SUBCHAPTER A—OFHEO ORGANIZATION AND FUNCTIONS [RESERVED]
SUBCHAPTER B [RESERVED]
SUBCHAPTER C—SAFETY AND SOUNDNESS

PARTS 1700–1709 [RESERVED]

PART 1750—CAPITAL

Subpart A—Minimum Capital

Subpart B—Risk-Based Capital

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Subpart A—Minimum Capital

§ 1750.1 General.

The regulation contained in this subpart A sets forth the methodology for computing the minimum capital requirement for each Enterprise. The board of directors of each Enterprise is responsible for ensuring that the Enterprise maintains capital at a level that is sufficient to ensure the continued financial viability of the Enterprise and that equals or exceeds the minimum capital requirement contained in this subpart A.

§ 1750.2 Definitions.

For purposes of this subpart A, the following definitions shall apply:

Affiliate means any entity that controls, is controlled by, or is under common control with, an Enterprise, except as otherwise provided by the Director.

Commitment means any contractual, legally binding agreement that obligates an Enterprise to purchase or to securitize mortgages.

Core Capital—(1) Means the sum of (as determined in accordance with generally accepted accounting principles)—

(i) The par or stated value of outstanding common stock;

(ii) The par or stated value of outstanding perpetual, noncumulative preferred stock;

(iii) Paid-in capital; and

(iv) Retained earnings; and

(2) Does not include debt instruments or any amounts the Enterprise could be required to pay at the option of an investor to retire capital instruments.

Director means the Director of OFHEO.

Enterprise means the Federal National Mortgage Association and any affiliate thereof or the Federal Home Loan Mortgage Corporation and any affiliate thereof.

Foreign exchange rate contracts—

(1) Means cross-currency interest rate swaps, forward foreign exchange contracts, currency options purchased (including currency options purchased over-the-counter), and any other instrument that gives rise to similar credit risks; and

(2) Does not mean foreign exchange rate contracts with an original maturity of 14 calendar days or less and foreign exchange rate contracts traded on exchanges that require daily payment of variation margins.

Interest rate contracts—

(1) Means single currency interest rate swaps, basis swaps, forward rate

agreements, interest rate options purchased (including caps, collars, and floors purchased), over-the-counter options purchased, and any other instrument that gives rise to similar credit risks (including when-issued securities and forward deposits accepted); and

(2) Does not mean such instruments traded on exchanges that require daily payment of variation margins.

Mortgage-backed security means a security, investment, or substantially equivalent instrument that represents an interest in a pool of loans secured by mortgages or deeds of trust where the principal or interest payments to the investor in the security or substantially equivalent instrument are guaranteed or effectively guaranteed by an Enterprise.

Multifamily credit enhancement means any guarantee, pledge, purchase arrangement, or other obligation or commitment provided or entered into by an Enterprise with respect to multifamily mortgages to provide credit enhancement, liquidity, interest rate support, and other guarantees and enhancements for revenue bonds issued by a state or local governmental unit (including a housing finance agency) or other bond issuer.

1992 Act means the Federal Housing Enterprises Financial Safety and Soundness Act of 1992, found at title XIII of the Housing and Community Development Act of 1992, Pub. L. 102–550, 12 U.S.C. 4501 *et seq.*

Notional amount means the face value of the underlying financial instrument(s) on which an interest rate or foreign exchange rate contract is based.

Off-balance sheet obligation means a binding agreement, contract, or similar arrangement that requires or may require future payment(s) in money or kind by another party to an Enterprise, or that effectively guarantees all or part of such payment(s) to third parties (including commitments), where such agreement or contract is a source of credit risk that is not included on its balance sheet.

OFHEO means the Office of Federal Housing Enterprise Oversight.

Other off-balance sheet obligations means all off-balance sheet obligations of an Enterprise that are not mortgage-backed securities or substantially equivalent instruments and that are not resecuritized mortgage-backed securities, such as real estate mortgage investment conduits or similar resecuritized instruments.

Perpetual, noncumulative preferred stock means preferred stock that—

(1) Does not have a maturity date;

(2) Provides the issuer the ability and the legal right to eliminate dividends and does not permit the accruing or payment of impaired dividends;

(3) Cannot be redeemed at the option of the holder; and

(4) Has no other provisions that will require future redemption of the issue, in whole or in part, or that will reset the dividend periodically based, in whole or in part, on the Enterprise's current credit standing, such as auction rate, money market, or remarketable preferred stock, or that may cause the dividend to increase to a level that could create an incentive for the issuer to redeem the instrument, such as exploding rate stock.

Qualifying collateral means cash on deposit; securities issued or guaranteed by the central governments of the OECD-based group of countries,[1]

[1] The OECD-based group of countries comprises full members of the Organization for Economic Cooperation and Development (OECD) regardless of entry date, as well as countries that have concluded special lending arrangements with the International Monetary Fund (IMF) associated with the IMF's General Arrangements to Borrow, but excludes any country that has rescheduled its external sovereign debt within the previous 5 years. A rescheduling of external sovereign debt generally would include any renegotiation of terms arising from a country's mobility or unwillingness to meet its external debt service obligations, but generally not include any renegotiation to allow the borrower to take advantage of a decline in interest rate or other change in market conditions. As of November 1995, the OECD countries included the following countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States; and Saudi Arabia has concluded special lending arrangements with the IMF associated with the IMF's General Arrangements to Borrow.

United States Government agencies, or United States Government-sponsored agencies; and securities issued by multilateral lending institutions or regional development banks.

§ 1750.3 Procedure and timing.

(a) Each Enterprise shall file with the Director a minimum capital report each quarter or at such other times as the Director requires, in his or her sole discretion. The report shall contain the information that responds to all of the items required by OFHEO in written instructions to the Enterprise, including, but not limited to:

(1) Estimate of the minimum capital requirement;

(2) Estimate of core capital overage or shortfall relative to the estimated minimum capital requirement;

(3) Such other information as may be required by the Director.

(b) The quarterly minimum capital report shall be submitted not later than April 30, July 30, October 30, and January 30 of each year.

(c) Each minimum capital report shall be submitted in writing and in such other format as may be required by the Director.

(d) In the event an Enterprise makes an adjustment to its financial statements for a quarter or a date for which the information was requested, which would cause an adjustment to a minimum capital report, the Enterprise shall file with the Director an amended minimum capital report not later than 3 business days after the date of such adjustment.

(e) Each minimum capital report or any amended minimum capital report shall contain a declaration by an officer authorized by the board of directors of the Enterprise to make such a declaration, including, but not limited to a president, vice president, or treasurer, that the report is true and correct to the best of such officer's knowledge and belief.

§ 1750.4 Minimum capital requirement computation.

(a) The minimum capital requirement for each Enterprise shall be computed by adding the following amounts:

(1) 2.50 percent times the aggregate on-balance sheet assets of the Enterprise;

(2) 0.45 percent times the unpaid principal balance of mortgage-backed securities and substantially equivalent instruments that were issued or guaranteed by the Enterprise;

(3) 0.45 percent of 50 percent of the average dollar amount of commitments outstanding each quarter over the preceding four quarters;

(4) 0.45 percent of the outstanding principal amount of bonds with multifamily credit enhancements;

(5) 0.45 percent of the dollar amount of sold portfolio remittances pending;

(6)(i) 3.00 percent of the credit equivalent amount of interest rate contracts and foreign exchange rate contracts, except to the extent of the current market value of posted qualifying collateral, computed in accordance with appendix A to this subpart;

(ii) 1.50 percent of the market value of qualifying collateral posted to secure interest rate and foreign exchange rate contracts, not to exceed the credit equivalent amount of such contracts, computed in accordance with appendix A to this subpart; and

(7) 0.45 percent of the outstanding amount, credit equivalent amount, or other measure determined appropriate by the Director, of other off-balance sheet obligations (excluding commitments, multifamily credit enhancements, sold portfolio remittances pending, and interest rate contracts and foreign exchange rate contracts), except as adjusted by the Director to reflect differences in the credit risk of such obligations in relation to mortgage-backed securities.

(b) Any asset or financial obligation that is properly classifiable in more than one of the categories enumerated in paragraphs (a) (1) through (7) of this section shall be classified in the category that yields the highest minimum capital requirement.

(c) As used in this section, the term ''preceding four quarters'' means the last day of the quarter just ended (or the date for which the minimum capital report is filed, if different), and the three preceding quarter-ends.

APPENDIX A TO SUBPART A OF PART 1750—MINIMUM CAPITAL COMPONENTS FOR INTEREST RATE AND FOREIGN EXCHANGE RATE CONTRACTS

1. The minimum capital components for interest rate and foreign exchange rate contracts are computed on the basis of the credit equivalent amounts of such contracts. Credit equivalent amounts are computed for each of the following off-balance sheet interest rate and foreign exchange rate contracts:

a. Interest Rate Contracts

i. Single currency interest rate swaps.

ii. Basis swaps.

iii. Forward rate agreements.

iv. Interest rate options purchased (including caps, collars, and floors purchased).

v. Any other instrument that gives rise to similar credit risks (including when-issued securities and forward deposits accepted).

b. Foreign Exchange Rate Contracts

i. Cross-currency interest rate swaps.

ii. Forward foreign exchange rate contracts.

iii. Currency options purchased.

iv. Any other instrument that gives rise to similar credit risks.

2. Foreign exchange rate contracts with an original maturity of 14 calendar days or less and foreign exchange rate contracts traded on exchanges that require daily payment of variation margins are excluded from the minimum capital requirement computation. Over-the-counter options purchased, however, are included and treated in the same way as the other interest rate and foreign exchange rate contracts.

3. Calculation of Credit Equivalent Amounts

a. The minimum capital components for interest rate and foreign exchange rate contracts are computed on the basis of the credit equivalent amounts of such contracts. The credit equivalent amount of an off-balance sheet interest rate and foreign exchange rate contract that is not subject to a qualifying bilateral netting contract in accordance with this appendix A is equal to the sum of the current exposure (sometimes referred to as the replacement cost) of the contract and an estimate of the potential future credit exposure over the remaining life of the contract.

b. The current exposure is determined by the mark-to-market value of the contract. If the mark-to-market value is positive, then the current exposure is the mark-to-market value. If the mark-to-market value is zero or negative, then the current exposure is zero. Mark-to-market values are measured in United States dollars, regardless of the currency or currencies specified in the contract, and should reflect changes in the relevant rates, as well as counterparty credit quality.

c. The potential future credit exposure of a contract, including a contract with a negative mark-to-market value, is estimated by multiplying the notional principal amount of the contract by a credit conversion factor. The effective rather than the apparent or stated notional amount must be used in this calculation. The credit conversion factors are:

Remaining maturity	Interest rate contracts (percent)	Foreign exchange rate contracts (percent)
1 year or less	0.0	1.0
Over 1 year	0.5	5.0

d. Because foreign exchange rate contracts involve an exchange of principal upon maturity, and foreign exchange rates are generally more volatile than interest rates, higher conversion factors have been established for foreign exchange rate contracts than for interest rate contracts.

e. No potential future credit exposure is calculated for single currency interest rate swaps in which payments are made based upon two floating rate indexes, so-called floating/floating or basis swaps. The credit exposure on these contracts is evaluated solely on the basis of their mark-to-market values.

4. Avoidance of Double Counting

In certain cases, credit exposures arising from the interest rate and foreign exchange instruments covered by this appendix A may already be reflected, in part, on the balance sheet. To avoid double counting such exposures in the assessment of capital adequacy, counterparty credit exposures arising from the types of instruments covered by this appendix A may need to be excluded from balance sheet assets in calculating the minimum capital requirement.

5. Collateral

a. The sufficiency of collateral for off-balance sheet items is determined by the market value of the collateral in relation to the credit equivalent amount. Collateral held against a netting contract is not recognized for minimum capital standard purposes unless it is legally available to support the single legal obligation created by the netting contract. Excess collateral held against one contract or a group of contracts for which a recognized netting agreement exists may not be considered.

b. The only forms of collateral that are formally recognized by the minimum capital standard framework are cash on deposit; securities issued or guaranteed by the central governments of the OECD-based group of countries, United States Government agencies, or United States Government-sponsored agencies; and securities issued by multilateral lending institutions or regional development banks.

6. Netting

a. For purposes of this appendix A, netting refers to the offsetting of positive and negative mark-to-market values in the determination of a current exposure to be used in the calculation of a credit equivalent amount. Any legally enforceable form of bilateral netting (that is, netting with a single counterparty) of interest rate and foreign exchange rate contracts is recognized for purposes of calculating the credit equivalent amount provided that the following criteria are met:

i. Netting must be accomplished under a written netting contract that creates a single legal obligation, covering all included individual contracts, with the effect that the Enterprise would have a claim to receive, or obligation to pay, only the net amount of the sum of the positive and negative mark-to-market values on included individual contracts in the event that a counterparty, or a counterparty to whom the contract has been validly assigned, fails to perform due to default, insolvency, liquidation, or similar circumstances.

ii. The Enterprise must obtain a written and reasoned legal opinion(s) representing that in the event of a legal challenge—including one resulting from default, insolvency, liquidation, or similar circumstances—the relevant court and administrative authorities would find the Enterprise's exposure to be such a net amount under—

A. The law of the jurisdiction in which the counterparty is chartered or the equivalent location in the case of noncorporate entities, and if a branch of the counterparty is involved, then also under the law of the jurisdiction in which the branch is located;

B. The law that governs the individual contracts covered by the netting contract; and

C. The law that governs the netting contract.

iii. The Enterprise must establish and maintain procedures to ensure that the legal characteristics of netting contracts are kept under review in the event of possible changes in relevant law.

iv. The Enterprise must maintain in its files documentation adequate to support the netting of rate contracts, including a copy of the bilateral netting contract and necessary legal opinions.

b. A contract containing a walkaway clause is not eligible for netting for purposes of calculating the credit equivalent amount.[1]

c. By netting individual contracts for the purpose of calculating its credit equivalent amount, the Enterprise represents that it has met the requirements of this appendix A and all the appropriate documents are in the Enterprise's files and available for inspection by OFHEO. OFHEO may determine that an Enterprise's files are inadequate or that a netting contract, or any of its underlying individual contracts, may not be legally enforceable under any one of the bodies of law described in this appendix A. If such a determination is made, the netting contract may be disqualified from recognition for minimum capital standard purposes or underlying individual contracts may be treated as though they are not subject to the netting contract.

d. The credit equivalent amount of interest rate and foreign exchange rate contracts that are subject to a qualifying bilateral netting contract is calculated by adding the current exposure of the netting contract and the sum of the estimates of the potential future credit exposures on all individual contracts subject to the netting contract, estimated in accordance with paragraph 3 of this appendix A. Offsetting contracts in the same currency maturing on the same date will have lower potential future exposure as well as lower current exposure. Therefore, for purposes of calculating potential future credit exposure to a netting counterparty for foreign exchange rate contracts and other similar contracts in which notional principal is equivalent to cash flows, total notional principal is defined as the net receipts falling due on each value date in each currency.

e. The current exposure of the netting contract is determined by summing all positive and negative mark-to-market values of the individual contracts included in the netting contract. If the net sum of the mark-to-market values is positive, then the current exposure of the netting contract is equal to that sum. If the net sum of the mark-to-market values is zero or negative, then the current exposure of the netting contract is zero. OFHEO may determine that a netting contract qualifies for minimum capital standard netting treatment even though certain individual contracts may not qualify. In such instances, the nonqualifying contracts should be treated as individual contracts that are not subject to the netting contract.

f. In the event a netting contract covers contracts that are normally excluded from the minimum capital requirement computation—for example, foreign exchange rate

[1] A walkaway clause is a provision in a netting contract that permits a non-defaulting counterparty to make lower payments than it would make otherwise under the contract, or no payment at all, to a defaulter or to the estate of a defaulter, even if the defaulter or the estate of the defaulter is a net creditor under the contract.

contracts with an original maturity of 14 calendar days or less, or instruments traded on exchanges that require daily payment of variation margin—an Enterprise may elect consistently either to include or exclude all mark-to-market values of such contracts when determining net current exposure.

Subpart B—Risk-Based Capital

SOURCE: 66 FR 47806, Sept. 13, 2001, unless otherwise noted.

§ 1750.10 General.

The regulation contained in this subpart B establishes the methodology for computing the risk-based capital level for each Enterprise. The board of directors of each Enterprise is responsible for ensuring that the Enterprise maintains total capital at a level that is sufficient to ensure the continued financial viability of the Enterprise and is equal to or exceeds the risk-based capital level computed pursuant to this subpart B.

§ 1750.11 Definitions.

Except where a term is explicitly defined differently in this subpart, all terms defined at § 1750.2 of subpart A of this part shall have the same meanings for purposes of this subpart. For purposes of subpart B of this part, the following definitions shall apply:

(a) *Benchmark loss experience* means the rates of default and severity for mortgage loans that—

(1) Were originated during a period of two or more consecutive calendar years in contiguous areas that together contain at least five percent of the population of the United States, and

(2) Experienced the highest loss rate for any period of such duration in comparison with the loans originated in any other contiguous areas that together contain at least five percent of the population of the United States.

(b) *Constant maturity Treasury yield* means the constant maturity Treasury yield, published by the Board of Governors of the Federal Reserve System.

(c) *Contiguous areas* means all the areas within a state or a group of two or more states sharing common borders. ''Sharing common borders'' does not mean meeting at a single point. Colorado, for example, is contiguous with New Mexico, but not with Arizona.

(d) *Credit risk* means the risk of financial loss to an Enterprise from nonperformance by borrowers or other obligors on instruments in which an Enterprise has a financial interest, or as to which the Enterprise has a financial obligation.

(e) *Default rate* of a given group of loans means the ratio of the aggregate original principal balance of the defaulted loans in the group to the aggregate original principal balance of all loans in the group.

(f) *Defaulted loan* means a loan that, within ten years following its origination:

(1) Resulted in pre-foreclosure sale,

(2) Completed foreclosure,

(3) Resulted in the acquisition of real estate collateral, or

(4) Otherwise resulted in a credit loss to an Enterprise.

(g) *Financing costs* of property acquired through foreclosure means the product of:

(1) The number of years (including fractions) of the period from the completion of foreclosure through disposition of the property,

(2) The average of the Enterprises' short-term funding rates, and

(3) The unpaid principal balance at the time of foreclosure.

(h) *Interest rate risk* means the risk of financial loss due to the sensitivity of earnings and net worth of an Enterprise to changes in interest rates.

(i) *Loss* on a defaulted loan means:

(1) With respect to a loan in category 1, 2, or 3 of the definition of defaulted loan the difference between:

(i) The sum of the principal and interest owed when the borrower lost title to the property securing the mortgage; financing costs through the date of property disposition; and cash expenses incurred during the foreclosure process, the holding period for real estate collateral acquired as a result of default, and the property liquidation process; and

(ii) The sum of the property sales price and any other liquidation proceeds (except those resulting from private mortgage insurance proceeds or other third-party credit enhancements).

(2) With respect to defaulted loans not in categories 1, 2, or 3, the amount of the financial loss to the Enterprise.

(j) *Mortgage* means any loan secured by such classes of liens as are commonly given or are legally effective to secure advances on, or the unpaid purchase price of, real estate under the laws of the State in which the real estate is located; or a manufactured house that is personal property under the laws of the State in which the manufactured house is located, together with the credit instruments, if any, secured thereby, and includes interests in mortgages.

(k) *Seasoning* means the change over time in the ratio of the unpaid principal balance of a mortgage to the value of the property by which such mortgage loan is secured.

(l) *Severity rate* for any group of defaulted loans means the aggregate losses on all loans in that group divided by the aggregate original principal balances of those loans.

(m) *Stress period* means a hypothetical ten-year period immediately following the day for which capital is being measured, which is a period marked by the severely adverse economic circumstances defined in 12 CFR 1750.13 and appendix A to this subpart.

(n) *Total capital* means, with respect to an Enterprise, the sum of the following:

(1) The core capital of the Enterprise;

(2) A general allowance for foreclosure losses, which—

(i) Shall include an allowance for portfolio mortgage losses, an allowance for non-reimbursable foreclosure costs on government claims, and an allowance for liabilities reflected on the balance sheet for the Enterprise for estimated foreclosure losses on mortgage-backed securities; and

(ii) Shall not include any reserves of the Enterprise made or held against specific assets.

(3) Any other amounts from sources of funds available to absorb losses incurred by the Enterprise, that the Director by regulation determines are appropriate to include in determining total capital.

(o) *Type of mortgage product* means a classification of one or more mortgage products, as established by the Director, that have similar characteristics from each set of characteristics under the paragraphs (o)(1) through (o)(7) of this section:

(1) The property securing the mortgage is—

(i) A residential property consisting of 1 to 4 dwelling units; or

(ii) A residential property consisting of more than 4 dwelling units.

(2) The interest rate on the mortgage is—-

(i) Fixed; or

(ii) Adjustable.

(3) The priority of the lien securing the mortgage is—

(i) First; or

(ii) Second or other.

(4) The term of the mortgage is—

(i) 1 to 15 years;

(ii) 16–30 years; or

(iii) More than 30 years.

(5) The owner of the property is—

(i) An owner-occupant; or

(ii) An investor.

(6) The unpaid principal balance of the mortgage—

(i) Will amortize completely over the term of the mortgage, and will not increase significantly at any time during the term of the mortgage;

(ii) Will not amortize completely over the term of the mortgage, and will not increase significantly at any time during the term of the mortgage; or

(iii) May increase significantly at some time during the term of the mortgage.

(7) Any other characteristics of the mortgage, as specified in appendix A to this subpart.

§ 1750.12 Procedures and timing.

(a) Each Enterprise shall file with the Director a Risk-Based Capital Report each quarter, and at such other times as the Director may require, in his or her discretion. The report shall contain the information required by the Director in the instructions to the Risk-Based Capital Report in the format or media specified therein and such other information as may be required by the Director.

(b) The quarterly Risk-Based Capital Report shall contain information for the last day of the quarter and shall be submitted not later than 30 days after the end of the quarter. Reports required by the Director other than quarterly reports shall be submitted within such time period as the Director shall specify.

(c) When an Enterprise contemplates entering a new activity, as the term is defined in section 3.11 of appendix A to this subpart, the Enterprise shall notify the Director as soon as possible while the transaction or activity is under consideration, but in no event later than 5 calendar days after settlement or closing. The Enterprises shall provide to the Director such information regarding the activity as the Director may require to determine a stress test treatment. OFHEO will inform the Enterprise as soon as possible thereafter of the proposed stress test treatment of the new activity. In addition, the notice of proposed capital classification required by §1777.21 of this chapter will inform the Enterprise of the capital treatment of such new activity used in the determination of the risk-based capital requirement.

(d) If an Enterprise discovers that a Risk-Based Capital Report previously filed with OFHEO contains any errors or omissions, the Enterprise shall notify OFHEO immediately of such discovery and file an amended Risk-Based Capital Report not later than three days thereafter.

(e) Each capital classification shall be determined by OFHEO on the basis of the Risk-Based Capital Report filed by the Enterprise under paragraph (a) of this section; provided that, in the event an amended Risk-Based Capital Report is filed prior to the issuance of the final notice of capital classification, the Director has the discretion to determine the Enterprise's capital classification on the basis of the amended report.

(f) Each Risk-Based Capital Report or any amended Risk-Based Capital Report shall contain a declaration by the officer who has been designated by the Board as responsible for overseeing the capital adequacy of the Enterprise that the report is true and correct to the best of such officer's knowledge and belief.

[66 FR 47806, Sept. 13, 2001, as amended at 67 FR 19322, Apr. 19, 2002]

§ 1750.13 Risk-based capital level computation.

(a) *Risk-Based Capital Test*—OFHEO shall compute a risk-based capital level for each Enterprise at least quarterly by applying the risk-based capital test described in appendix A to this subpart to determine the amount of total capital required for each Enterprise to maintain positive capital during the stress period. In making this determination, the Director shall take into account any appropriate distinctions among types of mortgage products, differences in seasoning of mortgages, and other factors determined appropriate by the Director in accordance with the methodology specified in appendix A to this subpart. The stress period has the following characteristics:

(1) *Credit risk*—With respect to mortgages owned or guaranteed by the Enterprise and other obligations of the Enterprise, losses occur throughout the United States at a rate of default and severity reasonably related, in accordance with appendix A to this subpart, to the benchmark loss experience.

(2) *Interest rate risk*—(i) *In general.* Interest rates decrease as described in paragraph (a)(2)(ii) of this section or increase as described in paragraph (a)(2)(iii) of this section, whichever would require more capital in the stress test for the Enterprise. Appendix A to this subpart contains a description of the methodology applied to implement the interest rate scenarios described in paragraphs (a)(2)(ii) and (iii) of this section.

(ii) *Decreases.* The 10-year constant maturity Treasury yield decreases during the first year of the stress period and remains at the new level for the remainder of the stress period. The yield decreases to the lesser of—

(A) 600 basis points below the average yield during the 9 months immediately preceding the stress period, or

(B) 60 percent of the average yield during the 3 years immediately preceding the stress period, but in no case to a yield less than 50 percent of the average yield during the 9 months immediately preceding the stress period.

(iii) *Increases.* The 10-year constant maturity Treasury yield increases during the first year of the stress period and will remain at the new level for the remainder of the stress period. The yield increases to the greater of—

(A) 600 basis points above the average yield during the 9 months immediately preceding the stress period, or

(B) 160 percent of the average yield during the 3 years immediately preceding the stress period, but in no case to a yield greater than 175 percent of the average yield during the 9 months immediately preceding the stress period.

(iv) *Different terms to maturity*. Yields of Treasury instruments with terms to maturity other than 10 years will change relative to the 10-year constant maturity Treasury yield in patterns and for durations that are reasonably related to historical experience and are judged reasonable by the Director. The methodology used by the Director to adjust the yields of those other instruments is specified in appendix A to this subpart.

(v) *Large increases in yields*. If the 10-year constant maturity Treasury yield is assumed to increase by more than 50 percent over the average yield during the 9 months immediately preceding the stress period, the Director shall adjust the losses resulting from the conditions specified in paragraph (a)(2)(iii) of this section to reflect a correspondingly higher rate of general price inflation. The method of such adjustment by the Director is specified in appendix A to this subpart.

(3) *New business*. Any contractual commitments of the Enterprise to purchase mortgages or issue securities will be fulfilled. The characteristics of resulting mortgages purchased, securities issued, and other financing will be consistent with the contractual terms of such commitments, recent experience, and the economic characteristics of the stress period, as more fully specified in appendix A to this subpart. No other purchases of mortgages shall be assumed.

(4) *Other activities*. Losses or gains on other activities, including interest rate and foreign exchange hedging activities, shall be determined by the Director, in accordance with appendix A to this subpart and on the basis of available information, to be consistent with the stress period.

(5) *Consistency*. Characteristics of the stress period other than those specifically set forth in paragraph (a) of this section, such as prepayment experience and dividend policies, will be determined by the Director, in accordance with appendix A to this subpart, on the basis of available information, to be most consistent with the stress period.

(b) *Risk-Based Capital Level*. The risk-based capital level of an Enterprise, to be used in determining the appropriate capital classification of each Enterprise, as required by section 1364 of the Federal Housing Enterprises Financial Safety and Soundness Act of 1992 (12 U.S.C. 4614), shall be equal to the sum of the following amounts:

(1) *Credit and Interest Rate Risk*. The amount of total capital determined by applying the risk-based capital test under paragraph (a) of this section to the Enterprise.

(2) *Management and Operations Risk*. To provide for management and operations risk, 30 percent of the amount of total capital determined by applying the risk-based capital test under paragraph (a) of this section to the Enterprise.

APPENDIX A TO SUBPART B OF PART 1750—RISK-BASED CAPITAL TEST METHODOLOGY AND SPECIFICATIONS

1.0 Identification of the Benchmark Loss Experience

OFHEO will use the definitions, data, and methodology described below to identify the Benchmark Loss Experience.

1.1 Definitions

The terms defined in the Glossary to this appendix shall apply for this appendix.

1.2 Data

[a] OFHEO identifies the Benchmark Loss Experience (BLE) using historical loan-level data required to be submitted by each of the two Enterprises. OFHEO's analysis is based entirely on the data available through 1995 on conventional, 30-year, fixed-rate loans secured by first liens on single-unit, owner-occupied, detached properties. For this purpose, detached properties are defined as single family properties excluding condominiums, planned urban developments, and cooperatives. The data includes only loans that were purchased by an Enterprise within 12 months after loan origination and loans for which the Enterprise has no recourse to the lender.

[b] OFHEO organizes the data from each Enterprise to create two substantially consistent data sets. OFHEO separately analyzes default and severity data from each Enterprise. Default rates are calculated from loan records meeting the criteria specified above. Severity rates are calculated from the subset of defaulted loans for which loss data are available.

1.3 Procedures

[a] Cumulative ten-year default rates for each combination of states and origination years (state/year combination) that OFHEO examines are calculated for each Enterprise by grouping all of the Enterprise's loans originated in that combination of states and years. For origination years with less than ten-years of loss experience, cumulative-to-date default rates are used. The two Enterprise default rates are averaged, yielding an "average default rate" for that state/year combination.

[b] An "average severity rate" for each state/year combination is determined in the same manner as the average default rate. For each Enterprise, the aggregate severity rate is calculated for all loans in the relevant state/year combination and the two Enterprise severity rates are averaged.

[c] The "loss rate" for any state/year combination examined is calculated by multiplying the average default rate for that state/year combination by the average severity rate for that combination.

[d] The rates of default and Loss Severity of loans in the state/year combination containing at least two consecutive origination years and contiguous areas with a total population equal to or greater than five percent of the population of the United States with the highest loss rate constitutes the Benchmark Loss Experience.

2.0 IDENTIFICATION OF A NEW BENCHMARK LOSS EXPERIENCE

OFHEO will periodically monitor available data and reevaluate the Benchmark Loss Experience using the methodology set forth in this appendix. Using this methodology, OFHEO may identify a new Benchmark Loss Experience that has a higher rate of loss than the Benchmark Loss Experience identified at the time of the issuance of this regulation. In the event such a Benchmark Loss Experience is identified, OFHEO may incorporate the resulting higher loss rates in the Stress Test.

3.0 COMPUTATION OF THE RISK-BASED CAPITAL REQUIREMENT

3.1 Data

3.1.1 Introduction

[a] The Stress Test requires data on all of an Enterprise's assets, liabilities, stockholders equity, accounting entries, operations and off-balance sheet obligations, as well as economic factors that affect them: interest rates, house prices, rent growth rates, and vacancy rates. The Enterprises are responsible for compiling and aggregating data on at least a quarterly basis into a standard format called the Risk-Based Capital Report (RBC Report). Each Enterprise is required to certify that the RBC Report submission is complete and accurate. Data on economic factors, such as interest rates, are compiled from public sources. The Stress Test uses proprietary and public data directly, and also uses values derived from such data in the form of constants or default values. (See Table 3–1, Sources of Stress Test Input Data.) Data fields from each of these sources for Stress Test computations are described in the following tables and in each section of this appendix.

[b] The RBC Report includes information for all the loans owned or guaranteed by an Enterprise, as well as securities and derivative contracts, the dollar balances of these instruments and obligations, as well as all characteristics that bear on their behavior under stress conditions. As detailed in the RBC Report, data are required for all the following categories of instruments and obligations:

- Mortgages owned by or underlying mortgage-backed securities (MBS) issued by the Enterprises (whole loans)
- Mortgage-related securities
- Nonmortgage related securities, whether issued by an Enterprise, (e.g., debt) or held as investments
- Derivative contracts
- Other off-balance sheet guarantees (e.g., guarantees of private-issue securities).

TABLE 3–1—SOURCES OF STRESS TEST INPUT DATA

Section of this Appendix	Table	Data Source(s) R = RBC Report P = Public Data F = Fixed Values			
		R	P	F	Intermediate Outputs
3.1.3, Public Data	3–19, Stress Test Single Family Quarterly House Price Growth Rates			F	
	3–20, Multifamily Monthly Rent Growth and Vacancy Rates			F	
3.2.2, Commitments Inputs	Characteristics of securitized single family loans originated and delivered within 6 months prior to the Start of the Stress Test	R			3.3.4, Interest Rates Outputs
3.2.3, Commitments Procedures	3–25, Monthly Deliveries as a Percentage of Commitments Outstanding (MDP)			F	
3.3.2, Interest Rates Inputs	3–18, Interest Rate and Index Inputs		P		
3.3.3, Interest Rates Procedures	3–26, CMT Ratios to the Ten-Year CMT			F	
3.4.2, Property Valuation Inputs	3–28, Property Valuation Inputs				3.1.3, Public Data 3.3.4, Interest Rates Outputs
3.5.3, Counterparty Defaults Procedures	3–30, Rating Agencies Mappings to OFHEO Ratings Categories		P		
	3–31, Stress Test Maximum Haircut by Ratings Classification			F	
3.6.3.3.2, Mortgage Amortization Schedule Inputs	3–32, Loan Group Inputs for Mortgage Amortization Calculation				3.3.4, Interest Rates Outputs
3.6.3.4.2, Single Family Default and Prepayment Inputs	3–34, Single Family Default and Prepayment Inputs	R		F	3.6.3.3.4, Mortgage Amortization Schedule Outputs
3.6.3.4.3.3, Prepayment and Default Rates and Performance Fractions	3–35, Coefficients for Single Family Default and Prepayment Explanatory Variables			F	
3.6.3.5.2, Multifamily Default and Prepayment Inputs	3–38, Loan Group Inputs for Multifamily Default and Prepayment Calculations	R		F	
3.6.3.5.3.3, Default and Prepayment Rates and Performance Fractions	3–39, Explanatory Variable Coefficients for Multifamily Default			F	3.6.3.3.4, Mortgage Amortization Schedule Outputs

TABLE 3–1—SOURCES OF STRESS TEST INPUT DATA—Continued

Section of this Appendix	Table	Data Source(s) R = RBC Report P = Public Data F = Fixed Values			
		R	P	F	Intermediate Outputs
3.6.3.6.2.6, Single Family Gross Loss Severity Inputs	3–42, Loan Group inputs for Gross Loss Severity			F	3.3.4, Interest Rates Outputs 3.6.3.3.4, Mortgage Amortization Schedule Outputs 3.6.3.4.4, Single Family Default and Prepayment Outputs
3.6.3.6.3.6, Multifamily Gross Loss Severity Inputs	3–44, Loan Group Inputs for Multifamily Gross Loss Severity			F	3.3.4, Interest Rates Outputs 3.6.3.3.4, Mortgage Amortization Schedule Outputs
3.6.3.6.4.8, Mortgage Credit Enhancement Inputs	3–46, CE Inputs for each Loan Group	R			3.6.3.3.4, Mortgage Amortization Schedule Outputs 3.6.3.4.4, Single Family Default and Prepayment Outputs 3.6.3.5.4, Multifamily Default and Prepayment Outputs 3.6.3.6.2.3, Single Family Gross Loss Severity Outputs 3.6.3.6.3.3, Multifamily Gross Loss Severity Outputs
	3–47, Inputs for each Distinct CE Combination (DCC)	R			
3.6.3.7.2, Stress Test Whole Loan Cash Flow Inputs	3–51, Inputs for Final Calculation of Stress Test Whole Loan Cash Flows	R			3.3.4, Interest Rates Outputs 3.6.3.3.4, Mortgage Amortization Schedule Outputs 3.6.3.4.4, Single Family Default and Prepayment Outputs 3.6.3.5.4, Multifamily Default and Prepayment Outputs 3.6.3.6.5.6, Single Family and Multifamily Net Loss Severity Outputs
3.6.3.8.2, Whole Loan Accounting Flows Inputs	3–54, Inputs for Whole Loan Accounting Flows	R			3.6.3.7.4, Stress Test Whole Loan Cash Flow Outputs
3.7.2, Mortgage-Related Securities Inputs	3–56, RBC Report Inputs for Single Class MBS Cash Flows	R			
	3–57, RBC Report Inputs for Multi-Class and Derivative MBS Cash Flows	R			
	3–58, RBC Report Inputs for MRBs and Derivative MBS Cash Flows	R			
3.8.2, Nonmortgage Instrument Inputs	3–66, Input Variables for Nonmortgage Instrument Cash flows	R			

TABLE 3–1—SOURCES OF STRESS TEST INPUT DATA—Continued

Section of this Appendix	Table	Data Source(s) R = RBC Report P = Public Data F = Fixed Values			
		R	P	F	Intermediate Outputs
3.9.2, Alternative Modeling Treatments Inputs	3–70, Alternative Modeling Treatment Inputs	R			
3.10.2, Operations, Taxes, and Accounting Inputs	3–71, Operations, Taxes, and Accounting Inputs	R			3.3.4, Interest Rates Outputs 3.6.3.7.4, Stress Test Whole Loan Cash Flow Outputs 3.7.4, Mortgage-Related Securities Outputs 3.8.4, Nonmortgage Instrument Outputs
3.12.2, Risk-Based Capital Requirement Inputs		R			3.3.4, Interest Rates Outputs 3.9.4, Alternative Modeling Treatments Outputs 3.10.4, Operations, Taxes, and Accounting Outputs

3.1.2 Risk-Based Capital Report

The Risk-Based Capital Report is comprised of information on whole loans, mortgage-related securities, nonmortgage instruments (including liabilities and derivatives), and accounting items (including off-balance sheet guarantees). In addition to their reported data, the Enterprises may report scale factors in order to reconcile this reported data with their published financials (*see* section 3.10.2[b] of this appendix). If so, specific data items, as indicated, are adjusted by appropriate scale factors before any calculations occur.

3.1.2.1 Whole Loan Inputs

[a] Whole loans are individual single family or multifamily mortgage loans. The Stress Test distinguishes between whole loans that the Enterprises hold in their investment portfolios (retained loans) and those that underlie mortgage-backed securities (sold loans). Consistent with Table 3–2, Whole Loan Classification Variables, each Enterprise aggregates the data for loans with similar portfolio (retained or sold), risk, and product characteristics. The characteristics of these loan groups determine rates of mortgage Default, Prepayment and Loss Severity and cash flows.

[b] The characteristics that are the basis for loan groups are called ''classification variables'' and reflect categories, e.g., fixed interest rate versus floating interest rate, or identify a value range, e.g., original loan-to-value (LTV) ratio greater than 80 percent and less than or equal to 90 percent.

[c] All loans with the same values for each of the relevant classification variables included in 3–2 (and where applicable 3–3 and 3–4) comprise a single loan group. For example, one loan group includes all loans with the following characteristics:

- Single family
- Sold portfolio
- 30-year fixed rate conventional loan
- Mortgage age greater than or equal to 36 months and less than 48 months
- Original LTV greater than 75 percent and less than or equal to 80 percent
- Current mortgage interest rate class greater than or equal to six percent and less than seven percent
- Secured by property located in the East North Central Census Division
- Relative loan size greater than or equal to 75 percent and less than 100 percent of the average for its state and origination year.

TABLE 3–2—WHOLE LOAN CLASSIFICATION VARIABLES

Variable	Description	Range
Reporting Date	The last day of the quarter for the loan group activity that is being reported to OFHEO	YYYY0331 YYYY0630 YYYY0930 YYYY1231
Enterprise	Enterprise submitting the loan group data	Fannie Mae Freddie Mac
Business Type	Single family or multifamily	Single family Multifamily
Portfolio Type	Retained portfolio or Sold portfolio	Retained Portfolio Sold Portfolio
Government Flag	Conventional or Government insured loan	Conventional Government
Original LTV	Assigned LTV classes based on the ratio, in percent, between the original loan amount and the lesser of the purchase price or appraised value	LTV≤60 60<LTV≤70 70<LTV≤75 75<LTV≤80 80<LTV≤90 90<LTV≤95 95<LTV≤100 100<LTV
Interest-only Flag	Indicates if the loan is currently paying interest-only. Loans that started as I/Os and are currently amortizing should be flagged as 'N'	Yes No
Current Mortgage Interest Rate	Assigned classes for the current mortgage interest rate	0.0≤Rate<4.0 4.0≤Rate<5.0 5.0≤Rate<6.0 6.0≤Rate<7.0 7.0≤Rate<8.0 8.0≤Rate<9.0 9.0≤Rate<10.0 10.0≤Rate<11.0 11.0≤Rate<12.0 12.0≤Rate<13.0 13.0≤Rate<14.0 14.0≤Rate<15.0 15.0≤Rate<16.0 Rate=>16.0
Original Mortgage Interest Rate	Assigned classes for the original mortgage interest rate	0.0≤Rate<4.0 4.0≤Rate<5.0 5.0≤Rate<6.0 6.0≤Rate<7.0 7.0≤Rate<8.0 8.0≤Rate<9.0 9.0≤Rate<10.0 10.0≤Rate<11.0 11.0≤Rate<12.0 12.0≤Rate<13.0 13.0≤Rate<14.0 14.0≤Rate<15.0 15.0≤Rate<16.0 Rate=>16.0

TABLE 3–2—WHOLE LOAN CLASSIFICATION VARIABLES—Continued

Variable	Description	Range
Mortgage Age	Assigned classes for the age of the loan	0≤Age≤12 12<Age≤24 24<Age≤36 36<Age≤48 48<Age≤60 60<Age≤72 72<Age≤84 84<Age≤96 96<Age≤108 108<Age≤120 120<Age≤132 132<Age≤144 144<Age≤156 156<Age≤168 168<Age≤180 Age>180
Rate Reset Period	Assigned classes for the number of months between rate adjustments	Period = 1 1<Period≤4 4<Period≤9 9<Period≤15 15<Period≤60 60<Period<999 Period = 999 (not applicable)
Payment Reset Period	Assigned classes for the number of months between payment adjustments after the duration of the teaser rate	Period≤9 9<Period≤15 15<Period<999 Period = 999 (not applicable)
ARM Index	Specifies the type of index used to determine the interest rate at each adjustment	FHLB 11th District Cost of Funds. 1 Month Federal Agency Cost of Funds. 3 Month Federal Agency Cost of Funds. 6 Month Federal Agency Cost of Funds. 12 Month Federal Agency Cost of Funds. 24 Month Federal Agency Cost of Funds. 36 Month Federal Agency Cost of Funds. 60 Month Federal Agency Cost of Funds. 120 Month Federal Agency Cost of Funds. 360 Month Federal Agency Cost of Funds. Overnight Federal Funds (Effective). 1 Week Federal Funds 6 Month Federal Funds 1 month LIBOR 3 Month LIBOR 6 Month LIBOR 12 Month LIBOR Conventional Mortgage Rate 15 Year Fixed Mortgage Rate 7 Year Balloon Mortgage Rate Prime Rate 1 Month Treasury Bill 3 Month CMT

TABLE 3–2—WHOLE LOAN CLASSIFICATION VARIABLES—Continued

Variable	Description	Range
		6 Month CMT 12 Month CMT 24 Month CMT 36 Month CMT 60 Month CMT 120 Month CMT 240 Month CMT 360 Month CMT
Cap Type Flag	Indicates if a loan group is rate-capped, payment-capped or uncapped	Payment Capped Rate Capped No periodic rate cap
OFHEO Ledger Code	OFHEO-specific General Ledger account number used in the Stress Test	Appropriate OFHEO Ledger Code based on the chart of accounts.

TABLE 3–3—ADDITIONAL SINGLE FAMILY LOAN CLASSIFICATION VARIABLES

Variable	Description	Range
Single Family Product Code	Identifies the mortgage product types for single family loans	Fixed Rate 30YR Fixed Rate 20YR Fixed Rate 15YR 5 Year Fixed Rate Balloon 7 Year Fixed Rate Balloon 10 Year Fixed Rate Balloon 15 Year Fixed Rate Balloon Adjustable Rate Step Rate ARMs Second Lien Other
Census Division	The Census Division in which the property resides. This variable is populated based on the property's state code	East North Central East South Central Middle Atlantic Mountain New England Pacific South Atlantic West North Central West South Central
Relative Loan Size	Assigned classes for the loan amount at origination divided by the simple average of the loan amount for the origination year and for the State in which the property is located. Average loan size for the appropriate quarter is provided by OFHEO based upon data from both Enterprises. It is expressed as a decimal	$0 \le Size \le .4$ $.4 < Size \le .6$ $.6 < Size \le .75$ $.75 < Size \le 1.0$ $1.0 < Size \le 1.25$ $1.25 < Size \le 1.5$ $Size > 1.5$

TABLE 3–4—ADDITIONAL MULTIFAMILY LOAN CLASSIFICATION VARIABLES

Variable	Description	Range
Multifamily Product Code	Identifies the mortgage product types for multifamily loans	Fixed Rate Fully Amortizing Adjustable Rate Fully Amortizing 5 Year Fixed Rate Balloon 7 Year Fixed Rate Balloon

TABLE 3–4—ADDITIONAL MULTIFAMILY LOAN CLASSIFICATION VARIABLES—Continued

Variable	Description	Range
		10 Year Fixed Rate Balloon 15 Year Fixed Rate Balloon Balloon ARM Other
New Book Flag	"New Book" is applied to Fannie Mae loans acquired beginning in 1988 and Freddie Mac loans acquired beginning in 1993, except for loans that were refinanced to avoid a default on a loan originated or acquired earlier	New Book Old Book
Ratio Update Flag	Indicates if the LTV and DCR were updated at origination or at Enterprise acquisition	Yes No
Current DCR	Assigned classes for the Debt Service Coverage Ratio based on the most recent annual operating statement	DCR<1.00 1.00≤DCR<1.10 1.10≤DCR<1.20 1.20≤DCR<1.30 1.30≤DCR<1.40 1.40≤DCR<1.50 1.50≤DCR<1.60 1.60≤DCR<1.70 1.70≤DCR<1.80 1.80≤DCR<1.90 1.90≤DCR<2.00 2.00≤DCR<2.50 2.50≤DCR<4.00 DCR>= 4.00
Prepayment Penalty Flag	Indicates if prepayment of the loan is subject to active prepayment penalties or yield maintenance provisions	Yes No

3.1.2.1.1 Loan Group Inputs

TABLE 3–5—MORTGAGE AMORTIZATION CALCULATION INPUTS

Variable	Description
	Rate Type (Fixed or Adjustable)
	Product Type (30/20/15-Year FRM, ARM, Balloon, Government, etc.)
UPB_{ORIG}	Unpaid Principal Balance at Origination (aggregate for Loan Group)
UPB_0	Unpaid Principal Balance at start of Stress Test (aggregate for Loan Group), adjusted by UPB scale factor.
MIR_0	Mortgage Interest Rate for the Mortgage Payment prior to the start of the Stress Test, or Initial Mortgage Interest Rate for new loans (weighted average for Loan Group) (expressed as a decimal per annum)
PMT_0	Amount of the Mortgage Payment (Principal and Interest) prior to the start of the Stress Test, or first Payment for new loans (aggregate for Loan Group), adjusted by UPB scale factor.

TABLE 3–5—MORTGAGE AMORTIZATION CALCULATION INPUTS—Continued

Variable	Description
AT	Original loan Amortizing Term in months (weighted average for Loan Group)
RM	Remaining term to Maturity in months (i.e., number of contractual payments due between the start of the Stress Test and the contractual maturity date of the loan) (weighted average for Loan Group)
A_0	Age of the loan at the start of Stress Test, in months (weighted average for Loan Group)
IRP	Initial Rate Period, in months
	Interest-only Flag
RIOP	Remaining Interest-only period, in months (weighted average for loan group)
UPB Scale Factor	Factor determined by reconciling reported UPB to published financials.
Additional Interest Rate Inputs	
GFR	Guarantee Fee Rate (weighted average for Loan Group) (decimal per annum)
SFR	Servicing Fee Rate (weighted average for Loan Group) (decimal per annum)
Additional Inputs for ARMs (weighted averages for Loan Group, except for Index)	
$INDEX_m$	Monthly values of the contractual Interest Rate Index
LB	Look-Back period, in months
MARGIN	Loan Margin (over index), decimal per annum
RRP	Rate Reset Period, in months
	Rate Reset Limit (up and down), decimal per annum
	Maximum Rate (life cap), decimal per annum
	Minimum Rate (life floor), decimal per annum
NAC	Negative Amortization Cap, decimal fraction of UPB_{ORIG}
	Unlimited Payment Reset Period, in months
PRP	Payment Reset Period, in months
	Payment Reset Limit, as decimal fraction of prior payment

TABLE 3–6—ADDITIONAL INPUTS FOR SINGLE FAMILY DEFAULT AND PREPAYMENT

Variable	Description
PROD	Mortgage Product Type
A_0	Age *immediately prior to* start of Stress Test, in months (weighted average for Loan Group)
LTV_{ORIG}	Loan-to-Value ratio at Origination (weighted average for Loan Group)

TABLE 3–6—ADDITIONAL INPUTS FOR SINGLE FAMILY DEFAULT AND PREPAYMENT—Continued

Variable	Description
UPB_{ORIG}	UPB at Origination (aggregate for Loan Group), adjusted by UPB scale factor.
MIR_{ORIG}	Mortgage Interest Rate at origination (''Initial Rate'' for ARMs), decimal per annum (weighted average for loan group)
UPB_0	Unpaid Principal Balance immediately prior to start of Stress Test (aggregate for Loan Group),
IF	Fraction (by UPB, in decimal form) of Loan Group backed by Investor-owned properties
RLS_{ORIG}	Weighted average Relative Loan Size at Origination (Original UPB as a fraction of average UPB for the state and Origination Year of loan origination)
$CHPGF_0^{LG}$	Cumulative House Price Growth Factor since Loan Origination (weighted average for Loan Group)

TABLE 3–7—ADDITIONAL INPUTS FOR MULTIFAMILY DEFAULT AND PREPAYMENT

Variable	Description
	Mortgage Product Type
A_0	Age *immediately prior to* start of Stress Test, in months (weighted average for Loan Group)
NBF	New Book Flag
RUF	Ratio Update Flag
LTV_{ORIG}	Loan-to-Value ratio at loan origination
DCR_0	Debt Service Coverage Ratio at the start of the Stress Test
PMT_0	Amount of the mortgage payment (principal and interest) prior to the start of the Stress Test, or first payment for new loans (aggregate for Loan Group)
PPEM	Prepayment Penalty End Month number in the Stress Test (weighted average for Loan Group)
RM	Remaining term to Maturity in months (i.e., number of contractual payments due between the start of the Stress Test and the contractual maturity date of the loan) (weighted average for Loan Group)

TABLE 3–8—MISCELLANEOUS WHOLE LOAN CASH AND ACCOUNTING FLOW INPUTS

Variable	Description
GF	Guarantee Fee rate (weighted average for Loan Group) (decimal per annum)
FDS	Float Days for Scheduled Principal and Interest (weighted average for Loan Group)
FDP	Float Days for Prepaid Principal (weighted average for Loan Group)
FREP	Fraction Repurchased (weighted average for Loan Group) (decimal)

TABLE 3–8—MISCELLANEOUS WHOLE LOAN CASH AND ACCOUNTING FLOW INPUTS—Continued

Variable	Description
RM	Remaining Term to Maturity in months
UPD_0	Sum of all unamortized discounts, premiums, fees, commissions, etc. for the loan group, such that the unamortized balance equals the book value minus the face value for the loan group at the start of the Stress Test, adjusted by the Unamortized Balance Scale Factor
Unamortized Balance Scale Factor	Factor determined by reconciling reported Unamortized Balance to published financials

TABLE 3–9—ADDITIONAL INPUTS FOR REPURCHASED MBS

Variable	Description
Wtd Ave Percent Repurchased	For sold loan groups, the percent of the loan group UPB that gives the actual dollar amount of loans that collateralize single class MBSs that the Enterprise holds in its own portfolio
$SUPD_0$	The aggregate sum of all unamortized discounts, premiums, fees, commissions, etc. associated with the securities modeled using the Wtd Ave Percent Repurchased, such that the unamortized balance equals the book value minus the face value for the relevant securities at the start of the Stress Test, adjusted by the percent repurchased and the Security Unamortized Balance Scale Factor
Security Unamortized Balances Scale Factor	Factor determined by reconciling reported Security Unamortized Balances to published financials

3.1.2.1.2 Credit Enhancement Inputs

To calculate reductions in mortgage credit losses due to credit enhancements, the following data are required for any credit-enhanced loans in a loan group. For this purpose, a Loan Group is divided into Distinct Credit Enhancement Combinations, as further described in section 3.6.3.6.4, Mortgage Credit Enhancement, of this appendix.

TABLE 3–10—CE INPUTS FOR EACH LOAN GROUP

Variable	Description
UPB_{ORIG}^{LG}	Origination UPB.
LTV_{ORIG}^{LG}	Original LTV.

TABLE 3–11—INPUTS FOR EACH DISTINCT CE COMBINATION (DCC)

Variable	Description
P^{DCC}	Percent of Initial Loan Group UPB represented by individual loan(s) in a DCC
$R^{MI,DCC}$ or $R^{LSA,DCC}$	Credit rating of Loan Limit CE (MI or LSA) Counterparty
$C^{MI,DCC}$ or $C^{LSA,DCC}$	Weighted Average Coverage Percentage for MI or LSA Coverage (weighted by Initial UPB)
$AB_0^{DCC,C1}$	DCC Available First Priority CE Balance immediately prior to start of the Stress Test
$AB_0^{DCC,C2}$	DCC Available Second Priority CE Balance immediately prior to start of the Stress Test

TABLE 3–11—INPUTS FOR EACH DISTINCT CE COMBINATION (DCC)—Continued

Variable	Description
$R^{DCC,C1}$	DCC Credit Rating of First Priority CE Provider or Counterparty; or Cash/Cash Equivalent (which is not Haircutted)
$R^{DCC,C2}$	DCC Credit Rating of Second Priority CE Provider or Counterparty; or Cash/Cash Equivalent (which is not Haircutted)
$C^{DCC,C1}$	DCC Loan-Level Coverage Limit of First Priority Contract (If Subtype is MPI; otherwise = 1)
$C^{DCC,C2}$	DCC Loan-Limit Coverage Limit of Second Priority Contract (if Subtype is MPI; otherwise = 1)
$ExpMo^{DCC,C1}$	Month in the Stress Test (1...120 or after) in which the DCC First Priority Contract expires
$ExpMo^{DCC,C2}$	Month in the Stress Test (1...120 or after) in which the DCC Second Priority Contract expires
$ELPF^{DCC,C1}$	DCC Enterprise Loss Position Flag for First Priority Contract (Y or N)
$ELPF^{DCC,C2}$	DCC Enterprise Loss Position Flag for Second Priority Contract (Y or N)

3.1.2.1.3 Commitments Inputs

[a] The Enterprises report Commitment Loan Group categories based on specific product type characteristics of securitized single family loans originated and delivered during the six months prior to the start of the Stress Test (*see* section 3.2, Commitments, of this appendix). For each category, the Enterprises report the same information as for Whole Loan Groups with the following exceptions:

1. Amortization term and remaining term are set to those appropriate for newly originated loans;
2. Unamortized balances are set to zero;
3. The House Price Growth Factor is set to one;
4. Age is set to zero;
5. Any credit enhancement coverage other than mortgage insurance is not reported.

3.1.2.2 Mortgage Related Securities Inputs

[a] The Enterprises hold mortgage-related securities, including single class and Derivative Mortgage-Backed Securities (certain multi-class and strip securities) issued by Fannie Mae, Freddie Mac, and Ginnie Mae; mortgage revenue bonds issued by State and local governments and their instrumentalities; and single class and Derivative Mortgage-Backed Securities issued by private entities. The Stress Test models the cash flows of these securities individually. Table 3–12, Inputs for Single Class MBS Cash Flows sets forth the data elements that the Enterprises must compile in the RBC Report regarding each MBS held in their portfolios. This information is necessary for determining associated cash flows in the Stress Test.

TABLE 3–12—INPUTS FOR SINGLE CLASS MBS CASH FLOWS

Variable	Description
Pool Number	A unique number identifying each mortgage pool
CUSIP Number	A unique number assigned to publicly traded securities by the Committee on Uniform Securities Identification Procedures
Issuer	Issuer of the mortgage pool
Government Flag	Indicates Government insured collateral
Original UPB Amount	Original pool balance adjusted by UPB scale factor and multiplied by the Enterprise's percentage ownership

TABLE 3–12—INPUTS FOR SINGLE CLASS MBS CASH FLOWS—Continued

Variable	Description
Current UPB Amount	Initial Pool balance (at the start of the Stress Test), adjusted by UPB scale factor and multiplied by the Enterprise's percentage ownership
Product Code	Mortgage product type for the pool
Security Rate Index	If the rate on the security adjusts over time, the index that the adjustment is based on
Unamortized Balance	The sum of all unamortized discounts, premiums, fees, commissions, etc., such that the unamortized balance equals book value minus face value, adjusted by Unamortized Balance Scale Factor
Wt Avg Original Amortization Term	Original amortization term of the underlying loans, in months (weighted average for underlying loans)
Wt Avg Remaining Term of Maturity	Remaining maturity of the underlying loans at the start of the Stress Test (weighted average for underlying loans)
Wt Avg Age	Age of the underlying loans at the start of the Stress Test (weighted average for underlying loans)
Wt Avg Current Mortgage Interest Rate	Mortgage Interest Rate of the underlying loans at the start of the Stress Test (weighted average for underlying loans)
Wt Avg Pass-Through Rate	Pass-Through Rate of the underlying loans at the start of the Stress Test (Sold loans only) (weighted average for underlying loans)
Wtg Avg Original Mortgage Interest Rate	The current UPB weighted average mortgage interest rate in effect at origination for the loans in the pool
Security Rating	The most current rating issued by any Nationally Recognized Statistical Rating Organization (NRSRO) for this security, as of the reporting date
Wt Avg Gross Margin	Gross margin for the underlying loans (ARM MBS only) (weighted average for underlying loans)
Wt Avg Net Margin	Net margin (used to determine the security rate for ARM MBS) (weighted average for underlying loans)
Wt Avg Rate Reset Period	Rate reset period in months (ARM MBS only) (weighted average for underlying loans)
Wt Avg Rate Reset Limit	Rate reset limit up/down (ARM MBS only) (weighted average for underlying loans)
Wt Avg Life Interest Rate Ceiling	Maximum rate (lifetime cap) (ARM MBS only) (weighted average for underlying loans)
Wt Avg Life Interest Rate Floor	Minimum rate (lifetime floor) (ARM MBS only) (weighted average for underlying loans)
Wt Avg Payment Reset Period	Payment reset period in months (ARM MBS only) (weighted average for underlying loans)
Wt Avg Payment Reset Limit	Payment reset limit up/down (ARM MBS only) (weighted average for underlying loans)
Wt Avg Lockback Period	The number of months to look back from the interest rate change date to find the index value that will be used to determine the next interest rate (weighted average for underlying loans)

TABLE 3–12—INPUTS FOR SINGLE CLASS MBS CASH FLOWS—Continued

Variable	Description
Wt Avg Negative Amortization Cap	The maximum amount to which the balance can increase before the payment is recast to a fully amortizing amount. It is expressed as a fraction of the original UPB (weighted average for underlying loans)
Wt Avg Original Mortgage Interest Rate	The current UPB weighted average original mortgage interest rate for the loans in the pool
Wt Avg Initial Interest Rate Period	Number of months between the loan origination date and the first rate adjustment date (weighted average for underlying loans)
Wt Avg Unlimited Payment Reset Period	Number of months between unlimited payment resets i.e., not limited by payment caps, starting with origination date (weighted average for underlying loans)
Notional Flag	Indicates if the amounts reported in Original Security Balance and Current Security Balance are notional
UPB Scale Factor	Factor determined by reconciling reported UPB to published financials
Unamortized Balance Scale Factor	Factor determined by reconciling reported Unamortized Balance to published financials
Whole Loan Modeling Flag	Indicates that the Current UPB Amount and Unamortized Balance associated with this repurchased MBS are included in the Wtg Avg Percent Repurchased and Security Unamortized Balance fields
FAS 115 Classification	The financial instrument's classification according to FAS 115
$HPGR_K$	Vector of House Price Growth Rates for quarters q = 1. . .40 of the Stress Period

[b] Table 3–13, Information for Multi-Class and Derivative MBS Cash Flows Inputs sets forth the data elements that the Enterprises must compile regarding multi-class and Derivative MBS (e.g., REMICs and Strips). This information is necessary for determining associated cash flows in the Stress Test.

TABLE 3–13—INFORMATION FOR MULTI-CLASS AND DERIVATIVE MBS CASH FLOWS INPUTS

Variable	Description
CUSIP Number	A unique number assigned to publicly traded securities by the Committee on Uniform Securities Identification Procedures
Issuer	Issuer of the security: FNMA, FHLMC, GNMA or other
Original Security Balance	Original principal balance of the security (notional amount for interest-only securities) at the time of issuance, adjusted by UPB scale factor, multiplied by the Enterprise's percentage ownership
Current Security Balance	Initial principal balance, or notional amount, at the start of the Stress Period, adjusted by UPB scale factor, multiplied by the Enterprise's percentage ownership
Current Security Percentage Owned	The percentage of a security's total current balance owned by the Enterprise
Notional Flag	Indicates if the amounts reported in Original Security Balance and Current Security Balance are notional
Unamortized Balance	The sum of all unamortized discounts, premiums, fees, commissions, etc., such that the unamortized balance equals book value minus face value, adjusted by the Unamortized Balance Scale Factor
Unamortized Balance Scale Factor	Factor determined by reconciling reported Unamortized Balance to published financials

TABLE 3–13—INFORMATION FOR MULTI-CLASS AND DERIVATIVE MBS CASH FLOWS INPUTS—Continued

Variable	Description
UPB Scale Factor	Factor determined by reconciling the reported current security balance to published financials
Security Rating	The most current rating issued by any Nationally Recognized Statistical Rating Organization (NRSRO) for this security, as of the reporting date

[c] Table 3–14, Inputs for MRBs and Derivative MBS Cash Flows Inputs sets forth the data elements that the Enterprises must compile in the RBC Report regarding mortgage revenue bonds and private issue mortgage related securities (MRS). The data in this table is supplemented with public securities disclosure data. This information is necessary for determining associated cash flows in the Stress Test.

TABLE 3–14—INPUTS FOR MRBS AND DERIVATIVE MBS CASH FLOWS INPUTS

Variable	Description
CUSIP Number	A unique number assigned to publicly traded securities by the Committee on Uniform Securities Identification Procedures
Original Security Balance	Original principal balance, adjusted by UPB scale factor and multiplied by the Enterprise's percentage ownership
Current Security Balance	Initial Principal balance (at start of Stress Period), adjusted by UPB scale factor and multiplied by the Enterprise's percentage ownership
Unamortized Balance	The sum of all unamortized discounts, premiums, fees, commissions, etc., such that the unamortized balance equals book value minus face value, adjusted by Unamortized Balance scale factor
Unamortized Balance Scale Factor	Factor determined by reconciling reported Unamortized Balance to published financials
UPB Scale Factor	Factor determined by reconciling the reported current security balance to published financials
Floating Rate Flag	Indicates the instrument pays interest at a floating rate
Issue Date	The issue date of the security
Maturity Date	The stated maturity date of the security
Security Interest Rate	The rate at which the security earns interest, as of the reporting date
Principal Payment Window Starting Date, Down-Rate Scenario	The month in the Stress Test that principal payment is expected to start for the security under the statutory "down" interest rate scenario, according to Enterprise projections
Principal Payment Window Ending Date, Down-Rate Scenario	The month in the Stress Test that principal payment is expected to end for the security under the statutory "down" interest rate scenario, according to Enterprise projections
Principal Payment Window Starting Date, Up-Rate Scenario	The month in the Stress Test that principal payment is expected to start for the security under the statutory "up" interest rate scenario, according to Enterprise projections
Principal Payment Window Ending Date, Up-Rate Scenario	The month in the Stress Test that principal payment is expected to end for the security under the statutory "up" interest rate scenario, according to Enterprise projections
Notional Flag	Indicates if the amounts reported in Original Security Balance and Current Security Balance are notional

TABLE 3–14—INPUTS FOR MRBS AND DERIVATIVE MBS CASH FLOWS INPUTS—Continued

Variable	Description
Security Rating	The most current rating issued by any Nationally Recognized Statistical Rating Organization (NRSRO) for this security, as of the reporting date
Security Rate Index	If the rate on the security adjusts over time, the index on which the adjustment is based
Security Rate Index Coefficient	If the rate on the security adjusts over time, the coefficient is the number used to multiply by the value of the index
Security Rate Index Spread	If the rate on the security adjusts over time, the spread is added to the value of the index multiplied by the coefficient to determine the new rate
Security Rate Adjustment Frequency	The number of months between rate adjustments
Security Interest Rate Ceiling	The maximum rate (lifetime cap) on the security
Security Interest Rate Floor	The minimum rate (lifetime floor) on the security
Life Ceiling Interest Rate	The maximum interest rate allowed throughout the life of the security
Life Floor Interest Rate	The minimum interest rate allowed throughout the life of security

3.1.2.3 Nonmortgage Instrument Cash Flows Inputs

Table 3–15, Input Variables for Nonmortgage Instrument Cash flows sets forth the data elements that the Enterprises must compile in the RBC Report to identify individual securities (other than Mortgage Related Securities) that are held by the Enterprises in their portfolios. These include debt securities, preferred stock, and derivative contracts (interest rate swaps, caps, and floors). All data are instrument specific. The data in this table are supplemented by public securities disclosure data. For instruments with complex or non-standard features, the Enterprises may be required to provide additional information such as amortization schedules, interest rate coupon reset formulas, and the terms of the call options.

TABLE 3–15—INPUT VARIABLES FOR NONMORTGAGE INSTRUMENT CASH FLOWS

Data Elements	Description
Amortization Methodology Code	Enterprise method of amortizing deferred balances (e.g., straight line)
Asset ID	CUSIP or Reference Pool Number identifying the asset underlying a derivative position
Asset Type Code	Code that identifies asset type used in the commercial information service (e.g. ABS, Fannie Mae pool, Freddie Mac pool)
Associated Instrument ID	Instrument ID of an instrument linked to another instrument
Coefficient	Indicates the extent to which the coupon is leveraged or de-leveraged
Compound Indicator	Indicates if interest is compounded
Compounding Frequency	Indicates how often interest is compounded
Counterparty Credit Rating	NRSRO's rating for the counterparty
Counterparty Credit Rating Type	An indicator identifying the counterparty's credit rating as short-term ('S') or long-term ('L')
Counterparty ID	Enterprise counterparty tracking ID

TABLE 3–15—INPUT VARIABLES FOR NONMORTGAGE INSTRUMENT CASH FLOWS—Continued

Data Elements	Description
Country Code	Standard country codes in compliance with Federal Information Processing Standards Publication 10–4
Credit Agency Code	Identifies NRSRO (e.g., Moody's)
Current Asset Face Amount	Current face amount of the asset underlying a swap adjusted by UPB scale factor
Current Coupon	Current coupon or dividend rate of the instrument
Current Unamortized Discount	Current unamortized premium or unaccreted discount of the instrument adjusted by Unamortized Balance Scale Factor. If the proceeds from the issuance of debt or derivatives or the amount paid for an asset were greater than par, the value should be positive. If the proceeds or the amounts paid were less than par, the value should be negative
Current Unamortized Fees	Current unamortized fees associated with the instrument adjusted by Unamortized Balance Scale Factor. Generally fees associated with the issuance of debt or derivatives should be negative numbers. Fees associated with the purchase of an asset should generally be reported as positive numbers
Current Unamortized Hedge	Current unamortized hedging gains (positive) or losses (negative) associated with the instrument adjusted by the Unamortized Balance Scale Factor
Current Unamortized Other	Any other unamortized items originally associated with the instrument adjusted by Unamortized Balance Scale Factor. If the proceeds from the issuance of debt or derivatives or the amount paid for an asset were greater than par, the value should be positive. If the proceeds or the amounts paid were less than par, the value should be negative
CUSIP__ISIN	CUSIP or ISIN Number identifying the instrument
Day Count	Day count convention (e.g. 30/360)
End Date	The last index repricing date
EOP Principal Balance	End of Period face, principal or notional, amount of the instrument adjusted by UPB scale factor
Exact Representation	Indicates that an instrument is modeled according to its contractual terms
Exercise Convention	Indicates option exercise convention (e.g., American Option)
Exercise Price	Par = 1.0; Options
First Coupon Date	Date first coupon is received or paid
Index Cap	Indicates maximum index rate
Index Floor	Indicates minimum index rate
Index Reset Frequency	Indicates how often the interest rate index resets on floating-rate instruments
Index Code	Indicates the interest rate index to which floating-rate instruments are tied (e.g., LIBOR)
Index Term	Point on yield curve, expressed in months, upon which the index is based
Instrument Credit Rating	NRSRO credit rating for the instrument

TABLE 3–15—INPUT VARIABLES FOR NONMORTGAGE INSTRUMENT CASH FLOWS—Continued

Data Elements	Description
Instrument Credit Rating Type	An indicator identifying the instruments credit rating as short-term ('S') or long-term ('L')
Instrument ID	An integer used internally by the Enterprise that uniquely identifies the instrument
Interest Currency Code	Indicates currency in which interest payments are paid or received
Interest Type Code	Indicates the method of interest rate payments (e.g., fixed, floating, step, discount)
Issue Date	Indicates the date that the instrument was issued
Life Cap Rate	The maximum interest rate for the instrument throughout its life
Life Floor Rate	The minimum interest rate for the instrument throughout its life
Look-Back Period	Period from the index reset date, expressed in months, that the index value is derived
Maturity Date	Date that the instrument contractually matures
Notional Indicator	Identifies whether the face amount is notional
Instrument Type Code	Indicates the type of instrument to be modeled (e.g., ABS, Cap, Swap)
Option Indicator	Indicates if instrument contains an option
Option Type	Indicates option type (e.g., Call option)
Original Asset Face Amount	Original face amount of the asset underlying a swap adjusted by UPB scale factor
Original Discount	Original premium or discount associated with the purchase or sale of the instrument adjusted by Unamortized Balance Scale Factor. If the proceeds from the issuance of debt or derivatives or the amount paid for an asset were greater than par, the value should be positive. If the proceeds or the amounts paid were less than par, the value should be negative
Original Face	Original face, principal or notional, amount of the instrument adjusted by UPB scale factor
Original Fees	Fees or commissions paid at the time of purchase or sale adjusted by the Unamortized Balance Scale Factor. Generally fees associated with the issuance of debt or derivatives should be negative numbers. Fees associated with the purchase of an asset should generally be reported as positive numbers
Original Hedge	Gains (positive) or losses (negative) from closing out a hedge associated with the instrument at settlement, adjusted by the Unamortized Balance Scale Factor
Original Other	Any other items originally associated with the instrument to be amortized or accreted adjusted by the Unamortized Balance Scale Factor. If the proceeds from the issuance of debt or derivatives or the amount paid for an asset were greater than par, the value should be positive. If the proceeds of the amounts paid were less than par, the value should be negative
Parent Entity ID	Enterprise internal tracking ID for parent entity
Payment Amount	Interest payment amount associated with the instrument (reserved for complex instruments where interest payments are not modeled) adjusted by UPB scale factor

TABLE 3–15—INPUT VARIABLES FOR NONMORTGAGE INSTRUMENT CASH FLOWS—Continued

Data Elements	Description
Payment Frequency	Indicates how often interest payments are made or received
Performance Date	‘‘As of’’ date on which the data is submitted
Periodic Adjustment	The maximum amount that the interest rate for the instrument can change per reset
Position Code	Indicates whether the Enterprise pays or receives interest on the instrument
Principal Currency Code	Indicates currency in which principal payments are paid or received
Principal Factor Amount	EOP Principal Balance expressed as a percentage of Original Face
Principal Payment Date	A valid date identifying the date that principal is paid
Settlement Date	A valid date identifying the date the settlement occurred
Spread	An amount added to an index to determine an instrument’s interest rate
Start Date	The date, spot or forward, when some feature of a financial contract becomes effective (e.g., Call Date), or when interest payments or receipts begin to be calculated
Strike Rate	The price or rate at which an option begins to have a settlement value at expiration, or, for interest-rate caps and floors, the rate that triggers interest payments
Submitting Entity	Indicates which Enterprise is submitting information
Trade ID	Unique code identifying the trade of an instrument
Transaction Code	Indicates the transaction that an Enterprise is initiating with the instrument (e.g. buy, issue reopen)
Transaction Date	A valid date identifying the date the transaction occurred
UPB Scale Factor	Factor determined by reconciling reported UPB to published financials
Unamortized Balances Scale Factor	Factor determined by reconciling reported Unamortized Balances to published financials

3.1.2.4 Inputs for Alternative Modeling Treatment Items

TABLE 3–16—INPUTS FOR ALTERNATIVE MODELING TREATMENT ITEMS

Variable	Description
TYPE	Type of item (asset, liability or off-balance sheet item)
BOOK	Book Value of item (amount outstanding adjusted for deferred items)
FACE	Face Value or notional balance of item for off-balance sheet items
REMATUR	Remaining Contractual Maturity of item in whole months. Any fraction of a month equals one whole month
RATE	Interest Rate
INDEX	Index used to calculate Interest Rate

TABLE 3–16—INPUTS FOR ALTERNATIVE MODELING TREATMENT ITEMS—Continued

Variable	Description
FAS115	Designation that the item is recorded at fair value, according to FAS 115
RATING	Instrument or counterparty rating
FHA	In the case of off-balance sheet guarantees, a designation indicating 100% of collateral is guaranteed by FHA
MARGIN	Margin over an Index

3.1.2.5 Operations, Taxes, and Accounting Inputs

[a] Table 3–17, Operations, Taxes, and Accounting Inputs sets forth the data the Enterprises must compile in the RBC Report to permit the calculation of taxes, operating expenses, and dividends. These data include:

- Average monthly Operating Expenses (i.e., administrative expenses, salaries and benefits, professional services, property costs, equipment costs) for the quarter prior to the beginning of the Stress Test;
- Income for the current year-to-date, one year, and two years prior to the beginning of the stress test, before taxes and provision for income taxes;
- Dividend payout ratio for the four quarters prior to the beginning of the Stress Period;
- Minimum capital requirement as of the beginning of the Stress Period.

TABLE 3–17—OPERATIONS, TAXES, AND ACCOUNTING INPUTS

Input	Description
FAS 115 and 125 fair value adjustment on retained mortgage portfolio	
FAS 133 fair value adjustment on retained mortgage portfolio	
Reserve for losses on retained mortgage portfolio	
FAS 115 and 125 fair value adjustments on non-mortgage investments	
FAS 133 fair value adjustments on non-mortgage investments	
Total cash	
Accrued interest receivable on mortgages	
Accrued interest receivable on non-mortgage investment securities	
Accrued interest receivable on non-mortgage investment securities denominated in foreign currency—hedged	
Accrued interest receivable on non-mortgage investment securities denominated in foreign currency—unhedged	
Accrued interest receivable on mortgage-linked derivatives, gross	
Accrued interest receivable on investment-linked derivatives, gross	

TABLE 3–17—OPERATIONS, TAXES, AND ACCOUNTING INPUTS—Continued

Input	Description
Accrued interest receivable on debt-linked derivatives, gross	
Other accrued interest receivable	
Accrued interest receivable on hedged debt-linked foreign currency swaps	Underlying instrument is GSE issued debt
Accrued interest receivable on unhedged debt-linked foreign currency swaps	
Accrued interest receivable on hedged asset-linked foreign currency swaps	Underlying instrument is an asset
Accrued interest receivable on unhedged asset-linked foreign currency swaps	
Currency transaction adjustments—hedged assets	Cumulative gain or loss due to changes in foreign exchange rates relative to on-balance sheet assets originally denominated in foreign currency
Currency transaction adjustments—unhedged assets	Cumulative gain or loss due to changes in foreign exchange rates relative to unhedged assets and off-balance sheet items originally denominated in foreign currency
Federal income tax refundable	
Accounts receivable	
Fees receivable	
Low income housing tax credit investments	
Fixed assets, net	
Clearing accounts	Net book value of all clearing accounts
Other assets	
Foreclosed property, net	Real estate owned including property acquired through foreclosure proceedings
FAS 133 fair value adjustment on debt securities	
Accrued interest payable on existing fixed-rate debt securities	
Accrued interest payable on existing floating-rate debt securities	
Accrued interest payable on existing debt issued in foreign currency—hedged	
Accrued interest payable on existing debt issued in foreign currency—unhedged	
Accrued interest payable on mortgage-linked derivatives, gross	
Accrued interest payable on investment-linked derivatives, gross	

TABLE 3–17—OPERATIONS, TAXES, AND ACCOUNTING INPUTS—Continued

Input	Description
Accrued interest payable on debt-linked derivatives, gross	
Other accrued interest payable	
Accrued interest payable debt-linked foreign currency swaps—hedged	
Accrued interest payable debt-linked foreign currency swaps—unhedged	
Accrued interest payable asset-linked foreign currency swaps—hedged	
Accrued interest payable asset-linked foreign currency swaps—unhedged	
Principal and interest due to mortgage security investors	Cash received on sold mortgages for onward submission to mortgage security investors
Currency transaction adjustments—hedged debt	Cumulative gain or loss due to changes in foreign exchange rates relative to on-balance sheet debt originally denominated in foreign currency
Currency transaction adjustments—unhedged debt	Cumulative gain or loss due to changes in foreign exchange rates relative to unhedged liabilities and off-balance sheet items originally denominated in foreign currency
Escrow deposits	Cash balances held in relation to servicing of multifamily loans
Federal income taxes payable	
Preferred dividends payable	
Accounts payable	
Other liabilities	
Common dividends payable	
Reserve for losses on sold mortgages	
Common stock	
Preferred stock, non-cumulative	
Additional paid-in capital	
Retained earnings	
Treasury stock	
Unrealized gains and losses on available-for-sale securities, net of tax, in accordance with FAS 115 and 125	
Unrealized gains and losses due to mark to market adjustments, FAS 115 and 125	
Unrealized gains and losses due to deferred balances related to pre-FAS 115 and 125 adjustments	

TABLE 3–17—OPERATIONS, TAXES, AND ACCOUNTING INPUTS—Continued

Input	Description
Unrealized gains and losses due to other realized gains, FAS 115	
Other comprehensive income, net of tax, in accordance with FAS 133	
OCI due to mark to market adjustments, FAS 133	
OCI due to deferred balances related to pre-FAS 133 adjustments	
OCI due to other realized gains, FAS 133	
Operating expenses	Average of prior three months
Common dividend payout ratio (average of prior 4 quarters)	Sum dollar amount of common dividends paid over prior 4 quarters and divided by the sum of total of after tax income less preferred dividends paid over prior 4 quarters
Common dividends per share paid 1 quarter prior to the beginning of the stress period	
Common shares outstanding	
Common Share Market Price	
Dividends paid on common stock 1 quarter prior to the beginning of the stress period	
Share Repurchases (average of prior 4 quarters)	Sum dollar amount of repurchased shares, net of newly issued shares, over prior 4 quarters and divided by 4
Off-balance-sheet Guarantees	Guaranteed instruments not reported on the balance sheet, such as whole loan REMICs and multifamily credit enhancements, and not 100% guaranteed by the FHA
Other Off-Balance Sheet Guarantees	All other off-balance sheet guaranteed instruments not included in another category, and not 100% guaranteed by the FHA
YTD provision for income taxes	Provision for income taxes for the period beginning January 1 and ending as of the report date
Tax loss carryforward	Net losses available to write off against future years' net income
Tax liability for the year prior to the beginning of the Stress Test	
Tax liability for the year 2 years prior to the beginning of the Stress Test (net of carrybacks)	
Taxable income for the year prior to the beginning of the Stress Test	
Taxable income for the year 2 years prior to the beginning of the Stress Test (net of carrybacks)	
Net after tax income for the quarter preceding the start of the stress test	

TABLE 3–17—OPERATIONS, TAXES, AND ACCOUNTING INPUTS—Continued

Input	Description
YTD taxable income	Total amount of taxable income for the period beginning January 1 and ending as of the report date
Minimum capital requirement at the beginning of the Stress Period	
Specific allowance for loan losses	Loss allowances calculated in accordance with FAS 114
Zero coupon swap receivable	
Unamortized discount on zero coupon swap receivable	

3.1.3 Public Data

3.1.3.1 Interest Rates

[a] The Interest Rates component of the Stress Test projects Treasury yields as well as other interest rate indexes that are needed to calculate cash flows, to simulate the performance of mortgages and other financial instruments, and to calculate capital for each of the 120 months in the Stress Period. Table 3–18, Interest Rate and Index Inputs, sets forth the interest rate indexes used in the Stress Test

[b] The starting values for all of the Interest Rates are the monthly average of daily rates for the month preceding the start of the stress test.

[c] For the 10-year CMT, monthly values are required for the three years prior to the start of the Stress Test (m = −35, −34...0). For all other indexes, monthly values for the prior two years are required (m = −23, −22...0).

TABLE 3–18—INTEREST RATE AND INDEX INPUTS

Interest Rate Index	Description	Source
1 MO Treasury Bill	One-month Treasury bill yield, monthly simple average of daily rate, quoted as actual/360	Bloomberg Generic 1 Month. U.S. Treasury bill. Ticker: GB1M (index).
3 MO CMT	Three-month constant maturity Treasury yield, monthly simple average of daily rate, quoted as bond equivalent yield	Federal Reserve H.15 Release.
6 MO CMT	Six-month constant maturity Treasury yield, monthly simple average of daily rate, quoted as bond equivalent yield	Federal Reserve H.15 Release.
1 YR CMT	One-year constant maturity Treasury yield, monthly simple average of daily rate, quoted as bond equivalent yield	Federal Reserve H.15 Release.
2 YR CMT	Two-year constant maturity Treasury yield, monthly simple average of daily rate, quoted as bond equivalent yield	Federal Reserve H.15 Release.
3 YR CMT	Three-year constant maturity Treasury yield, monthly simple average of daily rate, quoted as bond equivalent yield	Federal Reserve H.15 Release.
5 YR CMT	Five-year constant maturity Treasury yield, monthly simple average of daily rate, quoted as bond equivalent yield	Federal Reserve H.15 Release.

TABLE 3–18—INTEREST RATE AND INDEX INPUTS—Continued

Interest Rate Index	Description	Source
10 YR CMT	Ten-year constant maturity Treasury yield, monthly simple average of daily rate, quoted as bond equivalent yield	Federal Reserve H.15 Release.
20 YR CMT	Twenty-year constant maturity Treasury yield, monthly simple average of daily rate, quoted as bond equivalent yield	Federal Reserve H.15 Release.
30 YR CMT	Thirty-year constant maturity Treasury yield, monthly simple average of daily rate, quoted as bond equivalent yield; after February 15, 2002, estimated according to the Department of Treasury methodology using long-term average rates and extrapolation factors as referenced in OFHEO guideline 402	Federal Reserve H.15 Release, Extrapolation Factors used for estimation, U.S. Dept. of Treasury.
12-mo Moving Treasury Average (MTA)	12-month Federal Reserve cumulative average 1 year CMT, monthly simple average of daily rate	Bloomberg Ticker: 12MTA (Index).
Overnight Fed Funds (Effective)	Overnight effective Federal Funds rate, monthly simple average of daily rate	Federal Reserve H.15 Release.
Certificate of Deposits Index (CODI)	12-month average of monthly published yields on 3-month certificates of deposit, based on the Federal Reserve Board statistical release, H–15	Bloomberg Ticker: COF CODI (index).
1 Week Federal Funds	1 week Federal Funds rate, monthly simple average of daily rates	Bloomberg Term Fed Funds U.S. Domestic Ticker: GFED01W (index).
6 Month Fed Funds	6 month Federal Funds rate, monthly simple average of daily rates	Bloomberg Term Fed Funds U.S. Domestic Ticker: GFED06M (index).
Conventional Mortgage Rate	FHLMC (Freddie Mac) contract interest rates for 30 YR fixed-rate mortgage commitments, monthly average of weekly rates	Federal Reserve H.15 Release.
Constant Maturity Mortgage (CMM) Index	Bond equivalent yield on TBA mortgage-backed security which prices at the par price	TradeWeb.
1-mo Freddie Mac Reference Bill	1-month Freddie Mac Reference Bill, actual price and yield by auction date	Freddiemac.com website: *http://www.freddiemac.com/debt/data/cgi-bin/refbillaucres.cgi?order = AD.*
FHLB 11th District COF	11th District (San Francisco) weighted average cost of funds for savings and loans, monthly	Bloomberg Cost of Funds for the 11th District Ticker: COF11 (index).
1 MO LIBOR	One-month London Interbank Offered Rate, average of bid and asked, monthly simple average of daily rates, quoted as actual/360	British Bankers Association Bloomberg Ticker: US0001M (index).

TABLE 3–18—INTEREST RATE AND INDEX INPUTS—Continued

Interest Rate Index	Description	Source
3 MO LIBOR	Three-month London Interbank Offered Rate, average of bid and asked, monthly simple average of daily rates, quoted as actual/360	British Bankers Association Bloomberg Ticker: US0003M (index).
6 MO LIBOR	Six-month London Interbank Offered Rate, average of bid and asked, monthly simple average of daily rates, quoted as actual/360	British Bankers Association Bloomberg Ticker: US0006M (index).
12 MO LIBOR	One-year London Interbank Offered Rate, average of bid and asked, monthly simple average of daily rates, quoted as actual/360	British Bankers Association Bloomberg Ticker: US0012M (index).
Prime Rate	Prevailing rate as quoted, monthly average of daily rates	Federal Reserve H.15 Release.
1 MO Federal Agency COF	One-month Federal Agency Cost of Funds, monthly simple average of daily rates, quoted as actual/360	Bloomberg Generic 1 Month Agency Discount Note Yield Ticker: AGDN030Y (index).
3 MO Federal Agency COF	Three-month Federal Agency Cost of Funds, monthly simple average of daily rates, quoted as actual/360	Bloomberg Generic 3 Month Agency Discount Note Yield Ticker: AGDN090Y (index).
6 MO Federal Agency COF	Six-month Federal Agency Cost of Funds, monthly simple average of daily rates, quoted as actual/360	Bloomberg Generic 6 Month Agency Discount Note Yield Ticker: AGDN180Y (index).
1 YR Federal Agency COF	One-year Federal Agency Cost of Funds, monthly simple average of daily rates, quoted as actual/360	Bloomberg Generic 12 Month Agency Discount Note Yield. Ticker: AGDN360Y (index).
2 YR Federal Agency COF	Two-year Federal Agency Fair Market Yield, monthly simple average of daily rates	Bloomberg Generic 2 Year Agency Fair Market Yield. Ticker: CO842Y (index).
3 YR Federal Agency COF	Three-year Federal Agency Fair Market Yield, monthly simple average of daily rates	Bloomberg Generic 3 Year Agency Fair Market Yield. Ticker: CO843Y (index).
5 YR Federal Agency COF	Five-year Federal Agency Fair Market Yield, monthly simple average of daily rates	Bloomberg Generic 5 Year Agency Fair Market Yield. Ticker: CO845Y (index).
10 YR Federal Agency COF	Ten-year Federal Agency Fair Market Yield, monthly simple average of daily rates	Bloomberg Generic 10 Year Agency Fair Market Yield. Ticker: CO8410Y (index).
30 YR Federal Agency COF	Thirty-year Federal Agency Fair Market Yield, monthly simple average of daily rates	Bloomberg Generic 30 Year Agency Fair Market Yield. Ticker: CO8430Y (index).
15 YR fixed-rate mortgage	FHLMC (Freddie Mac) contract interest rates for 15 YR fixed-rate mortgage commitments, monthly average of FHLMC (Freddie Mac) contract interest rates for 15 YR	Bloomberg FHLMC 15 YR, 10 day commitment rate Ticker: FHCR1510 (index).

TABLE 3–18—INTEREST RATE AND INDEX INPUTS—Continued

Interest Rate Index	Description	Source
7-year balloon mortgage rate	Seven-year balloon mortgage, equal to the Conventional Mortgage Rate less 50 basis points	Computed.
2-yr Swap	2-yr U.S. Dollar Swap Rate, quoted as semi-annually fixed rate vs. 3-mo U.S. dollar	Bloomberg Ticker: USSWAP2 (index).
3-yr Swap	3-yr U.S. Dollar Swap Rate, quoted as semi-annually fixed rate vs. 3-mo U.S. dollar LIBOR	Bloomberg Ticker: USSWAP3 (Index).
5-yr Swap	5-yr U.S. Dollar Swap Rate, quoted as semi-annually fixed rate vs. 3-mo U.S. dollar LIBOR	Bloomberg Ticker: USSWAP5 (Index).
10-yr Swap	10-yr U.S. Dollar Swap Rate, quoted as semi-annually fixed rate vs. 3-mo U.S. dollar LIBOR	Bloomberg Ticker: USSWAP10 (Index).
30-yr Swap	30-yr U.S. Dollar Swap Rate, quoted as semi-annually fixed rate vs. 3-mo U.S. dollar LIBOR	Bloomberg Ticker: USSWAP30 (Index).

3.1.3.2 Property Valuation Inputs

Table 3–19, Stress Test Single Family Quarterly House Price Growth Rates and Table 3–21, HPI Dispersion Parameters, set forth inputs which are used to project single family mortgage performance. Table 3–20, Multifamily Monthly Rent Growth and Vacancy Rates, sets forth inputs which are used to project multifamily mortgage performance.

TABLE 3–19—STRESS TEST SINGLE FAMILY QUARTERLY HOUSE PRICE GROWTH RATES [1]

Stress Test Months	Historical Months	House Price Growth Rate	Stress Test Months	Historical Months	House Price Growth Rate
1–3	Jan-Mar 1984	−0.005048	61–63	Jan-Mar 1989	0.006292
4–6	Apr-Jun 1984	0.001146	64–66	Apr-Jun 1989	0.010523
7–9	Jul-Sep 1984	0.001708	67–69	Jul-Sep 1989	0.017893
10–12	Oct-Dec 1984	−0.007835	70–72	Oct-Dec 1989	−0.004881
13–15	Jan-Mar 1985	−0.006975	73–75	Jan-Mar 1990	−0.000227
16–18	Apr-Jun 1985	0.004178	76–78	Apr-Jun 1990	0.008804
19–21	Jul-Sep 1985	−0.005937	79–81	Jul-Sep 1990	0.003441
22–24	Oct-Dec 1985	−0.019422	82–84	Oct-Dec 1990	−0.003777
25–27	Jan-Mar 1986	0.026231	85–87	Jan-Mar 1991	0.009952
28–30	Apr-Jun 1986	0.022851	88–90	Apr-Jun 1991	0.012616
31–33	Jul-Sep 1986	−0.021402	91–93	Jul-Sep 1991	0.002267
34–36	Oct-Dec 1986	−0.018507	94–96	Oct-Dec 1991	0.012522

TABLE 3–19—STRESS TEST SINGLE FAMILY QUARTERLY HOUSE PRICE GROWTH RATES [1]—Continued

Stress Test Months	Historical Months	House Price Growth Rate	Stress Test Months	Historical Months	House Price Growth Rate
37–39	Jan-Mar 1987	0.004558	97–99	Jan-Mar 1992	0.013378
40–42	Apr-Jun 1987	−0.039306	100–102	Apr-Jun 1992	−0.000519
43–45	Jul-Sep 1987	−0.024382	103–105	Jul-Sep 1992	0.016035
46–48	Oct-Dec 1987	−0.026761	106–108	Oct-Dec 1992	0.005691
49–51	Jan-Mar 1988	−0.003182	109–111	Jan-Mar 1993	0.005723
52–54	Apr-Jun 1988	0.011854	112–114	Apr-Jun 1993	0.010614
55–57	Jul-Sep 1988	−0.020488	115–117	Jul-Sep 1993	0.013919
58–60	Oct-Dec 1988	−0.007260	118–120	Oct-Dec 1993	0.011267

[1] Source: OFHEO House Price Report, 1996:3.

TABLE 3–20—MULTIFAMILY MONTHLY RENT GROWTH [1] AND VACANCY RATES [2]

Stress Test Month	Historical Month	Rent Growth Rate	Vacancy Rate	Stress Test Month	Historical Month	Rent Growth Rate	Vacancy Rate
1	Jan 1984	0.001367	0.136	61	Jan 1989	0.000052	0.135
2	Feb 1984	0.001186	0.136	62	Feb 1989	0.000284	0.135
3	Mar 1984	0.001422	0.136	63	Mar 1989	0.000404	0.135
4	Apr 1984	0.001723	0.136	64	Apr 1989	0.000150	0.135
5	May 1984	0.001537	0.136	65	May 1989	0.000331	0.135
6	Jun 1984	0.001354	0.136	66	Jun 1989	0.001483	0.135
7	Jul 1984	0.000961	0.136	67	Jul 1989	0.000759	0.135
8	Aug 1984	0.000601	0.136	68	Aug 1989	0.001502	0.135
9	Sep 1984	0.001106	0.136	69	Sep 1989	0.002254	0.135
10	Oct 1984	0.001623	0.136	70	Oct 1989	0.002768	0.135
11	Nov 1984	0.001395	0.136	71	Nov 1989	0.002220	0.135
12	Dec 1984	0.001170	0.136	72	Dec 1989	0.002040	0.135
13	Jan 1985	0.001014	0.150	73	Jan 1990	0.002180	0.120
14	Feb 1985	0.000857	0.150	74	Feb 1990	0.002772	0.120
15	Mar 1985	0.000315	0.150	75	Mar 1990	0.002867	0.120
16	Apr 1985	–0.000225	0.150	76	Apr 1990	0.003243	0.120
17	May 1985	0.000154	0.150	77	May 1990	0.002963	0.120
18	Jun 1985	0.000534	0.150	78	Jun 1990	0.003588	0.120
19	Jul 1985	0.001115	0.150	79	Jul 1990	0.004885	0.120

TABLE 3–20—MULTIFAMILY MONTHLY RENT GROWTH [1] AND VACANCY RATES [2]—Continued

Stress Test Month	Historical Month	Rent Growth Rate	Vacancy Rate	Stress Test Month	Historical Month	Rent Growth Rate	Vacancy Rate
20	Aug 1985	0.001702	0.150	80	Aug 1990	0.004564	0.120
21	Sep 1985	0.001576	0.150	81	Sep 1990	0.005491	0.120
22	Oct 1985	0.001450	0.150	82	Oct 1990	0.005475	0.120
23	Nov 1985	0.001357	0.150	83	Nov 1990	0.005763	0.120
24	Dec 1985	0.001266	0.150	84	Dec 1990	0.005817	0.120
25	Jan 1986	0.001823	0.168	85	Jan 1991	0.005261	0.108
26	Feb 1986	0.002392	0.168	86	Feb 1991	0.005456	0.108
27	Mar 1986	0.002665	0.168	87	Mar 1991	0.005637	0.108
28	Apr 1986	0.002942	0.168	88	Apr 1991	0.005843	0.108
29	May 1986	0.002517	0.168	89	May 1991	0.005970	0.108
30	Jun 1986	0.002105	0.168	90	Jun 1991	0.005719	0.108
31	Jul 1986	0.001372	0.168	91	Jul 1991	0.005533	0.108
32	Aug 1986	0.000652	0.168	92	Aug 1991	0.004512	0.108
33	Sep 1986	0.000110	0.168	93	Sep 1991	0.003916	0.108
34	Oct 1986	–0.000431	0.168	94	Oct 1991	0.003779	0.108
35	Nov 1986	–0.000201	0.168	95	Nov 1991	0.004226	0.108
36	Dec 1986	0.000030	0.168	96	Dec 1991	0.004791	0.108
37	Jan 1987	–0.001448	0.175	97	Jan 1992	0.005361	0.098
38	Feb 1987	–0.002162	0.175	98	Feb 1992	0.004085	0.098
39	Mar 1987	–0.001202	0.175	99	Mar 1992	0.003885	0.098
40	Apr 1987	–0.001136	0.175	100	Apr 1992	0.002992	0.098
41	May 1987	–0.001466	0.175	101	May 1992	0.002941	0.098
42	Jun 1987	–0.002809	0.175	102	Jun 1992	0.002851	0.098
43	Jul 1987	–0.002069	0.175	103	Jul 1992	0.002346	0.098
44	Aug 1987	–0.002530	0.175	104	Aug 1992	0.003850	0.098
45	Sep 1987	–0.001033	0.175	105	Sep 1992	0.003245	0.098
46	Oct 1987	–0.001148	0.175	106	Oct 1992	0.003194	0.098
47	Nov 1987	–0.001617	0.175	107	Nov 1992	0.001931	0.098
48	Dec 1987	–0.002064	0.175	108	Dec 1992	0.001494	0.098
49	Jan 1988	–0.001372	0.158	109	Jan 1993	0.001527	0.104
50	Feb 1988	–0.001524	0.158	110	Feb 1993	0.002317	0.104

TABLE 3–20—MULTIFAMILY MONTHLY RENT GROWTH [1] AND VACANCY RATES [2]—Continued

Stress Test Month	Historical Month	Rent Growth Rate	Va-cancy Rate	Stress Test Month	Historical Month	Rent Growth Rate	Va-cancy Rate
51	Mar 1988	–0.001972	0.158	111	Mar 1993	0.001904	0.104
52	Apr 1988	–0.001363	0.158	112	Apr 1993	0.002545	0.104
53	May 1988	–0.001143	0.158	113	May 1993	0.002570	0.104
54	Jun 1988	–0.001194	0.158	114	Jun 1993	0.002449	0.104
55	Jul 1988	–0.001429	0.158	115	Jul 1993	0.002161	0.104
56	Aug 1988	–0.001315	0.158	116	Aug 1993	0.001857	0.104
57	Sep 1988	–0.002581	0.158	117	Sep 1993	0.001664	0.104
58	Oct 1988	–0.002337	0.158	118	Oct 1993	0.002184	0.104
59	Nov 1988	–0.001218	0.158	119	Nov 1993	0.002932	0.104
60	Dec 1988	–0.000203	0.158	120	Dec 1993	0.002776	0.104

[1] Source: U.S. Department of Labor, Bureau of Labor Statistics, Rent of Primary Residence component of the Consumer Price Index—All Urban Consumers.
[2] Source: U.S. Census Bureau, Housing Vacancy Survey—Annual 1999.

TABLE 3–21—HPI DISPERSION PARAMETERS [1]

	Linear (α)	Quadratic (β)
Dispersion Parameter	0.002977	−0.000024322

[1] Source: OFHEO House Price Report, 1996:3.

3.1.4 Constant Values

Certain values are numerical constants that are parameters of the cash flow simulation. These values are established by OFHEO on the basis of analysis of Benchmark and other historical data.

3.1.4.1 Single Family Loan Performance

TABLE 3–22—LOAN GROUP INPUTS FOR SINGLE FAMILY GROSS LOSS SEVERITY

Variable	Description	Value	Source
MQ	Months Delinquent: time during which Enterprise pays delinquent loan interest to MBS holders	4 for sold loans 0 otherwise	
MF	Months to Foreclosure: number of missed payments through completion of foreclosure	13 months	Average value of BLE data
MR	Months in REO	7 months	Average value of BLE data
F	Foreclosure Costs as a decimal fraction of Defaulted UPB	0.037	Average of historical data from Enterprise loans, 1979–1999

TABLE 3–22—LOAN GROUP INPUTS FOR SINGLE FAMILY GROSS LOSS SEVERITY—Continued

Variable	Description	Value	Source
R	REO Expenses as a decimal fraction of Defaulted UPB	0.163	Average of historical data from Enterprise loans, 1979–1999
RR	Recovery Rate for Defaulted loans in the BLE, as a percent of predicted house price using HPI (decimal)	0.61	Average value of BLE data

See also Table 3–35, Coefficients for Single Family Default and Prepayment Explanatory Variables.

3.1.4.2 Multifamily Loan Performance

TABLE 3–23—LOAN GROUP INPUTS FOR MULTIFAMILY DEFAULT AND PREPAYMENT

Variable	Description	Value	Source
OE	Operating expenses as a share of gross potential rents	0.472	Average ratio of operating expenses to gross rents, 1970–1992 Institute for Real Estate Management annual surveys of apartments.
RVR_o	Initial rental vacancy rate	0.0623	National average vacancy rate, 1970–1995, from census surveys.

TABLE 3–24—LOAN GROUP INPUTS FOR MULTIFAMILY GROSS LOSS SEVERITY

Variable	Description	Value	Source
MQ	Time during which delinquent loan interest is passed-through to MBS holders	4 for sold loans 0 otherwise	
RHC	Net REO holding costs as a decimal fraction of Defaulted UPB	0.1333	UPB-weighted average, Freddie Mac ''old book'' REO through 1995.
MF	Time from Default to completion of foreclosure (REO acquisition)	18 months	UPB-weighted average, Freddie Mac ''old book'' REO through 1995.
MR	Months from REO acquisition to REO disposition	13 months	UPB-weighted average, Freddie Mac ''old book'' REO through 1995.
RP	REO proceeds as a decimal fraction of Defaulted UPB	0.5888	UPB-weighted average, Freddie Mac ''old book'' REO through 1995.

See also Table 3–39, Explanatory Variable Coefficients for Multifamily Default.

3.2 Commitments

3.2.1 Commitments Overview

The Enterprises make contractual commitments to purchase or securitize mortgages. The Stress Test provides for deliveries of mortgages into the commitments that exist at the start of the Stress Period. These mortgages are grouped into ''Commitment Loan Groups'' that reflect the characteristics of the mortgages that were originated in the six months preceding the start of the Stress Period and securitized by the Enterprise, except that they are assigned coupon rates consistent with the projected delivery month in each interest rate scenario. These Commitment Loan Groups are added to the Enterprise's sold portfolio and the Stress Test projects their performance during the Stress Period. In the down-rate scenario, the Stress Test provides that 100 percent of the mortgages specified in the commitments are delivered within the first three months. In the up-rate scenario, 75 percent are delivered within the first six months.

3.2.2 Commitments Inputs

The Stress Test uses two sources of data to determine the characteristics of the mortgages delivered under commitments:

- Information from the Enterprises on the characteristics of loans originated and delivered to the Enterprises in the six months preceding the start of the Stress Period, broken out into four categories, scaled by the dollar value of commitments outstanding at the start of the Stress Period;
- Interest Rate series generated by the Interest Rates component of the Stress Test.

3.2.2.1 Loan Data

[a] The Enterprises report Commitment Loan Group categories based on the following product type characteristics of securitized single family loans originated and delivered during the six months prior to the start of the Stress Test:

- 30-year fixed-rate
- 15-year fixed-rate
- One-year CMT ARM
- Seven-year balloon

[b] For each Commitment Loan Group category, the Enterprises report the same information as in section 3.6 for Whole Loan groups with the following exceptions:

- Amortization term and remaining term are set to those appropriate for newly originated loans
- Unamortized balances are set to zero
- The House Price Growth Factor is set to one
- Age is set to zero
- Any credit enhancement coverage other than mortgage insurance is not reported.

[c] For each Commitment Loan Group category, the Enterprises report the Starting UPB defined as follows:

$$\text{Starting UPB} = \begin{bmatrix} \text{Total dollar amount} \\ \text{of Commitments} \\ \text{Outstanding} \end{bmatrix} \times \begin{bmatrix} \dfrac{\begin{array}{c}\text{Starting UPB for the} \\ \text{Commitment Loan Group Category}\end{array}}{\begin{array}{c}\text{Total Starting UPB for all} \\ \text{Commitment Loan Group} \\ \text{Categories}\end{array}} \end{bmatrix}$$

3.2.2.2 Interest Rate Data

The Stress Test uses the following Interest Rate series, generated from section 3.3, Interest Rates, of this appendix, for the first 12 months of the Stress Period:

- One-year Constant Maturity Treasury yield (CMT)
- Conventional mortgage rate (30-year fixed rate)
- 15-year fixed-rate mortgage rate
- Seven-year balloon mortgage rate.

3.2.3 Commitments Procedures

[a] Determine Commitment Loan Groups from the Commitment Loan Group categories as follows:

1. Divide each category into one subcategory for each delivery month. Three subcategories are created in the down-rate scenario and six in the up-rate scenario.
2. Calculate the total starting UPB for each subcategory as follows:

$$\text{Subcategory Starting UPB} = \begin{bmatrix} \text{Starting UPB for} \\ \text{Commitment Loan} \\ \text{Group Category} \end{bmatrix} \times \text{MDP}$$

Where: MDP is taken from Table 3–25.

TABLE 3–25—MONTHLY DELIVERIES AS A PERCENTAGE OF COMMITMENTS OUTSTANDING (MDP)

Delivery Month (DM)	Up-Rate Scenario MDP	Down-Rate Scenario MDP
1	18.75%	62.50%
2	18.75%	25.00%
3	12.50%	12.50%

TABLE 3–25—MONTHLY DELIVERIES AS A PERCENTAGE OF COMMITMENTS OUTSTANDING (MDP)—Continued

Delivery Month (DM)	Up-Rate Scenario MDP	Down-Rate Scenario MDP
4	12.50%	0.00%
5	6.25%	0.00%
6	6.25%	0.00%
Total	75%	100%

3. Set the Initial Mortgage Interest Rate for each subcategory using the interest rate series consistent with the commitment product type. For fixed rate loans, this rate = $INDEX_{DM}$. For ARM loans, the Initial Mortgage Interest Rate and the Mortgage Interest Rate at Origination are equal and set to $INDEX_{DM-LB-1}$ + MARGIN, where LB (Lookback Period) and MARGIN for ARM commitment loan groups come from the RBC Report. Calculate the mortgage payment amount consistent with the Initial rate and amortizing term.

[b] Cash flows for the commitment loan groups, broken down by subcategory corresponding to assumed month of delivery to the Enterprises, are to be generated using the same procedures as contained in section 3.6, Whole Loan Cash Flows, of this appendix, except as follows:

1. For purposes of generating cash flows, treat each commitment loan subcategory as if the loans were newly originated and delivered just prior to the start of the Stress Test (that is, treat them as if mortgage age at time zero, A_0, were zero).
2. Wherever section 3.6, Whole Loan Cash Flows, of this appendix, refers to interest rate or discount rate adjustments, add Delivery Month (DM) to the Interest Rate or discount rate monthly counter, where constant DM $\in$ [1,2,3,4,5,6] refers to the number of months into the Stress Test that the commitment subcategory is assumed to be delivered to the Enterprise. For example,

a. Section 3.6.3.3.3[a]1.b.3) of this appendix, if m is a rate reset month, then:

$$MIR_m = INDEX_{m-1-LB+DM} + MARGIN$$

b. Section 3.6.3.4.3.1[a]3.a., of this appendix,

$$B_q = 1 \text{ if } MCON_{m+DM} + 0.02 \le MIR_m$$

c. Section 3.6.3.4.3.1[a]4., of this appendix,

$$RS_q = avg\left(\frac{MIR_{ORIG} - MCON_{m+DM}}{MIR_{ORIG}}\right)$$

d. Section 3.6.3.4.3.1[a]5., of this appendix,

$$YCS_q = avg\left(\frac{T120Y_{m+DM}}{T12Y_{m+DM}}\right)$$

e. Section 3.6.3.6.5.1, of this appendix. Throughout this section replace DR_m with DR_{m+DM} wherever it appears.

f. Section 3.6.3.7.3[a]9.b., of this appendix. The formula for float income received should replace FER_m with FER_{m+DM}

3. For purpose of computing LTV_q as defined in section 3.6.3.4.3.1[a]2.a., of this appendix, adjust the quarterly index for the vector of house price growth rates by adding DQ = 2 if the loans are delivered in the Stress Test month 6, DQ = 1 if the loans are delivered in Stress Test months 3, 4 or 5, and 0 otherwise. That is, in the LTV_q formula:

$$Exp\left(\sum_{k=1}^{q} HPGR_{k+DQ}\right)$$

Where:

$$DQ = int\left(\frac{DM}{3}\right)$$

4. The note at the end of section 3.6.3.4.3.2[a]5., of this appendix, should be adjusted to read: for m >120 − DM, use MPR_{120-DM} and MDR_{120-DM}.
5. Adjust the final outputs for each commitment subcategory by adding DM to each monthly counter, m. That is, the outputs in Table 3–52 and 3–55 should be revised to replace each value's monthly counter of m with the new counter of m + DM, which will modify the description of each to read "in month m = 1 + DM, ... RM + DM". (Note that for one variable, $PUPB_m$, the revised counter will range from DM to RM + DM). The revised monthly counters will now correspond to the months of the Stress Test. For values of m under the revised description which are less than or equal to DM, each variable (except Performing UPB) in these two tables should equal zero. For Performing UPB in month DM, the variable will equal the Original UPB for month DM and will equal zero for months less than DM.

3.2.4 Commitments Outputs

[a] The outputs of the Commitment component of the Stress Test include Commitment Loan Groups specified in the same way as

loan groups in the RBC Report (*See* section 3.6, Whole Loan Cash Flows, of this appendix) with two exceptions: mortgage insurance is the only available credit enhancement coverage; and delivery month is added to indicate the month in which these loan groups are added to the sold portfolio. The data for these loan groups allow the Stress Test to project the Default, Prepayment and loss rates and cash flows for loans purchased under commitments for the ten-year Stress Period.

[b] The Commitment outputs also include cash flows analagous to those specified for Whole Loans in section 3.6.4, Final Whole Loan Cash Flow Outputs, of this appendix, which are produced for each Commitment Loan Group.

3.3 Interest Rates

3.3.1 Interest Rates Overview

[a] The Interest Rates component of the Stress Test projects Constant Maturity Treasury yields as well as other interest rates and indexes (collectively, ''Interest Rates'') that are needed to project mortgage performance and calculate cash flows for mortgages and other financial instruments for each of the 120 months in the Stress Period.

[b] The process for determining Interest Rates is as follows: first, identify the values for the necessary Interest Rates at time zero; second, project the ten-year CMT for each month of the Stress Period as specified in the 1992 Act; third, project the 1-month Treasury yield, the 3-month, 6-month, 1-, 2-, 3-, 5-, 20-year, and 30-year CMTs; fourth, project non-treasury Interest Rates, including the Federal Agency Cost of Funds Index; and fifth, project the Enterprises Cost of Funds Index, which provides borrowing rates for the Enterprises during the Stress Period, by increasing the Agency Cost of Funds Index by 10 basis points for the last 108 months of the Stress Test. Guidance in determining interest rates is available under OFHEO Guideline No. 402, ''Risk Based Capital Process for Capturing and Utilizing Interest Rates Files,'' which is available on OFHEO's Web site, *http://www.OFHEO.Gov*.

[c] In cases where the Stress Test would require interest rates for maturities other than those specifically projected in Table 3–18 of section 3.1.3, Public Data, of this appendix, the Interest Rates component performs a monthly linear interpolation. In cases where the Stress Test would require an Interest Rate for a maturity greater than the longest maturity specifically projected for that index, the Stress Test would use the longest maturity for that index.

3.3.2 Interest Rates Inputs

The Interest Rates that are input to the Stress Test are set forth in Table 3–18 of section 3.1.3, Public Data, of this appendix. Inputs for the 30-year CMT yield after February 15, 2002 are estimated according to the Department of Treasury methodology using long-term average rates and extrapolation factors.

3.3.3 Interest Rates Procedures

[a] Produce Interest Rates for use in the Stress Test using the following three steps:

1. Project the Ten-Year CMT as specified in the 1992 Act:
   a. *Down-Rate Scenario*. In the Stress Test, the ten-year CMT changes from its starting level to its new level in equal increments over the first twelve months of the Stress Period, and remains constant at the new level for the remaining 108 months of the Stress Period. The new level of the ten-year CMT in the last 108 months of the down-rate scenario equals the lesser of:
   1) The average of the ten-year CMT for the nine months prior to the start of the Stress Test, minus 600 basis points; or
   2) The average yield of the ten-year CMT for the 36 months prior to the start of the Stress Test, multiplied by 60 percent;

but in no case less than 50 percent of the average for the nine months preceding the start of the Stress Period.

   b. *Up-Rate Scenario*. In the Stress Test, the ten-year CMT changes from its starting level to its new level in equal increments over the first twelve months of the Stress Period, and remains at the new level for the remaining 108 months of the Stress Period. The new level of the ten-year CMT in the last 108 months of the up-rate scenario is the greater of:
   1) The average of the ten-year CMT for the nine months prior to the start of the Stress Test, plus 600 basis points; or
   2) The average of the ten-year CMT for the 36 months prior to the start of the Stress Test, multiplied by 160 percent;

but in no case greater than 175 percent of the average of the ten-year CMT for the nine months preceding the start of the Stress Period.

2. Project the 1-month Treasury and other CMT yields:
   a. *Down-Rate Scenario*. For the down-rate scenario, the new value of each of the other Treasury and CMT yields for the last 108 months of the Stress Test is calculated by multiplying the ten-year CMT by the appropriate ratio from Table 3–26. For the first 12 months of the Stress Period, the other rates are computed in the same way as the ten-year CMT, i.e. from their time zero levels. Each of the other CMTs changes in equal steps in each of the first twelve months of the Stress Period until it reaches the new level for the remaining 108 months of the Stress Test.

TABLE 3–26—CMT RATIOS TO THE TEN-YEAR CMT [1]

1 MO / 10 YR	0.68271
3 MO / 10 YR	0.73700
6 MO / 10 YR	0.76697
1 YR / 10 YR	0.79995
2 YR / 10 YR	0.86591
3 YR / 10 YR	0.89856
5 YR / 10 YR	0.94646
20 YR / 10 YR	1.06246
30 YR / 10 YR	1.03432

[1] Source: calculated over the period from May, 1986, through April, 1995.

b. *Up-Rate Scenario*. In the up-rate scenario, all other Treasury and CMT yields are equal to the ten-year CMT in the last 108 months of the Stress Test. Each of the other yields changes in equal increments over the first twelve months of the Stress Test until it equals the ten-year CMT.

3. Project Non-Treasury Interest Rates:

a. *Non-Treasury Rates*. For each of the non-Treasury interest rates with the exception of mortgage rates, rates during the Stress Test are computed as a proportional spread to the nearest maturity Treasury yield as given in Table 3–27. The proportional spread is the average over the two years prior to the start of the Stress Test, of the difference between the non-Treasury rate and the comparable maturity Treasury yield divided by that Treasury yield. For example, the three month LIBOR proportional spread would be calculated as the two year average of the ratio:

$$\frac{\left(\begin{array}{c}\text{3-month LIBOR minus}\\ \text{3-month Treasury}\end{array}\right)}{\text{3-month Treasury}}$$

During the Stress Test, the 3-month LIBOR rate is projected by multiplying the 3-month Treasury yield by 1 plus this average proportional spread.

b. *Mortgage Rates*. Mortgage interest rates are projected as described in this section for other non-Treasury interest rates, except that an average of the additive, not proportional, spread to the appropriate Treasury interest rate is used. For example, the 30-year Conventional Mortgage Rate spread is projected as the average, over the two years preceding the start of the Stress Test, of: (Conventional Mortgage Rate minus the ten-year CMT). This spread is then added to the ten-year CMT for the 120 months of the Stress Test to obtain the projected Conventional Mortgage Rate.

TABLE 3–27—NON-TREASURY INTEREST RATES

Mortgage Rates	Spread Based on
15-year Fixed-rate Mortgage Rate	10-year CMT
30-year Conventional Mortgage Rate	10-year CMT
7-year Balloon Mortgage Rate	(computed from Conventional Mortgage Rate)
Constant Maturity Mortgage Index	10-year CMT
Other Non-Treasury Interest Rates	
Overnight Fed Funds	1-month Treasury Yield
7-day Fed Funds	1-month Treasury Yield
1-month LIBOR	1-month Treasury Yield
1-month Federal Agency Cost of Funds	1-month Treasury Yield
1-mo Freddie Mac Reference Bill	1-month Treasury Yield
3-month LIBOR	3-month CMT
3-month Federal Agency Cost of Funds	3-month CMT
PRIME	3-month CMT

TABLE 3–27—NON-TREASURY INTEREST RATES—Continued

Mortgage Rates	Spread Based on
6-month LIBOR	6-month CMT
6-month Federal Agency Cost of Funds	6-month CMT
6-month Fed Funds	6-month CMT
FHLB 11th District Cost of Funds	1-year CMT
12-month LIBOR	1-year CMT
12-mo Moving Treasury Average	1-year CMT
Certificate of Deposits Index	1-year CMT
1-year Federal Agency Cost of Funds	1-year CMT
2-year Federal Agency Cost of Funds	2-year CMT
3-year Federal Agency Cost of Funds	3-year CMT
5-year Federal Agency Cost of Funds	5-year CMT
10-year Federal Agency Cost of Funds	10-year CMT
30-year Federal Agency Cost of Funds	30-year CMT
2-yr Swap	2-year CMT
3-yr Swap	3-year CMT
5-yr Swap	5-year CMT
10-yr Swap	10-year CMT
30-yr Swap	30-year CMT

c. *Enterprise Borrowing Rates*. In the Stress Test, the Federal Agency Cost of Funds Index is the same as the Enterprise Cost of Funds Index during the Stress Period, except that the Stress Test adds a 10 basis-point credit spread to the Federal Agency Cost of Funds rates to project Enterprise Cost of Funds rates for the last 108 months of the Stress Period.

3.3.4 Interest Rates Outputs

Interest Rate outputs are monthly values for: the projected ten points on the Treasury yield curve (1-month, 3-month, 6-month, 1-year, 2-year, 3-year, 5-year, 10-year, 20-year and 30-year); the 21 non-Treasury rates contained in Table 3–27; and the nine points on the Enterprise Cost of Funds curve.

3.4 Property Valuation

3.4.1 Property Valuation Overview

[a] The Property Valuation component applies inflation adjustments to the single family house price growth rates and multifamily rent growth rates that are used to determine single family property values and multifamily current debt-service coverage ratios during the up-rate scenario, as required by the 1992 Act.

[b] Single family house price growth rates during the 120 months of the Stress Test are calculated from the HPI series for the West South Central Census Division for the years 1984–1993, as derived from OFHEO's Third Quarter, 1996 HPI Report. The West South Central Census Division includes Texas and all of the Benchmark states except Mississippi. This series is applied to single family loans nationwide during the Stress Test because the 1992 Act applies a regional loss experience (the BLE) to the entire nation. In contrast, house prices are brought forward to the start of the Stress Test based on local Census Division HPI values available at the start of the Stress Test.

[c] Multifamily rent growth rates during the 120 months of the Stress Test are computed using a population-weighted average of the monthly growth of the Rent of Primary

Residence component of the Consumer Price Index-Urban, which is generated by the U.S. Department of Labor Bureau of Labor Statistics. The metropolitan areas used for this computation are the Dallas/Ft. Worth CMSA, the Houston/Galveston/Brazoria CMSA, and the New Orleans MSA.

[d] Multifamily rental vacancy rates during the 120 months of the Stress Test are computed using a population-weighted average of annual rental vacancy rates from the U.S. Department of Commerce, Bureau of the Census' Housing Vacancy Survey. The metropolitan areas used for this computation are the Dallas, Houston and Fort Worth PMSAs and the San Antonio, New Orleans and Oklahoma City MSAs.

[e] *Inflation adjustment*. In the up-rate scenario, if the ten-year CMT rises more than 50 percent above the average yield during the nine months preceding the Stress Period, rent and house price growth rates are adjusted to account for inflation as required by the 1992 Act. The single family House Price Growth Rates and the multifamily Rent Growth Rates are increased by the amount by which the ten-year CMT exceeds 50 percent of its annualized monthly yield averaged over the nine months preceding the Stress Test. The inflation adjustment is applied only in the last 60 months of the Stress Period.

3.4.2 Property Valuation Inputs

The inputs required for the Property Valuation component are set forth in Table 3–28.

TABLE 3–28—PROPERTY VALUATION INPUTS

Variable	Description	Source
$CMT10_m$	10-year CMT yield for months m = 1...120 of the Stress Test	section 3.3, Interest Rates
$ACMT_o$	Unweighted nine-month average of the ten-year CMT yield for the nine months immediately preceding the Stress Test. (Monthly rates are unweighted monthly averages of daily rates, bond equivalent yield)	section 3.3, Interest Rates
$HHPGR_q^{HSP}$	Quarterly single family historical house price growth rates computed from the HPI series for the Benchmark region and time period, unadjusted for inflation. The specific series is the West South Central Census Division for the years l984–1993, as reported in OFHEO's Third Quarter, 1996 HPI Report	Table 3–19 of section 3.1.3, Public Data
RG_m^{HSP}	Multifamily Rent Growth Rates for months m = 1...120 of the Benchmark region and time period, unadjusted for inflation	Table 3–20 of section 3.1.3, Public Data
RVR_m^{HSP}	Multifamily Rental Vacancy Rates for months m = 1...120 of the Benchmark region and time period	Table 3–20 of section 3.1.3, Public Data

3.4.3 Property Valuation Procedures for Inflation Adjustment

[a] Calculate inflation-adjusted House Price Growth Rates and Rent Growth Rates using the following six steps:

1. Calculate the Inflation-Adjustment (IA) for the up-rate stress test, as follows:

$$IA = max\begin{bmatrix} CMT10^{MAX} \\ -(1.50 \times ACMT_0), 0 \end{bmatrix}$$

Where:

$CMT10^{MAX}$ is the value of the ten-year CMT during the last 108 months of the up-rate Stress Test.

2. The Inflation Adjustment (IA) is compounded annually over 9 years and 2 months (110 months) to obtain the Cumulative Inflation Adjustment (CIA) according to the following equation:

$$CIA = (1 + IA)^{\frac{110}{12}}$$

3. For single family house prices, convert the CIA to continuously compounded quarterly factors, the Quarterly House Price Growth Adjustments ($QHGA_q$), which take on positive values only in the last twenty quarters of the Stress Test, using:

$$QHGA_q = \frac{ln(CIA)}{20} \text{ for } q = 21 \ldots 40$$
$$\text{in the up-rate Stress Test}$$

$$QHGA_q = 0, \text{ otherwise}$$

4. For Multifamily rent growth, the CIA is converted to discrete monthly factors or Monthly Rent Growth Adjustments ($MRGA_m$), and is applied only in the last 60 months of the Stress Test in the up-rate scenario, as follows:

$$MRGA_m = \left[(CIA)^{\frac{1}{60}} - 1 \right] \text{ for } m = 61 \ldots 120$$
$$\text{in the up-rate Stress Test}$$

$$MRGA_m = 0, \text{ otherwise}$$

5. Calculate the inflation-adjusted House Price Growth Rates ($HPGR_q$), used in updating single family house prices during the Stress Test:

$$HPGR_q = HHPGR_q^{HSP} + QHGA_q$$

6. Calculate inflation-adjusted Rent Growth Rates (RGR_m), used in updating Multifamily debt-service coverage ratios during the Stress Test:

$$RGR_m = RG_m^{HSP} + MRGA_m$$

3.4.4 Property Valuation Outputs

[a] The outputs of the Property Valuation component of the Stress Test are set forth in Table 3–29.

TABLE 3–29—PROPERTY VALUATION OUTPUTS

Variable	Description
$HPGR_q$	House price growth rates for quarters 1...40 of the Stress Test, adjusted for inflation, if applicable.
RGR_m	Multifamily Rent Growth Rates for months m = 1...120 of the Stress Test, adjusted for inflation, if applicable.
RVR_m	Multifamily Rental Vacancy Rates for months m = 1...120 of the Stress Test.

[b] Inflation-adjusted House Price Growth Rates ($HPGR_q$) are inputs to the Single Family Default and Prepayment component of the Stress Test (*see* section 3.6.3.4, of this appendix). Inflation-adjusted Rent Growth Rates (RGR_m) and Rental Vacancy Rates (RVR_m) are inputs to the Multifamily Default and Prepayment component (*see* section 3.6.3.5, of this appendix).

3.5 Counterparty Defaults

3.5.1 Counterparty Defaults Overview

The Counterparty Defaults component of the Stress Test accounts for the risk of default by credit enhancement and derivative contract counterparties, corporate securities, municipal securities, and mortgage-related securities. The Stress Test recognizes five rating categories (''AAA'', ''AA'', ''A'', ''BBB'', and ''Below BBB and Unrated'') and establishes appropriate credit loss factors that are applied during the Stress Period. Securities rated below BBB are treated as unrated securities, unless OFHEO determines to specify a different treatment upon a showing by an Enterprise that a different treatment is warranted.

3.5.2 Counterparty Defaults Input

For counterparties and securities, information on counterparty type and the lowest public rating of the counterparty is required. The Stress Test uses credit ratings issued by Nationally Recognized Statistical Rating Organizations (''NRSROs'') to assign rating categories to counterparties and securities. If a counterparty or security has different ratings from different rating agencies, i.e., a ''split rating,'' or has a long-term rating and a short-term rating, then the lower rating is used.

3.5.3 Counterparty Defaults Procedures

[a] Apply the following three steps to determine maximum haircuts:

1. *Identifying Counterparties.* The Stress Test divides all sources of credit risk other than mortgage default into two categories—(1) derivative contract counterparties and (2) non-derivative contract

counterparties and instruments. Non-derivative contract counterparties and instruments include mortgage insurance (MI) counterparties, seller-servicers, mortgage-related securities such as mortgage revenue bonds (MRBs) and private label REMICS, and nonmortgage investments such as corporate and municipal bonds and asset-backed securities (ABSs).

2. *Classify Rating Categories.*

a. Stress Test rating categories are defined as set forth in Table 3–30. Organizations frequently apply modifiers (numerical, plus, minus) to the generic rating classifications. In order to determine the correct mapping, ignore these modifiers except as noted in Table 3–30.

TABLE 3–30—RATING AGENCIES MAPPINGS TO OFHEO RATINGS CATEGORIES

OFHEO Ratings Category	AAA	AA	A	BBB	Below BBB and Unrated
Standard & Poor's Long-Term	AAA	AA	A	BBB	Below BBB and Unrated
Fitch Long-Term	AAA	AA	A	BBB	Below BBB and Unrated
Moody's Long-Term	Aaa	Aa	A	Baa	Below Baa and Unrated
Standard & Poor's Short-Term	A–1 + SP–1 +	A–1 SP–1	A–2 SP–2	A–3	SP–3, B or Below and Unrated
Fitch Short-Term	F–1 +	F–1	F–2	F–3	B and Below and Unrated
Moody's [1]	Prime-1 MIG1 VMIG1	Prime-1 MIG1 VMIG1	Prime-2 MIG2 VMIG2	Prime-3 MIG3 VMIG3	Not Prime, SG and Unrated
Fitch Bank Individual Ratings	A	B A/B	C B/C	D C/D	E D/E
Moody's Bank Financial Strength Rating	A	B	C	D	E

[1] Any rating that appears in more than one OFHEO category column is assigned the lower OFHEO rating category.

b. The Stress Test also includes a ratings classification called cash. This includes cash equivalents as defined in FAS 95, Government securities, and securities of the reporting Enterprise.

c. Unrated, unsubordinated obligations issued by Government Sponsored Enterprises other than the reporting Enterprise are treated as AAA. Unrated seller-servicers are treated as BBB.

d. The Stress Test will permit a higher rating to be used for an unrated seller-servicer who participates in a multifamily delegated underwriting and servicing program that requires a loss-sharing agreement when: (1) The loss sharing agreement is collateralized by a fully funded reserve account pledged to the Enterprise; and (2) the reserve account is in an amount that is equal to or exceeds the amount that OFHEO has determined to be adequate to support the seller-servicer's loss-sharing obligation under the program. Determinations of the reserve requirement and of the rating that will be permitted will be made on a program-by-program and Enterprise-by-Enterprise basis by the Director.

3. *Determine Maximum Haircuts.* The Stress Test specifies the Maximum Haircut (i.e., the maximum reduction applied to cash flows during the Stress Test to reflect the risk of loss due to counterparty (including security) default) by rating category and counterparty type as shown in Table 3–31.

a. The Maximum Haircut for a rating category is the product of its default rate and its loss severity rate. For all counterparties, the default rates are 5 percent for AAA, 12.5 percent for AA, 20 percent for A, 40 percent for BBB and 100 percent for Below BBB and Unrated. For non-derivative counterparties, the loss severity rate is 70 percent; for derivative counterparties, it is 10 percent. For all Below BBB and Unrated counterparties, the loss severity rate is 100 percent.

b. For periods prior to the implementation of netting, a separate set of Maximum Haircuts (set forth in Table 3–31) will be applied to derivative contract cash flows to approximate the impact of the net exposures to derivative contract counterparties (see section 3.8.3, Nonmortgage Instrument Procedures). After the implementation of netting, exposures will be netted as described in section 3.8.3 before the haircut is applied.

c. With the exception of haircuts for the Below BBB and Unrated category, haircuts for all counterparty categories are phased-in linearly over the 120 months of the Stress Period. The Maximum Haircut is applied in month 120 of the Stress Period. Haircuts for the Below BBB and Unrated category are applied fully starting in the first month of the Stress Test.

TABLE 3–31—STRESS TEST MAXIMUM HAIRCUT BY RATINGS CLASSIFICATION

Ratings Classification	Derivative Contract Counterparties prior to Implementation of Netting	Derivative Contract Counterparties after Implementation of Netting	Non-Derivative Contract Counterparties or Instruments	Number of Phase-in Months
Cash	0%	0%	0%	N/A
AAA	0.3%	0.5%	3.5%	120
AA	0.75%	1.25%	8.75%	120
A	1.2%	2%	14%	120
BBB	2.4%	4%	28%	120
Below BBB and Unrated	100%	100%	100%	1

3.5.4 Counterparty Defaults Outputs

The Maximum Haircut for a given Counterparty Type and Rating Classification is used in section 3.6, Whole Loan Cash Flows, section 3.7, Mortgage-Related Securities Cash Flows, and section 3.8, Nonmortgage Instrument Cash Flows, of this appendix.

3.6 Whole Loan Cash Flows

3.6.1 Whole Loan Cash Flows Overview

[a] *Loan Aggregation.* In the Stress Test calculations (except as described in section 3.6.3.6.4, Mortgage Credit Enhancement, of this appendix), individual loans having similar characteristics are aggregated into Loan Groups as described in section 3.1.2.1, Whole Loan Inputs, of this appendix (RBC Report). All individual loans within a Loan Group are considered to be identical for computational purposes. In the discussions in this section, quantities described as ''loan level'' will actually be computed at the Loan Group level.

[b] *Loan Participations.* In some cases, an Enterprise may hold only a *pari passu* fractional ownership interest in a loan. This interest is referred to as a participation, and is specified by the ownership percentage held by the Enterprise (the participation percentage). In such cases, the Unpaid Principal Balance (UPB) and Mortgage Payment reported in the RBC Report will be only the Enterprise's participation percentage of the loan's actual UPB and Mortgage Payment. The actual UPB is not explicitly used in the calculations described in this section 3.6 but it is used in the creation of the RBC Report.

[c] *Retained Loans vs. Sold Loans.* The Stress Test models cash flows from single family and multifamily mortgage loans that are held in portfolio (Retained Loans) and loans that are pooled into Mortgage-Backed Securities (MBSs) that are sold to investors and guaranteed by the Enterprises (Sold Loans). Together, Retained Loans and Sold Loans are referred to as ''Whole Loans.'' The treatment of cash flows for loans not guaranteed by the Enterprises, e.g., loans backing GNMA Certificates and private label MBSs and REMICs, is discussed in section 3.7, Mortgage-Related Securities Cash Flows, of this appendix.

[d] *Repurchased MBSs.* From time to time an Enterprise may repurchase all or part of one of its own previously issued single-class MBSs for its own securities portfolio. At an Enterprise's option, these ''Repurchased MBSs'' may be reported with the underlying Whole Loans for computation in this section 3.6 rather than in section 3.7, Mortgage-Related Securities Cash Flows, of this appendix. In such cases, the Enterprise will report the underlying Whole Loans as sold loans, along with the appropriate Fraction Repurchased and any security unamortized balances associated with the purchase of the MBS (not with the original sale of the underlying loans, which unamortized balances are reported separately).

[e] *Sources of Enterprise Whole Loan Cash Flows.* For Retained Loans, the Enterprises receive all principal and interest payments on the loans, except for a portion of the interest payment retained by the servicer as compensation (the Servicing Fee). For Sold Loans, the Enterprises receive Guarantee Fees and Float Income. Float Income is the earnings on the investment of loan principal and interest payments (net of the Servicing Fee and Guarantee Fee) from the time these payments are received from the servicer until they are remitted to security holders. The length of this period depends on the security payment cycle (the remittance cycle). For both retained and sold loans, the Enterprises retain 100 percent of their credit losses

and experience amortization of discounts as income and amortization of premiums as expense. For Repurchased MBSs, the Enterprise receives the Fraction Repurchased of the cash flows it remits to investors, and retains 100 percent of the Credit Losses and the Guarantee Fee. *See* section 3.6.3.7, Stress Test Whole Loan Cash Flows and section 3.6.3.8, Whole Loan Accounting Flows, of this appendix.

[f] *Required Inputs.* The calculation of Whole Loan cash flows requires mortgage Amortization Schedules, mortgage Prepayment, Default and Loss Severity rates, and Credit Enhancement information. The four mortgage performance components of the Stress Test are single family Default and Prepayment, single family Loss Severity, multifamily Default and Prepayment, and multifamily Loss Severity. Mortgage Amortization Schedules are computed from input data in the RBC Report. (For ARMs, selected interest rate indexes from section 3.3, Interest Rates, of this appendix, are also used.) Prepayment and Default Rates are computed by combining explanatory variables and weighting coefficients according to a set of logistic equations. The explanatory variables are computed from the mortgage Amortization Schedule and external economic variables such as Interest Rates (section 3.3, Interest Rates, of this appendix), historical house-price indexes (HPIs) or rental-price indexes (RPIs), and Stress Period HPI growth rate, RPI and Vacancy Rate (RVR) series from section 3.4, Property Valuation, of this appendix. The weighting coefficients determine the relative importance of the different explanatory variables, and are estimated from a statistical analysis of data from the Benchmark Loss region and time period as described in section 1, Identification of the Benchmark Loss Experience, of this appendix. Mortgage Amortization information is also combined with HPI, RPI and VR series to determine Gross Loss Severity rates, which are offset by Credit Enhancements. Finally, the Amortization Schedules, Default and Prepayment rates and Net Loss Severity rates are combined to produce Stress Test Whole Loan Cash Flows to the Enterprises for each Loan Group, as well as amortization of any discounts, premiums and fees.

[g] *Specification of Mortgage Prepayment.* Mortgages are assumed to prepay in full. The model makes no specific provision for partial Prepayments of principal (curtailments).

[h] *Specification of Mortgage Default and Loss.* Mortgage Defaults are modeled as follows: Defaulting loans enter foreclosure after a number of missed payments (MQ, Months in Delinquency), and are foreclosed upon several months later. Months in Foreclosure (MF) is the total number of missed payments through foreclosure. Upon completion of foreclosure, the loan as such ceases to exist and the property becomes Real Estate Owned by the lender (REO). Foreclosure expenses are paid and MI proceeds received when foreclosure is completed. After several more months (MR, Months in REO), the property is sold, REO expenses are paid, and sales proceeds and other credit enhancements are received. These timing differences are not modeled explicitly in the cash flows, but their economic effect is taken into account by calculating the present value of the Default-related cash flows back to the initial month of Default.

[i] *Combining Cash Flows from Scheduled Payments, Prepayments and Defaults.* Aggregate Whole Loan Cash Flows, adjusted for the effects of mortgage performance, are based on the following conceptual equation, which is made more explicit in the calculations in the sections specified in section 3.6.2 of this appendix:

$$\begin{bmatrix}\text{Aggregate Cash Flows from}\\ \text{Whole Loans that Default}\\ \text{and Prepay at Rates that}\\ \text{vary in each month m}\end{bmatrix} = \begin{bmatrix}\begin{pmatrix}\text{scheduled Mortgage}\\ \text{Payment}\end{pmatrix}\times \begin{pmatrix}\text{fraction of loans that remain}\\ \text{on original schedule}\end{pmatrix}\\ \text{plus}\\ \begin{pmatrix}\text{entire loan UPB plus}\\ \text{final interest payment}\end{pmatrix}\times \begin{pmatrix}\text{fraction of loans that}\\ \text{Prepay in month m}\end{pmatrix}\\ \text{plus}\\ \begin{pmatrix}\text{present value of Default-related}\\ \text{receipts minus expenses}\end{pmatrix}\times \begin{pmatrix}\text{fraction of loans that}\\ \text{Default in month m}\end{pmatrix}\end{bmatrix}$$

3.6.2 Whole Loan Cash Flows Inputs

Inputs for each stage of the Whole Loan Cash Flows calculation are found in the following sections:

- Section 3.6.3.3.2, Mortgage Amortization Schedule Inputs
- Section 3.6.3.4.2, Single Family Default and Prepayment Inputs

- Section 3.6.3.5.2, Multifamily Default and Prepayment Inputs
- Section 3.6.3.6.2.2, Single Family Gross Loss Severity Inputs
- Section 3.6.3.6.3.2, Multifamily Gross Loss Severity Inputs
- Section 3.6.3.6.4.2, Mortgage Credit Enhancement Inputs
- Section 3.6.3.7.2, Stress Test Whole Loan Cash Flow Inputs
- Section 3.6.3.8.2, Whole Loan Accounting Flows Inputs, of this appendix

3.6.3 Whole Loan Cash Flows Procedures

3.6.3.1 Timing Conventions

[a] *Calculations are monthly.* The Stress Test operates monthly, with all events of a given type assumed to take place on the same day of the month. For mortgages, unless otherwise specified, all payments and other mortgage-related cash flows that are due on the first day of the month are received on the fifteenth. Biweekly loans are mapped into their closest term-equivalent monthly counterpart.

[b] *''Time Zero'' for Calculations.* Time Zero refers to the beginning of the Stress Test. For example, if the 2Q2000 Stress Test uses Enterprise Data as of June 30, ''month zero'' represents conditions as of June 30, the Stress Period begins July 1, and July 2000 is month one of the Stress Test. In this document, UPB_0 is the Unpaid Principal Balance of a loan immediately prior to (as of) the start of the Stress Test, i.e. as reported by the Enterprise in the RBC Report. Origination refers to the beginning of the life of the loan, which will be prior to the start of the Stress Test for all loans except those delivered later under Commitments, for which Origination refers to the delivery month (*See* section 3.2, Commitments, of this appendix).

[c] *Definition of Mortgage Age.* The Mortgage Age at a given time is the number of scheduled mortgage payment dates that have occurred prior to that time, whether or not the borrower has actually made the payments. Prior to the first payment date, the Mortgage Age would be zero. From the first payment date until (but not including) the second loan payment date, the Mortgage Age would be one. The Mortgage Age at Time Zero (A_0) is thus the number of scheduled loan payment dates that have occurred prior to the start of the Stress Test. The scheduled payment date for all loans is assumed to be the first day of each month; therefore, the Mortgage Age will be A_1 on the first day of the Stress Test (except for Commitments that are delivered after the start of the Stress Test).

[d] *Interest Rate Setting Procedure.* Mortgage interest is due in arrears, i.e., on the first day following the month in which it is accrued. Thus, a payment due on the first day of month m is for interest accrued during the *prior* month. For example, for Adjustable Rate Mortgages (ARMs) the Mortgage Interest Rate (MIR_m) applicable to the July reset is set on the first day of June, and is generally based on the May or April value of the underlying Index, as specified in the loan terms. This Lookback Period (LB) is specified in the Stress Test as a period of one or two months, respectively. Thus, PMT_m will be based on MIR_m, which is based on $INDEX_{m-1-LB}$.

[e] *Prepayment Interest Shortfall.* In some remittance cycles, the period between an Enterprise's receipt of Prepayments and transmittal to investors exceeds a full month. In those cases, the Enterprise must remit an additional month's interest (at the Pass-Through Rate) to MBS investors. *See* section 3.6.3.7.3, Stress Test Whole Loan Cash Flow Procedures, of this appendix.

[f] *Certain Calculations Extend Beyond the End of the Stress Test.* Even though the Stress Test calculates capital only through the ten year Stress Period, certain calculations (for example, the level yield amortization of discounts, premiums and fees, as described in section 3.10, Operations, Taxes, and Accounting, of this appendix) require cash flows throughout the life of the instrument. For such calculations in the Stress Test, the conditions of month 120 are held constant throughout the remaining life of the instrument: specifically, Interest Rates (which are already held constant for months 13 through 120), Prepayment and Default rates for months m >120 are taken to be equal to their respective values in month 120.

3.6.3.2 Payment Allocation Conventions

3.6.3.2.1 Allocation of Mortgage Interest

[a] *Components of Mortgage Interest.* The interest portion of the Mortgage Payment is allocated among several components. For all Whole Loans, a Servicing Fee is retained by the servicer. For Sold Loans, the Enterprise retains a Guarantee Fee. An additional amount of interest (Spread)[1] may be deposited into a Spread Account to reimburse potential future credit losses on loans covered by this form of Credit Enhancement, as described further in section 3.6.3.6.4, Mortgage Credit Enhancement, of this appendix. The remaining interest amount is either retained by the Enterprise (Net Yield on Retained Loans) or passed through to MBS investors (Pass-Through Interest on Sold Loans).

[b] *Effect of Negative Amortization.* If the Mortgage Payment is contractually limited to an amount less than the full amount accrued (as may be the case with loans that permit Negative Amortization), then the Servicing Fee, the Guarantee Fee and the

[1] The spread may or may not be embedded in the recorded Servicing Fee.

spread are paid in full, and the shortfall is borne entirely by the recipient of the Net Yield or Pass-Through Interest.

[c] *Effect of Variable Rates.* For ARMs, the Servicing Fee, Guarantee Fee and Spread rates are taken to be constant over time, as they are for Fixed Rate Loans. Thus in the Stress Test the Mortgage Interest Rate and the Net Yield or Pass-through Rate will change simultaneously by equal amounts. All other details of the rate and payment reset mechanisms are modeled in accordance with the contractual terms using the inputs specified in section 3.6.3.3.2, Mortgage Amortization Schedule Inputs, of this appendix.

3.6.3.2.2 Allocation of Mortgage Principal

[a] Scheduled Principal is that amount of the mortgage payment that amortizes principal. For calculational purposes, when a loan prepays in full the amount specified in the Amortization Schedule is counted as Scheduled Principal, and the rest is Prepayment Principal. For a Balloon Loan, the final Balloon Payment includes the remaining UPB, all of which is counted as Scheduled Principal.

[b] Mortgages that prepay are assumed to prepay in full. Partial Prepayments (curtailments) are not modeled.

[c] Any loan that does not prepay or Default remains on its original Amortization Schedule.

3.6.3.3 Mortgage Amortization Schedule

3.6.3.3.1 Mortgage Amortization Schedule Overview

[a] The Stress Test requires an Amortization Schedule for each Loan Group. A mortgage is paid down, or amortized over time, to the extent that the contractual mortgage payment exceeds the amount required to cover interest due.

[b] *Definitions.*

1. *Fully Amortizing Loans.* The Amortization Schedule for a mortgage with age A_0 at the beginning of the Stress Test is generated using the starting UPB (UPB_0), the Remaining Term to Maturity (RM), the remaining Amortization Term ($AT - A_0$), the remaining Mortgage Payments (PMT_m for m = 1...RM) and Mortgage Interest Rates (MIR_m for m = 1...RM). The Amortization Schedule is generated by repeating the following three steps iteratively until the UPB is zero:
   a. Interest Due = UPB × Mortgage Interest Rate
   b. Principal Amortization = Payment − Interest Due
   c. Next period's UPB = UPB − Principal Amortization

2. *Balloon Loans.* A Balloon Loan matures prior to its Amortizing Term, i.e. before the UPB is fully amortized to zero. Computationally, $AT - A_0 > RM$, usually by at least 180 months. In order that $UPB_{RM} = 0$, the principal component of the resulting lump sum final payment (the Balloon Payment, equal to UPB_{RM-1}) is counted as Scheduled Principal, not as a Prepayment.

[c] *Special Cases.* In general the UPB of a mortgage decreases monotonically over time, i.e. $UPB_m > UPB_{m+1}$, reaching zero at maturity except for Balloon Loans as described in [b]2. in this section. However, in practice certain exceptions must be handled.

1. *Interest-Only Loans.* Certain loans are interest-only for all or part of their term. The monthly payment covers only the interest due, and the UPB stays constant until maturity (in some cases), in which case a Balloon Payment is due or a changeover date (in other cases) at which time the payment is recast so that the loan begins to amortize over its remaining term. If the loan does not amortize fully over its remaining term, a Balloon Payment will be due at maturity.
2. *Negative Amortization.* For some loans, the UPB may increase for a period of time if the mortgage payment is contractually limited to an amount that is less than the amount of interest due, and the remainder is added to the UPB. At some point, however, the payment must exceed the interest due or else the loan balance will never be reduced to zero. In the calculation, this is permitted to occur only for payment-capped ARMs that contractually specify negative amortization. Certain types of FRMs, notably Graduated Payment Mortgages (GPMs) and Tiered Payment Mortgages (TPMs), also have variable payment schedules that result in negative amortization, but in the Stress Test all such loans are assumed to have passed their negative amortization periods.
3. *Early Amortization.*
   a. If a borrower has made additional principal payments (curtailments or partial prepayments) on a FRM prior to the start of the Stress Test, the contractual mortgage payment will amortize the loan prior to its final maturity, i.e. $UPB_m = 0$ for some m <RM. *This is an acceptable outcome in the Stress Test. Note:* for ARMs, the mortgage payment is recalculated, and thus the amortization schedule is recast to end exactly at m = RM, on each rate or payment reset date.
   b. When this calculation is performed for a fully amortizing FRM using weighted average values to represent a Loan Group, the final scheduled payment may exceed the amount required to reduce the UPB to zero, or the UPB may reach zero prior to month RM. This is because the mortgage payment calculation is nonlinear, and as a result the average mortgage

payment is not mathematically guaranteed to amortize the average UPB using the average MIR. This is an acceptable outcome in the Stress Test.

4. *Late Amortization*. According to its contractual terms, the UPB of a mortgage loan must reach zero at its scheduled maturity. The borrower receives a disclosure schedule that explicitly sets forth such an Amortization Schedule. If the characteristics of a mortgage loan representing a Loan Group in the RBC Report do not result in $UPB_{RM} = 0$, it must be for one of three reasons: a data error, an averaging artifact, or an extension of the Amortization Schedule related to a delinquency prior to the start of the Stress Test. In any such case, the Stress Test does not recognize cash flows beyond the scheduled maturity date and models the performing portion of UPB_{RM} in month RM as a credit loss.
5. *Biweekly Loans*. Biweekly loans are mapped into the FRM category that most closely approximates their final maturity.
6. *Step-Rate (or "Two-Step") Loans*. Certain loans have an initial interest rate for an extended period of time (typically several years) and then "step" to a final fixed rate for the remaining life of the loan. This final fixed rate may be either a predetermined number or a margin over an index. Such loans can be exactly represented as ARMs with the appropriate Initial Mortgage Interest Rate and Initial Rate Period, Index and Margin (if applicable). If the final rate is a predetermined rate (e.g., 8 percent per annum) then the ARM's Maximum and Minimum Rate should be set to that number. The Rate and Payment Reset Periods should be set equal to the final rate period after the step.
7. *Reverse Mortgages*. In a reverse mortgage, a borrower receives one or more payments from the lender and the lender is repaid with a lump sum when the borrower dies, sells the property or moves out of the home permanently. The stress test models reverse mortgages as a ladder of zero-coupon securities:

a. 11 proxy securities for each reverse mortgage program are created.

b. A 10% conditional payment rate is used to create the zero-coupon securities that will mature in every year of the stress test. The zero-coupon securities are a laddered series of floating-rate coupon-bearing accreting bonds with a first payment date at maturity.

c. The 11th zero-coupon security will mature three months after the stress test to reflect the 35% of UPB not paid down during the stress period.

d. An OFHEO credit rating equivalent to AAA for the FHA insured programs and AA for other reverse mortgage programs is assigned.

8. *Split-Rate ARM Loans*. In split-rate ARM loans, the principal portion of the payment is based on a fixed-rate amortization schedule while the interest portion is based on a floating rate index. These multifamily loans are available as fully amortizing product or with a balloon feature. The stress test model does not provide treatment for split-rate ARM loans. Split-rate loans shall be treated as ARMs when they are issued without a balloon payment feature or as Balloon ARMs when the loans contain a balloon payment feature.

3.6.3.3.2 Mortgage Amortization Schedule Inputs

The inputs needed to calculate the amortization schedule are set forth in Table 3–32:

TABLE 3–32—LOAN GROUP INPUTS FOR MORTGAGE AMORTIZATION CALCULATION

Variable*	Description	Source
	Rate Type (Fixed or Adjustable)	RBC Report
	Product Type (30/20/15-Year FRM, ARM, Balloon, Government, etc.)	RBC Report
UPB_{ORIG}	Unpaid Principal Balance at Origination (aggregate for Loan Group)	RBC Report
UPB_0	Unpaid Principal Balance at start of Stress Test (aggregate for Loan Group)	RBC Report
MIR_0	Mortgage Interest Rate for the Mortgage Payment prior to the start of the Stress Test, or Initial Mortgage Interest Rate for new loans (weighted average for Loan Group) (expressed as a decimal per annum)	RBC Report

TABLE 3–32—LOAN GROUP INPUTS FOR MORTGAGE AMORTIZATION CALCULATION—Continued

Variable*	Description	Source
PMT_0	Amount of the Mortgage Payment (Principal and Interest) prior to the start of the Stress Test, or first payment for new loans (aggregate for Loan Group)	RBC Report
AT	Original loan Amortizing Term in months (weighted average for Loan Group)	RBC Report
RM	Remaining term to Maturity in months (i.e., number of contractual payments due between the start of the Stress Test and the contractual maturity date of the loan) (weighted average for Loan Group)	RBC Report
A_0	Age immediately prior to the start of the Stress Test, in months (weighted average for Loan Group)	RBC Report
	Interest-only Flag	RBC Report
RIOP	Remaining Interest-only period, in months (weighted average for loan group)	RBC Report
Additional Interest Rate Inputs		
GFR	Guarantee Fee Rate (weighted average for Loan Group) (decimal per annum)	RBC Report
SFR	Servicing Fee Rate (weighted average for Loan Group) (decimal per annum)	RBC Report
Additional Inputs for ARMs (weighted averages for Loan Group, except for Index)		
$INDEX_m$	Monthly values of the contractual Interest Rate Index	section 3.3, Interest Rates
LB	Look-Back period, in months	RBC Report
MARGIN	Loan Margin (over index), decimal per annum	RBC Report
RRP	Rate Reset Period, in months	RBC Report
	Rate Reset Limit (up and down), decimal per annum	RBC Report
	Maximum Rate (life cap), decimal per annum	RBC Report
	Minimum Rate (life floor), decimal per annum	RBC Report
NAC	Negative Amortization Cap, decimal fraction of UPB_{ORIG}	RBC Report
	Unlimited Payment Reset Period, in months	RBC Report
PRP	Payment Reset Period, in months	RBC Report
	Payment Reset Limit, as decimal fraction of prior payment	RBC Report
IRP	Initial Rate Period, in months	RBC Report

* Variable name is given when used in an equation

3.6.3.3.3 Mortgage Amortization Schedule Procedures

[a] For each Loan Group, calculate a mortgage Amortization Schedule using the inputs in Table 3–32 and the following ten steps. *Note:* Do not round dollar amounts to the nearest penny.)

For months m = 1...RM, calculate quantities for month m based on values from month m − 1 as follows:

1. Calculate current month's Mortgage Interest Rate (MIR_m).

a. For FRMs: $MIR_m = MIR_0$ for all m = 1 to RM

b. For ARMs, use the following procedure:

1) If RRP = PRP then month m is a rate reset month if:

$$\left[A_0 + m - (IRP+1)\right] \textit{mod } RRP = 0$$

$$\text{and} \quad A_0 + m - 1 \geq IRP$$

2) If RRP ≠ PRP then month m is a rate reset month if either:

a) $A_0 + m - (IRP + 1) = 0$, or

b) $[A_0 + m - 1]$ *mod* RRP = 0 and $A_0 + m - 1 \geq IRP$

3) If m is a rate reset month, then:

$$MIR_m = INDEX_{m-1-LB} + MARGIN,$$

but not greater than MIR_{m-1} + Rate Reset Limit

nor less than MIR_{m-1} − Rate Reset Limit

and in no case greater than Maximum Rate

and in no case less than Minimum Rate

4) If month m is not a rate reset month, then $MIR_m = MIR_{m-1}$.

c. In all cases, $MIR_m = MIR_{120}$ for m >120, and $MIR_m = 0$ for m >RM.

2. Calculate current month's Payment (PMT_m).

a. For FRMs:

1) For Interest-Only Loans, if m = RIOP + 1 then month m is a reset month; recompute PMT_m as described for ARMs in step b.4)b), of this section without applying any payment limit.

2) $PMT_m = PMT_0$ for all m = 1 to RM

b. For ARMs, use the following procedure:

1) For Interest Only Loans, if m = RIOP + 1 then month m is a payment reset month.

2) If PRP = RRP, then month m is a payment reset month if m is also a rate reset month.

3) If PRP ≠ RRP then month m is a payment reset month if:

$$\left[A_0 + m - 1\right] \textit{mod } PRP = 0$$

4) If month m is a payment reset month, then:

a) For loans in an Interest-only Period,

$$PMT_m = UPB_{m-1} \times \frac{MIR_m}{12}$$

b) Otherwise, PMT_m = the amount that will fully amortize the Loan over its remaining Amortizing Term (i.e. $AT - A_o - m + 1$ months) with a *fixed* Mortgage Interest Rate equal to MIR_m as determined in Step 1 of this section

but not greater than PMT_{m-1} × (1 + Payment Reset Limit Up)

nor less than PMT_{m-1} × (1 − Payment Reset Limit Down)

unless month m is the month following the end of an Unlimited Payment Reset Period, in which case PMT_m is not subject to any reset limitations.

5) If month m is not a payment reset month, then $PMT_m = PMT_{m-1}$

6) If, in any month,

$$UPB_{m-1} \times \left(1 + \frac{MIR_m}{12}\right) - PMT_m$$

$$> UPB_{ORIG} \times NAC,$$

then recalculate PMT_m without applying any Payment Reset Limit.

c. For Balloon Loans, or for loans that have RIOP = RM, if m = RM then:

$$PMT_m = UPB_{m-1} \times \left(1 + \frac{MIR_m}{12}\right)$$

d. In all cases, PMT_m should amortize the loan within the Remaining Maturity:

$$PMT_m = 0 \text{ for } m > RM \text{ or after } UPB_m = 0$$

3. Determine Net Yield Rate (NYR_m) and, for sold loans, Pass-Through Rate (PTR_m) applicable to the m^th^ payment:

$$NYR_m = MIR_m - SFR$$

$$PTR_m = NYR_m - GFR$$

4. Calculate Scheduled Interest Accrued (during month m − 1) on account of the m^{th} payment (SIA_m)

$$SIA_m = UPB_{m-1} \times \frac{MIR_m}{12}$$

5. Calculate the Scheduled Interest component of the m^{th} payment (SI_m)

$$SI_m = \textit{min}\left(SIA_m,\ PMT_m\right)$$

6. Calculate Scheduled Principal for the m^{th} payment (SP_m):

$$SP_m = \textit{min}\left(PMT_m - SIA_m,\ UPB_{m-1}\right)$$

NOTE: Scheduled Principal should not be greater than the remaining UPB. SPM can be negative if the Scheduled Payment is less than Scheduled Interest Accrued.

7. Calculate Loan Unpaid Principal Balance after taking into account the m^{th} monthly payment (UPB_m):

$$UPB_m = \textit{max}\left(UPB_{m-1} - SP_m,\ 0\right)$$

8. In the month when UPB_m is reduced to zero, reset

$$PMT_m = UPB_{m-1} \times \left(1 + \frac{MIR_m}{12}\right)$$

9. Repeat all steps for m = 1...RM or until $UPB_m = 0$.

NOTE: If UPB_{RM} is greater than zero, the performing portion is included in Credit Losses (section 3.6.3.7.3, Stress Test Whole Loan Cash Flow Procedures, of this appendix).

10. Determine Net Yield Rate (NYR_o) and, for sold loans, Pass-Through Rate (PTR_o) for month 0:

$$NYR_0 = MIR_0 - SFR$$
$$PTR_0 = NYR_0 - GFR$$

3.6.3.3.4 Mortgage Amortization Schedule Outputs

The Mortgage Amortization Schedule Outputs set forth in Table 3–33 are used in section 3.6.3.4, Single Family Default and Prepayment Rates, section 3.6.3.5, Multifamily Default and Prepayment Rates, section 3.6.3.6, Calculation of Single Family and Multifamily Mortgage Losses, section 3.6.3.7, Stress Test Whole Loan Cash Flows, and section 3.6.3.8, Whole Loan Accounting Flows, of this appendix.

TABLE 3–33—MORTGAGE AMORTIZATION SCHEDULE OUTPUTS

Variable	Description
UPB_m	Unpaid Principal Balance for months m = 1...RM
MIR_m	Mortgage Interest Rate for months m = 1...RM
NYR_m	Net Yield Rate for months m = 1...RM
PTR_m	Passthrough Rate for months m = 1...RM
SP_m	Scheduled Principal (Amortization) for months m = 1...RM
SI_m	Scheduled Interest for months m = 1...RM
PMT_m	Scheduled Mortgage Payment for months m = 1...RM

3.6.3.4 Single Family Default and Prepayment Rates

3.6.3.4.1 Single Family Default and Prepayment Overview

[a] The Stress Test projects conditional Default and Prepayment rates for each single family Loan Group for each month of the Stress Period. The conditional rate is the percentage (by principal balance) of the remaining loans in a Loan Group that defaults or prepays during a given period of time. Computing Default and Prepayment rates for a Loan Group requires information on the Loan Group characteristics at the beginning of the Stress Test, historical and projected interest rates from section 3.3, Interest Rates, and house price growth rates and volatility measures from section 3.4, Property Valuation, of this appendix.

[b] *Explanatory Variables*. Several explanatory variables are used in the equations to determine Default and Prepayment rates for single family loans: Mortgage Age, Original Loan-to-Value (LTV) ratio, Probability of Negative Equity, Burnout, the percentage of Investor-owned Loans, Relative Interest Rate Spread, Payment Shock (for ARMs only), Initial Rate Effect (for ARMs only), Yield Curve Slope, Relative Loan Size, and Mortgage Product Type. Regression coefficients (weights) are associated with each variable. All of this information is used to compute conditional quarterly Default and Prepayment rates throughout the Stress Test. The quarterly rates are then converted to monthly conditional Default and Prepayment rates, which are used to calculate Stress Test Whole Loan cash flows and Default losses. *See* section 3.6.3.7, Stress Test Whole Loan Cash Flows, of this appendix.

[c] The regression coefficients for each Loan Group will come from one of three models. The choice of model will be determined by the values of the single family product code and Government Flag in the RBC Report. *See* section 3.6.3.4.3.2, Prepayment and Default Rates and Performance Fractions, of this appendix.

[d] *Special Provision for Accounting Calculations*. For accounting calculations that require cash flows over the entire remaining life of the instrument, Default and Prepayment rates for months beyond the end of the Stress Test are held constant at their values for month 120.

3.6.3.4.2 Single Family Default and Prepayment Inputs

The information in Table 3–34 is required for each single family Loan Group:

TABLE 3–34—SINGLE FAMILY DEFAULT AND PREPAYMENT INPUTS

Variable	Description	Source
PROD	Mortgage Product Type	RBC Report
A_0	Age *immediately prior to* start of Stress Test, in months (weighted average for Loan Group)	RBC Report
LTV_{ORIG}	Loan-to-Value ratio at Origination (weighted average for Loan Group)	RBC Report
UPB_{ORIG}	UPB at Origination (aggregate for Loan Group)	RBC Report
MIR_{ORIG}	Mortgage Interest Rate at Origination (“Initial Rate” for ARMs), decimal per annum (weighted average for loan group)	RBC Report
UPB_0	Unpaid Principal Balance immediately prior to start of Stress Test (aggregate for Loan Group)	RBC Report
UPB_m	Unpaid Principal Balance in months m = 1...RM	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
MIR_m	Mortgage Interest Rate in months m = 1...RM (weighted average for Loan Group)	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
$MCON_m$	Conventional (30 Year Fixed-Rate) Mortgage Rate series projected for months 1...RM and for the 24 months prior to the start of the Stress Test	section 3.3.2, Interest Rates Inputs, and section 3.3.4, Interest Rates Outputs
$T12Y_m$	1-year CMT series projected for months 1...120 of the Benchmark region and time period	section 3.3.4, Interest Rates Outputs
$T120Y_m$	10-year CMT series projected for months 1...120 of the Benchmark region and time period	section 3.3.4, Interest Rates Outputs
$HPGR_q$	Vector of House Price Growth Rates for quarters q = 1...40 of the Stress Period	section 3.4.4, Property Valuation Outputs
$CHPGF_0^{LG}$	Cumulative House Price Growth Factor since Loan Origination (weighted average for Loan Group)	RBC Report
α, β	HPI Dispersion Parameters for the Stress Period (Benchmark Census Division, currently West South Central Census Division, as published in the OFHEO House Price Report for 1996:3)	$\alpha = 0.002977$ $\beta = -0.000024322$
IF	Fraction (by UPB, in decimal form) of Loan Group backed by Investor-owned properties	RBC Report
RLS_{ORIG}	Weighted average Relative Loan Size at Origination (Original UPB as a fraction of average UPB for the state and Origination Year of loan origination)	RBC Report

3.6.3.4.3 Single Family Default and Prepayment Procedures

3.6.3.4.3.1 Single Family Default and Prepayment Explanatory Variables

[a] Compute the explanatory variables for single family Default and Prepayment in the seven steps as follows:

1. Calculate A_q, the loan Age in quarters, for quarter q:

$$A_q = int\left(\frac{A_0}{3}\right) + q,$$

Where:

int means to round to the lower integer if the argument is not an integer.

2. Calculate $PNEQ_q$, the Probability of Negative Equity in quarter q:

$$PNEQ_q = N\left(\frac{ln LTV_q}{\sigma_q}\right),$$

where:

N designates the cumulative normal distribution function.

a. LTV_q is evaluated for a quarter q as:

$$LTV_{ORIG} \times \frac{\begin{pmatrix}\text{Ratio of current}\\ \text{Loan Group UPB}\\ \text{to Original UPB}\end{pmatrix}}{\begin{pmatrix}\text{Ratio of current property}\\ \text{value (based on HPI in}\\ \text{quarter q) to original}\\ \text{property value (based on}\\ \text{HPI at Origination)}\end{pmatrix}}$$

The HPI at Origination is updated to the beginning of the Stress Test using actual historical experience as measured by the OFHEO HPI; and then updated within the Stress Test using House Price Growth Factors from the Benchmark region and time period:

$$LTV_q = LTV_{ORIG} \times \frac{\left(\frac{UPB_{m=3_q-3}}{UPB_{ORIG}}\right)}{\left[CHPGF_0^{LG} \times exp\left(\sum_{k=1}^{q} HPGR_k\right)\right]}$$

Where:

$UPB_{m = 3q-3}$ = UPB for the month at the end of the quarter prior to quarter q

$CHPGF_o^{LG}$ = 1.0 if the loan was originated in the same quarter as or after the most recently available HPI as of the reporting date

3. Calculate B_q, the Burnout factor in quarter q. A loan's Prepayment incentive is ''burned out'' (i.e., reduced) if, during at least two of the previous eight full quarters, the borrower had, but did not take advantage of, an opportunity to reduce his or her mortgage interest rate by at least two percentage points. For this purpose, the mortgage interest rate is compared with values of the Conventional Mortgage Rate (MCON) Index.

a. Compare mortgage rates for each quarter of the Stress Test and for the eight quarters prior to the start of the stress test (q = −7, −6,...0, 1,...40):

$$\begin{aligned} b_q &= 1 \text{ if } MCON_m + 0.02 \le MIR_m \\ &\quad \text{for all three months in quarter q} \\ &\quad \text{(i.e., m} = 3q-2,\ 3q-1,\ 3q), \\ b_q &= 0 \text{ otherwise} \end{aligned}$$

Note: For this purpose, $MCON_m$ is required for the 24 months (eight quarters) prior to the start of the Stress Test. Also, MIR_m = MIR_0 for m <0.

b. Determine whether the loan is ''burned out'' in quarter q (Burnout Flag, B_q^f):

$$\begin{aligned} B_q^f &= 1 \text{ if } b_{q'} = 1 \text{ for two or more} \\ &\quad \text{quarters } q' \text{ between q-8 and q-1} \\ &\quad \text{inclusive, or since Origination if} \\ &\quad 2 < A_q < 8 \text{ (Note: by definition,} \\ &\quad B_q = 0 \text{ if } A_q < 3); \\ B_q^f &= 0 \text{ otherwise} \end{aligned}$$

Where:

q' = index variable for prior 8 quarters

c. Adjust for recently originated loans as follows:

$$\begin{aligned} B_q &= 0.25 \times B_q^f \text{ if } A_q = 3 \text{ or } 4 \\ &= 0.50 \times B_q^f \text{ if } A_q = 5 \text{ or } 6 \\ &= 0.75 \times B_q^f \text{ if } A_q = 7 \text{ or } 8 \\ &= B_q^f \text{ otherwise} \end{aligned}$$

4. Calculate RS_q, the Relative Spread in quarter q, as the average value of the monthly Relative Spread of the Original

mortgage interest rate to the Conventional (30-Year Fixed Rate) Mortgage Rate series for the three months in the quarter.

NOTE: Use the Current MIR for Fixed Rate Loans and the Original MIR for Adjustable Rate Loans.

$$RS_q = avg\left(\frac{MIR - MCON_m}{MIR}\right)$$

$$\text{over all three months m in quarter q}$$

If MIR = 0, then $RS_q = -0.20$ for all q.

5. Calculate YCS_q, the Yield Curve Slope in quarter q, as the average of the monthly ratio of the 10-Year CMT to the One-Year CMT for the three months in the quarter:

$$YCS_q = avg\left(\frac{T120Y_m}{T12Y_m}\right)$$

$$\text{for all three months in quarter q}$$

6. Evaluate the Payment Shock Indicator (PS_q) for ARMs only:

$$PS_q = RS_q \text{ if } PROD = ARM$$

7. Evaluate the Initial Rate Effect Flag ($IREF_q$) for ARMS only:

$$IREF_q = 1 \text{ if } A_q \le 12 \text{ and } PROD = ARM$$
$$= 0 \text{ otherwise}$$

3.6.3.4.3.2 Prepayment and Default Rates and Performance Fractions

[a] Calculate Prepayment and Default Rates and Performance Fractions using the following five steps:

1. Compute the logits for Default and Prepayment using the formulas for simultaneous processes using inputs from Table 3–34 and explanatory variable coefficients in Table 3–35.

NOTE: $\beta_{BCal_{LTV}}$ is the LTV-specific constant used to calibrate the Default rates to the BLE.

$$X\beta_q = \beta_{A_q} + \beta_{LTV_{ORIG}} + \beta_{PNEQ_q} + \beta_{B_q}B_q + \beta_{IF}IF + \beta_{PS_q} + \beta_{IREF} \times IREF_q + \beta_{Prod} + \beta_{BCal_{LTV}} + \beta_0$$

$$X\gamma_q = \gamma_{A_q} + \gamma_{LTV_{ORIG}} + \gamma_{PNEQ_q} + \gamma_{B_q}B_q + \gamma_{IF}IF + \gamma_{RS_q} + \gamma_{PS_q} + \gamma_{YCS_q} + \gamma_{IREF} \times IREF_q + \gamma_{RLS_{ORIG}} + \gamma_{Prod} + \gamma_0$$

TABLE 3–35—COEFFICIENTS FOR SINGLE FAMILY DEFAULT AND PREPAYMENT EXPLANATORY VARIABLE

Explanatory Variable (V)	30-Year Fixed-Rate Loans		Adjustable-Rate Loans (ARMs)		Other Fixed-Rate Loans	
	Default Weight (β_v)	Prepayment Weight (γ_v)	Default Weight (β_v)	Prepayment Weight (γ_v)	Default Weight (β_v)	Prepayment Weight (γ_v)
A_q						
$0 \le A_q \le 4$	−0.6276	−0.6122	−0.7046	−0.5033	−0.7721	−0.6400
$5 \le A_q \le 8$	−0.1676	0.1972	−0.2259	0.1798	−0.2738	0.1721
$9 \le A_q \le 12$	−0.05872	0.2668	0.01504	0.2744	−0.09809	0.2317
$13 \le A_q \le 16$	0.07447	0.2151	0.2253	0.2473	0.1311	0.1884
$17 \le A_q \le 20$	0.2395	0.1723	0.3522	0.1421	0.3229	0.1900
$21 \le A_q \le 24$	0.2773	0.2340	0.4369	0.1276	0.3203	0.2356
$25 \le A_q \le 36$	0.2740	0.1646	0.2954	0.1098	0.3005	0.1493
$37 \le A_q \le 48$	0.1908	−0.2318	0.06902	−0.1462	0.2306	−0.2357

TABLE 3–35—COEFFICIENTS FOR SINGLE FAMILY DEFAULT AND PREPAYMENT EXPLANATORY VARIABLE—Continued

Explanatory Variable (V)	30-Year Fixed-Rate Loans		Adjustable-Rate Loans (ARMs)		Other Fixed-Rate Loans	
	Default Weight (β_v)	Prepayment Weight (γ_v)	Default Weight (β_v)	Prepayment Weight (γ_v)	Default Weight (β_v)	Prepayment Weight (γ_v)
$49 \leq A_q$	−0.2022	−0.4059	−0.4634	−0.4314	−0.1614	−0.2914
LTV_{ORIG}						
$LTV_{ORIG} \leq 60$	−1.150	0.04787	−1.303	0.08871	−1.280	0.02309
$60<LTV_{ORIG} \leq 70$	−0.1035	−0.03131	−0.1275	−0.005619	−0.06929	−0.02668
$70<LTV_{ORIG} \leq 75$	0.5969	−0.09885	0.4853	−0.09852	0.6013	−0.05446
$75<LTV_{ORIG} \leq 80$	0.2237	−0.04071	0.1343	−0.03099	0.2375	−0.03835
$80<LTV_{ORIG} \leq 90$	0.2000	−0.004698	0.2576	0.004226	0.2421	−0.01433
$90<LTV_{ORIG}$	0.2329	0.1277	0.5528	0.04220	0.2680	0.1107
$PNEQ_q$						
$0<PNEQ_q \leq 0.05$	−1.603	0.5910	−1.1961	0.4607	−1.620	0.5483
$0.05<PNEQ_q \leq 0.1$	−0.5241	0.3696	−0.3816	0.2325	−0.5055	0.3515
$0.1<PNEQ_q \leq 0.15$	−0.1805	0.2286	−0.1431	0.1276	−0.1249	0.2178
$0.15<PNEQ_q \leq 0.2$	0.07961	−0.02000	−0.04819	0.03003	0.07964	−0.02137
$0.2<PNEQ_q \leq 0.25$	0.2553	−0.1658	0.2320	−0.1037	0.2851	−0.1540
$0.25<PNEQ_q \leq 0.3$	0.5154	−0.2459	0.2630	−0.1829	0.4953	−0.2723
$0.3<PNEQ_q \leq 0.35$	0.6518	−0.2938	0.5372	−0.2075	0.5979	−0.2714
$0.35<PNEQ_q$	0.8058	−0.4636	0.7368	−0.3567	0.7923	−0.3986
B_q	1.303	−0.3331	0.8835	−0.2083	1.253	−0.3244
RLS						
$0<RLS_{ORIG} \leq 0.4$	....	−0.5130	....	−0.4765	....	−0.4344
$0.4<RLS_{ORIG} \leq 0.6$	....	−0.3264	....	−0.2970	....	−0.2852
$0.6<RLS_{ORIG} \leq 0.75$	....	−0.1378	....	−0.1216	....	−0.1348
$0.75<RLS_{ORIG} \leq 1.0$	....	0.03495	....	0.04045	....	0.01686
$1.0<RLS_{ORIG} \leq 1.25$	....	0.1888	....	0.1742	....	0.1597
$1.25<RLS_{ORIG} \leq 1.5$	....	0.3136	....	0.2755	....	0.2733
$1.5<RLS_{ORIG}$	....	0.4399	....	0.4049	....	0.4045
IF	0.4133	−0.3084	0.6419	−0.3261	0.4259	−0.3035
RS_q						
$RS_q \leq -0.20$	....	−1.368	....	−0.5463	....	−1.195
$-0.20 < RS_q \leq -0.10$	....	−1.023	....	−0.4560	....	−0.9741
$-0.10 < RS_q \leq 0$	....	−0.8078	....	−0.4566	....	−0.7679

TABLE 3–35—COEFFICIENTS FOR SINGLE FAMILY DEFAULT AND PREPAYMENT EXPLANATORY VARIABLE—Continued

Explanatory Variable (V)	30-Year Fixed-Rate Loans		Adjustable-Rate Loans (ARMs)		Other Fixed-Rate Loans	
	Default Weight (β_v)	Prepayment Weight (γ_v)	Default Weight (β_v)	Prepayment Weight (γ_v)	Default Weight (β_v)	Prepayment Weight (γ_v)
$0<RS_q \le 0.10$	....	−0.3296	....	−0.3024	....	−0.2783
$0.10 <RS_q \le 0.20$	....	0.8045	....	0.3631	....	0.7270
$0.20 <RS_q \le 0.30$	....	1.346	....	0.7158	....	1.229
$0.30 <RS_q$	....	1.377	....	0.6824	....	1.259
PS_q $PS_q \le -0.20$	....	....	0.08490	0.6613		
$-0.20 <PS_q \le -0.10$	....	....	0.3736	0.4370		
$-0.10 <PS_q \le 0$	....	....	0.2816	0.2476		
$0<PS_q \le 0.10$	....	....	0.1381	0.1073		
$0.10 <PS_q \le 0.20$	....	....	−0.1433	−0.3516		
$0.20 <PS_q \le 0.30$	....	....	−0.2869	−0.5649		
$0.30 <PS_q$	....	....	−0.4481	−0.5366		
YCS_q $YCS_q <1.0$	....	−0.2582	....	−0.2947	....	−0.2917
$1.0 \le YCS_q <1.2$	....	−0.02735	....	−0.1996	....	−0.01395
$1.2 \le YCS_q <1.5$	....	−0.04099	....	0.03356	....	−0.03796
$1.5 \le YCS_q$	....	0.3265	....	0.4608	....	0.3436
$IREF_q$	....	....	0.1084	−0.01382		
PROD ARMs	....	....	0.8151	0.2453		
Balloon Loans	....	....	....	....	1.253	0.9483
15−Year FRMs	....	....	....	....	−1.104	0.07990
20−Year FRMs	....	....	....	....	−0.5834	0.06780
Government Loans	....	....	....	....	0.9125	−0.5660
$BCal_{LTV}$ $LTV_{ORIG} \le 60$	2.045	....	2.045	....	2.045	
$60<LTV_{ORIG} \le 70$	0.3051	....	0.3051	....	0.3051	
$70<LTV_{ORIG} \le 75$	−0.07900	....	−0.07900	....	−0.07900	
$75<LTV_{ORIG} \le 80$	−0.05519	....	−0.05519	....	−0.05519	
$80<LTV_{ORIG} \le 90$	−0.1838	....	−0.1838	....	−0.1838	
$90<LTV_{ORIG}$	0.2913	....	0.2913	....	0.2913	

TABLE 3–35—COEFFICIENTS FOR SINGLE FAMILY DEFAULT AND PREPAYMENT EXPLANATORY VARIABLE—Continued

Explanatory Variable (V)	30-Year Fixed-Rate Loans		Adjustable-Rate Loans (ARMs)		Other Fixed-Rate Loans	
	Default Weight (β_v)	Prepayment Weight (γ_v)	Default Weight (β_v)	Prepayment Weight (γ_v)	Default Weight (β_v)	Prepayment Weight (γ_v)
Intercept (β_0, γ_0)	−6.516	−4.033	−6.602	−3.965	−6.513	−3.949

2. The choice of coefficients from Table 3–35 will be governed by the single family product code and Government Flag, according to Table 3–36.

TABLE 3–36—SINGLE FAMILY PRODUCT CODE COEFFICIENT MAPPING

Single Family Product Code	Model Coefficient Applied
Non-Government Loans	
Fixed Rate 30YR	30-Year FRMs
Fixed Rate 20YR	20-Year FRMs
Fixed Rate 15YR	15-Year FRMs
5-Year Fixed Rate Balloon	Balloon Loans
7-Year Fixed Rate Balloon	Balloon Loans
10-Year Fixed Rate Balloon	Balloon Loans
15-Year Fixed Rate Balloon	Balloon Loans
Adjustable Rate	ARMs
Second Lien	Balloon Loans
Other	Balloon Loans
Government Loans	
Government Flag	Model Coefficient Applied
All government loans except for ARMs	Government Loans
Government ARMs	ARMs

3. Compute Quarterly Prepayment and Default Rates (QPR, QDR) from the logistic expressions as follows:

$$QDR_q = \frac{exp\left\{X\beta_q\right\}}{1 + exp\left\{X\beta_q\right\} + exp\left\{X\gamma_q\right\}}$$

$$QPR_q = \frac{exp\left\{X\gamma_q\right\}}{1 + exp\left\{X\beta_q\right\} + exp\left\{X\gamma_q\right\}}$$

4. Convert quarterly rates to monthly rates using the following formulas for simultaneous processes. The quarterly rate for q = 1 gives the monthly rate for months m = 1,2,3, and so on through q = 40:

$$MDR_m = \frac{QDR_q}{QDR_q + QPR_q} \times \left[1 - \left(1 - QDR_q - QPR_q\right)^{\frac{1}{3}}\right]$$

$$MPR_m = \frac{QPR_q}{QDR_q + QPR_q} \times \left[1 - \left(1 - QDR_q - QPR_q\right)^{\frac{1}{3}}\right]$$

5. Calculate Defaulting Fraction (DEF), Prepaying Fraction (PRE), and Performing Fraction (PERF) of the Initial Loan Group. Initially (at the beginning of the Stress Test), all loans are assumed to be performing, i.e. $PERF_0$ = 1.0. For each month m = 1...RM, calculate the following quantities. *Note:* For m >120, use and MPR_{120} and MDR_{120}:

$$PRE_m = PERF_{m-1} \times MPR_m$$
$$DEF_m = PERF_{m-1} \times MDR_m$$
$$PERF_m = PERF_{m-1} - PRE_m - DEF_m$$

3.6.3.4.4 Single Family Default and Prepayment Outputs

Single family Default and Prepayment outputs are set forth in Table 3–37. Prepayment, Default and Performing Fractions for single family loans for months m = 1...RM are used in section 3.6.3.6, Calculation of Single Family and Multifamily Mortgage Losses; and section 3.6.3.7, Stress Test Whole Loan Cash Flows, of this appendix. Quarterly LTV ratios are used in section 3.6.3.6.2.3, Single Family Gross Loss Severity Procedures, of this appendix.

TABLE 3–37—SINGLE FAMILY DEFAULT AND PREPAYMENT OUTPUTS

Variable	Description
LTV_q	Current Loan-to-Value ratio in quarter q = 1...40
PRE_m^{SF}	Prepaying Fraction of Initial Loan Group in month m = 1...RM (single family Loans)
DEF_m^{SF}	Defaulting Fraction of Initial Loan Group in month m = 1...RM (single family Loans)
$PERF_m^{SF}$	Performing Fraction of Initial original Loan Group in month m = 1...RM (single family loans)

3.6.3.5 Multifamily Default and Prepayment Rates

3.6.3.5.1 Multifamily Default and Prepayment Rates Overview

[a] The Stress Test projects conditional Default and Prepayment rates for each multifamily Loan Group for each month of the Stress Period. Computing Default rates for a Loan Group requires information on the Loan Group characteristics at the beginning of the Stress Test and the economic conditions of the Stress Period—interest rates (section 3.3 of this appendix), vacancy rates and rent growth rates (section 3.4 of this appendix). These input data are used to create values for the explanatory variables in the Multifamily Default component.

[b] *Explanatory Variables for Default Rates.* Eight explanatory variables are used as specified in the equations in section 3.6.3.5.3.1, of this appendix, to determine Default rates for multifamily loans: Mortgage Age, Mortgage Age Squared, New Book indicator, Not Ratio-updated ARM indicator, current Debt-Service Coverage Ratio, Underwater Current Debt-Service Coverage indicator, Loan-To-Value Ratio at origination/acquisition, and a Balloon Maturity indicator. Regression coefficients (weights) are associated with each variable. All of this information is used to compute conditional annual Default rates throughout the Stress Test. The annualized Default rates are converted to monthly conditional Default rates and are used together with monthly conditional Prepayment rates to calculate Stress Test Whole Loan Cash Flows. (*See* section 3.6.3.7, Stress Test Whole Loan Cash Flows, of this appendix).

[c] *Specification of Multifamily Prepayment Rates.* Multifamily Prepayment rates are not generated by a statistical model but follow a set of Prepayment rules that capture the effect of yield maintenance, Prepayment penalties and other mechanisms that effectively curtail or eliminate multifamily Prepayments for a specified period of time.

[d] *Special Provision for Accounting Calculations.* For accounting calculations, which require cash flows over the entire remaining life of the instrument, Default and Prepayment rates for months beyond the end of the

Stress Test are held constant at their values for month 120.

3.6.3.5.2 Multifamily Default and Prepayment Inputs

The information in Table 3–38 is required for each multifamily Loan Group:

TABLE 3–38—LOAN GROUP INPUTS FOR MULTIFAMILY DEFAULT AND PREPAYMENT CALCULATIONS

Variable	Description	Source
	Mortgage Product Type	RBC Report
A_o	Age immediately prior to start of Stress Test, in months (weighted average for Loan Group)	RBC Report
NBF	New Book Flag	RBC Report
RUF	Ratio Update Flag	RBC Report
LTV_{ORIG}	Loan-to-Value ratio at loan Origination	RBC Report
DCR_o	Debt Service Coverage Ratio at the start of the Stress Test	RBC Report
PMT_o	Amount of the mortgage Payment (principal and interest) prior to the start of the Stress Test, or first Payment for new loans (aggregate for Loan Group)	RBC Report
PPEM	Prepayment Penalty End Month number in the Stress Test (weighted average for Loan Group)	RBC Report
RM	Remaining term to Maturity in months (i.e., number of contractual payments due between the start of the Stress Test and the contractual maturity date of the loan) (weighted average for Loan Group)	RBC Report
RGR_m	Benchmark Rent Growth for months m = 1...120 of the Stress Test	section 3.4.4, Property Valuation Outputs
RVR_m	Benchmark Vacancy Rates for months m = 1...120 of the Stress Test	section 3.4.4, Property Valuation Outputs
PMT_m	Scheduled Payment for months m = 1... RM	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
OE	Operating expenses as a share of gross potential rents (0.472)	fixed decimal from Benchmark region and time period
RVR_o	Initial rental vacancy rate	0.10

3.6.3.5.3 Multifamily Default and Prepayment Procedures

3.6.3.5.3.1 Explanatory Variables

[a] Compute the explanatory variables for multifamily Default and Prepayment in five steps as follows:

1. Calculate Loan Age in Years for months m = 0…120 of the Stress Test (AY_m):

$$AY_m = \frac{A_0 + m}{12}$$

Where:

$A_0 + m$ is Loan Age in months at the beginning of month m of the Stress Test.

NOTE: AY_m is calculated for each month m, whereas the corresponding Age variable for single family Loans A_q is calculated only quarterly.

2. Assign product and ratio update flags (NBF, NRAF). *Note:* these values do not change over time for a given Loan Group.
   a. New Book Flag (NBF):

NBF = 1 for Fannie Mae loans acquired after 1987 and Freddie Mac loans acquired after 1992, *except* for loans that were refinanced to avoid a Default on a loan originated or acquired earlier.

NBF = 0 otherwise.

b. Not Ratio-updated Arm Flag (NRAF):

NRAF = 1 if both ARMF = 1 and RUF = 0,

NRAF = 0 otherwise.

Where:

ARMF = 1 for ARMs (including Balloon ARMs)

ARMF = 0 otherwise, and

RUF = 1 if the LTV and DCR were calculated or delegated to have been calculated at origination or recalculated or delegated to have been recalculated at Enterprise acquisition according to current Enterprise standards.

RUF = 0 otherwise

3. Calculate Debt Service Coverage Ratio in month m (DCR_m):

The standard definition of Debt Service Coverage Ratio is current net operating income divided by current mortgage payment. However, for the Stress Test, update DCR_m each month from the prior month's value using Rent Growth Rates (RGR_m) and Rental Vacancy Rates (RVR_m) starting with DCR_m from Table 3–38, as follows:

$$DCR_m = DCR_{m-1} \times \left[\frac{\left(1+RGR_m\right)\left(\dfrac{1-OE-RVR_m}{1-OE-RVR_{m-1}}\right)}{\dfrac{PMT_m}{PMT_{m-1}}} \right]$$

4. Assign Underwater Debt-Service Coverage Flag ($UWDCRF_m$):

$UWDCRF_m = 1$ if $DCR_m < 0.98$ in month m

$UWDCRF_m = 0$ otherwise.

5. Assign Balloon Maturity Flag (BMF_m) for any Balloon Loan that is within twelve months of its maturity date:

$$BMF_m = 1 \text{ if } RM - m < 12$$

$$BMF_m = 0 \text{ otherwise.}$$

3.6.3.5.3.2 Default and Prepayment Rates and Performance Fractions

[a] Compute Default and Prepayment Rates and Performance Fractions for multifamily loans in the following four steps:

1. Compute the logits for multifamily Default using inputs from Table 3–38 and coefficients from Table 3–39. For indexing purposes, the Default rate for a period m is the likelihood of missing the m_{th} payment; calculate its corresponding logit ($X\delta_m$) based on Loan Group characteristics as of the period *prior* to m, i.e. *prior* to making the m^{th} payment.

$$\begin{aligned} X\delta_m = {} & \delta_{AY} AY_{m-1} + \delta_{AY^2} AY_{m-1}^2 \\ & + \delta_{NBF} NBF + \delta_{NRAF} NRAF \\ & + \delta_{DCR} \, ln\left(DCR_{m-1}\right) \\ & + \delta_{UWDCRF} UWDCRF_{m-1} \\ & + \delta_{LTV} \, ln\left(LTV_{ORIG}\right) \\ & + \delta_{BMF} BMF_{m-1} + \delta_0 \end{aligned}$$

TABLE 3–39—EXPLANATORY VARIABLE COEFFICIENTS FOR MULTIFAMILY DEFAULT

Explanatory Variable (V)	Default Weight (δ_v)
AY	0.5256
AY^2	0.0284
NBF	−1.219
NRAF	0.4193
DCR	−2.368
UWDCRF	1.220
LTV	0.8165
BMF	1.518
Intercept (δ_0)	−4.553

2. Compute Annual Prepayment Rate (APR) and Annual Default Rate (ADR) as follows:

$$ADR_m = \frac{exp\left\{X\delta_m\right\} \times \left(1-APR_m\right)}{1+exp\left\{X\delta_m\right\}}$$

APR_m is a constant, determined as follows:

a. For the up-rate scenario, $APR_m = 0$ for all months m

b. For the down-rate scenario,

$APR_m = 0$ percent during the Prepayment penalty period (i.e., when $m \le PPEM$)

$APR_m = 25$ percent after the Prepayment penalty period (i.e., when $m > PPEM$)

3. Convert annual Prepayment and Default rates to monthly rates (MPR and MDR) using the following formulas for simultaneous processes:

$$MPR_m = \frac{APR_m}{ADR_m + APR_m} \times \left[1-\left(1-ADR_m-APR_m\right)^{\frac{1}{12}}\right]$$

If both ARMF = 0 and RUF = 0, then

$$MDR_m = \left[\frac{ADR_m}{ADR_m + APR_m} \times \left[1-\left(1-ADR_m - APR_m\right)^{\frac{1}{12}}\right]\right] \times 1.2$$

otherwise,

$$MDR_m = \frac{ADR_m}{ADR_m + APR_m} \times \left[1-\left(1-ADR_m - APR_m\right)^{\frac{1}{12}}\right]$$

4. Calculate Defaulting Fraction (DEF_m), Prepaying Fraction (PRE_m), and Performing Fraction ($PERF_m$) of the Initial Loan Group for each month m = 1...RM. Initially (immediately prior to the beginning of the Stress Test), all loans are assumed to be performing, i.e. $PERF_0 = 1.0$. *Note:* For m>120, use MPR_{120} and MDR_{120}.

$$PRE_m = PERF_{m-1} \times MPR_m$$

$$DEF_m = PERF_{m-1} \times MDR_m$$

$$PERF_m = PERF_{m-1} - PRE_m - DEF_m$$

3.6.3.5.4 Multifamily Default and Prepayment Outputs

[a] Multifamily Default and Prepayment Outputs are set forth in Table 3–40.

TABLE 3–40—MULTIFAMILY DEFAULT AND PREPAYMENT OUTPUTS

Variable	Description
PRE_m^{MF}	Prepaying Fraction of initial Loan Group in month m = 1...RM (multifamily Loans)
DEF_m^{MF}	Defaulting Fraction of initial Loan Group in month m = 1...RM (multifamily Loans)
$PERF_m^{MF}$	Performing Fraction of initial Loan Group in month m = 1...RM (multifamily Loans)

[b] Multifamily monthly Prepayment Fractions ($PERF_m^{MF}$) and monthly Default Fractions (DEF_m^{MF}) for months m = 1...RM are used in section 3.6.3.6, Calculation of Single Family and Multifamily Mortgage Losses; section 3.6.3.7, Stress Test Whole Loan Cash Flows, and section 3.6.3.8, Whole Loan Accounting Flows, of this appendix.

3.6.3.6 Calculation of Single Family and Multifamily Mortgage Losses

3.6.3.6.1 Calculation of Single Family and Multifamily Mortgage Losses Overview

[a] *Definition*. Loss Severity is the net cost to an Enterprise of a loan Default. Though losses may be associated with delinquency, loan restructuring and/or modification and other loss mitigation efforts, foreclosures are the only loss events modeled during the Stress Test.

[b] *Calculation*. The Loss Severity rate is expressed as a fraction of the Unpaid Principal Balance (UPB) at the time of Default. The Stress Test calculates Loss Severity rates for each Loan Group for each month of the Stress Period. Funding costs (and offsetting revenues) of defaulted loans are captured by discounting the Loss Severity elements using a cost-of-funds interest rate that varies during the Stress Period. Table 3–41 specifies the Stress Test Loss Severity timeline. Loss Severity rates also depend upon the application of Credit Enhancements and the credit ratings of enhancement providers.

TABLE 3–41—LOSS SEVERITY EVENT TIMING

Month	Event
1	First missed payment
4 (= MQ)	Loan is repurchased from securitized pool and UPB is passed through to MBS investors (Sold Loans only)
13 (= MF^{SF})	Single family foreclosure
18 (= MF^{MF})	Multifamily foreclosure
20 (= MF^{SF} + MR^{SF})	Single family property disposition
31 (= MF^{MF} + MR^{MF})	Multifamily property disposition

[c] *Timing of the Default Process*. Mortgage Defaults are modeled as follows: defaulting loans enter foreclosure after a number of months (MQ, Months in Delinquency) and are foreclosed upon several months later. MF (Months in Foreclosure) is the total number of missed payments. Upon completion of foreclosure, the loan as such ceases to exist and the property becomes Real Estate Owned by the lender (REO). After several more months (MR, Months in REO), the property

is sold. Foreclosure expenses are paid and MI proceeds (and, for multifamily loans, loss sharing proceeds) are received when foreclosure is completed. REO expenses are paid, and sales proceeds and other Credit Enhancements are received, when the property is sold. These timing differences are not modeled explicitly in the cash flows, but their economic effect is taken into account by present-valuing the default-related cash flows to the month of Default.

[d] *Gross Loss Severity, Credit Enhancement, and Net Loss Severity*. The calculation of mortgage losses is divided into three parts. First, Gross Loss Severity is determined by expressing the principal loss plus unpaid interest plus expenses as a percentage of the loan UPB at the time of Default (section 3.6.3.6.2, Single Family Gross Loss Severity, and section 3.6.3.6.3, Multifamily Gross Loss Severity, of this appendix). Second, Credit Enhancements (CEs) are applied according to their terms to offset losses on loans that are covered by one or more CE arrangements (section 3.6.3.6.4, Mortgage Credit Enhancement, of this appendix). Finally, to account for the timing of these different cash flows, net losses are discounted back to the month in which the Default initially occurred (section 3.6.3.6.5, Single Family and Multifamily Net Loss Severity, of this appendix).

3.6.3.6.2 Single Family Gross Loss Severity

3.6.3.6.2.1 Single Family Gross Loss Severity Overview

The Loss Severity calculation adds the discounted present value of various costs and offsetting revenues associated with the foreclosure of single family properties, expressed as a fraction of UPB on the date of Default. The loss elements are:

[a] *Unpaid Principal Balance*. Because all Loss Severity elements are expressed as a fraction of Default date UPB, the outstanding loan balance is represented as 1.

[b] *Unpaid Interest*. Unpaid interest at the Mortgage Interest Rate is included in the MI claim amount. Unpaid interest at the Pass-Through Rate must be paid to MBS holders until the Defaulted loan is repurchased from the MBS pool.

[c] *Foreclosure Expenses and REO Expenses*. Foreclosure expenses are reimbursed by MI. REO expenses are incurred in connection with the maintenance and sale of a property after foreclosure is completed. Stress Test values for these quantities are derived from historical Enterprise REO experience.

[d] *Net Recovery Proceeds from REO sale (RP)*. This amount is less than the sale price for ordinary properties as predicted by the HPI, because of the distressed nature of the sale.

3.6.3.6.2.2 Single Family Gross Loss Severity Inputs

The inputs in Table 3–42 are used to compute Gross Loss Severity for single family loans:

TABLE 3–42—LOAN GROUP INPUTS FOR GROSS LOSS SEVERITY

Variable	Description	Definition or Source
	Government Flag	RBC Report
MQ	Months Delinquent: time during which Enterprise pays delinquent loan interest to MBS holders	4 for sold loans 0 otherwise
MF	Months to Foreclosure: number of missed payments through completion of foreclosure	13 months
MR	Months from REO acquisition to REO disposition	7 months
F	Foreclosure Costs as a decimal fraction of Defaulted UPB	0.037
R	REO Expenses as a decimal fraction of Defaulted UPB	0.163
DR_m	Discount Rate in month m (decimal per annum)	6-month Enterprise Cost of Funds from section 3.3, Interest Rates
LTV_q	Current LTV in quarter q = 1...40	section 3.6.3.4.4, Single Family Default and Prepayment Outputs

TABLE 3–42—LOAN GROUP INPUTS FOR GROSS LOSS SEVERITY—Continued

Variable	Description	Definition or Source
MIR_m	Mortgage Interest Rate in month m (decimal per annum)	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
PTR_m	Pass-Through Rate applicable to payment due in month m (decimal per annum)	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
RR	Recovery Rate for Defaulted loans in the BLE, as a percent of predicted house price using HPI (decimal)	0.61

3.6.3.6.2.3 Single Family Gross Loss Severity Procedures

[a] Calculate single family gross Loss Severity using the following three steps:

1. Compute REO Proceeds in month m (RP_m) as a fraction of Defaulted UPB:

$$RP_m = \frac{RR}{LTV_q}$$

2. Compute MI Claim Amount on loans that Defaulted in month m (CLM_m^{MI}) as a fraction of Defaulted UPB:

$$CLM_m^{MI} = 1 + \left(\frac{MF}{12} \times MIR_m\right) + F \text{ for all loans other than Government Loans}$$

$$= 1 + \left(0.75 \times \frac{MF}{12} \times MIR_m\right) + (0.67 \times F) \text{ for Government Loans}$$

Where:

0.67 = FHA reimbursement rate on foreclosure-related expenses

0.75 = adjustment to reflect that FHA reimbursement on unpaid interest is at a government debenture rate, not MIR.

3. Compute Gross Loss Severity of loans that Defaulted in month m (GL_m) as a fraction of Defaulted UPB:

$$GLS_m = 1 + \left(\frac{MQ}{12} \times PTR_m\right) + F + R - RP_m \text{ but not} < 0$$

3.6.3.6.2.4 Single Family Gross Loss Severity Outputs

The single family Gross Loss Severity outputs in Table 3–43 are used in the Credit Enhancement calculations in section 3.6.3.6.4 of this appendix.

TABLE 3–43—SINGLE FAMILY GROSS LOSS SEVERITY OUTPUTS

Variable	Description
GLS_m	Gross Loss Severity for loans that defaulted in month m = 1...120
CLM_m^{MI}	MI claim on account of loans that defaulted in month m = 1...120
RP_m	REO Proceeds on account of loans that defaulted in month m = 1...120

3.6.3.6.3 Multifamily Gross Loss Severity

3.6.3.6.3.1 Multifamily Gross Loss Severity Overview

The multifamily Loss Severity calculation adds the discounted present value of various costs and offsetting revenues associated with the foreclosure of multifamily properties, expressed as a fraction of Defaulted UPB. The loss elements are:

[a] *Unpaid Principal Balance (UPB).* Because all Loss Severity elements are expressed as a fraction of Default date UPB, the outstanding loan balance is represented as 1.

[b] *Unpaid Interest.* Unpaid interest at the Net Yield Rate is included in the Loss Sharing Claim amount. Unpaid interest at the Pass-Through Rate must be paid to MBS holders until the defaulted loan is repurchased from the MBS pool.

[c] *Net REO Holding Costs (RHC).* Foreclosure costs, including attorneys fees and other liquidation expenses are incurred between the date of Default and the date of foreclosure completion (REO acquisition). Operating and capitalized expenses are incurred and rental and other income are received between REO acquisition and REO disposition. As a result, half of the Net REO Holding Costs (RHC) are expensed at REO acquisition and the remainder are expensed at REO disposition.

[d] *Net Proceeds from REO sale (RP).* The gross sale price of the REO less all costs associated with the disposition of the REO asset are discounted from the date of REO sale.

3.6.3.6.3.2 Multifamily Gross Loss Severity Inputs

The inputs in Table 3–44 are used to compute Gross Loss Severity for multifamily Loans:

TABLE 3–44—LOAN GROUP INPUTS FOR MULTIFAMILY GROSS LOSS SEVERITY

Variable	Description	Value or Source
	Government Flag	RBC Report
DR_m	Discount Rate in month m (decimal per annum)	6-month Enterprise Cost of Funds from Section 3.3, Interest Rates
MQ	Time during which delinquent loan interest is passed-through to MBS holders	4 for sold loans 0 otherwise
PTR_m	Pass Through Rate applicable to payment due in month m (decimal per annum)	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
NYR_m	Net Yield Rate applicable to payment due in month m (decimal per annum)	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
RHC	Net REO holding costs as a decimal fraction of Defaulted UPB	0.07
MF	Time from Default to completion of foreclosure (REO acquisition)	9 months
MR	Months from REO acquisition to REO disposition	15 months
RP	REO proceeds as a decimal fraction of Defaulted UPB	0.63

3.6.3.6.3.3 Multifamily Gross Loss Severity Procedures

[a] Calculate multifamily gross loss severity in the following two steps:

1. For Conventional Loans, compute the Loss Sharing Claim Amount (CLM_m^{LSA}) and Gross Loss (GLS_m) on loans that Defaulted in month m, as a fraction of Defaulted UPB:

$$CLM_m^{LSA} = 1.75 + \left(\frac{MF}{12} \times NYR_m \right) + RHC - RP$$

$$GLS_m = 1 + \frac{MQ}{12} \times PTR_m + RHC - RP$$

2. For FHA-insured (i.e., government) multifamily Loans, separate Gross Loss Severity and Credit Enhancement calculations are not necessary. Net Loss Severity is determined explicitly in section 3.6.3.6.5, Single Family and Multifamily Net Loss Severity, of this appendix).

3.6.3.6.3.4 Multifamily Gross Loss Severity Outputs

Multifamily Gross Loss Severity Outputs in Table 3–45 are used in the Credit Enhancements Calculations section 3.6.3.6.4, of this appendix.

TABLE 3–45—MULTIFAMILY GROSS LOSS SEVERITY OUTPUTS FOR USE IN CREDIT ENHANCEMENT CALCULATIONS

Variable	Description
GLS_m	Gross Loss Severity for loans that Defaulted in month m = 1...120
CLM_m^{LSA}	Loss Sharing Claim on account of loans that Defaulted in month m = 1...120

3.6.3.6.4 Mortgage Credit Enhancement

3.6.3.6.4.1 Mortgage Credit Enhancement Overview

[a] *Types of Mortgage Credit Enhancements.* Credit Enhancements (CE) reimburse losses on individual loans. The CE most often utilized by the Enterprises at the present time is primary Mortgage Insurance (MI) including both private and government MI or loan guarantees (e.g. FHA, VA), which pays claims up to a given limit on each loan. Most other types of CE do not limit the amount payable on each loan individually, but do limit the aggregate amount available under a given CE arrangement or Contract. These two types of CE must be computed differently. To denote this distinction, this appendix will refer to ''Loan Limit'' and ''Aggregate Limit'' CE types. Loan Limit CE includes Mortgage Insurance for single family loans and Loss-Sharing Arrangements (LSA) for multifamily loans. Aggregate Limit CE includes Pool Insurance, Spread Accounts, Letters of Credit, Cash or Collateral Accounts, and Subordination Agreements. For operational convenience in the Stress Test, the Aggregate Limit classification also includes Unlimited Recourse, which has neither loan-level nor aggregate-level coverage limits, and Modified Pool Insurance, Limited Recourse, Limited Indemnification and FHA risk-sharing, which may have both loan-level and aggregate-level coverage limits.

[b] *Loan Limit Credit Enhancements.* Loan Limit Credit Enhancements are applied to every covered loan individually, without regard to how much has been paid on any other covered loan. For example, an MI policy covers losses on an individual loan up to a specified limit. If every loan with MI were to Default, every claim would be payable regardless of the total outlay on the part of the MI provider. Loss Sharing Arrangements on multifamily loans operate the same way.

[c] *Aggregate Limit Credit Enhancements.* Aggregate Limit Credit Enhancements cover a group of loans on an aggregate basis. In most such arrangements, the coverage for any individual loan is unlimited, except that the total outlay by the provider cannot exceed a certain aggregate limit. Thus, the amount of Aggregate Limit coverage available to an individual loan depends, in practice, on how much has been paid on all previous claims under the specified Contract.

[d] *Credit Enhancement Counterparty Defaults.* CE payments from a rated counterparty are subject to Haircuts to simulate counterparty failures during the Stress Test. These Haircuts are based on the rating of the counterparty or guarantor immediately prior to the Stress Test, and are applied each month as described in section 3.5, Counterparty Defaults, of this appendix.

[e] *Stress Test Application of Credit Enhancement.* The Stress Test calculates mortgage cash flows for aggregated Loan Groups, within which individual loans are assumed to have identical characteristics, and therefore are not differentiated in the computations. However, a single Loan Group may include loans with Loan Limit CE and/or one or more types of Aggregate Limit CE. Additionally, this coverage may come from a rated provider or from cash or cash-equivalent collateral. Therefore, for computational purposes it is necessary to distinguish among the different possible CE combinations that each loan or subset of loans in a Loan Group may have. In the Stress Test, this is accomplished by creating Distinct Credit Enhancement Combinations (DCCs).

1. *Distinct Credit Enhancement Combinations.* When aggregating individual loans into Loan Groups for the RBC Report, the applicable CE arrangements will have been identified for each loan:
   a. Loan Group (LG) Number
   b. Initial UPB of individual loan
   c. Rating of MI or LSA Counterparty

d. Loan-Limit Coverage Percentage for MI or LSA
e. Contract Number for Aggregate Limit CE, First Priority
f. Contract Number for Aggregate Limit CE, Second Priority
g. Contract Number for Aggregate Limit CE, Third Priority
h. Contract Number for Aggregate Limit CE, Fourth Priority

2. Individual loans for which all of the entries in step 1) of this section (except UPB and Loan-Limit Coverage Percent) are identical, are aggregated into a DCCs. For example, all loans in a given Loan Group with MI from a AAA-rated provider and no other CE would comprise one DCC whose balance is the aggregate of the included loans and whose MI Coverage Percent is the weighted average of that of the included loans. In each month, within each Loan Group, for each DCC, each applicable form of CE is applied in priority order to reduce Gross Loss Severity as much as possible to zero. The total CE payment for each DCC, as a percentage of Defaulted UPB is converted to a total CE payment for each Loan Group and then factored into the calculation of Net Loss Severity in section 3.6.3.6.5, Single Family and Multifamily Net Loss Severity, of this appendix.
3. *DCC First and Second Priority Available Aggregate CE Balance*. In the Stress Test, First and Second Priority Available Aggregate CE Balances are allocated to the DCCs that are parties to each Contract on a pro-rata basis. Third and Fourth Priority Aggregate Limit Contracts are not modeled because they are extremely rare. In each month of the Stress Test these CE Balances, adjusted by appropriate Haircuts, are reduced by the losses incurred by each DCC that is a party to each Contract. Spread Account deposits, if applicable, are included in the First and Second Priority DCC Available Aggregate CE Balances.

a. Spread Accounts may take one of two forms: Balance-Limited, or Deposit-Limited. A Balance-Limited Spread Account receives monthly spread payments based on the UPB of the covered loans until a required balance is achieved and maintained. Any amounts paid to cover losses must be replenished by future spread payments from the covered loans that are still performing. Thus, there is no known limit to the amount of spread deposits that may be made over the life of the covered loans. In contrast, for a Deposit-Limited Spread Account the limit is similar to a customary coverage limit. The total amount of spread deposits made into the account is limited to a maximum amount specified in the Contract.

b. In the Stress Test, the Available Contract Balance of a Spread Account is adjusted prior to the calculation of the DCC Available Balance as reported in the RBC Report. For each Spread Account contract, the Enterprises report the Remaining Limit Amount, which represents the maximum dollar amount of additional spread deposits that could be required under the Contract. For Deposit-Limited Spread Accounts, this amount is the maximum remaining dollar amount of spread deposits required under the Contract. For Balance-Limited Spread Accounts, this amount is defined as one-twelfth of the annualized spread rate times the UPB of the covered loans at the start of the Stress Test times the weighted average Remaining term to Maturity of those loans. However, the maximum amount of spread deposits that could be received will generally be higher than the amount reasonably expected to be received during the Stress Test, because the UPB of the covered loans, which is the basis for determining the amounts of future spread deposits, declines over the term of the Contract due to Amortization, Defaults, and Prepayments. Therefore, the Enterprises report an adjusted Available Contract Balance for both types of Spread Accounts before reporting the DCC Available Balance by adding the lesser of the Remaining Limit Amount or one-twelfth of the spread rate times the UPB of the covered loans at the start of the stress test times 60 months.

c. Modified Pool Insurance, Limited Recourse, Limited Indemnification and FHA risk-sharing contracts may have both loan-level and aggregate-level coverage limits. To account for this aspect of these types of Aggregate Limit CE, the Enterprises report a DCC Loan Level Coverage Limit Amount, which represents the share of each loss after deductibles (such as MI or First Priority Contract payments) covered by a given MPI Contract. (The Loan Level Coverage Limit Amount takes the value of one if the Contract is not of this type, representing that 100 percent of losses are covered by other types of Contracts).

d. In practice, Unlimited Recourse Contracts have neither loan-level nor aggregate-level coverage limits. However, the Enterprises report the Available Aggregate CE Balance of Unlimited Recourse Contracts as the summation of the Original UPB of all covered loans.

e. The Available Aggregate CE Balances of Collateral Account Contracts funded with anything other than Cash or Cash-equivalents are discounted by thirty percent to account for market risk in securities that are not cash equivalents.

f. Enterprise Loss Positions are treated as Aggregate Limit CE in terms of reducing remaining losses eligible to be covered by a next-priority Contract. However, since Enterprise Loss Positions are typically a deductible for other forms of supplementary coverage, payments from such accounts do not reduce loss severity.

[f] *Multiple Layers of Credit Enhancement.* For loans with more than one type of Credit Enhancement, MI or Loss Sharing is applied first, and then other types of CE (if available) are applied in priority order to the remaining losses. MI and Loss Sharing claims are payable regardless of whether (and to what extent) a loan is also covered by other forms of CE. MI is unique in that the MI payment is based on a percentage of a Claim Amount equal to the entire Defaulted UPB plus expenses, not the actual loss incurred upon liquidation. Therefore, an Enterprise can receive MI payments on a defaulted loan in excess of the actual realized loss on that loan. However, it is frequently the case that MI payments are insufficient to cover the entire loss amount. In such cases, one or more types of Aggregate Limit CE may be available to make up the deficiency. Unlike MI claims, however, the Claim Amounts for Loss Sharing and for all Aggregate Limit CE types do depend on the actual losses incurred; and unlike Loss Sharing and MI, Claim Amounts payable under other forms of CE are net of payments received on account of other forms of CE. When a single loan is covered by multiple forms of CE, the order in which they are to be applied (First Priority, Second Priority, etc.) must be specified. To avoid double-counting, a higher-numbered priority CE only covers losses that were not covered by a lower-numbered priority CE.

3.6.3.6.4.2 Mortgage Credit Enhancement Inputs

[a] For each Loan Group, the inputs in Table 3–46 are required:

TABLE 3–46—CE INPUTS FOR EACH LOAN GROUP

Variable	Description	Source
UPB_{ORIG}^{LG}	Origination UPB	RBC Report
UPB_0^{LG} and UPB_m^{LG}	Initial UPB and UPB in month m = 0,1...120	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
LTV_{ORIG}^{LG}	Original LTV	RBC Report
DEF_m^{LG} and $PERF_m^{LG}$	Defaulting and Performing Fractions of Initial Loan Group UPB in month m = 1...120	section 3.6.3.4.4, Single Family Default and Prepayment Outputs and section 3.6.3.5.4, Multifamily Default and Prepayment Outputs
$CLM_m^{MI,LG}$ $CLM_m^{LSA,LG}$	MI Claim Amount and LSA Claim Amount	section 3.6.3.6.2, Single Family Gross Loss Severity and section 3.6.3.6.3, Multifamily Gross Loss Severity
GLS_m^{LG}	Gross Loss Severity	section 3.6.3.6.2, Single Family Gross Loss Severity and section 3.6.3.6.3, Multifamily Gross Loss Severity

[b] For each DCC covering loans in the Loan Group, the inputs in Table 3–47 are required:

TABLE 3–47—INPUTS FOR EACH DISTINCT CE COMBINATION (DCC)

Variable	Description	Source
P^{DCC}	Percent of Initial Loan Group UPB represented by individual loan(s) in a DCC	RBC Report
$R^{MI,DCC}$ or $R^{LSA,DCC}$	Credit rating of Loan Limit CE (MI or LSA) Counterparty	RBC Report

TABLE 3–47—INPUTS FOR EACH DISTINCT CE COMBINATION (DCC)—Continued

Variable	Description	Source
$C^{MI,DCC}$ or $C^{LSA,DCC}$	Weighted Average Coverage Percentage for MI or LSA Coverage (weighted by Initial UPB)	RBC Report
$AB_0^{DCC,C1}$	DCC Available First Priority CE Balance immediately prior to start of the Stress Test	RBC Report
$AB_0^{DCC,C2}$	DCC Available Second Priority CE Balance immediately prior to start of the Stress Test	RBC Report
$R^{DCC,C1}$	DCC Credit Rating of First Priority CE Provider or Counterparty; or Cash/Cash Equivalent (which is not Haircutted)	RBC Report
$R^{DCC,C2}$	DCC Credit Rating of Second Priority CE Provider or Counterparty; or Cash/Cash Equivalent (which is not Haircutted)	RBC Report
$C^{DCC,C1}$	DCC Loan-Level Coverage Limit of First Priority Contract (If Subtype is MPI; otherwise = 1)	RBC Report
$C^{DCC,C2}$	DCC Loan-Limit Coverage Limit of Second Priority Contract (if Subtype is MPI; otherwise = 1)	RBC Report
$ExpMo^{DCC,C1}$	Month in the Stress Test (1...120 or after) in which the DCC First Priority Contract expires	RBC Report
$ExpMo^{DCC,C2}$	Month in the Stress Test (1...120 or after) in which the DCC Second Priority Contract expires	RBC Report
$ELPF^{DCC,C1}$	DCC Enterprise Loss Position Flag for First Priority Contract (Y or N)	RBC Report
$ELPF^{DCC,C2}$	DCC Enterprise Loss Position Flag for Second Priority Contract (Y or N)	RBC Report

[c] In the RBC Report, Aggregate Limit CE Subtypes are grouped as illustrated in Table 3–48.

TABLE 3–48—AGGREGATE LIMIT CE SUBTYPE GROUPING

Symbol	Subtype	Also Includes
REC	Unlimited Recourse	Unlimited Indemnification
PI	Pool Insurance	Pool Insurance
		Letter of Credit
		Subordination Arrangements
MPI	Modified Pool Insurance	Modified Pool Insurance
		Limited Recourse
		Limited Indemnification
		FHA Risk-sharing Agreements
CASH	Cash Account	Cash Account

TABLE 3–48—AGGREGATE LIMIT CE SUBTYPE GROUPING—Continued

Symbol	Subtype	Also Includes
COLL	Collateral Account	Collateral
ELP	Enterprise Loss Position	GSE Loss Position (ledger item)
SA	Spread Account	Spread Account

3.6.3.6.4.3 Mortgage Credit Enhancement Procedures

[a] For each month m of the Stress Test, for each Loan Group (LG), carry out the following six steps [a] 1–6 for each DCC.

NOTE: Process the Loan Groups and DCCs using the numerical order assigned to them in the RBC Report.

1. Determine Mortgage Insurance Payment (MI_m) for single family loans in the DCC, or Loss Sharing Payment (LSA_m) for multifamily loans in the DCC, as a percentage of Defaulted UPB, applying appropriate counterparty Haircuts from section 3.5., of this appendix:

$$MI_m^{DCC} = \left(1 - MIExp_m^{LG}\right) \times C^{MI,DCC} \times CLM_m^{MI,LG} \times \left[1 - \frac{m'}{120} \times MaxHct\left(R^{MI,DCC}\right)\right]$$

$$LSA_m^{DCC} = C^{LSA,DCC} \times CLM_m^{LSA,LG} \times \left[1 - \frac{m'}{120} \times MaxHct\left(R^{LSA,DCC}\right)\right]$$

Where:

m′ = m, except for counterparties rated below BBB, where m′ = 120

$$MIExp_m^{LG} = 1 \; if \left(\left(LTV_{ORIG} \times \frac{UPB_m^{LG}}{UPB_{ORIG}^{LG}}\right) < 0.78\right) \text{ and the loan group comprises conventional loans}$$

$$MIExp_m^{LG} = 0 \text{ otherwise}$$

0.78 (78%) = the LTV at which MI is cancelled if payments are current

2. Determine Remaining Loss in Dollars (RLD) after application of MI or LSA and prior to application of other Aggregate Limit CE:

$$RLD_m^{DCC,(MI-LSA)} = max\left[\left(GLS_m^{LG} - MI_m^{DCC}\right), 0\right] \times P^{DCC} \times UPB_{m-1}^{LG} \times DEF_m^{LG}$$

3. Determine the contractual CE Payment in Dollars under the First Priority Contract C1. Determine Payment after Haircut. Update Remaining Loss Dollars and DCC Available Balance.

a. Determine CE Payment as the minimum of the Remaining Loss Dollars after MI or LSA (if applicable) times the DCC Loan-Level Coverage Limit (= 1 if not MPI Contract) or the previous month's ending DCC Available Balance:

$$PD_m^{DCC,C1} = min\left(RLD_m^{DCC,(MI-LSA)} \times C^{DCC,C1}, AB_{m-1}^{DCC,C1}\right)$$

b. Determine CE Payment in Dollars after application of Haircuts:

$$PD_m^{DCC,C1,H} = PD_m^{DCC,C1} \times \left[1 - \frac{m'}{120} \times MaxHct\left(R^{DCC,C1}\right)\right]$$

Where:

m′ = m, except for counterparties rated below BBB, where m′ = 120

c. Update DCC Remaining Loss Dollars and DCC Available Balance under the First Priority Contract C1:

$$RLD_m^{DCC,C1} = max\left(RLD_m^{DCC,(MI-LSA)} - PD_m^{DCC,C1,H}, 0\right)$$

$$AB_m^{DCC,C1} = max\left(\left[AB_{m-1}^{DCC,C1} - PD_m^{DCC,C1}\right] \times \left(1 - Exp_m^{DCC,C1}\right), 0\right)$$

Where:

Exp_m^C = 1 if the Contract has expired, i.e. if the calendar month corresponding to the m^{th} month of the Stress Test is on or after the expiration month ($ExpMo^C$)

Exp_m^C = 0 otherwise

4. Determine the contractual CE Payment in Dollars under the Second Priority Contract C2. Determine Payment after Haircut. Update Remaining Loss Dollars and DCC Available Balance.

a. Determine CE Payment as the minimum of the Remaining Loss Dollars after C1 Payment (if applicable) times a DCC Loan-Level Coverage Limit (= 1 if not MPI Contract) or the previous month's ending DCC Available Balance:

$$PD_m^{DCC,C2} = min\left(RLD_m^{DCC,C1} \times C^{DCC,C2}, AB_{m-1}^{DCC,C2}\right)$$

b. Determine CE Payment in Dollars after application of Haircuts:

$$PD_m^{DCC,C2,H} = PD_m^{DCC,C2} \times \left[1 - \frac{m'}{120} \times MaxHct\left(R^{DCC,C2}\right)\right]$$

Where:

m′ = m, except for counterparties rated below BBB, where m′ = 120

c. Update DCC Remaining Loss Dollars and DCC Available Balance under the Second Priority Contract C2:

$$\mathrm{RLD}_{\mathrm{m}}^{\mathrm{DCC,C2}} = max\left(\mathrm{RLD}_{\mathrm{m}}^{\mathrm{DCC,C1}} - \mathrm{PD}_{\mathrm{m}}^{\mathrm{DCC,C2,H}}, 0\right)$$

$$\mathrm{AB}_{\mathrm{m}}^{\mathrm{DCC,C2}} = max\left(\left[\mathrm{AB}_{\mathrm{m-1}}^{\mathrm{DCC,C2}} - \mathrm{PD}_{\mathrm{m}}^{\mathrm{DCC,C2}}\right] \times \left(1 - \mathrm{Exp}_{\mathrm{m}}^{\mathrm{DCC,C2}}\right), 0\right)$$

Where:

Exp_m^C = 1 if the Contract has expired, i.e. if the calendar month corresponding to the m^{th} month of the Stress Test is on or after the expiration month (ExpMo^C)

Exp_m^C = 0 otherwise

5. Convert Aggregate Limit First and Second Priority Contract receipts in Dollars for each DCC in month m to a percentage of DCC Defaulted UPB:

$$\text{If } \mathrm{DEF}_{\mathrm{m}} = 0, \text{ then } \mathrm{ALPD}_{\mathrm{m}}^{\mathrm{DCC}} = 0$$

$$\mathrm{ALPD}_{\mathrm{m}}^{\mathrm{DCC}} = \frac{\left(\mathrm{PD}_{\mathrm{m}}^{\mathrm{DCC,C1,H}} \times \mathrm{ELPI}^{\mathrm{DCC,C1}}\right) + \left(\mathrm{PD}_{\mathrm{m}}^{\mathrm{DCC,C2,H}} \times \mathrm{ELPI}^{\mathrm{DCC,C2}}\right)}{\mathrm{DEF}_{\mathrm{m}} \times \mathrm{UPB}_{\mathrm{m-1}}^{\mathrm{LG}} \times \mathrm{P}^{\mathrm{DCC}}}$$

Where:

$\mathrm{ELPI}^{DCC,C}$ = 0 if $\mathrm{ELPF}^{DCC,C}$ = Y (Yes, indicating that Contract C is an Enterprise Loss Position)

$\mathrm{ELPI}^{DCC,C}$ = 1 otherwise

6. Add the Loan Limit CE (MI and LSA) and Aggregate Limit CE (ALPD), each expressed as a share of DCC Defaulted UPB, separately for each DCC to increment the respective Loan Group totals:

$$\mathrm{MI}_{\mathrm{m}}^{\mathrm{LG}} = \mathrm{MI}_{\mathrm{m}}^{\mathrm{LG}} + \left(\mathrm{P}^{\mathrm{DCC}} \times \mathrm{MI}_{\mathrm{m}}^{\mathrm{DCC}}\right) \text{ for single family Loans; or}$$

$$\mathrm{LSA}_{\mathrm{m}}^{\mathrm{LG}} = \mathrm{LSA}_{\mathrm{m}}^{\mathrm{LG}} + \left(\mathrm{P}^{\mathrm{DCC}} \times \mathrm{LSA}_{\mathrm{m}}^{\mathrm{DCC}}\right) \text{ for multifamily Loans; and}$$

$$\mathrm{ALCE}_{\mathrm{m}}^{\mathrm{LG}} = \mathrm{ALCE}_{\mathrm{m}}^{\mathrm{LG}} + \left(\mathrm{P}^{\mathrm{DCC}} \times \mathrm{ALPD}_{\mathrm{m}}^{\mathrm{DCC}}\right) \text{ for both single family and multifamily Loans}$$

3.6.3.6.4.4 Mortgage Credit Enhancement Outputs

[a] Mortgage Credit Enhancement Outputs are set forth in Table 3–49.

TABLE 3–49—SINGLE FAMILY AND MULTIFAMILY CREDIT ENHANCEMENT OUTPUTS

Variable	Description
MI_m	MI payments applied to reduce single family Gross Loss Severity in month m of the Stress Test (as a fraction of Defaulted UPB in month m)
LSA_m	LSA payments applied to reduce multifamily Gross Loss Severity in month m of the Street Test (as a fraction of Defaulted UPB in month m)
ALCE_m	Aggregate receipts from all forms of Aggregate Limit Limit Credit Enhancement applied to reduce single- and multifamily Gross Loss Severity in month m of the Stress Test (as a fraction of Defaulted UPB in month m)

[b] MI_m^{LG} or LSA_m^{LG} and ALCE_m^{LG} for months m = 1...120 of the Stress Test are used in section 3.6.3.6.5, Single Family and Multifamily Net Loss Severity, of this appendix.

3.6.3.6.5 Single Family and Multifamily Net Loss Severity

3.6.3.6.5.1 Single Family and Multifamily Net Loss Severity Procedures

Combine inputs and outputs from Gross Loss Severity and Credit Enhancements (Table 3–42 through Table 3–49) in the following formulas for each Loan Group in month m:

[a] For Conventional single family Loan Groups:

$$MIExp_m^{LG} = 1 \text{ if } \left(\left(LTV_{ORIG} \times \frac{UPB_m^{LG}}{UPB_{ORIG}^{LG}} \right) < 0.78 \right) \text{ and the loan group comprises conventional loans}$$

$$MIExp_m^{LG} = 0 \text{ otherwise}$$

0.78 (78%) = the LTV at which MI is cancelled if payments are current

[b] For Government single family Loan Groups, complete the following three steps:

1. Compute a Loss Severity value for FHA-insured loans using the Conventional formula for all government loans. FHA reimbursement rates will be reflected in the value of MI_m, as computed in section 3.6.3.6.4.3, Mortgage Credit Enhancement Procedures, of this appendix.
2. Compute a Loss Severity value for VA-insured loans as follows for all government loans:

$$LS_m^{VA} = \max \left[\frac{1 + F + \left(\frac{MQ}{12} \times PTR_m \right) + \left(R - RP_m \right) - 0.30}{\left(1 + \frac{DR_m}{2} \right)^{\frac{MF}{6}}}, 0 \right]$$

Where:

0.30 is a fixed percentage representing the VA guarantee coverage percentage. (The VA coverage rate is a function of the initial loan size.)

3. Compute Net Loss Severity by combining FHA-insured and VA-insured Loss Severity values as follows:

$$LS_m^{SF,GVT} = \left(\frac{2}{3} \times LS_m^{SF} \right) + \left(\frac{1}{3} \times LS_m^{VA} \right)$$

[c] For multifamily Loan Groups other than FHA-Insured:

$$LS_m^{MF} = \frac{1 + \left(\frac{MQ}{12} \times PTR_m \right)}{\left(1 + \frac{DR_m}{2} \right)^{\frac{MQ}{6}}} + \frac{\frac{RHC}{2} - LSA_m}{\left(1 + \frac{DR_m}{2} \right)^{\frac{MF}{6}}} + \frac{\frac{RHC}{2} - RP - ALCE_m}{\left(1 + \frac{DR_m}{2} \right)^{\frac{MF+MR}{6}}}$$

[d] For FHA-Insured multifamily Loan Groups:

$$LS_m^{MF} = 0.03 \text{ (3 percent) for all months}$$

3.6.3.6.5.2 Single Family and Multifamily Net Loss Severity Outputs

Net Loss Severity outputs are set forth in Table 3–50:

TABLE 3–50—SINGLE FAMILY AND MULTIFAMILY LOSS SEVERITY OUTPUTS

Variable	Description
LS_m^{SF}	Loss Severity (as a fraction of Defaulted UPB) for single family loans in month m
LS_m^{MF}	Loss Severity (as a fraction of Defaulted UPB) for multifamily loans in month m

Single family and multifamily Loss Severities for months 1...120 of the Stress Test are used in section 3.6.3.7, Stress Test Whole Loan Cash Flows, of this appendix.

3.6.3.7 Stress Test Whole Loan Cash Flows

3.6.3.7.1 Stress Test Whole Loan Cash Flow Overview

This section combines the mortgage Amortization Schedules with Default, Prepayment and Net Loss Severity Rates to produce performance-adjusted cash flows for Enterprise Whole Loans in the Stress Test.

3.6.3.7.2 Stress Test Whole Loan Cash Flow Inputs

The inputs required to compute Stress Test Whole Loan Cash Flows for each Loan Group are listed in Table 3–51.

TABLE 3–51—INPUTS FOR FINAL CALCULATION OF STRESS TEST WHOLE LOAN CASH FLOWS

Variable	Description	Source
UPB_m	Aggregate Unpaid Principal Balance in month m = 0 ... RM	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
NYR_m	Net Yield Rate in month m = 1 ... RM	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
GF	Guarantee Fee rate (weighted average for Loan Group) (decimal per annum)	RBC Report
PTR_m	Pass-Through Rate in month m = 1 ... RM	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
SP_m	Aggregate Scheduled Principal (Amortization) in month m = 1 ... RM	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
PRE_m^{SF} PRE_m^{MF}	Prepaying Fraction of original Loan Group in month m = 1 ... RM	section 3.6.3.4.4, Single Family Default and Prepayment Outputs and, section 3.6.3.5.4, Multifamily Default and Prepayment Outputs
DEF_m^{SF} DEF_m^{MF}	Defaulting Fraction of original Loan Group in month m = 1 ... RM	section 3.6.3.4.4, Single Family Default and Prepayment Outputs and, section 3.6.3.5.4, Multifamily Default and Prepayment Outputs

TABLE 3–51—INPUTS FOR FINAL CALCULATION OF STRESS TEST WHOLE LOAN CASH FLOWS—Continued

Variable	Description	Source
$PERF_m^{SF}$ $PERF_m^{MF}$	Performing Fraction of original Loan Group in month m = 1 ... RM	section 3.6.3.4.4, Single Family Default and Prepayment Outputs and, section 3.6.3.5.4, Multifamily Default and Prepayment Outputs
FDS	Float Days for Scheduled Principal and Interest (weighted average for Loan Group)	RBC Report
FDP	Float Days for Prepaid Principal (weighted average for Loan Group)	RBC Report
FER_m	Float Earnings Rate in month m = 1 ... RM	1 week Fed Funds Rate; section 3.3, Interest Rates
LS_m^{SF}	Loss Severity Rate in month m = 1 ... RM	section 3.6.3.6.5.2, Single Family and Multifamily Net Loss Severity Outputs
FREP	Fraction Repurchased (weighted average for Loan Group) (decimal)	RBC Report

3.6.3.7.3 Stress Test Whole Loan Cash Flow Procedures

[a] Calculate Stress Test whole loan cash flows using the following nine steps:

1. Calculate Scheduled Principal Received (SPR) in month m:

$$SPR_m = max\left(SP_m, 0\right) \times \left(PERF_m + PRE_m\right)$$

NOTE: Scheduled Principal Received is zero, not negative, when amortization is negative.

2. Calculate Net Interest Received (NIR) in month m. Any interest shortfall due to Negative Amortization reduces Net Yield directly. *Note:* NIR includes loans that default in month m, because lost interest is included in Credit Losses in step 6) of this section. (*See* section 3.6.3.6, Calculation of Single Family and Multifamily Mortgage Losses, of this appendix.)

$$NIR_m = \left[\left(UPB_{m-1} \times \frac{NYR_m}{12}\right) + min\left(SP_m, 0\right)\right] \times PERF_{m-1}$$

3. Calculate Prepaid Principal Received (PPR) in month m:

$$PPR_m = UPB_m \times PRE_m$$

4. Calculate newly Defaulted Principal (DP) in month m:

$$DP_m = UPB_{m-1} \times DEF_m$$

5. Calculate Recovery Principal Received (RPR) on account of loans that Defaulted in month m:

$$RPR_m = UPB_{m-1} \times DEF_m \times \left(1 - LS_m\right)$$

6. Calculate Credit Losses (CL) on account of loans that Defaulted in month m:

$$CL_m = UPB_{m-1} \times DEF_m \times LS_m$$

In addition, if m = RM and $UPB_{RM} > 0$ then,

$$CL_{RM} = \left(UPB_{RM} \times PERF_{RM}\right) + \left(UPB_{RM-1} \times DEF_{RM} \times LS_{RM}\right),$$

and

$$PUPB_{RM} = 0$$

7. Calculate Performing Loan Group UPB in month m ($PUPB_m$), including $PUPB_0$.

NOTE: All loans are assumed to be performing in month 0; therefore $PUPB_0 = UPB_0$.

$$PUPB_m = UPB_m \times PERF_m$$

8. Calculate Total Principal Received (TPR) and Total Interest Received (TIR) in month m:

$$TPR_m = SPR_m + PPR_m + RPR_m$$

$$TIR_m = NIR_m$$

9. For Sold Loans, calculate the following cash flow components:

a. Guarantee Fee (GF) received in month m:

$$GF_m = UPB_{m-1} \times \frac{GFR}{12} \times \left(PERF_m + PRE_m\right)$$

b. Float Income (FI) received in month m

$$FI_m = \left(\left[\left(\left[\left(SPR_m + NIR_m - GF_m\right) \times \frac{FDS}{365}\right] + \left[PPR_m \times \frac{FDP}{365}\right]\right) \times FER_m\right] - PIS_m\right) \times (1 - FREP)$$

where: Prepayment Interest Shortfall (PIS) in month m is:

$$PIS_m = UPB_{m-1} \times PRE_m \times \frac{PTR_m}{12} \quad \text{if } FDP \geq 30$$

$$PIS_m = UPB_{m-1} \times PRE_m \times \frac{PTR_m}{24} \quad \text{if } 15 \leq FDP < 30$$

3.6.3.7.4 Stress Test Whole Loan Cash Flow Outputs

The Whole Loan Cash Flows in Table 3–52 are used to prepare pro forma balance sheets and income statements for each month of the Stress Period (*see* section 3.10 Operations, Taxes and Accounting, of this appendix). For Retained Loan groups, cash flows consist of Scheduled Principal, Prepaid Principal, Defaulted Principal, Credit Losses, and Interest. For Sold Loan groups, cash flow consists of Credit Losses, Guarantee Fees and Float Income. For Repurchased MBSs, cash flows are allocated according to the Fraction Repurchased. Table 3–52 covers all cases; for Retained Loans FREP = 1.0.

TABLE 3–52—OUTPUTS FOR WHOLE LOAN CASH FLOWS

Variable	Description
SPR_m	Scheduled Principal Received in month m = 1...RM
PPR_m	Prepaid Principal Received in month m = 1...RM
DP_m	Defaulted Principal in month m = 1...RM
CL_m	Credit Losses in month m = 1...RM
$PUPB_m$	Performing Loan Group UPB in month m = 0...RM
TPR_m	Total Principal Received in month m = 1...RM
TIR_m	Total Interest Received in month m = 1...RM
GF_m	Guarantee Fees received in month m = 1...RM
FI_m	Float Income received in month m = 1...RM

TABLE 3–53—ADDITIONAL OUTPUTS FOR REPURCHASED MBSS

Variable	Quantity	Description
$STPR_m$	$FREP \times (SPR_m + PPR_m + DP_m)$	Enterprise's portion of Total Principal Received in months m = 1...RM, reflecting its fractional ownership of the MBS

TABLE 3–53—ADDITIONAL OUTPUTS FOR REPURCHASED MBSS—Continued

Variable	Quantity	Description
$STIR_m$	FREP × ($TIR_m - GF_m$)	Enterprise's portion of Total Interest Received (at the Pass-Through Rate) in months m = 1...RM, reflecting its fractional ownership of the MBS
$SPUPB_m$	FREP × $PUPB_m$	Enterprise's portion of the Performing UPB of the repurchased MBS in months m = 0...RM, reflecting its fractional ownership of the MBS

3.6.3.8 Whole Loan Accounting Flows

3.6.3.8.1 Whole Loan Accounting Flows Overview

[a] For accounting purposes, cash flows are adjusted to reflect (1) the value over time of discounts, premiums and fees paid or received (Deferred Balances) when an asset was acquired; and (2) the fact that mortgage interest is paid in arrears, i.e. it is received in the month after it is earned. In the Stress Test calculations, payments are indexed by the month in which they are received. Therefore, interest received in month m was earned in month m − 1. However, principal is accounted for in the month received.

[b] Deferred Balances are amortized over the remaining life of the asset. Therefore, these calculations go beyond the end of the Stress Test if the Remaining Maturity (RM) is greater than the 120 months of the Stress Test. The projection of cash flows beyond the end of the Stress Test is discussed in the individual sections where the cash flows are first calculated. In general, for interest rate indexes, monthly Prepayment rates and monthly Default rates, the value for m = 120 is used for all months 120 $<m \leq$RM, but LS = 0 for m >120.

3.6.3.8.2 Whole Loan Accounting Flows Inputs

The inputs in Table 3–54 are required to compute Accounting Flows:

TABLE 3–54—INPUTS FOR WHOLE LOAN ACCOUNTING FLOWS

Variable	Description	Source
RM	Remaining Term to Maturity in months	RBC Report
UPD_0	Sum of all unamortized discounts, premiums, fees, commissions, etc. for the loan group, such that the unamortized balance equals the book value minus the face value for the loan group at the start of the Stress Test, adjusted by the Unamortized Balance Scale Factor	RBC Report
NYR_0	Net Yield Rate at time zero	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
$PUPB_m$	Performing Loan Group UPB in months m = 0 ... RM	section 3.6.3.7.4, Stress Test Whole Loan Cash Flow Outputs
PTR_0	Pass-Through Rate at time zero	section 3.6.3.3.4, Mortgage Amortization Schedule Outputs
$SPUPB_m$	Security Performing UPB in months m = 0 ... RM	section 3.6.3.7.4, Stress Test Whole Loan Cash Flow Outputs

TABLE 3–54—INPUTS FOR WHOLE LOAN ACCOUNTING FLOWS—Continued

Variable	Description	Source
$SUPD_0$	The sum of all unamortized discounts, premiums, fees, commissions, etc. associated with the securities modeled using the Wtd Ave Percent Repurchased, such that the unamortized balance equals the book value minus the face value for the relevant securities at the start of the Stress Test, adjusted by the percent repurchased and the Security Unamortized Balance Scale Factor	RBC Report

3.6.3.8.3 Whole Loan Accounting Flows Procedures

3.6.3.8.3.1 Accounting for Retained and Sold Whole Loans

[a] Complete the following three steps to account for Retained and Sold loans:

1. Compute Allocated Interest in month m (AI^m) as follows:

$$AI_m = PUPB_{m-1} \times \frac{NYR_0}{12}$$

NOTE: Allocated Interest is used only to determine the allocation of Amortization Expense over time, not to generate actual cash flows)

2. Calculate the monthly Internal Rate of Return (IRR) that equates the adjusted cash flows (actual principal plus Allocated Interest) to the Initial Book Value (BV_0) of the Loan Group. A single IRR is used for all months m. Solve for IRR such that:

$$BV_0 = \sum_{m=1}^{RM} \frac{ACF_m}{(1+IRR)^m}$$

Where:

$$BV_0 = PUPB_0 + UPD_0$$

$$ACF_m = AI_m - PUPB_m + PUPB_{m-1}$$

3. Calculate the monthly Amortization Expense for each month m:

a. If BV_0 <0, or if 12 × IRR >1.0 (100%), or if

$$BV_0 > \sum_{m=1}^{RM} ACF_m$$

then the full amount of UPD_0 is realized in the first month ($AE_1 = -UPD_0$)

b. Otherwise:

$$AE_m = (BV_{m-1} \times IRR) - AI_m$$
$$\text{if } PUPB_m > 0$$

$$AE_m = -UPD_{m-1} \text{ if } PUPB_m = 0$$

$$UPD_m = UPD_{m-1} + AE_m$$

$$BV_m = PUPB_m + UPD_m$$

3.6.3.8.3.2 Additional Accounting for Repurchased MBSs

[a] Complete the following three steps to account for Repurchased MBSs:

1. Compute Security Allocated Interest in month m (SAI_m) as follows:

$$SAI_m = SPUPB_{m-1} \times \frac{PTR_0}{12}$$

Note: Security Allocated Interest is used only to determine the allocation of Security Amortization Expense over time, not to generate actual cash flows.

2. Calculate the monthly Internal Rate of Return (IRR) that equates the adjusted cash flows (actual principal plus Allocated Interest) to the Initial Book Value (SBV_0) of the Loan Group. A single IRR is used for all months m. Solve for IRR such that:

$$SBV_0 = \sum_{m=1}^{RM} \frac{SACF_m}{(1+IRR)^m}$$

Where:

$SBV_0 = SPUPB_0 + SUPD_0$

$SACF_m = SAI_m - SPUPB_m + SPUPB_{m-1}$

3. Calculate the monthly Security Amortization Expense for each month m:

a. If SBV_0 <0, or if 12 × IRR >1.0 (100%), or if

$$SBV_0 > \sum_{m=1}^{RM} SACF_m$$

then the full amount of $SUPD_0$ is realized in the first month ($SAE_1 = -SUPD_0$).

b. Otherwise:

$$SAE_m = (SBV_{m-1} \times IRR) - SAI_m$$
$$\text{if } SPUPB_m > 0$$
$$SAE_m = -SUPD_{m-1} \text{ if } SPUPB_m = 0$$
$$SUPD_m = SUPD_{m-1} + SAE_m$$
$$SBV_m = SPUPB_m + SUPD_m$$

3.6.3.8.4 Whole Loan Accounting Flows Outputs

Whole loan accounting flows outputs are set forth in Table 3–55. Amortization Expense for months m = 1...RM are used in section 3.10, Operations, Taxes, and Accounting, of this appendix.

TABLE 3–55—OUTPUTS FOR WHOLE LOAN ACCOUNTING FLOWS

Variable	Description
AE_m	Amortization Expense for months m = 1...RM
SAE_m	Security Amortization Expense for months m = 1...RM

3.6.4 Final Whole Loan Cash Flow Outputs

The final outputs for section 3.6, Whole Loan Cash Flows, of this appendix are as specified in Table 3–52, and Table 3–55.

3.7 Mortgage-Related Securities Cash Flows

3.7.1 Mortgage-Related Securities Overview

[a] Mortgage-Related Securities (MRSs) include Single Class MBSs, Multi-class MBSs (REMICs or Collateralized Mortgage Obligations (CMOs)), Mortgage Revenue Bonds (MRBs), and Derivative Mortgage Securities such as Interest-Only and Principal-Only Stripped MBSs. MBSs and Derivative Mortgage Securities are issued by the Enterprises, Ginnie Mae and private issuers. MRBs are issued by State and local governments or their instrumentalities. For computational purposes, certain Asset-Backed Securities (ABS) backed by mortgages (Mortgage ABSs backed by manufactured housing loans, second mortgages or home equity loans) are treated as REMICs in the Stress Test.

[b] Cash flows from Single Class MBSs represent the pass-through of all principal and interest payments, net of servicing and guarantee fees, on the underlying pools of mortgages. Cash flows from Multi-Class MBSs and Derivative Mortgage Securities represent a specified portion of the cash flows produced by an underlying pool of mortgages and/or Mortgage-Related Securities, determined according to rules set forth in offering documents for the securities. MRBs may have specific maturity schedules and call provisions, whereas MBSs have only expected maturities and, in most cases, no issuer call provision (other than ''cleanup calls'' if the pool balance becomes quite small). However, the timing of principal payments for MRBs is still closely related to that of their underlying mortgage collateral. The Stress Test treats most MRBs in a manner similar to single class MBSs. Finally, a small number of Enterprise and private label REMIC securities for which modeling information is not readily available and which are not modeled by a commercial information service (referred to as ''miscellaneous MRS'') are treated separately.

[c] In addition to reflecting the defaults of mortgage borrowers during the Stress Period, the Stress Test considers the possibility of issuer Default on Mortgage-Related Securities. Credit impairments throughout the Stress Period are based on the rating of these securities, and are modeled by reducing contractual interest payments and ''writing down'' principal. No Credit Losses are assumed for the Enterprise's own securities and Ginnie Mae securities (*see* section 3.5.3, Counterparty Defaults Procedures, of this appendix).

[d] The calculation of cash flows for Mortgage-Related Securities requires information from the Enterprises identifying their holdings, publicly available information characterizing the securities, and information on the interest rate, mortgage performance and credit rating (for rated securities).

[e] Cash and accounting flows—monthly principal and interest payments and amortization expense—are produced for each month of the Stress Period for each security. (Principal- and interest-only securities pay principal or interest respectively.) These cash flows are input to the Operations, Taxes, and Accounting component of the Stress Test.

3.7.2 Mortgage-Related Securities Inputs

3.7.2.1 Inputs Specifying Individual Securities

3.7.2.1.1 Single Class MBSs

The information in Table 3–56 is required for single class MBSs held by an Enterprise at the start of the Stress Test. This information identifies the Enterprise's holdings and describes the MBS and the underlying mortgage loans.

TABLE 3–56—RBC REPORT INPUTS FOR SINGLE CLASS MBS CASH FLOWS

Variable	Description
Pool Number	A unique number identifying each mortgage pool
CUSIP Number	A unique number assigned to publicly traded securities by the Committee on Uniform Securities Identification Procedures
Issuer	Issuer of the mortgage pool
Original UPB Amount	Original pool balance multiplied by the Enterprise's percentage ownership
Current UPB Amount	Initial Pool balance (at the start of the Stress Test), multiplied by the Enterprise's percentage ownership
Product Code	Mortgage product type for the pool
Security Rate Index	If the rate on the security adjusts over time, the index that the adjustment is based on
Unamortized Balance	The sum of all unamortized discounts, premiums, fees, commissions, etc., such that the unamortized balance equals book value minus face value, adjusted by the Unamortized Balance Scale Factor
Wt Avg Original Amortization Term	Original amortization term of the underlying loans, in months (weighted average for underlying loans)
Wt Avg Remaining Term of Maturity	Remaining Maturity of the underlying loans at the start of the Stress Test (weighted average for underlying loans)
Wt Avg Age	Age of the underlying loans at the start of the Stress Test (weighted average for underlying loans)
Wt Avg Current Mortgage Interest rate	Mortgage Interest Rate of the underlying loans at the start of the Stress Test (weighted average for underlying loans)
Wt Avg Pass-Through Rate	Pass-Through Rate of the underlying loans at the start of the Stress Test (weighted average for underlying loans)
Wtg Avg Original Mortgage Interest Rate	The current UPB weighted average Mortgage Interest Rate in effect at Origination for the loans in the pool
Security Rating	The most current rating issued by any Nationally Recognized Statistical Rating Organization (NRSRO) for this security, as of the reporting date. In the case of a ''split'' rating, the lowest rating should be given
Wt Avg Gross Margin	Gross margin for the underlying loans (ARM MBS only) (weighted average for underlying loans)
Wt Avg Net Margin	Net margin (used to determine the security rate for ARM MBS) (weighted average for underlying loans)
Wt Avg Rate Reset Period	Rate reset period in months (ARM MBS only) (weighted average for underlying loans)
Wt Avg Rate Reset Limit	Rate reset limit up/down (ARM MBS only) (weighted average for underlying loans)
Wt Avg Life Interest Rate Ceiling	Maximum rate (lifetime cap) (ARM MBS only) (weighted average for underlying loans)
Wt Avg Life Interest Rate Floor	Minimum rate (lifetime floor) (ARM MBS only) (weighted average for underlying loans)

TABLE 3–56—RBC REPORT INPUTS FOR SINGLE CLASS MBS CASH FLOWS—Continued

Variable	Description
Wt Avg Payment Reset Period	Payment reset period in months (ARM MBS only) (weighted average for underlying loans)
Wt Avg Payment Reset Limit	Payment reset limit up/down (ARM MBS only) (weighted average for underlying loans)
Wt Avg Lookback Period	The number of months to look back from the interest rate change date to find the index value that will be used to determine the next interest rate (ARM MBS only) (weighted average for underlying loans)
Wt Avg Negative Amortization Cap	The maximum amount to which the balance can increase before the payment is recast to a fully amortizing amount. It is expressed as a fraction of the original UPB. (ARM MBS only) (weighted average for underlying loans)
Wt Avg Initial Interest Rate Period	Number of months between the loan origination date and the first rate adjustment date (ARM MBS only) (weighted average for underlying loans)
Wt Avg Unlimited Payment Reset Period	Number of months between unlimited payment resets, *i.e.*, not limited by payment caps, starting with Origination date (ARM MBS only) (weighted average for underlying loans)
Notional Flag	Indicates that amounts reported in Original UPB Amount and Current UPB Amount are notional
UPB Scale Factor	Factor applied to the current UPB that offsets any timing adjustments between the security level data and the Enterprise's published financials
Whole Loan Modeling Flag	Indicates that the Current UPB Amount and Unamortized Balance associated with this Repurchased MBS are included in the Wtg Avg Percent Repurchased and Security Unamortized Balance fields
FAS 115 Classification	The financial instrument's classification according to FAS 115
$HPGR_K$	Vector of House Price Growth Rates for quarters q = 1...40 of the Stress Period

3.7.2.1.2 Multi-Class MBSs and Derivative Mortgage Securities

[a] The information in Table 3–57 is required for Multi-Class MBSs and Derivative Mortgage Securities held by an Enterprise at the start of the Stress Test. This information identifies the MBS and an Enterprise's holdings.

TABLE 3–57—RBC REPORT INPUTS FOR MULTI-CLASS AND DERIVATIVE MBS CASH FLOWS

Variable	Description
CUSIP Number	A unique number assigned to publicly traded securities by the Committee on Uniform Securities Identification Procedures
Issuer	Issuer of the security: FNMA, FHLMC, GNMA or other
Original Security Balance	Original principal balance of the security (notional amount for Interest-Only securities) at the time of issuance, multiplied by the Enterprise's percentage ownership
Current Security Balance	Initial principal balance, or notional amount, at the start of the Stress Period multiplied by the Enterprise's percentage ownership
Current Security Percentage Owned	The percentage of a security's total current balance owned by the Enterprise

TABLE 3–57—RBC REPORT INPUTS FOR MULTI-CLASS AND DERIVATIVE MBS CASH FLOWS—Continued

Variable	Description
Unamortized Balance	The sum of all unamortized discounts, premiums, fees, commissions, etc., such that the unamortized balance equals book value minus face value, adjusted by the Unamortized Balance Scale Factor.

[b] The Stress Test requires sufficient information about the cash flow allocation rules among the different classes of a Multi-Class MBS to determine the cash flows for the individual class(es) owned by an Enterprise, including descriptions of the component classes of the security, the underlying collateral, and the rules directing cash flows to the component classes. This information is obtained from offering documents or securities data services. In the Stress Test, this information is used either as an input to a commercial modeling service or, for securities that are not so modeled, to derive an approximate modeling treatment as described more fully in this section.

[c] If a Derivative Mortgage Security is itself backed by one or more underlying securities, sufficient information is required for each underlying security as described in the preceding paragraph.

3.7.2.1.3 Mortgage Revenue Bonds and Miscellaneous MRSs

[a] The Stress Test requires two types of information for Mortgage Revenue Bonds and miscellaneous MRS held by an Enterprise at the start of the Stress Test: information identifying the Enterprise's holdings and the contractual terms of the securities. The inputs required for these instruments are set forth in Table 3–58.

TABLE 3–58—RBC REPORT INPUTS FOR MRBS AND DERIVATIVE MBS CASH FLOWS

Variable	Description
CUSIP Number	A unique number assigned to publicly traded securities by the Committee on Uniform Securities Identification Procedures
Original Security Balance	Original principal balance, multiplied by the Enterprise's percentage ownership
Current Security Balance	Initial principal balance (at start of Stress Period), multiplied by the Enterprise's percentage ownership
Unamortized Balance	The sum of all unamortized discounts, premiums, fees, commissions, etc., such that the unamortized balance equals book value minus face value, adjusted by the Unamortized Balance Scale Factor
Issue Date	The Issue Date of the security
Maturity Date	The stated Maturity Date of the security
Security Interest Rate	The rate at which the security earns interest, as of the reporting date
Principal Payment Window Starting Date, Down-Rate Scenario	The month in the Stress Test that principal payment is expected to start for the security under the statutory "down" interest rate scenario, according to Enterprise projections
Principal Payment Window Ending Date, Down-Rate Scenario	The month in the Stress Test that principal payment is expected to end for the security under the statutory "down" interest rate scenario, according to Enterprise projections
Principal Payment Window Starting Date, Up-Rate Scenario	The month in the Stress Test that principal payment is expected to start for the security under the statutory "up" interest rate scenario, according to Enterprise projections
Principal Payment Window Ending Date, Up-Rate Scenario	The month in the Stress Test that principal payment is expected to end for the security under the statutory "up" interest rate scenario, according to Enterprise projections

TABLE 3–58—RBC REPORT INPUTS FOR MRBS AND DERIVATIVE MBS CASH FLOWS—Continued

Variable	Description
Security Rating	The most current rating issued by any Nationally Recognized Statistical Rating Organization (NRSRO) for this security, as of the reporting date. In the case of a "split" rating, the lowest rating should be given.
Security Rate Index	If the rate on the security adjusts over time, the index on which the adjustment is based
Security Rate Index Coefficient	If the rate on the security adjusts over time, the coefficient is the number used to multiply by the value of the index
Security Rate Index Spread	If the rate on the security adjusts over time, the spread is added to the value of the index multiplied by the coefficient to determine the new rate
Security Rate Adjustment Frequency	The number of months between rate adjustments
Security Interest Rate Ceiling	The maximum rate (lifetime cap) on the security
Security Interest Rate Floor	The minimum rate (lifetime floor) on the security

[b] The Payment Window Starting and Ending Dates are projected by the Enterprise on the basis of prospectus information or simulations from a dealer in the securities or other qualified source, such as the structured finance division of an accounting firm, for the two statutory scenarios.

3.7.2.2 Interest Rate Inputs

Interest rates projected for each month of the Stress Period are used to calculate principal amortization and interest payments for ARM MBSs and MRBs, and for Derivative Mortgage Securities with indexed coupon rates. This information is produced in section 3.3, Interest Rates, of this appendix.

3.7.2.3 Mortgage Performance Inputs

Default and Prepayment rates for the loans underlying a single- or multiclass MBS are computed according to the characteristics of the loans as specified in this section 3.7.2, Mortgage-Related Securities Inputs. LTV and Census Region are not uniquely specified for the loans underlying a given security; instead, the Prepayment and Default rates are averaged over all LTV categories, weighted according to the distribution of LTVs given in Table 3–59. (This weighting applies to Time Zero, i.e., the start of the Stress Test; the weightings will change over time as individual LTV groups pay down at different rates. *See* section 3.7.3, Mortgage-Related Securities Procedures, of this appendix.) Instead of Census Division, the national average HPI is used for all calculations in this section.

TABLE 3–59—AGGREGATE ENTERPRISE AMORTIZED ORIGINAL LTV ($AOLTV_0$) DISTRIBUTION [1]

Original LTV	UPB Distribution	Wt Avg AOLTV for Range
00<LTV≤60		
60<LTV≤70		
70<LTV≤75		
75<LTV≤80		
80<LTV≤90		
90<LTV≤95		
95<LTV≤100		
100<LTV		

[1] SOURCE: RBC Report, combined Enterprises single-family sold loan portfolio. Table 3–59 is updated as necessary with combined Enterprises single-family sold loan group data from the RBC Report in accordance with OFHEO guideline #404. The contents of the table appear at *http://www.OFHEO.gov.*

NOTE: Amortized Original LTV (also known as the "current-loan-to-original-value" ratio) is the Original LTV adjusted for the change in UPB but not for changes in property value.

3.7.2.4 Third-Party Credit Inputs

For securities not issued by the Enterprise or Ginnie Mae, issuer Default risk is reflected by haircutting the instrument cash flows based on the rating of the security, as described in section 3.5, Counterparty Defaults, of this appendix.

3.7.3 Mortgage-Related Securities Procedures

The following sections describe the calculations for (1) single class MBSs, (2) Multi-Class MBSs and derivative mortgage securities, and (3) MRBs and miscellaneous MRS.

3.7.3.1 Single Class MBSs

[a] The calculation of cash flows for single class MBSs is based on the procedures outlined earlier in section 3.6, Whole Loan Cash Flows, of this appendix. The collateral (i.e., the mortgage pool) underlying each MBS is treated as one single family Loan Group with characteristics equal to the weighted average characteristics of the underlying loans.

[b] For each MBS, compute the scheduled cash flows specified in Table 3–33, as directed in section 3.6.3.3.3, Mortgage Amortization Schedule Procedures of this appendix, with the following exceptions and clarifications:

1. The Net Yield Rate (NYR) is not used in the MBS calculation. Instead, the Pass-Through Rate (for Fixed-Rate MBSs) and INDEX + Net Margin (for Adjustable-Rate MBSs) are used.
2. PMT is not a direct input for MBSs. (That is, it is not specified in the RBC Report.) Instead, compute PMT from UPB, MIR and remaining amortizing term $AT-A_0$, using the standard mortgage payment formula (and update it as appropriate for ARMs, as described in the Whole Loan calculation).
3. For ARM MBS, interest rate and monthly payment adjustments for the underlying loans are calculated in the same manner as they are for ARM Loan Groups.
4. MBSs backed by Biweekly mortgages, GPMs, TPMs, GEMs, and Step mortgages are mapped into mortgage types as described in section 3.6, Whole Loan Cash Flows, of this appendix.

[c] Use the Loan Group characteristics to generate Default and Prepayment rates as described in section 3.6.3.4.3, Single Family Default and Prepayment Procedures, of this appendix. For the following explanatory variables that are not specified for MBSs, proceed as follows:

1. For fixed rate Ginnie Mae certificates and the small number of multifamily MBS held by the Enterprises, use the model coefficients for Government Loans. For loans underlying Ginnie Mae ARM certificates, use the conventional ARM model coefficients.
2. Set Investor Fraction (IF) = 7.56%
3. Set Relative Loan Size (RLS) = 1.0. For Ginnie Mae certificates, use RLS = 0.75.
4. For LTV_{ORIG} of the underlying loans: Divide the MBS's single weighted average Loan Group into several otherwise identical Loan Groups (''LTV subgroups''), one for each Original LTV range specified in Table 3–59. UPB_0 for each of these LTV subgroups is the specified percentage of the aggregate UPB_0. $AOLTV_0$ for each subgroup is also specified in Table 3–59. For Ginnie Mae certificates, use only the $95 < LTV \leq 100$ LTV category and its associated weighted average LTV.
5. For each LTV subgroup, compute LTV_0 as follows:

$$LTV_0 = AOLTV_0 \times \left(\frac{HPI_{ORIG}}{HPI_{AQ'_0}} \right)^{\frac{AQ_0}{AQ'_0}}$$

Where:

HPI = the national average HPI figures in Table 3–60 (updated as necessary from subsequent releases of the OFHEO HPI).

A_0 = weighted average age in months of the underlying loans immediately prior to the start of the Stress Test.

AQ_0 = weighted average age in quarters of the underlying loans immediately prior to the start of the Stress Test. $AQ_0 = int(A_0/3)$.

AQ'_0 = AQ_0 minus the number of whole quarters between the most recently available HPI at the start of the Stress Test and time zero.

If $AQ'_0 \leq 0$, then $LTV_0 = AOLTV_0$.

TABLE 3–60—HISTORICAL NATIONAL AVERAGE HPI [1]

Quarter [2]	HPI	Quarter	HPI	Quarter	HPI
1975Q1	62.45	1983Q4	116.63	1992Q3	177.94
1975Q2	63.50	1984Q1	118.31	1992Q4	178.71
1975Q3	62.85	1984Q2	120.40	1993Q1	178.48
1975Q4	63.92	1984Q3	121.68	1993Q2	179.89
1976Q1	65.45	1984Q4	122.94	1993Q3	180.98
1976Q2	66.73	1985Q1	124.81	1993Q4	182.38

TABLE 3–60—HISTORICAL NATIONAL AVERAGE HPI [1]—Continued

Quarter [2]	HPI	Quarter	HPI	Quarter	HPI
1976Q3	67.73	1985Q2	126.91	1994Q1	183.35
1976Q4	68.75	1985Q3	129.38	1994Q2	183.95
1977Q1	70.70	1985Q4	131.20	1994Q3	184.43
1977Q2	73.34	1986Q1	133.77	1994Q4	184.08
1977Q3	75.35	1986Q2	136.72	1995Q1	184.85
1977Q4	77.71	1986Q3	139.37	1995Q2	187.98
1978Q1	79.96	1986Q4	141.99	1995Q3	190.81
1978Q2	82.75	1987Q1	145.07	1995Q4	192.42
1978Q3	85.39	1987Q2	147.88	1996Q1	194.80
1978Q4	87.88	1987Q3	150.21	1996Q2	195.00
1979Q1	91.65	1987Q4	151.57	1996Q3	195.78
1979Q2	94.26	1988Q1	154.26	1996Q4	197.48
1979Q3	96.24	1988Q2	157.60	1997Q1	199.39
1979Q4	98.20	1988Q3	159.25	1997Q2	201.00
1980Q1	100.00	1988Q4	160.96	1997Q3	203.94
1980Q2	100.86	1989Q1	163.10	1997Q4	206.97
1980Q3	104.27	1989Q2	165.33	1998Q1	210.09
1980Q4	104.90	1989Q3	169.09	1998Q2	212.37
1981Q1	105.69	1989Q4	170.74	1998Q3	215.53
1981Q2	107.85	1990Q1	171.42	1998Q4	218.09
1981Q3	109.21	1990Q2	171.31	1999Q1	220.80
1981Q4	109.38	1990Q3	171.85	1999Q2	224.32
1982Q1	111.02	1990Q4	171.03	1999Q3	228.46
1982Q2	111.45	1991Q1	172.41	1999Q4	232.41
1982Q3	110.91	1991Q2	173.14	2000Q1	235.91
1982Q4	111.96	1991Q3	173.14	2000Q2	240.81
1983Q1	114.12	1991Q4	175.46	2000Q3	245.15
1983Q2	115.33	1992Q1	176.62		
1983Q3	116.15	1992Q2	176.26		

[1] These numbers are updated as necessary from subsequent releases of the HPI after 2000Q3.
[2] *Note:* If the underlying loans were originated before 1975, use the HPI from 1975Q1 as HPI_{ORIG}.

6. For each quarter q of the Stress Test, use UPB_q and the house price growth rates from the Benchmark regional time period:

$$LTV_q = LTV_0 \times \frac{\left(\dfrac{UPB_{m=3q-3}}{UPB_0}\right)}{exp\sum_{k=1}^{q} HPGR_K}$$

7. Generate Default, Prepayment and Performance vectors PRE_m, DEF_m and $PERF_m$ for each LTV subgroup. When LTV_{ORIG} is used as a categorical variable, use the corresponding range defined for each LTV subgroup in Table 3–59. For LTV subgroup 95 <LTV <100, use 90 <LTV_{ORIG} in Table 3–35.

[d] For each LTV subgroup, do not compute any Loss Severity or Credit Enhancement amounts. MBS investors receive the full UPB of defaulted loans.

[e] Compute Total Principal Received (TPR), Total Interest Received (TIR), and Amortization Expense (AE) for each LTV subgroup as directed in section 3.6.3.7.3, Stress Test Whole Loan Cash Flow Procedures and section 3.6.3.8.3, Whole Loan Accounting Flows Procedures, of this appendix, with the following exception:

1. For Net Interest Received (NIR), do not use the Net Yield Rate (NYR_m). Instead, use the Pass-Through Rate (PTR_m) for Fixed Rate Loans, and $INDEX_{m-1-LB}$ + Wt Avg Net Margin, subject to rate resets as described in section 3.6.3.3.3, Mortgage Amortization Schedule Procedures, [a]1.b.3) of this appendix, for ARMs.

2. Calculate Recovery Principal Received using a Loss Severity rate of zero (LS = 0).

[f] Sum over the LTV subgroups to obtain the original MBS's TPR, TIR and AE for m = 1...RM.

[g] Apply counterparty Haircuts in each month m as follows:

1. Compute:

$$HctFac_m = \frac{m'}{120} \times MaxHct\,(R)$$

Where:

m' = m, except for MBS credit rating below BBB where m' = 120

R = MBS credit rating

2. Compute:

$$HctAmt_m = \left(TPR_m + TIR_m\right) \times HctFac_m$$

[h] The resulting values, for each MBS, of TPR, TIR, AE, and HctAmt for months m = 1...RM are used in the section 3.10, Operations, Taxes, and Accounting, of this appendix.

3.7.3.2 REMICs and Strips

[a] Cash flows for REMICs and Strips are generated according to standard securities industry procedures, as follows:

1. From the CUSIP number of the security, identify the characteristics of the underlying collateral. This is facilitated by using a securities data service.
2. Calculate the cash flows for the underlying collateral in the manner described for whole loans and MBS, based on Stress Test interest, Default, and Prepayment rates appropriate for the collateral.
3. Calculate cash flows for the Multiclass MBS using the allocation rules specified in the offering materials.
4. Determine the cash flows attributable to the specific securities held by an Enterprise, applying the Enterprise's ownership percentage.
5. For securities not issued by the Enterprise or Ginnie Mae, reduce cash flows by applying the Haircuts specified in section 3.5, Counterparty Defaults, of this appendix, as appropriate.

[b] If a commercial information service is used for steps [a] 1 through 4 of this section, the information service may model mortgage product types beyond those described for Whole Loans in section 3.6, Whole Loan Cash Flows, and ARM indexes in addition to those listed in section 3.3, Interest Rates, of this appendix. In such cases, the cash flows used are generated from the actual data used by the information service for the underlying security.

3.7.3.3 Mortgage Revenue Bonds and Miscellaneous MRS

[a] Cash flows for mortgage revenue bonds and miscellaneous MRS are computed as follows:

1. From the start of the Stress Test until the first principal payment date at the start of the Principal Payment Window, the security pays coupon interest at the Security Interest Rate, adjusted as necessary according to the Security Rate Index and Adjustment information in Table 3–58, but pays no principal.
2. During the Principal Payment Window, the security pays principal and interest equal to the aggregate cash flow from a level pay mortgage whose term is equal to the length of the Principal Payment Window and whose interest rate is the Security Interest Rate. If the Security Interest Rate is zero (as in the case of zero-coupon MRBs), then the security pays principal only in level monthly payment amounts equal to the Current Security Balance divided by the length of the Principal Payment Window.
3. For securities not issued by the Enterprise or Ginnie Mae, reduce cash flows by applying the Haircuts specified in section 3.5, Counterparty Defaults, of this appendix, as appropriate.

3.7.3.4 Accounting

Deferred balances are amortized as described in section 3.6.3.8, Whole Loan Accounting Flows, of this appendix, using the Pass-Through Rate (or Security Interest Rate for MRBs) rather than the Net Yield Rate. For principal-only strips and zero-coupon MRBs, assume Allocated Interest is zero. If the conditions in section 3.6.3.8.3.1[a]3.a. of this appendix, apply, do not realize the full amount in the first month. Instead, amortize the deferred balances using a straight line method over a period from the start of the Stress Test through the latest month with a non-zero cash flow.

3.7.4 Mortgage-Related Securities Outputs

[a] The outputs for MBS and MRS Cash Flows, found in Table 3–61, are analogous to those specified for Whole Loans in section 3.6.4, Final Whole Loan Cash Flow Outputs, of this appendix, which are produced for each security for each month.

TABLE 3–61—OUTPUTS FOR MORTGAGE-RELATED SECURITIES

Variable	Description
TPR_m	Total Principal Received in month m = 1...RM
TIR_m	Total Interest Received in month m = 1...RM
$HctAmt_m$	Total Haircut amount in month m = 1...RM
AE_m	Amortization Expense for months m = 1...RM

[b] These outputs are used as inputs to the Operations, Taxes, and Accounting component of the Stress Test, which prepares pro forma financial statements. *See* section 3.10, Operations, Taxes, and Accounting, of this appendix.

3.8 Nonmortgage Instrument Cash Flows

3.8.1 Nonmortgage Instrument Overview

[a] The Nonmortgage Instrument Cash Flows component of the Stress Test produces instrument level cash flows and accounting flows (accruals and amortization) for the 120 months of the Stress Test for:

1. Debt
2. Nonmortgage investments
3. Guaranteed Investment Contracts (GICs)
4. Preferred stock
5. Derivative contracts
   a. Debt-linked derivative contracts
   b. Investment-linked derivative contracts
   c. Mortgage-linked derivative contracts
   d. Derivative contracts that hedge forecasted transactions
   e. Non-linked derivative contracts

[b] Although mortgage-linked derivative contracts are usually linked to mortgage assets rather than nonmortgage instruments, they are treated similarly to debt-linked and investment-linked derivative contracts and, therefore, are covered in this section.

[c] Debt, nonmortgage investments, and preferred stock cash flows include interest (or dividends for preferred stock) and principal payments or receipts, while debt-linked, investment-linked, and mortgage-linked derivative contract cash flows are composed of interest payments and receipts only. Debt, nonmortgage investments, and preferred stock are categorized in one of six classes[2] as shown in Table 3–62.

TABLE 3–62—DEBT, NON-MORTGAGE INVESTMENTS, AND PREFERRED STOCK CLASSIFICATIONS

Classification	Description
Fixed-Rate Bonds or Preferred Stock	Fixed-rate securities that pay periodic interest or dividends
Floating-Rate Bonds or Preferred Stock	Floating-rate securities that pay periodic interest or dividends
Fixed-Rate Asset-Backed Securities	Fixed-rate securities collateralized by nonmortgage assets
Floating-Rate Asset-Backed Securities	Floating-rate securities collateralized by nonmortgage assets
Short-Term Instruments	Fixed-rate, short-term securities that are not issued at a discount and which pay principal and interest only at maturity
Discount Instruments	Securities issued below face value that pay a contractually fixed amount at maturity

[d] Derivative contracts consist of interest rate caps, floors, and swaps. The primary difference between financial instruments and derivative contracts, in terms of calculating cash flows, is that interest payments on financial instruments are based on principal amounts that are eventually repaid to creditors, whereas interest payments on derivative contracts are based on notional amounts

[2] In addition to the items listed here, there are instruments that do not fit into these categories. Additional input information and calculation methodologies may be required for these instruments.

that never change hands. Debt- and investment-linked derivative contracts are categorized in one of seven classes[3] as shown in Table 3–63:

TABLE 3–63—DEBT- AND INVESTMENT-LINKED DERIVATIVE CONTRACT CLASSIFICATION

Classification	Description of Contract
Basis Swap	Floating-rate interest payments are exchanged based on different interest rate indexes
Fixed-Pay Swap	Enterprise pays a fixed interest rate and receives a floating interest rate
Floating-Pay Swap	Enterprise pays a floating interest rate and receives a fixed interest rate
Long Cap	Enterprise receives a floating interest rate when the interest rate to which it is indexed exceeds a specified level (strike rate)
Short Cap	Enterprise pays a floating interest rate when the interest rate to which it is indexed exceeds the strike rate
Long Floor	Enterprise receives a floating interest rate when the interest rate to which it is indexed falls below the strike rate
Short Floor	Enterprise pays a floating interest rate when the interest rate to which it is indexed falls below the strike rate

[e] Mortgage-linked swaps are similar to debt-linked swaps except that the notional amount of a mortgage-linked swap amortizes based on the performance of certain MBS pools. Mortgage-linked derivative contracts are divided into two classes[4] as shown in Table 3–64:

TABLE 3–64—MORTGAGE-LINKED DERIVATIVE CONTRACT CLASSIFICATION

Classification	Description of Contract
Fixed-Pay Amortizing Swaps	Enterprise pays a fixed interest rate and receives a floating interest rate, both of which are based on a declining notional balance
Floating-Pay Amortizing Swaps	Enterprise pays a floating interest rate and receives a fixed interest rate, both of which are based on a declining notional balance

[f] In a currency swap, the Enterprise receives payments that are denominated in a foreign currency and it makes payments in U.S. dollars. The main difference between currency swaps and the type of swaps discussed above is that in a currency swap principal amounts are actually exchanged between the two counterparties. Currency swaps are divided into two classes, as shown in Table 3–65.[5]

TABLE 3–65—CURRENCY SWAP CONTRACT CLASSIFICATION

Classification	Description of Contract
Fixed-for-Fixed Currency Swap	Enterprise receives fixed interest payments denominated in a foreign currency and makes fixed, US dollar-denominated payments
Fixed-for Floating Currency Swap	Enterprise receives fixed interest payments denominated in a foreign currency and makes payments in US dollar based on a floating interest rate

3.8.2 Nonmortgage Instrument Inputs

[a] The Nonmortgage Instrument Cash Flows component of the Stress Test requires numerous inputs. Instrument level inputs provided by the Enterprises in the RBC Report are listed in Table 3–66. Many instrument classes require simulated Interest Rates because their interest payments adjust periodically based on rates tied to various indexes. These rates are generated as described in section 3.3, Interest Rates, of this appendix.

[3] *Ibid.*
[4] *Ibid.*
[5] *Ibid.*

TABLE 3–66—INPUT VARIABLES FOR NONMORTGAGE INSTRUMENT CASH FLOWS

Data Elements	Description
Amortization Methodology Code	Enterprise method of amortizing deferred balances (e.g., straight line)
Asset ID	CUSIP or Reference Pool Number identifying the asset underlying a derivative position
Asset Type Code	Code that identifies asset type used in the commercial information service (e.g., ABS, Fannie Mae pool, Freddie Mac pool)
Associated Instrument ID	Instrument ID of an instrument linked to another instrument
Coefficient	Indicates the extent to which the coupon is leveraged or de-leveraged
Compound Indicator	Indicates if interest is compounded
Compounding Frequency	Indicates how often interest is compounded
Counterparty Credit Rating	NRSRO's rating for the counterparty
Counterparty Credit Rating Type	An indicator identifying the counterparty's credit rating as short-term ('S') or long-term ('L')
Counterparty ID	Enterprise counterparty tracking ID
Country Code	Standard country codes in compliance with Federal Information Processing Standards Publication 10–4
Credit Agency Code	Identifies NRSRO (e.g., Moody's)
Current Asset Face Amount	Current face amount of the asset underlying a swap
Current Coupon	Current coupon or dividend rate of the instrument
Current Unamortized Discount	Current unamortized premium or unaccreted discount of the instrument adjusted by the Unamortized Balance Scale Factor. If the proceeds from the issuance of debt or derivatives or the amount paid for an asset were greater than par, the value should be positive. If the proceeds or the amounts paid were less than par, the value should be negative
Current Unamortized Fees	Current unamortized fees associated with the instrument adjusted by the Unamortized Balance Scale Factor. Generally fees associated with the issuance of debt or derivatives should be negative numbers. Fees associated with the purchase of an asset should generally be reported as positive numbers
Current Unamortized Hedge	Current unamortized hedging gains (positive) or losses (negative) associated with the instrument adjusted by the Unamortized Balance Scale Factor
Current Unamortized Other	Any other unamortized items originally associated with the instrument adjusted by the Unamortized Balance Scale Factor. If the proceeds from the issuance of debt or derivatives or the amount paid for an asset was greater than par, the value should be positive. If the proceeds or the amounts paid were less than par, the value should be negative
CUSIP__ISIN	CUSIP or ISIN Number identifying the instrument
Day Count	Day count convention (e.g., 30/360)
End Date	The last index repricing date
EOP Principal Balance	End of Period face, principal or notional, amount of the instrument
Exact Representation	Indicates that an instrument is modeled according to its contractual terms

TABLE 3–66—INPUT VARIABLES FOR NONMORTGAGE INSTRUMENT CASH FLOWS—Continued

Data Elements	Description
Exercise Convention	Indicates option exercise convention (e.g., American Option)
Exercise Price	Par = 1.0; Options
First Coupon Date	Date first coupon is received or paid
Index Cap	Indicates maximum index rate
Index Floor	Indicates minimum index rate
Index Reset Frequency	Indicates how often the interest rate index resets on floating-rate instruments
Index Code	Indicates the interest rate index to which floating-rate instruments are tied (e.g., LIBOR)
Index Term	Point on yield curve, expressed in months, upon which the index is based
Instrument Credit Rating	NRSRO credit rating for the instrument
Instrument Credit Rating Type	An indicator identifying the instruments credit rating as short-term ('S') or long-term ('L')
Instrument ID	An integer used internally by the Enterprise that uniquely identifies the instrument
Interest Currency Code	Indicates currency in which interest payments are paid or received
Interest Type Code	Indicates the method of interest rate payments (e.g., fixed, floating, step, discount)
Issue Date	Indicates the date that the instrument was issued
Life Cap Rate	The maximum interest rate for the instrument throughout its life
Life Floor Rate	The minimum interest rate for the instrument throughout its life
Look-Back Period	Period from the index reset date, expressed in months, that the index value is derived
Maturity Date	Date that the instrument contractually matures

TABLE 3–66—INPUT VARIABLES FOR NONMORTGAGE INSTRUMENT CASH FLOWS—Continued

Data Elements	Description
Notional Indicator	Identifies whether the face amount is notional
Instrument Type Code	Indicates the type of instrument to be modeled (e.g., ABS, Cap, Swap)
Option Indicator	Indicates if instrument contains an option
Option Type	Indicates option type (e.g., Call option)
Original Asset Face Amount	Original face amount of the asset underlying a swap
Original Discount	Original premium or discount associated with the purchase or sale of the instrument adjusted by the Unamortized Balance Scale Factor. If the proceeds from the issuance of debt or derivatives or the amount paid for an asset were greater than par, the value should be positive. If the proceeds or the amounts paid were less than par, the value should be negative
Original Face	Original face, principal or notional, amount of the instrument
Original Fees	Fees or commissions paid at the time of purchase or sale adjusted by the Unamortized Balance Scale Factor. Generally fees associated with the issuance of debt or derivatives should be negative numbers. Fees associated with the purchase of an asset should generally be reported as positive numbers
Original Hedge	Gains (positive) or losses (negative) from closing out a hedge associated with the instrument at settlement, adjusted by the Unamortized Balance Scale Factor

TABLE 3–66—INPUT VARIABLES FOR NONMORTGAGE INSTRUMENT CASH FLOWS—Continued

Data Elements	Description
Original Other	Any other amounts originally associated with the instrument to be amortized or accreted adjusted by the Unamortized Balance Scale Factor. If the proceeds from the issuance of debt or derivatives or the amount paid for an asset were greater than par, the value should be positive. If the proceeds or the amounts paid were less than par, the value should be negative
Parent Entity ID	Enterprise internal tracking ID for parent entity
Payment Amount	Interest payment amount associated with the instrument (reserved for complex instruments where interest payments are not modeled)
Payment Frequency	Indicates how often interest payments are made or received
Performance Date	"As of" date on which the data is submitted
Periodic Adjustment	The maximum amount that the interest rate for the instrument can change per reset
Position Code	Indicates whether the Enterprise pays or receives interest on the instrument
Principal Currency Code	Indicates currency in which principal payments are paid or received
Principal Factor Amount	EOP Principal Balance expressed as a percentage of Original Face
Principal Payment Date	A valid date identifying the date that principal is paid
Settlement Date	A valid date identifying the date the settlement occurred
Spread	An amount added to an index to determine an instrument's interest rate
Start Date	The date, spot or forward, when some feature of a financial contract becomes effective (e.g., Call Date), or when interest payments or receipts begin to be calculated
Strike Rate	The price or rate at which an option begins to have a settlement value at expiration, or, for interest-rate caps and floors, the rate that triggers interest payments
Submitting Entity	Indicates which Enterprise is submitting information
Trade ID	Unique code identifying the trade of an instrument
Transaction Code	Indicates the transaction that an Enterprise is initiating with the instrument (e.g., buy, issue reopen)
Transaction Date	A valid date identifying the date the transaction occurred
UPB Scale Factor	Factor applied to UPB to adjust for timing differences
Unamortized Balances Scale Factor	Factor applied to Unamortized Balances to adjust for timing differences

[b] In addition to the inputs in Table 3–66, other inputs may be required depending on the characteristics of the instrument modeled. For example, the mortgage-linked derivative contract cash flows require inputs describing the performance of the mortgage assets to which they are linked, including Single Family Default and Prepayment rates (*See* section 3.6.3.4, Single Family Default and Prepayment Rates, of this appendix). Mortgage-linked derivative contract identification numbers (Asset IDs) are used to link the derivative contract to the required pool information that will be used to calculate the cash flows of the corresponding swap.

3.8.3 Nonmortgage Instrument Procedures

In general, non mortgage instruments are modeled according to their terms. The general methodology for calculating cash flows for principal and interest payments is described in this section and is not intended to serve as definitive text for calculating all possible present and future complex instruments. As mentioned in section 3.8.2, Nonmortgage Instrument Inputs, of this appendix, there are some instruments that may require additional input information and calculation methodologies. Simplifying assumptions are made for some instrument terms until they can be modeled more precisely.

3.8.3.1 Apply Specific Calculation Simplifications

[a] In order to produce cash flows, accruals, or amortization of deferred balances, the following simplifications are used for all instruments to which they apply. Should the language in any other portion of section 3.8, Nonmortgage Instrument Cash Flows, of this appendix, seem to conflict with a statement in this section, the language in section 3.8.3.1 takes precedence.

1. For day count methodology, use one of three methodologies 30/360, Actual/360, and Actual/365. All special day counts (i.e. Actual/366 B, Actual/366 S, Actual/366 E, and Actual/Actual) are treated as Actual/365.
2. Set the first index reset date to the First Coupon Date. If the Issue Date is later than the start of the Stress Test, use the Current Coupon Rate to determine the interest paid from Issue Date to First Coupon Date. When a calculation requires a rate that occurs before the start of the Stress Test, use the Current Coupon Rate. This applies to interest accrued but not paid for the start of the Stress test and to rate indexes where applying a Look Back Period requires data prior to the start of the Stress Test.
   a. If periodic caps are zero, change them to 999.99; If periodic floors are greater than 1, change them to zero.
   b. For instruments which have principal balance changes other than those caused by compounding interest, perform calculations as if the principal changes occur only on coupon dates (coupon dates on the fixed-rate leg for swaps) on or later than the first principal change date.
   c. When using a rate index for a specified term in an option exercise rule or as an index, assume that rate is appropriate for the calculation. Do not convert from bond equivalent yield to another yield form for a discount, monthly pay, quarterly pay, semi-annual pay or annual pay instrument.
3. When applying the option exercise rule:
   a. For zero coupon and discount securities, instruments with European options, and zero coupon swaps, evaluate option exercise only on dates listed in the instrument's option exercise schedule. For Bermudan options, evaluate option exercise on the first option date in the instrument's option exercise schedule and subsequent coupon dates (coupon dates on the fixed-rate leg for swaps). For American options, evaluate option exercise on the first option date in the instrument's option exercise schedule and subsequent monthly anniversaries of the instrument's first coupon date.
   b. Assume all call/put premiums/discounts are zero except for zero coupon instruments (including zero coupon swaps and discount notes). For these exceptions, when calculating a rate to compare with the Enterprise Cost of Funds, use the yield to maturity calculated by equating the face or notional amount plus the unamortized discount at the start of the Stress Test to the present value of the face or notional amount at maturity.
   c. Assume basis swaps and floating rate securities have no cancel, put, or call options.
   d. If the remaining maturity is greater than 360 months, use the equivalent-maturity Enterprise Cost of Funds as if the remaining maturity is 360 months.
   e. In the Stress Test, no preferred stock issued by the Enterprise will be called.

3.8.3.2 Determine the Timing of Cash Flows

Project payment dates from the payment date immediately prior to the start of the stress test according to the Payment Frequency, First Coupon Date, and Maturity Date.

3.8.3.3 Obtain the Principal Factor Amount at Each Payment Date

[a] Where there is no amortization or prepayment of principal, the Principal Factor Amount is 1.0 for each payment date until the stated Maturity Date, when it becomes zero.

[b] For debt and debt-linked derivative contracts that amortize, either a principal or a notional amortization schedule must be provided. If amortization information is unavailable, then the Principal Factor Amount is 1.0 for each payment date until the stated Maturity Date, when it becomes zero.

[c] Monthly prepayment rates are 3.5 percent for fixed-rate and 2.0 percent for floating-rate asset-backed securities. Furthermore, asset-backed securities are modeled through a commercial information service where possible. Instruments that cannot be modeled through the commercial information service are treated in accordance with section 3.9, Alternative Modeling Treatments, of this appendix.

[d] In the case of mortgage-linked derivative contracts, notional amounts are amortized based on the characteristics of the underlying pool in the manner described for principal balances of mortgage-backed securities held by an Enterprise in section 3.7, Mortgage-Related Securities Cash Flows, of this appendix.

3.8.3.4 Calculate the Coupon Factor

The Coupon Factor applicable to a given period, which applies to dividends also, depends on day count conventions used to calculate the interest payments for the instrument. For example, the Coupon Factor for a bond that pays interest quarterly based on a non-compounded 30/360 convention would be 3 (representing the number of months in a quarter) times 30 days divided by 360 days, or 0.25. Table 3–67 lists the most common day count conventions.

TABLE 3–67—DAY COUNT CONVENTIONS

Convention	Coupon Factor Calculation
30/360	Number of days between two payment dates assuming 30 days per month/360
Actual/360	Number of days between two payment dates/360
Actual/365	Number of days between two payment dates/365
Actual/Actual	Number of days between two payment dates/Number of days in the year

3.8.3.5 Project Principal Cash Flows or Changes in the Notional Amount

For all financial instruments, principal outstanding for the current period is determined by multiplying the Original Face by the Principal Factor Amount for the current period. The principal payment equals the amount of principal outstanding at the end of the previous period less the principal outstanding at the end of the current period, or zero if the instrument has a notional amount.

3.8.3.6 Project Interest and Dividend Cash Flows

3.8.3.6.1 Non-Complex Financial Instruments

[a] *Fixed-Rate Instruments*. The current period principal outstanding is multiplied by the product of the Current Coupon and current period Coupon Factor and rounded to even 100ths of a dollar.

[b] *Zero-Coupon Bonds*. Interest payments equal zero.

[c] *Discount Notes*. Interest payments equal zero.

[d] *Floating-Rate Instruments*. Interest payments are calculated as principal outstanding multiplied by the coupon for the current period. The current period coupon is calculated by adding a spread to the appropriate interest rate index and multiplying by the Coupon Factor. The coupon for the current period is set to this amount as long as the rate lies between the periodic and lifetime maximum and minimum rates. Otherwise the coupon is set to the maximum or minimum rate.

[e] *Interest Rate Caps and Floors*. These derivative instruments pay or receive interest only if the underlying index is above a Strike Rate (for caps) or below it (for floors). Interest payments are based on notional amounts instead of principal amounts.

1. The interest payment on a long cap is the Original Face multiplied by the amount, if any, by which the index exceeds the Strike Rate, as defined by the equation in Table 3–68. The interest payment on a long floor is the Original Face multiplied by the amount, if any, by which the index is below the Strike Rate. Otherwise interest payments are zero for caps and floors. Interest payments are either paid or received depending on whether the Enterprise is in a long or short position in a cap or a floor.
2. Monthly cash flows for long caps and floors are calculated as illustrated in Table 3–68:

TABLE 3–68—CALCULATION OF MONTHLY CASH FLOWS FOR LONG CAPS AND FLOORS

Instrument	Cash Flows
Cap	$(I - K) \times N \times D$ if $I > K$; O if $I \leq K$
Floor	$(K - I) \times N \times D$ if $I < K$; O if $I \geq K$

Where:

N = Original Face
K = Strike Rate
I = interest rate index
D = Coupon Factor

[f] *Swaps*. A derivative contract in which counterparties exchange periodic interest payments. Each swap leg (pay side or receive side) is modeled as a separate instrument, with interest payments based on the same notional amount but different interest rates.

1. For debt- and investment-linked swaps, each leg's interest payment is determined in the same manner as payments for fixed-rate, floating-rate or zero coupon instruments as described in paragraph [a], [b] and [d] of this section.
2. For mortgage-linked swaps, calculate the reduction in the notional amount due to scheduled monthly principal payments (taking into account both lifetime and reset period caps and floors), Prepayments, and Defaults of the reference MBS or index pool. Reduce the notional amount of the swap for the previous period by this amount to determine the notional amount for the current period. Calculate interest payments or receipts

for a given period as the product of the notional amount of the swap in that period, the coupon, and the Coupon Factor applicable for that period.

3.8.3.6.2 Complex Financial Instruments

[a] Some instruments have more complex or non-standard features than those described in section 3.8.3.6.1, Non-Complex Financial Instruments, of this appendix. These complexities can include more sophisticated variants of characteristics such as principal or notional amortization schedules, interest accrual methodologies, coupon reset formulas, and option features. In these instances, additional information may be required to completely specify the contractual cash flows or a proxy treatment for these instruments.

[b] An example of an instrument with complex features is an indexed amortizing swap. This instrument is non-standard because its notional amount declines in a way that is related to the level of interest rates. Its amortization table contains a notional amount reduction factor for a given range of interest rates. To compute cash flows for this instrument, reduce the notional amount on each payment date as specified in the amortization table. (The notional amount at the beginning of the Stress Period is given as an input to the calculation.)

[c] Special treatment is also required for foreign-currency-linked notes, the redemption value of which is tied to a specific foreign exchange rate. These require special treatment because the Stress Test does not forecast foreign currency rates. If these instruments are currency-hedged, then the note plus the hedge comprise a synthetic debt instrument for which only the pay side of the swap is modeled. If these instruments are not currency-hedged, the following treatment applies:

1. In the up-rate scenario, the U.S. dollar per unit of foreign currency ratio is increased in proportion to the increase in the ten-year CMT; therefore, the amount of an interest or principal payment is increased accordingly. For example, if the ten-year CMT shifts up by 50 percent, then the U.S. dollar per unit of foreign currency ratio shifts up by 50 percent. In the Stress Test, the payment would be multiplied by 1.5.
2. In the down-rate scenario, the foreign currency per U.S. dollar ratio is decreased in proportion to the decrease in the ten-year CMT.

[d] Futures and Options on Futures also require special treatment:

1. Settle positions on their expiration dates. Exercise only in-the-money options (settlement value greater than zero).
2. Settle all contracts for cash
3. Calculate the cash settlement amount—the change in price of a contract from the contract trade date to its expiration date. Calculate the price on the expiration date based on stress test interest rates (or, as necessary, forward rates extrapolated from these rates).
4. Amortize amounts received or paid at the expiration date into income or expense on a straight-line basis over the life of the underlying instrument (in the case of an option on a futures contract, the life of the instrument underlying the futures contract).
5. Amortize an option premium on a straight-line basis over the life of the option. (Amortize any remaining balances upon option exercise.)

[e] Swaptions also require special treatment:

1. Assume swap settlement (i.e., initiation of the underlying swap) when a swap option is exercised.
2. Calculate a ''normalized'' fixed-pay coupon by subtracting the spread over the index, if any, from the coupon on the fixed-rate swap leg.
3. For all exercise types (American, Bermudan, and European), consistent with RBC Rule section 3.8.3.7, assume exercise by the party holding the swap option if the equivalent maturity Enterprise Cost of Funds is more than
   a. 50 basis points above the normalized fixed-pay coupon, for a pay-fixed swaption (a call or 'payor'' swaption), or
   b. 50 basis points below the normalized fixed pay coupon for a receive-fixed swaption (a put or 'receiver' swaption).
4. Amortize option premiums on a straight-line basis over the option term. (Amortize any remaining balances upon option exercise).

[f] CPI-Linked Instruments also require special treatment. The stress test lacks the ability to accommodate floating-rate instruments that reset in response to changes in the consumer price index (CPI) as published by the Bureau of Labor Statistics. Enterprise issuance of CPI-linked instruments is tied to swap market transactions intended to create desired synthetic debt structure and terms. In such cases, the true economic position nets to the payment terms of the related derivative contract. Accordingly, in order to accommodate and address the existence of CPI-linked instruments in the Enterprises' portfolios, the net synthetic position shall be evaluated in the stress test. That is, for CPI-linked instruments tied to swap transactions that are formally linked in a hedge accounting relationship, the Enterprise should substitute the CPI-linked instrument's coupon payment terms with those of the related swap contract.

[g] Pre-refunded municipal bonds also require special treatments. Pre-refunded municipal bonds are collateralized by securities that are structured to fund all the cash flows

of the refunded municipal bonds until the bonds are callable. Since the call date for the bonds, also referred to as the pre-refunded date, is a more accurate representation of the payoff date than the contractual maturity date of the bonds, the stress test models the bonds to mature on the call date.

[h] If a financial instrument's inputs are described in section 3.1, Data, of this appendix, then model the instrument according to its terms; however, the Director reserves the authority to determine a more appropriate treatment if modeling the instrument according to its terms does not capture the instrument's impact on Enterprise risk. If the financial instrument's inputs are not described in section 3.1, then treat it as described in section 3.9, Alternative Modeling Treatments, of this appendix.

3.8.3.7 Apply Call, Put, or Cancellation Features, if Applicable

[a] In some cases, principal and interest cash flows may be altered due to options imbedded in individual financial instruments. Securities can be called or put and contracts can be cancelled at the option of the Enterprise or the counterparty. The Option Type, Exercise Convention Type, and the Start Date determine when an option may be exercised. There are three standard Exercise Convention Types, all of which are accommodated in the Stress Test:

- American—Exercise can occur at any time after the Start Date of the option.
- European—Exercise can occur only on the Start Date of the option.
- Bermudan—Exercise can occur only on specified dates, usually on coupon payment dates between the Start Date of the option and maturity.

[b] The options are treated in the following manner for each date on which the option can be exercised:

1. Project cash flows for the instrument with the imbedded option assuming that the option is not exercised. If the instrument is tied to an index, assume that the index remains constant at its value on that date.
2. Determine the discount rate that equates the outstanding balance of the security plus option premium and accrued interest to the sum of the discounted values of the projected cash flows. This discount rate is called the yield-to-maturity.
3. Convert the yield-to-maturity to a bond-equivalent yield and compare the bond-equivalent yield with the projected Enterprise Cost of Funds for debt with an equivalent maturity. Interpolate linearly if the maturity is not equal to one of the maturities specified in section 3.3, Interest Rates, of this appendix.
4. If the equivalent-maturity Enterprise Cost of Funds is lower (higher) than 50 basis points below (above) the bond-equivalent yield of the callable (putable) instrument, then the option is exercised. Otherwise, the option is not exercised, and it is evaluated at the next period when the option can be exercised.

[c] Some swap derivative contracts have cancellation features that allow either counterparty to terminate the contracts on certain dates. The cancellation feature is evaluated by comparing the fixed-rate leg of the swap to the Enterprise Cost of Funds. If either leg of the swap is cancelled, then the other leg is cancelled concurrently. Cancellable swaps are treated in the following manner:

1. For each period when an option can be exercised, compare the swap's fixed-leg coupon rate to the Enterprise Cost of Funds with a maturity equivalent to the maturity date of the swap.
2. If the option is a Call, it is deemed to be exercisable at the discretion of the Enterprise. If the option is a Put, it is deemed to be exercisable at the discretion of the Counterparty. If the option is a PutCall, it is deemed to be exercisable at the discretion of either party to the swap. Exercise the option when the swap is out of the money for the party who holds the option. A swap is considered out of the money when the rate on its fixed leg is at least 50 basis point higher or lower, depending upon whether the fixed rate is paid or received, than the like-maturity Enterprise Cost of Funds. For zero coupon swaps in all option exercise periods, use the yield to maturity calculated by equating the notional amount plus the unamortized discount at the start of the Stress Test to the present value of the notional amount at maturity.
   a. For example, if the Enterprise holds a call option for a fixed-pay swap and the coupon rate on the fixed-pay leg is at least 50 basis points above the Enterprise cost of funds for a maturity equivalent to that of the swap, then cancel the swap. Otherwise, the swap is not cancelled and it is evaluated the next time that the swap can be cancelled.

3.8.3.8 Calculate Monthly Interest Accruals for the Life of the Instrument

[a] Monthly interest accruals are calculated by prorating the interest cash flows on an actual-day basis. In this section, the term ''from'' means from and including, ''to'' means up to and not including, and ''through'' means up to and including. As an example, from the first to the third of a month is two days from the first through the third is three days. This convention is used to facilitate the day count and does not imply on which day's payments or accruals are actually made. Use one of the three following methodologies with the exception

that interest cash flow dates occurring on or after the 30th of a month are considered as occurring on the last day of the month:

1. If the final interest cash flow occurs within the month, the interest accrual for that month is calculated by multiplying the final interest cash flow amount (as calculated in section 3.8.3.6 of this appendix) times the number of days from the beginning of the month through the final maturity date divided by the number of days from the previous interest cash flow date to the maturity date.
2. If an interest cash flow other than the final interest cash flow occurs within a month, the interest accrual for that month is determined by multiplying the interest cash flow amount for the current month times the number of days from the beginning of the month through the interest cash flow date, divided by the number of days from the previous interest cash flow date (or issue date) to this interest cash flow date. To this add the interest cash flow amount for the next interest cash flow date times the number of days from the current month's interest cash flow date to the end of the month, divided by the number of days from the current month's interest cash flow date to the following next interest cash flow date.
3. If no interest cash flows occur during a month other than the issue month, the monthly interest accrual is calculated by multiplying the next interest cash flow amount times the number of days in the month divided by the number of days from the previous interest cash flow date to the next interest cash flow date.
4. If the issue month occurs after the start of the Stress Test, the monthly interest accrual is calculated by multiplying the next interest cash flow amount by the number of days in the month minus the day of issue, divided by the number of days from the issue date to the next interest cash flow date.

3.8.3.9 Calculate Monthly Amortization (Accretion) of Premiums (Discounts) and Fees

[a] Adjust monthly interest accruals (*see* section 3.10.3.6.1[a]3., of this appendix) to reflect the value over time of discounts, premiums, fees and hedging gains and losses incurred (Deferred Balances). Amortize Deferred Balances that exist at the beginning of the Stress Test until the instrument's Maturity Date. If there are any put, call, or cancel options that are executed, amortize any remaining Deferred Balances in the execution month.

TABLE 3–69—INPUTS FOR NONMORTGAGE INSTRUMENT ACCOUNTING FLOWS

Variable	Description	Source
MD	Maturity Date	Table 3–66, Input Variables for Nonmortgage Instrument Cash Flows
UDB_0	The sum of Current Unamortized Discount, Current Unamortized Hedge, and Current Unamortized Other (Deferred Balances) for the instrument at the start of the Stress Test	Table 3–66, Input Variables for Nonmortgage Instrument Cash Flows
$MACRU_m$	Monthly Interest Accruals	section 3.8.3.8, Calculate Monthly Interest Accruals for the Life of the Instrument
$EOMPBAO_m$	Principal Balance at the end of the month for months m = 0...RM after modeling all options execution	section 3.8.3.6, Project Interest and Dividend Cash Flows
$EOMPB_m$	Principal Balance at the end of the month for months m = 0...RM before modeling any options execution	section 3.8.3.6, Project Interest and Dividend Cash Flows

1. Compute Remaining Term (RM) as follows:

$$RM = 12 \times (\text{year }(MD) - \text{year }(STDT)) + \text{month }(MD) - \text{month }(STDT) + 1$$

Where:

STDT is the Starting Date of the Stress Test

2. For nonmortgage instruments with notional principal, calculate the monthly Amortization Amount (AA_m) for each month m = 1...RM:

$$AA_m = -\frac{UDB_0}{RM} \text{ if } EOMPBAO_m > 0$$

$$AA_m = -UDB_{m-1} \text{ if } EOMPBAO_m = 0$$

$$UDB_m = UDB_{m-1} + AA_m$$

3. For nonmortgage instruments with principal and interest payments,

a. Compute Allocated Interest for all months m (AI_m) as follows:

$$AI_m = \left[\frac{EOMPB_{m-1}}{\sum_{k=0}^{RM} EOMPB_k} \right] \times \sum_{k=1}^{RM} MACRU_k$$

b. Calculate the monthly Internal Rate of Return (IRR) that equates the adjusted cash flows (actual principal plus allocated interest) to the Initial Book Value (BV_0) of the instrument. Solve for IRR such that:

$$BV_0 = \sum_{m=1}^{RM} \frac{ACF_m}{(1+IRR)^m}$$

Where:

$BV_0 = EOMPB_0 + UPD_0$

$ACF_m = EOMPB_{m-1} - EOMPB_m + AI_m$

c. Calculate the monthly Amortization Amount (AA_m) for each month m = 1...RM:

$$AA_m = (BV_{m-1} \times IRR) - AI_m \text{ if } EOMPBAO_m > 0$$

$$AA_m = -UDB_{m-1} \text{ if } EOMPBAO_m = 0$$

$$UDB_m = UDB_{m-1} + AA_m$$

$$BV_m = EOMPBAO_m + UDB_m$$

4. For discount notes,

a. Calculate Remaining Maturity in Actual Days (RMD):

$$RMD = MD - STDT + 1$$

b. Calculate the month Amortization Amount (AA_m) for each month m = 1...RM:

$$AA_m = -UDB_0 \times \frac{ADAYS_m}{RDM} \text{ if } EOMPBAO_m > 0$$

$$AA_m = -UDB_{m-1} \text{ if } EOMPBAO_m = 0$$

$$UDB_m = UDB_{m-1} + AA_m$$

Where:

$ADAYS_m$ = actual number of days in month m (days from the first of the month through maturity in month RM)

5. For zero coupon bonds,

a. Calculate Remaining Maturity in Actual Days (RMD):

$$RMD = MD - STDT + 1$$

b. Calculate Yield Factor (YF):

$$YF = \left(\frac{EOMPB_0}{EOMPB_0 + UDB_0} \right)^{\frac{1}{RMD}}$$

c. Calculate the monthly Amortization Factor (AF_m) for each month m = 1...RM:

$$AF_m = 1 \text{ if } m = 0$$

$$AF_m = AF_{m-1} \times YF^{ADAYS_m}$$

Where:

$ADAYS_m$ = actual number of days in month m (days from the first of the month through maturity in month RM):

d. Calculate the monthly Amortization Amount (AA_m) for each month m = 1...RM

$$AA_m = (EOMPB_0 + UDB_0) \times (AF_m - AF_{m-1}) \text{ if } EOMPBAO_m > 0$$

$$AA_m = -UDB_{m-1} \text{ if } EOMPBAO_m = 0$$

$$UDB_m = UDB_{m-1} + AA_m$$

3.8.3.10 Apply Counterparty Haircuts

[a] Finally, the interest and principal cash flows received by the Enterprises for nonmortgage instruments other than swaps and foreign currency-related instruments are

Haircut (i.e., reduced) by a percentage to account for the risk of counterparty insolvency, if a counterparty obligation exists. The amount of the Haircut is calculated based on the public rating of the counterparty and time during the stress period in which the cash flow occurs, as specified in section 3.5, Counterparty Defaults, of this appendix.

[b] An Enterprise may issue debt denominated in, or indexed to, foreign currencies, and eliminate the resulting foreign currency exposure by entering into currency swap agreements. The combination of the debt and the swap creates synthetic debt with principal and interest payments denominated in U.S. dollars. The Haircuts for currency swaps are applied to the pay (dollar-denominated) side of the currency swaps, or to the cash outflows of the synthetic debt instrument. Therefore, the payments made by the Enterprise on a foreign currency contract are increased by the haircut amount. The Haircuts and the Phase-in periods for currency swaps are detailed in Table 3–31, under Derivative Contracts.

[c] Haircuts for swaps that are not foreign currency related are applied to the Monthly Interest Accruals (as calculated in section 3.8.3.8, of this appendix) on the receive leg minus the Monthly Interest Accruals on the pay leg when this difference is positive. Use the maximum haircut from Table 3–31 for periods before and after the implementation of netting, as appropriate. After the implementation of netting, net the swap proceeds for each counterparty before applying the haircuts. The following example applies to an Enterprise having two swaps with the same counterparty. On the first swap, the Enterprise pays fixed and receives floating and on the second swap it pays floating and receives fixed. If the counterparty is a net payer to the Enterprise, the haircuts will be applied to the sum of the two receive legs net of the sum of the two pay legs.

3.8.4 Nonmortgage Instrument Outputs

[a] Outputs consist of cash flows and accounting information for debt, nonmortgage investments, preferred stock, and derivative contracts. Cash flows and accounting information outputs are inputs to section 3.10, Operations, Taxes, and Accounting, of this appendix.

[b] Cash flows include the following monthly amounts:

1. Interest and principal payments for debt and nonmortgage investments,
2. Dividends and redemptions for preferred stock, and
3. Interest payments for debt-linked, investment-linked, and mortgage-linked derivative contracts.

[c] Accounting information includes the following monthly amounts:

1. Accrued interest and
2. Amortization of discounts, premiums, fees and other deferred items.

3.9 Alternative Modeling Treatments

3.9.1 Alternative Modeling Treatments Overview

[a] This section provides treatment for items that cannot be modeled in one of the ways specified in paragraph [b] of this section, but must be included in order to run the Stress Test. Because the rule provides treatments for a wide variety of instruments and activities that can be applied to accommodate unusual instruments, OFHEO expects few items to fall into this category.

[b] An Alternative Modeling Treatment (AMT) applies to any on- or off-balance-sheet item that is missing data elements required to calculate appropriate cash flows, or any instrument with unusual features for which this appendix does *not*:

1. Provide an explicit computational procedure and set of inputs (i.e., the appendix specifies exact data inputs and procedures for a class of instruments to which the item belongs); or,
2. Provide an implicit procedure (used for a general class of instruments), and explicit inputs that allow the item to be fully characterized for computational purposes (i.e., the appendix specifies procedures and data inputs for a class of instruments to which the item does not belong that can be applied to the item to accurately compute its cash flows); or
3. Provide an implicit procedure by exact substitution, i.e., by representing the item as a computationally equivalent combination of other items that are specified in paragraphs (1) or (2) in this section (i.e., the appendix specifies treatments for two or more instruments, which, in combination, exactly produce the item's cash flows); or
4. Permit the approximation of one or more computational characteristics by other similar values that are explicitly specified in this appendix, or in the RBC Report instructions (i.e., the appendix specifies a treatment, or combination of treatments, that can be used as a reasonable proxy for the computational characteristics of the item). Such proxy treatments must be approved by OFHEO. OFHEO may, in its discretion, approve a proposed proxy treatment, adopt a different proxy treatment, or treat items for which a proxy treatment has been proposed by the Enterprises according to the remaining provisions of section 3.9, Alternative Modeling Treatments, of this appendix.

[c] For a given on- or off-balance sheet item, the appropriate AMT is determined according to the categories specified in section

3.9.3, Alternative Modeling Treatments Procedures, of this appendix, based on the information available for that item. The output for each such item is a set of cash and accounting flows, or specific amounts to be applied in section 3.12, Calculation of the Risk-Based Capital Requirement, of this appendix.

3.9.2 Alternative Modeling Treatments Inputs

Table 3–70 identifies the minimal inputs that are used to determine an AMT. (*See also* section 3.1, Data, of this appendix)

TABLE 3–70—ALTERNATIVE MODELING TREATMENT INPUTS

Variable	Description
TYPE	Type of item (asset, liability or off-balance sheet item)
BOOK	Book Value of item (amount outstanding adjusted for deferred items)
FACE	Face Value or notional balance of item for off-balance sheet items
REMATUR	Remaining Contractual Maturity of item in whole months. Any fraction of a month equals one whole month.
RATE	Interest Rate
INDEX	Index used to calculate Interest Rate
FAS115	Designation that the item is recorded at fair value, according to FAS 115
RATING	Instrument or counterparty rating
FHA	In the case of off-balance sheet guarantees, a designation indicating 100% of collateral is guaranteed by FHA
MARGIN	Margin over an Index

3.9.3 Alternative Modeling Treatments Procedures

For each item, one of the following alternatives will be applied:

3.9.3.1 Off-Balance Sheet Items

[a] If the item is a guarantee of a tax-exempt multifamily housing bond, or a single family or multifamily whole-loan REMIC class rated triple-A, or other similar transaction guaranteed by the Enterprises, multiply the face value of the guaranteed instruments by 0.45 percent. This amount is added to the amount of capital required to maintain positive total capital throughout the ten-year Stress Period. Any instruments or obligations with 100 percent of collateral guaranteed by the Federal Housing Administration (FHA) are excluded from this calculation.

[b] Otherwise, add to the amount of capital required to maintain positive total capital throughout the ten-year Stress Period an amount equal to the face or notional value of the item at the beginning of the Stress Period times three percent.

3.9.3.2 Reconciling Items

Reconciling items falling into this category will be treated according to the specifications in section 3.10, Operations, Taxes, and Accounting, of this appendix.

3.9.3.3 Balance Sheet Items

[a] If the item is a trading security recorded at fair value according to FAS 115, then the book value (the face value adjusted for deferred balances) will be converted to cash in the first month of the Stress Test.

[b] Otherwise, if the item is an earning asset, then it is treated as a held-to-maturity asset, based on book value, as follows:

1. In the up-rate scenario, it will be treated as a held-to-maturity bond paying compound interest on a 30/360 basis at maturity, with the item's contractual maturity and rate. The item will be Haircut according to its rating. If no maturity is provided, maturity will be set at 120 months. If no rate is provided, a rate will be assigned at the Initial Enterprise Cost of Funds whose term is equal to the remaining maturity, less 200 basis points (but not less than zero). If no rating is provided, the asset will be classified as unrated.
2. In the down-rate scenario, it will be treated as a held-to-maturity bond paying compound interest on a 30/360 basis at maturity, with the item's contractual

maturity and rate. The item will be Haircut according to its rating. If no maturity is provided, maturity will be set at 120 months. If no rate is provided, a rate will be assigned at the floating one-month Enterprise Cost of Funds less 200 basis points (but not less than zero). If no rating is provided, the asset will be classified as unrated.

[c] If the item is a non-earning asset it will remain on the books and earn no interest throughout the Stress Period.

[d] Otherwise, if the item is a liability, then it is treated as follows, based on book value:

1. In the up-rate scenario, it will be treated as non-callable and monthly coupon-paying to maturity on a 30/360 basis. If the coupon rate is not specified, the liability will be given a floating rate at the one-month Enterprise Cost of Funds plus 200 basis points. If no maturity is provided, maturity will be set at 120 months.
2. In the down-rate scenario, it will be treated as non-callable and monthly coupon paying to maturity. If no coupon is provided, the liability will be given a fixed rate at the Initial Enterprise Cost of Funds plus 200 basis points. If no maturity is provided, maturity will be set at ten years.

[e] Unamortized Balances should be amortized on a straight-line basis over the designated remaining maturity of the instrument.

[f] All items in this section are treated as if they had no options or cancellation features. The face value will be held constant until maturity. If an item has an adjustable rate, it is assumed that the interest rate will adjust monthly with no caps and a lifetime floor of zero percent.

3.9.4 Alternative Modeling Treatments Outputs

For each AMT item, the output is a set of cash and accounting flows appropriate to its respective treatment as specified in section 3.9.3, Alternative Modeling Treatments Procedures, or specific amounts to be applied in section 3.12, Calculation of the Risk-Based Capital Requirement, of this appendix.

3.10 Operations, Taxes, and Accounting

3.10.1 Operations, Taxes, and Accounting Overview

This section describes the procedures for determining new debt issuance and investments, computing capital distributions, calculating operating expenses and taxes, and creating pro forma balance sheets and income statements. Input data include an Enterprise's balance sheet at the beginning of the Stress Period, interest rates from the Interest Rates component of the Stress Test, and the outputs from cash flow components of the Stress Test. The outputs of the procedures discussed in this section—monthly pro forma balance sheets, cash flow and income statements for each month of the Stress Test—are the basis for the capital calculation described in section 3.12, Calculation of the Risk-Based Capital Requirement, of this appendix.

3.10.2 Operations, Taxes, and Accounting Inputs

[a] Data described in section 3.1, Data, section 3.3.4, Interest Rates Outputs, section 3.6.4, Final Whole Loan Cash Flow Outputs, section 3.7.4, Mortgage-Related Securities Outputs, and section 3.8.4, Nonmortgage Instrument Outputs, of this appendix, is used to produce monthly pro forma balance sheets and income statements for the Enterprises. In addition to the starting position data, described in the cash flow components, the Enterprises provide the starting position dollar values for the items in Table 3–71.

TABLE 3–71—OPERATIONS, TAXES, AND ACCOUNTING INPUTS

Input	Description
FAS 115 and 125 fair value adjustment on retained mortgage portfolio	
FAS 133 fair value adjustment on retained mortgage portfolio	
Reserve for losses on retained mortgage portfolio	
FAS 115 and 125 fair value adjustments on non-mortgage investments	
FAS 133 fair value adjustments on non-mortgage investments	

TABLE 3–71—OPERATIONS, TAXES, AND ACCOUNTING INPUTS—Continued

Input	Description
Total cash	
Accrued interest receivable on mortgages	
Accrued interest receivable on non-mortgage investment securities	
Accrued interest receivable on non-mortgage investment securities denominated in foreign currency—hedged	
Accrued interest receivable on non-mortgage investment securities denominated in foreign currency—unhedged	
Accrued interest receivable on mortgage-linked derivatives, gross	
Accrued interest receivable on investment-linked derivatives, gross	
Accrued interest receivable on debt-linked derivatives, gross	
Other accrued interest receivable	
Accrued interest receivable on hedged debt-linked foreign currency swaps	Underlying instrument is GSE issued debt
Accrued interest receivable on unhedged debt-linked foreign currency swaps	
Accrued interest receivable on hedged asset-linked foreign currency swaps	Underlying instrument is an asset
Accrued interest receivable on unhedged asset-linked foreign currency swaps	
Currency transaction adjustments—hedged assets	Cumulative gain or loss due to changes in foreign exchange rates relative to on-balance sheet assets originally denominated in foreign currency
Currency transaction adjustments—unhedged assets	Cumulative gain or loss due to changes in foreign exchange rates relative to unhedged assets and off-balance sheet items originally denominated in foreign currency
Federal income tax refundable	
Accounts receivable	
Fees receivable	
Low income housing tax credit investments	
Fixed assets, net	
Clearing accounts	Net book value of all clearing accounts
Other assets	
Foreclosed property, net	Real estate owned including property acquired through foreclosure proceedings

TABLE 3–71—OPERATIONS, TAXES, AND ACCOUNTING INPUTS—Continued

Input	Description
FAS 133 fair value adjustment on debt securities	
Accrued interest payable on existing fixed-rate debt securities	
Accrued interest payable on existing floating-rate debt securities	
Accrued interest payable on existing debt issued in foreign currency—hedged	
Accrued interest payable on existing debt issued in foreign currency—unhedged	
Accrued interest payable on mortgage-linked derivatives, gross	
Accrued interest payable on investment-linked derivatives, gross	
Accrued interest payable on debt-linked derivatives, gross	
Other accrued interest payable	
Accrued interest payable debt-linked foreign currency swaps—hedged	
Accrued interest payable debt-linked foreign currency swaps—unhedged	
Accrued interest payable asset-linked foreign currency swaps—hedged	
Accrued interest payable asset-linked foreign currency swaps—unhedged	
Principal and interest due to mortgage security investors	Cash received on sold mortgages for onward submission to mortgage security investors
Currency transaction adjustments—hedged debt	Cumulative gain or loss due to changes in foreign exchange rates relative to on-balance sheet debt originally denominated in foreign currency
Currency transaction adjustments—unhedged debt	Cumulative gain or loss due to changes in foreign exchange rates relative to unhedged liabilities and off-balance sheet items originally denominated in foreign currency
Escrow deposits	Cash balances held in relation to servicing of multifamily loans
Federal income taxes payable	
Preferred dividends payable	
Accounts payable	
Other liabilities	
Common dividends payable	
Reserve for losses on sold mortgages	

TABLE 3–71—OPERATIONS, TAXES, AND ACCOUNTING INPUTS—Continued

Input	Description
Common stock	
Preferred stock, non-cumulative	
Additional paid-in capital	
Retained earnings	
Treasury stock	
Unrealized gains and losses on available-for-sale securities, net of tax, in accordance with FAS 115 and 125	
Unrealized gains and losses due to mark to market adjustments, FAS 115 and 125	
Unrealized gains and losses due to deferred balances related to pre-FAS 115 and 125 adjustments	
Unrealized gains and losses due to other realized gains, FAS 115	
Other comprehensive income, net of tax, in accordance with FAS 133	
OCI due to mark to market adjustments, FAS 133	
OCI due to deferred balances related to pre-FAS 133 adjustments	
OCI due to other realized gains, FAS 133	
Operating expenses	Average of prior three months
Common dividend payout ratio (average of prior 4 quarters)	Sum dollar amount of common dividends paid over prior 4 quarters and divided by the sum of total of after tax income less preferred dividends paid over prior 4 quarters
Common dividends per share paid 1 quarter prior to the beginning of the stress period	
Common shares outstanding	
Common Share Market Price	
Dividends paid on common stock 1 quarter prior to the beginning of the stress period	
Share Repurchases (average of prior 4 quarters)	Sum dollar amount of repurchased shares, net of newly issued shares, over prior 4 quarters and divided by 4
Off-balance-sheet Guarantees	Guaranteed instruments not reported on the balance sheet, such as whole loan REMICs and multifamily credit enhancements, and not 100% guaranteed by the FHA
Other Off-Balance Sheet Guarantees	All other off-balance sheet guaranteed instruments not included in another category, and not 100% guaranteed by the FHA

TABLE 3–71—OPERATIONS, TAXES, AND ACCOUNTING INPUTS—Continued

Input	Description
YTD provision for income taxes	Provision for income taxes for the period beginning January 1 and ending as of the report date
Tax loss carryforward	Net losses available to write off against future years' net income
Tax liability for the year prior to the beginning of the Stress Test	
Tax liability for the year 2 years prior to the beginning of the Stress Test (net of carrybacks)	
Taxable income for the year prior to the beginning of the Stress Test	
Taxable income for the year 2 years prior to the beginning of the Stress Test (net of carrybacks)	
Net after tax income for the quarter preceding the start of the stress test	
YTD taxable income	Total amount of taxable income for the period beginning January 1 and ending as of the report date
Minimum capital requirement at the beginning of the Stress Period	
Specific allowance for loan losses	Loss allowances calculated in accordance with FAS 114
Zero coupon swap receivable	
Unamortized discount on zero coupon receivable	

[b] Amounts required to reconcile starting position balances from cash flow components of the Stress Test with an Enterprise's balance sheet will be reported in the RBC Report with the related instrument. The corresponding balance for the related instrument will be adjusted accordingly.

3.10.3 Operations, Taxes, and Accounting Procedures

The Stress Test calculates new debt and investments, dividends, allowances for loan losses, operating expenses, and income taxes. These calculations are determined by, and also affect, the pro forma balance sheets and income statements during the Stress Period.

3.10.3.1 New Debt and Investments

[a] For each month of the Stress Test, cash deficits and surpluses are eliminated by issuing new debt or purchasing new investments. The Stress Test calculates cash received and cash disbursed each month in order to determine the net availability of cash. Depending on the calculated net cash position at month end, new short term investments are purchased at mid-month or a mix of long and short term debt is issued at mid-month so that the recalculated net cash position at month end is zero.

[b] For each month of the Stress Test, the following calculations are performed to determine the amount and type of new debt and investments. The short-term investments and appropriate mix of long-term and short-term debt are reflected in the pro forma balance sheets. Interest income or interest expense for the new investments or debt are reflected in the pro forma income statements.

1. In any month in which the cash position is positive at the end of the month, the Stress Test invests the Enterprise's excess cash on the 15th day of that month in one-month Treasury bills that yield the six-month Treasury rate for that month as specified in section 3.3, Interest Rates, of this appendix.
2. In any month in which the cash position is negative at the end of the month, the Stress Test issues a mix of new short-term and long-term debt on the 15th day of that month. New short-term debt issued is six-month discount notes with a

discount rate at the six-month Enterprise Cost of Funds as specified in section 3.3, Interest Rates, of this appendix, with interest accruing on a 30/360 basis. New long-term debt issued is five-year bonds not callable for the first year (''five-year-no call-one'') with an American call at par after the end of the first year, semiannual coupons on a 30/360 basis with principal paid at maturity or call, and a coupon rate set at the five year Enterprise Cost of Funds as specified in section 3.3, Interest Rates, of this appendix, plus a 50 basis point premium for the call option. During the Stress Test, the call option for new long-term debt issued is not executed in the up-rate scenario and in the down-rate scenario follows the same call exercise rule as other debt. An issuance cost of 2.5 basis points is assessed on new short-term debt at issue and an issuance cost of 20 basis points is assessed on new long-term debt at issue. New long-term debt is issued to target a total debt mix of short- to long-term debt that is the same as the short- to long-term debt mix at the beginning of the Stress Test. Issuance fees for new debt are amortized on a straight line basis to the maturity of the appropriate instrument.

3. Given the Net Cash Deficit (NCD_m) in month m, use the following constants and method to calculate the amount of short-term and long-term debt to issue in month m:

a. Set the Issuance Cost on new short-term debt at issue (ISCOST):
ISCOST = 0.00025

b. Set the Issuance Cost on new long-term debt at issue (ILCOST):
ILCOST = 0.002

c. Calculate Net Short-term Debt Outstanding ($NSDO_0$) and Total Debt Outstanding (TDO_0) at the start of the Stress Test (m = 0) using the following methodology:

1) For each month m and each debt and swap instrument i (each swap leg is considered a separate instrument), determine the Month of Next Repricing (MNR_m) defined as the first month greater than m in which the instrument matures or repricing can occur whether or not the coupon rate actually changes. Set the Principal Balance (PB_m) to be:

a) The principal (or notional principal) outstanding if the instrument cash flows are paid by the Enterprise,

b) Minus the principal (or notional principal) outstanding if the instrument cash flows are received by the Enterprise.

c) Zero if m is less than or equal to the issue month or the month in which an option exercised during the stress test would begin accruing cash flows to or from the Enterprise.

d) Zero if m is greater than or equal to the maturity month or the month in which an option exercised during the stress test would cease further cash flows to or from the Enterprise.

2) Calculate $NSDO_m$ by summing $PB_{m,i}$ for all instruments where $MNR_{m,i}$ is less than or equal to m plus 12.

3) Calculate TDO_m by summing $PB_{m,i}$ for instruments where $MNR_{m,i}$, is greater than m.

d. Set the Maximum Proportion of Total Debt (MPD):

$$MPD = \frac{TDO_0 - NSDO_0}{TDO_0}$$

e. Calculate Discount Rate Factor (DRF_m):

$$DRF_m = \left(1 + \frac{CF_m}{12}\right)^6$$

Where: CF_m = six month Enterprise Cost of Funds for month m

f. Calculate the Adjustment Factor for Short-Term Debt Issuance Fees ($AFSIF_m$):

$$AFSIF_m = \frac{DRF_m}{1 - ISCOST \times DRF_m}$$

g. Calculate the Adjustment Factor for Long-Term Debt Issuance Fees ($AFLIF_m$):

$$AFLIF_m = \frac{1}{1 - ILCOST}$$

h. Calculate the Maximum Long-Term Issuance ($MLTI_m$):

$$MLTI_m = NCD_m \times AFLIF_m$$

i. Calculate Net Short-Term Debt Outstanding ($NSDO_m$) and Total Debt Outstanding (TDO_m) for month m using the methodology described in paragraph 3.10.3.1.[b]3.c. of this appendix. *Note:* This calculation must reflect all new issuances, option exercises, and maturities between the beginning of the Stress Test and month m.

j. Calculate Interim Face Amount of Long-Term Debt to be issued this month ($IFALD_m$):

$$IFALD_m = \frac{((MPD-1)\times TDO_m) + NSDO_m + (MPD \times AFSIF_m \times NCD_m)}{1 - MPD + \left(AFSIF_m \times \frac{MPD}{AFLIF_m}\right)}$$

k. Calculate Face Amount of Long-Term Debt to be issued ($FALD_m$):

$$FALD_m = min(MLTI_m, max(0, IFALD_m))$$

l. Calculate Face Amount of Short-Term Debt to be issued ($FASD_m$):

$$FASD_m = AFSIF_m \times max\left(0, NCD_m - \frac{FALD_m}{AFLIF_m}\right)$$

3.10.3.2 Dividends and Share Repurchases

[a] The Stress Test determines quarterly whether to pay dividends and make share repurchases. Dividends are decided upon and paid during the first month after the end of the quarter for which they are declared. If any dividends are paid, the dividend payout cannot exceed an amount equal to core capital less the estimated minimum capital requirement at the end of the quarter. Share repurchases are made during the middle month of the quarter.

1. *Preferred Stock*. An Enterprise will pay dividends on preferred stock as long as that Enterprise meets the estimated minimum capital requirement before and after the payment of these dividends. Preferred stock dividends are based on the coupon rates of the issues outstanding. The coupon rates for any issues of variable rate preferred stock are calculated using projections of the appropriate index rate. Preferred stock dividends may not exceed core capital less the estimated minimum capital requirement at the end of the preceding quarter.
2. *Common Stock*. In the first year of the Stress Test, dividends are paid on common stock in each of the four quarters after preferred dividends, if any, are paid unless the Enterprise's capital is, or after the payment, would be, below the estimated minimum capital requirement.
   a. *First Quarter*. In the first quarter, the dividend is the dividend per share ratio for common stock from the quarter preceding the Stress Test times the current number of shares of common stock outstanding.
   b. *Subsequent Quarters*.
   1) In the three subsequent quarters, if the preceding quarter's after tax income is greater than after tax income in the quarter preceding the Stress Test, (adjusted by the ratio of the Enterprise's retained earnings and retained earnings after adjustments are made that revert investment securities and derivatives to amortized cost), pay the larger of (1) the dividend per share ratio for common stock from the quarter preceding the Stress Test times the current number of shares of common stock outstanding or (2) the average dividend payout ratio for common stock for the four quarters preceding the start of the Stress Test times the preceding quarter's after tax income (adjusted by the reciprocal of the ratio of the Enterprise's retained earnings and retained earnings after adjustments are made that revert investment securities and derivatives to amortized cost) less preferred dividends paid in the current quarter. In no case may the dividend payment exceed an amount equal to core capital less the estimated minimum capital requirement at the end of the preceding quarter.
   (2) If the previous quarter's after tax income is less than or equal to after tax income in the quarter preceding the Stress Test (adjusted by the ratio of the Enterprise's retained earnings and retained earnings after adjustments are made that revert investment securities and derivatives to amortized cost), pay the lesser of (1) the dividend per share ratio for common stock for the quarter preceding the Stress Test times the current number of shares of common stock outstanding or (2) an amount equal to core capital less the estimated minimum capital requirement at the end of the preceding quarter, but not less than zero.
3. *Share Repurchases*. In the first two quarters of the Stress Test, the capital of the Enterprises will be reduced to reflect the

repurchase of shares. The amount of the capital reduction in each of those two quarters will be equal to the average net stock repurchases by the Enterprise during the four quarters preceding the start of the Stress Period. Net stock repurchases equal repurchases less receipts from new stock issued, but not less than zero. Repurchases in each of the first two quarters may occur only up to the point that the amount of core capital exceeds the estimated minimum capital requirement at the end of the first month of the quarter.

4. *Minimum Capital Requirements*. For the purposes of the Stress Test, the Enterprise's minimum capital requirement is computed by applying leverage ratios to all assets (2.50 percent) and off-balance sheet obligations (0.45 percent), and summing the results. Repurchases of an Enterprise's own previously-issued MBSs are excluded from the minimum capital calculation used in section 3.10.3.2, Dividends and Share Repurchases, of this appendix.

3.10.3.3 Allowances for Loan Losses and Other Charge-Offs

[a] The Stress Test calculates a tentative allowance for loan losses monthly by multiplying current-month Credit Losses (CL in Table 3–52) by twelve, thus annualizing current month Credit Losses. This is a proxy for a loss contingency where it is probable that a loss has been incurred and the amount can be reasonably estimated. For both the retained and sold portfolios, these credit losses include lost principal (net of recoveries from credit enhancements and disposition of the real estate collateral), and foreclosure, holding, and disposition costs. If the tentative allowance for loan losses for the current period is greater than the balance from the prior month less charge-offs (i.e., credit losses) for the current month, a provision (i.e., expense) is recorded. Otherwise, no provision is made and the allowance for loan losses is equal to the prior period amount less current month charge-offs.

[b] Other charge-offs result from Haircuts related to mortgage revenue bonds, private-issue MBS, and non mortgage investments, described in their respective cash flow components.

1. In the case of Enterprise investments in securities, these Haircuts result in the receipt of less principal and interest than is contractually due. Lost principal is recorded as Other Losses when due and not received, while lost interest is recorded as a reduction of Interest Income.
2. In the case of interest rate derivative instruments, these Haircuts result in the receipt of less net interest than is contractually due from, or the payment of more interest than is contractually due to, an Enterprise counterparty. For those swaps that are linked to Enterprise investments, the increase or decrease of net swap interest due is recorded as an adjustment of Interest Income. For those swaps that are linked to Enterprise debt obligations, the increase or decrease of net swap interest due is recorded as an adjustment of Interest Expense.

3.10.3.4 Operating Expenses

[a] The Stress Test calculates operating expenses, which include non-interest costs such as those related to an Enterprise's salaries and benefits, professional services, property, equipment and office space. Over the Stress Period, operating expenses are equal to the sum of two components. The first component in each month is equal to one-third (⅓) of the average monthly operating expenses of the Enterprise in the quarter immediately preceding the start of the Stress Test. The second component changes in proportion to the change in the size of the Enterprise's mortgage portfolio (i.e., the sum of outstanding principal balances of its retained and sold mortgage portfolios). The Stress Test calculates the Enterprise's mortgage portfolio at the end of each month of the Stress Period as a percentage of the portfolio at the start of the Stress Test, and then multiplies the percentage of assets remaining by two-thirds (⅔) of the average monthly operating expenses of the Enterprise in the quarter immediately preceding the start of the Stress Test.

[b] The sum of the two components in paragraph [a], of this section, is multiplied by a factor which equals

$$\left(1-\frac{m}{36}\right)$$

for the first 12 months of the Stress Test and then equals two-thirds for months 13 and beyond. This product is the Enterprise's operating expense for a given month in the Stress Period.

3.10.3.5 Income Taxes

[a] Both Enterprises are subject to Federal income taxes, but neither is subject to state or local income taxes.

[b] The Stress Test applies an effective Federal income tax rate of 30 percent when calculating the monthly provision for income taxes (e.g., income tax expense). OFHEO may change the 30 percent income tax rate if there are significant changes in Enterprise experience or changes in the statutory income tax.

[c] The Stress Test sets income tax expense for tax purposes equal to the provision for income taxes. The effects of timing differences between taxable income and Generally Accepted Accounting Principles

(GAAP) income before income taxes are ignored. Income before taxes is adjusted by the ratio of Enterprise retained earnings and retained earnings after adjustments are made that revert investment securities and derivatives to amortized cost. Therefore, Net Operating Loss (NOL) occurs only when the net income, before the provision for income taxes, is negative.

[d] Payments for estimated income taxes are made quarterly, in the month after the end of the quarter. At the end of each year, the annual estimated tax amount is compared to the annual actual tax amount. In March of the next year, a payment of remaining taxes is made or a refund for overpayment of income taxes is received.

[e] The NOL for the current year is ''carried back'' to offset taxes in any or all of the preceding two calendar years. (The Enterprises' tax year is the same as the calendar year.) This offset of the prior years' taxes results in a negative provision for income taxes (e.g., income) for the current year. Use of a carry back reduces available carry backs in subsequent years. Any NOL remaining after carry backs are exhausted becomes a carry forward.

[f] Carry forwards represent NOLs that cannot be carried back to offset previous years' taxes, but can be used to offset taxes in any or all of the subsequent 20 years. Carry forwards accumulate until used, or until they expire 20 years after they are generated.

[g] A valuation adjustment is used to eliminate any deferred tax asset.

3.10.3.6 Accounting

[a] The 1992 Act specifies that total capital includes core capital and a general allowance for foreclosure losses. For the Enterprises, this general allowance is represented by general allowances for loan losses on their retained and sold mortgage portfolios. As defined at 12 CFR 1750.2, core capital includes the sum of the following components of equity:

1. The par or stated value of outstanding common stock,
2. The par or stated value of outstanding perpetual, noncumulative preferred stock,
3. Paid-in capital, and
4. Retained earnings.

[b] In order to determine the amount of total capital an Enterprise must hold to maintain positive total capital throughout the ten-year Stress Period, the Stress Test projects the four components of equity listed in paragraph [a] of this section plus general loss allowances as part of the monthly pro forma balance sheets.

[c] Details of an Enterprise's actual balance sheet at the beginning of the Stress Test are recorded from a combination of starting position balances for all instruments for which other components of the Stress Test calculate cash flows and other starting position balances for assets, liabilities, and equity accounts needed to complete an Enterprise's balance sheet.

[d] After recording an Enterprise's balance sheet at the beginning of the Stress Period, the Stress Test creates monthly pro forma balance sheets and income statements by recording output from the cash flow components of the Stress Test; recording new debt and investments (and related interest), dividends, loss allowances, operating expenses, and taxes; and applying accounting rules pertaining to pro forma balance sheets and income statements.

3.10.3.6.1 Accounting for Cash Flows and Accounting Flows

[a] Balances at the beginning of the Stress Test are obtained from the RBC Report. Subsequent changes to related pro forma balance sheet and income statement accounts are obtained from data generated by cash flow components of the Stress Test as follows:

1. *Retained Loans.* For Retained Loans, interest cash flows in the first month of the Stress Period reduce accrued interest receivable at the beginning of the Stress Test. Subsequent months interest cash flows are recorded as accrued interest receivable and interest income in the month prior to receipt. When the interest cash flows are received, accrued interest receivable is reduced. Monthly principal cash flows (including Prepayments and defaulted principal) are recorded as reductions in the outstanding balance of the loan group. Net losses on Defaults are charged off against the allowance for loan losses. Amortization of deferred discounts increases interest income; amortization of deferred premiums decreases interest income.
2. *Mortgage Revenue Bonds.* For mortgage revenue bonds, interest cash flows in the first month of the Stress Period reduce accrued interest receivable at the beginning of the Stress Test. Subsequent months' interest cash flows are recorded as accrued interest receivable and interest income in the month prior to receipt. When the interest cash flows are received, accrued interest receivable is reduced. Monthly principal cash flows (including Prepayments) are recorded in the month received as a reduction in the outstanding balance of mortgage assets. Defaulted principal is charged off when due and is not received. Amortization of deferred discounts increases interest income; amortization of deferred premiums decreases interest income.
3. *Nonmortgage Instruments.* Principal repayments of nonmortgage instruments reduce the nonmortgage instrument and

increases or decreases cash. When the interest cash flows are received or paid, accrued interest receivable or payable is reduced. Accrued interest includes both amounts at the beginning of the Stress Period and subsequent monthly accruals (also recorded as interest income or interest expense). Amortization of deferred discounts and premiums increases or decreases interest income or interest expense. Defaulted principal is charged off when due and not received.

4. *Sold Portfolio*. Sold portfolio cash flows include monthly guarantee fees, float, and principal and interest due MBS investors. Guarantee fees are recorded as income in the month received. Principal and interest due mortgage security investors does not affect the balance sheet; however, interest earned on these amounts (float) is recorded as income in the month the underlying principal and interest payments are received. Principal payments received and defaulted loan balances reduce the outstanding balance of the sold portfolio. Losses (net of recoveries) are charged off against the allowance for losses on the sold portfolio (a liability on the pro forma balance sheets) and reduce cash. Amortization of deferred premiums and discounts increases or decreases guarantee fees.

3.10.3.6.2 Accounting for Non-Cash Items

[a] Changes in the pro forma balances for other parts of the Enterprise's balance sheet not resulting from cash flows are recorded as described in the following nine steps:

1. *Unrealized Gains and Losses*.

a. The valuation impact of any Applicable Fair Value Standards (AFVS), cumulative from their time of implementation, will be reversed out of the starting position data, by debiting any accumulated credits, and crediting any accumulated debits.

(1) AFVS are defined as GAAP pronouncements that require or allow fair value measurements, *e.g.*, EITF 99–20, FAS 65, FAS 87, FAS 115, FAS 133, FAS 140, FAS 149 and FIN 45. Valuation impacts of AVFS pertain only to amounts that are measured at fair value and not to other amounts that are included in AFVS but are not measured at fair value.

(2) The GAAP pronouncements covered by this treatment are subject to OFHEO review. The Enterprises will submit a list of standards and pronouncements that are being reversed in their RBC Reports.

b. After reversing the valuation impact of AFVS, any affected items are presented as follows:

(1) If absent the adoption of the AFVS, the affected transactions measured at fair value would have been accounted for on an amortized cost basis, they are presented as if they had always been accounted for on an amortized cost basis. Amounts not measured at fair value are represented as specified by GAAP and are presented using current GAAP rules.

(2) To the extent that transactions would not have been accounted for on an amortized cost basis, they are accounted for as if they were income and expense items.

2. *Low Income Housing Tax Credit Investments*. Low income housing tax credit investments at the beginning of the Stress Test are converted to cash on a straight line basis over the first six months of the Stress Period.

3. *Other Assets*. The following other assets at the beginning of the Stress Test are converted to cash as follows:

a. Clearing accounts and other miscellaneous receivables (e.g., fees receivable, accounts receivable, and other miscellaneous assets) in the first month of the Stress Test.

b. Earning assets (*see* section 3.9, Alternative Modeling Treatments, of this appendix)

c. Items not covered by a. and b. of this section on a straight-line basis over the first five-years of the Stress Test.

4. *Real Estate Owned (REO)*. Real estate owned at the beginning of the Stress Test is converted to cash on a straight-line basis over the first six months of the Stress Test.

5. *Fixed Assets*. 25 percent of fixed assets (net of accumulated depreciation) as of the beginning of the Stress Test remain constant over the Stress Test. The remaining 75 percent is converted to cash on a straight line basis over the ten-year Stress Period. Depreciation is included in the base on which operating expenses are calculated for each month during the Stress Period.

6. *Principal and Interest Payable*. Principal and interest payable to an Enterprise's mortgage security investors at the beginning of the Stress Test are paid during the first two months of the Stress Test (one-half in month one and one-half in month two).

7. *Other Liabilities*. The following liabilities at the beginning of the Stress Test are paid in the first month of the Stress Test, reducing cash:

a. Escrow deposits

b. Other miscellaneous liabilities

8. *Commitments*. No gains or losses are recorded when commitments are added to the Enterprise's sold portfolio. *See* section 3.2.1, of this appendix.

9. *Fully-Hedged Foreign Currency-Denominated Liabilities*. Amounts that relate to currency swaps and foreign currency-denominated liabilities will be treated as follows:

a. Recorded balances that correspond to converted foreign currency-denominated liabilities will be amortized in a manner that is consistent with scheduled pay leg exchanges of notional amounts as set forth in corresponding currency swaps. The unamortized premiums, discounts and/or fees that are associated with these liabilities will be amortized as described in section 3.8, of this appendix, as if they were associated with the pay legs of the corresponding currency swap. Any differences will be reflected as an increase or decrease in Retained Earnings.
b. Interest payable amounts associated with currency swaps will be settled in a manner that is consistent with the contractual terms for these instruments.
c. Receivable amounts associated with currency swaps and interest payable amounts associated with foreign currency-denominated debt will be reversed against Retained Earnings.
d. The adjustments in a., b. and c., of this section, will take place at the start of the Stress Test. These treatments are not applied to instruments that are modeled under AMT (*see* section 3.9, Alternative Modeling Treatments, of this appendix) or foreign currency-denominated instruments that are not fully hedged.

3.10.3.6.3 Other Accounting Principles

The following additional accounting principles apply to the pro forma balance sheets and income statements:
1. All investment securities are treated as held to maturity. As such, they are recorded as assets at amortized cost, not at fair value.
2. All non-securitized mortgage loans will be classified as ''held-to-maturity'' and will be accounted for on an amortized cost basis.
3. Effective control over the collateral for collateral financings is with the party that originally delivered such collateral.
4. Enterprise Real Estate Investment Trust (REIT) subsidiaries are consolidated. Specifically, REIT assets are treated as Enterprise assets. Preferred stock of the REIT is reflected as Enterprise debt. Dividends paid on the preferred stock are reported as interest expense.
5. Treasury stock is reflected as a reduction in retained earnings.

3.10.4 Operations, Taxes, and Accounting Outputs

For each month of the Stress Period, the Stress Test produces a pro forma balance sheet and income statement. The Operations, Taxes and Accounting component outputs 121 monthly and 11 annual balance sheets, 120 monthly and 10 annual income statements, and 120 monthly and 10 annual cash flow statements, including part-year statements for the first and last calendar years of the Stress Test when necessary. These pro forma financial statements are the inputs for calculation of the risk-based capital requirement (*see* section 3.12, Calculation of the Risk-Based Capital Requirement, of this appendix).

3.11 Treatment of New Enterprise Activities

3.11.1 New Enterprise Activities Overview

[a] Given rapid innovation in the financial services industry, OFHEO anticipates the Enterprises will become involved with new mortgage products, investments, debt and derivative instruments, and business activities, which must be accommodated in the Stress Test in order to capture all of the risk in the Enterprises' businesses. New accounting entries resulting from these innovations and changes in accounting must also be accommodated. The regulation is sufficiently flexible and complete to address new Enterprise activities as they emerge, using the procedures outlined in this section. However, OFHEO will monitor the Enterprises' activities and, when appropriate, propose amendments to this regulation addressing the treatment of new instruments, activities, or accounting treatments.

[b] For the purpose of this section of the appendix, the term New Activity means any type of asset, liability, off-balance-sheet item, accounting entry, or activity to which a Stress Test treatment has not previously been applied. In addition, the Director has the discretion to treat as a New Activity: (1) any activity or instrument with characteristics or unusual features that create risks or hedges for the Enterprise that are not reflected adequately in the specified treatments for similar activities or instruments; and (2) any activity or instrument for which the specified treatment no longer adequately reflects the risk/benefit to the Enterprise, either because of increased volume or because new information concerning those risks/hedges has become available.

3.11.2 New Enterprise Activities Inputs

[a] Complete data and full explanations of the operation of the New Activity sufficient to understand the risk profile of the New Activity must be provided by the Enterprise. The Enterprises are required to notify OFHEO, pursuant to §1750.12(c), of proposals related to New Activities as soon as possible, but in any event no later than five calendar days after the date on which the transaction closes or is settled. The Enterprises are encouraged to suggest an appropriate capital treatment that will fully capture the credit and interest rate risk in the New Activity. Information on New Activities must also be

submitted and appropriately identified as such in the RBC Report.

[b] The Stress Test will not give an Enterprise the capital benefit associated with a New Activity where OFHEO determines that the impact of that activity on the risk-based capital level of the Enterprise is not commensurate with the economic benefit to the Enterprise.

3.11.3 New Enterprise Activities Procedures

[a] OFHEO will analyze the risk characteristics and determine whether an existing approach specified in the appendix appropriately captures the risk of the New Activity or whether some combination or adaptation of existing approaches specified in the appendix is appropriate. For example, the Stress Test might employ its mortgage performance components and adapt its cash flow components to simulate accurately the loss mitigating effects and counterparty credit risk of credit derivatives.

[b] Where there is no reasonable approach using existing combinations or adaptations of treatments specified in this appendix that could be applied within the timeframe for computing a quarterly capital calculation, the Stress Test will employ an appropriately conservative treatment, consistent with OFHEO's role as a safety and soundness regulator. Such treatment may include an alternative modeling treatment specified in section 3.9, Alternative Modeling Treatments, of this appendix, or some other conservative treatment that OFHEO deems more appropriate.

[c] OFHEO will provide the Enterprise with its estimate of the capital treatment as soon as possible after receiving notice of the New Activity. In any event, the Enterprise will be notified of the capital treatment in accordance with the notice of proposed capital classification provided for in §1777.21 of this chapter.

[d] After a treatment has been incorporated into a final capital classification, OFHEO will provide notice of such treatment to the public, including the other Enterprise. OFHEO will consider any comments it receives from the public regarding the treatment during subsequent quarters. OFHEO may change the treatment as a result of such input or otherwise, if OFHEO determines that the risks of the New Activity are not appropriately reflected in a treatment previously adopted.

3.11.4 New Enterprise Activities Outputs

The Stress Test will generate a set of cash and/or accounting flows reflecting the treatment applied to the New Activity.

3.12 Calculation of the Risk-Based Capital Requirement

3.12.1 Risk-Based Capital Requirement Overview

The risk-based capital requirement is the sum of (1) the minimum amount of total capital that an Enterprise must hold at the start of the Stress Test in order to maintain positive total capital throughout the ten-year Stress Period, for all financial instruments explicitly modeled in the Stress Test (Stress Test capital subtotal) and (2) certain additional amounts relating to off-balance-sheet items addressed in section 3.9, Alternative Modeling Treatments, of this appendix, and (3) 30 percent of that sum for management and operations risk. The Stress Test capital subtotal is determined based on monthly total capital figures from the pro forma financial statements, the additional amounts related to off-balance-sheet items, and Enterprise short term borrowing and investment rates.

3.12.2 Risk-Based Capital Requirement Inputs

[a] Inputs to the capital calculation are outputs from section 3.3, Interest Rates, section 3.9, Alternative Modeling Treatments, and section 3.10, Operations, Taxes, and Accounting, of this appendix.

[b] For each month of the Stress Test, the following inputs are from, or used in the creation of, pro forma financial statements projected in section 3.10, Operations, Taxes, and Accounting, of this appendix:

1. Total capital
   a. The par or stated value of outstanding common stock,
   b. The par or stated value of outstanding perpetual, noncumulative preferred stock,
   c. Paid-in capital,
   d. retained earnings, and
   e. allowance for losses on retained and sold mortgages less specific losses calculated in accordance with FAS 114,
2. Provision for income taxes (income tax expense),
3. Valuation adjustment that reduces benefits recorded from net operating losses when no net operating loss tax carrybacks are available, and
4. An Enterprise's cash position prior to the decision to issue new debt or purchase new investments to balance the balance sheet (*see* section 3.10.3.1, New Debt and Investments, of this appendix).

[c] For present-value calculations, the Stress Test uses the six-month Enterprise Cost of Funds or the six-month CMT yield as described in section 3.3, Interest Rates, of this appendix.

[d] The amount for off-balance-sheet items that are not explicitly modeled is obtained

from section 3.9.3.1, Off-Balance Sheet Items, of this appendix.

3.12.3 Risk-Based Capital Requirement Procedures

[a] The following eight steps are used to determine the Stress Test capital subtotal and the risk-based capital requirement for an Enterprise:

1. Determine the effective tax rate in each month. If the provision for income taxes is positive (reflecting taxes owed) or negative (reflecting tax refunds to be received), then the effective tax rate is 30 percent. If the provision for income taxes is zero after applying any valuation adjustments (*see* section 3.10.3.6, Accounting, of this appendix), then the effective tax rate applied in step 3. of this section is zero.
2. Determine whether an Enterprise is an investor or a borrower in each month of the Stress Period. In months where an Enterprise has outstanding six-month discount notes that were issued during the stress test, then the Enterprise is a borrower. Otherwise, the Enterprise is an investor.
3. Determine the appropriate monthly discount factor for each month of the Stress Period:
   a. In months where an Enterprise is an investor, the monthly discount factor is based on the yield of short-term assets:

$$\text{Monthly Discount Factor} = \left[1 + \frac{(1 - \text{Effective Tax Rate}) \times \text{6-month CMT yield}}{2}\right]^{1/6}$$

   b. In months where an Enterprise is a borrower, the monthly discount factor is based on the cost of the Enterprise's short-term debt:

$$\text{Monthly Discount Factor} = \left[\frac{1 + \left[(1 - \text{Effective Tax Rate}) \times \left(\frac{\text{6-month Enterprise Cost of Funds}}{2}\right)\right]}{1 - \left[(1 - \text{Effective Tax Rate}) \times 0.00025\right]}\right]^{1/6}$$

Where:

0.00025 is the factor that incorporates the issuance and administrative costs for an Enterprise's new discount notes.

4. Compute the appropriate cumulative discount for each month of the Stress Period. The cumulative discount factor for a given month is the monthly discount factor for that month multiplied by the cumulative discount factor for the preceding month. (The cumulative discount factor for the first month of the Stress Period is the monthly discount factor for that month.) Thus, the cumulative discount factor for any month incorporates all of the previous monthly discount factors.
5. Discount total capital for each month of the Stress Period to the start of the Stress Period for both interest rate scenarios. Divide the total capital for a given month by the cumulative discount factor for that month.
6. Identify the Stress Test capital subtotal, which is the lowest discounted total capital amount from among the 240 monthly discounted total capital amounts.
7. From the Stress Test capital subtotal, subtract the capital required for off-balance sheet items not explicitly modeled in the Stress Test, as calculated in section 3.9.3.1, Off-Balance Sheet Items, of this appendix. Then subtract the resulting difference from the Enterprise's total capital at the start of the Stress Period. The resulting number is the amount of total capital that an Enterprise must hold at the start of the Stress Test in order to maintain positive total capital throughout the ten-year Stress Period.
8. Multiply the minimum total capital amount by 1.3 for management and operations risk.
9. Subtract the net increase (or add the net decrease) in Retained Earnings related to Fair Value Hedges at the start of the stress test made in accordance with section 3.10.3.6.2[a]1.b. of this appendix.

3.12.4 Risk-Based Capital Requirement Output

The output of the calculations in this section is the risk-based capital requirement for an Enterprise at the start date of the Stress Test.

4.0 GLOSSARY

This glossary is intended to define terms in the Regulatory appendix that are used in a computationally specific sense that require a precise quantitative definition.

A

Accounting Flows: one or more series of numbers tracking various components of the accounting computations over time, analogous to ''Cash Flows.''

Age: of a Mortgage Loan, for computational purpose: the number of scheduled payment dates that have occurred prior to the time at which the Age is determined. The Age of a newly originated Mortgage is zero prior to its first payment date.

Amortization Expense: used in the accounting sense of the monthly allocation of a one-time amount (positive or negative) over time, not to describe amortization of principal in a mortgage.

Amortization Schedule: for a Mortgage Loan, a series of numbers specifying the (1) principal and (2) interest components of each Mortgage Payment, and (3) the Unpaid Principal Balance after each such payment is made.

Allocated Interest: in certain accounting calculations, the amount of interest deemed to be received on a certain date according to an allocation formula, whether or not equal to the amount actually received on that date (*see*, e.g., section 3.6.3.8.3, Whole Loan Accounting Flows Procedures, of this appendix).

Aggregate Limit: see section 3.6.3.6.4.1, Mortgage Credit Enhancement Overview, of this appendix.

B

Balance Limit: see section 3.6.3.6.4.1, Mortgage Credit Enhancement Overview, of this appendix.

Balloon Payment: the final payment of a Balloon Loan, the principal component of which is the entire Unpaid Principal Balance of said loan at the time the Balloon Payment is contractually due.

Balloon Loan: a Mortgage Loan that matures before the Unpaid Principal Balance is fully amortized to zero, thus requiring a large final Balloon Payment.

Balloon Date: the maturity date of a Balloon Loan.

Benchmark: used as an adjective to refer to the economic environment (including interest rates, house prices, and vacancy and rental rates) that prevailed in the region and time period of the Benchmark Loss Experience.

Benchmark Census Division: the Census Division, designated by OFHEO, that is used to determine house prices and vacancy and rental rates of the Stress Period.

Benchmark Loss Experience (BLE): the rates of default and loss severity of loans in the state/year combination (containing at least two consecutive origination years and contiguous areas with a total population equal to or greater than five percent of the population of the United States) with the highest loss rate.

Burnout: in describing Mortgage Prepayments, the reduced rates of Prepayment observed with Mortgage Loans that were not prepaid during earlier periods when it would have been advantageous to do so.

C

Cash Flow Hedges: cash flow hedges as defined by FAS 133.

Census Division: any one of the nine geographic areas of the United States so designated by the Bureau of the Census. The OFHEO House Price Index determined at the Census Division level is used in the Stress Test.

Claim Amount: the amount of Credit Enhancement that an Enterprise is eligible to receive as a reimbursement on mortgage loan losses, which is often but not always equal to the total amount of the loss.

Commitment Loan Groups: hypothetical groups of Mortgage Loans assumed to be originated during the months immediately after the start of the Stress Test pursuant to Commitments made but not yet fulfilled by the Enterprises prior to the start of the Stress Test to purchase or securitize loans.

Contract: a Mortgage Credit Enhancement contract covering a distinct set of loans with a distinct set of contractual terms.

Constant Maturity Treasury (CMT) Rate: see table 3–18, Interest Rate and Index Inputs.

Counterparty Type: classification used to specify the appropriate Haircut level in section 3.5, Counterparty Defaults, of this appendix.

Credit Enhancement: for the GSEs, agreements with lenders or third-parties put in place to reduce or limit mortgage credit (default) losses for an individual loan. *See* section 3.1.2.1.1, Loan Group Inputs, of this appendix.

D

Debt Service Coverage Ratio: see section 3.6.3.5.3.1, Explanatory Variables, of this appendix.

Default: for purposes of computing rates of mortgage default and losses, *see* the specific process specified in section 3.6.1, Whole Loan Cash Flows Overview, of this appendix.

Defaulting Fraction: in any month, for any group of loans, the proportion of loans newly defaulted in that month expressed as a fraction of the *initial* loans (by number or by balance, depending on how Prepayment and Default Rates are measured) in the loan group; *see*, e.g., section 3.6.3.4.3.2, Prepayment and

Default Rates and Performance Fractions, of this appendix.

Defaulted UPB: the Unpaid Principal Balance (UPB) of a loan in the month that it Defaults.

Deferred Balances: see section 3.6.3.8.1, Whole Loan Accounting Flows Overview, of this appendix.

Derivative Mortgage Security: generally refers to securities that receive cash flow with significantly different characteristics than the aggregate cash flow from the underlying mortgage loans, such as Interest-Only or Principal-Only Stripped MBSs or REMIC Residual Interests. *See* section 3.7.1, Mortgage-Related Securities Overview, of this appendix.

Deposit Limit: see section 3.6.3.6.4.1, Mortgage Credit Enhancement Overview, of this appendix.

Distinct Credit Combination (DCC): see section 3.6.3.6.4.1, Mortgage Credit Enhancement Overview, of this appendix.

E

Enterprise Cost of Funds: Cost of funds used in computing the cost of new debt for the Enterprises during the Stress Test, as specified in section 3.3.3.[a]3.c., of this appendix.

Enterprise Loss Position: see section 3.6.3.6.4.1, Mortgage Credit Enhancement Overview, of this appendix.

F

Fair Value Hedges: fair value hedges as described in FAS 133.

Float Income: the earnings on the investment of loan principal and interest payments (net of the Servicing Fee and Guarantee Fee) from the time these payments are received from the servicer until they are remitted to security holders. *See* section 3.6.1, Whole Loan Cash Flows Overview, of this appendix.

G

Gross Loss Severity: Loss Severity including the excess, if any, of Defaulted UPB over gross sale price of an REO property, fees, expenses and certain unpaid interest amounts, before giving effect to Credit Enhancement or any other amounts received on account of a defaulted loan (all such amounts expressed as a fraction of Defaulted UPB); *see* section 3.6.3.6.2, Single Family Gross Loss Severity, and section 3.6.3.6.3, Multifamily Gross Loss Severity, of this appendix.

Guarantee Fee: the amount received by an Enterprise as payment for guaranteeing a mortgage loan; *see,* e.g., section 3.6.3.2, Payment Allocation Conventions, of this appendix.

H

Haircut: the amount by which payments from a counterparty are reduced to account for a given probability of counterparty failure.

I

Initial: used as an adjective to specify conditions at the start of the Stress Test, except in defined terms; *see also* Time Zero.

Initial Rate Period: for an Adjustable Rate Mortgage, the number of months before the mortgage interest rate changes for the first time. Also known as ''teaser period.''

Interest-only Period: for interest-only loans, the period of time for which the monthly payment covers only the interest due. (During the interest-only period, the UPB of the loan stays constant until maturity or a changeover date. For loans that mature, a Balloon Payment in the amount of the UPB is due at maturity. In other cases, the loan payment is recast at the changeover date and the loan begins to amortize over its remaining term.) *See* section 3.6.3.3.1, Mortgage Amortization Schedule Overview, of this appendix.

Interest Rates: the Constant Maturity Treasury yields and other interest rates and indexes used in the Stress Test.

Investor-owned: a property that is not owner-occupied.

L

Loan Limit: used to describe a type of Credit Enhancement; *see* section 3.6.3.6.4.1, Mortgage Credit Enhancement Overview, of this appendix.

Loan Group: a group of one or more mortgage loans with similar characteristics, that are treated identically for computational purposes in the Risk-Based Capital calculations.

Loss Severity: the amount of a mortgage loss divided by the Defaulted UPB.

Loss Sharing Arrangements (LSA): see section 3.6.3.6.4.1, Mortgage Credit Enhancement Overview, of this appendix.

M

Maximum Haircut: as defined in section 3.5, Counterparty Defaults, of this appendix.

Modified Pool Insurance: a form of Single Family Mortgage Credit Enhancement described in section 3.6.3.6.4.1, Mortgage Credit Enhancement Overview, of this appendix.

Mortgage Insurance (Primary Mortgage Insurance): a type of credit enhancement that pays claims up to a given limit on each loan. *See* section 3.6.3.6.4.1, Mortgage Credit Enhancement Overview, of this appendix.

Mortgage Related Security: a collective reference for (1) securities directly backed by mortgage loans, such as Single Class MBSs, Multi-Class MBSs (REMICs or Collaterilized Mortgage Obligations (CMOs)); (2) Derivative Mortgage-Backed Securities (certain multiclass and strip securities) issued by Fannie

Mae, Freddie Mac, and Ginnie Mae; (3) Mortgage Revenue Bonds issued by State and local governments and their instrumentalities; or (4) single class and Derivative Mortgage-Backed Securities issued by private entities. *See* section 3.1.2.2, Mortgage-Related Securities Inputs, of this appendix.

N

Negative Amortization: as defined in section 3.6.3.2.1, Allocation of Mortgage Interest, of this appendix.

Net Loss Severity: Gross Loss Severity reduced by Credit Enhancements and any other amounts received on account of a defaulted loan (all such amounts expressed as a fraction of Defaulted UPB).

Net Yield Rate: the Mortgage Interest Rate minus the Servicing Fee Rate.

New Activity: as defined in section 3.11, Treatment of New Enterprise Activities, of this appendix.

Notional Amount: the amount analogous to a principal balance which is used to calculate interest payments in certain swap transactions or derivative securities.

O

Original: used as an adjective to specify values in effect at Loan Origination.

Origination: for a Mortgage Loan with monthly payments, the date one month prior to the first contractual payment date.

Owner-Occupied: a property, or a Mortgage Loan backed by a property, that is a single family residence which is the primary residence of the owner.

P

Pass-Through Rate: the Mortgage Interest Rate minus the Servicing Fee and the Guarantee Fee.

Performing Fraction: in any month, for any group of loans, the proportion of loans that have not either prepaid or defaulted in that month or any prior month, expressed as a fraction of the loans at the start of the Stress Test (by number or by balance, depending on how Prepayment and Default rates are measured) in a loan group; *see* e.g., section 3.6.3.4.3.2, Prepayment and Default Rates and Performance Fractions, of this appendix.

Prepaying Fraction: in any month, for any group of loans, the proportion of loans that prepay in full in that month expressed as a fraction of the loans at the start of the Stress Test (by number or by balance, depending on how Prepayment and Default rates are measured) in the loan group; *see* e.g., section 3.6.3.4.3.2, Prepayment and Default Rates and Performance Fractions, of this appendix.

Prepayment: the prepayment in full of a loan before its contractual maturity date

Prepayment Interest Shortfall: as defined in section 3.6.3.1, Timing Conventions, of this appendix.

R

Risk-Based Capital (RBC) Report: The form in which Enterprise data is to be submitted for purposes of calculating the risk-based capital requirement, as described in section 3.1, Data, of this appendix.

Relative Spread: as defined in section 3.6.3.4.3.1, Single Family Default and Prepayment Explanatory Variables, of this appendix.

Retained Loans: as described in section 3.6.1, Whole Loan Cash Flows Overview, of this appendix.

S

Scheduled Principal: the amount of principal reduction that occurs in a given month according to the Amortization Schedule of a mortgage loan; *see* section 3.6.3.3, Mortgage Amortization Schedule, of this appendix.

Servicing Fee: portion of mortgage interest payment retained by servicer.

Sold Loans: as described in section 3.6.1, Whole Loan Cash Flows Overview, of this appendix.

Spread Accounts: a form of Credit Enhancement; section 3.6.3.6.4, Mortgage Credit Enhancement, of this appendix.

Stress Period: the 10-year period covered by the Stress Test simulation.

Stress Test: the calculation, which applies specified economic assumptions to Enterprise portfolios, described in this appendix.

Strike Rate: the interest rate above/below which interest is received for caps/floors.

Subordination Agreements: a form of Credit Enhancement in which the cash flows allocable to a portion of a mortgage pool are used to cover losses on loans allocable to another portion of the mortgage pool; *see* section 3.6.3.6.4, Mortgage Credit Enhancement, of this appendix.

T

Time Zero: used to designate the conditions in effect at the start of the Stress Test, as defined in section 3.6.3.1, Timing Conventions, of this appendix.

U

Unpaid Principal Balance (UPB): the Unpaid Principal Balance of a loan or loan group based solely on its Amortization Schedule, without giving effect to any missed or otherwise unscheduled payments.

W

Whole Loan: a mortgage loan.

[66 FR 47806, Sept. 13, 2001, as amended at 67 FR 11861, Mar. 15, 2002; 67 FR 66535, Nov. 1, 2002; 68 FR 7312, Feb. 13, 2003; 71 FR 75087, Dec. 14, 2006; 73 FR 35895, June 25, 2008]

APPENDIX B TO SUBPART B OF PART 1750 [RESERVED]

PART 1777—PROMPT CORRECTIVE ACTION

AUTHORITY: 12 U.S.C. 1452(b)(2), 1456(c), 1718(c)(2), 1723a(k), 4513(a), 4513(b), 4514, 4517, 4611–4619, 4622, 4623, 4631, 4635.

SOURCE: 67 FR 3598, Jan. 25, 2002, unless otherwise noted.

§ 1777.1 Authority, purpose, scope, and implementation dates.

(a) *Authority.* This part is issued by the Office of Federal Housing Enterprise Oversight (OFHEO) pursuant to sections 1313, 1371, 1372, and 1376 of the Federal Housing Enterprises Financial Safety and Soundness Act (1992 Act) (12 U.S.C. 4513, 4631, 4632, and 4636). These provisions broadly authorize OFHEO to take such actions as are deemed appropriate by the Director of OFHEO to ensure that the Federal National Mortgage Association and the Federal Home Loan Mortgage Corporation (collectively, the Enterprises) maintain adequate capital and operate in a safe and sound manner.

(b) *Authority, purpose and scope of subpart A.* In addition to the authority set forth in paragraph (a) of this section, subpart A of this part is also issued pursuant to section 1314 of the 1992 Act (12 U.S.C. 4514), section 307(c) of the Federal Home Loan Mortgage Corporation Act (12 U.S.C. 1456(c)), and section 309(k) of the Federal National Mortgage Association Charter Act (12 U.S.C. 1723a(k)), requiring each Enterprise to submit such reports to OFHEO as the Director of OFHEO determines, in his or her judgment, are necessary to carry out the purposes of the 1992 Act. Subpart A of this part is also issued in reliance on section 1317 of the 1992 Act (12 U.S.C. 4517) authorizing OFHEO to conduct examinations of the Enterprises. The purpose of subpart A of this part is to set forth a framework of early intervention supervisory measures, other than formal enforcement actions, that OFHEO may take to address emerging developments that merit supervisory review to ensure they do not pose a current or future threat to the safety and soundness of an Enterprise. OFHEO's initiation of procedures under subpart A does not necessarily indicate that any unsound condition exists. The supervisory responses enumerated in §1777.11 do not constitute orders under the 1992 Act for purposes of sections 1371 and 1376 thereof (12 U.S.C. 4631 and 4636).

(c) *Authority, purpose, and scope of subpart B.* In addition to the authority set forth in paragraph (a) of this section, subpart B of this part is also issued pursuant to subtitle B of the 1992 Act (12 U.S.C. 4611 through 4623), section 303(b)(2) of the Federal Home Loan Mortgage Corporation Act (12 U.S.C. 1452(b)(2)), and section 303(c)(2) of the Federal National Mortgage Association Charter Act (12 U.S.C. 1718(c)(2)). These provisions authorize OFHEO to administer certain capital requirements for the Enterprises, to classify the capital of the Enterprises based on capital levels specified in the 1992 Act, and, in appropriate circumstances, to exercise discretion to reclassify an Enterprise into a lower