
Introduction

Interest rate risk is the vulnerability of current or future earnings and capital to interest rate changes. Fluctuations in interest rates affect earnings by altering interest-sensitive income and expenses. Interest rate changes also affect capital by changing the net present value (NPV) of future cash flows and the cash flows themselves. Excessive interest rate risk can threaten liquidity, earnings, capital, and solvency. This module has applicability in the examinations of the Enterprises (Fannie Mae and Freddie Mac), and the Federal Home Loan Banks (FHLBanks) (collectively, the regulated entities).

In general, the regulated entities manage interest rate risk with a combination of swapped and unswapped callable and non-callable debt, fixed- and floating-rate bullet debt, and derivative instruments. They use derivatives to limit downside earnings exposures, preserve upside earnings potential, increase yield, and minimize income or capital volatility. When used properly, derivatives are an effective risk management tool, but improper usage can allow interest rate changes to have a sudden and significant effect on the regulated entity's financial position. For further details regarding derivatives, refer to the Derivatives examination module.

Risks Associated with Interest Rate Risk Management

The primary sources of interest rate risk include rate level risk, basis risk, yield curve risk, option risk (inclusive of volatility risk), and accounting risk. A brief analysis of these risks is presented below:

Interest Rate Level Risk

Interest rate level risk (sometimes less precisely called repricing risk) results from timing differences in the maturity or price reset periods of assets, liabilities, and off-balance sheet instruments, such that a change in the level of all interest rates will have different, non-offsetting effects on the value of assets, liabilities, and derivatives. For example, a long-term fixed-rate asset funded by an adjustable rate liability creates exposure to a change in the level of interest rates, which could lead to a decline in both earnings and economic value. If interest rates rise, then funding costs will rise before the asset's yield rises. Likewise, the present value of the asset's cash flows (and generally its market price) will decline to a greater degree than the present value of the liability's cash flows, thereby reducing the market value of equity.

Interest rate level risk is often a regulated entity's most apparent source of interest rate risk and is usually gauged by assessing the model-estimated effects of a parallel change in interest rates on the present value of the cash flows expected from assets, liabilities, and derivatives. A financial institution can intentionally structure its balance sheet to increase interest rate level risk in an attempt to enhance earnings. As the yield curve is

generally upward-sloping with long-term rates higher than short-term rates, a financial institution can often earn a positive spread by funding long-term assets with short-term liabilities. These earnings, however, are vulnerable to cost of funds increases if the level of interest rates rise.

An institution with exposure to interest rate level risk will often, but not always, see the effects of changes in the level of interest rates reflected in current earnings. If the maturity and rate-reset imbalances are at longer horizons (e.g. five-year assets funded by two-year liabilities) changes in interest rates will not affect future earnings until the shorter maturity instruments mature and need to be replaced (e.g. two years in the example). An institution that focuses only on short-term maturity imbalances may be induced to take on increased interest rate risk by extending maturities to improve yield. The potential for maturity or rate-reset imbalances at more distant dates is one reason that measuring the effects of changing interest rates on the present value of an institution's positions is essential in measuring interest rate risk. When evaluating interest rate level risk, the board of directors and management must consider long-term maturity or rate-reset imbalances as well as near-term imbalances. Failure to measure and manage material long-term maturity imbalances can leave future earnings significantly exposed to interest rate movements. Financial models that estimate the effects of parallel changes in interest rates on market value and earnings projections for an institution's entire portfolio are the most widely used technique for assessing, monitoring, and managing interest rate level risk and interest rate risk more generally, though some institutions may still use maturity gap reports.

As mentioned in the preceding paragraph, the potential for imbalances at both short and long horizons makes the consideration of the sensitivity of near-term earning to changes in interest rates an inadequate tool for assessing exposure to interest rate level risk. Several market or present value-based tools are available to help address this concern. The standard market value-based tool kit includes measuring the sensitivity of market value to various parallel interest rate shocks (effective duration and convexity measures are calculated based on the results of such sensitivities). These risk metrics assess how much the present value (generally termed market value in common practice) of some or all of the institution's instruments changes if all interest rates, at every term point, change by the same amount (e.g., 50 basis points).

Basis Risk

Basis risk arises from imperfect correlation in the adjustment of the rates earned and paid on different instruments that are linked to different interest rate indices. When interest rates change, the rate spread relationship between different indices may widen or narrow. This can produce unexpected changes in the cash flows and the earnings spread between assets and liabilities. For example, a strategy of funding a one-year loan that reprices monthly based on the one-month Treasury bill rate, with a one-year deposit that reprices

monthly based on the one-month London Interbank Offered Rate (LIBOR), exposes the institution to the risk that the spread between the two index rates may change unexpectedly.

Although historically the movement of the one-month Treasury bill rate and one-month LIBOR have been closely correlated, the two benchmark rates have not always moved in tandem, and spreads between them have fluctuated significantly. Unanticipated changes in the correlation between these two rates would affect a regulated entity's net interest margin through changes in the earned/paid spreads of instruments being repriced. This also affects the instrument's anticipated future cash flows, which in turn affects the regulated entity's underlying net economic value.

Certain pricing indices have a built-in lag feature such that the index will respond more slowly to interest rate changes. Such lags may either accentuate or moderate short-term interest rate exposure. One common lagging index is the 11th District Federal Home Loan Bank Cost of Funds Index (COFI) that is sometimes used in residential adjustable rate mortgages. The COFI, which is based upon the monthly average interest costs of liabilities for thrifts in the 11th District, comprising California, Arizona, and Nevada, is a composite index containing both short- and long-term liabilities. Because current market interest rates will not be reflected in the index until the long-term liabilities have been repriced, the index generally will lag market interest rate movements.

Yield Curve Risk

Yield curve risk results from changing rate relationships between different maturities of the same index that could have an adverse effect on the institution's income and economic value. For example, a 30-year Treasury bond's yield may change by 200 basis points, but a three-year Treasury note's yield may change by only 50 basis points during the same period.

The relationships change when the yield curve shape for a given market flattens, steepens, or becomes negatively sloped or inverted during an interest rate cycle. Yield curve variation can accentuate the risk of a bondholder's position by amplifying the effect of maturity or repricing mismatches.

Certain types of structured notes can be particularly vulnerable to yield curve shape changes. For example, the performance of dual index notes is directly linked to basis and yield curve relationships. These bonds have coupon rates that are determined by the difference between market indices, such as the constant-maturity Treasury rate (CMT) and LIBOR. An example would be a coupon rate based on the following formula: 10-year CMT plus 300 basis points less three-month LIBOR. Since the coupon adjusts as interest rates change, the bondholder may incorrectly assume that it will always benefit if interest rates increase. If, however, the three-month LIBOR increase exceeds the 10-year

CMT increase, the coupon will fall, even if both LIBOR and Treasury rates are increasing. Regulated entities holding these types of instruments should evaluate how their performance may vary under different yield curve shapes.

Flat or inverted yield curves have historically been associated with narrowing net interest margins and lower earnings. Whether the yield curve shape is positive, flat, or negative, regulated entities can appropriately limit risk with strategies designed to cope with the uncertainty of changing interest rates.

One tool for measuring yield curve risk is the key rate duration (KRD). Parallel rate shocks, which shift the entire yield curve by the same amount, will not identify exposures to changes in rates at particular points on the curve. For example, a financial institution could lose market value if short-term rates increased and gain market value if long-term rates increased. A parallel rate shock could then indicate little change in aggregate market value. The KRD measure considers the sensitivity of market values to changes in all relevant rates at a particular term point. A positive KRD implies that a positive rate shock will reduce market value of equity (MVE), and a negative rate shock will increase MVE. A negative KRD has the opposite implications. Roughly speaking, a KRD of five years at the three-year term point, for example, implies that a one-percent positive shock to the three-year rate would result in a five-percent decrease in MVE. An alternative to KRD is to measure the sensitivity of market value to a wide variety of slopes and twists in the yield curve. Sophisticated financial institutions should use both KRD and a wide variety of changes in yield curve shape to measure their exposures to yield curve risk.

Option Risk

Interest rate risk also arises from stand-alone options or options embedded in financial instruments. An option provides the holder the right, but not the obligation, to buy (call option), sell (put option), or in some manner alter an instrument or financial contract's cash flows at a specified price (strike price) over a stated period. The option's seller or writer, has an obligation to perform if the option holder exercises the option. Examples of stand-alone instruments include exchange-traded options and over-the-counter (OTC) option contracts. Option-embedded instruments include bonds and notes with call or put provisions, loans that give borrowers the right to prepay balances such as mortgages, adjustable rate loans with interest rate caps or floors, and various types of non-maturity deposits which give depositors the right to withdraw funds at any time, often without any penalties.

Option features can adversely affect earnings by reducing asset yields or increasing funding costs, and may reduce the expected cash flow's NPV. For instance, assume that a newly issued 30-year callable bond was purchased that pays a 10 percent coupon. If market rates decline to eight percent, the bond's issuer will likely call the bond because new debt will be less costly. At call, the issuer effectively repurchases the bond. As a

result, the bondholder will not receive the originally expected 10 percent coupon cash flow for 30 years. Instead, the bondholder must invest that principal at the new, lower market rate.

The asymmetrical payoff characteristics of instruments with option features can pose significant risk if not adequately managed, particularly to those who sell them, since the options held, both explicit and embedded, are generally exercised to the holder's advantage. An option holder's downside risk is limited to the premium or amount paid for the option, but upside reward is unlimited. The option seller typically has unlimited downside risk because the option holder usually exercises the option at a disadvantageous time for the option seller. If the option holder does not exercise the option, the option seller's upside reward is limited to the premium amount.

If a regulated entity writes or sells options, the amount of earnings or market value that a regulated entity may lose from an unfavorable interest rate movement may exceed the amount that may be gained if rates move in a favorable direction. As a result, the regulated entity may have more downside exposure than upside reward.

Some regulated entities may buy and sell options on a stand-alone basis. The option has an explicit price at which it is bought or sold and might or might not be linked with another product on the regulated entity's balance sheet. An institution does not have to buy and sell explicitly priced options to incur option risk, because options are embedded in certain assets, liabilities, and derivative instruments (i.e., swaptions).

Prepayment options are the regulated entities' most prevalent type of embedded options. The regulated entities assume significant interest rate risk when funding residential mortgages assets because the borrowers are able to prepay their mortgage loans at any time and in most cases without penalty. A prepayment option is equivalent to having written a call option to the customer. Consequently, the regulated entities face the risk that when mortgage interest rates drop they will receive principal payments earlier than anticipated and be left to invest that principal at lower yields. Conversely, when rates rise, customers are likely to keep their mortgages, making it difficult to shorten asset maturities just when shortening them would be preferable.

Since prepayments accelerate when interest rates drop and slow down when interest rates rise, mortgage assets are said to have "negative convexity." Convexity is a measure of how much a financial instrument's duration changes as interest rates change. In other words, the speed of price increase for mortgage assets declines as interest rates fall, depending on the underlying coupon(s) and the level of current market rates. As interest rates rise, prepayments tend to slow, creating extension risk.

Products containing interest rate caps or floors are other sources of option risk. For instance, the FHLBanks offer advances with embedded caps and floors. An advance cap

is like selling a put option on a fixed income security, and a floor is like owning a call. The cap or floor interest rate is the strike price. When market interest rates exceed the cap rate, the borrower's option is "in-the-money" because the borrower is paying a below market interest rate. Conversely, when market interest rates decline below the floor, the FHLBank's option is in-the-money because the advance rate is above the market rate.

Option risk results when the cash flow timing or amount is altered due to interest rate changes. This risk can adversely affect earnings by reducing asset yields or increasing funding costs, and it could reduce the expected cash flow's present value and thus, the regulated entity's economic value. For example, historically, rapid and sustained interest rate declines typically result in unprecedented prepayment speeds. The regulated entities that funded mortgage assets with callable debt endured earnings declines because most of the callable debt had specific lockout periods that prevented them from responding to prepayments in a timely manner. Consequently, net interest spreads were compressed because they retained higher priced debt and had to redeploy the prepayment proceeds in lower-yielding assets.

In addition to interest rate movements, changes in the expected volatility of interest rates changes can cause option values to change. If market participants expect increased rate volatility, options become more valuable. Changes in expected (or implied) volatility will, therefore, affect the market values of financial instruments with embedded options such as mortgage-related securities and callable bonds. A mortgage asset will tend to fall in value when implied volatility rises (the asset owner is "short" the option, the value of which rises when implied volatility rises) and rise when implied volatility falls. A callable liability, in contrast, will tend to rise in value when volatility rises (the issuer of the liability is "long" the option) and fall in value when implied volatility falls.

GAAP Accounting Risk

Accounting risk results from changes in the value of marked-to-market financial instruments that occur when interest rates fluctuate. For example, trading portfolios and held-for-sale loan portfolios contain accounting risk. Since these assets are marked-to-market, any value loss must be reflected in current earnings or the capital account in accordance with U.S. generally accepted accounting principles (GAAP). While some derivatives can offset these price changes, earnings and capital may still fluctuate because associated derivatives do not meet certain GAAP requirements. Accounting risk also arises from "mark-to-model" estimates for instruments that either do not trade in the market or do not have any liquid proxies in the marketplace from which to infer a reasonable price.

Interest Rate Risk Measurement and Management

Interest rate risk is generally managed with respect to an institution's earnings and economic capital. In assessing a regulated entity's exposure to interest rate risk, an examiner should assess the effect of interest rate changes on both earnings and the economic value of the entity (synonymous with the term "market value of equity").

Earnings Perspective

The earnings perspective considers the effect of interest rate changes on reported earnings. Typically the analysis focuses on the risk to near-term earnings over a relatively short-term horizon such as the next one or two years. Interest rate fluctuations generally influence reported earnings through changes in net interest income, but can also affect non-interest income. FHLBank prepayment penalty fees and the Enterprises' guarantee fees from asset securitization programs are examples of non-interest income that can be highly sensitive to interest rate changes. Income will vary because of differences in the timing of accrual changes (repricing risk), changing interest rate and yield curve relationships (basis and yield curve risks), and options positions. When interest rates change, a regulated entity's volume and mix of balance sheet products might also change. Market value declines of certain instruments may diminish near-term earnings when accounting rules require charging such declines directly to current income.

Evaluating interest rate risk solely from an earnings perspective is insufficient because most earnings-at-risk models project earnings over a short-term horizon. As a result, the potential effects of interest rate changes on earnings beyond the forecast horizon are not projected. Regulated entities should routinely conduct income sensitivity analysis forecasts in base case and interest rate shock scenarios, including changes in the level of interest rates and the yield curve slope.

Economic Perspective

Market interest rate changes also affect the value of assets, liabilities, and off-balance sheet instruments and, thus, have a direct effect on the MVE, which is a barometer of future financial performance. The economic value of any financial instrument equals the present value of its future cash flows. By extension, a regulated entity's MVE can be viewed as the present value of the assets' expected cash flows minus the present value of the liabilities' expected cash flows plus or minus the present value of the off-balance sheet instruments' expected cash flows (i.e., stand-alone caps or floors). One can estimate the sensitivity of interest rate changes to a regulated entity's MVE by estimating changes in the present value of assets, liabilities, and off-balance sheet instruments under a range of different interest rate scenarios.

Capturing the effect of interest rate changes on the value of all future cash flows provides a more comprehensive interest rate risk measurement than the earnings perspective. For example, income simulation may not discern the effect of interest rate changes for instruments linked to pricing and cash flow options, such as mortgage-backed securities and FHLBank advances with embedded interest rate caps. The economic perspective reflects one view of the regulated entity's ongoing worth and can often provide a basis for assessing past management decisions in light of current circumstances. Moreover, this approach can offer comprehensive insights into the potential future direction of earnings performance since MVE changes reflect changes in the present value of future earnings arising from its current holdings. Further, an economic value analysis facilitates risk/reward analysis because it provides a common benchmark, present value, for evaluating instruments with different maturities and cash flow characteristics.

Accepting some interest rate risk is a normal part of a financial institution's operations, but excessive interest rate risk can threaten earnings, capital, liquidity, and solvency. Interest rate risk management decisions should take into account the risk/reward tradeoff of interest rate risk positions. Management should compare the potential risk of an interest rate risk position or strategy under adverse rate movements against the potential reward of favorable rate movements.

Derivatives can be used to achieve any or all of the following objectives: limit downside earnings exposures, preserve upside earnings potential, increase yield, and minimize income or capital volatility. In the case of some FHLBanks, derivatives effectively convert large portions of both sides of the balance sheet to floating rate as a way of limiting interest rate risk. A regulated entity using off-balance sheet derivatives to hedge or alter the on-balance sheet interest rate risk characteristics needs to consider how the derivatives' cash flows may change with interest rate movements and in relation to the positions being hedged or altered. Derivative strategies designed to hedge or offset the balance sheet risk position will typically use derivatives whose cash flow characteristics have a strong and offsetting correlation with the instrument or position being hedged. During the selection process, the relative liquidity and cost of various contracts should be considered in order to select the product that offers the best mix of correlation, liquidity, and relative cost. Even if there is a high degree of correlation between the derivative contract and the hedged position, there may still be residual basis risk because cash and derivative prices do not always move in tandem.

To measure interest rate risk, management must project future interest rate environments and measure the risk in these environments by determining how certain influences such as cash flows, market, and product interest rates, will act together to change prices and earnings. This step requires management to make assumptions about future events. For the risk measurement system to be reliable, these assumptions must be sound.

Specific Risk Controls Relating to the Interest Rate Risk Management Function

Risk Management Framework

In general, the regulated entities assume considerable interest rate risk due to their holdings of mortgages and mortgage-related securities. It is essential to have a strong control framework that regularly evaluates risk-taking activities by assessing risk levels and the adequacy of risk management processes. The risk oversight function also monitors the development and implementation of control policies and risk measurement systems. Requisites for a sound risk management framework include adequate board and senior management oversight and a comprehensive risk management function and process.

Board of Directors and Senior Management Oversight

Board and senior management oversight is the cornerstone of an effective risk management process. The board and senior management have the responsibility to understand the nature and magnitude of interest rate risk being taken. Successful risk management requires an informed board, capable management, and appropriate staffing.

For its part, a board of directors must:

- 1) Establish clear strategic direction and interest rate risk tolerance limits and identify the senior managers who have the authority and responsibility for managing this risk.
- 2) Maintain comprehensive and up-to-date policies and procedures. Policies should be reviewed and approved at least annually.
- 3) Monitor performance and overall interest rate risk profile, ensuring a prudent amount of interest rate risk is maintained, is supported by adequate capital, and complies with regulatory requirements and internal policy parameters.
- 4) Confirm the adherence to sound risk management principles that facilitate the identification, measurement, monitoring, and control of interest rate risk.
- 5) Provide adequate resources devoted to interest rate risk management. Effective risk management requires both technical and human resources.
- 6) Ensure sufficient independence of the risk management, monitoring, and control functions from the position-taking functions.

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- 7) Have directors with practical interest rate risk skills and experience due to the complexity of managing interest rate risk. Further, the board should receive ongoing interest rate risk related training in order to ensure the directors understand the regulated entity's interest rate risk exposure.
 - 8) Establish a system for ensuring corrective action is taken to address regulatory, internal/external audit, and consultant findings.

Senior management is responsible for managing interest rate risk. In that capacity, senior management should:

- 1) Develop and implement procedures and practices that translate the board's goals, objectives, and risk tolerances into operating standards that are well understood by personnel.
- 2) Ensure adherence to the lines of authority and responsibility that the board has established for measuring, managing, and reporting interest rate risk exposures.
- 3) Oversee the implementation and maintenance of management information and other systems that identify, measure, monitor, and control interest rate risk.
- 4) Establish effective interest rate risk internal controls.

The primary risk in managing interest rate risk is taking inappropriate risk positions relative to earnings and capital. This risk is compounded when the risk management function cannot identify the excessive risk or exercise timely risk mitigation. An inappropriate risk position may result from poor corporate governance, inadequate risk measurement and information systems, weak internal controls, or inexperienced staff. Below are a few specific examples that may contribute to excessive interest rate risk.

- 1) The board and management may not have established adequate guidance and proper risk tolerance limits and may not monitor and regularly review the extent and direction of risk.
- 2) The funding and hedging strategies may not be commensurate with the level and types of risks undertaken.
- 3) The risk assessment process and risk measurement systems may not be sufficiently robust to identify and effectively capture all material risks.
- 4) An independent risk management function may not have been established to administer the risk measurement, monitoring, and control activities. Risk

management reporting lines and risk-taking functions may be improperly and ambiguously defined.

- 5) Senior management may lack controls over traders due to inadequate oversight.
- 6) The regulated entity may have internal control deficiencies that allow traders to create undetected policy exceptions due to unsatisfactory automated and manual controls.
- 7) The internal audit function may not have the requisite knowledge and expertise and/or the audit scope, frequency, and testing may be inadequate.
- 8) Traders and risk management staff could have insufficient experience and skills.
- 9) The new product development process may not be satisfactorily robust to identify and assess all material risks of new products *before* the products are rolled out.

Effective control of interest rate risk requires a comprehensive risk management process that ensures the timely identification, measurement, monitoring, and control of risk. Interest rate risk management policies and procedures should establish:

- 1) *Interest rate risk management strategy* - A regulated entity should have a well-defined strategy for managing its interest rate exposure. The strategy should provide an outline of approved interest rate risk management techniques and identify whether its principal objective is to manage its interest rate risk exposure with respect to earnings, or market value, or some combination thereof. The interest rate risk strategy should be approved by the board and included in a formal interest rate risk policy.
- 2) *Responsibility and authority* - Appropriate management must identify the potential interest rate risk arising from new or existing products or activities; establish and maintain an interest rate risk measurement system; formulate and execute strategies; and authorize policy exceptions.
- 3) *An interest rate risk measurement system* - The risk measurement system should be able to identify, quantify, and capture all material activities and products that increase the institution's interest rate risk exposure. Further, the system should be capable of measuring all significant market risk exposures under current and various alternative scenarios, including stress scenarios to provide information on the kinds of conditions under which its strategies and positions would be most vulnerable. The measurement system should be supported with adequate documentation and be validated at least annually.

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- 4) *A system for monitoring and reporting risk exposures* - The board should receive interest rate risk profile reports at least monthly. Senior management should receive reports more frequently depending on the nature and magnitude of the risk. These reports should allow management and the board to fully understand the regulated entity's interest rate risk position. The reports should, at a minimum, show the level and trend of interest rate risk exposure and compliance with regulations and policy risk limits.

 - 5) *Risk limits and controls* - When determining risk exposure limits, the board and management should consider the nature of the business strategies and activities, past performance, the amount of earnings and capital available to absorb potential losses, and the board's risk tolerance. The risk limits should be designed to control aggregate or entity-wide interest rate risk exposures. Where appropriate, there should also be limits for individual business activities or units, portfolios, traders, and positions.

 - 6) *Independent Risk Management Function* - There should be an independent risk management unit responsible for designing and administering the risk measurement, monitoring, and control functions. In general, the unit should be headed by an officer with responsibility for developing an effective risk management infrastructure which includes:
 - a) Maintaining a capable risk management staff;
 - b) Establishing risk management policies, procedures, and controls;
 - c) Reviewing and approving risk models;
 - d) Measuring and monitoring risk;
 - e) Monitoring and enforcing risk limits; and
 - f) Communicating risk management results to management and the board.

 - 7) *Risk Management Policies and Procedures* - There should be comprehensive interest rate risk management policies and procedures that are current, relevant, comply with applicable regulations, and are consistent with the other policies and procedures for risk measurement, monitoring, reporting, and controls.

 - 8) *Internal control procedures* - Board and senior management oversight is critical to the internal control process. In addition to establishing clear lines of authority, responsibilities, and risk limits, management and the board should ensure that adequate resources are provided to support risk monitoring, audit, and control functions. The persons or units responsible for risk monitoring and control functions should be separate from the persons or units that create risk exposures. There should be sufficient safeguards in place to ensure that all trades are reported to management in a timely manner and are consistent with approved strategies.

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- 9) *Internal Audit* - The internal audit function provides evaluations on the adequacy and effectiveness of the internal control structure. If the internal audit function does not have adequate technical expertise, independent testing should be outsourced to external auditors or consultants.

Regulatory Environment

- 1) ***Rules and Regulations of the predecessor Federal Housing Finance Board (Finance Board), which include the following parts and sections relevant to the FHLBank's interest rate risk management:***

12 CFR part 917 – Powers and Responsibilities of Bank Boards of Directors and Senior Management. In particular, 12 CFR 917.3, Risk Management and 12 CFR 917.6, Internal Control System, are pertinent.

12 CFR part 932 – Federal Home Loan Bank Capital Requirements. In particular, 12 CFR 932.5 defines an FHLBank's market risk capital requirements.

- 2) ***Rules and Regulations of the predecessor Office of Federal Housing Enterprise Oversight (OFHEO), which include the following parts and sections relevant to the Enterprises' interest rate risk management:***

12 CFR part 1710 – Corporate Governance – addresses powers and responsibilities of the boards of directors for Fannie Mae and Freddie Mac.

12 CFR part 1720 – Safety and Soundness, requires the Enterprises to, among other things, establish and implement policies and procedures that allow for the effective identification, measurement, monitoring, and management of market risk, including policies and procedures to quantify and monitor interest rate risk and to model the effect of differing interest rate scenarios on financial condition and operations.

- 3) ***Rules and Regulations of the Federal Housing Finance Agency, which include the following parts and sections relevant to interest rate risk management:***

12 CFR part 1236 Prudential Management and Operations Standards (PMOS) Standard 1 (Internal Controls and Information Systems), Standard 4 (Management of Market Risk - Measurement Systems, Risk Limits, Stress Testing, and Monitoring and Reporting), and Standard 8 (Overall Risk Management Processes). Among other things, these standards highlight the need for the regulated entities to establish risk management practices that measure, monitor, and control market risk and to have appropriate market risk policies, procedures, controls, and systems.

4) *Advisory Bulletins of the Federal Housing Finance Agency, and its predecessor, the Finance Board that provide guidance related to interest rate risk include the following:*

Advisory Bulletin 03-9 dated October 3, 2003 – Calculation of Duration of Equity (DOE) and DOE Limits in Low Interest Rate Environments and Related Reporting Requirements. Also refer to revised technical guidance memos issued on September 3, 2008 and November 12, 2009.

Advisory Bulletin 03-08 dated August 18, 2003 – Capital Management and Retained Earnings – provides guidance regarding capital management and retained earnings. Among other things, the Advisory Bulletin requires the board of directors of each FHLBank to maintain a formal retained earnings policy and to annually assess the adequacy of its retained earnings in the manner described therein.

Advisory Bulletin 04-5 dated September 29, 2004 – Interest Rate Risk Management – describes the Board’s responsibility for establishing interest rate risk limits and policies, procedures and internal controls. It also covers risk measurement, monitoring, and reporting systems requirements and expectations pertaining to stress testing, and model validation/documentation/back testing.

Advisory Bulletin 05-05 dated May 18, 2005 – Risk Management Oversight – provides guidance on the risk management responsibilities of the FHLBank’s board of directors, senior management, and risk management function.

Advisory Bulletin 05-06 dated June 10, 2005 – Changes to Internal Market Risk Models – provides guidance on the process through which an FHLBank may obtain approval to make changes to a previously approved internal market risk model.

Advisory Bulletin 09-03 dated December 15, 2009 – Validation and Documentation of Models and Related Controls on Internal Processes – provides guidance on model documentation and validation.

Advisory Bulletin 2012-03 dated December 19, 2012 – FHFA Examination Rating System – describes the FHFA examination rating system, known as CAMELSO (Capital, Asset Quality, Management, Earnings, Liquidity, Sensitivity to Market Risk, and Operational Risk). Among other things, AB 2012-03 provides guidance to examiners when rating a regulated entity’s earnings and instructs them to determine the quantity, trend, sustainability, and quality of earnings.

5) ***OFHEO Policy Guidance that provides supervisory guidance related to interest rate risk includes the following:***

PG-00-001 dated December 19, 2000 – Minimum Safety and Soundness Requirements. Among other things, requires management of the Enterprises to establish and maintain an effective risk management framework, including reviewing such framework to monitor its effectiveness and take appropriate action to correct any weaknesses.

PG-06-001 dated November 8, 2006 – Examination for Corporate Governance. Sets forth examination guidance and standards relating to the corporate governance of the Enterprises.

PG-06-002 dated November 8, 2006 – Examination for Compensation Practices. Sets forth examination guidance and standards relating to the compensation programs of the Enterprises.

PG-06-003 dated November 8, 2006 – Examination for Accounting Practices. Sets forth examination guidance and standards relating to the accounting practices of the Enterprises.

Issues Specific to the Regulated Entities

Regulated entities differ in the magnitude and degree of interest rate risk they are willing to assume. In general, the regulated entities should seek to minimize their interest rate risk exposure by closely matching their assets and liabilities' cash flows whenever possible, through either cash instruments or derivatives. However, in some instances regulated entities are willing to assume a greater extent of interest rate risk and could choose to take interest rate positions or to leave the positions open to capitalize on certain interest rate fluctuations. Assuming greater risk of any kind should be undertaken with appropriate analysis, including the effect on earnings and capital and the sufficiency of both.

To achieve a desired risk profile, an institution can alter its interest rate risk exposure by changing its balance sheet composition. Alternatively, it could use off-balance sheet derivatives to adjust its interest rate risk profile. Customarily, regulated entities establish strategies to substantially limit interest rate risk in certain business lines or asset classes.

FHLBank Example: The FHLBanks typically micro hedge a large advance with a derivative that has cash flows that mirror the advance. In funding fixed-rate advances, the FHLBanks frequently use interest rate swaps to convert fixed-rate callable consolidated obligations to floating-rate instruments that periodically reset to an index

such as three-month LIBOR. If the hedged advances or liabilities have embedded call options, caps, or floors, the FHLBank may hedge the risk with derivative instruments that emulate the embedded options. Bullet debt is often used to duration match term advances. Macro hedging strategies are sometimes employed to mitigate the interest rate risk exposure derived from advances that are too small to micro hedge. The regulated entities use derivatives such as caps, floors, swaps, swaptions, and callable debt to macro hedge the balance sheet.

Enterprise Example: An Enterprise might write call and put swaptions and sell them to counterparties, which gives the counterparty the option to enter into receive- and pay-fixed interest rate swaps, respectively. Additionally, the Enterprise could write call and put options on mortgage-related securities to give the counterparty the right to execute a contract under specified terms, which generally occurs when the Enterprise is in a liability position. These written options and swaptions might be used to manage convexity risk over a wide range of interest rates and lower an Enterprise's overall hedging costs. Additionally, they could use written options to rebalance the embedded options in callable debt and mortgage backed securities (MBS) portfolios.

In general, the regulated entities manage interest rate risk with a combination of swapped and unswapped callable and non-callable debt, fixed- and floating-rate bullet debt, and derivative instruments. Callable bonds, for instance, can be used to manage option risk associated with mortgage assets. Some regulated entities use both the receiver and payer swaptions to hedge volatilities in the mortgage portfolio's value. Specifically, the receiver swaptions are used to hedge the income volatility because of premium amortizations while the payer swaption hedges the value decline when interest rates increase.

FHLBank Example: It is not possible for the FHLBanks to consistently issue debt and advances simultaneously in the same amount and with the same terms as the advance, or to predict advance demand, including the terms sought for advances. As a result, the FHLBanks must have a ready supply of funds on hand to meet advance demand. Typically the FHLBanks will source debt as opportunities arise and make the debt issuance proceeds available for advance demand. Debt issued for liquidity is often referred to as "warehoused" debt or liabilities. Often, both the debt and advance are swapped to three-month LIBOR. The FHLBanks may use derivative instruments to hedge anticipated debt issuances and mortgage delivery commitments.

Some of the regulated entities use a delta hedging strategy to manage the mortgage portfolio's price volatilities through offsetting long and short positions. It is the process of setting or keeping the portfolio's delta at zero, or close to zero, where delta is the sensitivity of the derivative's value to price changes of its underlying instruments. The mortgage portfolio has to be adjusted continuously in order to maintain delta neutrality.

Interest Rate Risk Measurement

Risk measurement systems should be able to identify and quantify in a timely fashion the institution's major interest rate risk sources. At least annually, a summary of current interest rate risk measurement approaches, techniques and management practices should be provided to senior management and the board. This presentation should explicitly identify and report weaknesses or limiting assumptions in risk measurement models. In addition, significant model revisions should be reported and the effect on risk levels quantified.

Interest Rate Risk Modeling Assumptions

A regulated entity's interest rate risk exposure is largely a function of three variables, the sensitivity of its instruments to a given change in interest rates, the magnitude of the change, and the direction of the change. The assumptions and interest rate scenarios developed are usually shaped by these three variables. Some common problems in this step include:

- 1) Failing to assess potential risk exposures over a sufficiently wide range of interest rate movements to identify vulnerabilities and stress points.
- 2) Not modifying or varying assumptions for products with embedded options to be consistent with individual rate scenarios.
- 3) Basing assumptions solely on data without considering how the competitive market and customer base may change in the future.

While models enable management to quantify sensitivity to interest rate changes, these models introduce the risk that modeling assumptions may not hold in all cases. Such a possibility is generally termed "model risk". The regulated entities should regularly re-evaluate interest rate risk model assumptions to ensure that they provide a reasonable estimate of risk for the simulated scenarios.

Future Interest Rate Assumptions

A regulated entity must determine the range of potential interest rate movements to measure its exposure. Management should ensure that risk is measured over a reasonable range of potential rate changes, including meaningful stress situations, to allow management to understand the inherent risks in the regulated entity's products and activities. In developing appropriate rate scenarios, management should consider a variety of factors such as the shape and level of the current term interest rate structure and the historical and implied volatility of interest rates. The regulated entity should also take into account the nature and sources of its risk exposure, the time it would realistically

need to take actions to reduce or unwind unfavorable risk positions, and management's willingness to recognize losses in order to reposition its risk profile.

As the regulated entities have significant option risk, the scenarios should include ones that capture the exercise of such options. Products with caps or floors, for example, require scenarios that assess how the risk profile would change should those caps or floors become binding. Since an option's market value fluctuates with volatility changes as well as with changes in the level of rates, regulated entities that write options should also develop interest rate assumptions to measure their exposure to volatility changes.

Stress Testing

Stress testing and scenario analysis should play an important role in an interest rate risk management strategy. As a matter of sound practice, management should not plan its asset/liability strategy around a single "most likely" interest rate forecast, but rather should structure its position so that financial performance is acceptable across a range of plausible interest rate scenarios. The scenarios should comprise optimistic, pessimistic, and most likely forecasts under immediate and gradual rate movements. Additional stress scenarios need to address changes pertaining to relationships among key market interest rates, yield curve shapes, interest rate volatilities, prepayment rates, and interest rate spreads. It may also be appropriate to stress implied volatilities related to stand-alone or embedded options, as well as credit spreads. Management should ensure that the stress tests capture the risks associated with complex financial instruments, and that the risks associated with these instruments are properly understood.

A regulated entity's stress testing should include instantaneous parallel shifts of the yield curve of +/- 50, 100, 150, and 200 basis points. When interest rates are such that the -200 basis point parallel shock would produce some swap or consolidated obligation rates below zero or near enough to zero to cause modeling difficulties, FHLBanks should employ a smaller down shock (i.e., a constrained down shock) using methods described in Advisory Bulletin 03-9. This advisory bulletin describes the guidance for calculating DOE and DOE limits in low interest rate environments. Revised technical guidance memos issued on September 3, 2008 and November 12, 2009 provide further direction. If warranted by the prevailing interest rate environment, testing should also regularly assess changes in rates of greater magnitude (300 to 400 basis points) across different tenors to reflect changing slopes and twists of the yield curve. Tests should evaluate both instantaneous rate shocks and those that occur over a prolonged time and should be severe, but plausible given the existing level of rates.

Scenario analysis prompts decision-makers to think about and plan for alternative future environments. The board and management should consider stress test results when establishing and reviewing strategies, policies, and limits for managing and controlling interest rate risk. Further, they should periodically review the stress test designs to ensure

that they encompass the kinds of market conditions under which the regulated entity's positions and strategies would be the most vulnerable.

Additional details regarding interest rate risk assumptions and stress testing can be found in the Risk Modeling examination module. Examination activities related to interest rate risk measurement and management should be coordinated closely with activities in the risk modeling area.

Corporate Governance

The board of directors and senior management are responsible for identifying, measuring, monitoring, and reporting the regulated entity's interest rate risk exposure. For the regulated entities, the market risk related area of the risk management function is often part of the enterprise-wide risk management function. Although regulated entities may organize oversight of the market risk function differently, it is essential that the institution's enterprise risk management function is closely involved in ensuring risk limits are appropriate and compliance with the limits is continually monitored. The board and management in conjunction with the enterprise risk management function should ensure any established risk parameters are consistent with the institution's overall business plan and the organization's risk appetite.

A regulated entity should establish a policy detailing its risk governance structure and process. The policy should identify and capture the decision-making process and approval authority. Additionally, it should detail the board and senior management's role in establishing and overseeing strategies and processes that identify, measure, monitor, and control risk. The risk governance policy includes the risk policies, committees and management processes, information flows, and reporting that are required to effectively manage risk, including interest rate risk.

The regulated entity's board usually delegates responsibility for developing specific interest rate risk policies and practices to a management committee, such as a financial management committee or the asset liability management committee (ALCO). Usually, the ALCO manages the business structure and the amount of interest rate risk assumed. It is responsible for ensuring that measurement systems adequately reflect exposure and that reporting systems appropriately communicate the level and sources of the regulated entity's exposure.

To be effective, the ALCO should include representatives from each major business line that assumes interest rate risk. Sometimes the ALCO includes a business marketing representative so that promotion efforts are consistent with the ALCO's view on the business structure. Committee members should be senior managers with clear lines of authority over the units that establish and execute interest rate positions. A clear channel must exist to convey the ALCO's directives to these line units. The risk management and

strategic planning areas should communicate regularly to evaluate potential risks arising from future business.

The ALCO usually delegates day-to-day operating responsibilities to the treasury unit. Prior to delegation, the ALCO should establish specific operational practices and limits. Treasury personnel are typically tasked with managing discretionary portfolios, such as securities and derivatives contracts, and in the case of the FHLBanks consolidated obligations and discount notes. The treasury unit or investment officer can influence interest rate risk exposure when it implements the ALCO's policy on short- and long-term positions.

Effective Enterprise-Wide Communication

To effectively manage risk, close coordination with other key operating areas is required, including those that are responsible for the following processes:

- 1) New loan purchases, and principal and interest payment cash flows;
- 2) Banking services including activities such as deposits, wire transfers, automated clearing house transactions, Federal Reserve Bank and correspondent banks, and safekeeping;
- 3) Investment purchases, maturing assets, derivative transaction payments, and newly-issued and maturing debt;
- 4) Accounting, such as general ledger balances, premium amortization and discount accretion; and
- 5) Risk measurement, monitoring, and reporting.

Examination Guidance

The workprogram for the Interest Rate Risk Management examination module is detailed below. If this module is included in the examination scope, the examiner must perform worksteps sufficient in coverage to document the basis for conclusions on the quantity of risk and quality of risk management pertaining to this area. Transaction testing is mandatory and the examiner must document sufficient worksteps from Section 4, *Testing*, to support the findings and conclusions from this examination module.

In determining the extent of review and testing to be conducted in completing each examination, the examiner should take into account applicable FHFA off-site monitoring or analysis reports, such as analyses on the quality and effectiveness of corporate governance practices, financial condition and performance, economic and housing industry conditions, internal controls, and audit coverage relating to the institution's interest rate risk activities.

NOTE: Text in (*italics*) referenced in a workstep represents illustrative guidance that serves as suggestions for specific inquiry.

1. Scope of Examination Work Performed

- 1) Review past reports of examination for outstanding issues or previous problems related to interest rate risk management.
- 2) Review applicable FHFA off-site monitoring or analysis reports, and workpapers produced as part of on-going monitoring, related to interest rate risk management.
- 3) Assess the status of outstanding Matters Requiring Attention and Violations pertaining to interest rate risk management.
- 4) Review internal audit reports for outstanding issues relating to interest rate risk management.
- 5) Review minutes of meetings of the board of directors and relevant board and management committees for any issues regarding interest rate risk management.
- 5) Assess the regulated entity's responsiveness and actions taken to address concerns identified by internal/external auditors, third-party consultants, and the FHFA.

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- 6) Determine if the board approves all major interest rate risk management strategies and policies and reviews the strategies and policies at least annually and more frequently if market conditions warrant review or if the regulated entity incurs significant deviations from expectations. Further, ascertain whether the regulated entity's interest rate risk management strategy focuses on managing earnings, economic value, or both.
 - 7) Determine the quality and effectiveness of the interest rate risk policies and procedures.
 - 8) Based on a review of preliminary information, determine whether hedging strategies are appropriate and sufficient to manage option risk, basis risk, yield curve risk, price risk, and repricing risk associated with on- and off-balance sheet activities. *(Is the institution using derivatives for speculative purposes under the guise of hedging? Is the institution exposed to certain risks because management and the board failed to identify potential risk? Has the institution not addressed certain risks because hedging practices were inappropriate?)*
 - 9) Ascertain if derivatives are used effectively to hedge anticipated debt issuance and mortgage delivery commitments.
 - 10) Determine if the regulated entity uses a delta hedging strategy to manage volatility risk associated with mortgage assets. *(Do the board and management clearly define this strategy? Are they able to monitor the strategy's results? Is the delta hedging strategy appropriate to mitigate risks? Is the institution involved in a number of off-setting positions to ensure compliance with certain risk parameters without consideration of the institution's overall risk exposure?)*
 - 11) Review minutes for the board, board committees, and other appropriate committees such as the ALCO and risk management. Determine the extent and effectiveness of senior management and the board's oversight of interest rate risk activities. *(Do board committees report pertinent information to the full board appropriately? Does the board participate in the interest rate risk policymaking and strategic planning process?)*
 - 12) Review and conclude on whether the institution's potential market risk exposure has been appropriately identified.
 - 13) In combination with the examiner reviewing derivatives accounting, assess the adequacy of the accounting procedures and strategies for mitigating accounting risk arising from interest rate changes in the context of earnings and capital. The review should focus on the following Accounting Standard Codifications (ASC):

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- a) ASC 310-20 Receivables – Non Refundable Fees and Other Costs.
 - b) ASC 320 Investments – Debt and Equity Securities.
 - c) ASC 815 Derivatives and Hedging.

Summarize the work performed in the examination of Interest Rate Risk Management. To the extent there were modifications to the originally planned scope based on concerns identified during the examination, document those changes and the reasons for such changes.

2. Description of Risks

- 1) Discuss with management the interest rate risk management strategy and any key strategy deviations since the prior examination. *(The examiner should ensure that their review covers any significant strategy changes.)*
- 2) Determine if adequate systems and resources are available to measure, monitor, manage, and control interest rate risk.
- 3) Identify the source of interest rate risk exposure to the organization. *(Has the board and management identified those risks appropriately? Are those risks considered in establishing appropriate internal controls, including the development of risk parameters related to interest rate risk?)*
- 4) Evaluate any significant changes that have been implemented since the last examination or are being considered that may affect the regulated entity's risk profile. *(The examiner should consider:*
 - a) *New derivatives products offered.*
 - b) *Implementation of new systems or model upgrades.*
 - c) *Hedging strategy modifications due to anticipated interest rate risk changes and/or balance sheet composition changes.*
 - d) *Policies and key procedures.)*

3. Risk Management

Risk Identification Process

- 1) Based on worksteps performed under **Description of Risks**, assess and conclude on the adequacy of the organization's risk identification process.
- 2) Review the regulated entity's annual risk assessment to determine if it reasonably identifies and evaluates all material interest rate risk management risks. Investigate any action plans arising from the assessment and check corrective actions for effectiveness. (*Determine whether the regulated entity's risk assessment:*
 - a) *Identifies all business lines and processes and their strategic objectives;*
 - b) *Describes key business processes;*
 - c) *Defines associated risks and quantifies potential effects on earnings and capital;*
 - d) *Delineates control objectives;*
 - e) *Identifies and assesses the effectiveness of mitigating controls;*
 - f) *Documents methods used for testing control effectiveness;*
 - g) *Quantifies the likelihood of control failures; and*
 - h) *Identifies control weaknesses and describes remedial actions to address the deficiencies.*)
- 3) Determine if the institution appropriately identifies, measures, monitors, and reports interest rate risk trends and level of risk and that the interest rate risk management activities are consistent with the business strategy. (*If the regulated entity's practice differs from that of the business plan strategy, determine the cause for the difference. Do the organization's practices result in risk greater than the risk appetite defined by the board and management?)*

Organizational Structure

- 1) Identify the key interest rate risk officers and personnel and their primary responsibilities, reporting lines, knowledge, and technical expertise. Determine if the staffing and skill level, segregation of duties, and cross-training are sufficient to execute interest rate risk management strategies, focusing on any significant personnel changes since the prior examination.
- 2) Determine whether the board and management have received ongoing interest rate risk education regarding major activities and new interest rate risk management strategies.

- 3) Determine if the board's committee structure and delegated authorities effectively assist the full board in understanding the regulated entity's interest rate risk exposures and strategies. *(Are concerns appropriately identified and communicated to the board and management? Are explanations of how risk is mitigated appropriately described?)*
- 4) Review resumes or biographies of new managers in key positions and job descriptions for key positions, particularly any recently-created positions.
- 5) Determine if the risk management, monitoring, and control functions are sufficiently independent of risk-taking functions. Ideally, an independent risk management unit should be responsible for designing and administering the risk measurement, monitoring, and control functions. *(In general, the unit should be headed by an officer with responsibility for developing an effective risk management infrastructure which includes:*
 - a) Maintaining a capable risk management staff;*
 - b) Establishing risk management policies, procedures, and controls;*
 - c) Reviewing and approving risk models;*
 - d) Measuring and monitoring risk;*
 - e) Monitoring and enforcing risk limits; and*
 - f) Communicating risk management results to senior management and the board.)*

Policy and Procedure Development

- 1) Determine if departmental policies and procedures are current, relevant, comprehensive, comply with applicable regulations, and are consistent with the regulated entity's other policies. They should be approved annually by the board and senior management. *(Some points to consider include:*
 - a) Sources of interest rate risk;*
 - b) Policy limits and/or management action triggers;*
 - c) Policy exceptions;*
 - d) Roles and responsibilities;*
 - e) Approval authority;*
 - f) Authorized hedging strategies;*
 - g) Approval process for new hedging strategies;*
 - h) Applicable accounting issues;*
 - i) Eligible hedging instruments;*
 - j) Segregation of duties;*
 - k) Risk measurement approaches and value measures (i.e., MVE, DOE, KRD, etc.);*
 - l) Stress testing scenarios;*

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- m) Modeling assumptions and documentation;*
 - n) Measurement system changes and upgrades;*
 - o) Model validation;*
 - p) Risk monitoring; and*
 - q) Board and management reporting.)*

Risk Metrics

- 1) Determine if the board approves the interest rate risk limits at least annually and more frequently in the event of significant changes in market or financial conditions. The board's review should also include an assessment of management's compliance with the risk limits. Limits should not be set so far above actual risk exposures, or target levels of exposure, that they are meaningless or have no effect on risk-taking behavior. In conjunction with the examiner reviewing derivatives, evaluate the limit's appropriateness. (*Are the limits:*
 - a) Consistent with the strategy and the board's risk tolerance?*
 - b) Reasonable in light of recent financial performance and budget expectations?*
 - c) Adequately controlling interest rate risk exposures in normal and volatile market conditions?*
 - d) Defined in terms of economic capital and earnings and tailored to the various shock scenarios such as parallel and nonparallel interest rate shocks, as well as changes in other key risk factors such as prepayments, interest rate volatility, and interest rate spreads?*
 - e) Linked to risk metrics such as value-at-risk (VaR), DOE, duration gap, and the market value of equity to book value of equity or to specifics like the mortgage portfolio, repricing risk, and basis risk?)*
- 2) Obtain management analyses and determine whether the analyses consider the board's strategic direction and risk appetite, and the regulated entity's earnings and capital positions, including retained earnings, in order to set forth the regulated entity's interest rate risk exposure limits. (*Do risk parameters serve as a sound limit on risk exposure consistent with the organization's overall risk appetite?*)

Reporting

- 1) Assess the board and management interest rate risk reports. (*Consider whether the reports:*
 - a) Are tailored to the intended audience and level of risk;*
 - b) Are accurate and timely;*
 - c) Explain how risks have changed rather than simply providing data;*
 - d) Provide both summary information and transaction detail, as appropriate; and*

e) Address or include:

- i. Compliance with risk limits*
- ii. Policy exceptions/waivers (A large number could indicate a weakness, especially if not pre-approved by board or a supervisory committee)*
- iii. Performance relative to the business strategy*
- iv. Internal/external audit reports*
- v. Consultant reports covering significant issues*
- vi. Model validation reports)*

Internal/External Audit

- 1) Review interest rate risk-related Internal/External Audit reports to determine the audit function's coverage and effectiveness in identifying internal control and risk management deficiencies. Coordinate the review with the examiners assessing derivatives, modeling, and internal audit.
- 2) Review adequacy of internal audit's scope, testing, and frequency related to interest rate risk. At a minimum, the audit should accomplish the following:
 - a) Determine the adequacy of all policies and procedures;
 - b) Evaluate the accounting, operational, compliance, and risk management controls;
 - c) Test compliance with policies, including risk limits;
 - d) Determine the appropriateness of the risk measurement methodologies and assumptions, including those for interest rates, spreads, prepayments, yield curves, discount rates, volatilities, and interest rate scenarios;
 - e) Include reconciliations of on- and off-balance sheet model inputs to the general ledger;
 - f) Ensure the risk modeling process and assumptions are sufficiently documented;
 - g) Evaluate the risk management function's effectiveness and independence;
 - h) Verify internal risk measurement and revaluation methodologies' accuracy;
 - i) Validate the accuracy of pricing, revaluation, and risk measurement methodologies (including spreadsheet applications), especially with new products;
 - j) Test the reliability and timeliness of senior management and board reports;
 - k) Evaluate the appropriateness of the accounting treatment; and
 - l) Determine the adequacy of data processing systems and software.
- 3) Conclude on the adequacy of interest rate risk audit staff resources and qualifications. *(Has the internal audit department outsourced certain interest rate risk audit activities? Is such work outsourced because of the department's lack of expertise?)*
- 4) Review the audit findings since the previous examination and consider the seriousness of identified deficiencies.

- 5) Review the adequacy of management's steps to correct weaknesses identified by the internal/external audits and examination findings.

Information Technology

- 1) Obtain flow charts and analyze key processes and channels of information from the front office to the back office. Identify and assess the automated and manual systems and applicable controls for processing information within the same business unit as well as from one business unit to another. Identify and evaluate internal control exceptions and violations to determine whether they have occurred due to deficiencies in controls. *(Does the regulated entity exhibit a heavy reliance on manual entry systems and end-user developed programs to monitor interest rate risk? Are appropriate controls in place to ensure information relied upon is accurate?)*
- 2) In coordination with the examiners reviewing risk modeling, derivatives, and information technology (IT), review current systems' capabilities and planned upgrades or enhancements.

Compliance

- 1) Assess and conclude on the regulated entity's conformance with internal policies and procedures and regulatory requirements relating to interest rate risk. Consult with personnel from FHFA's Office of the Chief Accountant to evaluate compliance with GAAP for interest rate risk management activities. *(For instances of regulatory violations, the examiner should identify the cause of the violation. Determine how internal controls should be strengthened to ensure there are no future regulatory violations.)*
- 2) Evaluate the board and management's efforts to ensure compliance with interest rate risk policies and procedures.
- 3) Assess and conclude on compliance with FHFA Prudential Management and Operations Standards (12 CFR part 1236), including Standard 1 (*Internal Controls and Information Systems*), Standard 4 (*Management of Market Risk - Measurement Systems, Risk Limits, Stress Testing, and Monitoring and Reporting*), and Standard 8 (*Overall Risk Management Processes*).
- 4) Evaluate compliance with any conditions imposed as part of the FHFA approval to conduct a new business activity related to interest rate risk management, if applicable.

4. Testing

- 1) Obtain the regulated entity's prices for mortgage assets and derivative instruments used for the production of risk exposure reports. Compare the regulated entity's internally generated prices against broker-dealer prices and assess instances where there is significant variance.
- 2) Obtain a sample of trade transactions, such as FHLBank advances, MBS/Collateralized Mortgage Obligations (CMOs), and debt. Analyze their risk characteristics to determine that they are appropriate and consistent with the board-approved policies and regulatory guidelines.
- 3) In conjunction with FHFA risk modeling staff, assess and discuss with management the regulated entity's sensitivity to the following scenarios:
 - a) Parallel and non-parallel interest rate shocks such as yield curve shape changes, including steepening, flattening, and twists;
 - b) Changes in key spreads such as those between mortgage rates and LIBOR;
 - c) Exposure to rate fluctuations at particular yield curve term points; and
 - d) Shocks that determine the regulated entity's KRDs.
- 4) Assess the regulated entity's VaR analysis.
- 5) Review income sensitivity under various interest rate scenarios.
- 6) Evaluate the regulated entity's overall risk management practices for consistency with the stated objectives in managing interest rate risk. (*Are the organization's practices consistent with the stated risk appetite for the institution?*)
- 7) Assess other risk monitoring reports such as repricing, basis gap, and VaR reports.
- 8) Determine whether the regulated entity can adequately value instruments in both the base case and alternative scenarios and whether the values were independently obtained. Risk Modeling's pre-examination analysis should provide evidence that the regulated entity's models are valuing optionality accurately.
- 9) Review and analyze the balance sheet structure, off-balance sheet activities, trends, and asset and liability compositions to identify the major sources of interest rate risk exposures. Specifically, consider:

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- a) The maturity and repricing structures of the loan, investment, liability, and off-balance sheet portfolios;
 - b) Holdings of products with explicit or implicit embedded options, such as prepayment options, caps, or floors, or products whose rates will considerably lag market interest rates;
 - c) The various indices used to price variable rate products, such as Prime, LIBOR, Treasury, and the level or mix of products tied to these indices;
 - d) The use and nature of derivative products;
 - e) Other off-balance sheet items, such as, letters of credit, loan commitments, and mortgage delivery commitments; and
 - f) The timing of interest rate changes and cash flows because of maturity or repricing mismatches.

5. Conclusions

- 1) Summarize conclusions for all examination work performed, including work performed by other FHFA staff as it relates to the regulated entity's interest rate risk management practices. Develop a memorandum describing the risks to the institution related to capital and the regulated entity's management of those risks. The memorandum should describe the basis of conclusions reached and summarize the analysis completed. Within the memorandum, discuss the types of risk the regulated entity is exposed to in its interest rate risk management practices (e.g., market, credit, operational); the level of risk exposure; the direction of risk (stable, decreasing, increasing); and the quality of risk management practices (strong, adequate, weak). A memorandum must be prepared irrespective of whether the examiner's assessment is positive or negative. The memorandum should include a recommended rating for the Sensitivity component based on the FHFA CAMELSO rating system.
- 2) Conclude on the responsiveness to previous examination findings. Evaluate the adequacy of the regulated entity's response to previous examination findings and concerns.
- 3) Develop examination findings and prepare findings memoranda, as appropriate. Based on examination work performed, develop findings communicating concerns identified during the examination. Findings should identify the most significant risks to the institution and the potential effect to the regulated entity resulting from the concerns identified. Such documents should describe a remediation plan specifying the appropriate corrective action to address examination concerns and establish a reasonable deadline for the regulated entity to remediate the finding. Communicate preliminary findings to the EIC. Discuss findings with regulated entity personnel to ensure the findings and analysis are free of factual errors.

- 4) Develop a list of follow-up items to evaluate during the next annual examination. In addition to findings developed in the steps above, include concerns noted during the examination that do not rise to the level of a finding. Potential concerns include issues the regulated entity is in the process of addressing, but require follow-up work to ensure actions are completed appropriately. In addition, potential concerns should include anticipated changes to the institution's practices or anticipated external changes that could affect the institution's future interest rate risk management practices.

Workprogram

1. Scope of Examination Work Performed

Workpapers must document the examination activities undertaken to evaluate potential risks related to interest rate risk management.

2. Description of Risks

- Identify areas of concern related to interest rate risk management
- Assess current risks and trends in the risk to the organization emanating from the regulated entity's interest rate risk management function
- Evaluate changes within the organization or industry affecting risk
- Evaluate the entity's own risk identification practices and conclude on their adequacy

3. Risk Management

- Assess and conclude on the adequacy of the organization's risk identification process
- Assess and conclude on the overall adequacy of internal controls, including an evaluation of:
 - The regulated entity's organizational structure
 - Policy and procedure development for interest rate risk management
 - Appropriateness of risk metrics established in the interest rate risk management area
 - Reporting by management and the board
- Assess and conclude on the internal and external audit of risks
- Assess and conclude on the adequacy of information technology and controls related to interest rate risk management
- Assess and conclude on the adequacy of the organization's efforts to ensure:
 - Compliance with laws, regulations and other supervisory guidance
 - Compliance with the organization's policies and procedures

4. Testing

- Complete testing, as appropriate, to assess adherence with examination standards

5. Conclusions

- Summarize conclusions for all examination work performed related to interest rate risk management
 - Conclude on the level of risk to the organization
 - Include an assessment of the adequacy of an organization's monitoring of risk and establishment of internal controls to mitigate risk
- Conclude on responsiveness to examination findings from previous examinations
- Develop examination findings as appropriate
- Identify areas requiring follow-up examination activities or monitoring