



EM-61.2

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Overview

The *Interest Rate Risk Management* topic provides guidance on evaluating the interest rate risk (IRR) management framework and processes at Farm Credit System (System) institutions. While the guidance below focuses on banks and associations, it is also applicable to service corporations if they have IRR. Farm Credit Administration (FCA) Regulations [615.5180](#) and [615.5182](#) and Bookletter [BL-072](#) address IRR management requirements and expectations.

The board and senior management need to understand the institution's IRR sources and exposures, communicate acceptable risk tolerances, and ensure IRR is consistent with board philosophy and the institution's risk-bearing capacity. As stated in FCA Bookletter [BL-072](#), this is accomplished by:

- Establishing policies, procedures, and strategies for managing IRR.
- Allocating sufficient resources and assigning responsibilities for IRR management.
- Establishing processes for identifying, measuring, monitoring, controlling, and reporting IRR.
- Creating a system of internal controls, including audits and reviews, to ensure the integrity of IRR measurement and management processes.

The nature and complexity of business activities and risk exposures are important factors in determining the extent and sophistication of IRR management processes needed. As such, an important step before examining IRR management is to evaluate the institution's IRR exposures using the examination guidance in the *Interest Rate Risk* Examination Manual topic. Upon understanding the institution's IRR exposures, examiners should use the guidance below to evaluate IRR management differentially based on the nature of those exposures.

This guidance uses the term *institutions with significant IRR sources* (as it is defined in the attachment to FCA Bookletter [BL-072](#)) to refer to those institutions that need to adopt a more comprehensive IRR management framework to comply with FCA Regulation [615.5180](#). This most commonly includes banks and block-funded associations (also defined in the attachment to FCA Bookletter [BL-072](#)). However, it also refers generally to institutions that significantly mismatch funds transfer pricing (FTP) rates or options, concentrate equity in funding assets in certain time buckets, or are involved in other interest-rate-sensitive activities that could result in significant declines in earnings or market value of equity (MVE). As stated in FCA Regulation [615.5182](#), such institutions are subject to the requirements in FCA Regulation [615.5180](#) commensurate with the nature and complexity of their IRR exposures.

In addition to this guidance, the following resources developed by other regulatory agencies provide background information and general guidance on IRR management for financial institutions:

- Office of the Comptroller of the Currency's [Interest Rate Risk booklet](#)

- Federal Deposit Insurance Corporation’s [Winter 2014 Supervisory Insights](#) (articles addressing IRR management issues, including governance, model assumptions, and audit)
- [Basel Committee on Banking Supervision: Interest Rate Risk in the Banking Book](#) (April 2016)
- [Joint Agency Policy Statement: Interest Rate Risk](#) (June 1996)
- Interagency [Advisory on Interest Rate Risk Management](#) (January 2010) and the related [Frequently Asked Questions](#) (January 2012)

Examination Procedures and Guidance

General

1. Policy & Procedures:

Determine if policies and procedures addressing IRR management provide adequate guidance and risk parameters.

Guidance:

Policies and procedures establish the framework for IRR management. They should be designed to control the nature and amount of IRR the institution assumes and be appropriate for, and commensurate with, the complexity of the institution’s IRR exposures. Policies and procedures should be consistent with regulatory requirements, strategic business objectives, and risk tolerances. In addition, the specialized expertise of staff and the capability of risk management and measurement systems should be considered when establishing policies and procedures, particularly when establishing risk parameters and limits on business activities that affect IRR exposure. The board may delegate to management the authority to establish specific criteria in procedures. However, the board must provide sufficient policy guidance to comply with regulatory requirements and ensure effective governance and control of IRR exposure.

Evaluative questions and items to consider when examining IRR policy and procedures include:

- **Policies: Does the IRR policy include appropriate risk limits and provide adequate direction on IRR management?** FCA Bookletter [BL-072](#) (section II) lists specific areas that should be addressed in board policies, which are differential based on the level and nature of the institution’s IRR exposures. Also, FCA Regulation [615.5180\(c\)](#) identifies minimum policy requirements for banks and any other institutions that have significant IRR sources. For associations that use their funding bank’s FTP process, the policy description of the board’s risk tolerance should address, among other areas, the extent to which assets are match-funded with FTP rates. For example, an association board may mandate that all assets must be match-funded, with any exceptions requiring board approval. *Note: While all institutions’ policies should address delegated authorities, it is required by FCA Regulation [615.5180\(d\)](#) at institutions with significant IRR sources.*
- **Procedures: Do procedures provide sufficient detailed direction to communicate management’s expectations and ensure consistency and continuity of processes?** FCA Bookletter [BL-072](#) (section II) addresses expectations for management’s written operating procedures. As with board policies, expectations for management procedures are

differential based on the level and nature of the institution's IRR exposures.

- **Periodic Review: Are IRR policies and procedures periodically reviewed and updated?** Policies and procedures should be periodically reviewed and updated, with consideration given to any adjustments that may be needed in response to changes in market conditions, risk exposures, or the institution's financial condition. As addressed in FCA Bookletter [BL-072](#) (section II), this review should ensure risk limits remain consistent with the board's risk appetite as well as any changes in the institution's risk-bearing capacity. For example, at institutions that measure MVE, the periodic review should consider the current MVE-to-book value of equity (BVE) ratio, with an adjustment to risk limits, if necessary, to prevent this ratio from declining to an unsatisfactory level. The review should consider if changes in the level and composition of earnings result in a need to adjust risk limits. The review should also consider if new business activities or changes in existing business activities affect the institution's IRR profile and warrant a change in related policies or procedures.

2. IRR Strategies:

Determine if strategies for managing IRR are sufficient to maintain risk at an acceptable level.

Guidance:

IRR strategies are the actions, plans, and approaches the institution uses to manage and control IRR. Strategies should ensure IRR is maintained at an acceptable level. Accepting some IRR is normal for a financial institution, but excessive IRR can threaten earnings, capital, liquidity, and solvency.

Institutions have many strategy options available to mitigate and manage IRR. The nature and complexity of these strategies can vary depending on the institution's IRR profile and the board's risk appetite. For example, an institution that has a strategy of fully match-funding assets with the funding bank's FTP rates may not need to develop additional strategies or risk mitigating steps. However, if an institution is actively managing IRR or significantly mismatching FTP rates, strategies should be established to manage and control each significant IRR source. Strategies should be tailored to the distinct risks, business activities, operating environment, and challenges facing the institution. FCA Bookletter [BL-072](#) (section III) addresses expectations for IRR strategies. The evaluative questions and guidance below are differentiated by type of institution and related IRR sources and exposures.

All Institutions: Evaluative questions and items to consider when examining IRR strategies include:

- **IRR Exposures: Do historical and projected IRR exposures indicate strategies are effective in managing IRR?** IRR exposure levels are a good indicator of IRR strategy effectiveness. Excessive IRR exposures generally indicate strategies are inadequate. If IRR measures indicate risk is excessive in relation to earnings or capital, or is inconsistent with the board's risk appetite, strategies should exist to reduce and manage the risks (or increase earnings or capital). In addition, realized or estimated risks that are volatile and vary significantly across measurement periods generally indicate strategies for maintaining IRR at a stable and predictable level are inadequate (or that problems exist with the IRR model).
- **Risk Appetite: Are IRR strategies based on an appropriate appetite and tolerance for risk?** Risk appetite has a significant impact on IRR strategy. It is the amount of IRR the institution is willing to accept in pursuit of its financial and business objectives. Risk appetite is most

directly evidenced in board policy (sections addressing risk tolerances and limits), and management operating procedures (sections addressing operating thresholds or guidelines for IRR exposure). It should also be evident in plans and strategies, reports, and meeting minutes (e.g., board, asset/liability management committee (ALCO)). Considerations include the following:

- While accepting some IRR is a normal part of operations, the risk appetite should ensure IRR does not significantly threaten earnings or capital.
- Risk appetite should not be overly reliant on management's presumed ability to quickly respond and adjust IRR positions when market conditions change. Institutions that wait until market conditions have changed to reduce IRR exposures may find risk mitigation measures difficult, expensive, and ineffective. IRR strategies are easier, more effective, and less expensive to implement before substantial rate movements occur.
- **Derivatives: If derivatives are used, do they effectively hedge or mitigate IRR?** As addressed in FCA Bookletter [BL-072](#) (section III, item 6), derivatives can be an effective strategy for managing IRR if used correctly and in a safe and sound manner. Institutions implementing a derivative hedging program should have sufficient processes to manage related risks as well as modeling capabilities to measure the effectiveness of derivative strategies. Refer to the *Derivatives* Examination Manual topic for examining the use of derivatives.

Associations Using the Funding Bank's FTP Process: Evaluative questions and items to consider when examining IRR strategies include:

- **Match-Funding: Does the association have clear strategies for match-funding assets and positioning equity?** An association that uses the funding bank's FTP should have clear strategies on the assets and options that will be matched and mismatched to FTP rates. This includes strategies for adjusting pricing, maturity, balloon, and other characteristics on assets, when needed, to match those available under FTP. Where assets are mismatched to the FTP rate, the strategic objectives or operational constraints driving the mismatch should be clearly understood. In addition, if the bank enables the association to reposition its equity, strategies should exist on how the equity will be allocated to assets.

Banks and Block-Funded Associations: Evaluative questions and items to consider when examining IRR strategies include:

- **Balance Sheet Structuring: Does management have a clear strategy and tactical approach for structuring the balance sheet?** At banks and block-funded associations, balance sheet structuring is central to controlling IRR. Balance sheet structuring refers to the composition of assets and liabilities and the alignment of their repricing terms, cash flows, maturities, options, and duration. Off-balance sheet hedging, which typically involves derivatives, is a risk mitigation strategy that effectively alters the structure of the balance sheet. Banks and block-funded associations should have clearly defined strategies and tactical approaches for structuring the balance sheet, including the use of derivatives, as applicable. For example, the institution may initially structure the balance sheet using gap, duration, and convexity measures along with information from the FTP process to align assets and liabilities. Then, simulations and additional processes may be used to further refine strategies and target a specific IRR profile. Balance sheet structuring cannot be separated from funding and liquidity

management strategies; it is important to understand the interrelationships and tradeoffs created by this interplay.

Institutions with Significant IRR Sources: Evaluative questions and items to consider when examining IRR strategies include:

- **Risk-Bearing Capacity: Are IRR strategies appropriate relative to the institution's risk-bearing capacity?** An institution with strong earnings and a sound capital position may be able to assume relatively higher IRR without exposing itself to excessive risk. However, an institution with more marginal earnings or capital position should closely match assets with liabilities and employ IRR strategies that pose minimal risk or threat. In addition, an institution with a relatively high operating expense rate and efficiency ratio typically has less capacity for IRR. At such institutions, small changes in net interest income can have an amplified impact on earnings. If earnings or capital are insufficient to support the IRR level, strategies should be implemented that reduce IRR or increase earnings and capital.
- **Earnings Capacity: Is the achievement of acceptable earnings levels overly reliant on IRR positions or strategies?** The capacity to generate acceptable overall earnings should not be overly reliant on IRR positions and strategies that are vulnerable to changing market conditions. For example, a strategy of funding long-term, fixed-rate assets with short-term debt (i.e., short-funding) may have a positive impact on earnings so long as market interest rates remain stable or decline but could have a major negative impact if interest rates increase. Similarly, an institution may realize additional income from prepayment penalties, loan origination fees, or calling and replacing debt at lower rates in a falling rate environment, but such earnings sources can dry up quickly when interest rates begin to increase. In addition, the earnings from equity funding may be sensitive to interest rates. If the institution is overly dependent on rate-sensitive earnings sources or strategies to generate acceptable earnings, it likely has problems with both the quality of earnings and its IRR strategies. The institution should be able to generate adequate and stable earnings while taking reasonable and measured IRR. Examiners should consider results from work performed in the *Earnings Adequacy* Examination Manual topic and the *Realized IRR* procedure in the *Interest Rate Risk* topic.
- **Earnings vs. MVE: Do strategies appropriately consider and balance risks to both earnings and MVE?** Institutions with significant IRR sources must sometimes make tradeoffs in managing IRR exposures. For example, actions taken to immunize earnings from IRR frequently cause MVE to become more vulnerable, and vice versa. Management should not focus solely on earnings or MVE. Strategies should strike an appropriate balance between achieving short-term earnings objectives and maintaining risk to MVE and long-term earnings capacity at an acceptable level. Such a balance should be evidenced in IRR measures, policy limits, and management thresholds.
- **Risk/Reward Analysis: Are the risks and rewards of significant IRR strategies periodically analyzed?** The risks and rewards of significant IRR strategies should be periodically analyzed, quantified, and reported to the ALCO and board. The risk/reward relationships of strategies and corresponding costs and benefits can change significantly over time and when market conditions change. Management should periodically analyze and quantify the costs and benefits of significant balance sheet strategies to determine if they continue to accomplish intended objectives and provide an appropriate return relative to risks. These analyses should identify how risks and rewards have changed over time and in relation to a neutral position or other feasible strategy alternatives. In general, a neutral position is where assets

are match-funded, and equity is positioned proportionally across assets and time buckets. Examples of strategies that may need to be analyzed include concentrating equity in certain time buckets (i.e., equity positioning), and intentional mismatching in funding, FTP rates, or optionality. Analysis frequency may vary depending on the strategy and changes in market environment.

- ***Due Diligence: Is sufficient due diligence completed before changing existing or implementing new IRR strategies and positions?*** As addressed in FCA Bookletter [BL-072](#) (section III), the board or ALCO should approve major initiatives and changes in IRR strategies before they are implemented, including business products and initiatives that have a material direct or indirect impact on IRR. Proposals to the board or ALCO to undertake the new initiatives or strategies should be documented and address the following:
 - Estimated impact on IRR exposures and earnings performance, including the costs of measuring and managing additional risks.
 - Ability to measure and manage IRR resulting from the new strategy.
 - Processes that will be used to control IRR.

3. IRR Measurement:

Determine if the risks from all significant IRR sources are adequately measured.

Guidance:

All banks, associations, and (as applicable) service corporations need to measure IRR. Earnings and MVE simulations are the primary approaches for measuring IRR. Simulations use what-if scenarios to measure the impact of various interest rate changes on earnings and capital. While simulations of parallel interest rate shocks are considered the standard or minimum requirement for measuring IRR, this scenario is frequently insufficient to measure risks from all IRR sources. The simulations used to measure IRR should be tailored to the IRR sources. Institutions with non-complex balance sheets and limited mismatches may be able to justify running fewer or less complex scenarios to measure their risks. *Note: Examination of models (and assumptions) used to measure IRR is addressed in the IRR Models procedure.*

IRR simulation scenarios are primarily intended to measure the impact of various yield curve changes. The most common scenarios include the following.

- ***Base Case*** – This scenario is typically based either on an implied forward rate curve or the current yield curve and then holding the curve constant throughout the measurement period. This scenario is used as the base case that alternative scenarios are compared to and forms the basis for sensitivity analyses.
- ***Parallel Interest Rate Shock*** – This scenario assumes market interest rates immediately change and remain at the new level. It also assumes all yield curves remain the same shape and move in tandem. This is a standardized scenario that allows comparisons to other financial institutions and evaluation of changes in IRR exposures over time.

- *Nonparallel Interest Rate Shock* – This scenario assumes the shapes of yield curves change, such as becoming steeper or flatter (i.e., yield curve twists).
- *Basis Shock* – This scenario assumes the basis (i.e., spread) between two or more yield curves changes (due largely to changes in market liquidity or perceived changes in credit risk at the institution or in two or more broader markets and indexes).
- *Interest Rate Ramp* – This scenario assumes interest rates change gradually over a series of months or quarters (as opposed to instantaneously as assumed under shock scenarios).
- *Most Likely Interest Rate* – This scenario reflects management’s forecast of expected changes in interest rates.

The scenarios selected should be based on what is needed to measure the risks from mismatches and structural imbalances in the balance sheet. Scenarios may also be selected based on a potential event, such as changes in System, district, or institution conditions (stress events), inflationary expectations, monetary policy, economic conditions, or Federal Reserve actions. Event-based scenarios require assumptions on the impact the event will have on yield curves and spreads.

Evaluative questions and items to consider when examining IRR measurement include:

- ***Minimum IRR Measurement Requirements: Do the institution’s IRR measurements meet minimum regulatory requirements?*** As discussed in FCA Bookletter [BL-072](#), to meet the requirements in FCA Regulations [615.5180\(c\)\(3\)](#) and [615.5182](#):
 - All institutions with some degree of IRR exposure, including match-funded associations, must measure risk to earnings, commensurate with the level and nature of IRR exposure.
 - All banks and institutions with IRR exposures similar to a bank (e.g., block-funded associations) must simulate and measure risks to MVE. Any other institution with IRR that could pose a significant threat to MVE or long-term earnings capacity must also measure risks to MVE, commensurate with the level and nature of IRR.
- ***Simulation Stress Severity: Is the stress severity in simulations sufficient to measure IRR?*** The severity of interest rate scenarios should be sufficient to measure the institution’s IRR as discussed in FCA Bookletter [BL-072](#) (sections II and IV, item 5). In particular:
 - All banks, associations, and applicable service corporations should measure the impact of a ± 200 basis point (bp) immediate and sustained parallel interest rate shock on earnings.
 - If MVE simulations are required, the institution should measure the impact of a ± 200 bp immediate and sustained parallel interest rate shock on MVE.
 - More severe shocks, such as ± 400 bp, should be measured at institutions with significant IRR sources. Such severe shocks may capture unique risks like those caused by options in the balance sheet.
 - Basis risk scenarios should include severe yet plausible shocks that exceed normal historical volatility.

- Downward shocks may be appropriately adjusted when market rates are at or near zero.
- **Simulation Scenarios: Are simulation scenarios sufficient to measure risks from the institution's IRR sources?** As addressed in FCA Bookletter [BL-072](#) (section IV, item 4), the interest rate scenarios used should be tailored to the types of IRR exposure. In addition to the ± 200 bp parallel shock described previously, other scenarios should be added when needed. For example, the institution may need to measure the impact of basis shocks, nonparallel interest rate shocks, lags in interest rate adjustments, and other scenarios depending on its specific sources of IRR. Completing the *IRR Sources* procedure in the *Interest Rate Risk Examination Manual* topic should result in identifying the sources and types of IRR that need measurement. At institutions with complex IRR profiles, identifying the specific types of IRR exposures can be challenging. These institutions must assess a multitude of alternative interest rate scenarios to fully identify and measure all risks (FCA Regulation [615.5180\(c\)\(3\)](#)). The following describes common scenarios for measuring each type of IRR:
 - *Repricing Risk* – This risk can typically be measured by standard parallel interest rate shocks. For administered rate loans, simulations could focus on lagging interest rate adjustments when underlying funding costs change (if applicable).
 - *Yield Curve Risk* – Measuring this risk requires nonparallel interest rate shocks that change the shape of the yield curve. For example, short-term rates could be shocked by a different amount than long-term rates. The shocks should target the institution's specific IRR exposures or include a variety of possible yield curve scenarios to identify and measure those that have the most detrimental impact.
 - *Basis Risk* – Measuring this risk requires an adverse shock to the relationship or spread between different yield curves. For example, if loans indexed to Prime are funded with Farm Credit discount notes, the spread between these rates should be shocked to measure the risk. If floating rate assets are funded with floating rate liabilities priced off the same index but with shorter maturities, the funding spread should be shocked to assess the potential impact of refinancing at a higher cost.
 - *Options Risk* – Simulations should target the distinct options being measured. For example, risks from interest rate caps can be measured with parallel interest rate shocks provided the shock is sufficient to trigger the caps. Risks from prepayments could focus on adjusting or shocking prepayment assumptions and measuring the extent to which prepayments are effectively hedged (e.g., through funding with callable debt or FTP rates). For associations exposed to the risk that the funding bank can change the direct loan spread, simulations could focus on adjusting retail loan spreads.
- **Static vs. Dynamic Simulations: Are earnings-at-risk simulations based on a static balance sheet scenario?** Earnings-at-risk simulations should be based on a static or constant balance sheet. Static simulations assume the size and composition of the balance sheet remain stable with no new growth, and cash flows from maturing or amortizing assets and liabilities are rolled back into the same instruments. Such simulations are relatively standardized, involve fewer business assumptions, and enable comparisons to peers and an understanding of IRR changes over time. In addition to the static simulations, dynamic simulations may be

conducted. Dynamic simulations incorporate business and strategic assumptions such as growth, business plan projections, and changes in spreads, asset mix, and liability mix. While the addition of dynamic simulations can more fully capture the range of IRR exposures and are useful in evaluating strategic alternatives, they can potentially mask IRR exposures and are much more dependent on assumptions. For example, income from assumed growth or widening spreads, and assumed management responses to changing interest rates, could offset the impacts of IRR and prevent an understanding of IRR trends. Therefore, if dynamic simulations are used, then IRR should also be measured under a static simulation. FCA Bookletter [BL-072](#) (section IV, item 3, and the attachment) further discusses these expectations along with potential exceptions. Whether balance sheet assumptions are static or dynamic, the impact of assumptions on risk measures should be clearly understood.

- **Simulation Time Horizon: Are the time horizons used in earnings-at-risk simulations sufficient to measure IRR?** As discussed in FCA Bookletter [BL-072](#) (section IV, item 7), IRR measurements should assess the impact of interest rate changes on projected earnings over the next 1-year period. However, such a short-term horizon will not capture the impact of any intermediate-term and long-term mismatches. Institutions with significant IRR sources should supplement the 1-year measurement with projected exposures over longer time frames. In addition, to understand how risk evolves, institutions should measure the sensitivity of earnings to IRR for each 12-month period over the measurement horizon (as opposed to cumulative impact). Institutions may be hesitant to extend time horizons because assumptions become less reliable. However, limiting simulations to a 1-year time frame may not capture the true impacts of mismatches and IRR-related strategies. Using longer time horizons provides a better understanding of how the sensitivity of earnings to IRR shifts over time. It can also provide an important complementary metric to the MVE measurement, particularly at an institution with elevated MVE risk. *Note: MVE gives no information about the timing of risk, and elevated MVE risk can indicate significant risk to longer-term earnings.*
- **IRR Measurement Frequency: Is the frequency of IRR measurement sufficient to monitor changes in risks and meet minimum requirements or expectations?** As addressed in FCA Bookletter [BL-072](#) (section II), all institutions should measure IRR at least annually. Institutions with significant IRR sources must measure IRR at least quarterly, as required by FCA Regulations [615.5180\(c\)\(3\)](#) and [615.5182](#). If the institution has a significant sensitivity to a particular type of risk, scenarios covering that risk should be included in the regular quarterly monitoring. The institution may not need to measure all risk sources every quarter. The institution should determine which IRR sources require quarterly (or more frequent) monitoring, which may be based in part on risk volatility.
- **Non-Simulation IRR Measures: If used, are non-simulation IRR measures accurate and used in an appropriate manner?** Besides simulations, other methods may also be used in measuring and managing IRR. Common examples include gap, duration, and convexity measurement, as described below. These methods have limitations and are not a substitute for simulations. However, at institutions with significant IRR sources, these measures can provide useful information to help the board and management understand asset/liability mix and make tactical decisions affecting balance sheet structure and IRR profile. The institution should have processes to ensure these measures, if used, are accurate and validated. In addition, the institution's use of these measures should be consistent with their purpose and limitations.

- *Gap Analysis* – Gap analysis shows the amounts of assets, liabilities, and off-balance sheet transactions that reprice within various time bands. Gap analysis can use static or dynamic approaches to show repricing relationships between assets and liabilities under a variety of interest rate scenarios. Gap analysis can be used as a general guide to help management develop funding and equity positioning strategies and to structure the balance sheet. It can be used in conjunction with earnings-at-risk simulations to understand the nature and source of IRR exposure. However, gap analysis does not directly measure the potential impact of interest rate changes on earnings or MVE. Gap analysis shows the size of asset and liability mismatches but not the potential impact of mismatches on earnings or capital. In addition, gap analysis may not capture IRR presented by embedded options.
- *Duration Analysis* – Duration analysis estimates the price sensitivity of assets, liabilities, and off-balance sheet transactions to changes in interest rates. The primary advantages of duration are that it provides a base understanding of IRR in individual instruments and portfolios and can assist in structuring the balance sheet. Matching durations of assets and liabilities can help manage the risks from changes in market values. It can also be used to derive the duration of equity, which measures the sensitivity of MVE and the MVE-to-BVE ratio to changes in interest rates. Different approaches exist for measuring duration (e.g., modified, Macaulay, effective duration). Regardless of the approach, the primary limitations of duration are the challenges with using it to measure alternative types of risks, such as basis and yield curve risks; the risks under multiple interest rate scenarios; and the risks posed by convexity, embedded options, and changes in cash flows.
- *Convexity Analysis* – Convexity analysis is used to improve the usefulness of duration analysis. Convexity measures how the duration of a financial instrument changes as interest rates change. Stated another way, it measures the curvature of the relationship between an instrument’s price and yield. When convexity is low, the price/yield relationship is close to a linear relationship and duration measurements are stable with different changes in yields. When convexity is high, meaning the price-to-yield relationship is significantly curved (non-linear), duration measurements are unstable and will change (maybe significantly) with different changes in interest rates. High convexity can result from instrument optionality (e.g., optionality in prepayable loan assets or asset backed securities collateralized by prepayable assets). The primary advantage of convexity analysis is that it can be used to improve balance sheet structuring by matching both the duration and convexity of assets and liabilities.

4. IRR Model:

Evaluate the model for measuring IRR, including integrity of data input and underlying assumptions, model validation, and model controls.

Guidance:

All banks, associations, and (as applicable) service corporations need a reliable model for measuring IRR. The type and sophistication of the model depends on the complexity and nature of the institution’s risk profile. The model, whether a relatively noncomplex spreadsheet or a specialized and sophisticated software application, should be sufficient to measure the institution’s risks. *Note:*

This procedure focuses on IRR models. Examination of the overall IRR measurement process is addressed in the IRR Measurement procedure.

Evaluative questions and items to consider when examining the IRR model include:

- **Model Capability: Is the IRR model capable of measuring the institution's IRR?** As addressed in FCA Bookletter [BL-072](#) (section IV, item 1), the IRR model should be sufficient to measure the institution's risks as well as compliance with limits in policies and procedures. IRR models vary in how thoroughly they can capture each type of IRR exposure. To find a model that is appropriate, the institution should consider the nature and mix of its products and activities and thoroughly understand its IRR sources and how each source contributes to the overall IRR profile. Models can then be evaluated by how well they capture and quantify the major sources of risk. An association that uses the bank's wholesale FTP rates to fully match-fund assets and position equity proportionally across the balance sheet might use a relatively noncomplex spreadsheet or financial forecasting application to measure risks. As the sources of IRR increase, the model's risk measurement capabilities should increase accordingly. Banks and block-funded associations require sophisticated models (typically IRR-specific modeling platforms or applications from third-party vendors) to capture all material sources of IRR. These institutions may even need a combination of modeling platforms and sub-models to isolate and measure the various sources of IRR. Once selected, the institution should ensure the IRR model stays aligned with its intended purpose and is not used beyond its capabilities (e.g., conducting simulations outside the model's capacity to measure with reasonable accuracy). If a new product or strategy creates IRR that cannot be adequately analyzed by the existing model, the institution should take steps to address this before the new strategy is implemented.
- **Option Modeling: Is the IRR model capable of measuring the risk from options (if applicable)?** A deterministic model is typically sufficient for measuring earnings-at-risk regardless of whether the balance sheet contains options. A deterministic model may also suffice for MVE simulations if the balance sheet does not contain significant options or products with embedded options (or options are fully offset by match-funding with the bank's FTP rates). However, if significant options exist, MVE should be measured using the more sophisticated stochastic approach. Stochastic models more accurately value options because they recognize the change in value as the likelihood of the options going *into the money* or being exercised varies. The following briefly describes these two modeling approaches:
 - *Deterministic* – Under this approach, the institution specifies the change in interest rates being evaluated, such as a ± 200 bp shock or ramp or a change in yield curve shape. This approach uses no random variables. Thus, it will produce the same output from a given base scenario starting point. Simulations are based on one interest rate scenario and generate one outcome.
 - *Stochastic (i.e., random)* – Stochastic models use one or more random variables. Thus, output can change each time a given simulation is performed. This approach begins with a base case yield curve and then employs a model to randomly generate interest rate changes and measure results over hundreds or even thousands of individual interest rate paths. This generates a distribution of potential paths and exposures. The user might report the best and worst case, or the average of these paths. This can be compared to an alternative scenario, such as shocking the base curve by ± 200 bp before applying the model to generate results. Stochastic

approaches capture the impact of volatility, and the dispersion of outcomes is dependent in part on volatility assumptions. Lattice models, Black-Scholes models, and Monte Carlo methodologies are common examples of stochastic approaches.

- **Data Management: Does the institution maintain sufficient and reliable data for the IRR model?** The reliability of IRR measurement depends heavily on the adequacy and quality of data used in the model. Data management should be commensurate with the nature and complexity of IRR exposures and model requirements. Institutions with limited, simple IRR exposures may have relatively basic data needs to reasonably estimate IRR exposures. For institutions with significant IRR sources and more complex exposures, important considerations include the following:
 - Data should be collected that provides a description of each balance sheet and off-balance sheet position or instrument, including cash flow information, optionality, duration, and repricing characteristics. Examples of data that may need to be collected include:
 - Instrument type (e.g., type of loan, investment, bond, discount note, or swap)
 - Current balance (book or notional)
 - Contractual terms such as the interest rate or rate index, maturity, balloon, principal and interest payments, amortization, repricing frequency, and embedded options (e.g., prepayment options or restrictions, or interest rate caps or floors)
 - Age or seasoning
 - The granularity of data and levels of data aggregation and stratification are important modeling decisions. Increased aggregation reduces the number of instruments to model, lessens model run times and the computer processing resources required, and can increase modeling efficiency. However, this results in tradeoffs, including losing some degree of accuracy. For some homogeneous pools of assets and liabilities, data may be aggregated (e.g., by product type, interest rate, maturity, prepayment volatility, caps, rate reset frequency) without a significant loss of accuracy. Other financial instruments should be modeled in more detail to ensure their distinct repricing, cash flow, and optionality characteristics are captured, particularly where volumes are material to the balance sheet. For example, data on complex or structured securities may need to be captured individually because of the significant differences in embedded options, prepayment behavior, and cash flows. Management should have sound support for aggregation or stratification decisions as part of the model documentation.
 - Internal controls should exist to check the data for completeness and accuracy. This includes reconciling the data to source systems and verifying the terms and characteristics of financial instruments. In addition, controls over processes to extract, transform, and load data should be periodically reviewed and updated as needed. This is important because more data may become available, source systems may change, or data aggregation may need adjustment.
- **Assumptions: Are assumptions used in the IRR model reasonably supported?** Assumptions have a major impact on IRR model accuracy and results. As a result, management should ensure assumptions are well understood, documented, specific to the institution, supported

based on sound rationale, and regularly validated and updated. As with other elements of IRR modeling, the complexity and nature of IRR exposures drives the modeling assumptions needed. Institutions with limited or simple IRR exposures using a relatively noncomplex model may not need to develop comprehensive model assumptions. Nonetheless, baseline assumptions for even the simplest of processes should be documented to ensure users understand any limitations when interpreting resulting risk measurements. Considerations for developing assumptions include:

- *Static Earnings-at-Risk Simulation Assumptions* – The most critical assumptions used in static simulations typically relate to prepayment and refinancing behavior, callable debt methodology, and debt replacement. In particular, if prepayment assumptions significantly differ from realized prepayments, the simulation results can prove wildly inaccurate. Other important assumptions include benchmark driver rates (Treasury, Secured Overnight Financing Rate, etc.) and derivation of yield curves. (*Static and Dynamic simulations are defined in the attachment to FCA Bookletter [BL-072](#).*)
- *Dynamic Earnings-at-Risk Simulation Assumptions* – In addition to the assumptions used in static simulations, dynamic simulations add business and strategic assumptions. The most critical business assumptions typically relate to run-off replacement and new volume (e.g., pricing, mix, growth). Other important assumptions could involve changes in spreads, funding strategy, match-funding strategy, equity positioning, assumed management responses to changing interest rates, business plan projections, and other changes to the asset and liability mix.
- *MVE Simulation Assumptions* – MVE simulations assume a runoff balance sheet. Key assumptions relate to prepayment and refinancing behavior, benchmark driver rates, derivation of yield curves, mark-to-market credit spreads, and discounting methodology. If the balance sheet contains significant options or products with embedded options, MVE should be measured using stochastic simulations which add assumptions on mean reversion, number of paths, and interest rate volatility.
- *Differentiating Assumptions* – When appropriate, assumptions should be differentiated to fit each interest rate scenario evaluated. For example, prepayment speeds for prepayable assets should differ depending on the interest rate scenario.
- *Assumption Maintenance* – A formal process should exist to periodically review, recalibrate, and approve changes to assumptions. This should include assumptions in any sub-models or functions (e.g., prepayment, callable debt, cash flow, or yield curve sub-models). Any changes in asset behaviors should be considered when updating assumptions. Generally, key assumptions should be reviewed at least annually.
- *Assumption Sensitivity Testing* – Testing the sensitivity of key assumptions provides perspective on the potential impact of assumptions on risk measures in the event they prove incorrect. For example, the impact of prepayment assumptions can be evaluated by slowing down or speeding up modeled prepayment speeds. Sensitivity testing helps prioritize areas that should receive the most attention in refining and validating assumptions. Sensitivity testing also heightens management’s awareness of the potential risks and risk mitigation strategies that may be needed. (FCA Bookletter [BL-072](#), section IV, item 6)

- **Model Risk Management (MRM):** Are the models used for IRR management managed in accordance with the institution’s MRM framework and the guidance outlined in FCA’s **Model Risk Management procedure in the Corporate Governance Examination Manual topic?** These models should be included in the institution’s model inventory, which should accurately represent each model’s risk, materiality, and validation status. Model validation, change controls, staffing, separation of duties, and new model development should be consistent with the guidance in the institution’s MRM framework and FCA’s *Model Risk Management* procedure, recognizing that application of this guidance varies based on model risk and materiality. *Note: Examiners completing this procedure should focus on the specific model(s) being used; the overall MRM framework is examined using the Model Risk Management procedure referenced above.*

5. Monitoring & Controls:

Evaluate internal controls in IRR management, with a focus on reporting, oversight and approval processes, and staffing.

Guidance:

FCA Regulations [615.5180](#) and [615.5182](#) and Bookletter [BL-072](#) identify requirements and expectations for institutions to establish processes that effectively monitor and control IRR. These processes should be commensurate with and tailored to the institution’s risk exposure. An effective system of internal controls in IRR operations includes oversight by the board and management, reliable reporting, appropriate delegated authorities, reasonable separation of duties, adequate staffing, and sufficient audit coverage (refer to the *Audit* procedure for guidance on examining this area).

Evaluative questions and items to consider when examining the monitoring and internal control aspects of IRR management include:

- **Oversight: Are board and management governance and oversight of IRR management effective?** Strong governance and oversight are fundamentally important to effective IRR management. Key considerations include:
 - The board and senior management need to fully understand IRR sources and exposures, communicate acceptable risk tolerances, and ensure IRR strategies are consistent with board philosophy and risk tolerances as well as the institution’s risk-bearing capacity. FCA Bookletter [BL-072](#) (section I) describes how this is accomplished. FCA Regulations [615.5180\(a\) and \(b\)](#) describe requirements for institutions with significant IRR sources.
 - Board members do not need to be experts, but they do need to understand the sources and nature of exposures well enough to meet their responsibilities for oversight (FCA Regulation [615.5180\(a\)](#)). At institutions with significant IRR sources, board members should obtain periodic training to understand IRR. (FCA Bookletter [BL-072](#), section I)
 - Institutions with significant IRR sources should establish an ALCO to serve as a critical control in the governance structure. The ALCO’s members should include senior managers and decision-makers from each major function or department that can directly or indirectly influence IRR exposure. While day-to-day operating

responsibilities and tactical decisions are typically the responsibility of the finance team or treasury department, the ALCO should actively oversee the balance sheet structure and establish strategies and controls that maintain IRR exposures within acceptable operating ranges (as defined by the ALCO) and board limits. A charter should define the ALCO's purpose, authorities, responsibilities, membership, quorum requirements, meeting frequency, and requirements to record meeting minutes and report committee activities to the board (or designated board committee). (FCA Bookletter [BL-072](#), section I)

- **Reporting: Is reporting timely, accurate, and sufficient for the board and management to monitor IRR and make informed decisions?** Reporting is the board and management's primary way to monitor IRR exposures and the effectiveness of IRR strategies. Reporting should be tailored to the needs of each audience (e.g., board, ALCO, risk management committee). Reports should explain changes in risk and be sufficient to assess whether IRR exposures and strategies remain consistent with the board's risk appetite and limits. Reporting frequency depends on the level and complexity of IRR exposures. FCA Regulation [615.5180\(d\)](#) requires at least quarterly reporting of IRR exposures for institutions with significant IRR sources. Annual reporting may suffice for institutions with limited IRR exposures, such as associations that fully match-fund using the funding bank's FTP process. Internal controls should ensure reporting is accurate and not misleading. The following lists examples of reporting expectations, which should be applied based on the level and complexity of IRR exposures:
 - Compliance with board policy, risk limits, and operating guidelines. *Note: While all institutions should report policy compliance, FCA Regulation [615.5180\(d\)](#) requires such reporting at institutions with significant IRR sources.*
 - The nature, level, and trend in IRR exposures as measured by the institution's IRR measurement processes and scenarios. This includes overall IRR exposure as well as risk from each significant source. The causes of changes in IRR exposure should be clearly explained. *Note: While all institutions should report the nature and level of IRR exposures, FCA Regulation [615.5180\(d\)](#) requires such reporting at institutions with significant IRR sources.*
 - Significant ALCO activities and decisions (at institutions with significant IRR sources). (FCA Bookletter [BL-072](#), section I)
 - The MVE-to-BVE ratio, along with explaining and quantifying the causes of changes in MVE and the MVE-to-BVE ratio (at institutions that measure MVE and have significant IRR sources). (FCA Bookletter [BL-072](#), section II)
 - Effectiveness of each significant IRR strategy, including risks and rewards and historical financial impact (at institutions with significant IRR sources). (FCA Bookletter [BL-072](#), section III, item 2)
 - IRR model validation results, key model settings and related changes, and the impact of those changes on IRR measurement results. This includes key assumptions, assumption sensitivity analyses, and the impact of any changes in assumptions on IRR measurement results. (See the guidance in the *Model Risk Management* procedure in the *Corporate Governance* Examination Manual topic.)

- **Delegated Authorities: Are delegated IRR measurement and management authorities clearly defined and sufficient to control risk?** Delegations of authority should be established for measuring, managing, and reporting IRR exposures. The extent and limits of authority and responsibilities should be clearly defined as discussed in the *Policy & Procedures* procedure. Once established, processes and controls should exist to monitor and ensure compliance with the authorities. (FCA Bookletter [BL-072](#), section V, item 6)
- **Separation of Duties: Are the individuals responsible for taking or managing risks adequately separated from those responsible for measuring risk?** FCA Bookletter [BL-072](#) (section V) discusses areas to consider when examining separation of duties along with potential exceptions.
- **Staffing: Are sufficient staffing resources allocated to IRR measurement and management, commensurate with the nature and complexity of IRR?** FCA Bookletter [BL-072](#) (section VI) discusses areas to consider when examining staffing.

Examiners should also consider any internal control-related examination results from the other *Interest Rate Risk Management* procedures when concluding on the overall adequacy and effectiveness of internal controls. The *Policy & Procedures*, *IRR Model*, and *Audit* procedures, in particular, include important internal control considerations.

6. Audit:

Determine if the institution conducts an effective audit (scope, reporting, and followup) of IRR management.

Guidance:

The internal audit and review program is a key mechanism for ensuring IRR measurement and management are functioning effectively and in compliance with regulations and policies. The internal auditor or other qualified, independent party should review the adequacy of IRR measurement and management to ensure compliance with applicable criteria. The audit risk assessment and scope should address IRR topics, and audit or review frequency should be commensurate with the complexity of the institution's operations and risk profile. A reliable audit program provides the board reasonable assurance that IRR measurement and management are sound and that IRR reporting is complete and accurate.

Note: This procedure focuses on evaluating the reliability and effectiveness of internal audits and reviews in this topical area. Refer to the *Audit & Review Programs* topic in the Examination Manual for guidance on examining the overall internal audit and review program.

Evaluative questions and items to consider when examining the audit or review of IRR management include:

- **Audit Coverage: Is there periodic audit or review coverage of IRR management?** Audit or review coverage and frequency should be appropriate relative to risks, changes in the operating environment, regulatory requirements, and periodic testing needs. Coverage should also be consistent with the institution's risk assessment results and annual audit plan.
- **Scope and Depth: Are audit or review scope and depth sufficient to conclude on the adequacy, completeness, and timeliness of IRR management processes?** The scope and depth of work, including transaction testing, should cover the primary processes and

controls within the area being audited or reviewed and be sufficient to determine if internal controls are functioning as intended and regulatory requirements are met. The scope and depth of coverage should be documented and consistent with the approved audit or review plan and engagement contract (if applicable). Audit or review workpapers should be examined to verify the actual scope and depth of work performed. The workpapers may indicate the scope and depth deviated from what was identified (or implied) in the audit plan. For example, workpapers may indicate the work performed was limited to evaluating the existence of policies and procedures and didn't include reviewing other controls, such as training or reporting, or testing compliance with regulations or institution guidance. If the work deviated materially from the original planned scope, internal audit should notify the board (or Audit Committee, if so delegated) of the reasons for the change. As addressed in FCA Bookletter [BL-072](#), specific items that should be considered in the audit or review scope include:

- IRR-related policies and procedures.
 - Compliance with policies, procedures, FCA Regulations, and other FCA guidance.
 - IRR strategies.
 - IRR measurements and interest rate scenarios, including an assessment of whether they adequately capture and measure all significant IRR sources.
 - Monitoring and control processes (e.g., reporting, management oversight, delegated authorities, separation of duties, staffing, management information systems).
 - Management of all significant IRR management models, including consistency with the institution's overall model risk management framework.
 - Fraud-related threats and vulnerabilities, as well as anti-fraud controls.
- **Reliability of Results: Did FCA identify any concerns with audit or review reliability?** It is important to understand the scope and depth of the audit or review being examined, as discussed above, when evaluating audit or review reliability. With this understanding, the following are key considerations when evaluating the reliability of audit or review results:
 - *FCA Testing* – Evaluate the reliability of internal audit or review work by comparing the results to FCA's examination results in this area. This comparison often includes FCA testing transactions that were covered in the internal audit or review (transactions are often loans or loan applications, but may include other types of transactional activity, as well). In addition to the audit or review report, examiners should request and review the workpapers and hold discussions with the auditor to obtain a more thorough understanding of work completed. This can be especially important if the audit or review report is not sufficiently detailed or FCA's examination work and testing identifies potential concerns. Auditors and reviewers complete line sheets, flowcharts, control matrices, standard work programs, workpaper forms, or other relevant audit evidence when conducting and supporting their work. (IIA Standards 2240, 2300, 2310, and 2320) Workpapers should adequately document the work performed and support the final report. If FCA identifies weaknesses that were not identified in the audit or review, the cause for any discrepancy should be determined.

- *Audit/Review Staffing* – Whether internal or outsourced, auditors and reviewers conducting the work need to be qualified, independent, and objective to ensure reliable results. They should have the right mix of knowledge, skills, and other competencies needed to perform the work. (IIA Standard 2230) Additionally, auditors and reviewers need to be independent of the activities they audit so they can carry out their work freely and objectively. (IIA Standards 1100, 1112, 1120, and 1130) For example, audit and review staff should not be involved in developing and installing procedures, preparing records, operating a system of internal controls, or engaging in any other activity that they would normally review. Examiners should evaluate the staffing on the individual audit or review being examined as part of determining the reliability of results.
- *Institution Review of Work Performed* – The institution should complete an independent review of the workpapers to ensure audit or review objectives and scope were met and the results and conclusions were reliable and supported. (IIA Standard 2340) Examples could include a supervisory review of in-house audit work by the CAE or other audit staff, or a review of outsourced work by the CAE or audit coordinator. Examiners should consider whether the institution completed these reviews, and if any concerns were identified, when concluding on audit or review reliability.
- **Reports: Does the internal audit or review report sufficiently communicate IRR management review results and recommendations, if applicable?** Examiners should consider the following when evaluating the audit or review report:
 - Is the report prepared and communicated in accordance with the institution’s guidelines?
 - Is an executive summary or overview included to provide the board with a general conclusion on audit or review results?
 - Is the report accurate, concise, supported, and timely in communicating the audit or review objectives, scope, results, conclusions, and recommendations? (IIA Standards 2330, 2400, 2410, 2420, 2440, and 2450)
 - Are conclusions and recommendations realistic and reasonable, with material and higher risk issues clearly identified and prioritized?
 - Are conclusions and recommendations supported by convincing evidence and persuasive arguments (condition, criteria, cause, and effect)?
 - Do results in the workpapers align with report conclusions?
 - Does the report conclude whether the institution adheres to policies, procedures, and applicable laws or regulations, and whether operating processes and internal controls are effective?
 - Does the report address potential vulnerabilities to fraud, if applicable?
- **Corrective Action: Are management responses to audit or review findings in this area reasonable, complete, and timely? Have corrective actions been effective?** Audits and reviews are only effective if corrective action is taken to remedy the weaknesses identified.

As such, there should be a reasonable, complete, and timely management response to the audit or review report. Management commitments and agreements or any areas of disagreement should be documented in the report or in a separate memo or tracking system. (IIA Standards 2500 and 2600) If corrective actions are not resolving the issues or concerns in a timely manner, examiners should further investigate the reasons. For example, this could indicate the audit or review did not sufficiently identify the underlying causes or materiality of weaknesses, sufficient resources are not being directed toward corrective actions, or weaknesses exist in the institution's corrective action process, including board oversight of the process.