-year CMT is equal to the ratio of the two nine-year averages.

The problem, as already discussed, is that the variables are defined based on predeterminations of how rates will move relative to each other and for how long, rather than to capture actual historical experience. For example, using the ratio of nine-year averages reflects a decision that the rates in the ratio will remain fixed for nine years. In addition, regression models are based on explaining variance, yet the variable definitions effectively mask much of that variance by comparing only averages calculated over a long period of time and ignoring the variation within those periods.

The second problem is that the model uses flawed econometrics. The same variable, the nine-year average of the ten-year CMT rates, is on both sides of the equation. It is in the denominator of the dependent variable and the numerator of the explanatory variable:[14]

$$\frac{6\ month\ CMT_{\ 9\ year\ avg.}}{\boldsymbol{10\ year\ CMT_{\ 9year\ avg.}}} = a + b\,\frac{\boldsymbol{10\ year\ CMT_{\ 9year\ avg.}}}{10\ year\ CMT_{\ 9\ month\ avg.}} + e$$

In addition, the original model has a problem with serial correlation caused by using monthly observations of nine-year moving averages. A replication of the model has a Durbin-Watson statistic of only .009. The proposed regulation attempts to correct for this by rank ordering the observations based on the independent variable and taking the average of the four quartiles for the X and Y variables. A regression was then run with these four observations and showed results similar to the full data set. Fannie Mae believes that it is not appropriate to draw meaningful conclusions from a regression on data with only four observations, and that the rank ordering and averaging process exacerbates the problem of having the same variable on both sides of the equation.

A more straightforward method of dealing with the serial correlation problem in its model might have been attempted. For example, one approach would have been to utilize the two-step generalized least squares estimation technique available in the SAS AUTOREG procedure. Applying this two-step full transformation technique as an AR1 process (only one lag is significant) does not completely solve the serial correlation problem, but it results in a slope in the up-rate test of .91, much closer to the long-term average Fannie Mae is proposing. The revised model has an intercept of .8053 and an X coefficient of .0600. Thus, for a 75% increase in rates (X = 1.75), the projected yield

[14] NPR 2 at 18,148.

curve using the definition of the data in the proposed regulation is .91, not .99. Thus, even given the assumptions underlying the creation of its data, this correction to the econometric techniques would have led to a more moderate slope to the yield curve.

In summary, the data and analysis cited in the proposed regulation to support the yield curve specifications are flawed and bring into question the empirical support for those specifications. Therefore, the yield curve assumptions must be viewed as not being linked to historical experience and are thus not consistent with the statute.

II. OFHEO does not consider that Congress mandated two separate components for the interest rate test and that these two separate and independent components lead to at least two different yield curve shapes.

In the narrative section of NPR 2, the proposed regulation states: "A constant yield curve is a straightforward approach that is consistent with the statutory specification of a constant ten-year CMT."[15] A yield curve which is constant after some period where the ten-year CMT is constant is supported by economic theory and econometric evidence, but the timing and slopes of constant yield curves do not appear to be consistent with the statutory specification.

The statute is clear that there are two separate components to the interest rate portion of the stress test. The first component is the rise, or fall, in the ten-year CMT. The second component is that the ten-year CMT stays at those levels for the remaining nine years of the test.[16] Thus, two types of historical yield curve analysis are called for: what is the shape of the yield curve at the end of a year of rapid interest rate changes, and what is the shape of the yield curve when rates enter a persistent period of no change.

The statute does not support an assumption that the yield curve at the end of the first year should be the one that persists for the remaining nine years. The proposed regulation makes that assumption and, as already shown, justifies that assumption with analysis of the changes between nine-month averages of ten-year CMT rates and subsequent nine-year averages of the ten-year CMT. In other words, the proposed regulation does not recognize the two separate interest rate requirements in the stress test, and then blends the resulting yield curves together in formulating the evidence cited to support this position.

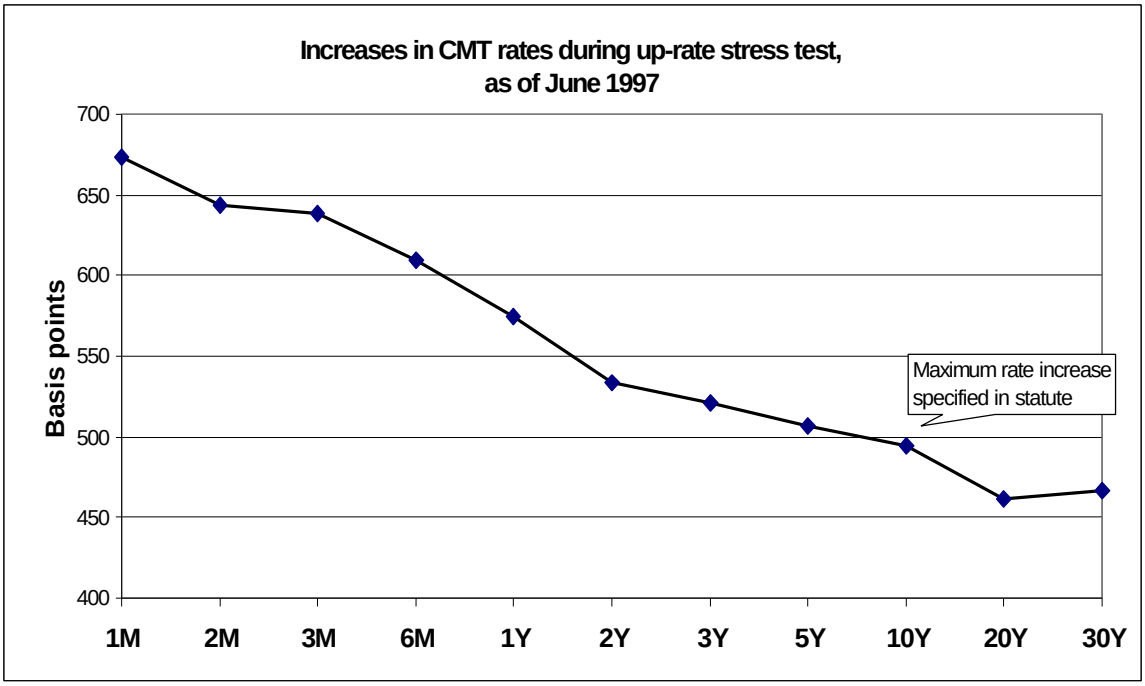
The fundamental mistake in the proposed regulation is that the yield curve shape is based on the change in rates over one year, but fails to reflect the likely shape of the yield curve if rates do not change over the next nine years. While no one can accurately or exactly predict the slope of the yield curve in the highly unlikely interest rate scenarios spelled out in statute, a much looser standard is reasonable versus unreasonable. By choosing an unreasonable specification of the yield curve, the proposed regulation introduces a level of stress beyond that intended by Congress.

[15] NPR 2 at 18,146.
[16] 12 U.S.C. § 4611(a)(2)(C).

III. Yield curve shapes cause short-term rates to move by more than the statutory maximum.

The statute specifies a rate movement in the ten-year CMT, with specific limits in the amount by which that rate may move. Specifically, the statute specifies that the ten-year CMT may increase by 600 basis points from the average of the ten-year CMT for the preceding nine months, or to 160% of the average ten-year CMT for the preceding three years, but in no case by more than 75% of the average for the preceding nine months.[17] It is clear from the statute and the supporting committee reports that this rate movement was the maximum to which the companies were to be subjected. The proposed regulation appears to go beyond Congressional intent by specifying a yield curve in the up-rate scenario which insures that that the statutory maximum is in fact the minimum amount by which all the other rates increase, assuming the beginning yield curve has a normal positive slope. All of the other CMTs, with the obvious exception of the 30-year, move up by the same amount as the ten-year CMT plus their initial difference from the ten-year. For example, for the June 1997 stress test, the ten-year CMT increases by 495 basis points by month 13. However, the six-month CMT increases 610 basis points, 495 plus the 115 basis point spread between the six-month and ten-year CMTs at the beginning of the test. The six-month agency debt rate is arguably the most important rate in the stress test because it is the rate used to new debt and for discounting in the capital calculation. Because this rate is tied to the six-month CMT, together with other interest rate modeling assumptions, it increases by 657 basis points, or by 116%. The chart below shows the amounts by the shorter-term CMTs increase as compared with the maximum for the ten-year CMT spelled out in the statute:

[17] 12 U.S.C. § 4611(a)(2)(C).



The interest rate increases shown in the chart above, coupled with the fact that these increases remain in effect for the last nine years of the stress test, are go well beyond the limits of the interest rate stress event intended by Congress. Therefore, it represents stress not reasonably related to the stress event as defined in statute.

IV. OFHEO's yield curve assumptions appear inconsistent with the macroeconomic environment underlying the stress test. In addition, the proposed regulation states that the goal of its yield curve specification was to require enough capital to cover a variety of interest rate changes in each rate scenario, rather than just the two specified by Congress. The implicit switch from a defined path stress test to a stochastic approach is not consistent with the 1992 Act.

The proposed regulation does not depict the macroeconomic environment which would lead to the credit losses and interest rate moves mandated by law. This is unfortunate because many observers might be surprised at the severe levels of sustained national unemployment, and home price deflation implied by the loss levels resulting from the loss benchmarking in the regulation. Perhaps nowhere else is the absence of such a macroeconomic scenario felt more acutely than in the decision on the shape of the yield curve. Assumptions on inflation and expectations on future levels of inflation are crucial to the shapes of the yield curve, and the proposed regulation should not have remained quiet on these assumptions. Instead, the proposed regulation states:

> "No specific pattern of yield changes can fully capture the range of possible future adverse changes. Based on historical experience, one would expect all interest rates to fluctuate over a broad range during a period as long as nine years. Different underlying macroeconomic circumstances would be associated with different evolutions of the entire yield curve, including the ten-year CMT. Tying the stress test to one specific set of macroeconomic circumstances would tend to limit its general usefulness."[18]

In not tying the yield curve to any particular macroeconomic scenario, the regulation proposes a yield curve which is consistent with no rational macroeconomic scenario. The proposed regulation further states:

> "The real-life danger the Enterprises face of much higher or much lower interest rates during the next decade[19] is not focused on any particular portion of that ten-year period. Designing a stress test with any specific pattern of interest rate changes after the first year of the stress period would imply a belief that Enterprise risk exposures in some future years would be a matter of greater public concern than in other years. While an argument could be made that near-term risk exposures would create losses with a high present value, that concern should be balanced by a recognition that the risk of a very different interest rate environment is greater for distant years than for the near-term."[20]

Fannie Mae believes OFHEO is mixing its approaches to determining capital adequacy. The two most commonly used are a stress test where financial performance is determined along a defined path of a stressful environment, and a stochastic approach where financial performance is determined across a large number of randomly generated interest rate and credit paths, and capital is determined as the amount needed to survive some percentage of these outcomes, 90%, 95%, 99%, etc. The stress test passed by Congress is a defined path stress test. The companies must survive a specified up-rate and down-rate test, as well as credit losses benchmarked against a specific regional experience. OFHEO's interpretation of its Congressional mandate has been to adopt defined paths of home prices, loss severity, vacancy rates and many other items. Yet when it comes to setting the yield curve, severe yield curve shapes are adopted, not because those shapes are the most likely based on the rest of the stress test conditions, but because the resulting required capital will cover a "broad range" of interest rate moves.

Any stress test is a fiction: how might a company fare in a set of circumstances that might occur. Such stress tests have value if the fiction is preserved, that is, that all decisions are made consistent with that fiction. But it appears the proposed regulation violates the fiction of its stress test by stepping out that fiction to interject multiple risk paths and risk posed by different points on the yield curve, yet within the fiction of the stress test, the

[18] NPR 2 at 18,146.
[19] It is not clear here whether OFHEO is referring to actual risk the companies may face during the next ten years, or the imaginary risk of the stress test.
[20] NPR 2 at 18,146.

proposed regulation dictates exactly the portion of the curve where Fannie Mae is expected to borrow and invest. This inconsistency must be addressed.

Finally, while the proposed regulation fails to specify a macroeconomic scenario, it also completely ignores the macroeconomic environment underlying the periods it used to benchmark the yield curve slopes it assumes. For example, the regulation proposes the period of May 1986 through April 1995 to benchmark the yield curve in the down-rate scenario. Yet rather than being a period of national home defaults unseen since the depression and falling home prices, this period saw:

- Personal income increase 66.9%
- Gross domestic product increase 64.4%
- Payroll employment increase 17.9 million
- Average new home prices increase 41.8%
- Average existing home prices increase 33.7%
- OFHEO's home price index increase 41.3%
- The number of homeowners increase by 7.6 million

Thus, while the proposed regulation states that the yield curve specifications are not tied to any particular economic scenario which would be consistent with the loss rates in the stress test, it actually tied its yield curve specification in the down-rate scenario to a set of economic conditions which are exactly opposite those which would be consistent with the stress loss rates.

IV. Proposed Alternative and Supporting Evidence.

Fannie Mae recommends that the proposed flat yield curve in the up-rate scenario by the end of the first year be maintained, but that the yield curve transition to a moderate upward slope by the end of the second or third year. In addition, the yield curve slopes should be in constant basis points relative to the ten-year CMT, rather than in ratios as specified by OFHEO. This proposal is more consistent with the two separate components of the interest rate stress events specified by Congress, the relatively short period of rapidly changing rates and the nine year period of stable rates, and is supported by the historical evidence.

Evidence supporting Fannie Mae's recommended solution:

The yield curve is a forward looking process, that is, it is based on expectations of future rates and inflation, but those expectations are based on recent history. Therefore, it should not be surprising that the historical evidence is that large changes in interest rates have only transitory impacts on the yield curve. In other words, rapidly rising interest rates create expectations of even higher interest rates, which might lead to a flat or inverted yield curve. Rapidly falling rates create expectations even lower rates, which might lead to a steep yield curve. Similarly, periods of no change in interest rates after a sharp rise would lead to expectations of continued no changes in rates, and perhaps an

expectation that rates have peaked and would begin to decline. The yield curves associated with such expectations would take on more traditional upward slopes.

The empirical evidence on sustained yield curves shapes following rate changes is weak because of this dependency of the yield curve on expectations. Since expectations are based on the most recent history, the impact of more distant history is a rapidly decaying effect. This is illustrated by a series of regressions run by Fannie Mae on the impact of a change in rates on the shape of the yield curve up to three years after the change in rates. In these regressions, the independent variable is the one-year percentage change in the ten-year CMT and the dependent variable the ratio of the 6-month CMT to the ten-year CMT immediately following the change and one to three years after the change. The results are reported before and after a generalized least squares transformation to correct for autocorrelation in the OLS residuals:

Regression Results for the Slope of the Yield Curve after a Change in Interest Rates				
	Immediately following change	1 year after change	2 years after	3 years after
Before GLS Transformation:				
Intercept	.8438 (.0001)	.8472 (.0001)	.8602 (.0001)	.8674 (.0001)
Slope	.6541 (.0001)	.4801 (.0001)	.1309 (.0209)	-.1011 (.0725)
Total R^2	.31	.17	.01	.01
Durbin-Watson	.12	.10	.07	.07
After GLS Transformation:				
Intercept	.8516 (.0001)	.8521 (.0001)	.8549 (.0001)	.8608 (.0001)
Slope	.2152 (.0001)	.0281 (.5274)	-.0157 (.7207)	-.0466 (.2879)
Total R^2	.94	.94	.94	.94
Durbin-Watson	1.84	1.90	1.96	1.99
# of lags used	4	4	4	4
	p-values in parentheses			

Two important facts emerge from these results. First, even before the transformation correction for serial correlation, the degree to which the yield curve slope is associated with a change in interest rates is increasingly smaller one, two and three years after the change. After the transformation, a change in interest rates has no significant impact on the slope of the yield curve one or more years after the change. Thus, one year after a change in interest rates, there is no significant difference in the expected slope of the yield curve from a long-term average of 0.85 to 0.86.

Second, using the significant results for the slope of the yield curve immediately following the change in rates results in a six-month CMT to ten-year CMT yield curve of

1.013 in the up-rate test, similar to what OFHEO is proposing for the end of the first year.[21] The difference is that these same models would predict yield curves of 0.85 to 0.86 for every year thereafter.

As has been discussed, the problem is that expectations determine the yield curve and expectations are based on the most recent events, not on events that occurred one, two, or three years ago. It is most likely that the response functions in these regressions are the result of expectations resulting from changes in interest rates followed by other changes in interest rates, whereas the stress test is characterized by a change in interest rates followed by no change in interest rates.

While it would be most informative to look at the behavior of the yield curve over periods where interest rates changed rapidly and then stayed constant for several years, such historical evidence simply does not exist. However, it is possible to identify periods where interest rates increased or decreased by larger amounts than normal, and where the subsequent change was less than normal. The interest rate data since 1958 were filtered to find those instances where ten-year CMT rates increased by more than 16% over one year (roughly upper 10th percentile moves) and subsequent annual changes were plus or minus 3.5%, where 3% is the median change. The exact level of the filters is not important since this is simply a cataloguing of the anecdotal evidence.

The table below lists the seven instances where the one-year increase in the ten-year CMT rate exceeded 16% and the absolute value of the change in the subsequent year was less than 3.5%. In some cases, several consecutive months would meet the criteria. In these cases, the month with the highest percentage change was selected to represent that period. The table shows the yield curve at month 0, the 12-month rate increase, the yield curve in month 12, the increase between month 12 and month 24, and the yield curve in month 24. For example, the ratio of the 6-month CMT and the ten-year CMT was 0.9287 in August 1965. After a 22.82% increase in the ten-year CMT rate, the yield curve increased to 1.01. After an increase of only 1.15% in the ten-year rate between August 1966 and August 1967, the yield curve fell to 0.91.

[21] .8516 + .2152 (.75) = 1.013.

Date	Yield Curve at Month 0	% change in 10-yr CMT Month 0 to Month 12	Yield Curve at Month 12	% change in 10-yr CMT Month 12 to Month 24	Yield Curve at Month 24
Aug. 1965	0.9287	22.8%	1.010	1.2%	0.915
Sept. 1968	0.9623	27.2%	1.022	3.2%	0.874
Oct. 1973	1.1345	16.4%	1.033	3.0%	0.804
Mar. 1979	1.1048	39.8%	1.292	2.9%	1.058
July 1980	0.8309	39.3%	1.130	-2.3%	0.918
Dec. 1986	0.8134	26.4%	0.740	1.3%	0.955
Apr.1993	0.5126	16.8%	0.610	1.3%	0.853

In five of the seven cases, an increase in the ten-year CMT rate was associated with an increase in the yield curve. The biggest increase in the ratio between the 6-month CMT and the ten-year CMT was associated with the 39.3% increase in the ten-year rate beginning July 1980 when the yield curve went from .831 to 1.130. Conversely, the smallest increase was the drop in the yield curve from 1.135 to 1.033 which was associated with a 16.4% increase in rates beginning in October 1973.

What is most important for this analysis is that in every case where an increase in rates was associated with a flat or inverted curve, the slope of the yield curve decreased over the next year when there was relatively little change in interest rates. For the period beginning twelve months after August 1965, the yield curve dropped from 1.010 to 0.915 despite a 1.2% increase in the ten-year rate. For the September 1968 observation, it dropped from 1.022 to 0.874 despite a 3.2% increase in rates. For March 1979 it dropped from 1.292 to 1.058 despite a 2.9% increase in rates, and for July 1980 it dropped from 1.130 to .919 with a 2.3% drop in rates. Thus while this empirical evidence is not overwhelming, it is generally supportive of Fannie Mae's proposed yield curve slopes in the up-rate scenario and inconsistent with OFHEO's proposal.

Conclusion

No capital model is 100% percent correct and no assumption in a capital model is 100% correct. However, Fannie Mae believes that its proposal on the yield curve is more reasonably related to historical experience. Fannie Mae is proposing that the initial shift in the yield curve in the up-rate scenario be the same that in the proposed regulation, flat at the end of the first year, but that a reversion to a more average slope in subsequent years better satisfies the statutory requirement for being reasonably related to historical experience. Fannie Mae believes its proposal successfully satisfies the requirements of being consistent with the two separate portions of the interest rate stress environment (rising rates and then stable rates), successfully imposes a realistic interest rate stress environment test for the companies within the framework of that defined in the statute, and is simple to implement.

For additional comment on yield curve specification, see First Manhattan Consulting Group brief in Appendix V-2.

B. Non-Treasury Interest Rates (Spreads)[22]

Introduction

OFHEO has no specific statutory guidance in setting the yields on non-Treasury instruments during the stress test, other than the general requirement that any such decisions be consistent with the stress period and be based on available information.[23] In the absence of clear statutory authority to exercise discretion, the Director is bound by the consistency requirement, which OFHEO correctly interprets as a mandate to rely in some fashion on historical measures. OFHEO's proposed approach is to model non-Treasury spreads as proportional spreads based on historical information compiled from a variety of sources.[24] The spreads on non-Treasury instruments are projected though the stress period using autoregressive integrated moving average (ARIMA) models, the form of which are specified in regulation for each individual instrument.[25]

Any proposed procedure for projecting non-Treasury instrument rates in the stress test should satisfy two requirements. First, does it capture as accurately as possible those interest rate spreads that truly pose a risk to the firms in a stress event? Second, is it implemented in a manner that does not add unneeded complexity to the test? Fannie Mae believes the methodology proposed in NPR 2 for projecting non-Treasury spreads fails both requirements. The ARIMA models it proposes are incorrectly constructed, incorrectly applied, needlessly complex, and, rather than measure risk in the stress test, are an actual source of risk. A number of the most important proposed spreads are incorrect because the data on which the models are based are incorrect. In addition, the use of proportional spreads rather than constant basis point spreads distorts the historical relations among various instruments and does not properly reflect risk in the test.

Fannie Mae proposes that all spreads be measured as simple three-year moving average basis point spreads over the appropriate Treasury instruments, and that mortgage spreads narrow 25 basis points in the up-rate scenario and widen by 25 basis points in the down-rate scenario to reflect the expected mortgage market dynamics in the stress event. Fannie Mae also proposes ways of improving the historical data series on which the average spreads are estimated.

I. Problems with using 19 separately identified and estimated ARIMA equations.

NPR 2 proposes that interest rates on 19 non-Treasury instruments be modeled relative to similar maturity Treasury instruments using 19 separately identified and estimated ARIMA models. Thus, the behavior of 3-month Agency debt is modeled independently

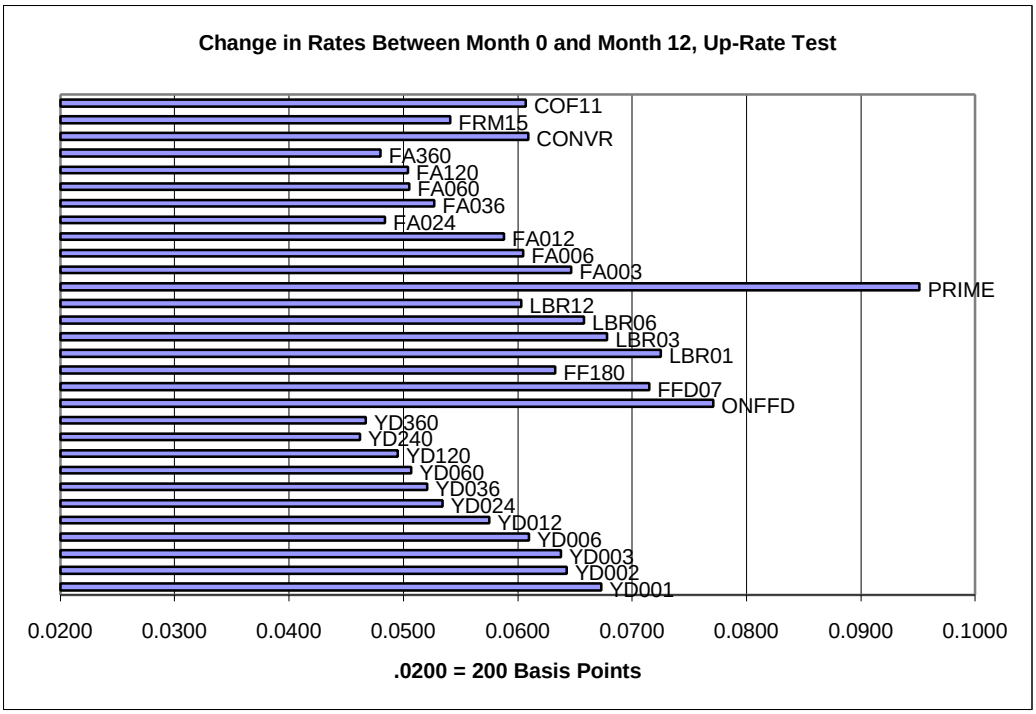
[22] NPR 2 § 3.3.3.4 at 18,234-6.
[23] 12 U.S.C. §§ 4611(a)(4) and 4611(b)(2).
[24] NPR 2 at 18,149 and NPR 2 § 3.3.2.
[25] NPR 2 § 3.3.3.4.

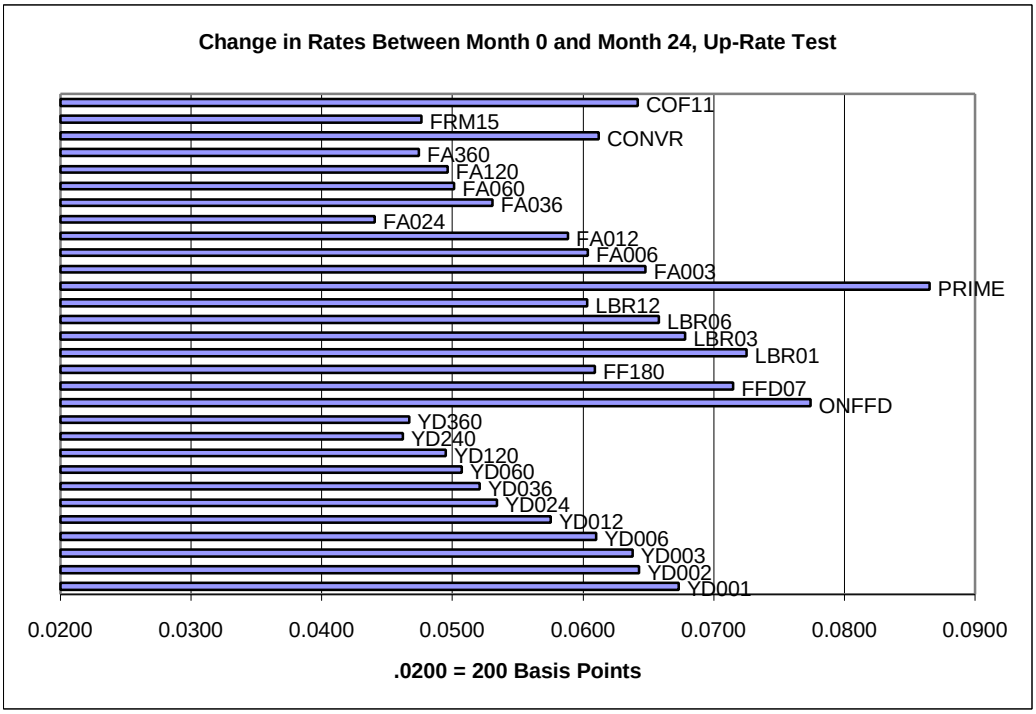
from the behavior of 6-month Agency debt and 3-month and 6-month LIBOR rates. Fixed-rate, 30-year mortgage rates are modeled independently from 10-year Agency debt and 15-year fixed-rate mortgages. But the rates in these instruments do not move independently from each other. Instead, they move relative to each other with fairly consistent spreads determined by market experience and expectations, with the underlying Treasuries determining the level of the overall system of rates.

The fundamental problem the approach NPR 2 takes to modeling the spreads on non-Treasury instruments is that it has framed the wrong argument. The issue is not how the spread between any particular instrument and a similar maturity Treasury instrument changes with the level of rates, but how the spreads between those non-Treasury instruments change. For example, the spread between 10-year Agency debt and the 10-year CMT is largely immaterial to Fannie Mae's risk. The interest rate risk faced by the two companies is not the conventional mortgage rate versus the 10-year Treasury rate, or 3-month Agency discount note rates relative to 3-month T-bill rate, or the 1-year LIBOR rate relative to the 1-year Treasury rate. The risk faced by the agencies is the Agency debt rate versus mortgage rates, and the Agency debt rate versus LIBOR. These spreads are central to the interest rate risk of Fannie Mae, however they are not modeled directly in the proposed regulation. Instead, these spreads which have the biggest impact on the risk of the firms are only the indirect results of nineteen individually justified but collectively incorrect ARIMA time series models.

The problems caused by the approach in the proposed regulation can be illustrated in the following graphs. The first shows the change in rates over the first 12 months of the up-rate stress test as of 1997q2. The second shows the change in rates over the first 24 months. The Agency debt rates shown here exclude the 50 BP risk penalty and the 2.5 BP issuance cost imposed beginning in month 13. The instrument notations are the same as those used in NPR 2:

COF11	11th District Cost of Funds
FRM15	15-year Fixed-Rate Mortgage
CONVR	30-year Fixed-Rate Mortgage
FA003-FA360	Agency Debt, Maturity in Months
PRIME	Prime Rate
LBR01-LBR12	LIBOR, Maturity in Months
FF180	180-day Fed Funds
FFD07	7-day Fed Funds
ONFFD	Overnight Fed Funds
YD001-YD360	Constant Maturity Treasuries, Maturity in Months


Change in Rates Between Month 0 and Month 12, Up-Rate Test
COF11
FRM15
CONVR
FA360
FA120
FA060
FA036
FA024
FA012
FA006
FA003
PRIME
LBR12
LBR06
LBR03
LBR01
FF180
FFD07
ONFFD
YD360
YD240
YD120
YD060
YD036
YD024
YD012
YD006
YD003
YD002
YD001
0.0200
0.0300
0.0400
0.0500
0.0600
0.0700
0.0800
0.0900
0.1000
.0200 = 200 Basis Points


Change in Rates Between Month 0 and Month 24, Up-Rate Test
COF11
FRM15
CONVR
FA360
FA120
FA060
FA036
FA024
FA012
FA006
FA003
PRIME
LBR12
LBR06
LBR03
LBR01
FF180
FFD07
ONFFD
YD360
YD240
YD120
YD060
YD036
YD024
YD012
YD006
YD003
YD002
YD001
0.0200
0.0300
0.0400
0.0500
0.0600
0.0700
0.0800
0.0900
.0200 = 200 Basis Points

The key points to notice are:

- The short-term Treasury instruments increase much more than the benchmark 10-year rate due to the proposed yield curve construction in the up-rate test.

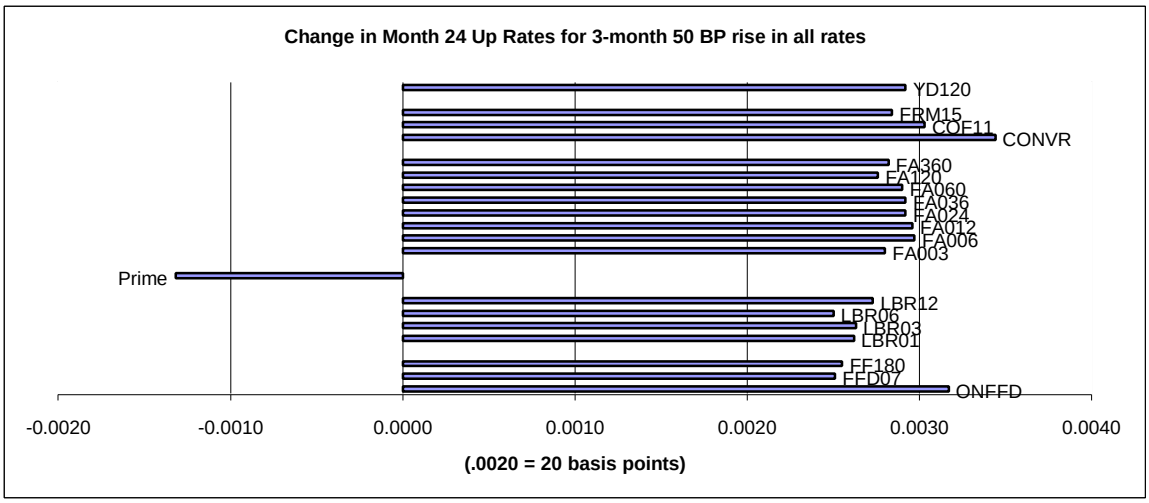
- The overnight Fed Funds rate increases 774 BPS while the 7-day Fed Funds rate increases only 715 BPS. This difference is far greater than any yield curve-driven differences in the Treasury rates.

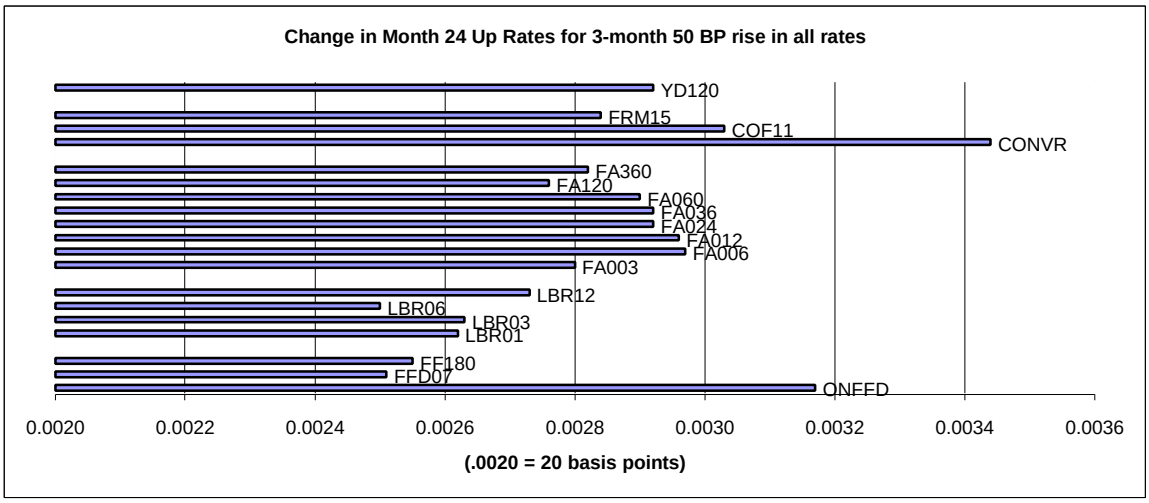
- The increase in LIBOR rates is greater than the increase in Agency debt rates for each maturity. While this may actually reduce required capital in the up-rate test, it will be shown that this relationship is unstable.

- The change in Agency debt rates is not consistent with the change in Treasury rates. The change in the 2-year rate is less than the changes for the longer Agency maturities, and 5- and 10-year Agency notes change by almost exactly the same amounts.

- While the 30-year conventional mortgage rate increases by over 600 BPS, the 15-year mortgage rate increases by only 477 BPS. This result is not consistent with the yield curve assumption in the proposed regulation. While most of the rates reach their terminal levels by month 12, the 15-year mortgage rate increases 541 BPS in the first 12 months, but then falls by 64 BPS between month 12 and month 24. In other words, the spread between 15-year and 30-year mortgages increases during a period when the yield curve is flat.

While the stress interest rates generated for the stress test as of June 30, 1997 are questionable, what is more disturbing is the behavior of the interest rate generation system when perturbed by various reasonable interest rate shocks. The following two charts show the results when all interest rates are increased by 50 BPS for the last three months leading up to the stress test. The charts show the difference between the month 24 up-rate stress test rates with the 50 BPS increase and the month 24 rates calculated by OFHEO. The 10-year CMT (YD120) is included as a point of reference. Again, the Agency debt rate does not include the 52.5 BP addition imposed beginning in month 13. The first chart includes the change in the prime rate. The second excludes the prime rate and changes the scale so that the difference in the reaction of the different rates can be better appreciated.





The key points from the above two charts are the following:

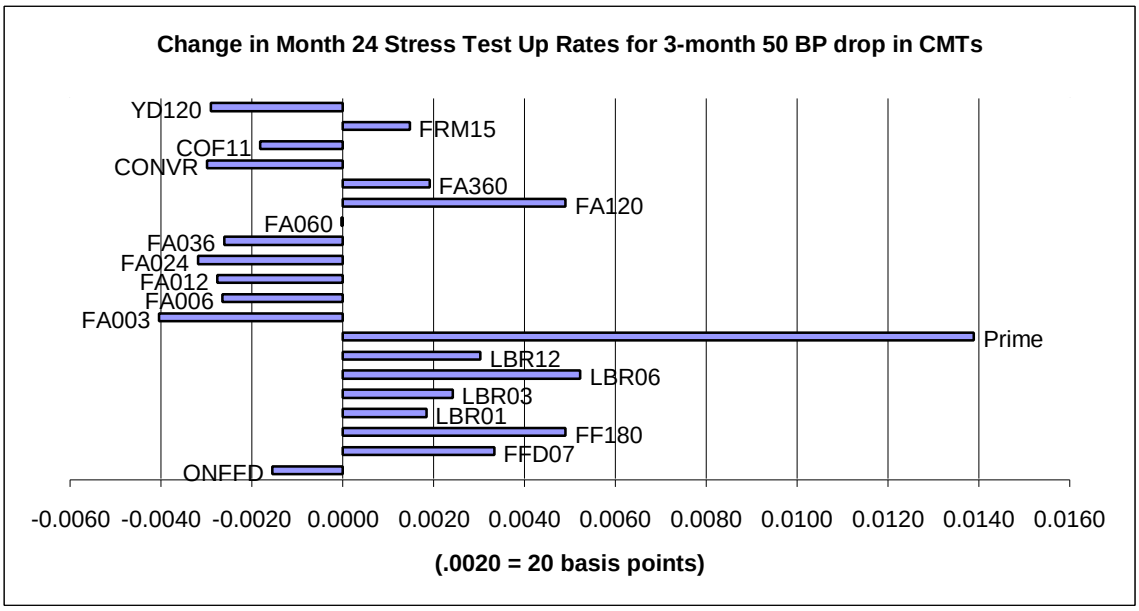
- The prime rate falls when all other rates increase. The reason lies in the nature of the ARIMA model selected to model the prime rate and the large difference between the long-term average prime spread and more recent spreads in OFHEO's data.

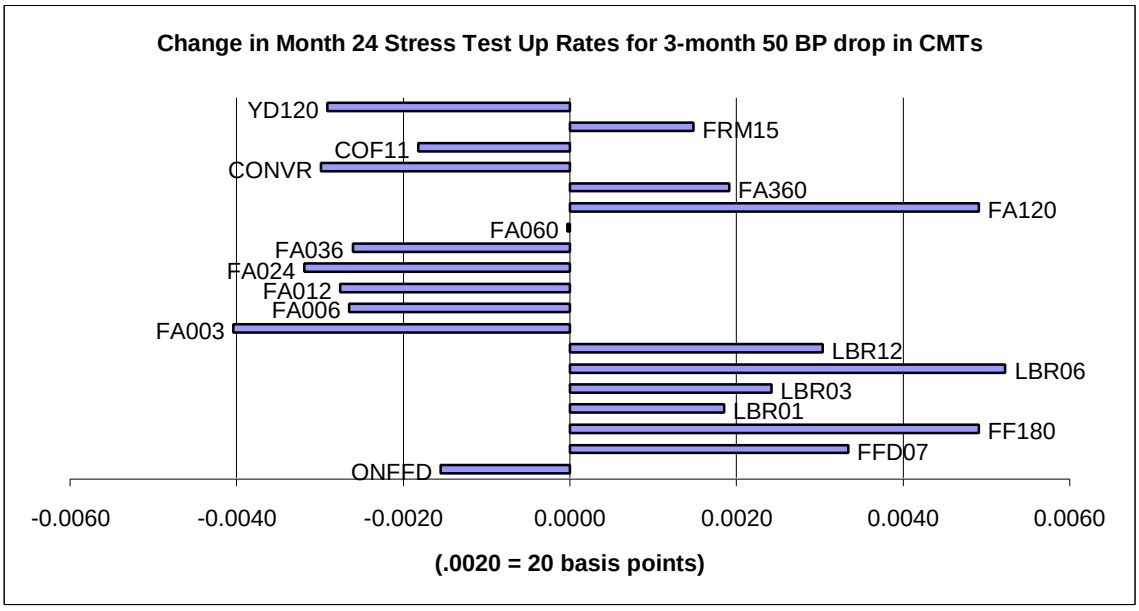
- The 50 BP increase in interest rates during in the three months immediately before the stress test increases the benchmark 10-year CMT by 29 BPS. In contrast, the two rates which increase the most are at the two opposite ends of the maturity spectrum--overnight Fed funds and 30-year fixed-rate mortgages.

- Agency debt increases by more than LIBOR across the board. While 6-month Agency debt goes up 30 BPS, 6-month LIBOR increases only 25 BPS.

- 10-year agency debt goes up by less than the 10-year CMT on which it is based.

The problem is even more pronounced when there is a movement in the Treasury curve without a shift in the rates on the other instruments. For example, a flight to quality or reductions in federal debt could force down Treasury rates relative to other instruments but leave those instruments unchanged relative to each other. The following two graphs are based on such a scenario where all Treasury rates drop 50 BPS in the last three months of the stress test but all other rates are unchanged. The graphs show the difference between the month 24 rates in this scenario and the month 24 rates used by OFHEO. The first graph includes the change in the prime rate, the second excludes prime and uses a different scale.





The key points are the following:

- The first chart shows that while the 10-year CMT drops 29 BPS, the prime rate increases 139 BPS.

- The second chart shows that LIBOR rates increase across the board, some by as much as 50 BPS, while rates on Agency debt fall, except for the 10-year and 30-year maturities.

- The rate on 10-year Agency debt increases by 49 BPS while the 5-year debt rate is essentially unchanged and the 3-year rate falls 26 BPS.

Simply put, these results make no sense. A drop in Treasury rates causes the spread between 30-year conventional mortgage rate and the 10-year agency debt rate to narrow by 80 BPS, while the spread between 6-month agency debt and 6-month LIBOR increases by 80 BPS. While some of these shifts might reduce Fannie Mae's capital requirements by artificially increasing the LIBOR to Agency debt spread, shifts in interest rates in the other direction would artificially narrow the spread between LIBOR and agency debt. For example, imagine a scenario under which, after a flight to quality, spreads between Treasuries and other rates begin to narrow, accompanied by an overall increase in interest rates. Under such a scenario, the combined effect of the 19 different models would be to drive up Agency debt costs relative to LIBOR in the stress test, even if actual Agency to LIBOR spreads remained unchanged.

The important issue is that the behavior of the interest rate models show that capital requirements would change, not due to changes in risk, but due solely to the faulty structure of the models. The incentive for Fannie Mae would be to hedge the potential rate movements generated by these models, not the rate movements possible under any

reasonable expectations of what might happen in the economy. In other words, the incentive will be for Fannie Mae to hedge model-generated risk rather that actual economic risk. Since the movements of some of the spread relations generated by these models are in the opposite direction of what might be expected, or are of a far different magnitude than what might be expected, hedging against the model-generated risk could increase the company's exposure to real-world risk.

The underlying cause of the problem is that NPR 2 models these rates against Treasuries with separate and independent ARIMA models which are inconsistent with each other. The assumption that spreads are proportional greatly magnifies the model-generated errors. There are several technical problems with the ARIMA models which invalidate them, including inadequate model selection criteria, inconsistent model construction, and inconsistent estimation periods.

The proposed regulation specifies in detail how each ARIMA model is to be constructed. The specification of the ARIMA models is very important because different specifications lead to different projected spreads in the stress test. In the up-rate test in particular, small changes in the model can lead to large differences in the calculated spreads. Several of the ARIMA models are technically incorrect. Some of the models have inadequate selection criteria statistics and others include spurious lag coefficients with no economic content or justification. Finally, the model coefficients were withdrawn three months into the comment period, since the coefficients originally published were incorrect and were subject to change quarterly anyway. In the revised NPR 2, only the ARIMA model structures are specified, ignoring the fact that the model structures themselves are time-dependent and subject to change as data are updated.

Regarding model selection, the proposed regulation states in part "Also, visual examination of the data series and residual analysis based on appropriate statistical criteria (e.g., Ljung-Box Q-statistics) were used to guide the model selection process."[26] The Ljung-Box Q-statistic is a measure of model adequacy only, not a criterion for selection of the best model. It measures whether any significant autocorrelation remains in the residuals of the fitted model, not whether or not any particular specification is the best model. Statistics normally used for selecting the best model, or at least a better model, are the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC). Both criteria essentially rely on imposing a penalty for excess parameterization of the model in exchange for marginal increases in accuracy. To test whether the specified models could be improved using the AIC or SBC statistics, the four Agency debt models which were not already AR(1) were modeled as AR(1). In three out of four cases, the AIC and SBC number improved (got smaller) with no adverse impact on the Box-Q statistics relative to the corresponding model specified in the proposed regulation. Since we believe the entire approach of estimating individual models relative to the appropriate Treasury instrument is incorrect, we did not attempt to seek improved models for each of the non-Treasury instruments.

[26] NPR 2 at 18,149 n. 149.

Special mention should be made of the 11th District Cost of Funds rate. The proposed regulation models this rate relative to the 1-year CMT. This model does not work well because an ARIMA model based on a single rate does not capture the way in which these banks shift to different maturities as the yield curve and level of interest rates change. Thus, the 11th District Cost of Funds rate is a complicated rate to model accurately, which argues for a simple approach rather than with a complicated model which does not wok well.

Closely tied to the issue of the inadequate model selection criteria are the problems of the inconsistency in model construction and the inclusion of spurious lag coefficients which have no economic justification. For example, the three-month LIBOR rate is modeled as an ARIMA (0,1,3) process with MA lags of 1, 3 and 4. In contrast, the six-month LIBOR rate was modeled as an ARIMA (4,1,1) process, with the AR lags being 4, 6, 7, and 8 and an MA lag of 1. Unless the LIBOR historical rate data are systematically flawed , Fannie Mae sees no economic justification for such a difference between the two models. The 2-year Agency debt rate is modeled as an ARIMA (3,0,2) with AR lags of 1, 6 and 18 and MA lags of 5 and 11. We see no justification for these long and seemingly random lags. It appears that the approach was to run models with many AR and MA lags and retained the ones with significant p-values, regardless of whether there was any underlying economic justification for such lags. Fannie Mae disagrees with this approach.

The problem with such inconsistency among the models is that the inconsistency causes spreads on similar instruments to behave very differently in the stress test and in ways that do not reflect risk. Depending on how they are modeled, some spreads are primarily influenced by and revert to historical means. Other spreads are more heavily influenced by the last few observations. This is caused by the use of a combination of stationary and first-difference ARIMA models. Stationary models are used in explaining and forecasting the level of a variable, while first-difference models are used to explain the change in variable's level. While each approach has its role and certain strengths and weakness, the problem arises when these models are mixed into one overall system for forecasting interest rates. The table below lists the instruments modeled with stationary models and those modeled with first-difference models:[27]

[27] NPR 2 § 3.3.3.4.

Type of ARIMA model used for the 19 non-Treasury interest rates projected for the stress test:

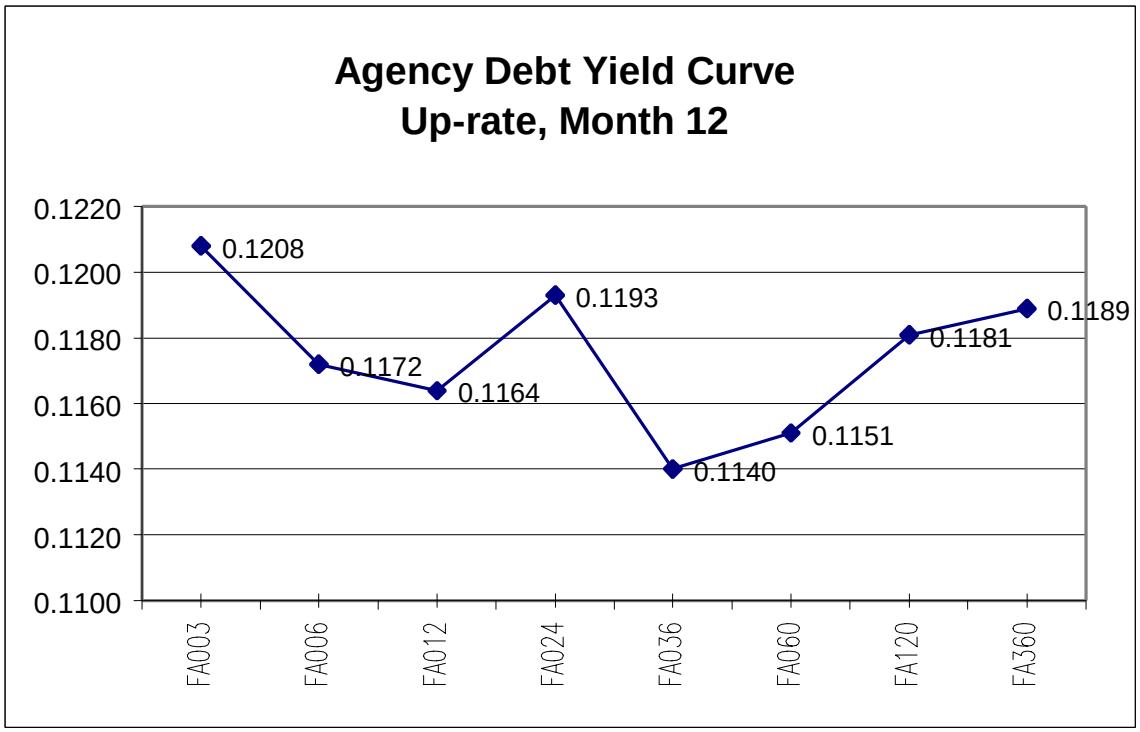
Stationary models	First-difference models
Fed Funds – Overnight	Fed Funds - 7 day
Fed Funds – 180 day	LIBOR 1-month
Agency debt – 6 months	LIBOR - 3 months
Agency debt - 1 year	LIBOR - 6 months
Agency debt - 2 years	LIBOR - 1 year
Agency debt -years	Agency debt - 3 months
Agency debt - 5 years	
Agency debt – 10 years	
Agency debt – 30 years	
Prime	
Mortgages – 15 year	
Mortgages – 30 year	
FHLB 11th Dist. Cost of Funds	

As has been stated, the spreads between LIBOR and Agency debt are some of the most important spreads in determining the risk exposure of Fannie Mae and Freddie Mac. The use of stationary models for Agency debt and first-difference models LIBOR introduces a major source of error into the capital calculation process that does not reflect actual risk.

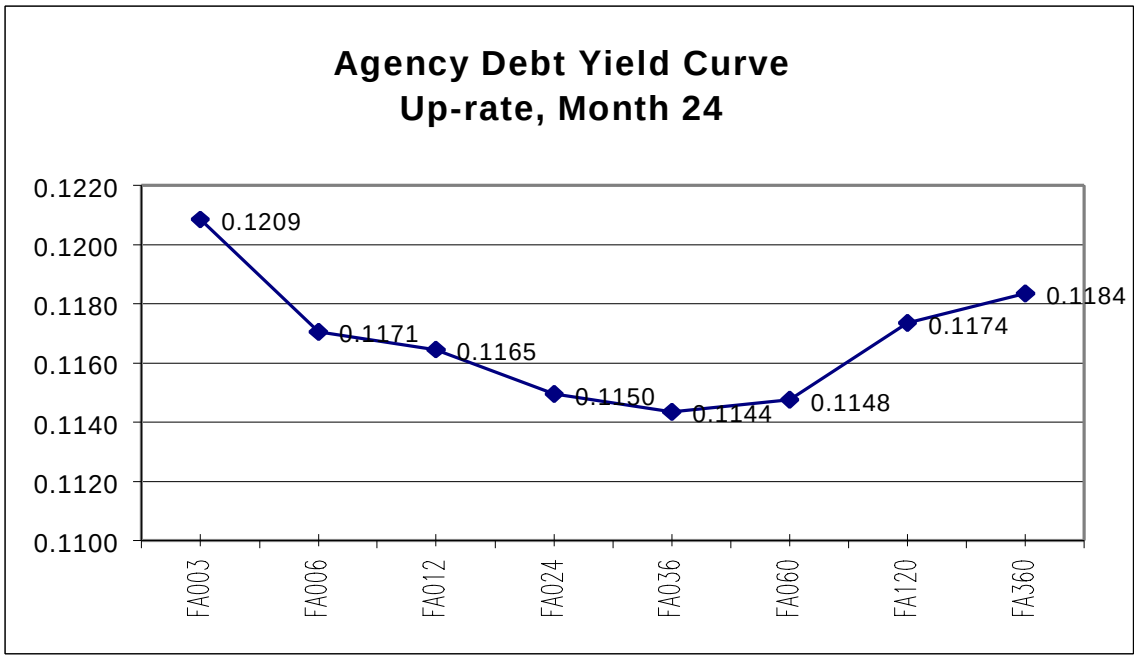
Finally, the choice of a complex system of models might be acceptable if such complexity more accurately captured risk, but cursory examination of the results of the models provides evidence of the degree to which they are flawed. For example, the spreads published on OFHEO's website[28] for the June 30, 1997 stress test indicate that the yields on ten-year Agency notes begin the test at 28 basis points over ten-year Treasuries, but are carrying rates below Treasuries by the second year of the stress test, before application of the 50 basis point risk premium. The 30-year Agency debt rates begin and end the stress test below Treasuries.

The proposed regulation specifies that the yield curve for Treasury instruments is flat in the up-rate scenario beginning in month 12. Due to the peculiarities of the rate modeling process, the yield curve for Agency debt is steeply downward sloping for maturities out to three years, and then steeply upward sloping for the longer maturities. The chart below shows the Agency debt yield curve in month 12 and is based on data furnished by OFHEO for the June 30, 1997 stress test. The Agency debt rates reported here contain neither the 50 basis point risk premium nor the 2.5 basis point issuance costs included in the rates released by OFHEO.[29]

[28] http://www.ofheo.gov/docs/regs/NPR 2-supp.html, "Proportional Spreads. "
[29] http://www.ofheo.gov/docs/regs/NPR 2-supp.html, "Interest Rates 6/30/97."

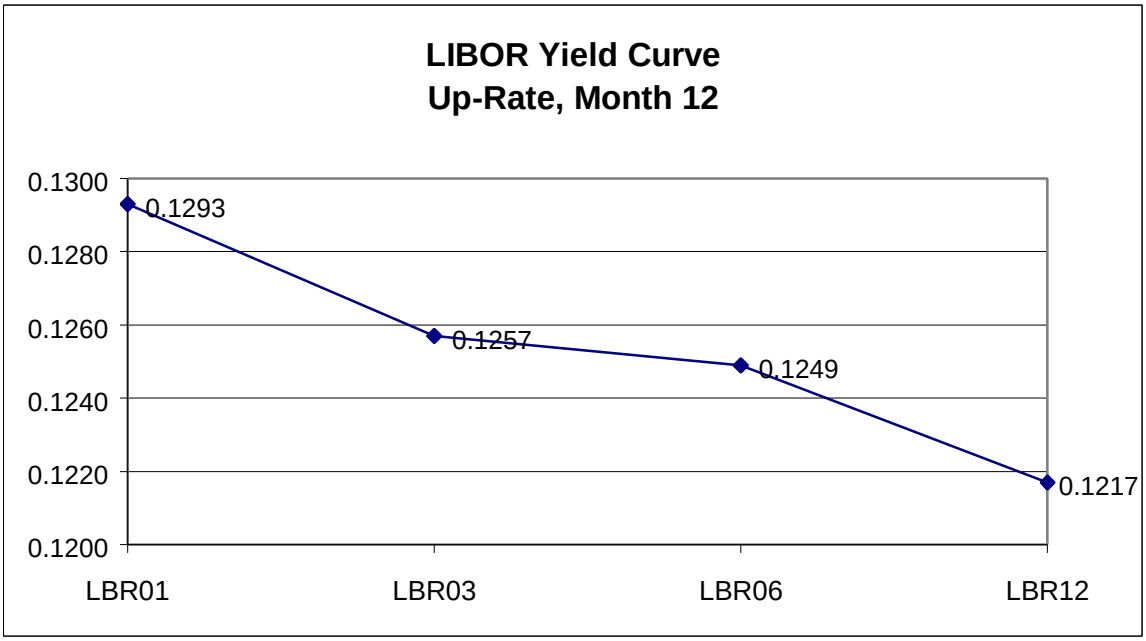


The 2-year Agency rate (FA024) is an artifact of the faulty historical data series used by OFHEO the interest rates it used in the stress, so it is perhaps more informative to look at the month 24 yield curve which persists through the final eight years of the test:

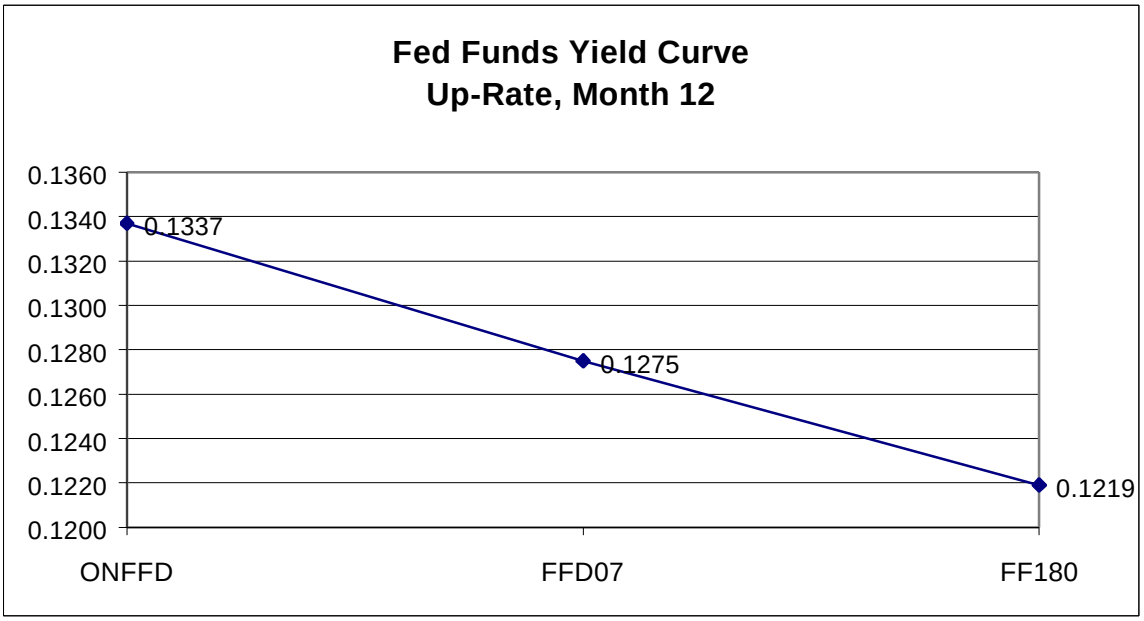


This yield curve is not consistent with either the other assumptions in the stress test or historical evidence. The three-year instrument (FA036) carries exactly the same yield as the three-year Treasury, but the three-month Agency debt carries a 65 basis point premium. These rate differentials have no reasonable explanation, lack historical precedent, yet have the potential of impacting Fannie Mae's required capital by hundreds of millions of dollars.

The LIBOR yield curve in the up-rate scenario is also inconsistent with the specification of a flat yield curve. Although the maturity range for LIBOR is only one-month to one-year, the interest rate models in the proposed regulation result in a sharply inverted curve and the one-month rate exceeding the one-year rate by 76 basis points for the last nine years of the stress test:



The results for the Fed Funds rates are even more questionable. Not only is the yield curve steeply inverted, but the overnight Fed Funds rate is 62 basis points higher than the 7-day rate in month 12 and stays at about that level for the full nine years of the test. The historical average difference, based on the DRI data used by OFHEO is 2 basis points. Similarly, the overnight rate is 118 basis points above the 180-day rate, but the historical difference has the 180-day rate 29 basis points above the overnight rate.



The problem with these results is that the rate behavior described here served in part as the basis for the finding in NPR 2 that Fannie Mae was undercapitalized as of June 30, 1997.[30] The reported undercapitalization was driven in part by interest rate risk which was determined by models with results such as these. NPR 2 contains an estimate that Fannie Mae would have been able to meet the capital requirement published in NPR 2 through debt restructuring and various options at an annual cost of less than $200 million.[31] But before undertaking such an expenditure, Fannie Mae would have to determine what portion of the calculated shortfall was due to the risk that overnight Fed Funds would exceed 7-day Fed Funds by 62 basis points for nine years, or the risk that the 1-month LIBOR rate will exceed the 1-year rate by 76 basis points for nine years, or the risk that the 3-year Agency debt rate would equal the 3-year CMT rate while the 3-month Agency debt rate exceeded the 3-month CMT by 65 basis points. Due to the overall complexity of the model, it is unclear to what extent any of these particular rate relationship impact the estimation of Fannie Mae's capital requirement, but they are illustrative of the problems endemic to the approach to interest rate modeling in NPR 2 and the degree to which the proposed methodology does not capture actual risk.

In summary, the approach to interest rate modeling in NPR 2 is technically flawed and so needlessly complex that it should be replaced in its entirety with straightforward, simplified approach. Fannie Mae is recommending an approach that better captures the rates and spreads that pose risk to the company and is much simpler the implement.

[30] NPR 2 at 18,113.
[31] NPR 2 at 18,114.

II. Problems with the historical rate data used in NPR 2

The historical interest rate data used by OFHEO are from the DRIFACS Database developed and maintained by DRI/McGraw-Hill.[32] While DRI/McGraw-Hill is the collector of the information, the sources of the data differ by instrument. For example, the LIBOR data come from Reuters but the Agency debt rates come from Bank of America. This difference leads to inconsistencies in timing, calculation and reporting. In addition, while NPR 2 states that the LIBOR series is furnished by Reuters since 1973, DRI/McGraw-Hill's documentation states that prior to October, 1986 the data were furnished by Bank of America.[33] Any inconsistencies between the two series need to be accounted for.

Far more significant, however, are the problems with the Agency debt data used by OFHEO. Probably the most important Agency debt rate in the NPR 2 stress test is the six-month rate. Not only does the proposed regulation assume that all new debt is raised with six-month instruments, but that the six-month rate is used for discounting loan loss severity cash flows and ending capital numbers to arrive at the final capital requirement. Therefore, the accuracy of the six-month Agency debt rate and the six-month Agency debt model are extremely important. Yet of the 201 securities which went into the construction of the six-month Agency debt history, only one was a Fannie Mae debt security.[34] Freddie Mac was not represented at all. Instead, the series is made up of 193 instruments issued by the Federal Farm Credit Bank and 7 instruments issued by the Federal Home Loan Bank.

OFHEO should not have relied on a debt series history for the Farm Credit Bank to represent the borrowing costs of Fannie Mae and Freddie Mac in something as important as a proposed capital regulation for Fannie Mae and Freddie Mac. A true Fannie Mae/Freddie Mac debt history could have been constructed if none was readily available, either by working with the two companies or a major Wall Street firm. The Farm Credit Bank series is an imperfect and unacceptable substitute because Farm Credit debt issues tend to be smaller and carry a higher liquidity premium. In addition, as pointed out in NRP 2, for some portions of the estimation period Farm Credit Bank issues carried a higher risk premium.

The data problems for the other Agency debt instruments are the same. The percentages listed below show the limited degree to which observations of the yields on Fannie Mae and Freddie Mac debt comprised the Agency debt data series used:

[32] NPR 2 § 3.3.2.
[33] DRIFACS Data Dictionary, DRI/McGraw Hill at 437.
[34] This analysis is based on information furnished by DRI/McGraw-Hill on the instruments selected by Bank of America to populate the Agency Yield Curve data series.

Maturity	Percent of observations made up of Fannie Mae or Freddie Mac debt.
3-month	5%
6-month	0%
1-year	9%
2-year	17%
3-year	19%
5-year	52%
10-year	59%
30-year	90%

In addition to the problem of not reflecting the yields on Fannie Mae and Freddie Mac debt, the Bank of America rate series suffers from serious quality control factors. For example, the following series of rates for 1994 for the 1-, 2- and 3-year Treasuries and Agency debt served as part of the series used for calculating the spreads on Agency debt:

Month	YD012	YD024	YD036	FA012	FA024	FA036
1/94	.0354	.0414	.0448	.0359	**.0349**	**.0411**
2/94	.0387	.0447	.0483	**.0387**	.0456	**.0476**
3/94	.0432	.0500	.0540	**.0431**	.0573	**.0508**
4/94	.0482	.0555	.0599	.0483	**.0500**	**.0538**
5/94	.0531	.0597	.0634	.0532	**.0526**	**.0567**
6/94	.0527	.0593	.0627	.0530	**.0477**	**.0563**
7/94	.0548	.0613	.0648	.0549	**.0481**	**.0564**
8/94	.0566	.0618	.0650	**.0552**	**.0476**	**.0564**
9/94	.0576	.0639	.0690	.0581	.0642	**.0676**
10/94	.0611	.0673	.0704	**.0608**	.0674	.0706
11/94	.0654	.0715	.0744	**.0646**	.0716	.0753
12/94	.0714	.0759	.0771	.0722	**.0750**	.0788

The rates in boldface are those cases where, according to the Bank of America series, Agency debt yields were <u>below</u> comparable Treasury yields--21 out of 36 monthly observations for these three debt instruments. The reason is not a breakdown in market efficiency but problems with what was produced by this group at Bank of America. The so-called 3-year Agency instrument used to determine the yields between January and July 1994 was actually a Federal Home Loan Bank instrument maturing in November, 1995. In other words, the quoted 3-year rate was based on an instrument which had less than a year and a half to maturity by the time the Bank of America analysts rolled to a different FHLB instrument in August, one which matured in August, 1997. But notice that the July and August rates are identical, despite the fact that the instruments on which those yields were based went from one and a half years to maturity to three. It is probably a typographical error, but the result is that the 3-year agency rate appears to jump by over 110 BPS between August and September, while the 3-year CMT only goes up 40 BPS.

Similarly, the 2-year Agency rate is not only lower than the 2-year CMT between May and August, it is also below the 1-year Agency rate. Again the problem is that the instrument chosen was an FHLB note due to mature in November, 1994. Thus by the time Bank of America rolled to a new instrument in August, the so-called 2-year instrument had only 4 months left to maturity. Between August and September, the spread between 2-year Agency debt and the 2-year CMT goes from a minus 142 BPS to a positive 3 BPS, a one-month swing of 145 BPS. The problem is that the time series models in NPR 2 were developed on faulty data such as these.

These types of data problems will not be a problem in the future because, as of early 1999, the agency debt series is no longer being produced at all. As was mentioned, the source of the data in the proposed regulation is DRI/McGraw-Hill, who received it from Bank of America. B of A stopped producing the series during the first part of 1999 and, according to DRI/McGraw-Hill, has shut down that department. Therefore, the proposed risk-based capital test will not be able to project agency debt rates based on the ARIMA equations in NPR 2 for any calculations of risk-based capital after 1999 Q1. Without specifying the specific conversion methodology they would use for combining any new data with the old, incorrect data, the Agency debt rate ARIMA models released as a revision to NPR 2 are invalid.

The mortgage rate data used in NPR 2 also have problems. For the 30-year conventional mortgage rate, OFHEO used the Freddie Mac monthly survey results as reported in the Federal Reserve H.15 report. Freddie Mac surveys rates and average points charged, reports each separately, and states explicitly that they should be cited together. Only the rates are reported in the H.15 and the rates are not adjusted to reflect points charged. The points range from 2.6 in 1984-1985 to 1.0 in the most recent data. Not making the appropriate adjustments to the 30-year rate to reflect points understates the effective market rate.

In contrast to the 30-year rate, OFHEO used a Dow Jones Telerate yield for 15-year fixed-rate loans to be delivered in 0 to 10 days. According to the DRI /McGraw Hill documentation for this rate, it is reported net of servicing.[35] Thus this rate understated the effective 15-year mortgage rate to borrowers by the applicable servicing amounts, a minimum of 25 to as much as 50 basis points. Since Freddie Mac has also released a 15-year rate as part of its survey since 1991, it is would have been better to avoid this inconsistency by using the same source of data for estimating the 15-year and 30-year mortgage rates.

One final point on data integrity is that the Federal Reserve H.15 report and Freddie Mac report the 30-year rate out to four decimal places, or precision to one basis point. In contrast, the historical rate data accompanying the proposed regulation reports many of the 30-year rates out to six decimal places.[36] The source of the extra precision is not documented. In addition, the interest rates it used in running the stress test were reported

[35] DRIFACS Data Dictionary, DRI/McGraw Hill at 483.
[36] http://www.ofheo.gov/docs/regs/NPR 2-supp.html, "Historical Interest Rate Series."

out to 16 decimal places.[37] Such precision is probably not meaningful and the final regulation should specify that the number of significant digits for rate projections should be limited to the significant digits contained in the input data.

III. The assumption that spreads are proportional is not supported by theory or empirical evidence

The interest rate models in the proposed regulation are built on the assumption that the spreads on non-Treasury instruments are proportional to the level of interest rates, that is, all spreads increase as rates go up and all spreads decrease as rates go down.[38] The assumption that spreads are proportional to the level of interest rates, however, is not supported by either theoretical or empirical evidence.

Fannie Mae's position is that spreads should be modeled as fixed basis point spreads over Treasury rates. Fannie Mae believes that the theoretical and most recent empirical evidence support fixed basis point spreads, that fixed basis point spreads will better capture the relations among non-Treasury rates, and that fixed-basis point spreads will not overstate risk in the up-rate scenario and understate it in the down-rate scenario as do proportional spreads.

The following discussion demonstrates that the variable or proportional component of spreads is a function of the higher default risk associated with higher rate levels, not the rate levels themselves. It shows that the degree to which basis point spreads change as rates change is a function of changing default risk, and that the use of proportional spreads automatically and unjustifiably narrows default premiums as rates fall and increases default premiums as rates increase.[39]

Assume a single payment case where a $1 risky discount bond is payable in one year. The present value of that payment is:

$$Value = \frac{1}{(1+r)}$$

where r is the risky yield to maturity. In contrast, the present value of a risk-free instrument would be:

$$Value = \frac{1}{(1+i)}$$

where i is the risk-free yield. Since $r > i$, then

$$\frac{1}{(1+r)} < \frac{1}{(1+i)}$$

[37] http://www.ofheo.gov/docs/regs/NPR 2-supp.html, "Interest Rates 6/30/97."
[38] NPR 2 § 3.3.3.4.
[39] Much of the following discussion is adapted from "Yield Spreads, Relative Spreads, and Default Risk," The Financial Review ,Vol. 15, Number 1 (1980).

If the probability of default[40] and zero payment of the risky instrument is *d*, the two investments are of equal value to a risk-neutral investor when

$$\frac{1}{(1+r)} = \frac{(1-d)}{(1+i)}$$

Rearranging terms shows that the default probability is the ratio between the risk-free yield and the risky yield.

$$d = 1 - \frac{(1+i)}{(1+r)}$$

Solving for the absolute and proportional spreads results in

$$r - i = d(1+r)$$

and

$$\frac{(r-i)}{i} = d\frac{(1+r)}{i}$$

It is important to note that both the absolute spread and the proportional spread are functions of the default risk *d*. In order to determine the behavior of the spreads relative to changes in the level of the risk-free interest rates, differentiate both the absolute and proportional spreads with respect to *i*.

For the absolute spread:

$$\frac{\partial(r-i)}{\partial i} = \frac{\partial d}{\partial i}(1+r) + \frac{\partial r}{\partial i}d$$

Assuming for the moment that the default probability is not a function of interest rates, that is $\partial d/\partial i = 0$, solving for $\partial r/\partial i$ results in

$$\frac{\partial r}{\partial i} = \frac{1}{1-d}$$

Thus the change in the risky yield for a change in the risk-free yield is a linear function of the probability of default, not the risk-free rate. The change in the risky yield is a function of the risk-free yield only when $\partial d/\partial i$? 0, in which case the risky rate is affected only through the change in default probability caused by the change in the risk-free rate. In other words, spreads will change only to extent default risk changes. The effect of a change in the level of interest rates has only an indirect effect on spreads through the degree to which the change in rates impacts default probability.

For the proportional spread:

$$\frac{\partial\frac{(r-i)}{i}}{\partial i} = \frac{\left[i\left(\frac{\partial d}{\partial i}(1+r) + \frac{\partial r}{\partial i}d\right) - d(1+r)\right]}{i^2}$$

[40] While this analysis looks at default risk, it can be expanded to include liquidity risk with no impact on the conclusions.

Again, if we assume for the moment that the probability of default is not a function of interest rates, $\partial d/\partial i = 0$ and substituting the absolute spread solution for $\partial r/\partial i$, then the change in proportional spreads becomes

$$\frac{\partial \frac{(r-i)}{i}}{\partial i} = \frac{\left[i\left(\frac{d}{1-d}\right) - d(1+r)\right]}{i^2}$$

Multiplying the numerator on the right hand side by (1 - d)/(1 -d) gives

$$\frac{\partial \frac{(r-i)}{i}}{\partial i} = \frac{\left[i\left(\frac{d}{1-d}\frac{(1-d)}{(1-d)}\right) - \frac{d(1+r)(1-d)}{(1-d)}\right]}{i^2}$$

Since from the initial statement of the problem, $(1 + r)(1 - d) = (1 + i)$ then this reduces to

$$\frac{\partial \frac{(r-i)}{i}}{\partial i} = -\left(\frac{d}{(1-d)i^2}\right)$$

Thus ignoring the change in the probability of default which would result from a change in interest rates, the change in the proportional spread is negatively related to the probability of default and the level of interest rates. Therefore, for a proportional spread even to remain constant in the face of increasing rates means that the increase in default risk associated with an increase in rates is large enough to offset what would otherwise be a decline in the proportional spread. In other words, what this analysis shows is that rather than spreads being proportional with the level of rates, they are instead inversely proportional except to the extent the default risk changes. Not only would the change in the default risk premium have to be sufficiently large to reverse the sign of the derivative, it would be evidence of a conclusion that the default risk in the down-rate scenario is much lower than default risk in the up-rate scenario.

The empirical evidence has been mixed on whether spreads are most properly modeled as proportional or as fixed basis points. However, in one of the most recent articles on the subject, Gregory R. Duffee finds that previous analyses of spread behavior ignored the behavior of embedded options in the instruments being studied.[41] Duffee, on the staff of the Federal Reserve Board and the University of California at Berkley, shows that yields on callable debt are affected by the changing value of the option to call. Once Duffee excludes option-embedded debt from his sample, he finds not only that spreads are most properly measured as fixed basis points spreads, but that there is evidence that the basis point spreads move inversely with rate changes. Thus Duffee finds not only that spreads are inversely proportional to interest rates, a natural outcome of using fixed basis point spreads, but even that the basis point spreads move inversely with interest rates.

Duffee's findings are important for approach used in NPR 2 because, with the exception of mortgages, the proposed regulation does not attempt to model any option-embedded debt. The special behavior of mortgage rates is discussed in the next section. However,

[41] G. Duffee, "Treasury Yields and Corporate Bond Yield Spreads: An Empirical Analysis," Journal of Finance (Dec. 1998).

for the rest of debt instruments modeled in the stress test, OFHEO should look to Duffee's results for guidance. While Duffee's model is too complicated to implement in the stress test, Fannie Mae is recommending that OFHEO move to simple three-year averages of fixed basis point spreads.

Finally, the way in which proportional spreads are applied in NPR 2 results in nonsymmetrical treatment of risk in the two rate scenarios. Purely proportional spreads overstate the increase in default risk in the up-rate scenario and overstate the decrease in default risk under the down-rate. In other words, the use of proportional spreads incorrectly biases downward the capital requirement in the down-rate scenario and upward in the up-rate scenario. The implication that the two companies are consistently more risky in the up-rate scenario than the down-rate scenario is not correct. Therefore, OFHEO's assumption on proportional spreads does not accurately reflect risk.

IV. Treatment of Mortgage Spreads

The changing dynamics of the mortgage market in the stress event should be recognized in projecting mortgage rates in the proposed regulation. Various factors can be reasonably expected to impact mortgage spreads. First, mortgage originators have periodically run into capacity constraints during large refinance waves. The level of refinancings anticipated in the down-rate stress test appear to be well in excess of past experience and appear to be beyond the current capacity of the mortgage industry to handle without some form of price rationing. Mortgage originators would be expected to set prices at levels which would maximize total revenue in light of their capacity to do business. They would charge based on what the market would bear, not on historical averages. Second, the cost of hedging the interest rate risk associated with newly originated mortgages will be larger. In addition, these costs for mortgage originators will be even higher given the no new business assumption for Fannie Mae and Freddie Mac in the stress test. A third factor, higher credit spreads, is dealt with in another comment section.

The questions, therefore, are whether these influences are supported by historical evidence, are they of a magnitude to make a difference in mortgage spreads, and whether these complicated processes can be represented by a simple proxy in the stress test. In order to answer these questions, Fannie Mae examined the behavior of 30-year fixed-rate mortgages relative to 10-year constant maturity Treasury rates. While the actual rate modeling process used by this company is much more complex, this analysis was confined to the rates used modeled in the stress test.

The data used were the 30-year mortgage rates for newly originated mortgages based on a monthly survey by Freddie Mac and the monthly average 10-year CMT rate reported in the Federal Reserve's H.15 report. The data were from the period of 1990 through 1999. This represents a compromise between using data that best reflects the current realities of the mortgage market and having a time series long enough to generate meaningful results. The models employed were two-step full transformation Cochrane-Orcutt-type GLS transformation models as implemented in the SAS AUTOREG procedure. This

transformation was made necessary by serial correlation problems in the data as evidenced by low Durbin-Watson statistics in the simple OLS models. ARIMA (1,0,1) models were also tried and produced similar results.

The independent variables were the 10-year CMT rate and the change in the 10-year rate. Because it can be argued that the change or volatility of rates can be expected to have an impact on spreads at least as large as rate levels, the change variable was included to isolate the effect of a rate change from the effect of the rate level. The dependent variables modeled were the 30-year mortgage rate and the mortgage to Treasury spread as measured in basis points, although these are essentially equivalent models.

The results are as follows. All coefficients are significant at the 5% level.

Dependent variable	Intercept (basis points)	10-year CMT	1-month change in 10-year CMT
30-year fixed mortgage rate	194	.9300	-.0940
Mortgage - 10-yr CMT spread (basis points)	194	-.0704	-.0935

The key points to notice are:

- For the mortgage rate model, the coefficient on the 10-year CMT rate is .9267, or less than 1.0. This means that for a given basis point change in the 10-year CMT rate, the basis point change in the 30-year mortgage rate is smaller.

- For the spread model, the sign of the coefficient is negative, meaning that spreads narrow at higher rate levels.

- The negative sign on the coefficient for the change in the 10-year CMT for the mortgage rate and mortgage spread models shows that both are lower with increases in rates and higher with decreases in rates.
- The coefficients on the rate level are significant even when the rate change variable is included.

The implication of these results is that, regardless of which of the possible causes is the key driver at any one time, mortgage spreads narrow at higher rate levels and widen at lower rate levels. Consider the following example using rates as of June 30, 1997. The three-year average basis point spread between 30-year mortgages and the 10-year CMT was 133 basis points. This would be the spread based on the methodology Fannie Mae is proposing for spreads on all other non-Treasury instruments. However, the results from the regressions predict spreads of 113 by Month 12 in the up-rate test and 171 in the

down-rate test.[42] Therefore, mortgages spreads are 20 basis points narrower in the up-rate test than the simple averages would predict, and 38 basis points wider in the down-rate test.

The exact amount of the difference between the three-year average spread and the spread predicted by the models varies from quarter to quarter based on up-dated calculations of the 3-year average spread and changes in the terminal levels of the 10-year CMT in the stress test. For example, as of December 31, 1999, the terminal 10-year CMT rate was 10.24% in the up-rate test and 2.93% in the down-rate test. This implies spreads of 121 basis points in the up-rate test and 173 basis points in the down-rate test, versus a 3-year average of 157 basis points. Thus the implied narrowing in the up-rate test is now 36 basis points and the implied widening in the down-rate test is 16 basis points. Given the expected range between the terminal CMT rate in the down-rate test and the terminal CMT rate in the up-rate test in the current interest rate environment, the combined narrowing and widening of mortgage spreads will be between 50 and 60 basis points, with the exact allocation between narrowing and widening being based on changes in the three-year average spread.

Fannie Mae is not proposing that this regression model be used to update spreads on a quarterly basis. Instead, Fannie Mae is recommending that the results be approximated with a general rule to add 25 basis points to fixed-rate mortgage spreads in Month 12 of the down-rate test and subtract 25 basis points from those spreads in Month 12 of the up-rate test. This recommendation effectively splits the 50 to 60 basis point combined widening and narrowing between the two scenarios and is a way to approximate the market realities of mortgage spreads in a way that is simple to implement.

[42] The terminal 10-year CMT rate is 11.44% in the up-rate test and 3.27% in the down-rate test. Applying the regression equations gives:

194 + (-.0704 * 1144) + (-.0935 * 0) = 113

194 + (-.0704 * 327) + (-.0935 * 0) = 171

The change in the 10-year CMT is assumed to be zero since that rate does not change after Month 12. Prior to Month 12, the effect is a further narrowing of spreads by 3 basis points when rates rise 40 basis points per month and a widening of 2 additional basis points when rates fall. This effect is not material to the final recommendation.

V. Fannie Mae's Recommended Changes

Fannie Mae believes the following changes are needed in the approach to modeling spreads on non-Treasury instruments in NPR 2:

1) Build a reliable historical rate series.

It has been shown that significant portions of the data used for the analyses supporting the spread behavior in the proposed regulation are inconsistent and incorrect, and, for the Agency debt series, no longer available after May, 1999. Fannie Mae and Freddie Mac have amble and reliable information on their debt costs, information which is already available, and the companies are available to help accurately interpret the data. In addition, third-parties such as Wall Street firms are available to help construct reliable data series. For mortgage rates, OFHEO should use the Freddie Mac survey series for both 30-year and 15-year mortgages.

2) Calculate a spreads based on a three-year moving average.

The ARMIA model processes in the proposed regulation have been shown to be incorrect in their application and needlessly complex in their implementation. In addition, changes in financial markets are so continuous that long time series often do not reflect the current relations between instruments. Therefore, Fannie Mae is recommending that simple moving averages of spreads be used. The selection of a timeframe for such averages is arbitrary. Using a timeframe that is too long will make the risk-based model slow to reflect new realities in the financial markets. In contrast, making the timeframe too short will cause the stress test interest rates to be overly influenced by transient rate moves, thus making capital requirements too volatile. Fannie Mae is recommending a three-year average because it represents a reasonable compromise between these two concerns and is tied to one of the averages for the 10-year CMT cited in statute.[43]

3) Calculate spreads using constant basis point spreads rather than proportional spreads.

For the reasons discussed in this comment, Fannie Mae believes the use of constant basis point spreads better reflects the actual risk in the up-rate and down-rate scenarios, and is more consistent with the theoretical and empirical evidence on spreads.

[43] 12 U.S.C. § 4611(a)(2)(B)(ii).

4) Adjust mortgage spreads to reasonably reflect the expected dynamics of the mortgage market in the stress event.

The changing dynamics of the mortgage market in the stress event should be recognized in projecting mortgage rates in the proposed regulation. Therefore, the proposed regulation should include adjustments to spreads which would reasonably reflect the various factors which would affect mortgage rates in the stress environment. Such adjustments should be made to reasonably reflect the high cost of hedging interest rate risk in the two rate environments, the effect on rates of industry capacity constraints when hit with the level of refinancings specified in the down-rate test, and rate concessions due to lack of business in the up-rate test. Fannie Mae proposes that these effects can be approximated by subtracting 25 basis points from mortgage rates beginning in Month 12 of the up-rate test and adding 25 basis points to the mortgage rates beginning in Month 12 in the down-rate test. Spread differentials in the first year are addressed in the next recommendation.

5. Provide for a better transition between current and spreads and stress period rates and spreads.

NPR 2 provides for a linear transition between current Treasury rates at the beginning of the stress period and the rates expected at the end of the first year. Since the three-year average spreads proposed here might be different than those observed at the beginning of the stress test, some transition mechanism is needed to avoid abrupt rate changes in the first month of the stress test. Fannie Mae proposes that for each non-Treasury instrument, OFHEO apply the average basis point spreads to the projected Treasury rate in Month 12, and linearly increase or decrease each non-Treasury rate in equal amounts between the last observed rate at the start of the stress test and the projected Month 12 rate. This will also address the problem of phasing in the narrowing or widening of mortgage spreads.

For additional comment on non-treasury interest rates and mortgage spreads, see First Manhattan Consulting Group briefs in Appendices V-3 and V-4.

C. Special Risk Premium on Fannie Mae and Freddie Mac Debt[44]

Introduction

The proposed regulation specifies that a 50 basis point risk premium be added to the annualized rate of all Agency debt agency debt issued during the last nine years of the stress test.[45] The 50 basis point credit spread is the same for all maturities of debt. The statute gives the Director clear authority only to exercise discretion in setting the rates on Treasury rates other than the 10-year constant maturity Treasury (CMT).[46] In the absence of clear statutory authority to exercise discretion to impose such an additional level of stress, the Director is bound by the consistency requirement, that is, that any such decisions be consistent with the stress period and be based on available information.[47] Fannie Mae believes the way in which the credit premium is imposed makes it inconsistent with the Director's statutory authority.

It is Fannie Mae's position that the 50 basis point credit premium as specified in NPR 2 is clearly outside the boundaries of the stress event as defined by Congress. Therefore, the credit risk premium must pass the consistency requirement in order to be valid. Fannie Mae believes it clearly fails that requirement in timing, level and universality. Therefore the 50 basis point credit premium should be dropped.

The following sections explore in detail why the 50 basis point credit premium is inconsistent with the specification of the stress event and the rest of the implementation of the stress test. The result of each of these inconsistencies is to place the 50 basis point credit premium outside the statutory discretion of the Director.

I. The 50 basis point credit premium is not tied to the expected levels of earnings and capital of the two companies in the stress test.

The imposition of the 50 basis point credit premium beginning in month 13 of the stress test is completely arbitrary in that it is not tied to the expected levels of earnings of the companies in month 13 or the expected levels of capital on the companies' books in that month. This inconsistency is acknowledged in NPR 2 when it states that "After one year of stress test conditions, the Enterprises might appear strong based on accounting measures of earnings and net worth."[48] Based on financial statements generated by OFHEO to reflect Fannie Mae's performance in the stress test, earnings through the first year are still positive and capital has increased. Indeed, Fannie Mae survives the stress

[44] NPR 2 § 3.3.3.5 at 18,236.
[45] NPR 2 § 3.3.3.5.
[46] 12 U.S.C. § 4611(a)(2)(D).
[47] 12 U.S.C. §§ 4611(a)(4) and 4611(b)(2).
[48] NPR 2 at 18,149.

test with billions of dollars of capital still on its books in both the up-rate and down-rate scenarios.

The credit premium is justified in NPR 2 in terms of market values and market perceptions, but it is clear that the 50 basis point credit premium as implemented is inconsistent with rational market behavior. The proposed regulation states: "However, market values of the Enterprises' assets, liabilities, and derivatives contracts would fully reflect the effects of the interest rate shock and some of the credit quality deterioration of the stress test. Investors would be aware of these changes in market value and adjust their evaluations of the Enterprises' financial health accordingly."[49] However, if there is a link between the credit premium and expected rational investor behavior, that link is not adequately explained in NPR 2. It is difficult to envision a rational market suddenly imposing a credit premium in a particular month with no immediate predicate cause, a credit premium which is applied equally to all maturities of debt, and a credit premium which remains unchanged for nine years.

Any additional premium on debt costs essentially accounts for two types of risk, default risk and liquidity risk. The first reflects the increased possibility that the issuer might default on its bonds, that is, not pay interest and principal when due. The second reflects the risk that holders of those bonds might not be able to sell them into a liquid market prior to maturity. Liquidity premiums tend to be more transitory. Any credit premium designed to reflect rational market behavior, therefore, should be linked to the maturity of the instruments and the expected investment horizon of the purchasers of the debt. A debt security maturing in 30-years carries much more uncertainty than one maturing in three months. In addition, an investor with a one-year investment horizon who expects to buy and hold a 1-year debt instrument will be much less concerned about liquidity risk than if that investor were to buy a 30-year instrument with the expectation of selling it in one year. For a credit premium to be truly consistent, it would have to reflect these different maturities.

Fannie Mae has billions of dollars of equity on its balance sheet throughout the stress test. Any rational investor in Fannie Mae's notes in the stress environment would see the billions of dollars in equity remaining, would see the rate of equity decline, and would buy those note at prices or rates based on at expectation of how much equity would still be on the books when those notes matured. Such expectations are easier to formulate for short-term notes than for long-term. In a rational market, investors in shorter-term instruments would not be able to demand the same default and liquidity premiums as investors in longer-term debt, and the ability to demand such premiums would vary with the financial condition of the firm.

Therefore, the proposal for the 50 basis credit premium is inconsistent with the conditions of the stress test and rational markets. Since the levels of earnings and capital reflect the conditions of the stress test as specified by Congress and the Director, and since the amounts of capital on the books of the company are large, and since the 50 basis point credit premium does not reflect this capital, the 50 basis point credit premium is

[49] NPR 2 at 18,149.

inconsistent with the rest of the stress test. Since the 50 basis points premium is applied in an equal amount to all maturities at the same time, it is inconsistent with rational market behavior.

II. The 50 basis point premium is inconsistent with the statutory requirement that the companies hold 30% more capital than that required to pass the stress test.

The statute requires that the risk-based capital total include "30 percent of the amount of total capital determined by applying the risk-based capital test under subsection (a) to the enterprise."[50] The numerical effect of this requirement is that the companies must finish the stress test with at least 30% of the amount of capital used up during the stress test. Ignoring any effect of discounting,[51] the implication of this requirement is that the minimum level of capital realized during the test must be at least 23% of the beginning capital amount. Discounting makes this percentage even higher. NPR 2 posited that Fannie Mae's capital requirement as of June 30, 1997 was $17.7 billion,[52] meaning that Fannie Mae's capital level would never drop below $4 billion if it held the amount of initial capital necessary to pass the test. Thus, Fannie Mae would never come close to defaulting on its debt and would never have less that $4 billion in equity on its books.

The fact that the proposed regulation does not take into account the benefit of the additional capital required for the 30% management and operations add-on makes the 50 basis point credit premium inconsistent with the statutory specification of the risk-based capital requirement.

III. OFHEO's application of the 50 basis point premium is inconsistent with its assumptions on haircuts applied to counterparties

The proposed regulation applies haircuts to payments received from counterparties such as banks and mortgage insurance companies.[53] The levels of these haircuts assume, for example, that losses from defaults by companies rated single-A would be 40% by the last month of the stress test. Most of the larger banks in the United States are rated single-A. Since the haircuts under the proposed regulation increase linearly from the beginning to the end of the stress test, the implication is that by the midpoint of the stress test, the loss rates for banks rated single-A would be 20%. Assuming that these loss rates reflect a modest 50% recovery rate, the stress event can be characterized one in which the default rate for banks rated single-A is 40% after five years and 80% after 10 years.

While Fannie Mae strongly disagrees with the haircut specification in NPR 2, the implementation of the 50 basis point premium is clearly inconsistent with that or any

[50] 12 U.S.C. § 4611(c)(2).
[51] Fannie Mae strongly disagrees with OFHEO's proposal for discounting ending capital. These objections are covered in a different section of the comment letter. OFHEO's discounting proposal greatly increases the amounts of ending period capital the companies must hold, and thus strengthens the inconsistency argument made here.
[52] NPR 2 at 18,113.
[53] NPR 2 §§ 3.6 and 3.7.

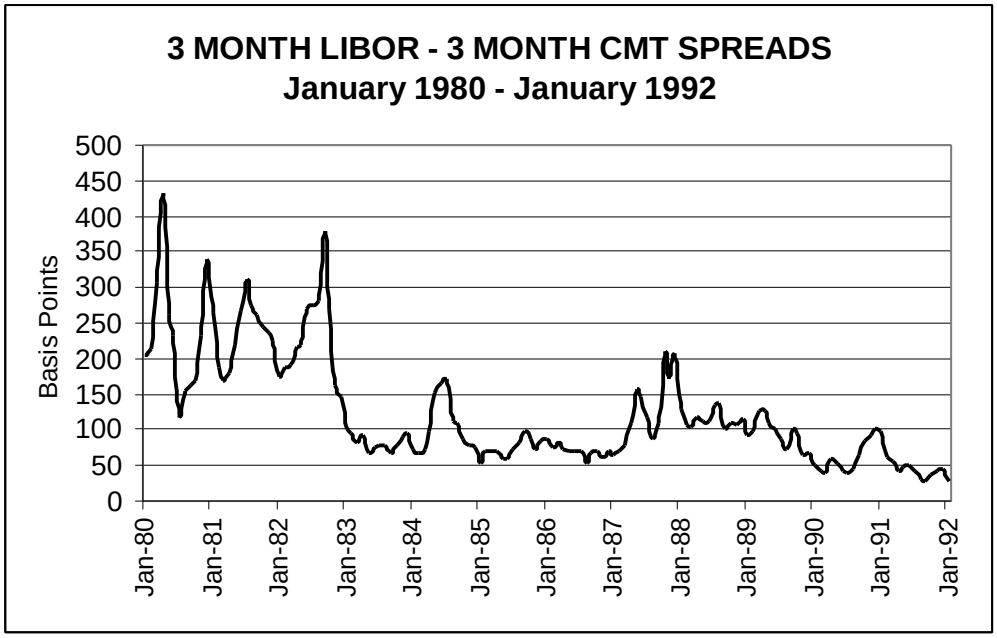
other haircut specification. At no point in the stress test does Fannie Mae default on any of its debt payments. At no point in the stress test does Fannie Mae have negative capital. In contrast, single-A rated banks are defaulting at what could be a 40% rate after five years. Yet Fannie Mae debt is assigned a 50 basis point credit premium beginning in month 13 while the appropriate bank lending rates, LIBOR and Fed Funds, are not assigned any credit premium.

Consistency requires that the debt of banks and other counterparties be assigned at least the same credit premium that is assigned to Agency debt, given the assumptions made about market conditions. However, if payments from banks and other counterparties are assigned any level of haircuts due to assumed levels of defaults, then consistency requires that debt premiums on obligations such as LIBOR be greater than those placed on similar maturity Agency debt. Clearly, the application of the 50 basis point credit premium on only Agency debt is inconsistent with the rest of stress test.

The issue of higher credit premiums on non-Agency debt is raised indirectly in the periods cited in the proposed regulation to justify the 50 basis point premium. NPR 2 states: "As illustrated by data reported in the General Accounting Office's 1990 report on government sponsored enterprises, Fannie Mae's short-term borrowing costs during 1980 through 1982 were generally about 80 basis points in excess of yields on comparable maturity Treasury debt, rising at one point to 200 basis points above Treasury yields. Spreads receded after sharp declines in interest rates greatly improved Fannie Mae's condition to a more normal range centered roughly at 20 basis points. Spreads were high again in the late 1980s for both Fannie Mae and the Farm Credit System, ranging from 40 to 100 basis points over a two-year period during the Farm Credit System's time of greatest financial difficulty."[54]

Leaving aside the question of the correctness and applicability of the GAO numbers, the proposed regulation fails to consider how other rates behaved during this same period. The graph below depicts the spread between the three-month LIBOR rate and the three-month constant maturity Treasury rate between January 1980 and January 1992. It is based on the same historical information used for the spread forecasting equations in NPR 2. During the period of 1975 to 1978, the LIBOR-Treasury spread averaged 85 basis points. During the 1980 through 1982 period, however, the LIBOR spread averaged 235 basis points, at one point reaching a high of 433 basis points. The maximum spread and the increase in the average were both much higher than the levels cited for Fannie Mae. During the period of mid-1987 to mid-1989, the period of higher spreads on Fannie Mae debt apparently referred to by the GAO report, LIBOR spreads increased to an average of 124 basis points, and in one month reached a high of 211 basis points. In contrast, the LIBOR spread averaged 40 basis points during the 1990s.

[54] NPR 2 at 18,149-150.



It is inconsistent, therefore, to seek to justify the 50 basis point credit premium based on two historical periods and ignore the fact that other spreads, such as the LIBOR spread, increased by even larger amounts during the same periods.

IV. OFHEO's arguments for the 50 basis point credit premium are inconsistent with OFHEO's arguments on preferred stock dividends

As part of the justification for the 50 basis point credit premium, the proposed regulation states: "Because the Enterprises' ability to withstand further interest rate and credit shocks likely would be low, the Enterprises in the final nine years of the stress period would likely not meet their risk-based capital requirement and would, therefore, be subject to dividend restrictions."[55] Yet another portion of the proposed regulation specifies that dividends on preferred stock be paid as long as the minimum capital requirement is met.[56] In OFHEO's implementation of NPR 2, Fannie Mae satisfies the minimum capital requirement for most of the stress test and is thus assumed to pay preferred dividends throughout most of the stress test. NPR 2 addresses the payment of preferred dividends by saying that such continued payment would be required to hold down funding costs: "…failure to pay dividends on both classes of stock likely would have greater repercussions on an Enterprise's funding costs and ability to attract new capital than would a failure to pay common stock dividends while preferred stock dividends were maintained."[57]

The assumption that the continued dissipation of capital through the payment of preferred dividends in the face of continued losses would results in lower credit premium for a

[55] NPR 2 at 18,149.
[56] NPR 2 § 3.10.3.2.
[57] NPR 2 at 18,170.

company's debt is inconsistent with the realities and transparency of financial markets. That continued payment of preferred dividends in such stress circumstances would more likely increase funding costs is dealt with in another section of Fannie Mae's comment on NPR 2. The issue here is that the arguments in NPR 2 are inconsistent with each other. On one hand the proposed regulation argues that debt costs will rise because the company will face dividend restrictions, yet on the other hand it argues that the companies will continue to dissipate capital through preferred dividends in order to hold down funding costs. This inconsistency should be addressed.

Summary

Absent any specific statutory authority for imposing an arbitrary 50 basis point credit premium on Agency debt. OFHEO must rely on its general statutory charge to make decisions consistent with the stress period and consistent with available information. The implementation of the 50 basis point credit premium in the proposed regulation fails this consistency requirement. It is inconsistent with the levels of earnings and capital of the companies in the stress test. It is inconsistent with the impact that capital will have on any differential credit premiums the market might assign based on maturity of the debt. It is inconsistent with the high level of capital which will remain on the companies books due to the 30% additional amount required for management and operations risk. It is inconsistent with the treatment of the debt costs for other financial institutions in the stress environment, particularly given the level of haircuts assumed in NPR 2. It is inconsistent with the arguments in the proposed regulation justifying the paying of preferred dividends in the stress test.

V. Fannie Mae's Recommendation

1) Fannie Mae believes the most simple approach would be to drop the 50 basis point credit premium because there is no basis for its inclusion.

2) For a credit premium to be even minimally consistent with the rest of the stress test environment it would need to be

- phased-in linearly up to the maximum of 50 basis points, in a manner similar to that proposed for haircuts, to more closely approximate the financial condition of the companies in the stress test.

- applied equally to all non-Treasury rates, including mortgages.

- applied in greater amount to non-Treasury rates if any level of haircuts are imposed on counterparty payments.

- applied in the maximum amount of 50 basis points only to longer maturity debt and be scaled down for shorter maturity debt.

- not imposed until after preferred dividends are stopped.

For additional comment on special risk premium on Fannie Mae and Freddie Mac debt, see First Manhattan Consulting Group brief in Appendix V-5.

D. Home Price Scenario[58]

During the stress period, changes in property values are computed by applying the pattern of house price changes from the benchmark (ALMO) experience as represented by the House Price Index series for the West South Central Census Division.[59] The benchmark loss experience spans twelve years from the beginning of 1983 through the end of 1994. The home price appreciation rates used in the stress test are those for the middle ten years of this period (1984-1993).

Proposal-Inflation Adjustment

The 1992 Act requires OFHEO to adjust the simulated credit losses to reflect higher inflation whenever interest rates (the ten-year CMT) rise more than 50 percent from the average yield during the nine months preceding the stress period ("required adjustment threshold"). As discussed below, OFHEO also has the discretion under the 1992 Act to lower credit losses in the up-rate scenario by taking increased inflation into account even when interest rates increase by less than the 50 percent required adjustment threshold ("discretionary adjustment"). In its proposal, OFHEO applies an inflation adjustment to house price growth only in the last five years of the up-rate scenario and only when the required adjustment threshold is triggered.[60] The inflation adjustment depends on the difference between the ten-year CMT in the stress test and the ten-year CMT at the required adjustment threshold. Thus, if the ten-year CMT increases 75 percent in the stress test, the inflation adjustment per year depends on the difference between the 50 percent increase and the 75 percent increase in the ten-year CMT.

Critique

Statutory Discretion

The proposed rule only makes inflation adjustments in the up-rate scenario when the required adjustment threshold in the statute is reached and only in an amount equal to the difference between the ten-year CMT at that threshold level and the ten-year CMT that obtains in the stress test. Fannie Mae agrees that the 1992 Act unambiguously provides that the risk-based capital regulation required to ("shall") adjust credit losses to reflect a correspondingly higher rate of general price inflation when interest rates rise by more than 50 percent. However, there is nothing in the 1992 Act that prohibits the regulation from making an inflation adjustment whenever interest rates rise, even when they rise by less than 50 percent. In addition, the Act does not specify the formula for the inflation adjustment. Thus, there is considerable discretion in defining the inflation adjustment,

[58] NPR 2 §§ 3.4.2 and 3.4.3 at 18,236-37 and 18,145-18,146.

[59] The proposed rule used the West South Central region's house price experience instead of a 4-state house-price index in the calibration process. Fannie Mae agrees that these two indices are substantially similar and there is no bias arising from the usage of the West South Central index.

[60] If the required threshold is not reached, OFHEO's procedures are to use the unadjusted house-price growth rates in Table 3-13 (See NPR 2 at 18,238).

particularly when such adjustment would result in an economic scenario most consistent with the stress period.[61]

Inconsistent with the intent of the 1992 Act.

Our interpretation of the intent of the inflation adjustment is that credit losses in the up-rate stress test should be lower than credit losses in the down-rate test–at least when interest rates increase by more than 50 percent--owing to the higher rate of general inflation. However, the rule's benign inflation adjustment (limited to the difference between the ten-year CMT in the stress test and the ten-year CMT at the required adjustment threshold) as well as the loading of the adjustment into the last five years of the stress period, contributes to the up-rate credit losses being higher than down-rate credit losses.[62]

Most consistent with the stress period.

Economic research suggests that a stress scenario such as depicted in the up-rate stress test would be accompanied by high inflation and home price appreciation. Michael Darby (UCLA) analyzed for Freddie Mac the economic scenario most consistent with a large and permanent increase in interest rates as prescribed by the 1992 Act.[63] Darby concluded that an inflationary environment would be most consistent with the interest rate path described in the 1992 Act. He further concluded that the increase in inflation would be 75 to 100 percent as large as the increase in interest rates. Macroeconomic Advisers, LLC, a second consultant hired by Freddie Mac, concurred with Darby's assessment. In addition, Macroeconomic Advisers estimated the impact on home prices given the range of inflation outcomes (75 to 100 percent of the interest rate shock) using a structural model of the housing sector.[64] Macroeconomic Advisers found that house prices would at least keep pace with inflation or exceed inflation. Thus, the inflation adjustment most consistent with the interest rate path given by the 1992 Act would be at least equal to 75 percent of the increase in interest rates in the up-rate scenario. (Thus, if interest rates increased 460 bps from 6.4% to 11% in the stress test, inflation and house prices growth rates would accelerate by at least 345 bps, from current levels.)

Timing of the adjustment is suspect.

Most macroeconomic models and empirical evidence show the rise in inflation is coincident with or prior to the increase in interest rates. The rule's specification shows the increase in inflation occurring five years after the start of the increase in interest rates.

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[61] 12 U.S.C. § 4611(b)(2).

[62] Fannie Mae estimates that its projected single-family credit losses implied by the regulation are $13.7 billion in the up-rate scenario and $11.4 billion in the down-rate scenario. These figures are as of the second quarter 1997, Fannie Mae book of business.

[63] Michael Darby, "Consistent Macroeconomic Conditions for a Risk-Based Capital Stress Test," June 6, 1997.

[64] Macroeconomic Advisers, LLC, "House Prices under Alternative Interest Rate Paths," Jan. 18, 1999.

Recommendations

The final rule should apply the up-rate inflation adjustment in the first five years of the stress test in addition to the second five years as currently proposed. In addition, the final rule should apply 75% of the increase in interest rates rather than the difference between the 50 percent increase and the 75 percent increase. The effects of these changes are to (1) adjust credit losses in the up-rate test to a level reasonably related to those in the down-rate stress test and (2) produce an up-rate scenario that is more consistent with that suggested by industry-leading economic research and models.

For additional comment on home price scenario, see Oliver Wyman & Company brief in Appendix V-6.

E. Home Price Volatility[65]

Proposal

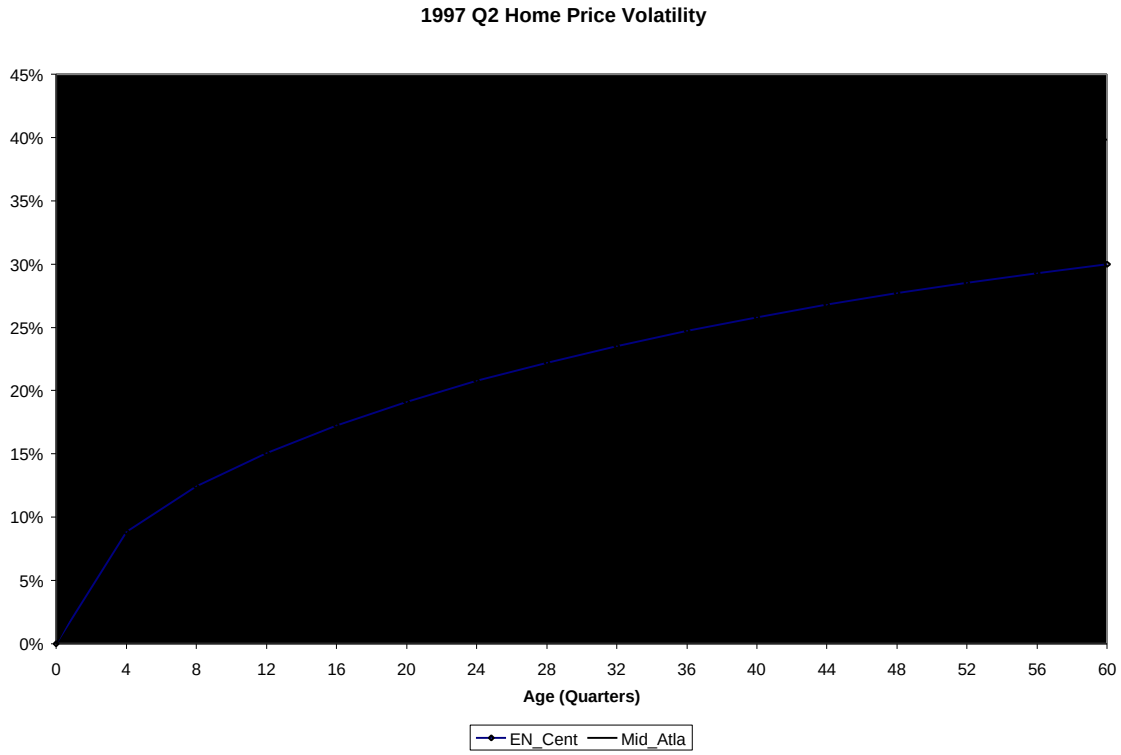
The proposed rule uses a quadratic specification in mortgage age for house price volatility, with different parameter values for each of the nine U.S. Census Divisions. The purpose of a home price volatility process is to estimate the dispersion of individual house prices around the average level implied by the house price index. The proposed rule calls for quarterly updates of the volatility coefficients in this quadratic specification.[66]

Critique

1. The approach in the proposed rule discriminates across regions. That is, the proposed approach to house price volatility establishes differences in the regulatory capital treatment of mortgages among the nine different U.S. Census Divisions. As a consequence, the NPR 2 approach discourages the companies' mission of promoting access to mortgage credit "throughout the Nation."[67] Similarly, this proposal for house price volatility would penalize the companies for pursuing a strategy of regional diversification in their mortgage portfolios.

    - Different volatility coefficients across Census Divisions result in volatility forecasts of identical mortgages being substantially different. The following graph shows the potential magnitude of these differences using the 1997, second quarter coefficients.[68]

[65] NPR 2 § 3.5.2.3.2.3.4 at 18,243-45, 18,122-123.
[66] NPR 2 at 18,246.
[67] 12 U.S.C. § 1451(b)(4).
[68] The remaining seven regions lie between the values of the East North Central and Mid-Atlantic regions. The volatility parameter estimates are available on OFHEO's website, www.ofheo.gov/docs/regs/NPR 2-supp.html, "Historical HPI Tables."



- The regional differences in house price volatility cause differences in the prepayments, defaults, credit losses and hence capital requirements. Regions with relatively high capital requirements would suffer relative to regions with low capital requirements by a lower availability of mortgage credit and/or higher mortgage rates. For example, a new loan from the Mid-Atlantic division could require as much as 40% more capital than a loan from the East North Central division. The table below shows the marginal capital requirements for loans originated across the different Census Divisions.

Marginal Capital Requirements[69]

Division	Down	Up
EN_CENTRAL	3.32%	1.29%
PACIFIC	3.78%	1.58%
ES_CENTRAL	3.87%	1.65%
NEW_ENGLAND	3.88%	1.64%
MID_ATLANTIC	4.10%	1.82%
MOUNTAIN	3.95%	1.61%
S_ATLANTIC	3.83%	1.66%
WN_CENTRAL	3.57%	1.50%
WS_CENTRAL	4.07%	1.67%

[69] The new loans are new 30-year fixed-rate MBS (not retained in portfolio) with a 7.5% gross note rate, 90% LTV, 17% AA primary mortgage insurance, 32 basis point guaranty fee and 25 basis point servicing fee. Marginal capital requirements are based on the 1997q2 Fannie Mae book. Lower guaranty fees or mortgage insurance will exacerbate these differences.

2. The proposed rule's approach to regularly changing home price volatility leads to instability that results in the Fannie Mae's and Freddie Mac's inability to anticipate capital requirements.

   - Due to the uncertainty in the future values of the volatility coefficients, excess capital will need to be held for a reason that is unrelated to the risk of the Companies. For example, Fannie Mae estimates that the change in volatility coefficients between 1997:Q2 and 1999:Q2 would have lead to a 2.5% change in its capital requirement. In this experiment, the underlying risk of Fannie Mae's portfolio (i.e., Fannie Mae's positions and book and the interest rate and home price environments) was held constant.[70] If risk-based capital requirements for both Companies totaled $40 billion, 2.5% excess capital equals $1 billion held for reasons unrelated to risk, and solely due to the proposed rule's method for changing volatility estimates.

   - House price volatility is difficult to estimate and hence unreliable. Unlike the use of the regional house prices indexes--which is an estimate of the first moment, or average, of the series--the volatility indexes are estimates of the second moment, or dispersion. Second moment behavior is much more difficult to explain. Fannie Mae has found that the R-squared statistic on such regressions is between 2% and 8%, which is statistically unreliable.[71] The estimation difficulty is also illustrated by the behavior of the estimated parameter values over time. In several recent quarters the parameter on the age squared term in the quadratic equation is positive for some Census Divisions[72] This causes the counter-initiative result that dispersion will increase at an increasing rate as mortgages age.

   - Neither the documentation in the proposed regulation (NPR 1, NPR 2) nor the documentation of the indices says, in the construction of indices, how data edits, sample exclusions, or other index details are handled. The home price index construction methods could change in the future and such changes would affect the resulting volatility estimates. In short, the proposed rule has not fully specified the estimation of the volatility parameters.

3. The proposed rule's approach is inconsistent with the benchmark loss experience. By updating the volatility coefficients, observations that are outside the benchmark loss experience will be utilized. Over time, this updating process will erode the link between default and severity rates and the benchmark loss

[70] Based on 1997q2 Fannie Mae book of business.

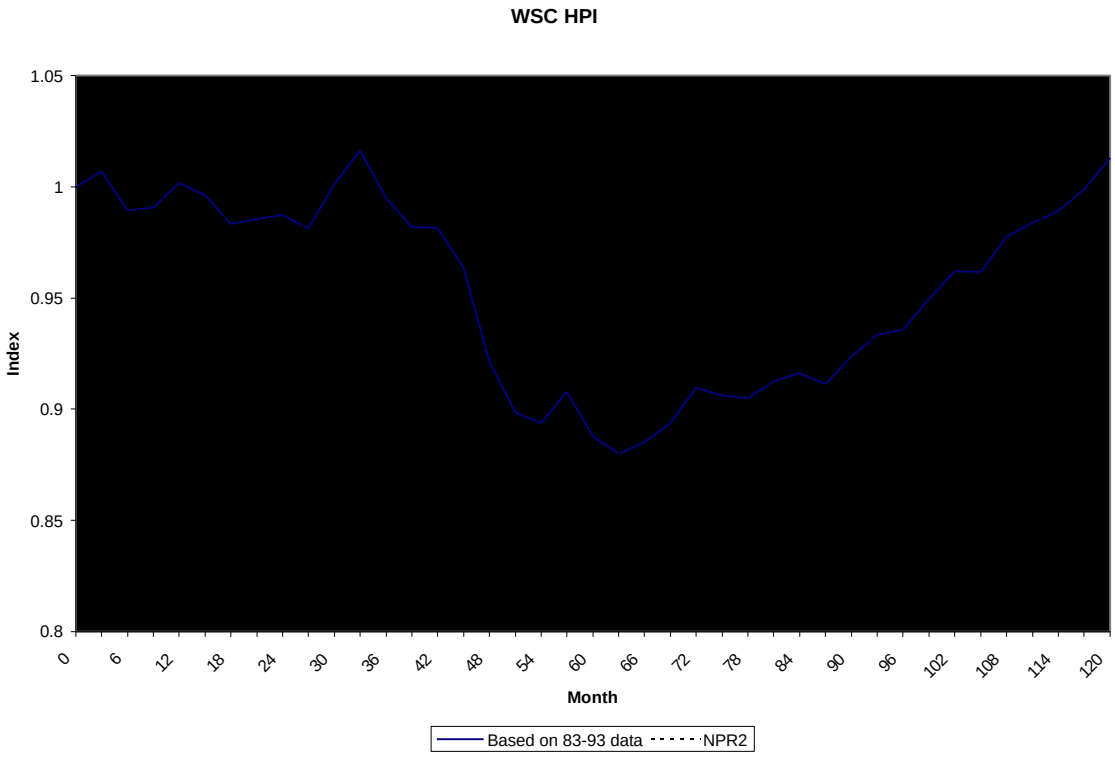
[71] OFHEO recognizes the importance of reliability in the volatility coefficients (NPR 2 at 18,123), yet provides no measures of the reliability of these coefficients.

[72] For example, in 1999q3, both the Middle Atlantic and the South Atlantic regions have a positive coefficient on the squared term. See www.ofheo.gov/house.

experience. It will also weaken any link that prepayments be reasonably related to the benchmark loss experience.

Recommendation

In order for the companies to be able to anticipate capital requirements and to not discriminate across geographic regions, the final rule should adopt volatility coefficients that are constant across time and regions. The average house price index used in the proposed rule is defined from the West South Central region over 1983-93. In order to capture the appropriate dispersion around this average, the same observations should be used in estimating volatility. Limiting the observations to the 1983-93 period would also affect the construction of the West South Central index itself, but Fannie Mae estimated that this would not be a material change in the level of the index. A comparison of the two house price indexes is shown below.



Fannie Mae estimates that over the West South Central region from 1983-93, the resulting volatility parameters are $\alpha = 0.00245905$and $\beta = -0.000031847$.

For additional comment on home price volatility, see Oliver Wyman & Company brief at Appendix V-6.

2. MORTGAGE PERFORMANCE–SINGLE-FAMILY

A. Benchmark Loss Experience[73]

Proposal

The 1992 Act requires OFHEO to establish a stress test by regulation that subjects the companies to specific severe credit loss and interest rate stress scenarios. In that regard, the 1992 Act requires that the frequency and severity of credit losses in the stress test be "reasonably related" to the highest rate of default and severity of mortgage losses experienced during a period of at least two consecutive years in contiguous areas of the United States that together contain at least 5 percent of the total U.S. population, in comparison with such rates of default and severity of mortgage losses in other such areas of the U.S. for any period of such duration.[74] To facilitate discussion, OFHEO refers to this region and period as the "benchmark loss experience." [75]

In NPR 1, OFHEO requested public comment on its proposed benchmark loss experience, including proposed definitions, proposed methodology and use of data. Using its proposed methodology and historical data from the companies,[76] OFHEO identified a benchmark time and region. The region identified and proposed by OFHEO consisted of Arkansas, Louisiana, Mississippi and Oklahoma (ALMO). OFHEO identified the two year period 1983-84 as the benchmark time period.[77]

In NPR 2, OFHEO estimated mortgage performance models using a wide range of historical data from the Companies data, and applied adjustments to these econometric models so that the benchmark loss experience estimated in NPR 1 was approximated.

Critique

Fannie Mae provided comments to NPR 1 in which we concluded that the benchmark specification in NPR 1 does not reasonably reflect our credit history.[78] The areas that remain problematic, especially in light of NPR 2, are the following:

1. Congress expressed in the 1992 Act its intention that the benchmark be representative of actual experience through requiring that the benchmark region contain at least 5 percent of the national population. The proposed methodology

[73] NPR 2 § 1.0 through 2.0, NPR 2 at 18,219.
[74] 12 U.S.C. § 4611(a)(1).
[75] See OFHEO Risk-based Capital Notice of Proposed Rulemaking, 61 Fed. Reg. 29,592 (June 11, 1996) (NPR 1) at 29,593.
[76] In the benchmark, OFHEO uses only loan level data on first-lien, 30-year, fixed-rate conventional mortgages. OFHEO uses only loans that were purchased by company within 12 months after loan origination and loans for which the company has no recourse to the lender. Thus, for example, OFHEO excludes company purchased mortgages if seasoned when purchased.
[77] See NPR 1; See also NPR 2 § 1.0, at 18,219.
[78] See Fannie Mae's comment letter on NPR 1 filed with OFHEO, October 24, 1996.

effectively contravenes this requirement by including states in the benchmark that contribute a significant part of the population requirement but have very few mortgage loans, notably Mississippi and Arkansas.

2. The proposed methodology does not recognize shortcomings in the loss severity data, causing a distorted representation of actual losses. For example, NPR 1 does not properly account for the bias introduced by the fact that loss severity data are typically not available for the early years of the benchmark loss period, when losses are typically lower.

3. The benchmark results are biased towards higher default and severity rates due to misclassified loans--e.g. investor properties classified as owner-occupied and multi-unit properties classified as single-unit.

4. Although the benchmark region has 5% of the national population in the early 1980s, it may not meet the 5% requirement over the full 10-year period used to measure defaults, losses and prepayments. This is further evidence that the selected benchmark region and its associated mortgage performance measures are tenuous.

Recommendation

While the benchmark region has numerous difficulties, we believe they can be addressed by the proper application of adjustments to the econometric default and severity models. These adjustments will be discussed below. The final rule should be careful not to misstate the risks to Fannie Mae and Freddie Mac businesses when calibrating to the benchmark experience because this experience itself already provides a conservative assessment of the level of credit losses intended by the 1992 Act.

B. Single Family Default, Prepayment and Loss Severity—General[79]

Proposal

The 1992 Act requires OFHEO to develop a stress test that is based on a regional recession involving the highest rates of default and loss severity experienced for a period of two years in an area of the United States containing at least five percent of the total U.S. population.[80] Although the 1992 Act does not specifically refer to "mortgage performance," OFHEO uses this term to facilitate discussion of essential elements of credit risk mortgage default and loss severity. OFHEO also uses this term to cover mortgage prepayment in recognizing that loans that paid off prior to maturity affect default rates by reducing the number of loans that have the potential to default and by increasing the proportion of loans likely to default. Taken together, default, loss severity and prepayment define how a portfolio of mortgages will perform in the proposed stress test.[81]

The 1992 Act mandates that default and severity rates in the stress test be "reasonably related" to the benchmark experience and requires that other characteristics of the stress period … "such as prepayment levels" be those determined "on the basis of available information to be most consistent with the stress period."[82] In addition, the 1992 Act mandates that OFHEO take into account appropriate distinctions among types of mortgage products and differences in loan "seasoning" (as defined in the 1992 Act) and any other factors OFHEO's Director considers appropriate.[83]

OFHEO's proposed approach to mortgage performance involves three steps: 1) estimation of econometric models of mortgage performance (default, severity, and prepayment) using a wide range of historical data from both companies, 2) adjustments or corrections to its statistical models intended to provide reasonable relationships to the benchmark loss experience, and 3) appropriate application of the adjusted models to starting mortgage portfolios in the stress test.[84] OFHEO states that its models are intended to simulate the interaction of the patterns of benchmark house prices as well as stress test interest rates and mortgage risk factors, to determine the performance of Company loans for each month of the stress period.[85]

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[79] NPR 2 § 3.5.1 through 3.5.3 at 18,240-18,260.
[80] 12 U.S.C. §4611(a)(1). See also Benchmark Loss Experience section of this comment letter.
[81] See also NPR 2 at 18,117-18,143.
[82] 12 U.S.C. § 4611(b)(2).
[83] 12 U.S.C. § 4611(b)(1) and (d)(1).
[84] See NPR 2 at 18,118 and 18,091-92.
[85] NPR 2 at 18,117.

General Critique

In step (1), OFHEO estimated its econometric models based on data from the Companies on mortgages that were originated throughout the United States from 1979 to 1993, observed through the end of 1995. These estimated econometric models for default and prepayment are essentially sound and should remain intact. Moreover, the level of detailed econometric modeling of loan performance is unmatched among risk-based capital regulations of other financial institutions. However, changes in steps (2) and (3) noted above are necessary in order to make the risk-based capital standard operational, consistent with the statute and the companies' housing mission, and more reflective of risk.

The estimated econometric model for sales proceeds within the severity model has little predictive power and hence not closely aligned with the benchmark experience.

General Recommendations

- Prepayments should be calibrated to the benchmark experience to meet the statutory requirement of consistency with the stress period.

- Prepayment speeds in the up-rate scenario need to be adjusted upward to reflect the introduction and enforcement of due-on-sale clauses in enterprise mortgages and to be more reflective of the generally recognized level of risk in this scenario.

- Default rates on housing-mission-critical high-LTV mortgages should be adjusted downward to be in better alignment with the benchmark period and true economic risk.

- Default rates are overstated in the up-rate scenario and should be adjusted to better capture risk. This can be largely accomplished by OFHEO specifying an earlier and larger inflation offset.[86] In the absence of a new inflation offset, larger adjustments should be included.

- The effects of burnout on default should only be applicable during the stress period. Moreover, this effect needs to be smoothed over time for the capital requirement to be operationally feasible.

- A finer application of the adjusted default and prepayment models is required in order to reflect risk better. Specifically, a finer level of loan group aggregation by occupancy status and single- versus multi-unit properties should be applied.

- Simplify the calculation of the loss of principal component within the loss severity with the resulting loss severity projections being better tied to risk.

[86] See House Price Scenario section of this comment letter.

- Treat all components of loss severity consistently in their relation to the benchmark.

- Various technical corrections need to be made before integration into the Companies' business processes can occur.

The justification for each of these recommendations is described below; and, for additional comment on single family default, prepayment, and severity, see Oliver Wyman & Company brief in Appendix V-7.

C. Single Family Mortgage Default[87]

Proposal

OFHEO calibrated the default equations derived from historical data (as described above) to the benchmark experience by first simulating what cumulative default rate the equations would have produced had they been applied to the benchmark house-prices and interest rates, and then estimating the constant adjustment needed to replicate the actual experience of the benchmark region.

Critique

The proposed rule's default specification implies greater risk on high-LTV (>80) loans than is economically reasonable for two reasons.

1. Since default rates on high-LTV loans are higher than on low-LTV loans, using a single constant calibration adjustment increases the default rate on high-LTV loans more than the default rate. This leads to an over-prediction of default rates on high-LTV loans.

2. Underwriting standards have changed dramatically since the early 1980s when the benchmark loans were originated. Specifically, underwriting standards were tightened considerably in 1986 for reduced- and low-documentation loans, investor, and self-employed borrowers. This tightening restricted the number of high-LTV loans with these characteristics. Therefore the underwriting quality of high-LTV loans has improved.

Recommendation

Recognize the change in underwriting standards in 1986 by adjusting the level of defaults on high-LTV loans to be below those of the benchmark loss experience. Currently, the default levels on high-LTV loans are above the benchmark loss experience. This adjustment will produce default rates on high-LTV loans that are more in-line with their economic risk.

Default behavior of discount mortgages

Proposal

A discount mortgage, i.e., a mortgage that has a mortgage rate lower than the current rates prevailing in the market, is a valuable instrument to the home owner. Therefore, a borrower either in distress or living in an area experiencing severe house-price declines

[87] NPR 2 §§ 3.5.2.3.2.9 at 18,248 and 3.5.3.3.3 at 18,251-18,259; see also NPR 2 at 18,143.

that has a 7 percent mortgage in a 9 percent environment would try to hold on to that mortgage much more than a similar borrower who has an 11 percent mortgage in that same environment. As a result, borrowers holding discount mortgages would be less likely to default than borrowers holding premium mortgages in a similar economic environment. The proposed rule makes most mortgages outstanding at the beginning of the scenario either premium (in the case of the down-rate path) or discount (in the case of the up-rate path) by the end of the first year, so it would be expected that defaults in the up-rate stress test be substantially lower than defaults in the down-rate stress test.

Critique

The proposed rule does not adequately capture the economic behavior of borrowers with discount mortgages. OFHEO considered the theoretical support for a "mortgage premium" variable[88] but it ultimately chose to not explicitly recognize the way in which interest rates can affect a borrower's default behavior.[89] The dependency of defaults on interest rates enters implicitly through the burnout variable alone. While the burnout variable can partially explain why premium borrowers might default more than non-premium borrowers, its purpose is different. The burnout variable is used to identify borrowers who passed a profitable opportunity to refinance and who are indicating that they might have some credit problem (i.e., failure to qualify for a new loan) and therefore be more likely to default. Since refinance opportunities will predominately occur only in the down rate scenario, the variable tells us little about default behavior in the up-rate scenario.

Our analysis suggests that the burnout variable in the proposed rule does not adequately capture the influence of interest rates on single-family defaults. Experts in mortgage defaults have typically found defaults on extreme discounts are about 30% lower than par coupon mortgages, even after controlling for burnout effects.[90]

Finally, as described in the sections above, the intent of the 1992 Act was that credit losses in the up-rate stress test should be less than the down-rate stress test. The expected relationship between credit losses in the up-rate and down-rate stress tests does not hold in the proposed rule.[91]

Recommendation

Implementation of the economically justified inflation offset as described in this document is a reasonable method of achieving a more sound prediction of the behavior of discount mortgages. To the extent that the final rule does not fully implement this

[88] See NPR 2 at 18,135.
[89] See NPR 2 Table 3-17 at 18,250.
[90] See, e.g., Yongheng Deng and Charles A. Calhoun (OFHEO), "A Dynamic Analysis of Adjustable- and Fixed-rate Mortgage Termination," (Dec. 1996). Paper presented at the AREUEA Annual Meetings, New Orleans, LA, January 3-6, 1997.
[91] Fannie Mae estimates that its projected single-family credit losses implied by the regulation are $13.7 billion in the up-rate scenario and $11.4 billion in the down-rate scenario. These figures are as of the second quarter 1997 Fannie Mae book of business.

recommended change, it should adjust up-rate default rates by multiplying a constant factor. A 0.7 adjustment factor to default rates in the up-rate scenario seems reasonable, and consistent with empirical findings. This adjustment will better tie capital to risk in the up-rate stress test scenario because, as the empirical evidence presented above indicates, discount mortgages default less. This adjustment provides a reasonable way to better reflect default behavior of mortgages with note rates much lower than the market rate and hence better ties capital to risk.

Effects of Burnout (NPR 2 § 3.5.2.3.2.4 at 18,247, 18,092, 18,134)

Proposal

For single family mortgages, the proposed burnout coefficient is intended to provide a method for capturing the effect of the inability of borrowers to refinance their mortgages due to equity or other credit constraints. Burnout is defined as the adverse selection that occurs when borrowers retain their mortgages during periods when there are clear financial benefits to refinancing. Mortgage loans that fail to prepay when there is sufficient economic incentive subsequently tend to have higher conditional default rates.

The burnout variable is defined as a binary variable – at least two quarters of "significant" refinance opportunities within the previous two years of the stress period. Significant is defined as gross note rate two percentage points or more than the contemporaneous conventional mortgage rate.

Critique

The estimated coefficient on the burnout variable is the largest coefficient in two of the three default equations and is the second largest in the remaining equation. In contrast, prior research and the large default literature suggest that the primary drivers of mortgage default are equity and borrower financial characteristics. The combination of a binary variable and a large coefficient leads to sudden large changes in projected default rates. For example, as of 1997:Q2, any new mortgage with coupon 6% or higher would have nearly a 400% increase in conditional default rates from quarter 8 to quarter 9 in the down-rate scenario. The magnitude of such changes is clearly stressful, but seems implausible in most economic environments.

Recommendation

1. The final rule should delay the impact of burnout on defaults until two years into the stress period by adding the condition that q-s-8 > 0 to the definition of burnout for defaults.[92]

2. In addition, OFHEO should also consider smoothing the impact of burnout on default. For example, to smooth out the effects over two years, 1/8 of the effect could occur in the first quarter that burnout is detected, ¼ in the second quarter,

[92] See NPR 2 definition of B_q at 18,247.

3/8 in the third quarter, and so on. This change would preserve the long-term effect of the burnout variable while mitigating its short-term volatility.

D. Single Family Prepayment Model[93]

Proposal

OFHEO estimated the single-family prepayment model equation on the data described above. The specification of the model is similar to the one for defaults with some additional variables recognizing explicitly the impact of the relative interest-rate spread and the impact of the slope of the yield curve. Unlike the default model, however, OFHEO did not calibrate the resulting predictions of the prepayment model to actual prepayment rates in the benchmark experience.

Critique - Lack of Prepayment Calibration

Three questions arise in considering the proposed rule's lack of calibration of prepayments to the benchmark experience:

1. Prepayments are likely to be constrained during the down-rate stress conditions outlined by NPR 2. NPR 2 does not consider the ability of the mortgage finance system to supply the mortgage funds – in the absence of new business by the companies – needed to support the level of refinancings that would occur in the down-rate scenario. In other words, the down-rate scenario is counterfactual to the historical data used in the econometric estimation of prepayments. Fannie Mae agrees that these supply constraints should not be explicitly included in risk-based capital model. However, calibrating prepayments to the benchmark is a simple way to implicitly recognize these effects.

2. A mathematically equivalent way of calibrating the cumulative default rate is to adjust the prepayment equation rather than the default equation. OFHEO recognizes this alternative by noting that prepayment behavior affects the proportion of loans likely to default.[94] However, OFHEO offers no reason they chose to calibrate to the benchmark by adjusting the default equation rather than adjusting the prepayment equation.

3. The 1992 Act mandates that characteristics of the stress period … "such as prepayment levels" be those determined "on the basis of available information to be most consistent with the stress period."[95] OFHEO reports prepayment rates from the benchmark experience on its web-site.[96] A comparison of these prepayment speeds to those from the NPR 2

[93] NPR 2 §3.5.2 at 18,241; 18,092-93 and 18,126-30.
[94] NPR 2 at 18,117.
[95] 12 U.S.C. § 4611(b)(2).
[96] See www.ofheo.gov/docs/regs/NPR 2-supp.html, "Benchmark Loan Defaults and Prepayments."

specification shows that the proposed estimation over the large data set will predict prepayments to be higher than those that would occur under stressful conditions such as in the benchmark loss experience:

10-year Prepayment Rates in Percent

	Benchmark		NPR 2 Specification[97]	
Original LTV	Cumulative	Average Conditional	Cumulative	Average Conditional
0<LTV<=60	92.3	24.6	98.3	34.3
60<LTV<=70	89.6	22.6	96.3	31.3
70<LTV<=75	84.5	20.7	92.5	28.8
75<LTV<=80	82.2	19.7	90.4	27.7
80<LTV<=85	75.7	16.3	81.6	22.4
85<LTV<=90	69.5	14.8	75.9	19.7
90<LTV<=95	57.6	11.5	65.1	16.1

Critique - Plausible Minimum Speeds

The sample that OFHEO used to estimate the prepayment and default equations was a period of generally falling interest rates. Moreover, many of the loans in this sample were originated in a period when mortgage assumptions were still prevalent in Fannie Mae and Freddie Mac mortgages. The introduction and enforcement of due-on-sale provisions have eliminated these assumptions which would lead to higher prepayment speeds in extreme up-rate scenarios. Hence inferences about mortgage performance in high and sharply rising mortgage rates need to be supplemented with additional data.

The table below shows default, prepay and total terminations (default plus prepayment) on new mortgages in the up-rate scenario (as of 1997:Q2), using NPR 2.[98]

[97] These figures are calculated for a new mortgage with a gross note rate of 13.55% (83-84 average mortgage rates from Freddie Mac Primary Market Survey). WSC home price path and actual interest rates from 1984-93. WSC dispersion parameters estimated as of 1997:q2. The LTVs are from midpoint of the bracket except for the first bracket which uses 50% LTV.

[98] Stress period interest rates, home prices and volatility as of 1997:q2 were used in these calculations.

		Cumulative		Average Conditional		Total
Rate	OLTV	Default	Prepay	Default	Prepay	Termination
0.05	0.8	4.31%	28.96%	0.51%	3.45%	3.96%
0.06	0.8	4.82%	28.60%	0.57%	3.41%	3.98%
0.07	0.8	5.19%	28.27%	0.62%	3.37%	3.99%
0.08	0.8	5.65%	28.07%	0.68%	3.35%	4.03%
0.09	0.8	5.87%	28.20%	0.70%	3.38%	4.08%
0.07	0.6	0.38%	34.37%	0.05%	4.13%	4.18%
0.07	0.7	1.74%	31.19%	0.21%	3.71%	3.92%
0.07	0.8	5.19%	28.27%	0.62%	3.37%	3.99%
0.07	0.9	12.23%	21.11%	1.46%	2.52%	3.97%
0.07	0.95	18.01%	16.55%	2.16%	1.99%	4.15%

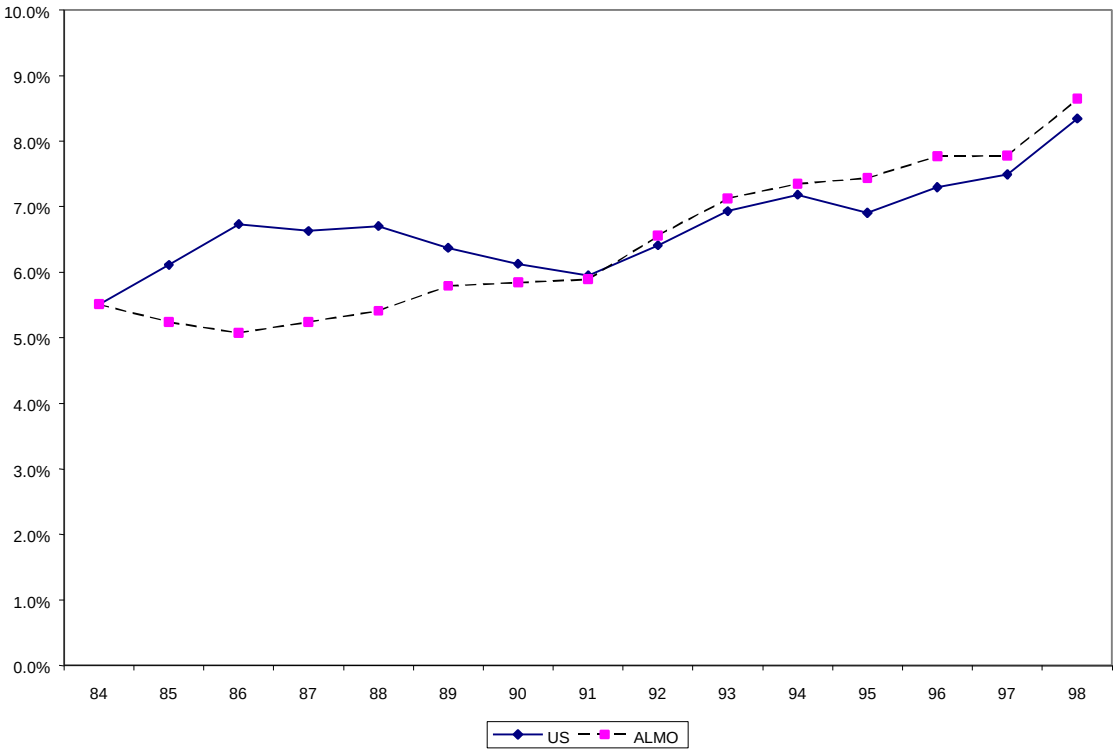
Thus, total termination rates from the NPR 2 specification are about four percent, which are well below plausible minimum rates. Data from industry experts, housing turnover statistics, and housing mobility studies all suggest a minimum termination rate of about 5.5%.

Industry Survey: Fannie Mae surveyed several industry experts to give us their estimates of the total termination rates for deep-discount mortgages assuming no home price appreciation.[99] The following table shows their estimates of the ten year average prepayment rates for four different mortgages when the mortgage coupon rates are 400 bps or 500 bps lower than the market rates.

	Goldman		Morgan Stanley		Salomon		DLJ	
	400 bps	500 bps	400 bps	500 bps	400 bps	500 bps	400 bps	500 bps
WAC 9.0, CLTV 0.9	7.0	6.7	8.2	7.4	5.7	5.4	8.5	8.1
WAC 8.0, CLTV 0.9	6.1	6.0	6.7	6.1	4.4	4.0	5.1	4.9
WAC 8.0, CLTV 0.7	6.1	6.0	6.7	6.1	6.5	6.1	6.3	5.7
WAC 7.0, CLTV 0.9	6.1	5.6	6.2	5.8	3.8	3.3	4.2	3.9

[99] At the time of the survey (May 1997) the prevailing market mortgage rate was 7.94%.

Housing Turnover: The following graph shows the housing turnover rates in the U.S. and the benchmark ALMO region from 1984 to 1998.[100] Because these rates are based on home sales, assumed mortgages and foreclosures are assumed are properly accounted for. The turnover rates in the U.S. range from 5.50% in 1984 to 8.3% in 1998, with an average of 6.7%. During the benchmark period (ALMO, 1984 – 1993), the average turnover rate for ALMO was 5.8%.



Mobility Studies: Quigley (1987) uses the Panel Study of Income Dynamics data and shows that even in the relatively high interest years under economic recession conditions (i.e. 1979-1981), substantially more than 4% of households move.[101] Specifically he finds that 7.6% of households moved in 1979, 5.3% in 1980 and 6.2% in 1981.

In summary, the generally recognized minimum level of total terminations is around 5.5%, even in extreme credit and interest rate environments.

Recommendation

1. Both defaults and prepayments should be calibrated to the benchmark loss experience. This will reduce down-rate prepayment speeds by approximately 5-10% CPR.

[100] Turnover rate is estimated as existing home sales (from National Association of Realtors) divided by the owner-occupied housing stock. The owner-occupied housing stock is estimated as the homeownership rate times the number of households (both from U.S. Census Bureau).

[101] John M. Quigley, "Interest Rate Variations, Mortgage Prepayments and Household Mobility," The Review of Economics and Statistics (1987).

2. After this calibration, the minimum total termination rate (defaults plus prepayments in the up-rate scenario) should be near a 5.5% annualized rate. Because default behavior is less sensitive to the interest rate environment than prepayment behavior, this adjustment should be made to the prepayment equation.

E. Comments Affecting both Single Family Default and Prepayment

Investor and Multi-unit Loans (NPR 2 §3.4.2.3.2.5 at 18,247)

Proposal

The 1992 Act requires OFHEO to consider differences in mortgage performance due to occupancy status.[102] Historically, single-family loans to owners who live in the collateral property have exhibited different performance than similar loans made to investors who rent the property. In NPR 2, OFHEO recognized differences in the behavior of investor loans by including a variable in the prepayment default equations that captures occupancy status.[103] In the application of this equation, however, the proposed rule does not use occupancy status as a classification variable determining loan groups.[104] Instead, the proposed rule specifies that a constant value applied equally to all loan groups and in all stress periods. This constant value is calculated as the proportion of UPB in investor-owned properties in the month immediately preceding the start of the stress test. [105]

Critique

In general, the proposed rule's separation of prepayment and default behavior by occupancy status is reasonable. However, our analysis and experience suggests that investor loans are not spread equally across all loan groups as assumed in the proposed rule. Because different underwriting criteria are used across owner-occupied and investor-occupied loans, distributions of loan characteristics such as LTV will not be equal across these types of loans.

We have also found that 2-4 unit properties exhibit behavior characteristics similar to investor-owned.

Recommendations

The final rule should include occupancy status as a classification variable determining loan groups. 2-4 unit properties should be included in the investor-owned loan groupings as well. This change would better capture the risks in the companies.

[102] 12 U.S.C. § 4611(d)(2)(E).
[103] See NPR 2 at 18,133.
[104] NPR 2 at 18,221-22.
[105] NPR 2 at 18,247.

Balloon Mortgage Model (NPR 2 at 18,131 n.98 and at 18,139))

Proposal

In the proposed rule, the monthly payment for balloon mortgages is calculated using the balloon term instead of the amortization term during the estimation process.

Critique

The balloon amortization in NPR 2 according to the balloon term in the estimation process is incorrect. The result is a misspecified model and incorrect prepayment and default equation coefficients.

Recommendation

Our analysis suggests that balloon mortgage behavior is close to the behavior of 15-year mortgages. Consequently, the final rule should apply the 15-year prepayment and default models to balloon mortgages.

UPB in Calculation of LTV (NPR 2 at 18,245)

Proposal

In NPR 2, the beginning-of-quarter UPB is used to calculate the LTV ratio.

Critique

In replicating the prepayment and default model test results shown on OFHEO's web-site, Fannie Mae found it necessary to use the end-of-quarter UPB.[106]

Recommendation

OFHEO should clarify its documentation on the use of beginning or ending balance in the LTV calculation.

Transformations of Prepayment and Default Rates (NPR 2 at 18,251)

Proposal

In NPR 2, quarterly prepayment and default rates are calculated as one minus the cube root of the quantity one minus the quarterly default or prepayment rate.

[106] See www.ofheo.gov/docs/regs/NPR 2-supp.html, "Single Family Default/Prepay Test Results."

Critique

This approach to transforming quarterly rates to monthly rates ignores the interaction of defaults and prepayments within a quarter and therefore misstates conditional prepayment and default rates. Moreover, using this formula is inconsistent with industry practices and the business systems employed by the Companies. By having to implement a different set of transformation rule, the costs of complying with the regulation are increased.

Recommendation

The final rule should restate the formulas transforming quarterly to monthly default and prepayment rates to account for their interactive effects. The formulas for translating quarterly to monthly rates should be the following:

$$Def_{j,q} = Def_q / (1 + (1 - Def_q - Prep_q)^{1/3} + (1 - Def_q - Prep_q)^{2/3})$$

$$Prep_{j,q} = Prep_q / (1 + (1 - Def_q - Prep_q)^{1/3} + (1 - Def_q - Prep_q)^{2/3})$$

These formulas should replace those given in NPR 2.[107]

[107] NPR 2 at 18,251.

F. Single Family Loss Severity[108]

Proposal

OFHEO proposed a specification for loss severity based on empirical data. Like the default equation, stress test loss severity depends on the mean and variance of regional house price growth. Also like the default equation, there is a calibration factor to help the equation reproduce the benchmark loss experience, given the stress test path for house price appreciation.

The loss severity model has two components:

1. The property loss portion is modeled explicitly from historical data on REO sales proceeds and is calibrated to the benchmark.

2. For the expense portion, broad measures are derived from national historical data and are not calibrated to the benchmark.

REO sales proceeds are estimated using a complex econometric model. The econometric model relates the REO sale price linearly to the "Z-score." The Z-score is a ratio of the mark-to-market value of the property over the dispersion in property values. The proposed rule derives the mark-to-market value by adjusting the original value of the property with Census division-level home price indices. The dispersion measure captures cross-sectional volatility of property values within a Census division. The result is that REO sale proceeds are increasing in the mark-to-market value of the property and decreasing in property price dispersion. During the stress period, sales proceeds are based on the projected house price index and its volatility factors, with an additional 10.34% is subtracted from projected sales proceeds to calibrate severity in the benchmark region and time period.

Critique

The proposed rule's use of the Z-score is not consistent with industry practice; indeed its use in the proposed rule is its only appearance in mortgage finance. Moreover, the regression equation used to determine REO sales prices in the stress period has an extremely low R-squared statistic of only 9% which shows a substantial lack of predictive power. This result raises significant questions on the accuracy and reasonableness of the property loss specification. A property loss specification which has no general acceptance in the industry or academic community and which has so little explanatory power is not appropriate for a regulatory capital standard.

The proposed rules's approach to calibration of the severity components is inconsistent. The proposed rule calibrates the property loss component to the benchmark loss

[108] NPR 2 §3.5.3 at 18,251-60; 18,139-40.

experience but not the expense component. These components are integrally related to each other. A mortgage property that spends a long time in REO status will most likely have both higher property loss and higher expenses. It is therefore unreasonable to take these components from different regions or time periods.

Recommendation

With the following changes, loss severity projections will be better tied to the risks faced by the companies.

- Treat all components of loss severity consistently in their relationship to the benchmark. In a manner consistent with the calibration of the property loss component, derive measures of expenses that are more closely related to the benchmark loss region. The exception to this rule would be the interest rates used in the foreclosure cost-of-carry calculations that are separately defined by the stress period interest rate paths.

- Simplify the loss of principal calculation by extracting estimates for loss of principal balance from the benchmark, and then using the relevant interest rates from NPR 2 to calculate the asset funding costs. This is described below.

Extracting REO revenues or loss of principal balance and transaction costs from the benchmark

The derivation of these loss severity components from the benchmark can be accomplished in the following steps:

- Start with the benchmark loss severity estimates as published in NPR 1.[109] These are replicated below:

Original LTV	Severity rate
<= 60%	43.5%
>60%, <=70%	46.2%
>70%, <=75%	50.1%
>75%, <=80%	58.9%
>80%, <=85%	55.0%
>85%, <=90%	60.2%
>90%	69.0%

[109] NPR 1, Table 4 at 29,598.

- Combine the NPR1 severity estimates above to three LTV buckets. These three are an appropriate number of LTV buckets based on data availability.[110] Historical severity data suggests estimates for these buckets are approximately:

Original LTV	Severity rate
<= 80%	55%
>80%, <=90%	59%
>90%	69%

- Subtract ALMO asset funding costs to obtain estimates for the loss of principal balance and transaction cost portions. There are two relevant asset-funding costs. The first is the mortgage interest lost and is calculated as the product of the time from the last mortgage payment to REO acquisition times the net yield of the mortgage. The second is the carrying cost of the property and is calculated as the product of the time spent in REO status times the REO financing cost. Assuming a 12.5% average net yield for the ALMO mortgages and an 8% average REO financing cost, and using the 13- and 7-month timeframes from NPR 2, yields an estimate of 18.2% for the total ALMO asset funding cost.[111] After subtracting the ALMO funding cost, the resulting estimates for the ALMO loss of principal balance plus transaction costs are:

Original LTV	Severity rate
<= 80%	36%
>80%, <=90%	41%
>90%	51%

- Adjust severity estimates for data problems discussed in the Benchmark Loss Experience section of this comment. Our analysis suggests that severity could be overstated by as much as five percentage points. The resulting adjusted estimates are:

Original LTV	Severity rate
<= 80%	31%
>80%, <=90%	36%
>90%	46%

[110] There are relatively few data points for LTV ratios less than or equal to 70% and also for the 81-85% LTV range.
[111] Calculated as 0.125*(13/12) + 0.08*(7/12).

Add asset funding costs in each stress test

The estimates derived above need to be increased by the appropriate measure of asset funding costs for each stress test. The total time period on which we need to calculate funding costs is 20 months, 13 months from default to foreclosure and a further 7 months spent in REO status. Asset funding costs will then vary depending on the value of the six-month Agency interest rate in each of the time the stress tests. As an example, if the initial value of the six-month Agency is 6.00 percent and we assume proportional movement during the stress test, the down-rate interest rate would be as low as 3.00 percent and the up-rate as high as 10.50 percent, a 50 percent drop and a 75 percent increase, respectively. Given these interest rates, the resulting severity rates are (rounding to the closest percentage point):

Original LTV	Severity rate	
	Down-rate	Up-rate
<= 80%	36%	48%
>80%, <=90%	41%	53%
>90%	51%	63%

Adjustment for age

The above methodology works well for mortgages that are new as of the beginning of the stress test. Mortgages that are older have generally seen a period of house-price appreciation and should, therefore, experience lower severities. In the interest of simplicity, Fannie Mae recommends two different age buckets: one for loans that are less than or equal to 2 years of age as of the beginning of the stress test, and a second one for loans that are older than 2 years of age. For the latter group, the recommendation is for severity rates to be lower by 10 percentage points, assuming that this group of loans consists of loans that are 4 years old on average and have experienced an average 2.5 percent house-price appreciation per year.

Severity Summary Table (without asset funding costs)

Original LTV	Severity Rate Age <= 2 yrs	Severity Rate Age > 2 yrs
<= 80%	31%	21%
>80%, <=90%	36%	26%
>90%	46%	36%

Adjustment for 15-year, 20-year product and for FHA/VA loans

The 15-year and 20-year product has experienced lower loss severities on average due to its faster amortization. The FHA/VA loans should have minimal losses and constitute a very small part of the mortgage portfolio. Fannie Mae recommends that OFHEO use a 0.9 multiplier for the 15-year and 20-year mortgage loss severity and assume a 0 percent loss severity for FHA and 5 percent loss severity for VA.

Severity Summary Table (without asset funding costs)
For 15-year and 20-year product

Original LTV	Severity Rate Age <= 2 yrs	Severity Rate Age > 2 yrs
<= 80%	28%	18%
>80%, <=90%	32%	22%
>90%	41%	31%

The above methodology simplifies substantially the loss severity calculation, is more directly tied to the benchmark, and relates capital to risk as well as the approach proposed in the NPR 2. In addition to avoiding the implementation challenges arising from the complexity of the loss of principal balance calculation, it avoids the present value calculation for both the loss of principal balance and the transaction cost components. Instead, asset-funding costs enter in a more direct and transparent manner. Finally, the relationship of loss severity to original loan-to-value ratio gives the companies the proper incentives to continue to use mortgage insurance arrangements.

3. MORTGAGE PERFORMANCE–MULTIFAMILY

A. Executive Summary[112]

The stress benchmark is defined by specified vacancy and rent paths selected to represent economic conditions prevalent in the benchmark region and time period. Multifamily (MF) loans are treated as a product type in the statute and in the proposed regulation. Like single family (SF) loan performance, multifamily default and prepayment equations are estimated on all available loans through 1995.

The default specification relies on both equity and cash flow characteristics of the property. The basic default equation structure links loan-specific survival or default to the joint probability of negative equity and negative cash flow, *JP*, and other variables. *JP* is a complex measure derived from 1) observed underwriting ratios at origination, updated through time with an MSA rental price index and vacancy rate, 2) a fixed expense ratio as a percentage of full occupancy levels of income, and 3) a capitalization rate multiplier tied to the level of the 10-year Treasury rate. Further the rental price indexes and vacancy rates are modeled as random distributions around the defined stress path to reflect property level variation around the MSA measures. Two default equations are estimated to reflect differences in loans in the companies' books of business.

Five prepayment equations are estimated and six severity relationships are specified.

Critique – Overview

1. *Calibration to the benchmark.* Multifamily default performance is not calibrated to observed losses in the benchmark region. Multifamily stress test interest rates and housing market variables interact in a complex manner to mark-to-market property values. Many possible interest rate scenarios yield stress losses significantly beyond any level that may be interpreted to be reasonably related to the highest level of multifamily mortgage losses experienced in the benchmark region. The most striking evidence of this effect is in the comparison of the up and down rate scenarios and the capital requirements for multifamily loans in each. Data limitations play a significant role in the inability to model the complex relationships specified by OFHEO for the loan performance modules.

2. *Default and prepayment models.* The proposed regulation offers a complicated statistical standard for multifamily defaults and prepayments that rests on limited data and produces unstable and unreasonable results. Loan performance in the up and down rate scenarios is so divergent as to make the business unmanageable, while seasoning creates excessively high additional capital requirements. The proposal ignores the business models employed by the companies to mitigate risk in the

[112] NPR 2 §§ 3.5.4, 3.5.5 at 18,260-18,280.

multifamily business through active asset management, lender supervision and risk-sharing. It is important to note that both companies have significantly improved their underwriting practices. At Fannie Mae, this change in underwriting was accompanied by much greater centralized control and management and by a growing reliance on a designated set of lender partners.

Prepay equations are misspecified. Yield maintenance penalties have not been adequately modeled. Prepayment rates for call protected contracts are implausibly high in the down rate scenario. No credit is given to the companies for the collection of yield maintenance penalties.

3. *MF Severity*. Data to document severity and loss rates were even more limited than data available to estimate the default and prepayment models. Severity is based on the REO experience of 705 Freddie Mac loans in the early 1990s. The Freddie Mac REO sample has a heavy concentration of properties in the New York and Atlanta metropolitan regions; this sample is not likely to be representative of the loss performance of the benchmark region. Severity components do not reflect current underwriting and loss management practices.

Recommendation

The NPR 2 proposal has placed too much reliance on statistical models. The empirical record should be used as a summary of the companies' loan performance to date, but it is necessary to build a growing body of evidence on the risk characteristics of this business line and to engage in a process with the companies to recognize the broad range of controls that are brought to bear in managing these loans. Despite the shortcomings in the proposed models, Fannie Mae believes that the methodology, if adjusted to remove certain deficiencies, may be used to inform risk based capital guidelines for the company's multifamily loans. These adjustments are outlined below.

1. Where available, instead of relying on market indices to compute property cash flows, property specific information should be used to update property cash flows, eliminating the need to employ strong assumptions to compute hypothetical cross-sectional volatilities.

2. Stress period conditional default rates should be based on a simplified calculation from the default equation. Multifamily default rates should be fixed at rates that vary only with the debt service coverage (DSCR) ratios observed and monitored at origination and through time, origination loan to value ratios, and factors that capture the additional risk of balloon default. These rates will be roughly consistent with the levels in the proposal for unseasoned loans. This approach will produce similar default rates in both the up and down rate scenarios and across seasoning categories, and will be responsive to the changing economic conditions in rental markets that affect the real exposure of the company to multifamily loans.

3. Given the weaknesses in the prepayment equations we propose a simple set of rules that reflect the contract terms of the mortgages and reasonable responses to the interest rate environments.

4. Regarding multifamily loss severity rates we would recommend that a constant severity rate be chosen for use in the stress period, to reflect broader experience of both companies and based on a more reasonable expectation of recovery from sale of properties. Rather than the 60-70 percent severity of the proposed regulation, we find that 40-45 percent is more consistent with the company's experience and fairly consistent with other industry and academic studies.

5. Unique features of multifamily loans must be captured, including actual yield maintenance and balloon terms, and used in the calculation of default and prepayment rates.

The approach outlined above is consistent with our overall desire to make the risk-based capital rules more responsive to the actual credit risk faced by the companies and easier to measure and implement. Capital requirements would be tied directly to known risk factors that affect multifamily mortgages, e.g., DSCRs, LTV, and balloon risk. Finally, capital requirements would be tied to observable and measurable mortgage characteristics, minimizing capital volatility associated with measurement error, while giving OFHEO a framework which is easily updated as new data and modeling techniques justify refinement to our proposed approach. Fannie Mae also notes that the proposed model and implementation applies most directly to the single project loans underwritten by both companies. The business however has evolved in important ways through the 1990's. The additional requirement that the regulation be flexible enough to support innovation and evaluate risk and risk-sharing appropriately is critically important in this segment.

For additional comment on multifamily default, prepayment, and severity, see Ernst & Young brief in Appendix V-8.

B. Multifamily Loans, the Benchmark and the Benchmark Loss Experience[113]

> General: The statute requires that the frequency and severity of stress test losses be "reasonably related" to the highest rate of default and severity of mortgage losses experienced during a period of at least two years in contiguous areas of the United States that together contain at least 5 percent of the total U.S. population.[114] With regard to prepayments, the 1992 Act requires: "Characteristics of the stress period other than those specifically set forth, such as prepayment experience … will be those determined by the Director, on the basis of available information, *to be most consistent with the stress period*."[115]
>
> The statute also requires that the "Director shall take into account appropriate distinctions among types of mortgage products"[116] and defines type of mortgage product to be characterized by the number of properties securing mortgages – 1 to 4 dwelling units and more than 4 dwelling units. (Other characteristics include fixed and adjustable rates, lien priority, mortgage term, and owner status).

Multifamily (MF) loans (more than 4 dwelling units) are differentiated from single-family loans in the statute and in the proposed regulation. Market conditions for the multifamily product type are identified with rental price and vacancy rates and by capitalization rate multipliers. The benchmark region and time period conditions are based on indices that covered the largest cities in the ALMO region--Little Rock, New Orleans, Jackson, and Oklahoma City. Indices were developed from government sources where available. The rental series in the proposed regulation is based on the MSA level residential rent component of the BLS Consumer Price Index (CPI), and on vacancy series supplied by the Bureau of Census (H-111 vacancy series) for selected MSAs. These sources did not provide adequate coverage of the benchmark region and time period however and OFHEO used rent and vacancy information published by the Institute for Real Estate Management (IREM) to augment the publicly available data. The resulting scenarios for rents and vacancies are presented in Tables 3-14 and 3-15 of NPR 2,[117] and are reproduced below, with other measures that are based on the index values.

[113] NPR 2 §§ 3.4 at 18,236; 3.5.4.2 at 18,260; 3.5.4.2.4 at 18,261; and 3.5.4.3.4 at 18.268; see also NPR 2 at 18,125-18,126.
[114] 12 U.S.C. § 4611(a)(1).
[115] 12 U.S.C. § 4611(b)(2) (emphasis added).
[116] 12 U.S.C. § 4611(b)(1).
[117] NPR 2 at 18,239-40.

Table 1: Stress rent and vacancy rates were derived from data for the major metropolitan areas in the benchmark states, Arkansas [Little Rock], Louisiana [New Orleans], Mississippi [Jackson], and Oklahoma [Oklahoma City]. The rental growth rates are derived from IREM data, while the vacancy rate data is derived from the Census Bureau's H-111 series for each of the benchmark states. (Note, the rental series reproduced below does not include an inflation adjustment specified by OFHEO for the up rate test after year 5 of the stress test.)

Year	Rental Growth Rate	Vacancy Rate	Rent Index	NOI multiplier	NOI Growth Rate	Volatility of Diffusion Param.	LTV Starting@80	DSCR Starting@1.25
1	0.0437	0.0988	1.0437	0.9618	-0.0382	0.666	100	1.20
2	0.0250	0.1095	1.0698	0.9612	-0.0007	0.707	99	1.20
3	0.0641	0.1145	1.1383	1.0105	0.0514	0.727	93	1.26
4	0.0093	0.1325	1.1488	0.9754	-0.0347	0.789	95	1.22
5	0.0125	0.1193	1.1632	1.0208	0.0465	0.750	90	1.28
6	0.0400	0.1160	1.2097	1.0701	0.0483	0.744	84	1.34
7	0.0360	0.1108	1.2533	1.1227	0.0492	0.731	79	1.41
8	0.0460	0.0885	1.3110	1.2371	0.1019	0.661	70	1.56
9	0.0436	0.0795	1.3682	1.3176	0.0650	0.634	65	1.66
10	0.0432	0.0848	1.4272	1.3583	0.0309	0.657	61	1.72

Critique

Because Multifamily loans (MF) may be a distinct type of mortgage product according to the statute and because industry relationships and markets are distinct, it is reasonable that the product should have specific default, prepayment, and severity modules in the proposed regulation. Other provisions of the stress period, including the interest rate conditions, apply equally to the multifamily and single family mortgage products and raise similar issues in implementation. It is important to note, however, that the benchmark region and time period were selected for the highest rates of default and severity for single-family loans and that the single-family loan performance modules have been calibrated to replicate single-family default and loss rates from the benchmark region and time period.

Multifamily loss modules do not have a similar observable performance measure from the benchmark region and time period. Rather the "benchmark" can only refer to economic conditions chosen in the proposal to drive multifamily loan performance, in particular, rent, vacancy rate and capitalization rate multiplier paths for the 10-year stress period. These rates are not specific to Fannie Mae's business in the same way that the house price indexes are, but are general market measures. The general nature of the benchmark region conditions is the result of a dearth of available multifamily data. For example, Fannie Mae has an electronic record for only one loan originated in the benchmark region (AK, LA, MS, OK) during the 1983-4 period.

We acknowledge that the task of establishing the multifamily benchmark loss experience is a challenging one and looking to indexes to define the economic conditions is a reasonable approach. However in developing indexes of economic conditions the tie to the ALMO region is tenuous. For the operating income, based on both rents and

vacancies, a model was used to map IREM rents to BLS series but it has low predictive power. The stress paths for rents and vacancies produce a harsh economic scenario as expected for the benchmark. Vacancy rates increase to over 13%, about 7% higher than the long-run average over the past two decades, a time period that has included two relatively stressful real estate cycles. The rental price path is less extreme, but nevertheless, when combined with the vacancy path and the random variation specified by OFHEO, results in a stressful environment.

The important property valuation relationship is not tied to the benchmark at all. For a typical loan on the companies' books of business, property values decline significantly in the up rate scenario, and increase substantially in the down rate scenario. Interest rate paths have been specified independently of the rent and vacancy paths; the interest rate paths are also not related to the path of interest rates observed during the benchmark period; and in NPR 2 stress period interest rates and multifamily housing market variables interact in a complex manner. Indeed, many possible interest rate scenarios will result in stress losses significantly beyond any level that may be considered 'reasonably related' to the level of MF mortgage losses experienced in the benchmark region. There is no tie to an observed rate of default and severity of mortgage losses, as implemented for single-family loans, and therefore there is no defined, empirical benchmark loss experience for multifamily loans.

Recommendation

In the absence of an empirical guideline from the benchmark period, we recommend a cautious approach to modeling, one that does not require measuring intricate relationships and that reflects the judgment of the companies and the industry about MF loan performance in the hypothetical conditions of the stress period.

C. Multifamily—the Mark-to-Market Process[118]

Loans are marked to market both for estimation of the default and prepayment models and to place loans in risk categories at the start of the stress test. Risk categories are defined by debt service coverage ratios (*DSC*, the ratio of net operating income, *NOI*, to the loan payment) and loan-to-value ratios (*LTV*), the common financial ratios used for underwriting MF properties. The updated underwriting ratios are used to create a probability measure of the joint distribution of *DSC* and *LTV*. This process and its significance are discussed more thoroughly in the next section. Here we discuss how *DSC* ratios are updated through time with rental price and vacancy rate series, and how *LTV* ratios are updated from changes in the indexed *NOI* and changes in a capitalization rate multiplier, assumed to be a function of 10-year Treasury rates.

[118] NPR 2 §§ 3.5.4.3.2 through 3.5.4.3.4 at 18,262-69;18,216-18.

1. NPR 2 Rent and Vacancy Indices

Market level *NOI* indices and growth rates were not available and were therefore constructed from components of NOI. *NOI* growth rates were determined using a combination of publicly available rent and vacancy information from the Bureau of Labor Statistics (CPI) and the Census Bureau (H-111 series). Rent and vacancy series provided by IREM were used to augment coverage of the benchmark region where there was little coverage from BLS. Finally the IREM rent data was normalized to make it compatible with the data provided by BLS. A property's expected rent level and vacancy rate are updated using MSA level indices.

The net operating income (*NOI)* series for a given property is based on the assumption that expenses are a fixed share (47.2%) of gross potential income and that vacancy rates at loan origination are 6.23%. A net income multiplier relating origination *NOI* to current *NOI* is derived using the following relationship:

$$NOI_t = NOI_{origination} \bullet RentIndex_t \bullet (1 - 2.15 \bullet (VacancyRate_t - 0.0623))$$

Critique

A constant expense factor significantly increases the volatility of *NOI* in response to changes in vacancy rates. The assumption in the proposal leads to a 1% change in the average vacancy rate of an MSA producing a 2.15% change in property *NOI*. This is not supported by statistical evidence, yet has a large influence on default outcomes. One might reasonably suggest that expenses are variable and more closely linked to income than in NPR 2. For example, borrowers' tax burdens can be variable in stressful environments: subject to a persistent and significant income shock and significant changes in value as modeled here, owners demand and often receive significant reductions in assessed property taxes.

Recommendation

Relaxing the assumption that expenses are a fixed portion of gross income would mitigate the NOI volatility. A factor of 1.0-1.2 on vacancy rates may be more reasonable. Alternatively, inasmuch as Fannie Mae collects annual operating statements for a large number of loans in its portfolio, marked to market values could be based on actual observations of *NOI* where available instead of imputing *NOI* values based on market indices.

2 NPR 2 Cap Rates and Property Values

Marked-to-market LTV ratios require updated property values, which are not generally observable with any frequency, but may be estimated by the relationship (NOI/capitalization rates). As there were no appropriate cap rate series to update property values, the evolution of cap rates was based on a linear regression model that determines cap rates as a function of the 10-year treasury rate, as follows:

$$CapRateMult_t = CapRateMult_{origination} \bullet \left(1 + 0.23 \bullet \left(1 - \frac{10yearCMT_t}{Avg10yearCMT_{orig.year}}\right)\right)$$

Critique – Cap Rate Model

The cap rate equation results in property values that are very sensitive to the path of interest rates, especially the difference between the current ten-year Treasury rate and the ten-year Treasury rate at the time of loan origination. The model fits the data very poorly—with a reported R^2 of 0.0525—yet it has a very significant impact on conditional default rates. In the absence of MF benchmark loss experience, the only link to actual credit conditions in the benchmark region is through the property valuation, rent and vacancy indices. Without a credible valuation model that link is broken. In the down rate, generally the model results in increased property values. (Depending on the coupon of the ten year treasury at origination and the down rate scenario, property values may increase by over 50% in the down rate scenario.) Conditional default rates in the down rate test are approximately one-fifth of their value during the up rate test.

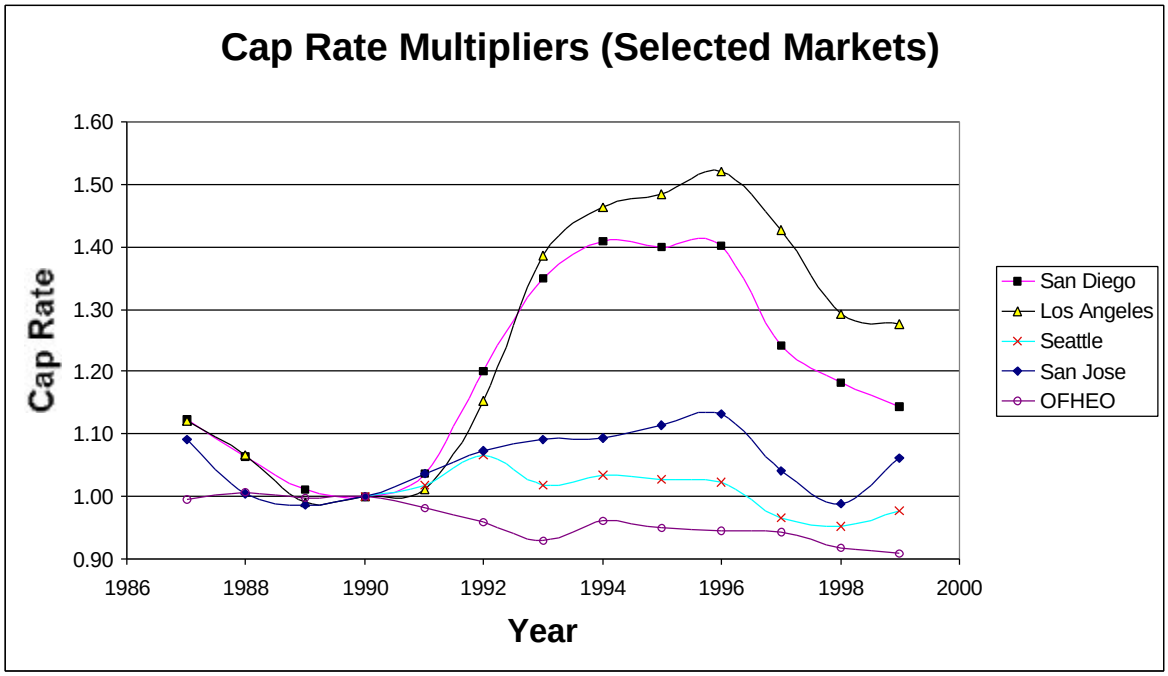


Figure 1: Comparison of observed *cap* rate multipliers in several different markets with *cap* rate multipliers predicted using NPR 2 model. 1990 has been normalized to 1.0. Source: Comps.com.

Two additional issues arise in applying the cap rate model, as highlighted in Figure 1, above. 1) The proposed property valuation model performs poorly, especially since it imposes one model on the entire nation and does not capture variation across property markets. 2) The effect of the poor performance of the cap rate model will corrupt the estimation of the default models, especially where observations are concentrated in

markets with cap rate multipliers that deviate significantly from NPR 2's modeled cap rates. For example, a large number of Fannie Mae loans in OFHEO's data were from southern California. During the 1991-1995 period southern California endured one of the most severe commercial real-estate recessions in the post-war era. This recession was characterized by a significant decline in property values. Interest rates, on average, also declined. Prevailing MSA level average rents, however, remained flat over this period. Based on the observed path for interest rates, the proposed mark to market procedure would indicate an increase in property values for these properties. The procedure therefore results in erroneous assignment of low LTVs to loans with high LTVs. The implications of this source of error will be developed in the next section on estimating the default models.

Recommendation – Property Valuation

As there is not a suitable alternative for the cap rate model, we propose that the regulation not be based on estimated property values, but instead use origination LTVs as a discriminator of risk for the stress period. If innovations in the future result in more robust estimators of property values and changes, we recommend that OFHEO work with the companies to incorporate them into future specifications of the risk-based capital regulation.

D. Multifamily Default and Prepayment Equations and Their Estimation[119]

Default model: Mortgage default and prepayment probabilities are often computed using log-logistic regressions, motivated by an option theoretic framework that attempts to capture the economic incentives to default. The default model specified in the NPR 2 follows a similar line of research and is discussed in this section.

The key explanatory variable in the multifamily default equations is *JP*, the *joint probability that a property is simultaneously subject to negative equity and negative cash flow.* Specifically it is the probability that, for a given property at a given time, the mark-to-market loan-to-value ratio, *LTV*, exceeds 100% and that the mark-to-market debt service coverage ratio, *DSCR*, is below 1.0. The larger the *JP* variable for a given loan-year combination, the higher the conditional default rate (and the lower the conditional prepayment rate for that loan).

The *JP* variable integrates five factors: origination *DSCRs;* and *LTV*s,[120] rent and vacancy series for the *MSA* or region where the property is located, and interest rates. Interest rates are used to compute time-varying capitalization rate multipliers or 'cap rates',

[119] NPR 2 § 3.5.4 at 18,260-77; 18,125-6; 18,136-8;18,195-209.

[120] *DSCRs* and *LTVs* have traditionally been identified as the two primary commercial lending underwriting ratios. *DSCR* is measured as the annual *NOI* of a project divided by the annual mortgage payment and is a proxy for the size of the cash cushions above operating expenses available for debt service. *LTV* measures available borrower equity.

which are then combined with marked-to-market property cash flows to determine property values. A probabilistic measure for default behavior is used since the exact financial condition of any given property at a given point in time cannot be determined with certainty from the market indexes used to update the *DSCR* and *LTVs*. The formulation of this probabilistic measure is complex and requires several assumptions:

- Building level vacancy rates follow a binomial process and are independent of rents. (Lowering asking rents does not increase occupancy rates). A binomial process implies that if an MSA's vacancy rate is 10%, for 35% of all properties the vacancy rate will exceed 19%.

- Operating expenses are constant and cannot be managed through time; every 1% increase in the vacancy rate results in a 2.15% decrease in operating incomes.

- Distribution of property level rents follows a diffusion process with a standard deviation of 7.5% per year.

- Changes in LTV and DSCR are negatively correlated with a correlation coefficient of -0.5975

In addition to *JP*, default behavior in the estimated equation is primarily governed by quadratic parameters describing loan seasoning.

The proposed default equations also include variables that capture the unique risks and incentives faced by multifamily lenders and borrowers.

- As investors in income-producing properties, borrowers are assumed to be sensitive to the tax treatment accorded to properties. The *DW* variable is meant to quantify the benefits of depreciation rules that might provide an incentive to borrowers to keep a mortgage on a property that is otherwise more likely to default. A strong impetus to including this variable is the significant change in tax law in 1986, within the period from which originations were drawn.

- OFHEO models balloon risk using the *BJP* variable, as a large proportion of multifamily loans are not fully amortizing. The balloon risk indicator increases cumulative default rates for a typical balloon.

- The proposal includes two separate default equations. One default equation is estimated for "cash" (loans originated for and purchased by Fannie Mae and Freddie Mac) and another for "negotiated transactions"—"NT." (NT refers to pools of seasoned loans.) There are a couple of objectives for separating loan programs into two separate classes: first, that the majority of the negotiated purchase programs had seller/servicer repurchase provisions and thus made it necessary to use 90-day delinquency as the default event of record; second, that the two programs historically performed differently, with NT default rates higher than cash default rates. Capturing

these differences was best achieved through an estimation that involved two separate models.

The equations were estimated using 21,994 (12,845 Freddie, 9,149 Fannie) MF loans acquired between 1983-1995. Sixty-one percent of the estimation sample is comprised of "cash" loans. Thirty-nine percent of the estimation sample is composed of "negotiated" loans. Loan performance was modeled between 1991-1995.

- Finally, OFHEO recognizes that underwriting practices changed within the estimation period, and that the changes may not be captured simply by the underwriting variables, origination *LTV* and *DSCR*. The variable *DD* measures the effect of the change in underwriting (1988 for Fannie Mae and 1991 for Freddie Mac).

Table 2: Explanatory variables that appear in the MF default equations.

Variable	*Description*	*"Cash" Eq.*	*"NT" Eq.*
Constant	Constant term in logistic default equations.	-10.0191	-9.6418
JP_t	The joint probability of negative equity and negative cash flow Pr(*LTV*>1 and *DSCR*<*1*).	7.8320	12.1660
BJP_t	For balloon loans, takes the value of the *JP* variable during the balloon year, otherwise 0.	2.6446	2.6446
DW_t	Present value of depreciation tax write-offs per $100 of property value.	-0.0829	0.0
DD	Dummy variable equal to 1 if the loan was originated under the original cash programs, prior to 1988 for Fannie Mae, prior to 1991 for Freddie Mac.	0.6203	0.0
RA	For ARM loans, equals 1, if the event of record is a 90-day delinquency.	0.0	0.6751
RF	For fixed-rate loans, equals 1, if the event of record is a 90-day delinquency.	0.0	0.2627
AY_t	Age of the mortgage in years.	1.2687	1.0596
AY_t^2	Loan Age squared.	-0.0790	-0.0633

Critique – Default Equations

The proposed methodology for estimating default performance is ambitious and innovative. We believe however that in important ways the equations rest on a number of assumptions that are not sufficiently proven to be the primary determination of the risk based capital for multifamily loans.

1. The computation of the *JP* variable is complex and is subject to several criticisms.

    - The mark to market procedure is contrived and errs in its predictions for cap rate multipliers and property values. The cap rate model is seriously flawed in it relationship to interest rates and can result in property values rising by 50% or more during the down rate scenario. The *JP* variable incorporates and compounds the errors affecting the updated LTV, making *JP* a very noisy measure of the default incentives faced by borrowers.

- The property valuation model has very low predictive power, R^2=0.05, yet it has a very significant influence on cumulative stress defaults over the stress scenario. Use of a single national cap rate is likely to bias the estimated default equation, for areas that deviated from national trends.

- Assumptions regarding the derivation of property operating incomes significantly increase modeled volatility in *NOI* as a function of vacancy rates, thereby increasing the value of the *JP* variable for any mark-to-market values for property *DSCR and LTV*. These assumptions ignore the information available in the annual operating statements that Fannie Mae collects on individual properties to monitor loan and property performance.

- The proposed methodology requires numerous assumptions regarding economic parameters (such as the variance, covariance, and the distribution of rent, vacancy rates, and property values). These assumptions are purely conjectural and unobservable from data currently available. Yet, if implemented as proposed, these factors significantly influence overall capital requirements.

2. Seasoning increases default rates to an unexpected degree. Rents must grow at above average levels just to maintain cumulative default rates at their starting values. For example, the ten year cumulative default rate for a cash 80 LTV, 1.25 DSCR 15 year balloon is 17% while the ten year cumulative default rate for the exact same loan with four years of seasoning is over 30% percent.

3. OFHEO imputes missing values for starting *LTV* and *DSCR*s. If *LTVs* were missing, a value of 71.57 percent was imputed for purposes of estimating model parameters. However, for purposes of the stress simulation, missing *LTVs* are assigned a value of 80 percent, while missing *DSCRs* are assigned a value of 1.20. The higher LTVs for the stress simulation bias the stress results towards higher default rates.

4. Differences in the default rates between the up and down interest rate scenarios are the result of errors in modeling prepayments, detailed below, and the interest rate sensitivity of the property valuation model. Excessive prepayments in the down rate scenarios result in few defaults. The difference in cumulative defaults between the up and down rate scenarios is due to the higher conditional default rates in the up rate where there are few prepayments. See Figure 2.

5. Two default equations are estimated, in part to reflect differences in data availability between ‘cash’ and ‘NT’ loans. We are not certain what data from Fannie Mae were used in the estimations and therefore cannot corroborate results described in NPR 2. Characteristics of earlier transactions are known, however, and lead us to believe that the NT equation is poorly specified and not a useful guide to multifamily loan performance.

- The NT equation produces excessive delinquency and default rates as shown in Table 3, as a result of several modeling and data limitations.

Table 3: Ten-year cumulative default rates for unseasoned "NT" loans entering the stress test in 1997. Here default is defined as a delinquency which results in a seller/servicer repurchase of the loan. (1.00 = 100% of all loans default.)

		D S C R											
		1.00	**1.05**	**1.10**	**1.15**	**1.20**	**1.25**	**1.30**	**1.35**	**1.40**	**1.45**	**1.50**	**1.55**
L T V	***1.00***	1.00	0.99	0.99	0.97	0.95	0.93	0.89	0.85				
	0.95	0.99	0.99	0.98	0.96	0.93	0.91	0.87	0.82	0.78			
	0.90	0.99	0.98	0.96	0.94	0.91	0.88	0.84	0.80	0.74	0.69		
	0.85	0.98	0.96	0.94	0.92	0.88	0.84	0.80	0.75	0.70	0.65	0.60	
	0.80	0.95	0.93	0.91	0.88	0.84	0.80	0.75	0.70	0.66	0.61	0.56	0.52
	0.75	0.92	0.89	0.86	0.82	0.77	0.74	0.69	0.65	0.60	0.56	0.51	0.46
	0.70	0.85	0.82	0.79	0.75	0.71	0.66	0.62	0.58	0.54	0.50	0.46	0.42
	0.65		0.73	0.69	0.66	0.61	0.58	0.54	0.49	0.47	0.43	0.40	0.37
	0.60			0.58	0.55	0.52	0.48	0.45	0.42	0.39	0.37	0.34	0.32
	0.55				0.44	0.41	0.39	0.37	0.34	0.32	0.30	0.28	0.26
	0.50					0.31	0.30	0.28	0.27	0.25	0.24	0.22	0.21

- The proposed property cash-flow models most likely bias estimates of conditional default rates upward in the "NT" model. The majority of Fannie Mae loans that we believe were included in the "NT" estimation were from southern California. During the 1991-1995 period used for estimation southern California endured one of the most severe commercial real-estate recessions in the post-war era. This recession was characterized by a significant decline in property values. Interest rates, on average, also declined. Prevailing MSA level average rents, however, remained flat over this period. Based on the observed path for interest rates, the proposed mark to market procedure would indicate an increase in property values for these properties. The procedure therefore results in erroneous assignment of low LTVs to loans with high LTVs. Since southern California provided many default observations over this time period, the estimated default equation has been biased to indicate default at lower LTVs, resulting in a default equation that over predicts default as a function of rising LTVs. The proposed methodology for updating cap rates likely affects the NT equation more severely because of the high concentration of southern California loans in Fannie Mae's NT estimation sample, whereas the "cash" sample is distributed more uniformly over the nation.

- Imputed values for starting *LTV* and *DSCR*s likely affect a large fraction of Fannie Mae's NT loans. As noted above the difference in imputed values for estimation and for mark-to-market bias the stress results towards higher default rates.

- There were too few observations to effectively estimate the coefficient multiplying the *BJP* variable in the NT default equation. Instead the coefficient

was assigned from an estimate in another equation. This is not a valid statistical solution to the data issue.

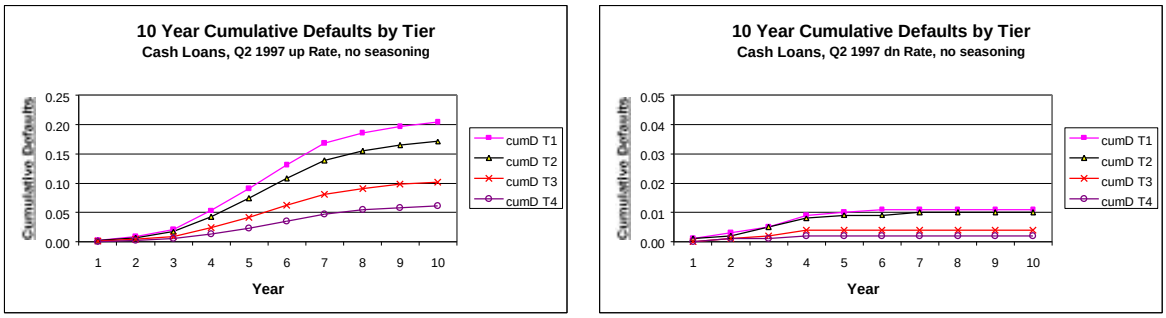


Figure 2: Cumulative default curves for Q2 1997 up and down interest rate paths. Down rate cumulative default rates are almost 1/20th of the up rate default rates. In the down rate the default rates are dampened because the increase in property values reduces annual conditional default rates to about 1/5th of their up rate counterparts, while the rapid prepayment rate chokes off the possibility of additional defaults after year 5. T1 corresponds to 1.15/80 DSCR/LTV loan, T2 1.25/80, T3 1.35/65, T4 1.55/55.

Recommendation

We believe that the proposal has placed too much reliance on statistical models and needs to use the empirical record as a summary of the companies' loan performance to date, to build a growing body of evidence on the risk characteristics of this business line and to recognize the broad range of controls that are brought to bear in managing these loans, including the process of reviewing loans annually and updating financial performance for individual properties.

From the empirical record examined by OFHEO, our recommendation is to ignore the NT equation entirely and calculate fixed default rates from the "cash" equation for unseasoned loans. The default rates would vary only with the debt service coverage (DSCR) ratios observed at origination and updated through time, and with origination loan to value ratios. These rates will be roughly consistent with the levels in the proposal for unseasoned 'cash' loans and will produce a more workable capital standard for multifamily loans:

- Default rates more consistent between the up and down rate scenarios
- Default rates less sensitive to seasoning categories, and
- Default rates that are responsive to measured changes in individual property performance.

The table of cumulative default rates below (Table 4) has been computed using the default model proposed by OFHEO for "cash" unseasoned loans and the 1997-Q2 stress conditions. The cumulative default rates are at reasonable levels for managing

multifamily risk based capital on Fannie Mae's loans. Loans would map to the table by the *current* DSCR and origination LTV. For balloon loans the conditional monthly default rate can be a multiple of the "base" conditional default rate for the mortgage in the 12 months preceding the balloon date. At a balloon year multiple of 3.0, 10 year cumulative default rates for unseasoned, 10-year balloons would increase by about 20%. (Conditional default rates are appended to this section.)

Table 4: Base model 10-year cumulative default rates (no prepayments). (0.50 = 50% of all loans default over 10 years.)

	DSCR															
	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60
1.10	0.540	0.490	0.450	0.400	0.360	0.320	0.290	0.260							
LTV 1.05	0.510	0.460	0.420	0.380	0.340	0.310	0.270	0.250	0.220						
1.00	0.470	0.430	0.390	0.350	0.320	0.290	0.260	0.230	0.210	0.190					
0.95	0.430	0.390	0.360	0.330	0.300	0.270	0.240	0.220	0.200	0.180	0.160				
0.90	0.390	0.360	0.330	0.300	0.270	0.250	0.220	0.200	0.180	0.170	0.150	0.140			
0.85	0.350	0.320	0.300	0.270	0.240	0.220	0.200	0.190	0.170	0.160	0.140	0.130	0.120		
0.80		0.280	0.260	0.240	0.220	0.200	0.180	0.170	0.160	0.140	0.130	0.120	0.110	0.100	
0.75			0.220	0.210	0.190	0.180	0.160	0.150	0.140	0.130	0.120	0.110	0.100	0.100	0.090
0.70				0.180	0.160	0.150	0.140	0.130	0.120	0.110	0.110	0.100	0.090	0.090	0.080
0.65					0.140	0.130	0.120	0.110	0.110	0.100	0.090	0.090	0.080	0.080	0.070
0.60						0.110	0.100	0.100	0.090	0.090	0.080	0.080	0.070	0.070	0.060
0.55							0.080	0.080	0.080	0.070	0.070	0.070	0.060	0.060	0.060
0.50								0.070	0.060	0.060	0.060	0.060	0.050	0.050	0.050
0.45									0.050	0.050	0.050	0.050	0.050	0.040	0.040

E. Multifamily Prepayment Modeling[121]

Prepayment rates are modeled by loan characteristics and product type. There are five prepayment equations:

1) Fixed-rate loans in yield maintenance or prepayment lockout periods,
2) Fully amortizing loans out of yield maintenance,
3) Balloon loans out of yield maintenance but prior to maturity,
4) Fully amortizing ARMs, and balloon ARMs before maturity, and
5) All balloon loans on or after their maturity date.

This breakdown was meant to capture differences in financial incentives to prepay that exist due to yield maintenance and lock-out provisions, adjustable-rate loans, and factors that impact prepayment rates such as balloon maturity and the possibility of post balloon maturity extensions. Table 6 summarizes the OFHEO prepayment equations.

As in the case of the default put option, a borrower may exercise the prepayment call option if the prospective gains from prepayment exceed the costs of prepayment. The benefit flows from the ability to lock-in a lower rate and the ability to withdraw

[121] NPR 2 at 18,204-10.

additional equity from the property. The costs include the transactions costs associated with arranging for new financing and the *cost of prepayment and yield maintenance penalties,* which are common in commercial and multifamily lending and important to the behavior of loans originated by Fannie Mae and Freddie Mac.

Table 5: Explanatory variables that appear in the MF prepayment equation.

Variable	Description	Eq. 1	Eq. 2	Eq. 3	Eq. 4	Eq. 5
Constant	Constant term in logistic prepayment equations.	-4.7854	0.7129	-7.3368	-.9037	-1.0021
RSD_t	Relative interest rate spread if current rates are less than the coupon rate, 0 otherwise.	11.079	3.994	5.17	0.0	0.0
RSU_t	Relative interest rate spread if current rates are above the coupon rate, 0 otherwise.	-7.13	-0.796	-0.796	0.0	0.0
$RSD1_t$	Equals RSD_t during the year prior to the balloon year, 0 otherwise.	0.0	0.0	1.92	0.0	0.0
$RSD2_t$	Equals RSD_t from 24 months to 12 months prior to the balloon date, 0 otherwise.	0.0	0.0	1.62	0.0	0.0
RS_t	Relative interest rate spread between ARM and FRM multifamily conventional loans in year t.	0.0	0.0	0.0	4.8137	0.0
Rf_t	Average market interest rate for conventional multifamily fixed-rate loans in year t.	0.0	0.0	0.0	-51.31	0.0
LTV_t	LTV ratio in year t.	-0.9499	-3.817	-2.2591	-3.222	0.0
PQ_t	Probability of qualification for a new loan in year t; Pr(LTV<=0.8 and DSCR>=1.2).	0.0	0.0	0.0	0.0	1.8013
YTG_t	Years remaining in the yield maintenance period.	-0.2656	0.0	0.0	0.0	0.0
AY_t	Age of the mortgage in years.	0.4393	-0.209	1.5412	1.7119	0.0
AY_t^2	Loan Age squared.	-0.0263	0.0044	-0.0952	-.1231	0.0

1.Fixed-rate loans in yield maintenance periods.
2.Fixed-rate, fully amortizing loans out of yield maintenance.
3.Balloon loans out of yield maintenance prior to maturity.
4.ARMs before maturity.
5.All balloon loans, on and after the maturity date.

Critique – MF Prepayment Modeling

The prepayment equations estimated by OFHEO are based on faulty measures of the incentives important to a model of multifamily prepayment behavior and produce unrealistic prepayment rates in the down rate stress test.

1. *LTV* enters the equations to capture incentives to refinance based on equity changes – LTV however is based on the property valuation model and its biases, as detailed above.

2. Interest rate measures capture the incentive to refinance due to reduced debt servicing costs as interest rates go down. This effect overwhelms other variables in the down rate stress environment and makes both the default and prepayment predictions unrealistic due to the mismeasurement of the yield maintenance costs.

3. The cost of prepayment penalties and yield maintenance to borrowers is underestimated.

- Prepayment penalties typically range from 1% to 5% of UPB. OFHEO has ignored prepayment penalties entirely.

- Yield maintenance penalties may be as high as 20% of UPB under some interest rate scenarios for unseasoned loans. OFHEO models the yield maintenance penalty in an ad-hoc way with the cost linear over the number of years remaining in the yield maintenance period. This choice results in a significantly overstated prepayment rate in the down rate scenario. (See Figure 3.) If modeled appropriately, these costs would rise rapidly as interest rates fall and significantly reduce cumulative prepay rates from the outcomes predicted using the NPR 2 prepay equations.

- The strength of the yield maintenance and other provisions is evident in the behavior of Fannie Mae's portfolio and is also supported by academic research. For example, Fu, LaCour-Little, and Vandell[122] conclude that "Yield maintenance and lockouts are the most effective constraints upon prepayment among penalty types." Their research demonstrates that prepayments on MF mortgages with yield maintenance provisions of the type used by Fannie Mae are extremely low and insensitive to the relative spread variable of the type used in the proposed model.

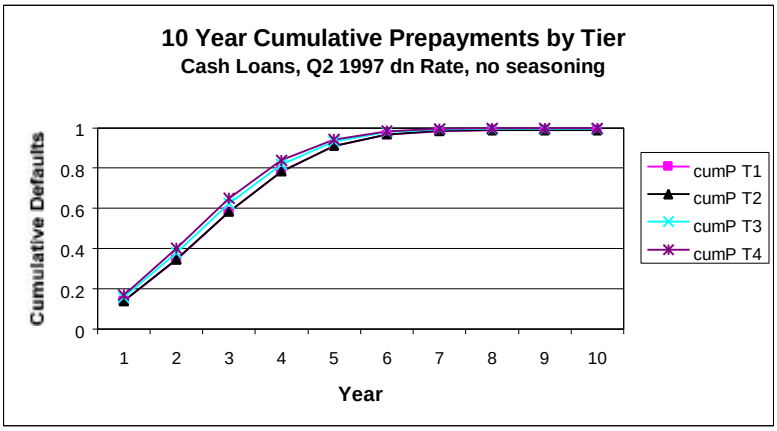


Figure 3: Cumulative and conditional stress default and prepayment rates for loans under different scenarios. T1: 1.15/80 DSCR/LTV, T2 1.25/80, T3 1.35/65, T4 1.55/55.

4. By specifying 5 prepayment equations, the proposal has attempted to model a degree of specificity that is not justified by the data. For example there were not sufficient observations of loans where market rates were higher than coupon rates to compute the coefficient multiplying the *RSU* variable in equation 2. Coefficients instead were

[122] "Multifamily Prepayment Behavior and Prepayment Penalty Structure." Presented at the 2000 Meetings of the Allied Social Sciences Associations, January 2000, Boston.

assigned from estimates in other equations. This is not a valid statistical solution to the data issue.

Recommendation - Prepayments:

Given the weak relationship measured in the NPR 2 prepayment equations we propose a simple set of rules that reflect the contract terms of the mortgages and reasonable responses to the interest rate environments.

- In the up rate and where the stress period interest rate exceeds the note rate, set the prepayment rate to 0.02% per month.
- In the down rate, when loans are within their yield maintenance period or are subject to the prepayment lockouts set the prepayment rate equal to 0.2% per month.
- In the down rate, when loans are not subject to prepayment restrictions, set the prepayment rate to 2% per month.

F. Multifamily Severity Modeling[123]

Severity equations determine the credit losses associated with monthly stress defaults. Six severity models are specified for multifamily loans: 1) FHA insured programs, 2) negotiated programs with repurchase agreements, and 3) cash programs (retained portfolio 'cash' loans with/without recourse, and sold loans with/without recourse). Loss severity rates on FHA-insured mortgages are set to three percent to reflect the costs of assigning defaulted loans to HUD. Loss severity rates for other mortgages are computed using the same five cost elements as single family loans—foreclosure costs, operating losses per month while the property is held in REO, net proceeds from property sale, time from default to foreclosure, and time in REO inventory. [It is assumed that four months of interest are passed through to investors before loans are bought out of the MBS trust for default resolution. Therefore, the UPB at time of default is discounted to reflect that the cash outlay occurs four months after default.] Averages for these components have been computed from a sample of 705 Freddie Mac defaults from 1987 to 1995 and REO dispositions from 1991 to 1996.

The default event modeled by the NPR 2 "NT" equation is a 90-day delinquency. The severity model is adjusted to take this into account. The adjustment ensures that "NT" severity equations compute a weighted average of losses associated with foreclosures and alternative resolutions. OFHEO assumes that 56% of 90-day delinquencies result in losses, with a loss severity of 70% (54% loss severity of "cash" loans plus asset holding costs). Therefore, the weighted average loss severity on these loans (56% X 70%) is 39% of the foreclosed UPB. OFHEO further stipulates that one year elapses between the time of delinquency and when the companies pay the seller/servicer claim. The net present

[123] NPR 2 § 3.5.5 at 18,177-80; 18,211-14; 18,142.

value of the loss to the company averages 34% in the up interest rate scenario and 37% in the down interest rate scenario.

Finally, OFHEO treats all defaults in the "cash" equations as full foreclosure events.

Table 6: MF loss severity components for "cash" loans without recourse as a percentage of foreclosed UPB. Computing stress up and down rates on a monthly basis from 1979-1999 and using month 13 stress interest rates, the NPR 2 specification results in total loss severity rates between 58%-71%. Loss severity rates are a function of the interest rate environment, as different components are discounted back to the time of default.

Component	1. Average Value (No discounting)	2. Contribution to Severity after Discounting (1998 Q4 Dn Rate)	3. Contribution to Severity after Discounting (1992 Q4 Up Rate)
Foreclosure costs (F)	9.01%	8.56%	7.45%
Operating loss, REO (O)	4.29%	4.02%	3.33%
Net proceeds from property sale (P)	-58.9%	-53.9%	-42.48%
Time from default to foreclosure (t_f)	18.0 months		
Time in REO inventory (t_i)	13.0 months		
UPB cash outlay	100.0%	100.00%	100.00%
Total Severity	54.5%	58.68%	68.30%

Critique – Multifamily Severity

1. Average loss severity rates required under the NPR 2 stress test are significantly above loss severity rates that Fannie Mae has experienced on REO dispositions. Several factors contribute to the high loss severity estimates.

   - Loss severity rates were computed for the stress period based on average losses on 705 Freddie Mac REO dispositions from 1991-1996. All the loans in the REO sample analyzed by OFHEO were originated on or before 1991, and subject to Freddie Mac's pre-1991 underwriting practices. NPR 2 notes that these loans were subject to "generous appraisal practices… and to other significant weaknesses in those programs that do not exist today."[124]

   - None of the loans was originated in the benchmark region and fewer than 25 (about 3%) of the loans were originated during the benchmark time period. (See Figures 4 and 5.)

   - While the NPR 2 proposal acknowledges the underwriting issue with Freddie Mac loans and adjusts the LTV and DSCR of these early loans for modeling defaults and prepayments, the severity models are not adjusted for the fact that the loans in the REO sample were subject to the same inadequacies in underwriting standards, procedures, and controls.

   - The average loss severity rate is significantly out of line with losses observed by Fannie Mae for loans originated after 1988. The discrepancy is primarily due to the low recovery rate from the sale of a property from REO. On average the

[124] NPR 2 at 18,194.

recovery is assumed to be 58.9% of foreclosed UPB by selling the property, whereas Fannie Mae has observed a recovery rate of approximately 80% of the foreclosed UPB on the sale of post 1988 origination "cash" loans that have been disposed from REO inventory. We estimated that not only has the proposal underestimated the loss recovery rate from the sale of an REO property by 20%, but it has also overestimated the operating expenses while the property is in REO, and overestimated the number of months required to dispose properties in REO inventories.

2. The REO disposition sample is concentrated in the New York and Atlanta regions, areas where in addition to lax underwriting, it had been documented that Freddie Mac was subject to outright fraud. Figure 5 below depicts the geographic distribution of the loans in the OFHEO sample. New York and Georgia comprise 44% of the REO sample, suggesting that these loans defaulted disproportionately more often than other loans in the sample portfolio. Even if the sample contained loans representative of current underwriting and controls, the sample is not geographically representative

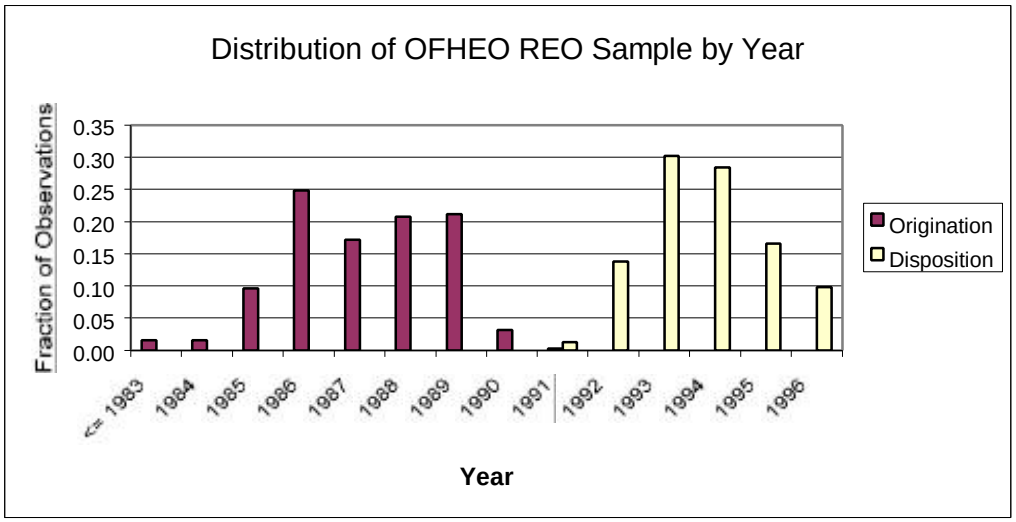


Figure 4: Distribution of REO sample by origination and disposition years.

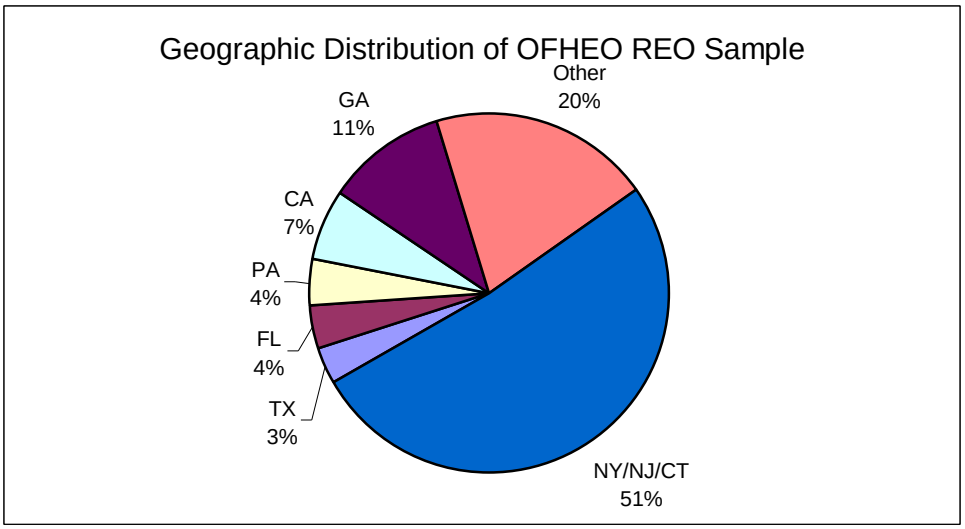


Figure 5: Geographic distribution of the 705 loans from the Freddie Mac REO sample used to develop the NPR 2 severity module.

3. The analysis of the Freddie Mac data uses simple averages for severity components to specify the severity model. This introduces bias, especially in the up-rate environment. The companies can actively manage their REO inventory to minimize losses on a given property.

4. Loss severity rates published by academic researchers also point to averages losses significantly below numbers estimated in the NPR 2. Although methodologies, time spans, and loan characteristics differ across these studies, in all cases surveyed average loss severity rates fall in the 20-40% range.

Source[125]	Total Severity
OFHEO	~61-71%
Ciochetti & Riddiough	~20%
Barnes & Giliberto	~31%
Ciochetti	~31%
Snyderman	~36%

[125] Barnes, Giliberto, and Peyton, "Commercial Mortgage Loss Severity: What is it and how should it be measured," unpublished draft 1998. Ciochetti, "Loss Characteristics of Commercial Mortgage Foreclosures," *Real Estate Finance*, 1997, Vol. 14, No. 1 at 53-69. Ciochetti and Riddiough, "Foreclosure Loss and the Foreclosure Process: An Examination of Commercial Mortgage Performance," unpublished draft, 1998. Snyderman, "Commercial Mortgages: Default Occurrence and Estimated Yield Impact," *Journal of Portfolio Management*, Fall 1991, at 82-87. Snyderman, "Update on Commercial Mortgage Defaults," *Real Estate Finance Journal*, Summer 1994, at. 22-32.

5. The proposal ignores an additional tool actively employed to manage losses from defaulting loans: a significant fraction of loans that default are modified and are subject to far lower loss severity rates. In practice fewer than half of all loans that default go through the complete process of foreclosure and disposition. This phenomenon has also been noted by outside researchers. For example, Snyderman notes that of defaulted loans, 41% went through the foreclosure process, while 59% either cured or were paid off. The NPR 2 document notes that treating all loans as foreclosures, rather than allowing for loss mitigation efforts, "results in an increase in loss severity—before the application of any credit enhancements—of 6.5 percent per defaulting loan."[126]

6. Researchers have identified variation in total loss severity as a function of UPB. Loans under $4 million suffer higher loss severity rates, since the fixed costs associated with foreclosure and disposition become more significant. Snyderman notes that the average loss severity rate for foreclosed loans above $4 million was 24%, while the loss severity rate for loans under $4 million was 42%. Similarly, loss severity rates for large loans tend to increase because of a significant reduction in liquidity for larger loans. Ciochetti notes that this factor becomes significant for loans over $8 million. Most of Fannie Mae's at risk portfolio lies in the $4-8 million range where loss severity rates are expected to be at their minimum.

Recommendation – Severity

Because NPR 2 severity parameters are not representative of the companies' books of business and current business practices, are not tied to the benchmark region, and the NPR 2 multifamily losses are significantly higher than loss rates computed by academic researchers we believe that a 40-45% loss severity rate is more consistent with losses that would be sustained on average for the company's loans in a stress period.

Note on default rate computation

The monthly conditional default rates for the base model were computed using inputs to the NPR 2 "cash" default equation outlined below. The model was run without converting annual losses into monthly losses. End of year rent, vacancy, and interest rate paths were used to compute annual conditional default rates. These were compounded to derive 10 year or 120 month cumulative default rates. Finally, monthly conditional default rates necessary to achieve the required 120 month cumulative default rates were computed. The monthly conditional default rates are referred to as the "base" case. Other inputs to the proposed NPR 2 model are summarized as follow:

[126] NPR 2 at 18,144.

Values used to initialize the OFHEO cash model to compute "base" case cumulative default rates.

Interest rate scenario	Q2 1997
Note rate	8%
12 month average 10 year treasury rates during origination year.	6.8%
Stress rent and vacancy path	As specified for the ALMO region in NPR 2
Loan Seasoning	Not seasoned
Model	Cash model
Product	15 year balloon, 30 year amortization, 10 year yield maintenance.

Table 7: Base model monthly conditional default rates, in percent.

DSCR - Current

OLTV	0.900	0.950	1.000	1.050	1.100	1.150	1.200	1.250	1.300	1.350	1.400	1.450	1.500	1.550	1.600
1.10	0.64502	0.55955	0.49696	0.42478	0.37122	0.32087	0.28500	0.25061	0.23945	0.20684	0.19624	0.17545	0.16524	0.14519	0.13534
1.05	0.59269	0.51217	0.45291	0.39757	0.34566	0.30874	0.26192	0.23945	0.20684	0.19624	0.17545	0.16524	0.14519	0.13534	0.12561
1.00	0.52767	0.46734	0.41107	0.35834	0.32087	0.28500	0.25061	0.21757	0.19624	0.17545	0.16524	0.14519	0.13534	0.12561	0.11598
0.95	0.46734	0.41107	0.37122	0.33318	0.29679	0.26192	0.22844	0.20684	0.18578	0.16524	0.14519	0.13534	0.12561	0.11598	0.10647
0.90	0.41107	0.37122	0.33318	0.29679	0.26192	0.23945	0.20684	0.18578	0.16524	0.15515	0.13534	0.12561	0.11598	0.10647	0.09706
0.85	0.35834	0.32087	0.29679	0.26192	0.22844	0.20684	0.18578	0.17545	0.15515	0.14519	0.12561	0.11598	0.10647	0.09706	0.08776
0.80	0.32087	0.27338	0.25061	0.22844	0.20684	0.18578	0.16524	0.15515	0.14519	0.12561	0.11598	0.10647	0.09706	0.08776	0.08776
0.75	0.27338	0.25061	0.20684	0.19624	0.17545	0.16524	0.14519	0.13534	0.12561	0.11598	0.10647	0.09706	0.08776	0.08776	0.07856
0.70	0.25061	0.20684	0.19624	0.16524	0.14519	0.13534	0.12561	0.11598	0.10647	0.09706	0.09706	0.08776	0.07856	0.07856	0.06946
0.65	0.20684	0.19624	0.16524	0.14519	0.12561	0.11598	0.10647	0.09706	0.09706	0.08776	0.07856	0.07856	0.06946	0.06946	0.06046
0.60	0.19624	0.16524	0.14519	0.12561	0.11598	0.09706	0.08776	0.08776	0.07856	0.07856	0.06946	0.06946	0.06046	0.06046	0.05155
0.55	0.16524	0.14519	0.12561	0.11598	0.09706	0.08776	0.06946	0.06946	0.06946	0.06046	0.06046	0.06046	0.05155	0.05155	0.05155
0.50	0.14519	0.12561	0.11598	0.09706	0.08776	0.06946	0.06946	0.06046	0.05155	0.05155	0.05155	0.05155	0.04274	0.04274	0.04274
0.45	0.12561	0.11598	0.09706	0.08776	0.06946	0.06946	0.06046	0.05155	0.04274	0.04274	0.04274	0.04274	0.04274	0.03401	0.03401

Errata: Various technical errors and ambiguities were noted in the NPR 2 document. As an example the definition of y120 variable is unclear in the implementation. Fannie Mae expects to work with OFHEO to correct such errors in the model and in the documentation.

4. CREDIT ENHANCEMENTS AND HAIRCUTS[127]

Executive Summary

Proposal

The companies are subject to credit risk on the mortgages that they either purchase or securitize and on the securities they purchase. To reduce their exposure to losses resulting from mortgagor default, these entities frequently enter mortgage credit enhancement agreements with counterparties. The 1992 Act does not specify the treatment of lender risk sharing agreements or credit enhancements. The Act does state, however, that "losses occur throughout the United States at a rate of default and severity (based on any measurements of default reasonably related to prevailing practice for that industry in determining capital adequacy) reasonably related to the rate and severity that occurred in [the benchmark loss experience]."[128] These credit enhancement agreements transfer some part of Fannie Mae's and Freddie Mac's mortgage credit risk to a counterparty and substitute the risk of counterparty nonperformance for that of mortgagor default. For credit enhancement counterparties, securities held as assets, and derivative counterparties, the stress test haircuts the amounts paid to Fannie Mae and Freddie Mac. The haircuts are determined by public credit rating and as stipulated in the regulation have the following characteristics:[129]

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- For mortgage credit enhancements and securities the final haircut percentages are

Rating	Final Haircut
AAA	10%
AA	20%
A	40%
BBB	80%

- All haircuts are phased in linearly throughout the 10-year stress test.

- Counterparties to derivative instruments are subject to only 20% of the above.

- All counterparties rated below BBB are treated as BBB for purposes of these haircuts.

- Ratings information from four public rating agencies (S&P, Moody's, Duff & Phelps, and Fitch) are acceptable for primary mortgage insurance and

[127] NPR 2 at 18,150.
[128] 12 U.S.C. § 4611(a)(1).
[129] NPR 2 at 18,151.

- pool insurance, but only S&P and Moody's ratings are acceptable for assessing the credit risk of seller/servicers.

- The credit risk of securities is determined by applying the mortgage credit enhancement haircuts to the principal and interest of these instruments.

For credit enhancements that have no institutional risk but can vary over time, such as a spread account, the Regulation values only the current balance effectively haircutting all future balances by 100%.

Identified Problems

The treatment of counterparty risk should tie capital to economic risk and the proposal doesn't accomplish this goal. This is obvious from its exclusion of any recovery values in the event of counterparty nonperformance. Fannie Mae believes that capital should correspond to economic risk and that this *requires* specialized credit enhancement agreements, including credit-linked securities, structured transactions, spread accounts, and servicing agreements, to be explicitly modeled in the stress test. Regarding OFHEO's proposed haircuts, Fannie Mae finds the timing and magnitude of the OFHEO-proposed haircuts to be extremely excessive. They are dramatically higher than the default rates of the worst cohort experience reported by Moody's in the post-1970 period. Moreover, these haircuts are exclusively default-based and fail to take into account any "recovery" value. These recovery values can take on different forms. In the case of mortgage credit enhancements where the Enterprise looks to a corporate entity for reimbursement of mortgage credit losses, the GSE has the legal right to capture either the borrower's payments or the servicing stream to create a nonrefundable loss reserve--a situation that characterizes private mortgage insurance as well as other risk-sharing agreements (notably Fannie Mae's Multifamily DUS Program). In this instance, recovery is an income stream to offset losses. In the case of direct investment in nonmortgage securities, recovery is the liquidation value of the defaulting assets. Finally, there are a variety of existing and potentially new instruments, such as spread accounts, structured transactions, and credit-linked obligations, where recovery is based on the performance of the underlying mortgages and should be modeled that way. Although OFHEO acknowledges that these haircuts are far more severe than that experienced over the post-1970 benchmark period, they are also excessive relative to the Great Depression. The data cited in Hickman's study of bond performance over the period 1900-1944 indicates that the default rates on investment grade bonds are less than the OFHEO haircuts and, furthermore, that these haircuts can be several times greater than the loss rates on the bonds (after accounting for the present value of recovered receipts).[130]

Another issue is the assessment of credit risk exposure. The proposal relies exclusively on public ratings despite the existence of both split ratings between agencies and complex organizational structures or cross-guarantees. If capital is to correspond to economic risk,

[130] W. Braddock Hickman, Corporate Bond Quality and Investor Experience, National Bureau of Economic Research (Princeton University Press, 1958).

then the regulations should attempt to capture the true exposure in the credit enhancement contract.

Proposed Solutions

- Based on post-1970 cohort origination year experience, adjusted to reflect a more severe regional recession, the default rates on **mortgage credit enhancements** should be 3.0% for AAA counterparties, 4.0% for AA entities, 8.0% for A credits, and 12.0% for BBB entities. However, in all cases where Fannie Mae and Freddie Mac have legal rights to the borrower's servicing and credit enhancement payments, these cashflows shall be included as income (or reserves) for purposes of absorbing losses in the stress test. For investments in securities, we recommend use of the same default rates. However, in the case of rated securities we recommend the application of a 50 percent recovery rate. This is conservative since typical experience--even in the Great Depression--indicates recovery values in excess of 50 percent.

- Historical experience on the observed timing of defaults indicates that there should be a maximum first year default rate of 0.50% for AAA, and 1.0% for AA and A credits. OFHEO's proposed linear accumulation of the haircut would be consistent with this constraint if administered in conjunction with the preceding recommendation as to the levels of the final haircuts.

- Rating Agencies should determine the counterparty credit rating when two or more of the agencies rate the entity. Any two agencies can rate an entity and all counterparties are treated alike (i.e., no differential requirements for mortgage insurers and Seller/Servicers). Otherwise, Fannie Mae assessments, subject to OFHEO examiner approval should determine the rating. Also, Fannie Mae assessments should be employed in cases of cross-collateralization and cross-guarantees.

- As a general principle, mortgage credit enhancements should be modeled by contract and capital must be linked to economic risk. Any aggregation of loans with loss protection should be done in a manner consistent with the underlying terms of the credit enhancement contract. This includes modeling the future value of spread account transactions (which is similar to modeling the guaranty fee), credit-linked securities, and other types of credit enhancements including mortgage servicing rights.

- Certain kinds of contracts and securities do not result in any counterparty exposure and should not be subject to haircuts. Spread accounts and other types of cash collateral should receive no haircut on their current balances. Similarly, certain collateralized investment securities do not subject their

holders to risk and should therefore not be haircut (see section on Non-Mortgage Investments).

- Because of the collateral agreements associated with them, derivative contracts are subject to a minimal level of risk. That risk is more akin to operational risk than to credit risk and should, therefore, be covered by the 30 percent management and operations risk add-on. In light of this, Fannie Mae proposes to apply OFHEO's minimum capital standard for derivative contracts. This is 3.00% of the credit equivalent amount, except to the extent of holdings of qualifying collateral, which are capitalized at 1.50% (see section on Debt and Derivatives).

For additional comments on credit enhancements and haircuts, see First Manhattan Consulting Group brief in Appendix V-9.

I. The Magnitude of the Haircuts

Proposal

For credit enhancement counterparties, securities held as assets, and derivative counterparties, the stress test haircuts the amounts paid to the Enterprise. For mortgage credit enhancements and securities held as assets, the haircut percentages are provided below:

	Rating			
Year End	AAA	AA	A	BBB
1	1	2	4	8
5	5	10	20	40
10	10	20	40	80

- The stress test models the loss coverage provided by mortgage credit enhancements by haircutting the counterparty payments to the Enterprise.

- The credit risk of securities is determined by applying the haircuts to the principal and interest payments on these securities.

- Counterparties to derivative instruments are subject to only 20% of the haircuts applied to mortgage credit enhancements and securities.

Identified Problems

The proposed level of haircuts is excessive in terms of both recent (post-1970) experience and that of investment-grade bond defaults in the Great Depression. Furthermore, the haircut levels do not tie capital to economic risk because they fail to account for recovery values--either in terms of liquidation values of securities, mortgage servicing rights, or the capture of premiums that the Enterprise is legally entitled to in the event of counterparty default (for example, MI premiums and DUS reserves and servicing).

1. Current Industry Practice

The current industry practice to evaluate counterparty credit risk exposure involves employing a set of probabilities that describe the transition of a particularly-rated security to either a future rating or a state of default. In the case of default, industry practice would be to assume some recovery rate, which, when multiplied by the likelihood of default, would generate a measure of expected loss. This methodology is currently embedded in several software packages including the popular CreditMetrics produced by JPMorgan.

The transition matrix is generally based on S&P's or Moody's calculations of corporate bond performance over time. It is typically for one year, but can be of longer duration, and depicts the average default experience in the post-1970 period. For example, in a recent study of default rates (Moody's Special Comment, "Historical Default Rates of Corporate Bond Issuers, 1920-1998", (January, 1999)), Moody's published two transition matrices. These were (1) an average of one-year ratings changes over the period 1980-1998, and (2) the one-year ratings changes for all rated firms between 1998-99. Although Moody's provides a Credit Risk Calculator to create tables of rating migration rates that would allow these ratings to be exported into CreditMetrics, more typical practice would be to employ the above matrix for 1980-98. Customers could use this matrix for determining the likelihood of corporate failures, the potential for ratings upgrades and downgrades, or to evaluate the risk and return of a particular bond portfolio. For purposes of projecting default, the relevant transition is the likelihood of going from a particular rating into a state of default. Extending this approach to a ten-year horizon, in order to be commensurate with the length of the stress test, would include averaging each rating's ten-year default rates over different cohort "origination" years.[131] Because of the length of the test period, if we start with cohorts originated in 1970 (published information is not available for cohorts originated prior to 1970), we can obtain 20 such origination-year cohorts. Table 1 presents the ten-year cumulative default experience based on Moody's data for those investment grade bonds from AAA to BBB. The row labeled "mean" is the average default experience for the twenty cohorts. A comparison of this row with the proposed OFHEO haircuts indicates there is a dramatic difference between the industry approach to analyzing counterparty risk and the approach employed by OFHEO.

An alternative approach that employs credit ratings is the one proposed for banks in June 1999, referred to as Basel II. This approach utilizes external credit ratings to assign loans to a particular risk-weight bucket. In particular, the base case risk-weight of 100% aligns with a BBB rating category, with lower (higher) risk-weights for more (less) highly-rated securities. A bank's risk-based capital requirement is then computed as the product of its risk-weight and the total capital requirement (8 percent). The U.S. banking agencies recently published a draft of a regulation that would implement this type of risk-based

[131] In this case origination year refers to the period when the rating was obtained.

standard on U.S. depository institutions.[132] The results under this approach, presented later, are also dramatically lower than the OFHEO proposed haircuts.

Another industry practice--cited by OFHEO in its NPR 2--is that of the rating agencies. Moody's, S&P, Duff & Phelps, and Fitch appear to use haircuts more consistent with the OFHEO approach. However, the approach of the rating agencies is inconsistent with the data in the post-1970 period, and is not reasonably related to the rate and severity of loss that occurred in the benchmark loss experience. Even OFHEO acknowledged this in NPR 2. It indicated that "The size of the haircuts proposed for the stress test … are far more severe than recent default experience but less severe than Depression-era experience." [133] Whereas there is no disagreement about the magnitude of the haircuts to the benchmark default experience, Fannie Mae believes that the haircuts are *more, not less,* than Depression-era experience. In his classic study of bond performance prior to 1944, W.B. Hickman cites life-span default rates for bonds that received agency ratings.[134] Life-span default rates represent the proportion of the par amount of a class of bond offerings that went into default at any time between offering and extinguishment (or 1944). For all large investment grade offerings over the period 1900-1943:[135]

Life-Span Default Rates

Agency Rating	All Issuers	Industrials
I (AAA)	5.9%	0.4%
II (AA)	6.0%	3.2%
III (A)	13.4%	8.8%
IV (BBB)	19.1%	18.5%

where Industrials excludes Railroads and Public Utility offerings. The differential performance between these two aggregates is due largely to the performance of the Railroads, which turned in "by far" the poorest performance.[136] Hickman also provides default rates for selected chronological periods. From this data, effective ten-year default rates can be computed for offerings outstanding in 1928 based on performance through 1939.[137] These are

Ten-Year Default Rates

Rating	All Issuers	Railroads	Industrials
AAA	6.75%	9.25%	0.0%
AA	10.25%	21.75%	0.0%
A	15.25%	57.50%	11.0%
BBB	21.50%	53.75%	17.5%

[132] See Notice of Proposed Rulemaking; "Risk-Based Capital Standards; Recourse and Direct Credit Substitutes," Memorandum to the Board of Governors of the Federal Reserve System, February 2, 2000 (not yet published).
[133] NPR 2 at 18,155.
[134] Hickman, Corporate Bond Quality and Investor Experience, at 176.
[135] The first rating was by Moody's Investor Service in 1909.
[136] Id. at 89.
[137] Hickman provides quadrennial default rates (p. 190) that can be converted to effective 10-year rates.

The above indicates that at the point of maximum exposure to the Great Depression, the default rates for all issuers were dramatically lower than OFHEO's proposed haircuts despite the disproportionate influence of the Rail industry on these results. Table 2 provides the dollar offerings by year and the default rates for investment grade and speculative grade issues. This table confirms 1928 as the year with the highest default rate on investment grade offerings and also illustrates that these highly rated securities dramatically outperformed those that were below investment-grade. Finally, Hickman's study of bond performance extends beyond default rates to recovery values and loss rates. By computing the discounted value of receipts after default, Hickman shows that the loss rate on investment grade bonds is less than one-half the default rate.[138] Applying this recovery rate to the above ten year default rates results in OFHEO's haircuts being *between 3 to 7 times the average loss experience of the Great Depression era.*

2. Magnitude of the Haircuts and Consistency with the Statute

Since OFHEO is charged with ensuring that capital is adequate for the companies and not for assessing counterparty risk in a normal environment, a strong case can be made that the application of average default experience may not be appropriate for determining the adequacy of capital in a stressful environment. The data in Table 1 clearly covers the relevant bond experience for the benchmark period. In addition to providing the ten-year default rate for each cohort, this table also provides the maximum default rate ("MAX") for each rating across the 20 cohort years. MAX includes the worst cases from among the different cohort origination years. For example, the worst case for AAA comes from the 1983 cohort year but the worst case for A is from 1985. This approach is extremely conservative because it employs the worst of the worst. The bold line for the 1982 cohort signifies that this is the single origination year with the highest overall default rate for investment grade securities.

The data in Table 1 indicates that the haircuts proposed by OFHEO are at least eight times greater for AA and below based on the MAX default experience. For comparison purposes, we present below OFHEO's proposed haircuts, Moody's 10-year Cumulative Defaults over 1920-98, after excluding the post-WWII period where default rates were near zero,[139] selected statistics from Table 1, and bank capital requirements as proposed by the Office of the Comptroller of the Currency, the Board of Governors of the Federal Reserve System, the FDIC, and the Office of Thrift Supervision:

Rating	**OFHEO**	**10-YR Cumulative Defaults**			
	Proposal	**1920-1998**	**Mean**	**MAX**	**U.S. Banks**
AAA	10.0	1.49%	.78%	3.20%	1.6%
AA	20.0	3.24	1.14	2.52	1.6
A	40.0	5.65	1.83	4.68	4.0
BBB	80.0	0.50	5.34	9.39	8.0

[138] Hickman at 192-93.

[139] See Moody's Special Comment, "Historical Default Rates of Corporate Bond Issues, 1920-1998" (Jan. 1999).

A comparison of Columns 3 and 4 implies that the early period from 1929-1970 is much worse than the post-1970 experience (confirmed from a comparison of Tables 1 and 2). Indeed, Moody's describes the period from the mid-1929 through December 1939, as that period that produced the heaviest default activity of the 20th century. The Great Depression generated a 79-year high, one-year corporate default rate of 9.2% in July 1932 indicating that one out of ten Moody's rated corporate issuers defaulted in the following year. Furthermore the severity of the depression ensured that such high rates of default did not quickly subside. The OFHEO proposal is dramatically higher than the average over 1920-1998 or **any** statistic above based on performance since 1970. It is also dramatically higher than the proposed regulations for banks. Finally, as has been previously shown, they are dramatically higher than the horrific experience of the Great Depression.

The MAX statistics are constructed to be conservative estimates of corporate bond defaults over the benchmark time period. Extending these results to account for a nationwide recession of the order of the 1983-84 ALMO experience is not obvious, with the exception that any such adjustments should result in default levels that are *far less* than the Great Depression experience. The OFHEO proposed haircuts are clearly well in excess of any historic default performance. Fannie Mae recommends that the level of default for mortgage credit enhancements be 3.0% for AAA, 4.0% for AA, 8.0% for A entities, and 12.0% for BBB. These default levels are very conservative and are predominantly substantially in excess of bond default performance over the benchmark time period. They are also reasonably related to the performance of all Industrial bond issuers (a better measure of counterparty risk than All Issues) in the Great Depression, especially when one recognizes the exceptional nature of this period relative to the 1980s. We believe that, based on available information, the proposed counterparty default levels are consistent with their projected performance in the stress period.

3. Recovery Values

In addition to the OFHEO haircuts being extremely excessive, they are also exclusively based on default experience and do not take into account the ability to recover funds from the defaulting entity or, as in the case of mortgage insurance, either obtaining equivalent coverage from a different counterparty or retaining the borrower's premium payment and creating a reserve to absorb future losses. Legally the Enterprises are entitled to either move the insurance coverage or create a loss reserve whenever the mortgage insurance coverage ceases to be in effect. Since the borrower is required to pay the premiums to keep the mortgage insurance in effect, the proposed regulation needs to include this aspect of "recovery" in determining the appropriate haircut. Also, OFHEO proposes to haircut both securities and mortgage credit enhancements in the same manner--with a default-only based haircut. Because the mortgage credit enhancement is a third-party reimbursement of credit **losses** and the securities transaction involves the repayment of the principal underlying the security, these different transactions should not be haircut in the same way.

To illustrate the difference between OFHEO's treatment of mortgage credit enhancements and their treatment of securities' credit risk, consider a pool of 100 homogeneous mortgages, each with the same $UPB, a projected stress failure rate of 5.0%, and gross loss severity of 50%. If there are no mortgage credit enhancements supporting this pool, an initial assumption, then mortgage credit losses would equal 2.5%. Compare this result to that obtained when we take the same 100 loans and use them to create 100 bonds, each backed by a single loan. If Fannie Mae purchases all these bonds then the application of OFHEO's default-based haircut directly to the principal repayment of the bonds results in a credit "loss" of 5.0%. But this is double the loss incurred on the mortgages underlying these bonds. The difference is attributable to the fact that the calculation of credit losses on securities ignores the underlying liquidation value of the assets, which in this case is 2.5% of the pool. This assumption of zero liquidation value is inconsistent with current industry practice (the previous described Credit Metrics approach) and inconsistent with past experience including the Great Depression where recovery values were 50% or more of underlying security asset values.[140] For the mortgage credit enhancement, the default-based haircut is more appropriate because this haircut is on the reimbursement of losses and is based on the likelihood that the counterparty can make a payment. The stress test treats mortgage credit enhancements by incorporating the impact of percent-denominated enhancements (net of the haircut) directly into the calculation of loss severity and then employing the dollar-denominated credits (again net of haircut) to absorb the remaining credit losses. Thus the impact of the haircutting is to adjust upward mortgage credit losses. Returning to our example, now assume there is a 2.5% dollar-denominated mortgage credit enhancement. In the absence of any counterparty haircut, Fannie Mae would incur 2.5% mortgage losses, which would be offset dollar-for-dollar by a third-party reimbursement. However, if there were a 5% haircut on the counterparty payments, then the Enterprise would have a net loss of .125%. Thus the haircut on mortgage credit enhancements *increases mortgage losses*, whereas the securities' haircut is not applied to the reimbursement of credit losses but directly to the security's principal and interest payments. This disparity can be corrected by adjusting the securities haircut to explicitly incorporate a factor for the recovery rate on the underlying assets.

In NPR 2, OFHEO discusses its approach to the haircuts. It indicated that Freddie Mac and Moody's recommended a survival approach in which an institution is assumed to meet 100% of its obligations for as long as it survives. However, OFHEO rejected this approach in favor of one used by S&P and Duff and Phelps in which "it is assumed that institutions will meet *some, but not all,* of their obligations, and the haircut is the percent of the obligations they will fail to meet."[141] *Regardless of whether the counterparty defaults or fails to meet all of its obligations, in the case of mortgage insurance coverage and other selected risk-sharing agreements (for example, Fannie Mae's Multifamily DUS Program) the companies would have the right to retain the borrower's payments as a non-refundable loss reserve.* Consequently, OFHEO's haircuts appear excessive related to the default rate and severity that occurred in the benchmark loss experience.

[140] Hickman at 192-93.
[141] NPR 2 at 18,154 (emphasis added).

Proposed Solution

The typical approach to haircuts is to calculate the projected default experience and multiply that by the loss severity. The OFHEO proposal appears to generate haircuts exclusively on the basis of default experience, where the default levels are substantially in excess of the experience of the worst 10 years in the post-1970 and also appear to be several times greater than the experience of investment grade bonds in the Great Depression. This is clearly excessive. Furthermore, it gives zero credit for any recovery value associated with securities' liquidation values or premium capture due to counterparty nonperformance. Based on the relevant default experience discussed above with an adjustment to reflect a regional recession at the national level, the default rates for **mortgage credit enhancements** should be 3.0% for AAA counterparties, 4.0% for AA entities, 8.0% for A credits, and 12.0% for BBB. In addition, in the case of mortgage insurance and other credit enhancements where the borrower purchases credit enhancement and the Enterprises have access to these premium payments in the event of counterparty failure, the stress test should include the borrowers' premium payments as proceeds to the Enterprises so that it can create a loss reserve to absorb future default losses. In addition, when the credit enhancer is a Fannie Mae servicer, then recovery should also extend to that entity's mortgage servicing rights. The haircuts for securities should be less than the haircuts for mortgage credit enhancements to reflect the liquidation values of the assets. We recommend haircuts for securities that are 50% of those for mortgage credit enhancements across rating categories.

II. The Timing of the Credit Haircuts

Proposal

The haircuts proposed by OFHEO are phased in linearly starting in Month 1 and accumulate each month at a rate of the quotient of the Final Haircut divided by 120. For example, for an AA counterparty risk exposure the Final Haircut is 20%. This implies that the default rate in Month 1 is .167%, in Month 2 it is .334%, at the end of Year 1 it is 2.0%, and finally at the end of Year 10 the haircut accumulates to 20.0%. This linear phase-in beginning in Month 1 holds for all rating categories with the only difference between categories being the magnitude of the haircut. Consequently, the haircut proposal by OFHEO implies that at the end of the first year of the stress test:

Rating	Year 1 Haircut
AAA	1%
AA	2%
A	4%
BBB	8%

Identified Problems

The one-year default rates assumed by OFHEO can be compared to the one-year default rates in the Moody's default study to determine their reasonableness. The Moody's data indicates that for all but 28 of the past 79 years, the one-year default rate for the

investment-grade sector was zero. Furthermore, since 1970 just .017% of all investment grade issuers defaulted within one year. This compares to a comparable failure rate of 3.27% for speculative grade issues. Table 3 presents one-year default rates by year and rating since 1970. This table includes both the investment grade and speculative grade default performance through a corporate rating of BB.

Out of 29 individual cohort years there were no one-year default rates for AAA rated entities, only one year for AA, one year for A, and nine years for BBB. Table 3 clearly shows negligible one-year default rates for bonds rated AAA through A. The likelihood of defaulting within one year begins to take on a nonzero, but small, value for BBB bonds and then this rate increases substantially for the lower rated BB-securities. The unmistakable pattern depicted in Table 3 is that of default being preceded by a rating migration from investment grade down to speculative grade. This rating migration is discussed in the Moody's study--

> Exhibit 15 [*not presented here*] shows that, five years prior to default, the median rating of defaulting companies is speculative-grade. The downward slope of the average shows that, as a group, these future defaulters are already seeing downward rating pressure five years in advance of default. At 24 months before default, the median rating has fallen to Ba2 *[BB]* and falls further to Ba3 *[BB-]* twelve months prior to default. Moreover, the fact that the average lies everywhere below the median rating indicates that the rating distribution for issuers that ultimately default is skewed toward the lower end of the rating scale.[142]

The Moody's results indicate that first-year defaults for investment grade counterparties should be very low and substantially less than 0.50% for AAA and 1.00% for both AA and A credits. Yet OFHEO's proposal is clearly in excess of these levels, in part because the magnitudes of their proposed ultimate haircuts are so huge. The 0.50% and 1.00% default levels should serve as criteria for the maximum first-year defaults of counterparties that have a rating of 'A' or better. If OFHEO reduces its haircuts to be consistent with those recommended by Fannie Mae, then these first-year constraints will not be binding on their proposed phase-in of the haircuts while still being substantially in excess of past experience.

Proposed Solution

The Moody's data indicates that (1) five years prior to default the median rating of defaulting companies is speculative grade, and (2) one-year default rates since 1970 were 0.0% for AAA entities and averaged only 0.017% for all investment grade issuers. Based on these findings, we believe it is very conservative to recommend maximum first-year **default** rates of 0.50% for AAA and 1.00% for AA and A counterparties. Any OFHEO recommendations inconsistent with these default levels should be phased in to ensure their compliance. For the haircut levels that we think are commensurate with benchmark loss experience, the above maximums would not be binding and OFHEO's linear phase-in

[142] Moody's Special Comment, "Historical Default Rates of Corporate Bond Issuers," (Jan. 1999) at 15.

would be applicable. Because BBB includes counterparties of that level or lower, a maximum one-year failure rate may not be appropriate.

III. Modeling the Contract

Proposal

To model the counterparty risk of mortgage credit enhancements, OFHEO segmented these credit enhancements into two basic types--percent denominated and dollar denominated, where dollar-denominated enhancements are characterized by a dollar limit to the credit enhancement while percent-based have no such limit. Percent-denominated credit enhancements include private mortgage insurance, unlimited recourse, unlimited indemnification, and certain risk-sharing agreements (such as Fannie Mae's Multifamily DUS Program). Dollar-denominated enhancements include limited recourse or indemnification, pool insurance, spread accounts, collateral posed under collateral pledge agreements, and cash accounts.[143] The stress test models the loss coverage provided by the mortgage credit enhancements by aggregating them into loan groups, by enhancement type, and then modeling credit losses within the stress test subject to discounts, or haircuts, for counterparty risk. For credit enhancements that have no institutional risk but can vary over time, such as a spread account, the Regulation values only the current balance effectively haircutting all future balances by 100%.

Identified Problems

As a general principle, Fannie Mae believes the underlying parameters of any contractual agreement between a company and a counterparty should be modeled and that credit enhancements should not be aggregated to a level that does not correspond to actual economic risk. For example, there may exist a contractual agreement that a particular lender's over 80% LTV loans carry the statutory minimum level of primary mortgage insurance. However, this agreement also provides for supplemental coverage in the form of a pool policy, where the level of the stop loss is a function of the LTV mix of the loans delivered. In order to be commensurate with economic risk, the stress test should attach a credit enhancement only to that lender's loans with LTVs greater than 80%, and the supplemental dollar-denominated coverage would need to be consistent with the stop loss structure stipulated in the contract. Modeling the contract would ensure this outcome.

In addition to the above, there are credit enhancements that can vary with the performance of the underlying mortgage pool. This would be true of credit-linked securities such as Freddie Mac's MODERNS transaction, structured transactions such as securities with separate senior and subordinated tranches, and it would also be true of spread accounts. The latter have no institutional risk but can vary over time based on loan balances outstanding. The Regulation values only the current balance of the spread account, but this type of enhancement grows by the product of a predetermined interest rate spread (part of the loan's excess servicing) on each loan in the pool and the balance outstanding. Thus the OFHEO proposal effectively applies a 100% haircut on spread

[143] NPR 2 §3.7.3.1.

income into these accounts despite the fact that spread accounts are very similar to fee income and could be modeled in the stress test. A guaranty fee income stream represents the revenues derived over time attributable to applying a small interest rate component, or premium (the guaranty fee), to an unpaid mortgage balance. The spread account is also an interest payment, derived from the excess servicing, that is applied to the balances of the mortgages outstanding. Both of these cashflow streams are devoid of any principal repayments, and both are critically dependent upon prepayment performance. Furthermore, both financial instruments would be available to absorb losses: the spread account would do it directly as a reserve against losses, the guaranty fee would do it indirectly by generating gross revenues or retained earnings available for protection against loss. Economically, spread income and guaranty fee incomes are equivalent in their ability to absorb losses. Since guaranty fee strips can be evaluated in OFHEO's stress test by employing their prepayment function to determine the outstanding balance in any month and then computing Fee Income, the same procedure can be used to generate spread account income. Thus the spread account is a credit enhancement that can be easily modeled should be, in accordance with its contract, to ensure the proper amount of credit enhancement.

Finally, OFHEO provides no value for mortgage servicing rights. In the case where Fannie Mae has unlimited recourse to a seller/servicer, then the recovery value of the servicing stream should be included in the stress test to offset losses. Mortgage servicing rights are economically very similar to spread accounts and guaranty fees in that they are interest rate strips whose value is a function of the outstanding balances through time. Since Fannie Mae has the legal rights to certain modelable cash flow streams, such as mortgage servicing rights and borrower insurance premiums, these streams should be included in the determination of economic capital and the risk-based requirement.

Proposed Solution

The stress test capital should correspond to the economic risk of a credit-enhanced structure. This suggests that loans should be aggregated in a manner consistent with the credit enhancement contract and that the terms of the contract be modeled. Examples of such credit enhancements include customized insurance agreements, credit-linked securities and spread accounts. Mortgage servicing rights should be included in the evaluation of counterparty risk to Fannie Mae servicers.

IV. Third-Party Assessments of Counterparty Risk

Proposal

Counterparties are defined to include mortgage insurers, pool insurers, seller/servicers, and derivatives counterparties. Although the statute states nothing in terms of requiring an external rating from an agency to assess counterparty risk, the Regulation allows for (1) a rating from any of four public rating agencies (S&P, Moody's, Duff & Phelps, and Fitch) to rate mortgage insurers and pool insurers, and (2) a rating from only S&P or Moody's to rate a seller or servicer of mortgages. In the case of a split rating, the

Regulation requires the use of the lower rating. In the case of no rating or a counterparty rated below BBB, OFHEO treats these entities as BBB for purposes of these haircuts.

Identified Problems

1. Split Ratings

In its proposal, OFHEO discusses the fact that the companies have developed their own internal ratings models. Because these models could project different ratings for the same counterparty, OFHEO rejected any approach based on the use of these models. The split rating illustrates that differential evaluation, hence ratings, can occur for the same counterparty from the rating agencies. Although this may not necessarily mean different required haircuts, the OFHEO requirement that the haircut be based on the lower of the split rating is very conservative and may mean haircutting the counterparty at the **wrong** credit level.

The existence of split ratings is not an infrequent event. In a study of split ratings, Cantor, Packer, and Cole employed a database of 4399 public offerings by U.S. corporations between July 1983 and July 1993 that had ratings from both Moody's and Standard & Poor's.[144] They found that Moody's and S&P agree 45.3% of the time on rating scales that include sixteen possible ratings (AAA/Aaa, AA+/Aa1,…, B-/B3). Aggregating their data, there is greater agreement but splits still occur frequently. More specifically, there were 995 issues that S&P rated in the broad AA rating. Moody's rated 732 of these issues as AA. Thus 26.4% of all the AA issues rated by S&P received a different rating from Moody's. A discrepancy of this magnitude between the two biggest rating agencies implies that requiring the companies to use the lower of the two ratings may result in an undue capital burden that is not representative of the risks faced by these Enterprises. An alternative would allow the companies to use their own systems, which would take into account their existing relationships with these counterparties including marketing, auditing, and reporting.

2. Complex Organizations and Collateralized Agreements

Another, and related, issue is whether the rating obtained from a rating agency appropriately measures the credit risk exposure to the company. In particular, does the rating capture the true risk exposure of the counterparty entity and secondly does it include any contractual agreements that exist between the two parties. Furthermore, how do you evaluate an unrated entity, particularly one affiliated with a rated parent? The absence of a rating implies BBB status in accordance with the proposed regulation, however the decision not to acquire a rating is based on the economic costs and benefits and may have nothing to do with the risk of the entity.

In assessing the true risk of the counterparty, the rating agency may have to sort out the creditworthiness of one entity in a complex organization from its affiliated firms. For

[144] Richard Cantor, Frank Packer, and Kevin Cole, "Split Ratings and the Pricing of Credit Risk," The Journal of Fixed Income, Vol. 7, No. 3 (Dec. 1997) at 72-82.

example, General Electric Corp. (GE) is a AAA-rated firm that is broadly diversified and a complex organization. GE owns GE Capital Corp (also AAA), which, in turn, owns GE Mortgage Capital, which serves as a holding company for two affiliates--GE Capital Mortgage Service Corp. and GE Mortgage Insurance (AAA rated). Neither GE Mortgage Capital nor GE Capital Mortgage Service Corp. is rated. GE Mortgage Capital is not rated since they do not issue debt or take on risk. GE Mortgage Services is not rated because their main function is the origination and servicing of loans and they don't need a rating because they receive funding from an affiliated entity. The entity that does need a rating is the MI subsidiary and they are rated AAA. In assessing Fannie Mae's risk to GE Mortgage Service Corp., one needs to look at both the direct counterparty and the relationship with their affiliates. The absence of a rating for GE Mortgage Services clearly does not reflect a BBB credit risk exposure.

Even in the case where a public rating exists and the credit rating assigned to the corporate counterparty is accurate, collateralized agreements may exist between the parties such that the rating may not accurately measure the company's true credit risk exposure. For example, collateral in the form of letters of credit from highly rated institutions constitute two-name guarantees where both firms would have to fail in order to subject the company to a loss. Indeed the true risk exposure to the company is no more than the highest rating and can be substantially less. To illustrate, consider the extreme case of unlimited recourse to a BBB seller that is backed by a bank's letter of credit (also BBB) where the profitability of the bank and the seller is assumed to be perfectly negatively correlated. In this case even though both credit enhancers are BBB rated, an earnings drop for the seller is always offset by a gain for the bank so that the effective counterparty risk exposure to the Enterprise is AAA, i.e., no risk of loss. Although this example is an extreme, it does illustrate the potential benefits of cross collateralizations and cross guarantees. In instances where these enhancements exist, the overall risk assessment should take them into account.

Proposed Solutions

A careful and thorough analysis of counterparty risk exposure requires a detailed examination of the specific institution offering the credit enhancement and a review of the contractual agreements that define this exposure. This may be a complex analysis--particularly in the case of seller/servicers--many of whom are not explicitly rated by an agency. Whereas the rating agency approach may be appropriate for those instances where the counterparties are large, well-known, and the nature of the risk exposure is standardized--notably for swaps and mortgage insurers and pool insurers--for other entities the requirement of a rating may be too time consuming, complex, and costly to justify. Therefore we recommend that the Rating Agency approach be employed only when there exist two or more ratings (from the four agencies) of the counterparty and when there are *no additional contractual agreements* that would affect the GSE risk exposure. Furthermore, the minimum two ratings can be from any of the four agencies regardless of whether the counterparty is a mortgage insurer or a seller/servicer. When two or more ratings from agencies are available, then the appropriate rating should be the median value. When none or one rating is available, then we recommend Fannie Mae’s

risk assessments be employed subject to OFHEO examiner oversight. This would take advantage of Fannie Mae's unique knowledge of our customer base to assess the appropriate risk exposure. The minimum rating should be BBB. This is consistent with OFHEO's approach and the business practices of Fannie Mae when evaluating the credit quality of our counterparties or when structuring a specific transaction.

TABLE 1- MOODY'S BOND RATINGS CUMULATIVE DEFAULT EXPERIENCE (10-YEAR)

		Rating		
Year	AAA	AA	A	BBB
1970	0.00	0.00	0.43	3.06
1971	0.00	0.00	0.79	2.92
1972	0.00	0.00	0.00	3.25
1973	0.00	0.00	0.38	3.67
1974	0.00	1.24	0.76	3.60
1975	0.00	1.04	0.37	3.61
1976	0.00	0.97	0.64	4.69
1977	0.00	0.90	1.25	4.83
1978	1.39	0.82	1.27	4.63
1979	1.30	1.71	2.69	4.59
1980	1.14	1.83	3.16	5.57
1981	2.32	2.52	2.95	8.28
1982	**2.31**	**2.28**	**3.68**	**9.39**
1983	3.20	1.98	3.42	7.73
1984	2.57	1.80	4.09	6.43
1985	1.36	0.79	4.68	6.46
1986	0.00	1.84	2.31	8.34
1987	0.00	0.93	1.68	7.23
1988	0.00	1.14	1.40	5.06
1989	0.00	1.05	0.56	3.40
Mean	0.78	1.14	1.83	5.34
Std	1.05	0.75	1.39	1.94
MAX	**3.20**	**2.52**	**4.68**	**9.39**

Source: Moody's Special Comment, "Historical Default Rates of Corporate Bond Issuers, 1920-1998," January 1999.

Table 2: Percent of Par Amount Offerings That Defaulted Before 1944

Year of Offering	$ millions	% Rated	AAA-BBB	<BBB
1920	1,448.0	97.4	11.7	56.0
1921	2,074.6	98.0	6.1	44.8
1922	2,270.2	98.4	10.9	27.3
1923	2,118.2	94.3	8.0	18.0
1924	2,227.0	99.2	21.6	19.9
1925	2,202.4	97.6	12.7	38.6
1926	2,724.8	98.4	16.2	45.5
1927	3,856.8	99.5	21.2	54.4
1928	2,997.0	97.0	24.9	75.1
1929	1,957.7	94.1	18.5	65.9
1930	2,978.3	97.4	24.4	44.9
1931	2,030.1	97.3	11.4	76.4
1932	873.7	90.9	2.0	55.6
1933	444.3	84.3	8.9	54.9
1934	581.3	90.6	13.0	10.1
1935	2,314.9	96.4	0.8	33.7

Source: W. Braddock Hickman, "Corporate Bond Quality and Investor Experience," National Bureau of Economic Research, Princeton University Press (1958), p. 179.

TABLE 3- MOODY'S BOND RATINGS ONE-YEAR DEFAULT RATES

		Rating			
Year	AAA	AA	A	BBB	BB
1970	0.00	0.00	0.00	0.27	4.12
1971	0.00	0.00	0.00	0.00	0.42
1972	0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00	0.45	0.00
1974	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.00	1.02
1976	0.00	0.00	0.00	0.00	1.01
1977	0.00	0.00	0.00	0.27	0.52
1978	0.00	0.00	0.00	0.00	1.08
1979	0.00	0.00	0.00	0.00	0.49
1980	0.00	0.00	0.00	0.00	0.00
1981	0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	0.26	0.30	2.73
1983	0.00	0.00	0.00	0.00	0.91
1984	0.00	0.00	0.00	0.36	0.83
1985	0.00	0.00	0.00	0.00	1.75
1986	0.00	0.00	0.00	1.33	2.05
1987	0.00	0.00	0.00	0.00	2.72
1988	0.00	0.00	0.00	0.00	1.24
1989	0.00	0.61	0.00	0.60	2.98
1990	**0.00**	**0.00**	**0.00**	**0.00**	**3.32**
1991	0.00	0.00	0.00	0.28	5.25
1992	0.00	0.00	0.00	0.00	0.30
1993	0.00	0.00	0.00	0.00	0.55
1994	0.00	0.00	0.00	0.00	0.23
1995	0.00	0.00	0.00	0.00	0.67
1996	0.00	0.00	0.00	0.00	0.00
1997	0.00	0.00	0.00	0.00	0.19
1998	0.00	0.00	0.00	0.12	0.61
Mean	0.00	0.02	0.01	0.14	1.21
Std	0.00	0.11	0.05	0.28	1.37
MAX	**0.00**	**0.61**	**0.26**	**1.33**	**5.25**

Source: Moody's Special Comment, "Historical Default Rates of Corporate Bond Issuers, 1920-1998," January 1999.

5. COMPANY OPERATIONS

A. Refunding and Reinvestment[145]

Executive Summary

The 1992 Act does not specifically address stress test refunding and reinvestment activities other than under the general guidance that: "Characteristics of the stress period … will be those determined by the Director, on the basis of available information, to be most consistent with the stress period."[146] The proposed regulation requires that companies rely exclusively on six-month debt to meet projected stress test refunding needs. For months where mortgage asset liquidations exceed scheduled debt redemption, surplus cash balances are to be invested in one-month assets. The regulation justifies the choice of these short-term instruments on the grounds that these refunding and reinvestment vehicles avoid introducing "new risks" into the companies' initial book-of-business and, therefore, eliminate the need to predict asset/liability management decisions.

Fannie Mae strongly disagrees with the reasoning offered to support these proposed refunding and reinvestment choices. Despite claims to the contrary, these particular "new security" choices significantly alter and, more importantly, distort economic risks posed by existing businesses. In fact, they predict or project company behavior that runs counter to both industry and Fannie Mae risk management practices. As a result, the proposed refunding and reinvestment treatment greatly inflates risk-based capital requirements, especially in the up-rate stress test scenario.

As part of its ongoing risk management procedures, Fannie Mae continually monitors a number of risk measures to help guide its daily operations. Resulting portfolio management decisions are always made within the context of formal, Board-approved risk limits. The risk imbalances that develop during either stress test scenario would unquestionably require aggressive rebalancing actions to maintain risk exposures within prescribed limits. Indeed, by themselves, refunding and reinvestment options would likely be insufficient to bring risk exposures back within these limits. Still, unless the final regulation allows for a broader range of stress period rebalancing strategies, proposed refunding and reinvestments rules should be specified so as to reflect, at a minimum, basic risk management policies.

Specifically, in accord with our desire for simplicity, we recommend that the proposed regulation adopt one generic-refunding rule per stress test scenario. In the up-rate stress test, we believe that an extremely conservative depiction of basic portfolio management practice would be captured using an 80 percent long-term, 20 percent short-term debt blend. In the down-rate test, we suggest that the proportions be reversed, with adoption of

[145] NPR 2 § 3.10.3.1 at 18,297.
[146] 12 U.S.C. § 4611(b)(2).

a blend comprised of 20 percent callable issuance and 80 percent short-term funding. However, to accurately represent the existing portfolio's economic risks, we believe that short-term debt redemption tied to longer-term synthetic debt positions should be excluded from these refunding rules as long as the related swap contract remains outstanding. Finally, a conservative rule regarding the reinvestment of surplus cash would be to assume that such funds are invested at the one-month Fed Funds rate.

Proposal

The proposed regulation stipulates that refunding needs during the stress period are to be met through the issuance of six-month discount notes. The cost on these securities is set equal to the projected periodic borrowing rate plus 2.5 basis points (the latter to account for issuance fees). If asset liquidations exceed debt redemption in any month, resulting surplus cash balances are invested in one-month Treasury securities that yield the six-month Treasury rate.

Identified problems

The proposed rule incorrectly assumes that a forward-looking 10-year simulation of the company's business can be effected as a static analysis of the existing risk profile. By its very nature, the stress test dramatically alters that risk profile, creating exposures that are far beyond those considered currently material. As evidenced by internal risk management policies and controls, management is fully prepared to respond to such risks as they begin to attain measurable significance. The risk-based capital standard should distinguish between stress test induced risks that are intractable and those that can be mitigated through normal, established practices. The proposed rule's refunding mechanism fails to make this distinction and, consequently, leads to excessive capital requirements that do not reflect the company's actual existing risk profile.

In fact, the rule's exclusive reliance upon a short-term refunding mechanism actually injects substantial risk that is unrelated to the existing business. Contrary to the proposal's stated intention, any refunding or reinvestment assumptions represent de facto decisions on risk management actions. Predictions of company behavior are an inevitable element of the stress test simulation.[147] The current proposal effectively stipulates that management not only completely disregards formal operating policies on managing risk, but also systematically acts to worsen the risk profile in the up-rate stress test.

Failure to reflect interest-rate risk management policies

Even tacit recognition of Fannie Mae's risk management policies would argue for a much different refunding rule given the risk exposures that would develop during the stress test. Portfolio management staff continually monitors these exposures through a variety of calculated risk measures. One such measure is the gap between the duration of portfolio assets and liabilities. The Board of Directors has formally implemented policies that

[147] HUD acknowledged this fact in linking ongoing risk management to simulated refunding decisions in its "1987 Report to Congress on FNMA."

require increasingly aggressive rebalancing actions if the duration gap were to widen beyond prescribed threshold levels. Most often, debt issuance blends are adjusted so as to either lengthen or shorten the overall duration of portfolio liabilities.

Absent concerted management action, the severity of the stress test interest rate shocks will clearly move portfolio risk measures well beyond established threshold levels. Management would be compelled to aggressively rebalance in order to attempt to remain within defined risk limits. The tool most commonly used to effect this strategy – and the only one available in the stress test format – is to swing the duration of marginal debt issuance markedly to one direction.

In the down-rate stress test, mortgage prepayments outpace debt retirements. The duration of mortgage assets shortens dramatically. With close to half of outstanding debt callable, liability durations also shorten, but not by as much. The resulting pronounced negative duration gap would result in immediate efforts to shorten liability durations by refunding primarily with short-term debt.

In the up rate scenario, the opposite cash flow mismatch occurs. Scheduled debt redemption overwhelms mortgage liquidations as prepayments drop to minimum demographic turnover levels. With interest rates moving as much as 50 basis points per month, the resulting positive duration gap would quickly exceed threshold levels. Sustained long-term debt issuance would ensue.

In either stress test path, measurable changes in the portfolio risk profile occur with the first month's rate movement. Adoption of rebalancing strategies would begin not long thereafter. Our analysis shows, however, that reliance upon the refunding blend alone will likely fail to keep risk measures from violating threshold levels at some point during the stress period. Thus, the proposed regulation should allow for highly aggressive refunding rules in order to reflect in a reasonable manner both established management practice and the true economic risks posed by existing businesses.

No-new-business stress test inherently overstates portfolio risks

Though required by statute, the no-new-business stress test greatly limits the ability to manage risks that may develop on the existing book-of-business. A business wind-down scenario offers fewer funding / rebalancing opportunities than would occur in practice. The purchase of targeted assets and the funding issued to buy them can be effectively used to manage the current book's risks. In this context, adoption of a more representative refunding blend should be viewed as a very conservative depiction of normal risk management practices. Fannie Mae fully expects the statutorily mandated new business studies to highlight this fact, and encourages OFHEO to embrace the dynamic nature of interest rate risk management sooner rather than later. Until new business is properly simulated, stress test interest rate risk will continue to be overstated.

Short-term refunding rule creates perverse funding incentives

As stated, the proposed short-term refunding rule grossly misrepresents prudent risk-management practice. On any given day, management bases its funding decisions on current risk measures and exposures. Actual funding blends are generally comprised of targeted proportions of laddered debt maturities with specified amounts of embedded optionality. While these blends are selected to best manage perceived economic risks, they may result in substantially inflating risk-based capital requirements due solely to the proposed refunding rule.

In order to match projected near-term mortgage liquidations, discount notes generally constitute a portion of ongoing debt issuance. These securities carry a stated maturity of one year or less. A subsequent sharp upward move in rates would cause mortgage liquidations to fall below expectations. These discount notes would mature and then have to be replaced with long duration debt in order to finance what are now long duration assets. In effect, discount notes greatly enhance management's ability to quickly respond to changes in the portfolio's risk profile – they represent an important risk-management tool.

The proposed refunding rule unduly penalizes current discount note issuance. In the stress test, these securities mature prior to interest rates having reached their extreme terminal levels. Yet, the regulation precludes using these instruments to realize any debt extension benefits. Instead, they only expose the Companies to rising stress test debt costs. As a result, the proposed regulation effectively encourages greater reliance on longer-term debt issuance even though such action may conflict with prudent economic risk management.

Reinvestment activities do not reflect company practice

Fannie Mae has never invested in the proposed reinvestment security. We know of no Treasury instrument that carries a six-month yield, but matures in one month. Further, this reinvestment rule establishes the unreasonable construct that we would invest surplus cash in a negative carry asset. Fundamental to the choice of reinvestment rates is the notion that the reinvestment rate should equal or exceed the cost of debt funding that position. If surplus cash could only be invested at rates below comparable short-term borrowing costs, the company would then simply repurchase its own short-term debt.

Proposed solution

Refunding

Fannie Mae manages interest rate risk primarily by either adjusting the composition of debt issuance or engaging in certain derivative-based activities. Derivative-based activities include the purchase of interest-rate caps, floors, swaps, or swaptions. Stress test recognition of these activities would require introduction of market pricing functionality, resulting in a significant increase in the proposal's overall complexity. We

do not advocate this approach. Instead, we believe that a reasonable portrayal of the company's risk management activities can be achieved by adopting a more realistic, though stylized, set of refunding rules.

Specifically, Fannie Mae recommends adoption of one generic-refunding rule per stress test scenario. In the up-rate test, we believe that a blend comprised of 80 percent 10-year bullet debt and 20 percent one-month discount notes represents a conservative depiction of portfolio management practice. In the down-rate test, we suggest a similarly conservative refunding blend consisting of 80 percent one-month discount notes and 20 percent 3-year debt callable in one year. To capture the option premium, Fannie Mae proposes that callable bond issues bear coupons that are 50 basis points above bullet debt of the same maturity. This treatment is consistent with the option premium implied by the regulation's call rule.

In order to make these refunding blends operational, Fannie Mae recommends that the final regulation specify a one-month company borrowing rate in its interest rate series. Consistent with our proposal on market spread calculations, we believe this rate should be determined based on the three-year moving average spread between one-month corporate debt and the one-month Treasury bill rate.

Synthetic Debt Exception

Fannie Mae routinely synthesizes debt securities by issuing combinations of short-term debt and derivative contracts. Existing short-term liabilities that are part of synthetic debt positions should not refund according to the aforementioned rules. Instead, these issues should refund into new short-term debt with terms dictated by the receipt leg of the corresponding swap. This rollover process should continue until the related derivative contract matures. Such treatment is required to insure that true economic exposures are accurately captured.

Reinvestment Security

Fannie Mae believes that surplus cash balances should be invested in one-month securities bearing the one-month Fed Funds rate. Such investments pose effectively no credit risk. Any possible credit concerns are more than completely addressed by the standard's 30 percent management and operations risk capital charge. Again, the final regulation should specify this rate in its interest rate series.

For additional comments on refunding and reinvestment, see First Manhattan Consulting Group brief in Appendix V-10.

B. Operating Expenses[148]

Proposal

Corporate operating expenses are defined to include such items as salaries, professional services, travel, property and equipment. The proposed rule projects company operating expenses during the stress period as a constant percentage of combined retained and sold mortgage portfolio balances outstanding at the end of each month. The applicable expense ratio is calculated using actual Fannie Mae expenses in the quarter immediately preceding the start of the stress test.

Identified problems

The regulation's proposed treatment of operating expenses neither ties capital to risk nor accommodates innovative expenditures that might improve overall risk management. First, reliance upon the most recent quarter's actual expenses substantially overstates the appropriate level of stress period operating expenses. As stipulated in statute, the proposed stress test is to evaluate each company's financial performance under a book-of-business run off scenario. No additional mortgage portfolio purchases or mortgage security issuance is to be considered during the stress period. Consequently, any stress test projection of operating expenses should clearly recognize that a substantial proportion of the company's ongoing operating expense is related to the generation and support of new business activity.

Specifically, based upon our internal cost allocations, we estimate that less than half of each company's current cost structure is devoted to the maintenance and support of existing book-of-business balances. Sizeable downward adjustment from current baseline operating expense 'running rate' levels is therefore required in order to project stress test operating costs that are both *reasonable and consistent* with a no-new-business environment.[149]

Even after deducting costs tied to new business activities, use of the most recent quarter's administrative expense not only injects unwarranted volatility in capital requirements, but also unnecessarily penalizes investment in risk management innovations. Quarterly operating expenses often vary due to seasonal factors or one-time events (e.g., Y2K expenditures) that are totally unrelated to changes in company risk. Indeed, quarterly expenses can fluctuate as a result of uneven and ongoing investment in process and system enhancements that serve to improve the overall risk management function. While the proposed rule projects forward the cost of these investments over the full ten-year stress period (raising capital requirements by some multiple of the actual cost), no corresponding reduction in expenses is captured as a result of this investment. This 'investment penalty' does not properly reward or encourage desired company behavior.[150]

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[148] NPR 2 § 3.10.3.4 at 18,297.
[149] See attached Ernst & Young Issue Brief: *Administrative Expenses* in Appendix V-11.
[150] Id.

Finally, in addition to greatly inflating projected operating expenses, the proposed rule results in a markedly different cost pattern across the two prescribed rate scenarios. This stems from the incorrect assumption that all such costs vary directly with outstanding book-of-business balances. Instead, a large portion of the cost associated with maintaining and servicing existing balances is relatively fixed and thus would be largely unaffected by dissimilar mortgage liquidation rates in the two stress test scenarios.

While OFHEO claims that adoption of a variable cost approach provides a "reasonable approximation" of company stress test expenses, our analysis shows that risk-based capital requirements in the up-rate stress path can be as much as $2 billion higher than the down-rate scenario due solely to this treatment. This projected difference in stress test operating expenses is neither reasonable nor consistent with the companies' cost structures. This fact combined with our strong belief that operating expenses should not be viewed as an interest rate risk exposure (which the current proposal implicitly does) argues for an alternative approach that better aligns administrative expenditures across the two stress test scenarios.

Not only are operating expenses unrelated to either interest rate risk or credit risk, no other financial institution's risk-based capital standard considers these costs in setting appropriate risk-based capital requirements. Some might therefore question whether operating expenses should be included as part of the risk-based test at all, especially since the 1992 Act makes no mention of including them. Our analysis shows that the proposed inclusion and treatment of company operating expenses represents a significant risk-based capital determinant – as much as $4 billion under the proposed regulation. We strongly believe that assessment of Fannie Mae's and Freddie Mac's capital adequacy should not hinge on subjective stress test assumptions involving administrative cost projections.

Proposed solution

A far more accurate depiction of administrative cost structures would be achieved by separating annual stress test operating expenses into fixed and variable cost components. To avoid unnecessary complexity, these costs could continue to be modeled as some constant proportion of mortgage portfolio balances with one distinction. Whereas periodic variable costs should be tied to the projected size of outstanding mortgage portfolio balances, fixed costs should remain constant at the same dollar level throughout the 10-year stress period.

After reviewing historical costs tied to servicing only the *existing* book-of-business, we estimate that variable costs should be applied as a 2.0 basis point annual charge against projected month-end balances. The same analysis shows that annual fixed costs appear to range between 1.5 and 2.0 basis points of current total balances. Because even some of these costs would disappear in a business wind-down scenario, we believe that fixed costs should be set equal to 1.5 basis points of beginning stress test balances in annual dollar terms.

While this alternative may actually raise the down-rate capital requirement, our analysis shows that the effective capital charge for operating expenses would be roughly equivalent across the two interest rate stress paths. We believe that the resulting overall level and symmetry provide a far more accurate depiction of our cost structure and attendant risks. Still, in order not to penalize investments in risk management tools and processes, the final regulation should establish these fixed and variable cost levels as static parameters not subject to quarterly update. All references to the most recent quarter's operating expense should be removed.

C. Capital Distributions[151]

Proposal

The proposed regulation stipulates treatment for capital distributions in the form of common stock and preferred stock dividends. Preferred stock dividends are to be paid as long as the Company meets the estimated minimum capital requirement during the stress period. The dollar value of these payments is set equal to preferred dividends currently paid with the exception of floating rate issues that vary with projected stress path index rates.

Common stock dividends are to be paid *only* during the first year of the stress test. If the Company is projected to fall below the minimum capital requirement before that point, common dividends terminate coincident with that event. The size of the common dividend payment is defined as the greater of (a) the prior quarter's dividend payment or (b) the average payout ratio for the most recent four quarters times simulated quarterly earnings.

Identified problems

The rule's assumption that Fannie Mae and Freddie Mac continue to make capital distributions in the face of mounting stress test losses is both arbitrary and unreasonable. As with other implementing assumptions, the 1992 Act requires that capital distributions be characterized in a manner deemed by the Director as "most consistent with the stress period."[152] We believe the proposed termination of common dividends meets this "consistency" requirement. By contrast, the assumed continuation of preferred dividends is inconsistent with not only prudent financial management, but also the same logic that underlies the proposed rule's common dividend treatment.[153]

Common dividends are stopped after four quarters on the likely premise that the companies would then be officially classified as "undercapitalized."[154] That is, it is highly improbable that either company would satisfy its risk-based capital requirement after having experienced the first year of an actual stress test scenario. With interest rate movements of as much as 600 basis points over the first year, a company's business would then have to withstand a further 600 basis point move over the next year in order to maintain its "adequately capitalized" certification at the end of the first year.

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[151] NPR 2 § 3.10.3.2 at 18,297.
[152] 12 U.S.C.§ 4611(b)(2).
[153] See attached Ernst & Young brief: *Dividends* in Appendix V-12.
[154] A company is considered to be "adequately capitalized" when it meets both the risk-based capital requirement and the minimum capital standard. It is deemed to be "undercapitalized" if it does not meet the risk-based capital level, but does meet the minimum capital requirement.

The inevitable "undercapitalized" classification means that both companies would be operating under mandatory capital restoration plans. Prior approval by the Director would be required before making any capital distribution. The assumed termination of common dividends implies that the companies either cease such discretionary payments or are instructed to do so by their regulator. Any proposal that requires continued payment of preferred stock dividends under such circumstances has to be viewed as extreme.

This position is supported not only by the existing regulatory structure, but also by the very reason firms maintain core equity capital as part of their overall financing structure. Equity capital exists to serve as a reserve to absorb unexpected losses. By all measures, the statutory stress test represents the ultimate unexpected adverse occurrence. Further, both firms are widely recognized as premier financial institutions with sophisticated and prudent risk management practices that are subject to regular examination by a dedicated regulator.

The only justification offered for continued payment of preferred dividends is that "failure to pay dividends on both classes of stock likely would have greater repercussions on an Enterprise's funding costs and ability to attract new equity capital than would a failure to pay common stock dividends [alone]."[155] Based on this statement, the logic for continuing preferred dividends is clearly untenable.

First, as a prudent regulator concerned with safety and soundness, OFHEO would invariably move to stop continued capital distributions if a company remained "undercapitalized" for more than a few quarters. Second, the firms themselves would likely move to curtail these payments as erosion in the core capital base became apparent. In a no new business scenario, the companies would certainly be more concerned with continued funding costs than with the ability to attract new equity capital. Continued depletion of the existing capital base through dividend payments would only serve to heighten credit concerns and risk adversely impacting ongoing funding needs.

Proposed solution

We strongly believe that *all* stress test capital distributions should terminate at the end of the first year. Such treatment most closely aligns dividend payments to both official capital classifications and real economic incentives. Moreover, the current proposal effectively penalizes preferred stock as a core capital component. The net effect of this specification will be to curtail the efficient use of preferred stock issuance as a key component of the overall capital structure – a decidedly perverse capital regulation outcome.

Given specific coupon rates attached to outstanding preferred stock issues, calculation of the first year's preferred dividend payments is straightforward. However, we recommend that the regulation employ a common dividend payout ratio based upon an average of the company's payment rates during the most recent three-year period. The current proposal's reliance upon a shorter one-year period means that any special one-time

[155] NPR 2 at 18,170.

distribution would make risk-based capital requirements not only overly volatile, but also change in ways unrelated to economic risk.

D. Tax Rate and Tax Rules[156]

Proposal

The proposed regulation applies an *effective* Federal income tax rate of 30 percent when calculating the monthly provision for income tax expense. This rate is lower than the current 35 percent corporate statutory rate to reflect Fannie Mae and Freddie Mac involvement in certain tax-advantaged activities, primarily investments in tax-exempt mortgage-revenue bonds and affordable housing projects.

Projected net operating losses (NOL) are allowed to be carried back to offset taxes paid in any or all of the preceding three calendar years. To the extent that NOL carry backs cannot be used, equivalent carry forward amounts can be applied to offset taxes in any or all of the subsequent fifteen years.

Identified problems

We concur with the proposed use of an effective tax rate. Attempts to explicitly model the tax benefits attached to these investments would introduce significant additional complexity with no obvious gain in stress test precision. However, the regulation's proposed adoption of a fixed 30 percent rate promises to undermine a key benefit of the risk-based capital standard – that of dynamically relating capital requirements to changes in the companies' book-of-business.

The composition of Fannie Mae's business evolves continuously in response to mortgage market developments and general economic conditions. Historical variation in the actual effective tax rate directly reflects these changes. To be relevant, the proposed regulation has to be able to automatically capture these changes. Use of a static 30 percent effective tax rate does not. Case in point: the effective tax rate for the two companies has averaged about 28 percent over the past three years.

The proposed regulation's specified 3-year carry back and 15-year carry forward periods for NOL tax offsets are no longer in sync with the current tax code. Under legislation enacted in 1997, these carry back and carry forward periods were changed to two and twenty years, respectively

Proposed solution

In order to relate capital more closely to risk, we believe the rule should require use of an effective rate based on actual recent experience. Specifically, we propose that the stress test apply an effective tax rate equal to that actually incurred by each company for the most recent three-year calendar period. This three-year reference period parallels similar

[156] NPR 2 § 3.10.3.5 at 18,297-8.

horizons proposed for stress test calculation of common dividend payment ratios and market spread levels.

Use of a three-year average insures that unusual one-time tax events do not cause capital requirements to move in ways unrelated to risk. Further, unforeseen statutory changes will gradually flow through the historical averages, thereby allowing the companies to anticipate and plan for how they might impact risk-based capital requirements.

In most other respects, the regulation's proposed treatment of tax-related items appears reasonable. For example, we agree that a regulatory risk-based capital stress test should not attempt to model timing differences between taxable income and GAAP income given the high level of complexity surrounding this difference. However, the final regulation should be modified to be consistent with current statutory provisions as regards allowable NOL carry back and carry forward periods.

E. Mortgage Commitments[157]

Proposal

The proposed regulation treats both mandatory and optional delivery commitments as equivalent contractual obligations by the companies to either purchase mortgages or issue securities during the stress period. The rule assumes that 100 percent of all outstanding commitments are delivered in the down-rate scenario and 75 percent in the up-rate scenario. The specified delivery pattern is disproportionately front loaded, with all commitments fulfilled in the first three months of the stress period in the down-rate path and during the first six months in the up-rate stress test. Relevant loan characteristics are to be based on the attributes of loans securitized by the Company during the six months prior to the start of the stress test. All mortgages delivered are assumed packaged into securities and added to the company's sold portfolios.

Identified problems

The proposed rule fails to properly differentiate between optional and mandatory commitments in terms of their use and delivery rates. From a contractual standpoint, these mortgage sale agreements are quite different. Mandatory commitments require the seller to deliver a fixed volume of mortgage product at a specified price (if a purchase) or guarantee fee (if an MBS swap) over a period not generally greater than a few months. Optional commitments represent delivery contracts that require the Company to either purchase or swap (at the seller's discretion) a specified volume of loans over a much longer period. Importantly, neither product type nor price is specified under an optional commitment. Moreover, the seller is not contractually bound to deliver any loans; he simply has the option to do so.

This difference in contract terms means that mortgage originators or brokers use mandatory and optional commitments to meet different needs. Mandatory commitments effectively represent a forward sale of mortgages already originated or about to settle. They immunize sellers from any market price risk. Optional commitments are generally used to establish credit lines for financing future production. That is, they allow mortgage lenders to demonstrate that they have a ready customer for mortgage loans not yet originated. Consequently, optional commitments represent a key source of liquidity for primary mortgage markets.

Optional commitments also play an important role in serving low- and moderate-income borrowers. Innovative mortgage products are primarily geared to serve this market segment. Because these products are new, market acceptance and borrower demand is uncertain. Optional commitments allow mortgage originators to promote these products knowing that they have a firm buyer for such loans.

[157] NPR 2 § 3.2 at 18,229-31.

Despite these marked differences, the proposed rule treats all outstanding commitments as equivalent contractual agreements that behave similarly. In fact, they do not. Mandatory commitments require mortgage sellers to pay Fannie Mae fees if specified delivery volumes are not met. Optional commitments have no such "pair-off" structure. Especially in an adverse stress scenario, the "fill rate" on commitment types would be expected to diverge considerably.[158]

During the first year in the up-rate scenario, mortgage rates are projected to rise by about 50 basis points per month. Mortgage originations will no doubt decline precipitously in this economic environment. For the most part, optional commitment holders will simply let their delivery options expire.

While the down-rate path might generally favor origination activity, the proposed stress test also assumes concurrent widespread credit stress. The period between loan underwriting and the delivery date often spans more than a few months. In this environment, some portion of pipeline loans will likely drop below our underwriting standards due to borrower distress or fall in home price value. These loans would no longer qualify for delivery under either a mandatory or optional commitment contract. As a result, even in the down-rate scenario, the optional commitment 'fill rate' would likely fall short of the initial dollar amount outstanding.

The proposed regulation's failure to recognize these important behavioral differences overstates the risks posed by the current outstanding commitment mix. This misrepresentation is significant given that optional commitments comprise between one-third and two-thirds of total outstanding commitments at any point in time. The rule's assumed delivery percentages and quick delivery pattern incorrectly reflect a far higher proportion of mandatory commitments. Consequently, the proposed regulation overstates capital requirements and may therefore lead to unnecessary restrictions on the extension and widespread use of optional commitments.

Proposed solution

The regulation's proposed commitment fill rate and rapid delivery pattern should properly capture behavioral differences between optional and mandatory commitment agreements. The roughly equivalent proportions of these commitment types mean that delivery percentages must be lowered to more accurately reflect optional commitment fall out. We believe the final regulation should establish deliveries in the down-rate test at 75% of total commitments outstanding. The corresponding up-rate test proportion should be fixed at 50 percent. Given that optional commitments are primarily used to support future mortgage originations, the proposed three- and six-month delivery windows is clearly unrealistic. Instead, the final regulation should extend the delivery period to six and twelve months in the down- and up-rate scenarios, respectively, with purchases spread more uniformly across these time frames.

[158] See attached Ernst & Young brief: *Mortgage Commitments* in Appendix V-13.

Given that the stress test is meant to measure financial performance on a "generally accepted accounting principles" basis, the proposal to treat all commitment deliveries as a guaranty and sale of mortgage securities seems appropriate. Assumptions regarding how the company might fund these future retained portfolio purchases would have to address issues surrounding recognition of a 'priced' versus 'settled' book-of-business. A GAAP framework clearly argues for focus on the latter. Further, existing hedge positions are not necessarily indicative of the actual type of debt instruments that will be issued to finance these purchases. The additional complexity and assumptions required to model retained portfolio purchases not only support the proposed securitization approach, but also place this activity under the new business provisions to be addressed in future regulation.

6. OTHER TECHNICAL COMMENTS

A. Non-Earning Assets[159]

Proposal

The proposed regulation provides detailed instructions on how certain non-cash flow items found in Fannie Mae's starting position balances should flow through simulated pro forma balance sheet and income accounts during the stress period. Starting position balance sheet items that fall into this category include miscellaneous receivables, real estate owned (REO), general clearing accounts, fixed assets, and equity investments in low and moderate income housing partnerships. Under the current proposal, the first three of these non-earning assets are assumed converted to cash on a straight-line basis over the first month, six months and twelve months of the stress period, respectively. By contrast, fixed asset balances and affordable housing investments are held constant over the entire ten-year stress period.

Identified problems

A stress test framework characterized by prolonged high rate levels generates especially onerous capital requirements for non-interest bearing assets. We believe the constant balance treatment proposed for fixed assets and low-income housing partnership investments is both unreasonable and inconsistent with the stress period. Such treatment not only artificially inflates risk-based capital requirements, but also unnecessarily threatens to dampen the two companies' involvement in low- and moderate-income housing partnerships.

Enterprise investment in affordable housing partnerships has increasingly become a key housing mission activity in recent years. By some estimates, the two companies now provide financing for more than 40 percent of the low- and moderate-income housing units created by these partnerships. Clearly, the risk-based capital stress test must carefully address the disposition of these mission sensitive assets. If handled incorrectly, the final proposal could have profound implications for the continued viability of this neediest market segment.

In a business run-off scenario, these tax-advantaged investments would provide no tangible economic return given the likely rapid onset of stress test operating losses. In short, they quickly become non-earning assets. The proposal's assumption that we maintain our position in these non-performing assets will require us to capitalize these investments at levels well in excess of 50 percent. In reality, each company would rapidly move to recapture the economic value attached to these investments through a sale to

[159] NPR 2 § 3.10.3.6.2 at 18,298-9.

other tax paying entities. The financial burden of carrying these balances in extreme stress scenarios would dictate nothing less.

No such behavioral issues surround the proposed constant balance treatment accorded fixed assets. This treatment is clearly mistaken. Fixed assets such as buildings, furnishings and equipment are subject to various depreciation schedules. As stated in the regulation itself, related depreciation expense is fully captured in the historical base used to project monthly operating expenses during the stress period.[160] Accordingly, fixed asset balances should amortize off the balance sheet during the stress test.[161]

In fact, the bulk of these assets disappear over a ten-year period. Applying actual depreciation schedules to each of the various fixed asset categories as of year-end 1999 results in a projected 83 percent decline in these balances by the end of 2009. After only three years, more than 50 percent of fixed assets amortize away due to use of accelerated depreciation methods.

Proposed solution

The final regulation must not directly threaten key housing mission activities due to arbitrary stress test assumptions that are at odds with stress test economic incentives. We therefore propose that affordable housing partnership investments receive treatment similar to that accorded REO starting position balances. That is, these investments should be assumed liquidated or sold at current amortized values over the first six months of the stress period in a straight-line manner.

Fixed asset starting position balances should also amortize down over the stress period. We believe the proposed rule should require use of a decay pattern consistent with actual depreciation schedules. In line with our desire to simplify where possible, we recommend that the final regulation should adopt a requirement that these assets amortize on a straight-line basis over a 5-year period as a conservative approximation of actual experience.

[160] NPR 2 at 18,298.
[161] See attached Ernst & Young brief: *Non-Earning Assets* in Appendix V-14.

B. Risk-based Capital Requirement Calculation[162]

Proposal

The proposed regulation employs a present value approach to determine the amount of starting total capital that Fannie Mae must hold to remain solvent throughout the ten-year stress test. Using periodic after-tax borrowing or reinvestment rates, projected monthly capital balances are discounted back to the start of the stress test. The lowest of the 120 discounted amounts is then subtracted from the company's starting capital position to derive the stress test's capital requirement. The actual risk-based capital requirement is 1.3 times this amount to reflect the 30 percent add-on for management and operations (M&O) risk.

Identified problems

The proposed present value methodology is incorrectly applied to the regulatory stress test model. Its use is neither suggested by the statute nor appropriate from a risk measurement perspective. As a result, firms who maintain positive capital balances throughout the stress period face an added present value capital charge, while those who fail the stress test receive a present value capital benefit. In either case, the resulting risk-based capital requirement is distorted and inconsistent with standard industry practice.[163]

The statutory risk-based stress test is clearly an earnings-based simulation model. By contrast, the proposed present value approach is generally associated with economic value models where discounted present values measure market value risk exposures. Importantly, economic value models are viewed as separate and distinct from income-based models given that market value exposures generally ignore firm-specific accounting, tax and dividend policies. In proposing to present value ending stress test capital levels, the rule incorrectly combines the two into a hybrid that looks unlike any standard financial industry model.

The 1992 Act simply requires that the proposed "risk-based capital test shall determine the amount of total capital for the enterprise that is sufficient for the enterprise to maintain positive capital during a 10-year period" of stressful economic conditions.[164] The corresponding risk-based capital requirement would therefore appear to be equivalent to the amount of total capital consumed during the stress period.

The rule bases adoption of a present value approach on a subtle yet key rewording of the statute's mandate. Under the proposed regulation, the stress test is "to determine the amount of capital that is sufficient for an Enterprise to *just* maintain positive capital

[162] NPR 2 § 3.12 at 18,299-300.
[163] See attached Oliver, Wyman & Co. brief: *Risk-based Capital Calculation* in Appendix V-15.
[164] 12 U.S.C. § 4611(a).

during the ten-year stress period."[165] We believe that OFHEO has incorrectly relied upon this interpretation to justify use of discounting for purposes of calculating the risk-based capital standard. Moreover, the suggested methodology fails to meet even this criterion.[166]

Finally, from a practical standpoint, the proposed discounting of month-end capital balances effectively penalizes companies who maintain positive stress test capital and benefits those who might show a deficit. Consider the stylized example of two firms, each with a $10.0 starting total capital base. At some point during the stress test, one firm's total capital falls to a minimum level of plus $3.0, while the other falls to a low of negative $3.0. Absent discounting and taking account of the 30 percent M&O add-on, the resulting risk-based capital requirement for the former would be $9.1, while the latter's would be $16.9.[167]

Assuming an average 7 percent discount rate and a related present value discount factor of 2.0, the present value of these minimum capital levels would be plus $1.5 and negative $1.5.[168] With the 30 percent M&O add-on, the corresponding risk-based capital requirements then become $11.0 and $15.0, respectively.[169] Consequently, use of a discounted capital approach raises the adequately capitalized company's requirement by $1.9 (thereby triggering an "undercapitalized" classification) while, at the same time, lowering by a similar amount the risk-based standard for the company that fails the stress test. This counterintuitive result clearly argues against reliance upon a present value approach and instead supports adoption of a 'capital consumed' measure for purposes of calculating the risk-based capital requirement.

Proposed solution

We strongly believe that the statute's explicit definition of core capital as that "determined in accordance with generally accepted accounting principles" requires that the risk-based capital calculation be based solely on the *maximum amount of total GAAP capital consumed* during the stress period.[170] The proposed regulation should not arbitrarily combine elements of an economic value model with an earnings-based model. Instead, the present value approach should be replaced with a simple calculation that determines the maximum amount of total capital consumed. The overall risk-based capital requirement would then be set at 130 percent of this amount given the M&O risk add-on.

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[165] NPR 2 at 18,171 (emphasis added).

[166] Calculated stress test capital would inevitably not be the precise amount required to *just* maintain positive capital due to the differential tax, dividend and refunding/reinvestment patterns that would accompany a new starting capital position.

[167] Applying the statutory 30% add-on for management and operations risk, the first company's risk-based capital requirement is computed as equal to [(10 - 3) * 1.3], while the second's is equal to [(10 - (-3)) * 1.3].

[168] While the minimum capital balance might occur in any month, this discount factor corresponds to the minimum level falling in month 120.

[169] Actual requirements of $11.05 and $14.95 are shown net of rounding.

[170] See 12 U.S.C. § 4502(4).

C. Accounting Rules[171]

Proposal

The proposed regulation establishes a detailed set of rules for creating pro forma financial statements during the stress period. These rules cover everything from required amortization methods for various premium and discount categories to the assumption that affordable housing investments remain constant throughout the entire stress period. Importantly, they also instruct that unrealized gains (losses) on available-for-sale securities be recorded as income in the first month of the stress test.

Aside from identifying what accounting treatment to apply to each account, the proposed regulation articulates four general accounting principles. They are: (1) all investments are held to maturity; (2) REIT subsidiaries are consolidated; (3) dividends are declared and paid simultaneously; and (4) company Treasury stock is captured as a reduction in retained earnings.

Identified problems

Instead of establishing accounting principles that provide general guidance on how to create stress period income statements and balance sheets, the proposed regulation attempts to codify unique accounting rules for every instrument and activity that flows through the pro forma financial statements. This unpredictable and highly detailed approach will inevitably cause the risk-based capital standard to lag behind financial market innovations. The companies will not be able to determine the risk-based capital implications for a new type of structure not currently on the regulation's enumerated list.

In large part, this future uncertainty exists because the proposed regulation does not uniformly adhere to generally accepted accounting principles (GAAP) in prescribing what methods to apply where. For example, amortization of premiums, discounts and fees on retained portfolio whole loans follows the liquidation method rather than the level-yield approach required by GAAP. Similarly, while premiums, discounts and fees on existing debt securities are to be amortized on a level-yield basis, discount note expense is calculated using a nonstandard, straight-line method.

A second major critique of the current proposal concerns the unquestionably flawed treatment proposed for market value gains or losses that fall under Financial Accounting Standard No. 115 (FAS 115). While not discussed in the regulation (the itemized list is outdated), we suspect that FAS 133 market value gains or losses would also fall into this category. The dilemma faced in confronting these accounting items relates to the proposed regulation's reliance upon a 1992 statutory definition of "total capital" that no longer meets current GAAP standards.

[171] NPR 2 § 3.10.3.6 at 18,298-9.

Statutory definitions of capital effectively direct that the stress test be conducted on a GAAP basis. Specifically, the 1992 Act defines "core capital" as "the sum of the following (as determined in accordance with generally accepted accounting principles)": (a) the stated or par value of common stock; (b) the stated or par value of perpetual, noncumulative preferred stock; (c) paid-in capital; and (d) retained earnings.[172] Further, "total capital" is defined as "core capital" plus general loan loss reserves and, importantly, "any other amounts from sources of funds available to absorb losses … that the Director by regulation determines are appropriate to include in determining total capital." [173]

Beginning with 1994 financial statements, FAS 115 required firms to report *unrealized* gains and losses on 'available-for-sale' (AFS) securities in a separate stockholder's equity account called 'Other Comprehensive Income' (OCI). The carrying amount of related AFS investments moves in tandem with changes in the OCI account. The proposed rule's omission of OCI as a component of total capital makes this treatment unacceptable.

The proposal's specified recognition of these gains or losses artificially creates or destroys stress test capital resulting in erroneous risk-based capital requirements. Implicit in such recognition is the assumption that these securities are actually sold in the first stress test month. However, any *realized* gain or loss flowing through income would be exactly offset by a corresponding adjustment in the OCI equity account. The actual sale event would have no impact whatsoever on a firm's overall GAAP capital position.[174]

Some might view the proposed approach as equivalent to simply recognizing a prior period's market value change absent FAS 115 reporting requirements. Leaving aside the fact that FAS 115 fails to recognize similar market value changes on securities funding these investments (resulting in equity volatility unrelated to risk), this perspective might have some merit if the AFS assets were explicitly removed from the balance sheet coincident with the assumed sale. The fact that no such removal is proposed means that the securities' cash flows will be recognized into earnings over the stress horizon – effectively double counting the first month's realized gain or loss.[175]

Formal implementation of FAS 133 in January 2001 raises a similar, though slightly different problem tied to GAAP treatment of unrealized gains or losses. FAS 133 requires that all outstanding derivatives (swaps, interest-rate caps/floors, etc.) be shown on the balance sheet at fair value. The vast majority of company derivatives will fall under the 'cash flow hedge' designation and be reported similar to AFS securities with OCI account recognition of unrealized gains or losses

[172] 12 U.S.C. § 4611(4).
[173] 12 U.S.C. § 4502(18).
[174] FAS 115 requires that the OCI account be shown on a net-of-tax basis.
[175] Absent further movement in market rates, a market value gain or loss will decay over time as the security's cash flows that account for that gain or loss are received.

In addition, however, FAS 133 mandates that unrealized gains or losses on derivatives classified as 'fair value hedges' flow directly to earnings. Though difficult to predict, some portion our derivative book may ultimately fall into this category. Instead of appearing in the OCI equity account, these unrealized gains or losses are reflected in retained earnings. While exactly equivalent to unrealized OCI gains or losses, these fair value hedge unrealized gains or losses directly impact the starting amount of stress test capital.

In the real world, these fair value gains or losses reverse themselves as the number of remaining payments decline and the maturity date of the contract approaches. In the stress test, no market value mechanism exists for their removal. The beginning 'snapshot' remains frozen in the retained earnings balance throughout the stress period. It is clearly nonsensical to carry forward a constant market value adjustment and, at the same time, model related stress period cash flows. Resulting risk-based capital requirements would not tie capital to risk.

Proposed solution

In order to accommodate innovation and allow the companies to anticipate their future risk-based capital needs, we strongly recommend that the final regulation adopt a more generalized approach toward accounting methods. That is, the rule should establish basic guidelines and not prescriptive rules for generating stress test pro forma statements. In most all cases, we believe that the proposed rule should conform to statutory intent and require application of current GAAP treatment as the overall implementation principle.

We see only two correct ways to handle FAS 115/133 unrealized gains and losses – effectively ignore them or introduce complex market value functionality into the stress test framework. A third alternative – an assumed immediate liquidation of affected positions - is nonsensical given that derivatives help define the overall economic risk profile. With mark-to-market functionality beyond the scope of the current proposal, we recommend that the proposed risk-based standard adopt a fifth general accounting principle – 'all unrealized gains or losses reflected in any current GAAP equity account are to be reversed, with related balance sheet items restated on an amortized cost basis'. The current proposal has already established a precedent for such capital account redefinition – the rule defines starting position retained earnings as equivalent to the statutory definition less amounts attached to corporate Treasury stock.

D. Non-Mortgage Investments and Other Housing Assets[176]

Proposal

The 1992 Act does not specify the treatment of non-mortgage investments, beyond the general guidance that, "Characteristics of the stress period... ... shall be determined by the Director, on the basis of available information, to be most consistent with the stress period."[177] Non-mortgage investments include Federal Funds, time deposits, Eurodollar deposits, asset-backed securities, corporate securities, and state and municipal securities. The proposed rule treats other housing assets such as mortgage revenue bonds (MRBs) and other mortgage related securities separately for modeling purposes, but views them as equivalent to non-mortgage investments for purposes of applying haircuts.

The proposed regulation models non-mortgage investments largely according to their contractual terms, but does make simplifying assumptions for payment frequencies and ABS paydowns. Mortgage revenue bonds and private label REMICs are modeled using mortgages as proxies. The proposal applies haircuts to non-mortgage investment cash flows, including MRBs and other mortgage related securities, at the same rates as specified for mortgage credit enhancements.

Identified Problems

Proposed haircuts are extremely excessive

Fannie Mae believes the proposed non-mortgage investment and other housing asset haircuts to be excessive in both their timing and magnitude. The haircuts are several times greater than historical corporate default experience and, furthermore, do not account for the possibility of asset recovery tied to residual liquidation value. Typical experiences, including those of the Great Depression, indicate recovery values in excess of 50 percent.[178] The proposed rule greatly overstates risk by failing to account for any asset recovery values.

In addition, proposed haircuts on certain collateralized securities, such as mortgage revenue bonds, are particularly inappropriate given the lack of credit or counterparty risk on these structures. Collateralized investments introduce risk only to the extent that the collateral has credit risk, or to the extent that the counterparty has control over the flow of funds. Collateral does not pose any credit risk when the collateral is comprised solely of government and agency securities, as is the case with mortgage revenue bonds. Furthermore, investment cash flows have no measurable counterparty risk if the collateral is held in the custody of a legal trust.

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[176] NPR 2 §§ 3.9.2.3.3 at 18,287 and 3.9.4 at 18,292-96.
[177] 12 U.S.C. § 4611(b)(2).
[178] W. Braddock Hickman, Corporate Bond Quality and Investor Experience, National Bureau of Economic Research (Princeton University Press, 1958).

Proposed haircuts create incentives contrary to key housing mission activities

The proposed rule's excessive non-mortgage investment haircuts create significant incentives for the company to limit or decrease the size of their liquidity portfolios. These short-term investment portfolios provide a critical source of ongoing liquidity to Fannie Mae and Freddie Mac. These portfolios allow the companies to safely store capital while awaiting opportunities for longer-term investment in mortgage product. Moreover, they provide the companies with the ability to move aggressively to support the mortgage market during turbulent economic times. The proposed haircuts impose a significant economic cost on these holdings and, consequently, encourage the companies to greatly minimize their liquidity balances. As proposed, the regulation will unduly impede Fannie Mae's ability to fulfill its housing liquidity function.

The regulation also undermines the companies' public missions by haircutting cash flows received from mortgage revenue bonds. These securities play a key role in both companies support of affordable housing initiatives. Proposed MRB haircuts threaten to constrain Fannie Mae's ability to continue its active involvement in this important market segment.

Mortgage revenue bonds pose effectively no credit risk because they are collateralized by government and agency securities held by a bond trustee. Indeed, underlying mortgage credit risk is already captured by the risk-based standard given that Enterprises must hold capital against projected stress test losses on the supporting MBS collateral. Thus, MRB haircuts effectively double count the mortgage credit exposure. In some respects, the proposed MRB haircut requirement implies that Fannie Mae fails to pay itself the full value of mortgage cash flows that we are actually projected to receive.

Proposed Solution

While Fannie Mae certainly has reservations concerning the imposition of haircuts on short-term, highly liquid non-mortgage investments, we strongly believe that such treatment should fully recognize the recovery value attached to these instruments. Accordingly, we recommend that applicable mortgage credit enhancement haircut rates be adjusted to reflect a 50 percent recovery factor. Adoption of a 50 percent recovery rate would appear quite conservative based upon historical experience.

We further propose that collateralized investments, such as mortgage revenue bonds, be exempt from any haircuts if two primary conditions exist: (1) the collateral consists of agency and/or government securities, and (2) the collateral is held by a trustee. Such treatment more closely relates capital to risk. Moreover, acceptance of these recommendations will remove improper restrictions on Fannie Mae' ability to support both affordable housing programs and market liquidity demands.

E. Debt and Derivatives: Derivative Modeling and Haircuts[179]

The Proposal

The Statute

The 1992 Act does not specify losses on counterparty relationships, other than providing the general guidance that: "Losses or gains on other activities, including interest rate and foreign exchange hedging activities, shall be determined by the Director, on the basis of available information, to be consistent with the stress period."[180]

Haircut rates[181]

Cashflows on derivative contracts which include collateral agreements are haircut at rates that are one fifth of those proposed for mortgage credit enhancements. Derivative contracts which do not include collateral agreements are haircut at rates equivalent to those set for mortgage credit enhancements. Fannie Mae requires collateral agreements on all of its swap and other derivative contracts.

Netting arrangements[182]

All derivative cashflows to and from a given counterparty are netted together before applying haircuts, with the exception of foreign currency swaps, which are treated on a stand-alone basis (see *Debt and Derivatives: Foreign Currency Linked Contracts*). If a derivative contract is not part of a netting agreement, it is haircut on a stand-alone basis. Fannie Mae requires bilateral netting arrangements for all of its swap and other derivative counterparties.

Identified Problems

The overall level and timing of derivative haircuts is excessively conservative. Company collateral agreements and other counterparty risk controls virtually eliminate the possibility of credit losses. The excessive haircuts alter the economics of routine company activities that employ derivatives. The test should not intrude upon day-to-day business by arbitrarily handicapping derivative based activities vis-a-vis equivalent non-derivative based activities.

The widespread financial duress implied by counterparty haircuts is both unlikely and internally inconsistent with the spread relationships in the proposed rule. Furthermore, the risks on derivative haircuts are operational risks which are unlikely to impact the

[179] NPR 2 §§ 3.9.3.3[n] and 3.6.3.3 at 18,292, 18,280-18,281.
[180] 12 U.S.C. § 4611(a)(4).
[181] NPR 2 § 3.6.3.3.
[182] NPR 2 §3.9.3.3.

companies due to their extensive counterparty controls. Any residual risk is amply provided for by the 30% risk-based capital add-on for management and operations risk.

The overall level and timing of derivative haircuts is excessively conservative.

The proposed magnitude of haircuts not only exceeds any level that was experienced during the benchmark loss period, but also Great Depression levels of corporate failures (see *Credit Enhancements and Haircuts*.) Fannie Mae has never suffered a loss due to derivative counterparty default, nor has any expectation to ever experience a loss. This is in part due to the controls the companies build into their counterparty relationships, and in part due to inherent counterparty disincentives to default.

Under the terms of its contracts, the companies can require counterparties to post collateral as credit risks develop, and have the technology to re-evaluate collateral adequacy, and request additional collateral, on an *intrada*y basis. As counterparties decline in credit quality, collateral is demanded in amounts equal to progressively higher proportions of the mark-to-market exposure. Collateral requests on lower rated contracts can eventually reach 125% of the market value of the swap exposure, resulting in an *overcollateralization* of risk.

The companies can also terminate contracts upon default, or other credit events. They can also require a troubled counterparty to appoint a more financially sound counterparty to assume the troubled counterparty's obligations. The combination of these controls allows the companies to limit their losses to a small fraction of those portrayed in the proposed regulation.

Additionally, derivative counterparties have many significant business relationships with the companies, outside of their counterparty relationship. For instance, derivative dealers are often also sellers of mortgages. These relationships would constitute additional disincentives to default. Also, derivative counterparties are often subsidiaries, whose specific missions are predicated upon maintaining a certain credit rating. Their parent companies would often have significant incentives to keep the subsidiary in good standing. Such disincentives, coupled with extremely tight company controls, effectively rule out the likelihood of measurable loss on derivative contracts.

The proposal improperly handicaps derivative based activities vis-a-vis equivalent non-derivative based activities.

The companies synthesize debt at times by issuing combinations of debt and derivative securities. This provides a net cost that is less than that available on similar securities issued in the "straight debt" market. The capital impact of the excessive derivative haircuts suffered under the stress test will make synthetic debt issuances artificially unattractive relative to straight debt issuance. This amounts to an arbitrary increase in the company's overall cost structure which is not related to risk.

The companies also enter into derivative contracts to manage their interest rate and credit risk. The excessive derivative haircuts suffered under the stress test will make derivative-based hedging and rebalancing strategies unattractive relative to other hedging and rebalancing strategies and could, at times, create the perverse incentive to hedge risks less aggressively.

The widespread financial duress implied by counterparty haircuts is unlikely and internally inconsistent with the spread relationships in the proposed rule.

Fannie Mae's counterparties are sophisticated investment grade financial institutions. Widespread default by such institutions is unlikely. In any case, widespread defaults by such financial institutions would certainly lead to higher borrowing costs for them. Yet OFHEO does not portray any widening in spreads between Treasuries and the sectors in which these financial institutions raise funds, such as LIBOR, COFI, or Prime. Company spreads to Treasury, however, incorporate an explicit increase of 50 bps under the proposal.

Derivative risk exposures are operational risks

Company collateral agreements represent a dynamic hedge against loss. The process of requesting collateral on derivative contracts as exposures increase has the effect of hedging away those exposures. To the extent that temporary conditions, such as a delay in posting collateral, result in transient imperfections in that hedge, these amount to operational risks.

The risks cited by OFHEO in justifying their derivative haircuts[183] are operational risks which are unlikely to impact the Companies due to their extensive counterparty controls, and which are in any case amply provided for by the 30 percent management and operations risk add-on. These risks included the possibility of sudden calamity, declines in collateral value, and competing claims on collateral.

The possibility of "sudden calamity" interfering with the posting of collateral is minimal. Collateral requirements can be evaluated multiple times per day. A calamity would have to occur in a time span denominated in hours and days in order to cause disaster before collateral could be requested and posted.

Declines in collateral value are possible, but only to an extremely limited extent. Because Treasury securities, cash, and agency MBS are the common forms of collateral, little credit risk exists on the collateral. This implies that any decline in collateral value would be from interest rate risk. In the down rate scenario, however, Treasuries will appreciate, not depreciate - particularly if there is a flight to quality. In the up rate test, all collateral will likely depreciate. These declines can be managed, however, as the companies can quickly call for additional collateral until a comfortable level of security is re-established - up to 125% of the market value of the derivative.

[183] NPR 2 at 18,159.

Competing claims are not likely to cause losses on collateralized contracts. To the extent that collateral has been already deposited with an escrow agent, it represents a secured interest which is not generally subject to competing claims. To the extent that collateral has been requested, but not yet posted, the claim is still a secured one, and generally enjoys seniority in bankruptcy proceedings over unsecured claims. Even if a counterparty were to deny a collateral request due to a simultaneous and competing request by another claimant, the amount in dispute would not include already posted collateral.

The risks of sudden calamity, declining collateral values, and competing claims on collateral, can all be managed by actively monitoring the adequacy of collateral, and timely requests for additional postings. To the extent that collateral is not adequately monitored, or that competing claims or other hazards cause requested collateral to not be posted, these are operational risks, which are covered by the substantial 30% add–on for management and operations risk.

Proposed Solution

Fannie Mae recommends applying OFHEO's minimum capital treatment to derivatives.[184] This capital requirement is calculated as 3.00 percent of the *credit equivalent amount*, except to the extent of holdings of qualifying collateral, which are capitalized at 1.50 percent.

The credit equivalent amount is comprised of two parts: the current exposure, as determined by mark-to-market value, and the potential future exposure, estimated as an OFHEO prescribed percentage of the notional amount. The percentage is greater for both longer-term contracts and foreign exchange contracts.

Applying the minimum capital rules will provide a level of capital more appropriate for the minimal level of operational risks attendant to derivative activities. Furthermore, the minimum capital rules are proven to be operationally feasible in that the Companies must already calculate minimum capital. Adoption of this simple alternative will avoid the additional modeling of netting arrangements, the economics of which OFHEO has chosen to model with precision, but at the cost of increasing the rule's complexity.

[184] See 12 C.F.R. Part 1750.

F. Debt and Derivatives: Foreign Currency Linked Contracts[185]

The Proposal

The Statute

The 1992 Act does not specify losses on counterparty relationships, other than providing the general guidance that, "Losses or gains on other activities, including interest rate and foreign exchange hedging activities, shall be determined by the Director, on the basis of available information, to be consistent with the stress period."[186]

Securities modeling[187]

The companies issue foreign denominated debt but, by policy, always hedge away the currency risk by swapping into dollars. The proposed rule models such debt net of the effects of the related currency swaps; the bond and the swap are combined, and the modeling expresses the debt in terms of a net economic position – a dollar denominated bond.

Haircuts[188]

OFHEO applies haircuts to foreign currency swaps at the same rates specified for other derivative contracts, but determines the cashflows to which haircuts are applied in a manner substantially different from other swaps. Currency swap haircuts are assessed solely on the $US denominated payment stream on the synthetic debt (effectively increasing debt coupon expense); other swap haircuts are assessed on the stream of *net receipts* from a swap. Unlike other swap exposures, currency swap exposures are not netted against other exposures with the same counterparty before assessing haircuts. OFHEO cites differences in currencies as its reason for not netting the pay and receive legs of currency swaps, and for not netting currency swap exposures with each other or with other swap exposures.

Identified Problems

The overall level of counterparty haircuts is excessive when compared with historical corporate default data (see discussion under *Credit Enhancements and Haircuts*). Furthermore, the overall level of derivative haircuts is excessive when considered in light of the tight controls the companies exert over their derivative contracts (see discussion

[185] NPR 2 §§ 3.9.3.3[n] and 3.6.3.3; 18,292, 18,280-18,281.
[186] 12 U.S.C. § 4611(a)(4).
[187] NPR 2, § 3.9.3.3.
[188] NPR 2, § 3.6.3.3.

under *Debt and Derivatives: Derivative Modeling and Haircuts*). The haircuts on foreign currency swap receipts are even more excessive because, unlike non-currency swap receipts, they are not netted with related payments within the swap, nor are they netted with exposures from other swaps with the same counterparty. The resulting treatment of currency swaps does a poor job of portraying the true risks of hedging currency exposures.

The test should not handicap Fannie Mae's ability to access low-cost funds for the U.S. mortgage market.

The companies issue foreign denominated debt in order to broaden the market for their debt, and to attain the lowest cost financing. The proposed treatment of currency swaps will make foreign debt issuances artificially unattractive relative to domestic debt issuance. For example, if Fannie Mae were contemplating issuing five-year bullet funding, it could either issue bonds denominated in $US, or issue bonds denominated in a foreign currency, and then swap them into $US. Both methods might have a net cost in the real world of 6.5 percent, but after haircuts, the cost of the foreign denominated bond and swap would increase the effective annual cost of the foreign denominated bond by more than 40 basis points, effectively making it an unacceptable funding source.

The proposed rule overstates risk by not reflecting the benefits of netting arrangements.

The companies substantially reduce the risk of counterparty losses in their swap books by requiring contractual arrangements to net all swap cashflows with each counterparty. These arrangements lower risk by reducing the extent and number of occasions on which the companies need to receive funds from their counterparties; the companies receive the net amount owed by a counterparty only after offsetting receipts due against payments due, for all contracts. These arrangements are reflected in the proposed rule for non-currency swaps, but are not recognized at all for currency swaps, leading to a significant overstatement of risk.

By assessing haircuts on the synthetic debt's $US payment stream, the rule haircuts a composite cashflow which is generally much larger than the net cashflow on the actual currency swap. That is, the rule haircuts a stream of positive values, which results in a larger haircut than a more theoretically correct haircut taken on the smaller sum of a positive and a negative value. Moreover, the proposed treatment results in currency swaps being *always* haircut, regardless of whether they are in the money. Thus the proposed rule is clearly too conservative, both in the frequency and magnitude with which it applies haircuts. This excessive conservatism is exacerbated by not allowing the currency swaps to be netted against other swaps.

An ideal implementation would value a foreign denominated swap leg in $US, and thereby allow it to be netted with the same swap's $US denominated leg, as well as with other swap exposures from the same counterparty. OFHEO, however, believes that it would be impractical to model the various currencies needed to value all foreign

denominated transactions. Though Fannie Mae generally concurs with this view, we believe that the proposed framework can be modified to better relate capital to risk.

At a minimum, OFHEO can improve its portrayal of risk by netting foreign currency exposures with other counterparty exposures. The current modeling of currency swaps - as part of a net synthetic security, could be incorporated into the netting process. For haircut purposes, the synthetic debt cashflows could be aggregated with other swap cashflows, after switching signs to make the debt expense a receipt. This improvement would capture some of the benefits of netting at the counterparty level, but would still significantly overstate the risk of individual currency swaps.

Proposed Solution

Securities Modeling

Fannie Mae proposes to model foreign denominated debt and their related currency swaps according to the OFHEO proposal, as a net synthetic instrument. Fannie Mae supports the principle of simplifying by combining related securities to portray a net economic position, so long as the resulting modeling still reflects risks accurately and does not create perverse incentives. OFHEO's simplification of currency hedges is an appropriate one.

Minimum Capital

In lieu of haircuts, Fannie Mae proposes to capitalize all derivative contracts, including foreign currency linked contracts, according to OFHEO's minimum capital standard.[189] The minimum capital standard provides for generally higher capital charges for foreign exchange contracts than other types of derivative contracts.

Use of the minimum capital requirement more accurately reflects the true risk of currency swap contracts, which is small due to collateral agreements (see *Debt and Derivatives: Derivative Modeling and Haircuts*). Moreover, this treatment does not create an artificially large disparity in capital requirements between currency and non-currency swaps. This approach is also easy to implement insofar as the Companies must already calculate minimum capital, and it avoids the difficulties of modeling foreign currencies, as well as those of modeling netting arrangements when a swap is part of a synthetic security.

[189] 12 C.F.R. Part 1750.

G. Debt and Derivatives: Call Rule[190]

The Proposal

The 1992 Act does not specify how the companies will make option exercise decisions, other than providing the general guidance that: "Characteristics of the stress period... ... shall be determined by the Director, on the basis of available information, to be most consistent with the stress period." [191] The OFHEO-proposed exercise decision for callable debt compares a bond's yield-to-maturity (YTM), to the coupon of a new replacement security, and exercises if the outstanding YTM is 50bp higher than the replacement coupon. Callable swap pay legs are also modeled this way.[192]

Identified Problems

Fannie Mae supports the OFHEO proposal. Fannie Mae advocates simple but consistent treatment of stand-alone and embedded options across security types, so that similar options should have similar exercise decisions, regardless of how or whether they are embedded into other securities.

Fannie Mae agrees with OFHEO's finding that more complex decision models would not yield significant changes in capital.[193] Fannie Mae also concurs with OFHEO in finding that the extreme interest rate moves posed by the two stress scenarios reduce the need for an elaborate decision model, as any model would predict either the near immediate exercise of all call options, or no exercise at all.

Fannie Mae disagrees with the implementation of the proposed rule in the debt and derivative test cases published in the "NPR 2 Supplemental Information."[194] These test cases show callable bonds and swaps as always having either "Bermudan" or "European" option styles. This portrayal is contrary to the actual call features on company debt, which include American style options.

Proposed Solution

Fannie Mae recommends that the proposed regulation model callable securities to reflect their contractual call features. American, European and Bermudan style options should be distinguished from each other.

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[190] NPR 2 § 3.9.3.3[j]; 18,291.
[191] 12 U.S.C. § 4611(b)(2).
[192] NPR 2 § 3.9.3.3.
[193] NPR 2 at 18,158.
[194] http://www.ofheo.gov/docs/regs/npr 2-supp.html.

H. Debt and Derivatives: Unhedged Foreign Currency Positions[195]

The Proposal

NPR 2 proposes different treatment for hedged and unhedged foreign currency risks. For unhedged foreign currency positions, the proposed regulation provides that such positions lose value relative to both upward and downward movements in the ten-year CMT rate. In addition, the regulation proposes that the treatment of unhedged foreign currency positions be used as a model for other positions whose risk is not tied to interest rates.

Identified Problems

Fannie Mae's position is that this section is not needed because Fannie Mae does not hold unhedged foreign currency positions or any other equivalent instruments. Therefore, Fannie Mae believes this section of the proposed regulation should be dropped.

A rule dealing with unhedged foreign currency positions is unnecessary.

Fannie Mae does not expose itself to foreign currency risk. The company issues foreign denominated debt but hedges away this risk by entering into offsetting currency swap agreements. The proposed regulation models foreign denominated debt net of the currency swap as a dollar denominated security, and then haircuts the resulting bond. Fannie Mae's comments on this portion of the rule are discussed in the section titled Debt and Derivatives: Foreign Currency Linked Securities. Since Fannie Mae has no unhedged positions and does not deal in foreign currency speculation, including a section in the proposed rule dealing with unhedged positions appears unnecessary.

In addition to being unnecessary, however, the capital treatment appears onerous. NPR 2 states "In the up-rate scenario, the U.S. Dollar per unit of foreign currency ratio is increased in proportion to the increase in the ten-year CMT. For example, if the ten-year CMT shifts up by 50 percent, then the U.S. Dollar per unit of foreign currency ratio shifts up by 50 percent. In the down-rate scenario, the foreign currency per U.S. Dollar ratio is decreased in proportion to the decrease in the ten-year CMT. "[196]

It is acknowledged in NPR 2 that this treatment of foreign currency positions is inexact when the proposed regulation states "The exchange rate in the up-rate scenario is not based upon a model or an economic prediction, but does reflect a recognition that there have been occasions in the past where the dollar has declined in value as CMT rates have been increasing."[197] Detailed modeling of foreign currency positions in this regulation is neither needed nor desired, but the treatment in NPR 2 which ties exchange rates only to

[195] NPR 2 § 3.9.3.3[m]; 18,292.
[196] NPR 2, § 3.9.3.3.
[197] NPR 2 at 18,158.

interest rates in the United States is too limited. Other factors such as foreign interest rates and differences between foreign and domestic inflation would also play a role.

In addition, tying the percentage change in interest rates to the same percentage change in the exchange rate appears incorrect. For example, the increase in the ten-year CMT in the June 30, 1997 stress test was 495 basis points, or almost 5 percentage points. Given that this is roughly a 75 percent increase in rates, it does not appear correct that the U.S. dollar would fall 75 percent against all other currencies in response to a 5 percentage point increase in U.S. interest rates.

The proposed rule may set a bad precedent.

Since Fannie Mae does not engage in unhedged foreign currency transactions, it may appear that this proposed rule is immaterial. However, a footnote in the narrative section of NPR 2 states "However, whenever the terms "foreign currency" or "currency" are used, they should be read to include any unit of value, except those interest rate indices that are included in the stress test, in which debt and derivatives may be denominated or to which such instruments may be linked."[198] Thus it appears that the proposed treatment of unhedged foreign currency positions may be applied to other unspecified positions. Fannie Mae believes this is a bad precedent to set and believes that any such instruments should be dealt with on a case-by-case basis.

Proposed Solution

Fannie Mae believes that the proposed rule dealing with unhedged foreign currency positions is unnecessary. The proposed rule's treatment of such positions appears onerous and incorrect, and therefore should not be used as a precedent for dealing with any other instruments.

[198] Id.