FARM CREDIT ADMINISTRATION

12 CFR Part 650

RIN 3052–AB56

Federal Agricultural Mortgage Corporation; Risk-Based Capital Requirements

AGENCY: Farm Credit Administration.

ACTION: Final rule.

SUMMARY: This final rule amends Farm Credit Administration (FCA) regulations, through the Office of Secondary Market Oversight (OSMO), by establishing risk-based capital regulations for the Federal Agricultural Mortgage Corporation (Farmer Mac). The final rule in part 650 sets forth the risk-based capital regulations for Farmer Mac, including definitions, methods, parameters and guidelines for developing and implementing the risk-based capital stress test. The final rule also specifies capital calculation, reporting, and compliance requirements; and delineates our monitoring, examination, supervisory, and enforcement activities with respect to Farmer Mac's compliance with the rule's risk-based capital requirements. Finally, the final rule prescribes certain requirements for business and capital planning.

EFFECTIVE DATE: This regulation will become effective 30 days after publication in the **Federal Register** during which either one or both houses of Congress are in session. We will publish a notice of the effective date in the **Federal Register**.

FOR FURTHER INFORMATION CONTACT:
Carl A. Clinefelter, Director, Office of Secondary Market Oversight, Farm Credit Administration, McLean, VA 22102–5090, (703) 883–4280, TDD (703) 883–4444,
or
Dennis K. Carpenter, Senior Policy Analyst, Office of Policy and Analysis, Farm Credit Administration, McLean, VA 22102–5090, (703) 883–4498, TDD (703) 883–4444,
or
Joy Strickland, Senior Counsel, Office of General Counsel, Farm Credit Administration, McLean, VA 22102–5090, (703) 883–4020, TDD (703) 883–4444.

SUPPLEMENTARY INFORMATION:

I. Objective

The objective of this final rule is to establish a risk-based capital stress test for Farmer Mac as required by section 8.32 of the Farm Credit Act of 1971, as amended (Pub. L. 92–181) (Act). The purpose of the risk-based capital stress test is to determine the minimum level of risk-based regulatory capital necessary for Farmer Mac to maintain positive capital during a 10-year period in which the most stressful credit and interest rate conditions occur.[1] The final rule contains specific information on the structure of the risk-based capital stress test, including guidelines for implementation, monitoring, reporting and examination. The rule also includes requirements for business and capital planning. The guidelines and procedures for implementation of the stress test are available to the public through the final rule, Appendix A to part 650, subpart B, and an electronic version of the risk-based capital stress test (spreadsheet-based) that is available on our Web site *''www.fca.gov''* or on written request. Appendix A contains details on how to construct the risk-based capital stress test, including basic assumptions used in the test.

II. Background

Farmer Mac is a federally chartered instrumentality of the United States (U.S.) established on January 6, 1988, by the Agricultural Credit Act of 1987 (Pub. L. 100–233) (1987 Act), which amended the Act. Farmer Mac is a Government-sponsored enterprise tasked with the public policy mission of providing a secondary market for agricultural real estate loans. Farmer Mac is charged with increasing liquidity to rural lenders, increasing available long-term credit to farmers and ranchers at stable interest rates, and enhancing the ability of individuals in rural communities to get financing for moderately priced homes.

A. Legislative History

Farmer Mac's statutory authority, established under title VIII of the Act, has been substantively amended several times since its origination in the 1987 Act. The 1991 amendments (Pub.L. 102–237) created OSMO and clarified FCA's authority, acting through OSMO, to regulate Farmer Mac. The 1991 amendments also set forth definitions for core capital,[2] regulatory capital, and established minimum capital[3] and critical capital[4] levels. The 1991 amendments required us to develop and issue a risk-based capital stress test for Farmer Mac, which will establish risk-based capital requirements for Farmer Mac. The 1996 amendments (Pub.L. 104–105) prohibited us from establishing a risk-based capital stress test prior to February 10, 1999, 3 years following the effective date of those amendments.

B. Overview of the Proposed Rule

We published a proposed risk-based capital rule in the **Federal Register** on November 12, 1999 (64 FR 61740) for a 120-day comment period. At the request of Farmer Mac, we extended the comment period to June 12, 2000 (65 FR 9223, February 24, 2000).

The risk-based capital stress test required by the Act determines the initial amount of regulatory capital necessary for Farmer Mac to preserve positive capital while undergoing stressful credit and interest rate risk conditions during a 10-year period. The Act also requires an added amount of capital to cover management and operational risks.

Section 8.32 of the Act requires that the risk-based capital stress test subject Farmer Mac to credit losses on agricultural mortgages it owns or guarantees. The rate of loan default and severity of losses must be reasonably related to those experienced in contiguous areas of the U.S. containing at least 5 percent of the total U.S. population that experienced the highest rate of default and severity of agricultural mortgage losses during a historical period of at least 2 consecutive years. We refer to this rate as the benchmark loss rate.

The Act also requires us to incorporate in the risk-based capital

[1] ''Regulatory capital'' is defined in section 8.31(5) of the Act as core capital plus an allowance for losses and guarantee claims (in accordance with generally accepted accounting principles (GAAP)). For the purposes of this definition, regulatory capital includes any allowance or reserve accounts Farmer Mac maintains for losses on loans held in portfolio and for losses on securities it has guaranteed, particularly, reserves required by section 8.10 of the Act.

[2] ''Core capital'' is defined in section 8.31(2) of the Act as the sum (as determined in accordance with GAAP) of: (1) The par value of outstanding common stock; (2) the par value of outstanding preferred stock; (3) paid-in capital; and (4) retained earnings.

[3] Farmer Mac's ''minimum capital'' requirements are described under section 8.33 of the Act. The minimum capital level for Farmer Mac is an amount of core capital equal to the sum of: (1) 2.75 percent of the aggregate on-balance sheet assets of Farmer Mac, as determined in accordance with GAAP; and (2) 0.75 percent of the aggregate off-balance sheet obligations of Farmer Mac which include: (a) The unpaid principal balance of outstanding securities that are guaranteed by Farmer Mac and backed by pools of qualified loans; (b) instruments that are issued or guaranteed by Farmer Mac and are substantially equivalent to (a); and (c) other off-balance sheet obligations. These minimum statutory capital standards will continue in effect after the risk-based capital rule becomes effective.

[4] Farmer Mac's ''critical capital level'' is described in section 8.34 of the Act. The critical capital level for Farmer Mac is an amount of core capital equal to 50 percent of the total minimum capital amount determined under section 8.33 of the Act.

stress test an interest rate risk stress scenario based on rising and falling interest rates on Treasury obligations of various terms.

In addition to the risk-based capital level required as a result of the credit loss and interest rate change components of the risk-based capital stress test, Farmer Mac is required to maintain additional capital to protect against management and operational risks. This additional capital level is specified in the Act as 30 percent of the capital level required for the sum of the credit loss and interest rate change components of the risk-based capital stress test.

The Act also required us to develop risk-based capital regulations containing specific information on the requirements, definitions, methods and parameters used in implementing the risk-based capital stress test. This enables others to apply the test in a similar manner. Finally, we must make available to the public any statistical model used to implement the risk-based capital stress test.

Although the risk-based capital stress test produces a dollar-valued total regulatory capital requirement, it also creates marginal capital requirements. Incremental capital requirements based on the riskiness of each additional dollar of business for every type of product that Farmer Mac guarantees or holds in its portfolio are required through application of the test. Marginal capital requirements for mortgages held in portfolio will vary depending on the interest rate and credit risks associated with the mortgages as well as Farmer Mac's funding strategy. These marginal capital requirements may have significant bearing on how Farmer Mac implements its business strategies.

We developed the risk-based capital stress test to reflect the risks inherent in Farmer Mac's various business activities. We incorporated, to the extent permitted by the Act, consistent relationships between the economic environment of the stress period and Farmer Mac's business activities. To do so required modeling Farmer Mac's assets, liabilities, and off-balance sheet positions at a sufficient level of detail to capture various risk characteristics.

Our philosophy guiding the development of the risk-based capital stress test was that it should:

- Be consistent with the requirements of the statute, i.e., it should reflect worst-case credit conditions and interest rate movements, as defined in the Act;
- Reflect Farmer Mac's regulatory capital needs for credit and interest rate risks measured under stressful conditions;
- Be internally consistent;
- Not create inappropriate economic incentives;
- Aim for simplicity; and
- Reflect, to the extent practical and meaningful, Farmer Mac's current operating policies and practices.

In developing the risk-based capital stress test, we engaged in three distinct activities that varied in complexity and time horizons:

- Identification of the benchmark loss experience;
- Construction of the risk-based capital stress test; and
- Examination and oversight.

The final rule specifies the basic structure and parameters of the risk-based capital stress test and allows Farmer Mac to implement the stress test internally, using a model built according to our specifications, to determine its risk-based capital level.

The goal of the risk-based capital stress test is to align capital requirements with risk and avoid creating incentives for Farmer Mac to engage in inappropriate risky activities. The stress test approach also provides greater flexibility to meet regulatory requirements than is available in traditional capital requirements. For instance, the stress test approach recognizes risk-mitigating activities. As an example, Farmer Mac may meet its risk-based capital needs by reducing risk and/or increasing capital.

III. Summary of Comments Received

We received six comment letters in response to the proposed rule. We received a comment letter from Farmer Mac, three from Farm Credit Banks (FCBs) who support the comments provided by Farmer Mac, one from the U.S. Department of the Treasury (Treasury), and a follow-up letter from Farmer Mac. The commenters generally supported the proposed rule and the risk-based capital stress test. However, the commenters did provide remarks on certain aspects of the proposed rule and stress test. These specific issues are discussed individually in the following sections of this preamble.

IV. Response to Comments on the Risk-Based Capital Stress Test

The principal objective of the risk-based capital standard is to ensure that Farmer Mac has sufficient capital to remain solvent in the face of extreme stressful economic conditions. Therefore, we focused our efforts on developing a risk-based capital stress test to reflect the risks inherent in Farmer Mac's various business activities. We incorporated, as required by the Act, consistent relationships between the economic environment of the stress period and Farmer Mac's business activities. To do so required modeling Farmer Mac's assets, liabilities, and off-balance sheet positions with sufficient detail to capture the risk characteristics. However, we recognize that as the level of detail in the stress test increases so does its complexity and the time and resources required for its implementation. Thus, we worked carefully to maintain an appropriate balance between the model's complexity and its applicability.

Overall, the commenters uniformly supported our efforts in developing a stress test for Farmer Mac that adheres to statutory requirements and contains an appropriate level of detail given Farmer Mac's current size and level of business activities. Farmer Mac noted in its comments that the FCA made significant strides toward the promulgation of a final rule that would comply with the terms and intent of the Act. Farmer Mac remarked that our most significant achievement was proposing a risk-based capital stress test with a high level of operational simplicity that can be performed using well-defined data inputs in a spreadsheet format. We agree with the commenters that this approach helps us to meet the requirements of the Act that the model be made available for public review and eases the regulatory burden on Farmer Mac for performing the final risk-based capital stress test, at least quarterly, or as needed.

Commenters also recognized the many challenges and limitations that we faced. Commenters realized that the task of designing and implementing an appropriate risk-based capital stress test is not simple. Farmer Mac identified numerous constraints on the development of the stress test, including conceptual and methodological issues relating to the limited availability and quality of historical data; model specification and estimation; and application of economic stress assumptions meeting the requirements of the Act. Farmer Mac added that, in many respects, we have succeeded in identifying and integrating the relevant sources of credit and interest rate risks into the risk-based capital model.

Treasury also commented on the challenges we encountered in developing the risk-based capital stress test for Farmer Mac. Treasury cited two key constraints in measuring agricultural mortgage credit risk:

- Models of agricultural mortgage default are much less developed than those for residential mortgage default; and

• Available agricultural mortgage performance data are highly limited compared to those for residential mortgage performance.

Treasury further commented that the lack of comprehensive literature on agricultural mortgage performance makes evaluation of the loss frequency model difficult. Treasury encouraged us to work with Farmer Mac and the Farm Credit System (FCS or System) in building a comprehensive agricultural mortgage database to help develop a better understanding of the determinants of agricultural mortgage performance.

Commenters encouraged us to develop a conditional default model in future revisions to the stress test when more data become available. Commenters contend that many of the conceptual and statistical issues raised from the use of a lifetime default model would be reduced with a conditional default model, but conceded that current data limitations could create a different set of issues affecting the implementation of a conditional default model.

We found that, from a statistical perspective, lifetime default models that used information based on origination and subsequent economic information were consistently more reliable than conditional default models. Specifically, the conditional models we reviewed were difficult to implement given that the Farm Credit Bank of Texas (FCBT) estimation data contained no updated information on underwriting variables through time or other ancillary conditioning variables. As a result, using the FCBT data to estimate a conditional model would require the reuse of independent underwriting variables at the origination values, or the development of other assumption-driven methodologies, to forecast conditioning variables through time. Repeating the same origination values during each year of a loan's life would not be an accurate reflection of loan performance through time and creates an artificial correlation among the independent variables. A true conditional model would be difficult to implement because the interest rate stress specified in the Act is a one-time instantaneous change to current interest rates. Whereas, both the current interest rate level and subsequent interest rate changes are likely to be significant drivers in a conditional model.

We are committed to periodically evaluating the stress test and refining it to improve its effectiveness as a regulatory tool. However, a significant period of time may be needed to collect and analyze new data for the process of updating the risk-based capital stress test procedures. The ongoing nature of the risk-based capital stress test will enhance our understanding of how changes in Farmer Mac's business activities affect its risk profile and resulting capital requirements and help us identify needed improvements. We support the suggestion that we should work closely with other agricultural mortgage lenders to encourage the development of loan-level databases so that our understanding of the factors affecting agricultural mortgage performance will be enhanced.

Although commenters provided general support for the proposed stress test, they also had a number of specific comments, objections and suggestions on certain components of the stress test. We have incorporated a number of changes into the stress test in response to the commenters' suggestions. The two most significant changes we incorporated were in response to comments received from Farmer Mac. As suggested by Farmer Mac, we modified our methodology for modeling the effect of loan size on the probability of loss and included the tax effect associated with gains and losses on marketable investments due to changes in interest rates. These changes, as well as others, are discussed in detail in the following responses to specific comments on the stress test components.

A. Credit Risk Component

1. Selection of a Stressful Economic Scenario for Land Value Change

The Act requires that we determine the rate and severity of losses occurring in contiguous areas of the U.S., containing an average of not less than 5 percent of the population, and exhibiting the highest rate of default and severity of agricultural mortgage losses for a period of not less than 2 consecutive years. As explained previously, we refer to this rate as the benchmark loss rate. The Act further requires that the losses used in the stress test must be ''reasonably related'' to the benchmark loss rate. To identify the benchmark loss rate, we conducted extensive searches for historical agricultural mortgage data.

We commissioned a study to identify the worst-case historical loss experience, as required by the Act. We published the study entitled ''Risk-Based Capital Regulations for Farmer Mac: Loan Loss Estimation Procedures'' for comment in the **Federal Register** on July 28, 1998 (Study).[5] Farmer Mac commented on the Study, and we discussed those comments in the preamble to the proposed rule.

We found two data sets with historic loan-level agricultural mortgage losses, one from the former St. Paul FCB and one from the FCBT.[6] The Study identified the FCBT as the most reliable data source. Although the FCBT data was the most reliable, it did not represent the worst agricultural mortgage loss as required by the Act. Therefore, we used a statistical procedure of extrapolation to determine the worst-case loss experience.

To implement the extrapolation, we used accepted statistical approaches to estimate a relationship from the FCBT data using information observable in all regions in the U.S. We analyzed the relationship between land value changes and loss rates in the FCBT data. We then applied the relationship observed in Texas to other states to estimate loss rates in other regions. It is necessary to use sample data to estimate relationships that exist in the population. We used the FCBT data as a sample data set for understanding the relationship between the land value change and losses nationwide. The extrapolation process identified the worst-case agricultural mortgage loss region as Minnesota, Iowa and Illinois during the 2-year period of 1983–1984.[7]

The primary variable used in the extrapolation was the change in farmland values. The change in farmland value is also the primary variable used in the default equation of the risk-based capital stress test. We incorporated Farmer Mac's current risk characteristics with the extrapolated farmland value decline for the worst-stress time period to determine the benchmark loss rate.

Farmer Mac provided several comments related to the proposed use of the stressful economic scenario for land value change derived from the Study. Farmer Mac asserts we proposed applying a credit stress scenario, based on the Study, that does not meet the requirements of the Act. Farmer Mac also contends the Study contains empirical and methodological shortcomings that invalidate both the

[5] *See* 63 FR 40282.

[6] In its comments, Farmer Mac agrees that the only available data for agricultural mortgage losses is in the former St. Paul FCB and the FCB of Texas.

[7] The extrapolation process yielded estimated historic time series of loan loss rates on Farmer Mac eligible loans for each state of the U.S. Using these historic data series, a ranking was compiled of 2-year loss rates for contiguous regions representing at least 5 percent of the 1990 U.S. population. The worst-case region contains Minnesota, Iowa and Illinois during the 1983–1984 time period with a 2-year loan loss rate of 4.18 percent.

proposed benchmark region and the related land value decline.

Farmer Mac proposed an alternative benchmark region and related credit stress scenario based on data from the FCBT without extrapolation. Farmer Mac believes its method is fully consistent with the Act and can be validated by actual credit loss data. Three FCBs supported Farmer Mac's comments on the benchmark loss issue and use of the FCBT data without extrapolation as the benchmark loss data.

Farmer Mac also commented that we did not adequately respond in the proposed rule to its comments on the Study. We believe we have been fully responsive to Farmer Mac. In the preamble to the proposed rule, we responded directly to Farmer Mac's comments that were relevant to how the Study was used in the proposed stress test. In addition, following publication of the Study, we provided Farmer Mac additional information on, and an explanation of, the Study in response to its questions and comments. We also met with Farmer Mac on many occasions to discuss the Study and other stress test issues.

a. Historical Loan Loss Data and Consistency With the Act

Farmer Mac commented that actual default and loss experience do not substantiate the proposed benchmark loss information because loss data for Farmer Mac-eligible loans do not exist for the three-state region identified as the benchmark region. Farmer Mac asserted that the Study does not meet the requirements of the Act because Congress mandated the use of actual, historic loss rates and not estimated rates. Farmer Mac suggested two alternatives to using actual, historic loss rates. Farmer Mac stated that we could have used the former St. Paul FCB data as the benchmark loss data. Alternatively, Farmer Mac contended that the FCBT data represented the worst-case agricultural mortgage loss data and are usable without estimation. Finally, Farmer Mac compared FCA's task to that of the Office of Federal Housing Enterprise Oversight (OFHEO) and asserted that OFHEO rejected the use of estimated data as the benchmark loss data.

First, we respond to Farmer Mac's comment that we could have used the St. Paul data as the benchmark loss experience. We do not believe the St. Paul data represent clear, definable losses that would be suitable for use in the stress test. The St. Paul FCB used loan workout techniques, such as restructuring and forbearance, that resulted in fewer foreclosures. As a result, losses were spread out over longer periods of time, operating expenses reflected higher loan management and forbearance costs, and earnings were reduced from rate concessions. In addition, loan restructurings resulted in some direct losses from partial debt forgiveness. Consequently, the direct charge-offs reported in the loan data from the St. Paul FCB region do not represent total regional losses.

Also, some areas of the St. Paul district were subject to a foreclosure moratorium for a portion of the sample period. In order to use the St. Paul data, we would have had to determine the impacts that forbearance procedures had on lending costs. We would also have had to use lost earnings as proxies for the loan loss rates to use the St. Paul data for the stress test. We determined that using the St. Paul data would not have been feasible given the large number of assumptions necessary to construct appropriate measures of credit loss from the St. Paul data. The FCBT did not use restructuring and forbearance to any substantial degree. The FCBT recorded immediate, quantifiable losses, making the data more reliable and verifiable, which results in a more reliable and verifiable stress test than if the data from the former St. Paul FCB were used.

Next, we respond to Farmer Mac's comment that we could have used the FCBT data without extrapolation. Farmer Mac claimed that use of the FCBT data without extrapolation is appropriate for the following reasons: The Act requires actual historical losses rather than estimated data; the FCBT data are the worst-case data (rather than Iowa, Illinois, and Minnesota); and the Texas losses are higher than any that might be seen in the future.

In initial comments on the Study, Farmer Mac asserted that the Act requires the FCA to use the FCBT data as the worst-case agricultural mortgage losses because it believes the Act requires the use of actual, historic losses rather than estimated losses. We responded to this comment in the proposed rule. As stated in the preamble to the proposed rule, the Act directs us to use the worst-case experience, not simply the worst-case data that are available. We continue to believe that using an extrapolation process permits us to reasonably identify the worst-case region as required by the Act.

We concluded that Texas was not the region in the U.S. with the worst-case loan losses based on the well-documented geographic distribution of financial stress and losses experienced by both farmers and agricultural lenders. In fact, the historical geographic distribution of farm financial stress and loan performance problems show that the greatest stress occurred in the Corn Belt, Lake States, and Northern Plains regions in 1984. Support for this conclusion is provided in the experience of the System, financial assistance provided by the Financial Assistance Corporation (FAC), and in an Economic Research Service (ERS) report entitled ''Loan Repayment Problems of Farmers in the Mid-1980s.'' [8] Based on an analysis of allowance for loan losses, the FCS experience of credit stress shows that the FCBT was the sixth worst of the eight Farm Credit banks.[9] In addition, substantial FAC assistance was provided to several FCBs other than the FCBT.[10] Lastly, the ERS report concluded that Texas ranked fourth worst for farms most affected by financial stress during 1984 to 1986 and third from 1987 to 1989. The report also consistently identified the upper Midwest as the focal point of farm stress in the 1980s, a result that is consistent with the findings of the Study. This evidence clearly shows that the State of Texas did not experience the worst historical agricultural mortgage losses.

Farmer Mac's contention is that the FCBT data must be used because the losses are higher than any losses that are likely to occur in the future. A comparison of the historic losses to ''possible'' future losses is not a relevant consideration for determining the benchmark loss rate in the Act. The benchmark losses must be higher than other losses experienced in history, not in the future, in order to be used as the benchmark for the stress test.

Finally, we believe that Farmer Mac's comparison of the benchmark used by OFHEO and the proposed stress test benchmark is invalid. Accurate, quantifiable data reflecting a wide geographic scope of housing mortgage losses are available to OFHEO to determine the worst-case benchmark housing mortgage losses. Despite an exhaustive search, we were not able to identify accurate, quantifiable, and geographically broad data to directly identify the agricultural mortgage loss

[8] Hanson, G., A. Parandvash, and J. Ryan. Loan Repayment Problems of Farmers in the Mid-1980s, AGR Report No. 649, ERS, USDA, 1991.

[9] Although more than 8 banks existed in the 1980s, this ranking is expressed in terms of the banks in existence at the time of the Study.

[10] FAC provided assistance to four banks in the amounts of $90 million for the FCB of Louisville, $133 million for the FCB of St. Paul, $107 million for the FCB of Omaha, and $89 million for the FCB of Spokane. The financial assistance was provided to strengthen their capital positions and for other purposes.

benchmark other than the Texas data. Thus, a comparison of our use of extrapolation and the lack of extrapolation by OFHEO is not appropriate.

After considering these comments, we are making no changes to the final rule in this area.

b. Underwriting Screens Applied to the FCBT Data

In the Study to determine the benchmark loss rate, we used underwriting standards in order to screen the Texas data and identify loans in that portfolio that could be considered ''qualified loans'' for Farmer Mac's programs under the Act. Farmer Mac commented that the underwriting screens applied to the historical FCBT data in the Study were different from those used in estimating the loss-frequency equation in the proposed rule.[11] As a result, Farmer Mac stated that the Study included loans inconsistent with Farmer Mac's current underwriting practices. Farmer Mac stated that the benchmark worst-case land value decline was invalid because it was developed using underwriting standards different from those used to estimate the loss-frequency equation used in the stress test. We address consistency with Farmer Mac's current loan-underwriting practices in a later section entitled ''Data Screens Applied in Estimating the Loss-Frequency Equation.''

Farmer Mac is correct that different underwriting screens were used in the Study and in estimating the loss-frequency equation in the stress test. To respond to the comment, we analyzed the FCBT data using data screens consistent with those used in the loss-frequency equation estimation.[12] Based on this analysis, we concluded that using either set of data screens leads to the selection of the same worst-case region and explanatory variable of land value change. Because the explanatory variable is the same, the ranking of the State-level losses is unchanged. The worst-case region remains Minnesota, Iowa, and Illinois during 1983–1984. Therefore, the 23.52 percent average 2-year land value decline for the worst-case region is an appropriate stressful input to use in the risk-based capital stress test and is consistent with the underwriting screens used in the risk-based capital stress test. It is not necessary to make any changes to the final rule because the use of different screens in the Study does not change the outcome of the Study.

Based on Farmer Mac's comment on the Study, we reviewed all aspects of the credit risk estimation procedures to ensure that consistent underwriting screens were applied throughout the stress test. As a result, we made a technical modification to the loan-seasoning adjustment as discussed in the later section entitled, ''Miscellaneous Technical Changes.''

c. Other Technical Comments on the Study

The proposed rule generated numerous comments on technical aspects of the Study, other than those already discussed. We address these comments in this section.

Farmer Mac commented that the FCBT data used to estimate the loss-frequency equation must be from the 2-year worst-case benchmark time period. Farmer Mac further observed that this benchmark is based on a worst-case land value decline occurring in 1984 and 1985 before losses occurred in the FCBT data. We believe Farmer Mac misunderstood the relationship between the benchmark land value change used in the stress test and the estimation and application of the loss-frequency equation in the stress test. There is no requirement for the time periods to be identical. The losses for other regions are based on maximum land value declines that occurred at different points in time, so the difference in timing is not consequential. Thus, the time period of losses occurring in the FCBT data set is not relevant to the use of the land value decline in the risk-based capital stress test.

Farmer Mac further suggested that a better approach would be to use the land value decline in Texas of 16.69 percent that actually occurred during the time period of the FCBT data. However, this land value decline is significantly less than those occurring elsewhere in the nation. As we have previously discussed, we know that other regions experienced greater losses than those that occurred in Texas. To comply with the Act, we must use the land value decline input in the stress test that corresponds to the worst-case historical agricultural mortgage losses.

Farmer Mac also noted that in the proposed rule, we recognized that the proposed land value decline of 23.52 percent exceeded the 16.69-percent decline occurring in the FCBT data used to estimate the loss-frequency equation. Farmer Mac claimed the use of a land value decline exceeding the decline found in the estimation data could result in unreasonably large loss rates. Farmer Mac suggested that we use the 16.69-percent land value decline as the stressful input in the loss-frequency equation, rather than the proposed adjustment for restricting the slope of the loss-frequency equation, to account for the possibility of unreasonably large loss rates.

We respond that the 16.69-percent FCBT land value decline is not the worst-case that occurred. The proposed 23.52-percent land value decline is more appropriate and consistent with the requirements of the Act. Restricting the slope of the loss-frequency equation is a reasonable approach to address the nonlinear nature of the loss-frequency equation when using inputs beyond those observed in the estimation data. We did, however, slightly adjust the technical calculation of the slope adjustment for other reasons as discussed in the later section entitled, ''Miscellaneous Technical Changes.''

Farmer Mac further commented that the application of the land value decline in the risk-based capital stress test is unnecessarily complex. Although our approach for restricting the slope of the loss-frequency equation is somewhat complicated, it directly addresses the difference between the 23.52-percent land value decline that occurred in the worst-case region and the maximum 16.69-percent land value decline that occurred in the FCBT data used to estimate the loss-frequency equation. We conclude that the proposed approach is an appropriate application of the stress scenario in the risk-based capital stress test and that it complies with the Act's requirement to use the worst-case region in the stress test. Thus, we made no changes to the benchmark land value decline as a result of these comments.

Although we are making no changes to the benchmark land value decline specification, we will study any new agricultural mortgage loss information and update the benchmark loss rate as appropriate. We note, however, that replacing the extrapolated benchmark data with direct, verifiable data requires the agricultural mortgages in a region (meeting the statutory criteria) to experience a loss situation that mirrors or exceeds the farm crisis of the 1980s. If such a loan loss situation occurs, we will examine loan portfolio data from Farmer Mac, the FCS, and other agricultural lenders in considering any changes.

[11] The loss-frequency equation is often referred to by commenters as the default model, lifetime default model or credit loss model. However, we use the term ''loss-frequency equation'' throughout because the equation was estimated based upon the occurrence of a loss in the screened FCBT data and not the occurrence of a default.

[12] See Farmer Mac's June 12, 2000, comment letter for the data presented in the column of Table 2 that represent the loan charge-off rates based upon data screens used for the estimation of the loss-frequency equation.

2. Distribution of Credit Loss by Exposure Years

After determining the rate and sensitivity of loss to apply in the stress test, we had to determine a reasonable way to apply that stress over the 10-year period. We proposed to distribute age-adjusted lifetime losses through time on a deterministic path that provides a stressful scenario. The proposed deterministic time path for converting from origination year to exposure year credit losses was 43 percent in year one, 17 percent in year two, 16 percent in year three, and 3.4 percent in each of the last 7 years.

Farmer Mac raised a number of conceptual issues with the proposed methodology for distributing credit losses by exposure year and suggested an alternative solution. Among the concerns Farmer Mac raised with our proposed approach were:

- Using single-year events appears to be inconsistent with the Act. The Act requires the use of a 2-year period for applying rates of default in the stress test.
- The loss allocation pattern aggregates and redistributes loan loss into a deterministic path in a manner that did not occur in history. The distribution of losses is not representative of any actual exposure year loss experience of loan cohorts in the FCBT data. Instead, it selectively concentrates the historical experiences of different loan cohorts across a range of exposure years into a single year of the stress test.
- The allocation method does not control for truncated default and loan loss effects, which could cause the losses to be biased upwards in origination years with limited default information.
- The distribution of the losses is inconsistent with the beta loss distribution used to derive State-level seasoned adjusted loan loss. The redistribution of loan losses obscures the relationship between loan age and the timing of loan losses established by the beta loss distribution.

Each of these concerns is addressed in turn in the following discussion.

First, we believe Farmer Mac has mistakenly concluded that the 2-year time period requirement in the Act applies to the distribution of losses in the stress test. The Act requires that the frequency and severity of loan losses used in the stress test must reasonably relate to a benchmark historical loss period of at least 2 consecutive years. We have complied with the 2-year requirement in the Act by using the land value decline from the 2 worst loss years, as determined by the Study, in the credit loss model to determine the loss frequency rate used in the stress test. The Act does not, however, prescribe how we must distribute the loss frequency over the 10-year stress period. Therefore, we applied a reasonable methodology to determine the most appropriate way to allocate the benchmark loss stress over the 10-year stress period required by the Act.

Second, Farmer Mac commented that the loss allocation pattern aggregates and redistributes loan loss into a deterministic path in a manner that did not occur in history. Section 8.32 of the Act does not require the allocation pattern to exactly replicate a specific historical pattern.[13] The Act requires that the rate be ''reasonably related'' to the historical data. Accordingly, we constructed a stressful allocation pattern that is reasonably representative of the historical data. In developing the stress test, we were required to identify a reasonable, but stressful pattern of losses. Among the choices considered in developing the proposed rule were to: (i) Place all origination losses into a single-exposure year; (ii) estimate a function to capture the time dependence observed in portfolio-level losses; (iii) sort in descending order from the maximum observed losses in any given cohort-exposure year as the sequence of maximum possible stress to minimum stress and take the top 10 (normalized to sum to one), or; (iv) use empirically guided descriptors from the limited data on losses available to construct a plausible, but stressful loss pattern.

In constructing the loss-allocation pattern, the limitations of the data led to our choice of the fourth approach, appropriately relating the FCBT data to the stressful conditions employed in the stress test.

Farmer Mac and other commenters also pointed to the significant data problems as barriers to implementing certain theoretical approaches. The data provide a relatively short loss observation window, and the observed loss levels contain unknown total lifetime losses. Thus, we concluded that simply taking the 7 years of data as the only possible loss values and arranging them into a specific time pattern that represents stress was not the most realistic method to characterize the stressful conditions required by the Act. We selected an average of the maximum 1-year, 2-year, 3-year, and so on, loss rates as the method to allocate losses. We used the cohort-weighted average of the individual loss rates to control for the influence on the relative loss rates of the shorter observation window of the latter originations. As a result, no individual loss rate observations were used independently from cohort-weighted averages to determine the loss pattern. This procedure prevents a single individual observation from becoming the maximum used to determine the exposure-year loss pattern. As a result, this procedure avoids the use of the maximum individual exposure-year loss occurrence of 91 percent observed in the data as the maximum loss rate when determining the exposure-year loss pattern.

Third, Farmer Mac also stated that the proposed allocation method does not control for truncated default and loan loss effects. The potential truncation bias referred to by Farmer Mac should be viewed relative to the overall application of losses within the stress test. Losses are estimated using a loss-frequency equation that only included losses observable in the data window. We believe it would not be appropriate to forecast loan activity occurring outside of the 7-year time period of the data set. As a result, the observed losses were truncated for loans with remaining lives at the end of the observed data window, including loans originated near the end of the data window. We believe the methodology selected to allocate losses into exposure years is appropriate due to the limitations of the available data.

Fourth, Farmer Mac suggested that the distribution of the losses is inconsistent with the beta-loss distribution used to derive State-level, age-adjusted loan loss totals. It contended that the redistribution of loan losses obscures the relationship between loan age and the timing of loan losses established by the beta distribution. In response, we note that the State-level loss totals are based on loans that are individually age-adjusted using a beta distribution as the seasoning function. The beta distribution was not estimated from, nor intended to reflect, the portfolio-level pattern of those losses through time. The loan-level ''unconditional'' seasoning effects (wherein cohorts were pooled across origination time in estimation) are not the same as the explicitly ''conditional'' time period effects (explicit dependence on a specific time period) that result in non-uniform, loss-allocation patterns at the portfolio level. Thus, we believe use of the beta distribution is not the appropriate method to control allocations of portfolio-level losses

[13] Also, using the 7-year historical pattern found in the historical data directly as the loss pattern would not account for the allocation of losses over the entire 10-year period of the stress test.

through time. Whereas, using different distributions for the loan seasoning and allocation effects is a logical and consistent application in the stress test. These two functions are inherently separate and it is not appropriate to apply the same distribution for both effects. We are not adopting Farmer Mac's comment in the final rule.

3. Data Screens Applied in Estimating the Loss-Frequency Equation

Our objective in determining the loss-frequency equation is to estimate the relationships between loss frequency and the independent variables that help explain loss frequency. Farmer Mac's comment raised concerns with the data screens used to select FCBT farm mortgages for estimating the loss-frequency equation. Generally, Farmer Mac contended that the data screens are not representative of its current loan underwriting practices and, therefore, the data includes loans Farmer Mac would not make today. Before we address Farmer Mac's specific concerns with the data screens, we first summarize the proposed data screens.

As noted in the proposal, the FCBT farm real estate loans used to estimate the loss-frequency equation had to satisfy at least three of four underwriting standards. This approach was intended to include estimation data encompassing ranges of data observed or potentially observed in Farmer Mac's current portfolio. The four data screens specify that: (1) The debt-to-asset (D/A) ratio must be less than 0.50; (2) the loan-to-value (LTV) ratio must be less than 0.70; (3) the debt-service-coverage ratio (DSCR) must exceed 1.25; and, (4) the current ratio (current assets divided by current liabilities) must exceed 1.0. Farmer Mac's procedures permit it to waive complete compliance with its underwriting standards if a loan is judged to have appropriate offsetting strengths. Accordingly, in our approach, we required that loans satisfy at least three of the four specified data screens. In addition, we restricted the D/A and LTV ratios to be less than or equal to 0.85.

Farmer Mac objected to our use of the three-out-of-four screening approach and the use of D/A and LTV ratios less than or equal to 0.85. Farmer Mac contended that the screening was incorrect because it misinterprets Farmer Mac's loan underwriting standards and practices. Farmer Mac's standards and practices ensure that any one standard exception/deficiency is duly offset by a compensating surplus/strength in another standard. It argues that the high LTV loans found in its portfolio relate solely to part-time farmer loans, which have additional compensating factors mitigating risk exposure. Farmer Mac referenced its policy of restricting the purchase of full-time farm loans with LTVs greater than 0.70.

Prior to publishing the proposed regulation, we reviewed portions of Farmer Mac's loan portfolio and found several instances where D/A and LTV ratios exceeded 0.50 and 0.70, respectively, with values of both ratios rarely exceeding 0.85. In the Farmer Mac data reviewed, 3.3 percent of the loans and 3.1 percent of the outstanding loan balances had LTV ratios exceeding 0.70. In response to Farmer Mac's comment, we reviewed and evaluated Farmer Mac's current loan portfolio characteristics for the 3 most recent quarters to determine if the screening criteria were appropriate. In our review of the March, June, and September 2000 Farmer Mac loan portfolios, we found numerous loans with LTV ratios greater than 0.70 that were to full-time farmers. For instance, at September 30, 2000, Farmer Mac's loan portfolio included 5.7 percent of loans and 3.0 percent of the origination loan balances, where the LTV ratios exceeded 0.70.[14] Of this group, 0.7 percent of loans and 1.1 percent of origination loan balances were full-time farmer loans. Part-time farmer loans with LTV ratios exceeding 0.70 represented 5.0 percent of loans and 1.9 percent of origination loan balances. We also found several instances of full-time farmer loans where D/A ratios exceeded 0.50. Given the characteristics of loans in Farmer Mac's portfolio, we conclude that the proposed data screens are reasonably consistent with its current underwriting practices. Therefore, we did not modify the data screens in the final rule.

We further note that the data screens used permit the estimation of the relationships across the entire range of data observed in Farmer Mac's portfolio. For instance, the use of the maximum values for LTV and D/A and the three of four standards requirement is intended to include data in the estimation sample that ''could'' occur in Farmer Mac's portfolio. Having a complete data set for estimating the loss-frequency equation is essential to appropriately estimate the relationships between underwriting variables and the frequency of loss.

We must apply a varied set of data screens to the FCBT data because Farmer Mac uses a varied set of underwriting practices based on the economic environment and other subjective factors. More importantly, the econometric methods we used to estimate the relationships between independent variables use nonlinear specifications of some variables. A rich data set is needed to estimate the nonlinear relationships and should include, if available, data across the entire range in which the relationship will be applied. Restricting the data to only data that met all underwriting criteria at any given time could restrict the estimation of the nonlinear relationship as well as exclude data that could be used to estimate the relationships. The data screens used provide a data set sufficiently rich to correctly estimate the loss-frequency equation, including the nonlinear relationships. The data screens result in selection of FCBT loans that span all observed underwriting characteristics found in Farmer Mac's portfolio.

4. Specification of the Loan-Size Variable Used in the Loss Frequency Model

We proposed using several variables to determine losses in the risk-based capital stress test. Specifically, we use a multivariate model to project credit losses. One of the proposed explanatory variables used in the loss-frequency model is loan size (SIZE) expressed in 1997 dollars. This variable is stated in absolute dollars, whereas all other variables are expressed as ratios (D/A and DSCR) or percentages (LTV and LANDVAL).[15] The LTV variable is represented as a nonlinear power function and LANDVAL is discounted by the age of the loan at the time of the maximum land value decline.

Farmer Mac commented that the loan-size variable disproportionately impacts projected loss frequency, regardless of the values of other underwriting variables, such as LTV and DSCR. Farmer Mac noted that for large loans, the loan-size variable dominates the lifetime default relationship and results in unrealistically high rates of default, even at low values of LTV and high values of DSCR. Farmer Mac stated that the estimated coefficient of SIZE is positively biased for relatively small and relatively large loans. Farmer Mac commented that loan size dominates the impacts of all the other explanatory variables for larger loans and causes the model to project extremely high loss frequency.

For these reasons, Farmer Mac suggested we re-estimate the loss-frequency model using a nonlinear specification for the loan size variable,

[14] All loan portfolio percentages are based on origination loan volume.

[15] LANDVAL refers to the maximum percentage land value decline.

consistent with the treatment of other variables such as LTV and LANDVAL. Farmer Mac explained that including this nonlinear specification for the impact of loan size on the lifetime probability of loss frequency improves the ability of the stress test to measure the actual risks of Farmer Mac's business.

We agreed with Farmer Mac's general assessment regarding the use of the linear specification for loan size and re-evaluated its use in the stress test. During the development of the model, we originally adapted and accepted the linear specification from Farmer Mac's preliminary modeling efforts to maintain some consistency with Farmer Mac's independent modeling efforts. We found that a linear specification of the loan size was adequate for use in the stress test because it generally had the desirable intuitive and statistical properties. The proposed specification was consistent with our observation that large loans resulted in higher loss frequencies and could have a material adverse impact on an institution due to size. After further analysis in response to the comment, however, we found that the FCBT data supported the use of a nonlinear specification for the SIZE variable. Although we observed that measured losses increase as loan size increases, the actual loss rate does not increase linearly with loan size. Thus, we re-estimated the model using a nonlinear estimation procedure to simultaneously estimate coefficients and nonlinear parameters for the model. Similar to maximum likelihood techniques for solving standard logit problems, this procedure minimizes the likelihood function.

We made nonlinear transformations to three independent variables: (1) LTV, (2) maximum land price decline, and (3) loan size. A functional form is required of each nonlinear variable. We chose the same forms as proposed for LTV and maximum land price decline. The functional form selected for loan size incorporates the observed relationship between loan size and frequency of default. The FCBT data suggest that frequencies of loss increase as loan size increases, but the rate of loss frequencies tends to increase at a decreasing rate as loan size increases. Within this relationship, the amount of dollar losses always increases as loan size increases. The form of the transformation we chose is:

$1\text{-}\exp(-\beta_8 \cdot \text{Age-adjusted loan size})$

The size of β_8 impacts the change in the loss frequency rate relative to the change in loan size. The transformation results in lower loss rates for both small and large loans as compared to the proposed loss-frequency equation. For smaller loans, a given change in loan size has a greater impact on loss rates than for larger loans.

The following table displays the estimated dollar losses and loss rates for various sized sample loans from the application of: (1) The proposed model, (2) the model suggested by Farmer Mac, and (3) the revised model (final rule).

Loan size (000's)	Proposed rule loss amount/rate ($/%)	FAMC example loss amount/rate ($/%)	Final rule loss amount/rate ($/%)
$50	$531/1.063	$222/0.444	$142/0.284
100	1,106/1.106	444/0.444	644/0.644
300	3,894/1.298	10,231/3.410	9,880/3.293
500	7,601/1.520	31,070/6.214	26,533/5.307
750	13,859/1.848	46,604/6.214	46,823/6.243
1,000	22,387/2.239	62,139/6.214	64,945/6.495
2,500	158,136/6.325	155,349/6.214	164,521/6.581
5,000	789,818/15.796	310,698/6.214	329,042/6.581

Notes: Loan size is shown in thousands and loss rates are shown as percentages. We calculated the estimated dollar losses and rates by varying the origination principal balance for an individual loan with the following characteristics.
Loan Origination Year: 1996.
Loan Age: 4 years.
LTV at Origination: 0.5.
D/A at Origination: 0.5.
DSCR at Origination: 1.3984.
Percentage Land Value Change: −23.52.
Loss severity: 20.9%.
Dampening factor: 4.133%.

The table shows that the final rule loss-frequency equation results in dollar losses and loss rates comparable to the example equation that Farmer Mac supplied and supported in its comments. As discussed previously, the dollar losses and loss rates increase at a decreasing rate and, thus the impact of a change in loan size on loss rates is greater for smaller loans. As shown in the table, dollar losses and loss rates increase significantly as the size of the origination principal outstanding changes from a small amount (e.g., $50,000) to a moderate amount (e.g., $300,000). As anticipated, the table further shows that dollar losses and loss rates increase at a lower rate as origination principal loan size changes from a large amount ($1,000,000) to a very large amount ($2,500,000). The model presented by Farmer Mac has a fixed ceiling on loss rates for loans greater than $500,000, whereas the loss rates in the final rule equation increase by an ever-smaller amount as loan size increases.

As can been seen in the table, the originally proposed specification caused dollar losses and loss rates to increase significantly at larger loan sizes. By comparison to the final rule, the proposed specification may have understated losses on moderately sized loans and may have overstated losses on larger sized loans—a point made by Farmer Mac in its comment letter. The nonlinear relationship is supported by the FCBT data and is consistent with expectations. Overall, the treatment of loan size adopted in the final rule provides a better specification of the relationship between loan size and losses.

5. Use of a Constant Loss-Severity Rate To Determine Credit Losses

We proposed a constant loss-severity rate of 20.9 percent on all mortgages in Farmer Mac's portfolio. The loss-severity rate was calculated by taking the average loss rate of defaulted loans in the FCBT data, weighted by loan volume. To calculate expected age-adjusted lifetime losses on individual loans, the loss-severity rate is essentially multiplied with loss-frequency

probability, origination loan size, and an appropriate age-adjustment factor.[16] We selected the constant severity rate after determining that the FCBT data provided insufficient evidence to the contrary. No significant statistical relationship was found between loss-severity rates and various independent indicators in the FCBT data.

Farmer Mac and the FCBs objected to using a loss-severity rate of 20.9 percent for all mortgages. Principally, commenters noted industry practice of varying loss-severity rates to account for different credit risk profiles of mortgages, especially LTV ratio categories. Although Farmer Mac acknowledges that the FCBT data may not provide the expected relationships between the loss-severity rate and LTV ratios, it contends that industry practice and academic research clearly indicate that these relationships exist. Farmer Mac further commented that applying a constant loss-severity rate would discourage risk-based pricing and suggests all borrowers would be charged the same interest rate, contrary to efficient market theories. Additionally, Farmer Mac commented that loss-severity rates on older loans, or loans with low original LTVs, are much lower due to the higher levels of borrower equity.

Farmer Mac suggested applying at least three different loss-severity rates, based on groupings of LTV ratios, as an alternative to the constant loss-severity rate for all mortgages. Farmer Mac provided independent research on agricultural mortgage losses and recommended a loss-severity rate of:

- 20.9 percent for mortgages with an LTV greater than 60 percent.
- 10.5 percent for mortgages with an LTV ranging from 40.01 to 60 percent.
- Zero for mortgages with an LTV that is less than or equal to 40 percent.

Farmer Mac presented no data to support this suggested application. Applying the average loss-severity rate to only the highest LTV category would result in lower total losses than supported by FCBT data.

Prior to publishing the proposed regulation, we met with Farmer Mac to discuss an approach for determining a loss-severity rate to use in the credit risk component of the stress test. Farmer Mac had also evaluated the FCBT data to determine whether a relationship existed between LTV and loan losses. Based on its own analysis, Farmer Mac concluded that the data were insufficient to estimate an acceptable loss-severity rate and concurred that when a richer data set becomes available, the loss-severity rate should be re-estimated. At that time, and based on its earlier efforts, Farmer Mac suggested a constant loss-severity rate of 20 percent may be appropriate based on its approach of averaging the loss-severity rate on defaulted loans that met its criteria in the FCBT data. We generally accepted Farmer Mac's initial approach.

It may be conceptually appealing to assume that loans with lower LTV ratios have lower loss rates than loans with higher LTV ratios. It may also be logical to assume that the equity buffers provided by borrowers help reduce loss exposure. We understand that residential mortgage research indicates different loss-severity rates should be applied to mortgages with different LTV ratios. As such, we carefully evaluated the proposal presented by Farmer Mac.

We found that the Farmer Mac proposal, which only applies the average loss-severity rate to the suggested top LTV category (*i.e.,* loans with LTV ratios greater than 60 percent), understates the expected total losses on Farmer Mac's loan portfolio, particularly compared to the losses found in the historical estimation data. To correct for this understatement, we analyzed loss-severity levels found in the FCBT data for the LTV categories suggested by Farmer Mac.

We performed additional analysis of the statistical relationship between LTV and loss-severity rates. Our data analysis confirmed the earlier results that there is no statistically significant relationship between LTV and loss-severity rates in the FCBT data. Therefore, we were unable to develop a statistically supportable method using available data to apply different loss-severity rates to various ranges of LTV ratios. In our analysis, the loss-severity rates we might have applied to various ranges of LTV ratios would have been arbitrary and without sufficient supporting data. We could have selected other approaches to loss severity, such as using the highest loss-severity rates observed by the data or the highest loss-severity rates over a 2-year period. However, such approaches would have produced extremely large expected credit losses not reasonably related to the historical FCBT data.

We also reviewed the study cited by Farmer Mac in support of its argument for varying loss-severity rates by LTV ratios on agricultural mortgages.[17] The study was intended to demonstrate the application of option theory to default. The analysis was based on changes in land values and did not reflect actual default or loss experienced by borrowers. The study was set up to show a certain outcome in a pre-determined way, and did not ''find'' that LTV is related to loss rates, only that such a relationship is assumed to exist in its model.

For the reasons noted above, we continue to believe that a constant 20.9-percent loss-severity rate, on average, reasonably reflects credit risk stemming from all agricultural mortgages in Farmer Mac's portfolio. Accordingly, the final rule requires Farmer Mac to use a 20.9-percent loss-severity rate for estimating loan losses on all its agricultural mortgages in its portfolio. When a more extensive data set becomes available, we will consider if the loss-severity rate should be re-estimated and evaluate other approaches to estimating the loss-severity rate on all loans.

6. Comparison of Actual to Predicted Losses Using Revised Loss-Frequency Equation and Unchanged Constant Loss-Severity Rate

As explained above, in response to comments received, we revised the loan size specification in the loss-frequency equation. We evaluated the revision by comparing the actual and estimated loss rates and amounts for all the FCBT loans for the years 1979 to 1992. To estimate the losses, we applied the revised loss-frequency equation, the unchanged constant 20.9-percent loss-severity rate, the appropriate maximum land value decline, and the loan-seasoning adjustment to the FCBT loan-level data. We then compared the estimated losses to actual losses observed in the actual FCBT data.

The comparison revealed that the revised loss-frequency equation and unchanged loss-severity rate performed well in replicating losses contained in the actual FCBT data. The predicted results are comparable to the actual loss rates and amounts found in the FCBT data. Our analysis estimates total losses over the entire sample period to be $10,341,616. Actual losses incurred total $9,805,472. The average of the predicted loss rates is 0.52 percent from 1979–1992, while the average of the actual rates is 0.50 percent. The maximum 1- and 2-year actual loss rates

[16] The example calculation of expected age-adjusted lifetime losses contained in Appendix A to subpart B, is separated into numerous steps for illustrative purposes. However, mathematically, several steps of the example calculation can be combined into a single step that calculates dollar losses by multiplying the final slope-adjusted loss frequency probability, loss severity, origination loan amount, and the appropriate age adjustment.

[17] See, DeVuyst, C.S., E.A. DeVuyst, and T. G. Baker. ''Expected Farm Mortgage Default Cost'' Agricultural Finance Review, Vol. 55, 1995 pp. 10–22.

in the FCBT data are 1.54 percent and 2.17 percent in 1985 and 1984–1985, respectively. The maximum 1- and 2-year loss rates estimated by the model are 1.26 percent in 1986 and 2.42 percent in 1985–1986.

To predict the losses, we applied the revised loss-frequency equation, the unchanged 20.9-percent loss-severity rate, ''actual Texas land price declines'', and the loan-seasoning adjustment. At the loan level, the largest discrepancies between the actual and predicted loss rates and amounts occur on loans originated in 1986 and 1987. As expected, many of the loan-level discrepancies are partly associated with using an average loss-severity value. Using an average loss-severity rate underestimates predicted losses on specific loans that have actual severity rates exceeding 20.9 percent and overestimates in other instances. However, at the portfolio level, using a weighted average loss-severity rate produces consistent results in predicted total portfolio loss rates and total-portfolio-dollar loss amounts.

7. Approximating Mortgage Performance Through Time

We used a dampening effect to reflect the econometric relationship between the land value change and the point in time in the life of a loan where loss is experienced. The dampening effect helps provide an appropriate structural representation of mortgage performance for the purpose of determining stressful credit losses.

Treasury asserted that the stress test contains two adjustment factors for loan age in the calculation of losses. Treasury stated that the first age adjustment is a result of applying the dampening factor to land value changes. The second is the loan-seasoning adjustment, which is applied after the constant loss-severity rate and loss frequency for a loan are combined to determine unseasoned dollar losses.[18] Treasury stated that these age effects could be estimated differently. Treasury suggested we estimate current LTV instead of using the original LTV.[19] Treasury explained that it may be possible to use loan-term information to amortize the origination balance through time to approximate the current LTV by updating the original property value. Treasury further commented that such a rough approximation might be conceptually more appropriate than making an adjustment to the effect of the decline in farmland values. Alternatively, Treasury suggested that a farmland price index that explicitly accounts for appreciation, if available, might be used. Treasury also suggested that loss severity and loan age could be more seamlessly tied together by directly relating loss severity, loan age at default and the origination LTV. We provide the following clarifications in response to Treasury's comments.

Treasury incorrectly indicated that the decline in the value of the property securing a 4-year old loan is assumed to be 4.3 percent (23.5 percent less the product of 4.8 percent and 4 years). Instead, the dampened decline in value of such a property is 19.5 percent ($23.5 (1 + 0.048) - 4 = 19.5$).[20] This calculation preserves much of the land value decline assumed in the model and provides a more appropriate model.

We believe that Treasury may have misinterpreted the dampening effect. We use a dampening effect to reflect the econometric relationship between the land value change and the point in time in the life of a loan that loss is experienced. Specifically, the 23.5-percent decline in agricultural real estate values is the stressful exogenous economic input in determining credit losses used in the stress test. When applying this land value decline in the loss-frequency equation, it is dampened for each year a loan has been in existence. This dampening of the stressful land value decline input is consistent with the relationship observed in the FCBT data of the effect of a land value decline on loss frequency. This relationship represents the impact that the timing of the land value change has on the loss-frequency probability. The dampening effect, however, does not take the place of the loan-seasoning effect on losses. The dampening effect also has no impact on loss severity.

Treasury asserted that the proposed loan-seasoning adjustment applied in conjunction with the constant average loss-severity rate gives Farmer Mac a substantial cushion. We do not believe the loan-seasoning adjustment provides Farmer Mac with a substantial cushion. In the model, we use average loss severity and the loss-frequency probability to determine the expected lifetime dollar losses before adjusting for loan seasoning. We then apply the loan-seasoning adjustment to provide an appropriate level of expected age-adjusted lifetime losses for use in the stress test. As a result, our approach appropriately considers the relationship between loan age and dollar loan losses. As previously discussed, the approach we used estimates losses that are comparable to the actual losses found in the historic FCBT data when stressful agricultural conditions occurred. There is no clear evidence of a substantial cushion being provided to Farmer Mac in our approach to predict age-adjusted lifetime dollar losses. Instead, the approach provides a level of stressful credit losses to use in the stress test that is reasonably related to actual historic losses.

Treasury further commented that, in reality, the loss-severity rate of 20.9 percent is actually the maximum loss severity. We generally agree with Treasury's observation. We note that the loss-severity rate is simply a fixed number, uniformly applied to all loans. The loss-severity rate is a constant and is not related to other variables. Thus, by its very construct, the rate is the maximum loss severity, and in fact the only loss severity, that can occur on an individual loan. As noted above, using a fixed loss-severity rate supports the calculation of an appropriate level of stress expected due to credit losses at the portfolio level. The term ''average loss severity'' was meant to be generally descriptive of how the loss-severity rate was determined from the FCBT data. We conclude that the use of the term ''average'' continues to be appropriate and that no change in the final rule is required.

We are unable to implement Treasury's suggestion to estimate the loss relationship to current LTV because the necessary loan terms are not available in the FCBT data. Therefore, it is not possible to directly calculate amortization schedules and prepayment patterns. We continue to believe that the use of the original LTV is more valid than an estimated LTV. The use of an estimated LTV depends on assumptions about changes in land value, interest rates, repayment arrangements, and other factors. In contrast, the use of the original LTV does not require such assumptions. We continue to believe that our approach effectively integrates loss-frequency probability, loss-severity, and loan-age effects.

8. Treatment of Long-Term Standby Loan Commitments

Farmer Mac commented that the proposed rule has an inconsistency in

[18] As discussed earlier, the maximum land value decline is dampened to reflect the effect that a land-value decline has on the loss-frequency probability given when the decline occurs in a loan's life. Separately, the calculation of dollar losses is adjusted for the effects of loan seasoning.

[19] Treasury's comment is based on the fact that the historical estimation data contains only values for underwriting variables at origination and not throughout the life of a loan. As a result, the historical data do not directly contain the necessary information to implement a different approach.

[20] *See* Proposed Risk-Based Capital Rule, Appendix A, Step 4, 64 FR 61759, November 12, 1999.

the calculation of the State-level loss rates for non-standby loans and standby loans. The proposed calculation for non-standby loans is total dollar losses divided by total ''origination'' loan balances for each State. Whereas, the calculation for standby loans is total dollar losses divided by ''current'' loan balances for each State. As a result of this difference in calculation, Farmer Mac contends that the model overstates the credit risk on standby loans. Farmer Mac suggested we modify the model to calculate the State-level loan loss rate for standby loans and non-standby loans in the same manner. The calculation Farmer Mac would use is the total dollar loan losses divided by ''origination'' loan balances, rather than ''current'' balances.

Given the purpose of the loss calculation, we cannot adopt Farmer Mac's suggestion. The primary purpose was to determine the dollar amount of losses to be applied in the stress test. The conversion to a loss rate was made for convenience to facilitate the calculation of expected age-adjusted lifetime losses in a separate spreadsheet named, ''Credit Loss Module. XLS.'' The loss rates were then copied to the spreadsheet called the ''FAMC RBCST,'' which is the spreadsheet that calculates the regulatory capital requirement under the stressful conditions required by the Act.[21] Our intent was always to apply loss rates in the FAMC RBCST spreadsheet that would produce a dollar amount of age-adjusted lifetime losses consistent with the amount estimated in the credit loss module component of the stress test.

Based on our analysis, the suggested change would misrepresent the loss rate on standby loans since the estimated losses are already adjusted for loan seasoning and tend to reflect the benefit of principal amortization that has occurred.[22] The following table illustrates this point.

(1) Year	(2) Origination principal balance	(3) Current balance	(4) Age-adjusted losses	(5) Age-adjusted losses divided by current balance (in percent)	(6) Losses applied to determine regulatory capital	(7) Age-adjusted losses divided by origination balance (in percent)	(8) Losses applied to determine regulatory capital as suggested
1	$100,000	$97,815	$2,664	2.72	$2,664	2.66	$2,606
2	100,000	95,455	2,442	2.56	2,442	2.44	2,331
3	100,000	92,906	1,853	1.99	1,853	1.85	1,721
4	100,000	90,153	1,114	1.24	1,114	1.11	1,005
5	100,000	87,180	525	0.60	525	0.53	458

Notes: The table shows the annual calculation of dollar losses and loss rates using both current and origination principal balances. The table also shows the dollar losses that would be applied to determine regulatory capital. The calculations in the table assume a hypothetical Farmer Mac portfolio consisting of only one standby loan originated in 1999 with an original principal balance of $100,000. The columns of the table are:

- Column 1 shows the year for the annual calculation.
- Column 2 of the table shows the origination principal balance.
- Column 3 shows the current principal balance as a result of principal amortization.
- Column 4 shows the age-adjusted origination year estimated losses for each subsequent annual calculation of the credit loss module.
- Column 5 shows the loss rate that would be calculated in the credit loss module component.
- Column 6 shows the dollar losses the FAMC RBCST would determine when calculating regulatory capital.
- Column 7 shows the loss rate calculated using Farmer Mac's suggested methodology.
- Column 8 shows the dollar losses that FAMC RBCST would determine using loss rates calculated following Farmer Mac's suggested methodology.

The eighth column of the table demonstrates that the suggested approach would understate the age-adjusted origination year loss rates. This result occurs because the calculated loss rates are applied to current principal balances outstanding in the FAMC RBCST component of the stress test. The current principal balances outstanding are based on the data input requirement of using the most recent quarterly financial statements for running the model. On Farmer Mac's financial statements, seasoned agricultural mortgage loans are not shown at origination value, but reflect principal amortizations made over time. Therefore, it would not be an appropriate application in the stress test to use origination principal loan balances to calculate loss rates as doing so understates the dollar amount of estimated losses.

However, we agree that the calculation of loss rates for standby and non-standby loans should be consistent. Consistency is needed to ensure the estimated age-adjusted lifetime loan loss rates are correctly calculated to replicate the right amount of dollar losses throughout the stress test. Rather than modify the calculation for standby loans as suggested by Farmer Mac, Appendix A of subpart B includes changes in the calculation of the loss rates for non-standby loans. In the final model, total dollar loan losses are divided by total ''current'' loan balances for each State to derive the State-level loss rate for both standby and non-standby loans in Farmer Mac's portfolio. The technical correction in the calculation of loss rates for non-standby loans ensures that the right amount of expected losses are applied in the stress test. The change in the calculation of loss rates for non-standby loans is discussed in detail in section IV.C.3 and Appendix A of subpart B of this rule.

9. Institutional Credit Risk

Treasury commented that we should include Farmer Mac's institutional credit risk exposure in the risk-based capital stress test. Treasury stated that Farmer Mac is exposed to institutional credit risk from a number of sources: AgVantage bonds; non-mission investments; sellers and servicers; and interest rate contract counterparties. Although Treasury agreed with us that these risks are currently limited, Treasury does not believe that the statutory 30-percent add-on for management and operations risks covers the institutional credit risks. Treasury also suggested that the risk-based capital requirements established by the Federal banking agencies and the OFHEO for

[21] The Credit Loss Module and FAMC RBCST spreadsheets are separate components of the stress test.

[22] The loss rate for non-standby loans are also adjusted for loan seasoning and tend to reflect the benefit of principal amortizations that have occurred.

insured depositories and Fannie Mae and Freddie Mac, respectively, should provide useful guidelines.

We proposed to capture Farmer Mac's institutional credit risk exposure through the 30-percent management and operations risk add-on provided in the Act. In response to Treasury's comment, we reviewed Farmer Mac's institutional credit risk relating to AgVantage bonds, sellers' and servicers' activities; other investments held by Farmer Mac and interest-rate contract counterparties. We found that Farmer Mac effectively manages its institutional credit risk exposure through appropriate policies and practices. We noted no increase in the level of institutional credit risk exposure since publication of the proposed rule.

As suggested by Treasury, we could develop and apply a risk-adjustment factor for institutional credit risks arising in the future, using several sources as guides, including the treatment by other financial regulators of such risks. We do not believe, however, that we can realistically predict how Farmer Mac's institutional credit risk may change in the future. Instead, we would have to determine an adjustment to apply to Farmer Mac's portfolio based on sources other than data specific to Farmer Mac's risks. At this time, adopting a risk factor adjustment to apply to Farmer Mac's portfolio would be an unnecessary step. The 30-percent add-on in the Act is clearly designed to capture risks such as those that are not measurable from historic benchmark agricultural mortgage losses. Congress has in essence, chosen a set percentage to apply in such situations. Therefore, we believe it is inappropriate to artificially add another factor that is not based on actual risk data.

We believe a better approach is to continue to monitor Farmer Mac's institutional credit risks. If we see changes in the nature of these risks, we can make adjustments to the stress test to capture them. This continuing approach to monitoring and addressing Farmer Mac's institutional credit risks is preferable to trying to capture possible future risks today. We will continue to monitor these risks and take regulatory action, including expedited rulemaking if warranted, at the appropriate time to address these risks.

We made no changes in the final rule in response to this comment.

B. Interest Rate Risk Component

We proposed a two-pronged interest rate risk test, combining stochastic market value of equity estimation with a deterministic steady-state cashflow projection. As part of the interest rate component of the stress test, we estimated the change in Farmer Mac's market value of equity in order to estimate the impact of an interest rate shock on Farmer Mac's net income over a 10-year period. To estimate the impact, we computed the effective duration of Farmer Mac's assets, liabilities and off-balance sheet instruments under each interest rate shock. The duration estimates were then used to calculate the estimated market value change in equity in the stress test.

Although the commenters generally supported our proposed approach of using Farmer Mac's internal risk models, they commented on, and requested changes to, several aspects of the proposed methodology. In response to commenters' suggestions, we incorporated several changes to the interest rate risk component of the stress test. Those changes and our response to specific comments are discussed below.

1. Timing of the Stressed Change in Interest Rates

The stress test is initialized with data from Farmer Mac's most recent historic quarter-end balance sheet. In the model, the starting position is identified as t^0. Subsequent annual accounting cycles are represented consecutively as t^1 to t^{10}. The model applies the stress test conditions required by the Act and builds pro forma financial statements that include the effects of the stress conditions.

Treasury commented that the change in interest rates should be applied at starting period (t^0) rather than the first period (t^1). Treasury observed that Farmer Mac generates earnings (from t^0 to t^1) on the amount of the interest rate risk that is not recognized until period t^1.

We generally agree with Treasury's observation that there is an earnings effect associated with not posting the interest rate shock to the starting balance sheet, t^0. We are further convinced that the stress test should reflect the effects of an interest rate change that occurs prior to period t^1. Changing the interest rates prior to period t^1 is more consistent with our goal of developing a stressful interest rate scenario that complies with the Act.

Therefore, we modified the interest rate shock calculation to include an earnings effect.

After careful analysis, we determined the earnings effect based on the assumption that the change in interest rates occurs mid-way in the annual income cycle from t^0 to t^1. Under this approach, the market value reduction in capital occurs at the end of the sixth month, which is halfway between periods t^0 to t^1. At month six, Farmer Mac's capital position decreases by the market value reduction and its liabilities increase by the same amount. However, rather than re-state Farmer Mac's balance sheet at month six, we capture the earnings effects by multiplying the market value change with Farmer Mac's annualized cost of funds and dividing by 2, as if the rates changed in the sixth month. This approach avoids unnecessary complications to the stress test and the confusion that may result from showing an inter-period balance sheet. Capital at t^1 is then adjusted to reflect the earnings effect. The interest rate shock posted to the balance sheet now reflects a market value change in equity and earnings effect, assuming rates change during the middle of the accounting cycle. As a result, starting in t^1, the earnings effect is fully reflected in the structure of the balance sheet.

2. Tax Effects of the Market Value of Equity Change From the Stressed Change in Interest Rates

In the proposed rule, we did not include the impact of taxes for the change in the market value of equity. Farmer Mac commented that the change in market value of equity for the interest rate risk portion of the stress test should be adjusted to reflect the effect of taxes before the increase or decrease is recorded to equity. Farmer Mac explained that accounting for the tax effects of market value gains and losses is consistent with GAAP treatment of unrealized holding gains or losses on available-for-sale assets under Statement of Financial Accounting Standards (SFAS) No. 115 and SFAS No. 109.

We concur that the estimated market value of equity change due to the stressful interest rate movement should include the effect of taxes, and we modified the stress test accordingly. This change more closely aligns the economic realities and accounting treatment resulting from changes in, or to, market value of equity. However, we placed some limitations on the amount of tax benefits that can be recorded during the stress test. The potential tax benefits of the unrealized market value loss in equity are captured in a similar manner as other financial institution regulators treat deferred-tax assets (DTA) in their regulatory capital requirements.[23]

[23] For FCA's treatment of DTAs, see 12 CFR 615.5120; for the Federal Deposit Insurance Corporation (FDIC), see 12 CFR 325.2 and 325.5; the Office of the Comptroller of the Currency (OCC), 12 CFR 3.2 and Appendix A to part 3, sections 1 and 2; the Federal Reserve Board (FRB), 12 CFR 208,

Continued

Generally, tax affects on available-for-sale securities are determined by multiplying the estimated unrealized market value loss by an enterprise's effective tax rate. As a result, a deferred tax asset is recorded. For regulatory capital purposes, DTAs may be included in the regulatory capital calculation if: (1) They are expected to be realized within the next 12 months; (2) they can be used to recapture taxes previously paid; or (3) they may reduce tax obligations 1 year into the future. We limit inclusion if DTAs exceed a specified level of certain components of capital.

Within the context of the stress test, we are treating the tax benefit of the unrealized market value loss in a manner that is similar, but not identical to, the other regulators' treatment of DTAs. Our approach differs in that we only address the potential DTAs that could arise from the unrealized loss in market value of equity as determined in the stress test. We exclude existing DTAs as immaterial and we do not create a DTA account on the balance sheet, as doing so would unnecessarily complicate the adjustment to the market value change for tax effects. The tax effects are limited solely to loss carry-backs to recapture previous taxes paid.

The stress test calculates a tax benefit from the unrealized loss that is included in regulatory capital. The amount included is based on the amount Farmer Mac can reasonably be assumed to realize immediately. The amount of the tax benefit included is based on the availability of tax-loss carry-backs to recapture any taxes paid in the past 2 years. The market value of equity loss resulting from stressful interest rate conditions is reduced by the amount of taxes actually paid in the 2 previous years. The stress test also permits the unrealized loss to be used to offset any tax obligations, subject to Internal Revenue Service requirements, in future accounting cycles.

3. Application of Interest Rate Risk Through Changes in the Market Value of Equity

To estimate the effects of the interest rate shocks (up and down scenarios) on Farmer Mac's equity position, the stress test computes the effective duration over each interest rate shock scenario using information supplied by Farmer Mac. The duration measure is then used as a proxy for market value effects under each interest rate scenario and market value changes are recorded as increases or decreases to equity on Farmer Mac's balance sheet.

As a comment on the proposed rule, Farmer Mac suggested revising the proposed approach to reflect interest rate risk in the stress test. Farmer Mac objected to using market value changes, contending that the Act's definition of regulatory capital excludes any reference to market valuation concepts. Despite this definitional concern, Farmer Mac suggested modifying the proposed treatment of interest rate risk in the stress test by marking-to-market the balance sheet equity stated in accordance with GAAP before applying the changes in market value equity for the statutorily prescribed stressful change in interest rates. Farmer Mac stated the suggested revision would ensure the market value changes are consistently calculated against the market value of equity rather than incorrectly against the book value of equity (determined in accordance with GAAP).

We developed the stress test so that its treatment of market value provides incentives for Farmer Mac to appropriately manage and control its exposure to movements in interest rates. The approach employed in the stress test uses effective duration measures supplied by Farmer Mac. We use these duration measures to determine a capital charge for interest rate risk. Our approach accepts that Farmer Mac's interest rate risk measurement accurately captures the dollar value of its interest rate risk exposure. This assumption represents a reasonable starting point for applying a stressful movement of interest rates used to determine Farmer Mac's regulatory capital requirement. Additionally, our approach eliminates the need to reconcile the differences between mark-to-market and book value financial statements that may vary through time for a multitude of reasons.

We also believe our treatment of interest rate risk is consistent with the approach taken by several other financial regulators. The OTS, for example, requires savings associations to deduct a portion of the measured interest rate risk exposure from total capital to determine whether it meets its risk-based capital requirement.[24] The starting point for determining total capital is a savings association's equity position determined in accordance with GAAP. The interest rate risk deduction to total capital is measured in accordance with the OTS Net Portfolio Value Model for a 200 basis point increase or decrease in market interest rates. The result of OTS's approach is a market value-based interest rate risk deduction to total capital that was determined in accordance with GAAP.

Other banking regulators[25] also apply a market risk component in the computation of regulatory capital ratios, again employing market value concepts.[26] These regulators require certain institutions to convert excess market risk exposure to a risk-adjusted asset, resulting in a dollar-for-dollar holding of capital for the exposure. The net result of this treatment is the inclusion of market value-based interest rate risk in regulatory capital requirements calculated on financial statements prepared in accordance with GAAP.

We also conclude that the treatment of interest rate risk is consistent with the Act's requirements and the definition of regulatory capital. The stress test implements the interest rate risk by considering its effect on various components that make up core capital, which in turn, make up regulatory capital.[27] The Act specifies the range that rates can be shocked in the interest rate risk component of the stress test. The Act does not prescribe how we should implement the interest rate risk in the stress test in order to determine the impact of the components on core capital, and thus regulatory capital. We must use our discretion to determine a reasonable way to measure and implement the interest rate stress. We believe that the duration method is an appropriate and reasonable way to determine the impact of the interest rate stress on the components of core capital. Implementing this approach captures the effects of stressful interest rate movements on Farmer Mac's regulatory capital requirements in accordance with the Act.

Treasury also commented on the treatment of interest rate risk in the stress test. Treasury suggested that interest rate risk effects could be measured using a cashflow approach

Appendix A, section B; and for the Office of Thrift Supervision (OTS), Thrift Bulletin 56—Regulatory Reporting Of Net Deferred Tax Assets, January 20, 1993.

[24] See 12 CFR 567.2 entitled, ''Minimum Regulatory Capital Requirement'' and 12 CFR 567.7, entitled, ''Interest Rate Risk Component.''

[25] The other regulators are the OCC, the FRB, and the FDIC. These agencies acted jointly to add a market risk component to capital requirements for bank holding companies with large trading activities relative to their size.

[26] See 61 FR 47357–47378 (September 6, 1996).

[27] ''Regulatory capital'' is defined in section 8.31(5) of the Act as core capital plus an allowance for losses and guarantee claims (in accordance with GAAP). For the purposes of this definition, regulatory capital includes any allowance or reserve accounts that Farmer Mac maintains for losses on loans that are held in portfolio and for losses on securities it has guaranteed, particularly, reserves required by section 8.10 of the Act.

where income and expenses are functions of the interest rate environment variable. Therefore, as rates moved in a stressful manner, Farmer Mac's net income performance would change.

We originally considered a cashflow approach, but decided to follow an effective duration approach because it reduces the complexity of the stress test, thereby increasing efficiency in implementing the model. From a theoretical perspective, the effective duration-based approach uses market value estimates for interest rate shocks from Farmer Mac that already summarize cashflow effects. Therefore, there is no need to duplicate these effects in the cashflow component. As stated in the proposed rule, Farmer Mac may use its own cashflow generator for running the stress test as long as it is consistent with the final rule.

4. Operating Expenses Regression Equation Used in the Stress Test

Farmer Mac commented that our proposed regression equation to represent operating expenses could be improved. Farmer Mac identified three problems with our proposed operating expense regression: (1) We should have included off-balance sheet assets in addition to on-balance sheet investments and program assets; (2) expenses are not a simple linear function of assets, but rather expenses increase at a decreasing rate as the volume of assets increases; and (3) we do not account for the difference in Farmer Mac's operating structure that resulted from a substantial statutory revision in 1996. Farmer Mac proposed the following regression equation:

$$Y = \alpha + \beta_1 \ln(X) + \beta_2 D$$

Where Y is operating expenses, excluding provision for losses and tax expenses; ln(X) is the natural log of investments and Farmer Mac program assets held on- and off-balance sheet, and D is a dummy variable (1 represents pre-1996 and 0 represents post-1996).

The regression is estimated using ordinary least squares, where (α) is the intercept, (β_1) is the coefficient for the natural log of the on-balance sheet program assets and investments, and off-balance sheet program assets, and (β_2) is the coefficient of the dummy variable.

Based on Farmer Mac's comments, we considered several different operating expense equations, including Farmer Mac's proposed equation. We also evaluated whether loans, by themselves, would be a better indicator of operating expense growth. We found that loans, both on- and off-balance sheet, plus investments were relevant to operating expenses. We also found that including off-balance sheet assets is beneficial. We analyzed Farmer Mac's suggested equation and found that including the dummy variable and the log-linear approach are appropriate to use based on standard goodness-of-fit criteria. We also concluded that there is a reasonable conceptual basis for the loans and investments to be good predictors of operating expenses.

We concur that the treatment of operating expenses should reflect the structural shift that occurred for Farmer Mac in 1996 due to statutory changes. Based on our analysis, we accept Farmer Mac's suggested regression equation as an appropriate treatment of operating expenses and we have revised Appendix A of subpart B accordingly.

C. Miscellaneous Technical Changes

Farmer Mac made several technical comments on the stress test and Appendix A to subpart B. In addition, since developing the proposed risk-based capital stress test, we have conducted additional audits of the model specifications and Appendix A. Through this effort and the process of receiving public comments, we identified errors and inconsistencies that warranted technical changes in the proposed model specifications and Appendix A. As a result, we provide the following changes and clarifications.

1. Beta Distribution Used for the Seasoning Adjustment

We noted an error in the implementation of the proposed beta distribution. In the proposed rule, we reported that the proposed beta distribution was estimated using a 14-year average loan life, while controlling for potentially longer lives. As implemented, using a 14-year life effectively compresses the losses back into a shorter life than that used to estimate the proposed beta function parameters. Doing so resulted in a misstatement of the effects of loan seasoning in the calculation of expected age-adjusted lifetime losses. The misstatement occurs in the application of the shorter average loan life in the stress test compared to the effective interval of loan life used in estimating the beta distribution. We corrected for the scaling error in the final rule, which caused expected age-adjusted lifetime losses to increase compared to the proposed rule. As discussed below, we made an additional refinement in the estimation of the loan-seasoning function in response to comments received.

Based on Farmer Mac's comments regarding the application of consistent underwriting screens to the estimation data, we again reviewed all components of the stress test to ensure we used appropriate data screens. This review revealed that we had estimated the proposed beta distribution parameters using different data screens than those used in the Study and in the estimation of the loss-frequency equation. However, the use of different data screens was not a critical concern or issue in selecting the functional form. For the final model we re-estimated the beta distribution parameters to fully address Farmer Mac's comment about consistent underwriting screens.

To re-estimate the beta distribution parameters, we used the same screened FCBT data that was used to estimate the loss-frequency model. The final re-estimated beta distribution parameters, assuming a 14-year average loan life, are $p = 4.288$ and $q = 5.3185$. The choice of data screens has an insignificant impact on the beta distribution properties.

2. Segregation of Off-Balance Sheet Instruments

Under the proposed rule, we required that off-balance sheet items be classified either as off-balance sheet assets or as off-balance sheet liabilities. Farmer Mac commented that its internal valuation models do not differentiate between off-balance sheet assets and liabilities and requested that we clarify this issue. We have considered the treatment of off-balance sheet items and have decided to change the stress test to accommodate Farmer Mac's concern. While making this change, we made conforming changes to the effective duration calculations and calculation of the dollar amount of market value of equity change. The calculation now uses the base value of equity before any change in interest rate to determine the dollar amount of interest rate risk. This approach provides a consistency between the amount of interest rate risk measured by Farmer Mac and the amount applied in the regulatory capital calculation contained in the stress test. Because we eliminated the separate asset and liability duration calculations, we needed a new link to Farmer Mac's measured interest rate risk amount. This treatment of measured amounts of interest rate risk is similar to that used by other regulators in their regulatory capital requirements as discussed earlier in the section entitled, ''Application of MVE Impacts.''

3. Calculation of State-Level Loss Rates for Non-Standby Loans

As discussed in section IV.A.8, we made a technical correction to the calculation of the loss rates for non-standby loans in the credit risk module. We now determine the loss rate for non-standby loans found on the ''Estimated Losses'' sheet of the credit loss module spreadsheet by dividing the estimated age-adjusted loan origination loss rates by the current principal balance outstanding. The change in methodology was needed to ensure consistent application of the correct dollar amount of estimated losses in the stress test. The revision also provides uniformity for the blending of non-standby and standby loss rates since each uses the same divisor.

This revision caused the loss rates to increase slightly because we eliminated an error in the proposed rule that tended to slightly understate losses. At September 30, 2000, the overall blended loss rate determined by the credit loss module in the proposed rule was 2.0 percent. In the final rule, the blended loss rate increased to 2.02 percent, before making any of the other changes to the credit loss module as discussed throughout this preamble.

4. Other Technical Corrections

Farmer Mac noted an inconsistency with the estimation of the logit model and application of the coefficient estimates to Farmer Mac's portfolio. We have changed the text in section 2.1 of Appendix A to subpart B to clarify the presentation.

Farmer Mac identified a spreadsheet error in the Credit Module Excel Worksheet named, ''Transformed Data.'' We corrected the reference in the VLOOKUP command to the array of land value declines by State. The correction has no effect on the results of the stress test because there were no loans in the States that the model incorrectly referenced and the stressful land value change applied in the stress test is the same for all States.

We also corrected an error in the spreadsheet relating to the computation of the 3-year maximum loss shares. Farmer Mac noted that when computing the 3-year losses for the column labeled 1992, the sum mistakenly included the column labeled, ''Total Losses.'' This corresponds to cohorts total lifetime losses so that the 3-year loss shares reported for 1992 are too high. This resulted in an erroneous 3-year maximum loss share of 95.3 for the 1982 loan cohort. Correcting this error results in a 3-year total weighted average loss share of 71.82 percent (versus 75.98 percent), and implies a year three stress period loss share of 11.66 percent (versus 15.82 percent), with an average loss share over the remaining 7 years of the stress period of 4.03 percent (versus 3.43 percent).

Farmer Mac noted that at June 30, 1999, the quarterly average 10-year Constant Maturity Treasury yield was 5.10 rather than 5.54 as shown in the illustration in the section of the proposed preamble that includes the interest rate risk sensitivity discussion. We found that this error only occurred in the preamble illustration and the correct interest rate was used in both Appendix A to subpart B and the model. The error does not impact the illustration and it still shows the correct effects that different starting rates would have on the stress test. Thus, no change is necessary.

In the preamble to the proposed rule, we noted that home mortgages from lenders in rural areas and small communities are eligible for sale to Farmer Mac for pooling and securitization. In that discussion, we incorrectly stated that the rural housing limit was $133,000. The current figure is $145,375, and is adjusted annually for inflation. This error had no effect on the model specifications.

D. Regulatory Capital Requirements Determined by the Final Stress Test

The impact of the stress test depends on Farmer Mac's risk profile and starting capital position. High-risk loan assets or significant interest rate risk exposure will result in the stress test determining a higher regulatory capital requirement. Conversely, if Farmer Mac maintains a low risk profile in its loan portfolio or interest rate risk exposure, the stress test will determine a low capital requirement.

Given Farmer Mac's September 30, 2000, financial position and risk profile, the stress test would not require Farmer Mac to increase its available regulatory capital. At this date, the stress test determined a regulatory capital requirement of $64.8 million. For illustration purposes only, this compares to Farmer Mac's core capital of $98.3 million and a statutory minimum capital requirement of $93.6 million.

We emphasize that the regulatory capital requirement is based on an evaluation of Farmer Mac's current financial condition and risk profile. If Farmer Mac accepts more risk as it grows into a mature business in the future, the risk-based capital requirement could exceed the statutory minimum capital standards. In such a situation, there are several options/alternatives available to Farmer Mac to meet its risk-based capital requirement, including:

- Issuing additional stock;
- Increasing guarantee fees to build earnings and capital;
- Reducing credit risk by modifying loan underwriting standards or obtaining credit enhancements; or
- Mitigating interest rate risk through funding and hedging strategies.

As addressed previously, commenters recommended numerous changes to the proposed stress test. In response to these comments, we modified the proposed stress test as described earlier. We compared the proposed and final rule results over the five most recent quarters. In all quarters, the final rule stress test produced higher estimated credit losses and thus a higher regulatory capital requirement. At September 30, 2000, using Farmer Mac's financial position and risk profile, the proposed rule would have determined a regulatory capital level of $36.2 million, while the final rule determined a regulatory capital level amount of $64.8 million. The final rule determines higher regulatory capital because of appropriate and consistent changes made to the stress test in response to comments about the loan size variable used in the loss-frequency equation, the loan-seasoning function, and the computation of loss rates in the credit loss component. With respect to the interest rate risk component, we changed the market value of equity calculation to provide consistent application based on comments received. This change had an insignificant impact on the level of interest rate risk factored into the final stress test compared to the proposed rule.

E. Appendix A to Subpart B of Part 650

We have modified Appendix A to reflect the changes previously discussed. Farmer Mac requested more detailed information on every component of the stress test to help it understand and implement all details of the models and to effectively manage the stress test. Specifically, Farmer Mac asked for additional information on:

- The estimation and application of a power function for LTV in the lifetime default model;
- The estimation and application of the discount function applied to the maximum annualized decline in farmland values in the lifetime default model; and
- The derivation and application of a beta distribution to account for loan-seasoning adjustments.

In response to Farmer Mac's request, we have included additional supporting information on each of these areas in the final Appendix A to subpart B. We anticipate that we will make additional revisions to Appendix A in the future, both to provide users more information and to clarify items. The most current version of Appendix A will be made available on our Web site (www.fca.gov) or by request.

V. Other Issues

A. Board of Directors and Reporting Issues

1. Business Planning Guidelines

Farmer Mac's comment letter discussed various aspects of the proposed risk-based capital rule's requirements relative to business and capital planning and provided recommendations for revising the proposed rule's requirements on planning. Farmer Mac commented that, although it largely concurs with the proposed rule's requirements on business planning, it has several concerns with the proposed rule's requirements.

First, Farmer Mac expressed a concern that the proposed rule requires the Farmer Mac board to adopt a business plan based on a calendar year cycle versus the board's specified planning year, which is currently June 1 through May 31. Although Farmer Mac's fiscal year coincides with the calendar year, Farmer Mac currently operates around the June 1 to May 31 business planning cycle. Because we do not see a need to disrupt Farmer Mac's current planning year cycle, we have modified the final rule to require Farmer Mac's board to adopt an annual business plan based on the plan year, as specified by its board.

Second, Farmer Mac commented on the proposed rule's timeframe for its board's adoption of a business plan no later than 30 days after the beginning of the calendar year, stating it was inconsistent with the board's planning process and meeting schedule. Farmer Mac recommended the rule's language read that its board of directors be required to adopt an annual business plan within 75 days after the beginning of the planning year. Farmer Mac stated that it is the board's established practice to, at its June meeting, review business results for the just-ended plan year (June–May), discuss new or revised objectives and strategies, and preliminarily approve the components of the business plan. Because the board only meets bimonthly, the board again reviews and adopts the plan at its August meeting.

New directors are elected at Farmer Mac's annual meeting in June and begin their service with the Farmer Mac board that same day. Farmer Mac has structured its business plan development and approval process beginning at the June meeting, based on the desire to fully involve new directors in the planning process.

We believe the full involvement of new directors in the planning process is highly beneficial. This process yields the best opportunity for meaningful business planning at Farmer Mac. The final rule requires that the Farmer Mac board annually adopt a business plan no later than 65 days after the beginning of its planning year.

Third, Farmer Mac commented on the proposed rule's requirement for the first year of its business plan to contain a detailed operating budget. Farmer Mac stated in its comment letter that budgets tend to impose rigid requirements for expenses that disregard the high variability of expense relative to income opportunities. In the past, Farmer Mac's board evaluated the merits of budgets versus financial forecasts and concluded that financial forecasts are more appropriate. Farmer Mac's comment letter indicated that financial forecasting allows the board to set targets for income and expenses that are reviewed during the year and adjusted as business and market conditions change. Farmer Mac requested that the final rule reflect the business judgment of its board and require an operating forecast instead of an operating budget in the first year of the plan.

We concur that forecasts of income and expenses for the first year and the ensuing 2 years of the plan, based on clearly defined business assumptions, are appropriate for the board's oversight of Farmer Mac's performance. We are aware that the board reviews Farmer Mac's business performance at least quarterly and expect the board to adjust the business plan as necessary to meet Farmer Mac's business objectives. Accordingly, in the final rule we require forecasted income and expense and balance sheet statements for each year of the plan.

Fourth, Farmer Mac commented that, with respect to business planning, the guidelines of the regulation should allow its board maximum flexibility and discretion in its business planning process and in exercising the business judgment expected of a board of a publicly traded corporation. In the rule, we set forth minimum standards for strategic business planning dictated by good business practices. These minimum standards allow the Farmer Mac board to retain a high degree of flexibility in its business plan; therefore, we are making no changes on this issue in the final rule.

Lastly, Farmer Mac expressed a concern that the requirement that the business plan include detailed 3-year forecasts might expose Farmer Mac to potential securities law liability. The final rule's requirement for a 3-year business plan containing financial forecasts for each year of the plan is a tool for the Farmer Mac board to use in setting direction and overseeing the progress of Farmer Mac. As to exposing Farmer Mac to securities law liability, the business plan is for Farmer Mac's and FCA's internal use and not a public document. Thus, we have made no change to the final rule in response to this comment.

2. Reporting Requirements

The proposed rule requires Farmer Mac to determine its risk-based capital requirements on a pro forma basis at any time that it expects to enter into any new business activity that could have a significant effect on capital. The proposed rule further requires that Farmer Mac report its pro forma determinations to OSMO at least 10-business days prior to implementation of the new business activity. Farmer Mac commented that a pro forma determination of risk-based capital should be made no later than 1 week ''after'' starting a new activity. Farmer Mac stated that we have adequate powers in rulemaking and enforcement to deal with any situation of noncompliance with the capital rule. Farmer Mac further stated that advance notice is similar to a prior approval process that we do not have authority to require.

The rule does not create a prior approval process with respect to future Farmer Mac programs. The rule requires advance notice to us of the effect of new programs on capital to help ensure that any new program does not result in capital insufficiency. It is necessary and prudent to have in place a proactive process to review and evaluate future programs that impact capital prior to implementation. We believe that the use of pro forma determinations is an appropriate tool to evaluate the impact to capital of a pending program prior to its implementation. Further, we question implementation of a program without an internal pro forma analysis of the impact of such a program on the earnings and capital positions of Farmer Mac. We designed the stress test to be an efficient and effective tool for Farmer Mac to make such a pro forma analysis.

We further believe that the reporting of a pro forma analysis to the OSMO

Director at least 10-business days prior to implementation is a reasonable timeframe that provides all parties ample time to discuss possible concerns and make adjustments where necessary and appropriate. A post review is inappropriate and could result in situations where programs might need to be modified after they have been established. Therefore, we continue to require a pro forma determination of the effect on risk-based capital requirements and reporting to the OSMO Director 10 days prior to implementation of a program that could have a significant effect on capital.

B. Examination and Oversight

From a regulatory perspective, the ongoing nature of the risk-based capital stress test facilitates our understanding of how changes in Farmer Mac's business activities will affect its risk profile and resulting capital requirements. The effectiveness of the risk-based capital stress test may be affected by changes in Farmer Mac's operations, underwriting standards or products and services offered.

Therefore, our ongoing monitoring and on-site examination will be integral in assessing Farmer Mac's capital adequacy. Our monitoring and examination program will help ensure that Farmer Mac appropriately implements the risk-based capital stress test. Together, the ongoing monitoring and examination by OSMO will enable us to provide effective regulatory oversight and ensure the adequacy of the regulatory capital standard set by the risk-based capital stress test.

C. Effective Date for Compliance With the Regulation

For the 12-month period beginning on the effective date of this regulation, Farmer Mac must determine a risk-based capital level by implementing the risk-based capital stress test as described in § 650.23 and appendix A of subpart B, and must report the results to us as described in § 650.28. During this 12-month period, Farmer Mac will not be required to maintain capital at the risk-based capital level. Before and after the end of the 12-month period, Farmer Mac must continue to maintain its minimum capital level as prescribed in section 8.33 of the Act. Beginning on the day following the 12-month period, Farmer Mac must comply with all provisions of this subpart.

During the 1-year period following adoption of the final risk-based capital regulation, and on an ongoing basis thereafter, we will examine and verify Farmer Mac's implementation of the risk-based capital stress test. Subsequent to the end of the 12-month period, we will ensure compliance with the regulation, including the specifications identified in appendix A of part 650, subpart B.

D. Audit of the Risk-Based Capital Stress Test

The final rule requires that Farmer Mac have its implementation of the risk-based capital stress test verified and audited once every 3 years by an external independent party. The audit should ensure that the financial data used in the stress test are accurate and that the stress test is implemented in accordance with our regulations.

E. Availability to the Public

As we noted in the beginning of this preamble, section 8.32(d) of the Act requires that the risk-based capital regulations contain specific information on the requirements, definitions, methods and parameters used in implementing the risk-based capital stress test in order to enable others to apply the test in a similar manner. We must also make available to the public any statistical model used to implement the risk-based capital stress test. Appendix A to part 650, subpart B, contains the specific information and instructions needed to run the risk-based capital stress test. An electronic version of the stress test is available to the public on our Web site at *www.fca.gov.*

We note that because of the proprietary nature of specific, transaction-level loan and financial data used in the risk-based capital stress test, it is unlikely that results of the test will be fully reproducible by parties other than Farmer Mac and us. Other parties will, however, be able to approximate the test results on an aggregate basis using publicly available information.

F. Future Risk-Based Capital Requirements

Farm Credit Bank commenters noted that the proposed regulation would not establish capital requirements applicable to any System institution other than Farmer Mac. Nevertheless, they expressed interest in this rulemaking proceeding for several reasons. First, the commenters acknowledged that, ''the development of the proposed stress test model to evaluate mortgage risk is new work in the agricultural mortgage sector.'' The commenters stated that risk-based capital measurement and management will become an increasingly important risk measurement tool for all System institutions. Second, the commenters stated that the final regulations established for Farmer Mac may serve as a precedent for the establishment of revised capital requirements for other System institutions at some point in the future.

At the same time, the commenters noted that we should not be constrained in following these same requirements in evaluating the appropriate capital levels for other System institutions, as the thinking in this area continues to evolve and new approaches may emerge. Finally, the commenters urged us to ensure that the regulatory requirements for all System entities, including Farmer Mac, are fairly and finally determined on a comparable risk basis for the ultimate benefit and protection of America's farmers and ranchers.

We appreciate the commenters' views on future capital requirements. However, we also recognize that the risk-based capital requirements for Farmer Mac are required to be established in response to title VIII of the Act. Title VIII establishes a credit and interest rate risk stress test. The stress test is designed to identify an extreme risk scenario and ensure that sufficient capital is maintained at all times to account for the most stressful risk scenario. In contrast, the structure of the pending Basel Accord revisions is directed toward establishing minimum and/or optimal capital requirements for financial institutions and is not based on one stressful scenario.

Thus, although future development of any System risk-based capital requirements might employ risk-modeling techniques, such modeling would likely be based on a different set of assumptions and statistical methodologies rather than the stress test required in title VIII.

List of Subjects in 12 CFR Part 650

Agriculture, Banks, banking, Conflicts of interest, Rural areas.

For the reasons stated in the preamble, part 650 of chapter VI, title 12 of the Code of Federal Regulations is amended as follows:

PART 650—FEDERAL AGRICULTURAL MORTGAGE CORPORATION

1. The authority citation for part 650 is revised to read as follows:

Authority: Secs. 4.12, 5.9, 5.17, 8.11, 8.31, 8.32, 8.33, 8.34, 8.35, 8.36, 8.37, 8.41 of the Farm Credit Act (12 U.S.C. 2183, 2243, 2252, 2279aa–11, 2279bb, 2279bb–1, 2279bb–2, 2279bb–3, 2279bb–4, 2279bb–5, 2279bb–6, 2279cc); sec. 514 of Pub. L. 102–552, 106 Stat. 4102; sec. 118 of Pub. L. 104–105, 110 Stat. 168.

2. Add subpart B to read as follows:

Subpart B—Risk-Based Capital Requirements

§ 650.20 Definitions.

For purposes of this subpart, the following definitions will apply:

(a) *Farmer Mac, Corporation, you, and your* means the Federal Agricultural Mortgage Corporation and its affiliates as defined in subpart A of this part.

(b) *Our, us, or we* means the Farm Credit Administration.

(c) *Regulatory capital* means the sum of the following as determined in accordance with generally accepted accounting principles:

(1) The par value of outstanding common stock;

(2) The par value of outstanding preferred stock;

(3) Paid-in capital, which is the amount of owner investment in Farmer Mac in excess of the par value of stock;

(4) Retained earnings; and

(5) Any allowances for losses on loans and guaranteed securities.

(d) *Risk-based capital* means the amount of regulatory capital sufficient for Farmer Mac to maintain positive capital during a 10-year period of stressful conditions as determined by the risk-based capital stress test described in § 650.23.

§ 650.21 General.

You must hold risk-based capital in an amount determined in accordance with this subpart.

§ 650.22 Corporation board guidelines.

(a) Your board of directors is responsible for ensuring that you maintain total capital at a level that is sufficient to ensure continued financial viability and provide for growth. In addition, your capital must be sufficient to meet statutory and regulatory requirements.

(b) No later than 65 days after the beginning of Farmer Mac's planning year, your board of directors must adopt an operational and strategic business plan for at least the next 3 years. The plan must include:

(1) A mission statement;

(2) A review of the internal and external factors that are likely to affect you during the planning period;

(3) Measurable goals and objectives;

(4) Forecasted income, expense, and balance sheet statements for each year of the plan; and,

(5) A capital adequacy plan.

(c) The capital adequacy plan must include capital targets necessary to achieve the minimum, critical and risk-based capital standards specified by the Act and this subpart as well as your capital adequacy goals. The plan must address any projected dividends, equity retirements, or other action that may decrease your capital or its components for which minimum amounts are required by this subpart. You must specify in your plan the circumstances in which stock or equities may be retired. In addition to factors that must be considered in meeting the statutory and regulatory capital standards, your board of directors must also consider at least the following factors in developing the capital adequacy plan:

(1) Capability of management;

(2) Strategies and objectives in your business plan;

(3) Quality of operating policies, procedures, and internal controls;

(4) Quality and quantity of earnings;

(5) Asset quality and the adequacy of the allowance for losses to absorb potential losses in your retained mortgage portfolio, securities guaranteed as to principal and interest, commitments to purchase mortgages or securities, and other program assets or obligations;

(6) Sufficiency of liquidity and the quality of investments; and

(7) Any other risk-oriented activities, such as funding and interest rate risks, contingent and off-balance sheet liabilities, or other conditions warranting additional capital.

§ 650.23 Risk-based capital stress test.

You will perform the risk-based capital stress test as described in summary form in this section and as described in detail in Appendix A to this subpart. The risk-based capital stress test spreadsheet is also available electronically at www.fca.gov. The risk-based capital stress test has five components:

(a) *Data requirements.* You will use the following data to implement the risk-based capital stress test.

(1) You will use Corporation loan-level data to implement the credit risk component of the risk-based capital stress test.

(2) You will use Call Report data as the basis for Corporation data over the 10-year stress period supplemented with your interest rate risk measurements and tax data.

(3) You will use other data, including the 10-year Constant Maturity Treasury (CMT) rate and the applicable Internal Revenue Service corporate income tax schedule, as further described in Appendix A to this subpart.

(b) *Credit risk.* The credit risk part estimates loan losses during a period of sustained economic stress.

(1) For each loan in the Farmer Mac I portfolio, you will determine a default probability by using the logit functions specified in Appendix A to this subpart with each of the following variables:

(i) Borrower's debt-to-asset ratio at loan origination;

(ii) Loan-to-value ratio at origination, which is the loan amount divided by the value of the property;

(iii) Debt-service-coverage ratio at origination, which is the borrower's net income (on- and off-farm) plus depreciation, capital lease payments, and interest, less living expenses and income taxes, divided by the total term debt payments;

(iv) The origination loan balance stated in 1997 dollars based on the consumer price index; and

(v) The worst-case percentage change in farmland values (23.52 percent).

(2) You will then calculate the loss rate by multiplying the default probability for each loan by the estimated loss-severity rate, which is the average loss of the defaulted loans in the data set (20.9 percent).

(3) You will calculate losses by multiplying the loss rate by the origination loan balances stated in 1997 dollars.

(4) You will adjust the losses for loan seasoning, based on the number of years since loan origination, according to the functions in Appendix A to this subpart.

(5) The losses must be applied in the risk-based capital stress test as specified in Appendix A to this subpart.

(c) *Interest rate risk.* (1) During the first year of the stress period, you will adjust interest rates for two scenarios, an increase in rates and a decrease in rates. You must determine your risk-based capital level based on whichever scenario would require more capital.

(2) You will calculate the interest rate stress based on changes to the quarterly average of the 10-year CMT. The starting rate is the 3-month average of the most recent CMT monthly rate series. To calculate the change in the starting rate, determine the average yield of the

preceding 12 monthly 10-year CMT rates. Then increase and decrease the starting rate by:

(i) 50 percent of the 12-month average if the average rate is less than 12 percent; or

(ii) 600 basis points if the 12-month average rate is equal to or higher than 12 percent.

(3) Following the first year of the stress period, interest rates remain at the new level for the remainder of the stress period.

(4) You will apply the interest rate changes scenario as indicated in Appendix A to this subpart.

(5) You may use other interest rate indices in addition to the 10-year CMT subject to our concurrence, but in no event can your risk-based capital level be less than that determined by using only the 10-year CMT.

(d) *Cashflow generator.* (1) You must adjust your financial statements based on the credit risk inputs and interest rate risk inputs described above to generate pro forma financial statements for each year of the 10-year stress test. The cashflow generator produces these financial statements. You may use the cashflow generator spreadsheet that is described in Appendix A to this subpart and available electronically at *www.fca.gov.* You may also use any reliable cashflow program that can develop or produce pro forma financial statements using generally accepted accounting principles and widely recognized financial modeling methods, subject to our concurrence. You may disaggregate financial data to any greater degree than that specified in Appendix A to this subpart, subject to our concurrence.

(2) You must use model assumptions to generate financial statements over the 10-year stress period. The major assumption is that cashflows generated by the risk-based capital stress test are based on a steady state scenario. To implement a steady state scenario, when on- and off-balance sheet assets and liabilities amortize or are paid down, you must replace them with similar assets and liabilities. Replace amortized assets from discontinued loan programs with current loan programs. In general, keep assets with small balances in constant proportions to key program assets.

(3) You must simulate annual pro forma balance sheets and income statements in the risk-based capital stress test using Farmer Mac's starting position, the credit risk and interest rate risk components, resulting cashflow outputs, current operating strategies and policies, and other inputs as shown in Appendix A to this subpart and the electronic spreadsheet available at www.fca.gov.

(e) *Calculation of capital requirement.* The calculations that you must use to solve for the starting regulatory capital amount are shown in appendix A to this subpart and in the electronic spreadsheet available at www.fca.gov.

§ 650.24 Risk-based capital level.

The risk-based capital level is the sum of the following amounts:

(a) *Credit and interest rate risk.* The amount of risk-based capital determined by the risk-based capital test under § 650.23.

(b) *Management and operations risk.* Thirty (30) percent of the amount of risk-based capital determined by the risk-based capital test in § 650.23.

§ 650.25 Your responsibility for determining the risk-based capital level.

(a) You must determine your risk-based capital level using the procedures in this subpart, appendix A to this subpart, and any other supplemental instructions provided by us. You will report your determination to us as prescribed in § 650.28. At any time, however, we may determine your risk-based capital level using the procedures in § 650.23 and appendix A to this subpart, and you must hold risk-based capital in the amount we determine is appropriate.

(b) You must at all times comply with the risk-based capital levels established by the risk-based capital stress test and must be able to determine your risk-based capital level at any time.

(c) If at any time the risk-based capital level you determine is less than the minimum capital requirements set forth in section 8.33 of the Act, you must maintain the statutory minimum capital level.

§ 650.26 When you must determine the risk-based capital level.

(a) You must determine your risk-based capital level at least quarterly, or whenever changing circumstances occur that have a significant effect on capital, such as exposure to a high volume of, or particularly severe, problem loans or a period of rapid growth.

(b) In addition to the requirements of paragraph (a) of this section, we may require you to determine your risk-based capital level at any time.

(c) If you anticipate entering into any new business activity that could have a significant effect on capital, you must determine a pro forma risk-based capital level, which must include the new business activity, and report this pro forma determination to the Director, Office of Secondary Market Oversight, at least 10-business days prior to implementation of the new business program.

§ 650.27 When to report the risk-based capital level.

(a) You must file a risk-based capital report with us each time you determine your risk-based capital level as required by § 650.26.

(b) You must also report to us at once if you identify in the interim between quarterly or more frequent reports to us that you are not in compliance with the risk-based capital level required by § 650.24.

(c) If you make any changes to the data used to calculate your risk-based capital requirement that cause a material adjustment to the risk-based capital level you reported to us, you must file an amended risk-based capital report with us within 5-business days after the date of such changes;

(d) You must submit your quarterly risk-based capital report for the last day of the preceding quarter not later than the last business day of April, July, October, and January of each year.

§ 650.28 How to report your risk-based capital determination.

(a) Your risk-based capital report must contain at least the following information:

(1) All data integral for determining the risk-based capital level, including any business policy decisions or other assumptions made in implementing the risk-based capital test;

(2) Other information necessary to determine compliance with the procedures for determining risk-based capital as specified in Appendix A to this subpart; and,

(3) Any other information we may require in written instructions to you.

(b) You must submit each risk-based capital report in such format or medium, as we require.

§ 650.29 Failure to meet capital requirements.

(a) *Determination and notice.* At any time, we may determine that you are not meeting your risk-based capital level calculated according to § 650.23, your minimum capital requirements specified in section 8.33 of the Act, or your critical capital requirements specified in section 8.34 of the Act. We will notify you in writing of this fact and the date by which you should be in compliance (if applicable).

(b) *Submission of capital restoration plan.* Our determination that you are not meeting your required capital levels may require you to develop and submit to us, within a specified time period, an

acceptable plan to reach the appropriate capital level(s) by the date required.

§ 650.30 Effective date for compliance with regulation.

For the 12-month period beginning on the effective date of this subpart, you must determine a risk-based capital level by implementing the risk-based capital stress test as described in § 650.23 and Appendix A to this subpart, and you must report the results to us as described in § 650.28. During this 12-month period, you will not be required to maintain capital at the risk-based capital level, but you must maintain your minimum capital level as prescribed in section 8.33 of the Act. Beginning on the day following the 12-month period, you must comply with all provisions of this subpart.

§ 650.31 Audit of the risk-based capital stress test.

You must have a qualified, independent external auditor review your implementation of the risk-based capital stress test every 3 years and submit a copy of the auditor's opinion to us.

Appendix A—Subpart B of Part 650—Risk-Based Capital Stress Test

1.0 Introduction

a. Appendix A provides details about the risk-based capital stress test (stress test) for Farmer Mac. The stress test calculates the risk-based capital level required by statute under stipulated conditions of credit risk and interest rate risk. The stress test uses loan-level data from Farmer Mac's agricultural mortgage portfolio, as well as quarterly Call Report and related information to generate pro forma financial statements and calculate a risk-based capital requirement. The stress test also uses historic agricultural real estate mortgage performance data, relevant economic variables, and other inputs in its calculations of Farmer Mac's capital needs over a 10-year period.

b. Appendix A establishes the requirements for all components of the stress test. The key components of the stress test are: specifications of credit risk, interest rate risk, the cashflow generator, and the capital calculation. Linkages among the components ensure that the measures of credit and interest rate risk pass into the cashflow generator. The linkages also transfer cashflows through the financial statements to represent values of assets, liabilities, and equity capital. The 10-year projection is designed to reflect a steady state in the scope and composition of Farmer Mac's assets.

2.0 Credit Risk

Loan loss rates are determined by applying loss-frequency and loss-severity equations to Farmer Mac loan-level data. From these equations, you must calculate loan losses under stressful economic conditions assuming Farmer Mac's portfolio remains at a ''steady state.'' Steady state assumes the underlying characteristics and risks of Farmer Mac's portfolio remain constant over the 10 years of the stress test. Loss rates are computed from estimated dollar losses for use in the stress test. The loan volume subject to loss throughout the stress test is then multiplied by the loss rate. Lastly, the stress test allocates losses to each of the 10 years assuming a time pattern for loss occurrence as discussed in section 4.3, ''Risk Measures.''

2.1 Loss-Frequency and Loss-Severity Models

a. Credit risks are modeled in the stress test using historical time series loan-level data to measure the frequency and severity of losses on agricultural mortgage loans. The model relates loss frequency and severity to loan-level characteristics and economic conditions through appropriately specified regression equations to account explicitly for the effects of these characteristics on loan losses. Loan losses for Farmer Mac are estimated from the resulting loss-frequency and loss-severity equations by substituting the respective values of Farmer Mac's loan-level data, and applying stressful economic inputs.

b. The loss-frequency and loss-severity equations were estimated from historical agricultural real estate mortgage loan data from the Farm Credit Bank of Texas (FCBT). Due to Farmer Mac's relatively short history, its own loan-level data are insufficiently developed for use in estimating default frequency and loss-severity equations. In the future, however, expansions in both the scope and historic length of Farmer Mac's lending operations may support the use of its data in estimating the relationships.

c. To estimate the equations, the data used included FCBT loans, which satisfied three of the four underwriting standards Farmer Mac currently uses (estimation data). The four standards specify: (1) The debt-to-assets ratio (D/A) must be less than 0.50, (2) the loan-to-value ratio (LTV) must be less than 0.70, (3) the debt-service-coverage ratio (DSCR) must exceed 1.25, (4) and the current ratio (current assets divided by current liabilities) must exceed 1.0. Furthermore, the D/A and LTV ratios were restricted to be less than or equal to 0.85.

d. Several limitations in the FCBT loan-level data affect construction of the loss-frequency equation. The data contained loans that were originated between 1979 and 1992, but there were virtually no losses during the early years of the sample period. As a result, losses attributable to specific loans are only available from 1986 through 1992. In addition, no prepayment information was available in the data.

e. The FCBT data used for estimation also included as performing loans, those loans that were re-amortized, paid in full, or merged with a new loan. Including these loans may lead to an understatement of loss-frequency probabilities if some of the re-amortized, paid, or merged loans experience default or incur losses. In contrast, when the loans that are re-amortized, paid in full, or merged are excluded from the analysis, the loss-frequency rates are overstated if a higher proportion of loans that are re-amortized, paid in full, or combined (merged) into a new loan are non-default loans compared to live loans.[1]

f. The structure of the historical FCBT data supports estimation of loss frequency based on origination information and economic conditions. Under an origination year approach, each observation is used only once in estimating loan default. The underwriting variables at origination and economic factors occurring over the life of the loan are then used to estimate loan-loss frequency.

g. The final loss-frequency equation is based on origination year data and represents a lifetime loss-frequency model. The final equation for loss frequency is:

$$p = 1/(1+\exp(-(BX))$$

Where:

$$BX = (-12.62738) + 1.91259 \cdot X_1 + (-0.33830) \cdot X_2 / (1 + 0.0413299)^{Periods} + (-0.19596) \cdot X_3 + 4.55390 \cdot (1 - \exp((-0.00538178) \cdot X_4) + 2.49482 \cdot X_5$$

Where:

- p is the probability that a loan defaults and has positive losses (Pr (Y=1|x));
- X_1 is the LTV ratio at loan origination raised to the power 5.3914596; [2]
- X_2 is the largest annual percentage decline in FCBT farmland values during the life of the loan dampened with a factor of 0.0413299 per year; [3]
- X_3 is the DSCR at loan origination;
- X_4 is 1 minus the exponential of the product of negative 0.00538178 and the

[1] Excluding loans with defaults, 11,527 loans were active and 7,515 loans were paid in full, re-amortized or merged as of 1992. A t-test[2] of the differences in the means for the group of defaulted loans and active loans indicated that active loans had significantly higher D/A and LTV ratios, and lower current ratios than defaulted loans where loss occurred. These results indicate that, on average, active loans have potentially higher risk than loans that were re-amortized, paid in full, or merged.

[2] Loss probability is likely to be more sensitive to changes in LTV at higher values of LTV. The power function provides a continuous relationship between LTV and defaults.

[3] The dampening function reflects the declining effect that the maximum land value decline has on the probability of default when it occurs later in a loan's life.

original loan balance in 1997 dollars expressed in thousands; and

- X_5 is the D/A ratio at loan origination.

h. The estimated logit coefficients and p-values are: [4]

	Coefficients	p-value
Intercept	−12.62738	<0.0001
X_1: LTV variable	1.91259	0.0001
X_2: Max land value decline variable	0.33830	<0.0001
X_3: DSCR	−0.19596	0.0002
X_4: Loan size variable	4.55390	<0.0001
X_5: D/A ratio	2.49482	<0.0000

i. The low p-values on each coefficient indicate a highly significant relationship between the probability ratio of loan-loss frequency and the respective independent variables. Other goodness-of-fit indicators are:

Hosmer and Lemeshow goodness-of-fit p-value.	0.1718
Max-rescaled R^2	0.2015
Concordant	85.2%
Disconcordant	12.0%
Tied	2.8%

j. These variables have logical relationships to the incidence of loan default and loss, as evidenced by the findings of numerous credit-scoring studies in agricultural finance.[5] Each of the variable coefficients has directional relationships that appropriately capture credit risk from underwriting variables and, therefore, the incidence of loan-loss frequency. The frequency of loan loss was found to differ significantly across all of the loan characteristics and lending conditions. Farmland values represent an appropriate variable for capturing the effects of exogenous economic factors. It is commonly accepted that farmland values at any point in time reflect the discounted present value of expected returns to the land.[6] Thus, changes in land values, as expressed in the loss-frequency equation, represent the combined effects of the level and growth rates of farm income, interest rates, and inflationary expectations—each of which is accounted for in the discounted, present value process.

k. When applying the equation to Farmer Mac's portfolio, you must get the input values for X_1, X_3, X_4, and X_5 for each loan in Farmer Mac's portfolio on the date at which the stress test is conducted. For the variable X_2, the stressful input value from the benchmark loss experience is −23.52 percent. You must apply this input to all Farmer Mac loans subject to loss to calculate loss frequency under stressful economic conditions.[7] The maximum land value decline from the benchmark loss experience is the simple average of annual land value changes for Iowa, Illinois, and Minnesota for the years 1984 and 1985.[8]

l. Forecasting with data outside the range of the estimation data requires special treatment for implementation. While the estimation data embody Farmer Mac values for various loan characteristics, the maximum farmland price decline experienced in Texas was −16.69 percent, a value below the benchmark experience of −23.52 percent. To control for this effect, you must apply a procedure that restricts the slope of all the independent variables to that observed at the maximum land value decline observed in the estimation data. Essentially, you must approximate the slope of the loss-frequency equation at the point −16.69 percent in order to adjust the probability of loan default and loss occurrence for data beyond the range in the estimating data. The adjustment procedure is shown in step 4 of section 2.3 entitled, ''Example Calculation of Dollar Loss on One Loan.''

m. Loss severity was not found to vary systematically and was considered constant across the tested loan characteristics and lending conditions. Thus, the simple weighted average by loss volume of 20.9 percent is used in the stress test.[9] You must multiply loss severity with the probability estimate computed from the loss-frequency equation to determine the loss rate for a loan.

n. Using original loan balance results in estimated probabilities of loss frequency over the entire life of a loan. To account for loan seasoning, you must reduce the loan-loss exposure by the cumulative probability of loss already experienced by each loan as discussed in section 2.2 entitled, ''Loan-Seasoning Adjustment.'' This subtraction is based on loan age and reduces the loss estimated by the loss-frequency and loss-severity equations. The result is an age-adjusted lifetime dollar loss that can be used in subsequent calculations of loss rates as discussed in section 2.5, ''Calculation of Loss Rates for Use in the Stress Test.''

2.2 Loan-Seasoning Adjustment

a. You must use the seasoning distribution to adjust each Farmer Mac loan for the cumulative loss exposure already experienced based on age. The effect of seasoning on the probability of loss is represented as a beta distribution. The distribution is based on the estimation data used to determine the loss-frequency equation. Using the estimation data, the cumulative total loss fractions are used to calculate the cumulative proportion of losses at each point in time. The two parameters of the beta distribution are then solved using a least squares error distance function, implemented with Microsoft Excel's solver utility. The spreadsheet for calculating the beta distribution is available on our Web site, *www.fca.gov,* or upon request.

b. The Excel solver utility uses a least squares framework rather than a direct maximum likelihood (product of probabilities) estimator. As a result, the Excel solver utility produces beta distribution parameters that are immaterially different from those estimated directly using a maximum likelihood estimator. The estimation of the beta distribution parameters is based on an average life of 14 years for agricultural mortgages. If the average life of agricultural mortgages in Farmer Mac's portfolio over time differs significantly from 14 years, we may re-estimate the beta distribution parameters.

c. The estimated seasoning beta distribution parameters for a 14-year average loan life that must be used are p = 4.288 and

[4] The nonlinear parameters for the variable transformations were simultaneously estimated using SAS version 8e NLIN procedure. The NLIN procedure produces estimates of the parameters of a nonlinear transformation for LTV, dampening factor, and loan-size variables. To implement the NLIN procedure, the loss-frequency equation and its variables are declared and initial parameter values supplied. The NLIN procedure is an iterative process that uses the initial parameter values as the starting values for the first iteration and continues to iterate until acceptable parameters are solved. The initial values for the power function and dampening function are based on the proposed rule. The procedure for the initial values for the size variable parameter is provided in an Excel spreadsheet posted at *www.fca.gov.* The Gauss-Newton method is the selected iterative solving process. As described in the preamble, the loss-frequency function for the nonlinear model is the negative of the log-likelihood function, thus producing maximum likelihood estimates. In order to obtain statistical properties for the loss-frequency equation and verify the logistic coefficients, the estimates for the nonlinear transformations are applied to the FCBT data and the loss-frequency model is re-estimated using the SAS Logistic procedure. The SAS procedures, output reports and Excel spreadsheet used to estimate the parameters of the loss-frequency equation are located on the Web site *www.fca.gov.*

[5] Splett, N.S., P. J. Barry, B. Dixon, and P. Ellinger. ''A Joint Experience and Statistical Approach to Credit Scoring,'' *Agricultural Finance Review,* 54(1994):39–54.

[6] Barry, P. J., P. N. Ellinger, J. A. Hopkin, and C. B. Baker. *Financial Management in Agriculture,* 5th ed., Interstate Publishers, 1995.

[7] On- and off-balance sheet Farmer Mac I agricultural mortgage program assets booked after the 1996 Act amendments are subject to the loss calculation.

[8] While the worst-case losses, based on origination year, occurred during 1983 and 1984, this benchmark was determined using annual land value changes that occurred 2 years later.

[9] We calculated the weighted-average loss severity from the estimation data.

q = 5.3185.[10] How the loan-seasoning distribution is used is shown in Step 7 of section 2.3, ''Example Calculation of Dollar Loss on One Loan.''

2.3 Example Calculation of Dollar Loss on One Loan

Here is an example of the calculation of the dollar losses for an individual loan with the following characteristics and input values: [11]

Loan Origination Year	1996
Loan Origination Balance	$1,250,000
LTV at Origination	0.5
D/A at Origination	0.5
DSCR at Origination	1.3984
Maximum Percentage Land Price Decline (MAX)	−23.52

Step 1: Convert 1996 Origination Value to 1997 dollar value (LOAN) based on the consumer price index and transform as follows:

$1,278,500 = $1,250,000 · 1.0228

0.998972 = 1 − exp((−.00538178) · $1,278,500 / 1000)

Step 2: Calculate the default probabilities using −16.64 percent and −16.74 percent land value declines as follows: [12]

Where,

$Z_1 = (-12.62738) + 1.91259 \cdot LTV^{5.3914596} - 0.33830 \cdot (-16.6439443) - 0.19596 \cdot DSCR + 4.55390 \cdot 0.998972 + 2.49482 \cdot DA = (-1.428509)$

Default Loss Frequency @ (−16.64%) = $1 / 1 + \exp^{-(-1.428509)} = 0.19333111$

And

$Z_1 = (-12.62738) + 1.91259 \cdot LTV^{5.3914596} - 0.33830 \cdot (-16.7439443) - 0.19596 \cdot DSCR + 4.55390 \cdot 0.998972 + 2.49482 \cdot DA = (-1.394679)$

Loss Frequency Probability @ (−16.74%) = $1 / 1 + \exp^{-(-1.394679)} = 0.19866189$

Step 3: Calculate the slope adjustment. You must calculate slope by subtracting the difference between ''Loss-Frequency Probability @ −16.64 percent'' and ''Loss-Frequency Probability @ −16.74 percent'' and dividing by −0.1 (the difference between −16.64 percent and −16.74 percent) as follows:

0.05330776 = (0.19333111 − 0.19866189) / −0.1

Step 4: Make the linear adjustment. You make the adjustment by increasing the loss-frequency probability where the dampened stressed farmland value input is less than −16.69 percent to reflect the stressed farmland value input, appropriately discounted. As discussed previously, the stressed land value input is discounted to reflect the declining effect that the maximum land value decline has on the probability of default when it occurs later in a loan's life.[13] The linear adjustment is the difference between −16.69 percent land value decline and the adjusted stressed maximum land value decline input of −23.52 multiplied by the slope estimated in Step 3 as follows:

Loss Frequency −16.69 percent =

$Z_1 = (-12.62738) + (1.91259)(LTV^{5.3914596}) - (0.33830)(-16.6939443) - (0.19596)(DSCR) + (4.55390)(0.998972) + (2.49482)(DA) = -1.411594$

And

$1 / 1 + \exp^{-(-1.411594)} = 0.19598279$

Dampened Maximum Land Price Decline = $(-20.00248544) = (-23.52)(1.0413299)^{-4}$

Slope Adjustment = 0.17637092 = $0.053312247 \cdot (-16.6939443 - (-20.00248544))$

Loan Default Probability = 0.37235371 = 0.19598279 + 0.17637092

Step 5: Multiply loan default probability times the average severity of 0.209 as follows:

0.077821926 = 0.37235371 · 0.209

Step 6: Multiply the loss rate times the origination loan balance as follows:

$97,277 = $1,250,000 · 0.077821926

Step 7: Adjust the origination based dollar losses for 4 years of loan seasoning as follows:

$81,987 = $97,277 − $97,277 · (0.157178762) [14]

2.4 Treatment of Long-Term Standby Purchase Commitments

The loss-frequency equation cannot be directly used to compute the loss exposure on loans covered by a long-term standby purchase commitment (standbys) because complete underwriting standards for these loans are unavailable. Instead, the initial loss rate applied to each standby loan is the respective state-level average loss rate unadjusted for loan seasoning. You must calculate the state-level loss rates from non-standby loans as total dollar loan losses before the loan-seasoning adjustment divided by total origination loan balances. Then, you must multiply the origination loan balance of each standby loan by the appropriate loss rate to calculate estimated dollar losses. You must then adjust the resulting standby loan-level dollar losses adjusted for loan seasoning as was done for non-standby loans. For example, consider a $1,000,000 standby loan originated in Idaho in 1990. And, suppose the unadjusted loss rate for Idaho is 3 percent. The loss for this loan is:

($1,000,000 · 0.03) = $30,000.

The loan is 7 years old, thus the seasoning adjustment is 0.635989125. The estimated age-adjusted losses for the standby loan are:

$10,920 = ($30,000)(1 − 0.635989125)

2.5 Calculation of Loss Rates for Use in the Stress Test

a. You must compute the loss rates by state (based on Farmer Mac's loan portfolio distribution) after you calculate dollar loan losses for each loan subject to loss in Farmer Mac's portfolio. The estimated lifetime losses adjusted for loan seasoning for non-standby loans are computed as total dollar loan losses adjusted for loan seasoning divided by total scheduled current loan balances for each state. Similarly, you must calculate the estimated lifetime losses and adjust for loan seasoning for standby loans. This calculation is the total dollar loan losses adjusted for loan seasoning divided by total scheduled current loan balances for each state. You must then blend the resulting state-level loss rates for non-standby and standby loans by blending the average loss rate for each state weighted by volume. The state loss rates estimated for Farmer Mac's loan portfolio are calculated in the spreadsheet, ''Credit Loss Module.XLS.'' This spreadsheet is available for download on our Web site, *www.fca.gov,* or will be provided upon request. The blended loss rates for each state are copied from the ''Credit Loss Module'' to the stress test spreadsheet for determining Farmer Mac's regulatory capital requirement.

b. The stress test use of the blended loss rates is further discussed in section 4.3, ''Risk Measures.''

3.0 Interest Rate Risk

The stress test explicitly accounts for Farmer Mac's vulnerability to interest rate risk from the movement in interest rates specified in the statute. The stress test considers Farmer Mac's interest rate risk position through the current structure of its balance sheet, reported interest rate risk shock-test results,[15] and other financial activities. The stress test calculates the effect of interest rate risk exposure through market value changes of interest-bearing assets, liabilities, and off-balance sheet transactions, and thereby the effects to equity capital. The stress test also captures this exposure through the cashflows on rate-sensitive assets and liabilities. We discuss how to calculate the dollar impact of interest rate risk in section 4.6, ''Balance Sheets.''

3.1 Process for Calculating the Interest Rate Movement

a. The stress test uses the 10-year Constant Maturity Treasury (10-year CMT) released by the Federal Reserve in HR. 15, ''Selected Interest Rates.'' The stress test uses the 10-year CMT to generate earnings yields on assets, expense rates on liabilities, and changes in the market value of assets and liabilities. For stress test purposes, the starting rate for the 10-year CMT is the 3-month average of the most recent monthly rate series published by the Federal Reserve. The 3-month average is calculated by summing the latest monthly series of the 10-year CMT and dividing by three. For

[10] We estimated the loan-seasoning distribution from portfolio aggregate charge-off rates from the estimation data. To do so, we arrayed all defaulting loans where loss occurred according to the time from origination to default. Then, a beta distribution, β(p, q), was fit to the estimation data scaled to the maximum time a loan survived (14 years).

[11] In the examples presented we rounded the numbers, but the example calculation are based on a larger number of significant digits. The stress test uses additional digits carried at the default precision of the software.

[12] This process facilitates the approximation of slope needed to adjust the loss probabilities for land value declines greater than observed in the estimation data.

[13] The dampened period is the number of years from the beginning of the origination year to the current year (i.e., January 1, 1996, to January 1, 2000, is 4 years).

[14] The age adjustment of 0.157178762 is determined from the beta distribution for a 4-year old loan.

[15] See paragraph c of section 4.1 entitled, ''Data Inputs'' for a description of the interest rate risk shock-reporting requirement.

instance, you would calculate the initial rate on June 30, 1999, as:

Month end	10-year CMT monthly series
04/1999	5.18
05/1999	5.54
06/1999	5.90
Average	5.54

b. The amount by which the stress test shocks the initial rate up and down is determined by calculating the 12-month average of the 10-year CMT monthly series. If the resulting average is less than 12 percent, the stress test shocks the initial rate by an amount determined by multiplying the 12-month average rate by 50 percent. However, if the average is greater than or equal to 12 percent, the stress test shocks the initial rate by 600 basis points. For example, determine the amount by which to increase and decrease the initial rate for June 30, 1999, as follows:

Month end	10-year CMT monthly series
07/1998	5.46
08/1998	5.34
09/1998	4.81
10/1998	4.53
11/1998	4.83
12/1998	4.65
01/1999	4.72
02/1999	5.00
03/1999	5.23
04/1999	5.18
05/1999	5.54
06/1999	5.90
12-Month Average	5.10

Calculation of Shock Amount:

12-Month Average Less than 12%	Yes
12-Month Average	5.10
Multiply the 12-Month Average by	50%
Shock in basis points equals	255

c. You must run the stress test for two separate changes in interest rates: (i) An immediate increase in the initial rate by the shock amount; and (ii) immediate decrease in the initial rate by the shock amount. The stress test then holds the changed interest rate constant for the remainder of the 10-year stress period. For example, at June 30, 1999, the stress test would be run for an immediate and sustained (for 10 years) upward movement in interest rates to 8.09 percent (5.54 percent plus 255 basis points) and also for an immediate and sustained (for 10 years) downward movement in interest rates to 2.99 percent (5.54 percent minus 255 basis points). The movement in interest rates that results in the greatest need for capital is then used to determine Farmer Mac's risk-based capital requirement.

4.0 Elements Used in Generating Cashflows

a. This section describes the elements that are required for implementation of the stress test and assessment of Farmer Mac capital performance through time. An Excel spreadsheet named FAMC RBCST, available at www.fca.gov, contains the stress test, including the cashflow generator. The spreadsheet contains the following seven worksheets:

(1) Data Input;
(2) Assumptions and Relationships;
(3) Risk Measures (credit risk and interest rate risk);
(4) Loan and Cashflow Accounts;
(5) Income Statements;
(6) Balance Sheets; and
(7) Capital.

b. Each of the components is described in further detail in sections 4.1 through 4.7 of this appendix with references where appropriate to the specific worksheets within the Excel spreadsheet. The stress test may be generally described as a set of linked financial statements that evolve over a period of 10 years using generally accepted accounting conventions and specified sets of stressed inputs. The stress test uses the initial financial condition of Farmer Mac, including earnings and funding relationships, and the credit and interest rate stressed inputs to calculate Farmer Mac's capital performance through time. The stress test then subjects the initial financial conditions to the first period set of credit and interest rate risk stresses, generates cashflows by asset and liability category, performs necessary accounting postings into relevant accounts, and generates an income statement associated with the first interval of time. The stress test then uses the income statement to update the balance sheet for the end of period 1 (beginning of period 2). All necessary capital calculations for that point in time are then performed.

c. The beginning of the period 2 balance sheet then serves as the departure point for the second income cycle. The second period's cashflows and resulting income statement are generated in similar fashion as the first period's except all inputs (i.e., the periodic loan losses, portfolio balance by category, and liability balances) are updated appropriately to reflect conditions at that point in time. The process evolves forward for a period of 10 years with each pair of balance sheets linked by an intervening set of cashflow and income statements. In this and the following sections, additional details are provided about the specification of the income-generating model to be used by Farmer Mac in calculating the risk-based capital requirement.

4.1 Data Inputs

The stress test requires the initial financial statement conditions and income generating relationships for Farmer Mac. The worksheet named ''Data Inputs'' contains the complete data inputs and the data form used in the stress test. The stress test uses these data and various assumptions to calculate pro forma financial statements. For stress test purposes, Farmer Mac is required to supply:

a. *Call Report Schedules RC: Balance Sheet and RI: Income Statement.* These schedules form the starting financial position for the stress test. In addition, the stress test calculates basic financial relationships and assumptions used in generating pro forma annual financial statements over the 10-year stress period. Financial relationships and assumptions are in section 4.2, ''Assumptions and Relationships.''

b. *Cashflow Data for Asset and Liability Account Categories.* The necessary cashflow data for the spreadsheet-based stress test are book value, weighted average yield, weighted average maturity, conditional prepayment rate, weighted average amortization, and weighted average guarantee fees. The spreadsheet uses this cashflow information to generate starting and ending account balances, interest earnings, guarantee fees, and interest expense. Each asset and liability account category identified in this data requirement is discussed in section 4.2, ''Assumptions and Relationships.''

c. *Interest Rate Risk Measurement Results.* The stress test uses the results from Farmer Mac's interest rate risk model to represent changes in the market value of assets, liabilities, and off-balance sheet positions during upward and downward instantaneous shocks in interest rates of 300, 250, 200, 150, and 100 basis points. The stress test uses these data to calculate a schedule of estimated effective durations representing the market value effects from a change in interest rates. The stress test uses a linear interpolation of the duration schedule to relate a change in interest rates to a change in the market value of equity. This calculation is described in paragraph 4.4 entitled, ''Loan and Cashflow Accounts,'' and is illustrated in the referenced worksheet of the stress test.

d. *Loan-Level Data for all Farmer Mac I Program Assets.*

(1) The stress test requires loan-level data for all Farmer Mac I program assets to determine lifetime age-adjusted loss rates. The specific loan data fields required for running the credit risk component are:

All other Farmer Mac I program loans	Long-term standby commitments
Loan Number	Loan Number.
Ending Scheduled Balance	Current Month Actual Balance.
Group	Group.
Pre/Post Act	Pre/Post Act.
Property State	Property State.
Product Type	Product Type.
Origination Date	Note Date.
Origination Loan Balance	Origination Loan Balance.

All other Farmer Mac I program loans	Long-term standby commitments
Origination Scheduled P&I	Cutoff Scheduled P&I.
Origination Appraised Value	Most Recent Appraised Value.
Loan-to-Value Ratio	Loan-To-Value Ratio.
Current Assets	Current Assets.
Current Liabilities	Current Liabilities.
Total Assets	Total Assets.
Total Liabilities	Total Liabilities.
Gross Farm Revenue	Gross Farm Revenue.
Net Farm Income	Net Farm Income.
Depreciation	Depreciation.
Interest on Capital Debt	Interest On Capital Debt.
Capital Lease Payments	Capital Lease Payments.
Living Expenses	Living Expenses.
Income & FICA Taxes	Income & FICA Taxes.
Net Off-Farm Income	Net Off-Farm Income.
Total Debt Service	Total Debt Service.
Guarantee Fee	Commitment Fee Rate.
Seasoned Loan	Seasoned Loan.

(2) From the loan-level data, you must identify the geographic distribution by state of Farmer Mac's loan portfolio and enter the current loan balance for each state in the ''Data Inputs'' worksheet. The lifetime age-adjustment of origination year loss rates was discussed in section 2.0, ''Credit Risk.'' The lifetime age-adjusted loss rates, blended across standby and non-standby program assets are entered in the ''Risk Measures'' worksheet of the stress test. The stress test application of the loss rates is discussed in section 4.3, ''Risk Measures.''

e. *Other Data Requirements.* Other data elements are taxes paid over the previous 2 years, the corporate tax schedule, selected line items from Schedule RS–C of the Call Report, and 10-year CMT information as discussed in section 3.1 entitled, ''Process for Calculating the Interest Rate Movement.'' The stress test uses the corporate tax schedule and previous taxes paid to determine the appropriate amount of taxes, including available loss carry-backs and loss carry-forwards. Three line items found in sections Part II 2.a. and 2.b. of Call Report Schedule RS–C Capital Calculation must also be entered in the ''Data Inputs'' sheet. The two line items found in Part II 2.a. contain the dollar volume off-balance sheet assets relating to the Farmer Mac I and II programs. The off-balance sheet program asset dollar volumes are used to calculate the operating expense regression on a quarterly basis. The single-line item found in Part II 2.b. provides the amount of other off-balance sheet obligations and is presented in the balance sheet section of the stress test for purposes of completeness. The 10-year CMT quarterly average of the monthly series and the 12-month average of the monthly series must be entered in the ''Data Inputs'' sheet. These two data elements are used to determine the starting interest rate and the level of the interest rate shock applied in the stress test.

4.2 Assumptions and Relationships

a. The stress test assumptions are summarized on the worksheet called ''Assumptions and Relationships.'' Some of the entries on this page are direct user entries. Other entries are relationships generated from data supplied by Farmer Mac or other sources as discussed in section 4.1, ''Data Inputs.'' After current financial data are entered, the user selects the date for running the stress test. This action causes the stress test to identify and select the appropriate data from the ''Data Inputs'' worksheet. The next section highlights the degree of disaggregation needed to maintain reasonably representative financial characterizations of Farmer Mac in the stress test. Several specific assumptions are established about the future relationships of account balances and how they evolve.

b. From the data and assumptions, the stress test computes pro forma financial statements for 10 years. The stress test must be run as a ''steady state'' with regard to program balances, and where possible, will use information gleaned from recent financial statements and other data supplied by Farmer Mac to establish earnings and cost relationships on major program assets that are applied forward in time. As documented in the stress test, entries of ''1'' imply no growth and/or no change in account balances or proportions relative to initial conditions. The interest rate risk and credit loss components are applied to the stress test through time. The individual sections of that worksheet are:

(1) *Elements related to cashflows, earnings rates, and disposition of discontinued program assets.*

(A) The stress test accounts for earnings rates by asset class and cost rates on funding. The stress test aggregates investments into the categories of: Cash and money market securities; commercial paper; certificates of deposit; agency mortgage-backed securities and collateralized mortgage obligations; and other investments. With FCA's concurrence, Farmer Mac is permitted to further disaggregate these categories. Similarly, we may require new categories for future activities to be added to the stress test. Loan items requiring separate accounts include the following:

(i) Farmer Mac I program assets post-1996 Act;

(ii) Farmer Mac I program assets post-1996 Act Swap balances;

(iii) Farmer Mac I program assets pre-1996 Act;

(iv) Farmer Mac I AgVantage securities;

(v) Loans held for securitization; and

(vi) Farmer Mac II program assets.

(B) The stress test also uses data elements related to amortization and prepayment experience to calculate and process the implied rates at which asset and liability balances terminate or ''roll off'' through time. Further, for each category, the stress test has the capacity to track account balances that are expected to change through time for each of the categories in paragraph b. (1)(A) of this section. For purposes of the stress test, all assets are assumed to maintain a ''steady state'' with the implication that any principal balances retired or prepaid are replaced with new balances. The exceptions are that expiring pre-1996 Act program assets are replaced with post-1996 Act program assets.

(2) *Elements related to other balance sheet assumptions through time.* As well as interest earning assets, the other categories of the balance sheet that are modeled through time include interest receivable, guarantee fees receivable, prepaid expenses, accrued interest payable, accounts payable, accrued expenses, reserves for losses (loans held and guaranteed securities), and other off-balance sheet obligations. The stress test is consistent with Farmer Mac's existing reporting categories and practices. If reporting practices change substantially, the list in this section will be adjusted accordingly. The stress test has the capacity to have the balances in each of these accounts determined based upon existing relationships to other earning accounts, to keep their balances either in constant proportions of loan or security accounts, or to evolve according to a user-selected rule. For purposes of the stress test, these accounts are to remain constant relative to the proportions of their associated balance sheet accounts that generated the accrued balances.

(3) *Elements related to income and expense assumptions.* Several other parameters that are required to generate pro forma financial statements may not be easily captured from historic data or may have characteristics that suggest that they be individually supplied. These parameters are the gain on agricultural mortgage-backed securities (AMBS) sales, miscellaneous income, operating expenses, reserve

requirement, and guarantee fees. The stress test assumes a 75 basis points gain rate on sales of AMBS securities, recognizing that this parameter, while reasonably related to recent performance, may change with changes in market conditions. Miscellaneous income as a percentage of total assets contributes 2 basis points to income.

(A) Fixed costs and variable costs are determined from historical financial data by running a regression (ordinary least squares) of operating expenses, excluding provision expense and taxes, to on-and off-balance sheet assets, including investments and Farmer Mac program assets. The regression equation can be expressed as:

$$Y = \alpha + \beta_1 \ln(X) + \beta_2 D$$

(B) Where Y is operating expenses excluding provision for loans and tax expenses; ln(X) is the natural log of investments and Farmer Mac program assets held on-and off-balance sheet, and D is a dummy variable (1 represents pre-1996 and 0 represents post-1996). The regression is estimated using ordinary least squares, where (α) is the intercept, (β_1) is the coefficient on the logarithm of on-balance sheet program assets and investments, and off-balance sheet program assets, and (β_2) is the coefficient on the dummy variable.

(C) To run the stress test, the operating expense regression equation must be re-estimated using data from Farmer Mac's inception to the most recent quarterly financial information and the resulting coefficient entered into the ''Assumptions and Relationships'' worksheet. As additional data accumulate, the specification will be re-examined and modified if we deem changing the specification results in a more appropriate representation of operating expenses.

(D) The reserve requirement as a fraction of loan assets can also be specified. However, the stress test is run with the reserve requirement set to zero. Setting the parameter to zero causes the stress test to calculate a risk-based capital level that is comparable to regulatory capital, which includes reserves. Thus, the risk-based capital requirement contains the regulatory capital required, including reserves. The amount of total capital that is allocated to the reserve account is determined by GAAP. The guarantee rates applied in the stress test are: post-1996 Farmer Mac I assets (50 basis points, current weighted average of 42 basis points); pre-1996 Farmer Mac I assets (25 basis points); and Farmer Mac II assets (25 basis points).

(4) *Elements related to earnings rates and funding costs.*

(A) The stress test can accommodate numerous specifications of earnings and funding costs. In general, both relationships are tied to the 10-year CMT interest rate. Specifically, each investment account, each loan item, and each liability account can be specified as fixed rate, or fixed spread to the 10-year CMT with initial rates determined by actual data. The stress test calculates specific spreads (weighted average yield less initial 10-year CMT) by category from the weighted average yield data supplied by Farmer Mac as described earlier. For example, the fixed spread for Farmer Mac I program post-1996 Act mortgages is calculated as follows:

Fixed Spread = Weighted Average Yield less 10-year CMT

$0.014 = 0.0694 - 0.0554$

(B) The resulting fixed spread of 1.40 percent is then added to the 10-year CMT when it is shocked to determine the new yield. For instance, if the 10-year CMT is shocked upward by 300 basis points, the yield on Farmer Mac I program post-1996 Act loans would change as follows:

Yield = Fixed Spread + 10-year CMT

$.0994 = .014 + .0854$

(C) The adjusted yield is then used for income calculations when generating pro forma financial statements. All fixed-spread asset and liability classes are computed in an identical manner using starting yields provided as data inputs from Farmer Mac. The fixed-yield option holds the starting yield data constant for the entire 10-year stress test period. You must run the stress test using the fixed-spread option for all accounts except for discontinued program activities, such as Farmer Mac I program loans made before the 1996 Act. For discontinued loans, the fixed-rate specification must be used if the loans are primarily fixed-rate mortgages.

(5) *Elements related to interest rate shock test.* As described earlier, the interest rate shock test is implemented as a single set of forward interest rates. The stress test applies the up-rate scenario and down-rate scenario separately. The stress test also uses the results of Farmer Mac's shock test, as described in paragraph c. of section 4.1, ''Data Inputs,'' to calculate the impact on equity from a stressful change in interest rates as discussed in section 3.0 titled, ''Interest Rate Risk.'' The stress test uses a schedule relating a change in interest rates to a change in the market value of equity. For instance, if interest rates are shocked upward so that the percentage change is 262 basis points, the linearly interpolated effective estimated duration of equity is -6.7405 years given Farmer Mac's interest rate measurement results at 250 and 300 basis points of -6.7316 and -6.7688 years, respectively found on the effective duration schedule. The stress test uses the linearly interpolated estimated effective duration for equity to calculate the market value change by multiplying duration by the base value of equity before any rate change from Farmer Mac's interest rate risk measurement results with the percentage change in interest rates.

4.3 Risk Measures

a. This section describes the elements of the stress test in the worksheet named ''Risk Measures'' that reflect the interest rate shock and credit loss requirements of the stress test.

b. As described in section 3.1, the stress test applies the statutory interest rate shock to the initial 10-year CMT rate. It then generates a series of fixed annual interest rates for the 10-year stress period that serve as indices for earnings yields and cost of funds rates used in the stress test. (See the ''Risk Measures'' worksheet for the resulting interest rate series used in the stress test.)

c. The blended loss rates by state, as described in section 2.5 entitled, ''Calculation of Loss Rates for Use in the Stress Test,'' are entered into the ''Risk Measures'' worksheet and applied to the loan balances that exist in each state as reported in the initial loan portfolio of Farmer Mac. The initial distribution of loan balances by state is used to allocate new loans that replace loan products that roll off the balance sheet through time. The loss rates are applied both to the initial volume and to new loan volume that replaces expiring loans. The total life of loan losses that are expected at origination are then allocated through time based on a set of user entries describing the time-path of losses.

d. The loss rates estimated in the credit risk component of the stress test are based on an origination year concept, adjusted for loan seasoning. All losses arising from loans originated in a particular year are expressed as lifetime age-adjusted losses irrespective of when the losses actually occur. The fraction of the origination year loss rates that must be used to allocate losses through time are 43 percent to year 1, 17 percent to year 2, 11.66 percent to year 3, and 4.03 percent for the remaining years. The total allocated losses in any year are expressed as a percent of loan volume in that year to reflect the conversion to exposure year.

4.4 Loan and Cashflow Accounts

The worksheet labeled ''Loan and Cashflow Data'' contains the categorized loan data and cashflow accounting relationships that are used in the stress test to generate projections of Farmer Mac's performance and condition. As can be seen in the worksheet, the steady-state formulation results in account balances that remain constant except for the effects of discontinued programs. For assets with maturities under 1 year, the results are reported for convenience as though they matured only one time per year with the additional convention that the earnings/cost rates are annualized. For the pre-1996 Act assets, maturing balances are added back to post-1996 Act account balances. The liability accounts are used to satisfy the accounting identity, which requires assets to equal liabilities plus owner equity. In addition to the replacement of maturities under a steady state, liabilities are increased to reflect net losses or decreased to reflect resulting net gains. Adjustments must be made to the long- and short-term debt accounts to maintain the same relative proportions as existed at the beginning period from which the stress test is run. The primary receivable and payable accounts are also maintained on this worksheet, as is a summary balance of the volume of loans subject to credit losses.

4.5 Income Statements

a. Information related to income performance through time is contained on the worksheet named ''Income Statements.'' Information from the first period balance sheet is used in conjunction with the earnings and cost-spread relationships from Farmer Mac supplied data to generate the first period's income statement. The same set of accounts is maintained in this worksheet as ''Loan and Cashflow Accounts'' for consistency in reporting each annual period of the 10-year stress period of the test. The income from each interest-bearing account is

calculated, as are costs of interest-bearing liabilities. In each case, these entries are the associated interest rate for that period multiplied by the account balances.

b. The credit losses described in section 2.0, ''Credit Risk,'' are transmitted through the provision account as is any change needed to re-establish the target reserve balance. For determining risk-based capital, the reserve target is set to zero as previously indicated in section 4.2. Under the income tax section, it must first be determined whether it is appropriate to carry forward tax losses or recapture tax credits. The tax section then establishes the appropriate income tax liability that permits the calculation of final net income (loss), which is credited (debited) to the retained earnings account.

4.6 Balance Sheets

a. The worksheet named ''Balance Sheets'' is used to construct pro forma balance sheets from which the capital calculations can be performed. As can be seen in the Excel spreadsheet, the worksheet is organized to correspond to Farmer Mac's normal reporting practices. Asset accounts are built from the initial financial statement conditions, and loan and cashflow accounts. Liability accounts including the reserve account are likewise built from the previous period's results to balance the asset and equity positions. The equity section uses initial conditions and standard accounts to monitor equity through time. The equity section maintains separate categories for increments to paid-in-capital and retained earnings and for mark-to-market effects of changes in account values. The process described in the ''Capital'' worksheet uses the initial retained earnings and paid-in-capital account to test for the change in initial capital that permits conformance to the statutory requirements. Therefore, these accounts must be maintained separately for test solution purposes.

b. The market valuation changes due to interest rate movements must be computed utilizing the linearly interpolated schedule of estimated equity effects due to changes in interest rates, contained in the ''Assumptions & Relationships'' worksheet. The stress test calculates the dollar change in the market value of equity by multiplying the base value of equity before any rate change from Farmer Mac's interest rate risk measurement results, the linearly interpolated estimated effective duration of equity, and the percentage change in interest rates. In addition, the earnings effect of the measured dollar change in the market value of equity is estimated by multiplying the dollar change by the blended cost of funds rate found on the ''Assumptions & Relationships'' worksheet. Next, divide by 2 the computed earnings effect to approximate the impact as a theoretical shock in the interest rates that occurs at the mid-point of the income cycle from period t_0 to period t_1. The measured dollar change in the market value of equity and related earnings effect are then adjusted to reflect any tax related benefits. Tax adjustments are determined by including the measured dollar change in the market value of equity and the earnings effect in the tax calculations found in the ''Income Statements'' worksheet. This approach ensures that the value of equity reflects the economic loss or gain in value of Farmer Mac's capital position from a change in interest rates and reflects any immediate tax benefits that Farmer Mac could realize. Any tax benefits in the module are posted through the income statement by adjusting the net taxes due before calculating final net income. Final net income is posted to accumulated unretained earnings in the shareholders' equity portion of the balance sheet. The tax section is also described in section 4.5 entitled, ''Income Statements.''

c. After one cycle of income has been calculated, the balance sheet as of the end of the income period is then generated. The ''Balance Sheet'' worksheet shows the periodic pro forma balance sheets in a format convenient to track capital shifts through time.

d. The stress test considers Farmer Mac's balance sheet as subject to interest rate risk and, therefore, the capital position reflects mark-to-market changes in the value of equity. This approach ensures that the stress test captures interest rate risk in a meaningful way by addressing explicitly the loss or gain in value resulting from the change in interest rates required by the statute.

4.7 Capital

The ''Capital'' worksheet contains the results of the required capital calculations as described in section 5.0, and provides a method to calculate the level of initial capital that would permit Farmer Mac to maintain positive capital throughout the 10-year stress test period.

5.0 Capital Calculation

a. The stress test computes regulatory capital as the sum of the following:

(1) The par value of outstanding common stock;

(2) The par value of outstanding preferred stock;

(3) Paid-in capital;

(4) Retained earnings; and

(5) Reserve for loan and guarantee losses.

b. Inclusion of the reserve account in regulatory capital is an important difference compared to minimum capital as defined by the statute. Therefore, the calculation of reserves in the stress test is also important because reserves are reduced by loan and guarantee losses. The reserve account is linked to the income statement through the provision for loan-loss expense (provision). Provision expense reflects the amount of current income necessary to rebuild the reserve account to acceptable levels after loan losses reduce the account or as a result of increases in the level of risky mortgage positions, both on-and off-balance sheet. Provision reversals represent reductions in the reserve levels due to reduced risk of loan losses or loan volume of risky mortgage positions. When calculating the stress test, the reserve is maintained at zero to result in a risk-based capital requirement that includes reserves, thereby making the requirement comparable to the statutory definition of regulatory capital. By setting the reserve requirement to zero, the capital position includes all financial resources Farmer Mac has at its disposal to withstand risk.

5.1 Method of Calculation

a. Risk-based capital is calculated in the stress test as the minimum initial capital that would permit Farmer Mac to remain solvent for the ensuing 10 years. To this amount, an additional 30 percent is added to account for managerial and operational risks not reflected in the specific components of the stress test.

b. The relationship between the solvency constraint (i.e., future capital position not less than zero) and the risk-based capital requirement reflects the appropriate earnings and funding cost rates that may vary through time based on initial conditions. Therefore, the minimum capital at a future point in time cannot be directly used to determine the risk-based capital requirement. To calculate the risk-based capital requirement, the stress test includes a section to solve for the minimum initial capital value that results in a minimum capital level over the 10 years of zero at the point in time that it would actually occur. In solving for initial capital, it is assumed that reductions or additions to the initial capital accounts are made in the retained earnings accounts, and balanced in the debt accounts at terms proportionate to initial balances (same relative proportion of long- and short-term debt at existing initial rates). Because the initial capital position affects the earnings, and hence capital positions and appropriate discount rates through time, the initial and future capital are simultaneously determined and must be solved iteratively. The resulting minimum initial capital from the stress test is then reported on the ''Capital'' worksheet of the stress test. The ''Capital'' worksheet includes an element that uses Excel's ''solver'' or ''goal seek'' capability to calculate the minimum initial capital that, when added (subtracted) from initial capital and replaced with debt, results in a minimum capital balance over the following 10 years of zero.

Dated: April 5, 2001.

Kelly Mikel Williams,

Secretary, Farm Credit Administration Board.

[FR Doc. 01–8923 Filed 4–11–01; 8:45 am]

BILLING CODE 6705–01–P