

### Overview

Interest rate risk (IRR) is the risk that changing market interest rates could affect a bank's earnings or capital levels. The inherent level of IRR in conjunction with the adequacy of risk management processes will determine the potential threat to a bank's earnings and capital. While IRR can arise from various sources, four key types of risk are common to community bank balance sheets:

#### Mismatch / Repricing Risk

- The risk that assets and liabilities will reprice or mature at different times, causing margins between interest income and interest expense to narrow.

#### Basis Risk

- The risk that changes in underlying index rates used to price assets and liabilities do not change in a correlated manner, causing margins to narrow.

#### Yield Curve Risk

- The risk that non-parallel changes in the yield curve will disproportionately affect asset values or cash flows.

#### Option Risk (Prepayment / Extension Risk)

- Prepayment risk is the risk that asset and/or liability repayments accelerate at a time when interest rates decline, resulting in diminished interest income and the need to reinvest repaid funds in lower-yielding assets. The flip side of prepayment risk is extension risk, which stems from the lengthening of asset and/or liability payoff rates in a rising rate environment, thereby reducing the funds available to invest at current market yields.

## Key Risk Management Elements

Many banks are in the business of utilizing short-term or more immediately repricing deposits to fund longer-term loans and investments; therefore, these banks are inherently exposed to some degree of IRR. Banks should have a risk management program that allows the bank's management team and board of directors to appropriately identify, measure, monitor, and control these exposures. To reaffirm supervisory expectations on sound practices for managing IRR that had been issued by the federal banking agencies in 1996,<sup>1</sup> the agencies issued an advisory statement on interest rate risk (interagency advisory)<sup>2</sup> in 2010 and, subsequently, a frequently asked questions (FAQs) follow-up document in 2012.<sup>3</sup> This supervisory guidance is collectively applicable to banks of all sizes and complexity, including community banks.

Figure 1 illustrates four key elements described in supervisory guidance that are fundamental to every bank's IRR management program:

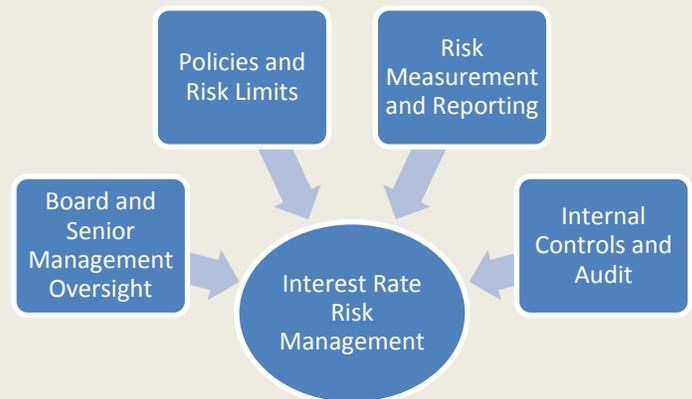


Figure 1

### Board and Senior Management Oversight

A bank's board of directors is ultimately responsible for understanding and monitoring the bank's IRR profile, ensuring that adequate resources are devoted to IRR management, and overseeing the establishment by senior management of appropriate risk controls, which directly impact the level of IRR exposure at the bank. While many community bank directors may have limited involvement

*FedLinks is intended to highlight the purpose of supervisory policy and guidance for community banking organizations. FedLinks does not replace, modify, or establish new supervisory policy or guidance.*

1 See Supervision and Regulation (SR) letter 96-13, "Joint Policy Statement on Interest Rate Risk," at [www.federalreserve.gov/boarddocs/srletters/1996/sr9613.htm](http://www.federalreserve.gov/boarddocs/srletters/1996/sr9613.htm).

2 See SR letter 10-1, "Interagency Advisory on Interest Rate Risk," at [www.federalreserve.gov/boarddocs/srletters/2010/sr1001.htm](http://www.federalreserve.gov/boarddocs/srletters/2010/sr1001.htm).

3 See SR letter 12-2, "Questions and Answers on Interagency Advisory on Interest Rate Risk Management," at [www.federalreserve.gov/bankinforeg/srletters/sr1202.htm](http://www.federalreserve.gov/bankinforeg/srletters/sr1202.htm).

with IRR management outside of the bank, bank examiners expect the bank’s board or a delegated committee of board members to have a collective fundamental working knowledge of the different types of IRR, the levels and trends of the bank’s IRR exposures, the bank’s IRR tolerance and limits, and how business activities could change the bank’s IRR exposure. Significant progress has been made in the banking industry to develop IRR and other training materials for directors, and the Federal Reserve System has developed tools such as the Bank Director’s Desktop.<sup>4</sup>

Senior management is responsible for day-to-day IRR management. These duties include: 1) translating the board of directors’ goals, objectives, and risk tolerances into operating procedures that are well understood by bank staff; 2) ensuring adherence to board-established risk tolerances, measurement standards, and IRR exposure reporting; 3) ensuring the implementation and maintenance of management information systems that effectively measure, monitor, and control IRR; and 4) implementing a system of effective internal controls.

*Policies and Risk Limits*

Bank policies and procedures should clearly govern all aspects of the bank’s IRR management process, and should be reviewed and updated periodically. IRR policies are typically either standalone documents or housed in a broader asset/liability management (ALM) policy. At a minimum, policies should describe the bank’s risk tolerance/appetite; methods to identify, quantify, and report exposures; parties responsible for ongoing risk measurement and management; and the controls and risk limits necessary to ensure that the risk management function is operating appropriately. Policies should also address the board’s role when policy limits are breached. For example, a board of directors’ requirement of management to develop an action plan to address a policy limit breach might be described in the ALM policy. When examiners evaluate IRR policies, these are the key components that are considered.

Perhaps the most discussed IRR management topic for community banks is risk measurement. Questions often arise regarding the types of tools or models that are needed, how to fine-tune those tools, and how often measurement reports should be provided to the asset/liability management committee (ALCO) and the board. At the most basic level, examiners expect a bank’s IRR measurement tools and techniques to be sufficient to quantify the bank’s risk exposure to both earnings and capital. Measurement techniques typically fall into two broad categories: short-term earnings risk measurements and long-term capital risk measures. Figure 2 lists common IRR measurement techniques.

Figure 2



Bankers have measured elements of IRR for decades, beginning with basic static gap analyses. Technological advancements have subsequently allowed IRR measurement tools to evolve from simple spreadsheet calculations to software from third-party vendors capable of measuring complex cash flows. Although regulatory guidance does not require sophisticated IRR measurement tools for non-complex institutions, these institutions can obtain cost-effective ALM models to quantify both short-term and long-term IRR exposures. While some of these models use complex mathematical computations to calculate a bank’s IRR exposure, the short- and long-term measures captured by these ALM models are conceptually straightforward and it is important to clearly understand the theory behind each measure.

**Short-term** measurement techniques quantify the potential reduction in earnings that might result over a 12- to 24-month time horizon from changing interest rates. The use of earnings-at-risk (EaR) analysis has become prevalent at most community banks, although many noncom-

4 The Bank Director’s Desktop is available at [www.bankdirectorsdesktop.org](http://www.bankdirectorsdesktop.org).

plex institutions also utilize static gap reports to calculate short-term exposures.

*Static gap* reports attempt to highlight potential gaps in the near future (typically over the next 12 months) where changes to interest rates on assets such as loans and bonds, or liabilities such as deposits, do not occur contemporaneously. Assets and liabilities with interest rates that change in the measurement window (say 12 months) are referred to as “rate-sensitive.” The difference between cumulative rate-sensitive assets and liabilities for the period being measured is referred to as the “static gap.” While the static gap report might provide some indication of the direction of IRR, it is an imprecise risk measurement tool. Specifically, the static gap report does not effectively capture cash flow timing from unscheduled loan and bond payments (prepayments), and slotting the repricing horizon of nonmaturity deposits becomes extremely difficult at best. Thus, it may only be suitable for noncomplex banks with very low IRR profiles to rely solely on this measure to quantify short-term IRR exposures. Often this measure is used in conjunction with the other measures discussed below.

*Earnings-at-risk* measurements are utilized over a 12- or 24-month time horizon to quantify short-term earnings exposures. To compute these earnings exposures, most models begin by calculating either net interest income or net income in a scenario which represents current market conditions (base case). Income and expenses are then recalculated using scenarios with higher and lower interest rates. The results of each variation are compared against the base case scenario to determine the potential change in earnings from each.

In general, the balance sheet forecast for these scenarios can be either static or dynamic. Static simulation models evaluate existing IRR exposures and assume a constant balance sheet with no new growth. In contrast, dynamic simulation models rely on detailed assumptions regarding

changes in existing business lines, new business, and changes in management and customer behavior. At a minimum, institutions utilizing EaR analysis should conduct the analysis using static balance sheet assumptions, as the purpose of EaR analysis is to evaluate existing, rather than speculative exposures. Dynamic earnings models can be useful for business planning and budgeting purposes, but assumptions used to forecast a changing balance sheet are extremely difficult to project with accuracy over an extended period. Furthermore, the balance sheet changes associated with dynamic simulations could potentially mask certain key underlying risk exposures. Thus, dynamic balance sheet simulations may serve as a useful tool to supplement static balance sheet simulations, but they should not be used as a substitute for static balance sheet modeling.

**Long-term** measurement techniques quantify the potential impact on capital by estimating a reduced economic value of capital that might result from changing interest rates. While long-term (up to five years) net income simulations (for example, long-term EaR analysis) are occasionally used at community banks, the most common long-term measurement technique is some variation of *economic value of equity* (EVE) analysis. Long-term simulations can provide a complementary metric to “risk-to-capital” measurements, allowing institutions to understand how interest rate shifts could affect future earnings over longer time horizons; however, institutions should measure the potential impact of changes in market interest rates on the economic value of capital.

EVE analysis, unlike the EaR measure, involves projecting cash flows from assets, liabilities, and off-balance-sheet hedges over the economic life of each product, assuming interest rates will not change. Cash flows are then discounted to determine their present value, and the present value of liabilities is subtracted from the present value of assets to determine the bank’s EVE in a base case. Cash flows are also projected for various rising and falling interest rate scenarios and discounted at higher and lower discount rates to recalculate the EVE. The percent change in EVE from the various scenarios provides a meaningful measure of the bank’s long-term IRR exposure relative to capital. The real value in EVE analysis is identifying risk exposures that extend beyond the next 12 to 24 months. For example, if a bank’s analysis predicts a significant reduction in EVE in a period of rising rates,

5 Gregory E. Sierra and Timothy J. Yeager, “What Does the Federal Reserve’s Economic Value Model Tell Us about Interest Rate Risk at U.S. Community Banks?” *Federal Reserve Bank of St. Louis Review*, 86 (November/December 2004), pp. 45-60, available at [www.research.stlouisfed.org/publications/review/04/11/SierraYeager.pdf](http://www.research.stlouisfed.org/publications/review/04/11/SierraYeager.pdf).

research has indicated that the bank's financial performance would be expected to deteriorate in the years following a period of increasing interest rates.<sup>5</sup>

When a bank contemplates purchasing ALM model software or contracting with a third party to measure its IRR, a number of considerations should factor into the decision. Some of these considerations include, but are not limited to, the intended use of the model, cost, measurement capabilities, features, reporting, and customer support. When selecting any ALM model, management should also weigh the strengths of the model against its limitations. Choosing an ALM model is a bank-specific decision, where one size truly does not fit all.

Once management and the board have determined the appropriate measurement tools to evaluate IRR exposures, they must also decide the frequency of reporting. This decision should be based upon the bank's inherent risk profile. Banks with low IRR profiles typically provide risk measurement reports to the ALCO and the board at least quarterly. As a bank's risk profile increases, either through an elevated EaR or EVE exposure or increased holdings of more-complex assets, then reporting frequency to the ALCO or the board should also increase. The complexity of a bank's balance sheet should be assessed in light of the four IRR types defined in the Overview above, with specific attention given to assets that contain implicit and/or explicit optionality such as mortgage-related products and callable securities or liabilities.

In situations where IRR exposures exceed the bank's risk limits, senior management should also provide a report to the board explaining actions planned to return the bank to an acceptable risk level, and subsequent meetings should include progress reports and updates to those action plans. It is important to document policy exceptions and resulting action plans in board and ALCO minutes. During ex-

aminations, examiners evaluate the adequacy of the risk measurement tool(s) used to quantify the institution's risk exposures, controls and accuracy of assumptions used to generate model results (if an IRR model is being used), and the appropriateness of information reported to management committees and the board.

### *Internal Controls and Audit*

Generally speaking, sound controls include secondary reviews of data accuracy in risk measurement tools, reporting of compliance with policy limits, and periodic review and documentation of the reasonableness of assumptions used in risk measurement tools. As community banks have increased their use of IRR models, examiners expect management teams to take greater steps to ensure that data, assumptions, and outputs are reasonable and accurate. At a minimum, an independent review of data inputs, key assumptions,<sup>6</sup> the accuracy of ALCO and board reports, and policy compliance should be conducted annually and reported to the board. However, an institution with an elevated risk profile is expected to maintain a more robust independent review of its IRR management program.

### Common Pitfalls

One of the unique opportunities examiners have is to observe both best practices and common weaknesses at a broad cross-section of banks. At community banks, three common IRR management deficiencies tend to recur and are often cited in examination reports as matters requiring board attention.

First, many examiners have reported that they often find discrepancies between board-prescribed risk limits and the risk measurement tools used to quantify risk exposures. For example, a bank's risk measurement tool may not measure EVE exposures, but the bank policy may specify a risk limit in terms of EVE. While not every risk measure captured by the measurement tool requires a risk limit, the risk limits established by the board should be routinely calculated and reported. If the risk limit cannot be captured by the risk measurement tool in place, the board should determine whether a new, appropriate, and calculable limit should be established or whether a different risk measurement tool is needed.

<sup>6</sup> Key assumptions for interest rate risk models could include asset prepayment speeds, nonmaturity deposit assumptions, and reinvestment rates and interest rate price sensitivities for significant balance sheet accounts. Price sensitivities refer to the percent change for asset or liability pricing for a 100-basis point change in the underlying interest rate (e.g., rates for savings accounts may increase 15 basis points for every 100-basis point increase in interest rates).

Second, many examiners have evaluated IRR model assumptions and determined that default or industry standard assumptions provided by the vendor have never been assessed or customized by the bank's management team. While certain vendor-provided assumptions may be appropriate, the management team should evaluate the reasonableness of those assumptions before accepting them for model use.

Finally, many banks have not incorporated independent or third-party reviews to ensure the integrity of their IRR management programs. Since 2010, this has been perhaps the most prevalent IRR matter identified by examiners as community bank management teams have worked to implement the interagency guidance. Independent reviews are helpful to identify risk measurement weaknesses, the need for improved reporting, or other risk management improvements needed by the bank.

## Resources

### *Supervisory Guidance*

SR Letter 12-2, "Questions and Answers on Interagency Advisory on Interest Rate Risk Management," is available at:

[www.federalreserve.gov/bankinforeg/srletters/sr1202.htm](http://www.federalreserve.gov/bankinforeg/srletters/sr1202.htm)

SR Letter 10-1, "Interagency Advisory on Interest Rate Risk," is available at:

[www.federalreserve.gov/boarddocs/srletters/2010/sr1001.htm](http://www.federalreserve.gov/boarddocs/srletters/2010/sr1001.htm)

SR Letter 96-13, "Joint Policy Statement on Interest Rate Risk," is available at:

[www.federalreserve.gov/boarddocs/srletters/1996/sr9613.htm](http://www.federalreserve.gov/boarddocs/srletters/1996/sr9613.htm)

### *Examination Guidance*

Federal Reserve Commercial Bank Examination Manual – Section 4090.1 ("Interest-Rate Risk Management") is available at:

[www.federalreserve.gov/boarddocs/supmanual/cbem/4000.pdf](http://www.federalreserve.gov/boarddocs/supmanual/cbem/4000.pdf)

Federal Reserve Bank Holding Company Supervision Manual – Section 2127.0 ("Interest-Rate Risk (Risk Management and Internal Controls)") is available at:

[www.federalreserve.gov/boarddocs/supmanual/bhc/2000p5.pdf](http://www.federalreserve.gov/boarddocs/supmanual/bhc/2000p5.pdf)

### *Other Resources*

The Bank Director's Desktop is available at:

[www.bankdirectorsdesktop.org](http://www.bankdirectorsdesktop.org)

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