

Interest rate risk



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Interest Rate Risk (IRR) Management What is Interest Rate Risk : Interest rate risk is the risk where changes in market interest rates might adversely affect a bank's financial condition. The management of Interest Rate Risk should be one of the critical components of market risk management in banks. The regulatory restrictions in the past had greatly reduced many of the risks in the banking system. Deregulation of interest rates has, however, exposed them to the adverse impacts of interest rate risk. What is the Impact of IRR:

The immediate impact of changes in interest rates is on the Net Interest Income (NII). A long term impact of changing interest rates is on the bank's networth since the economic value of a bank's assets, liabilities and off-balance sheet positions get affected due to variation in market interest rates. The Net Interest Income (NII) or Net Interest Margin (NIM) of banks is dependent on the movements of interest rates. Any mismatches in the cash flows (fixed assets or liabilities) or repricing dates (floating assets or liabilities), expose bank's NII or NIM to variations.

The earning of assets and the cost of liabilities are closely related to market interest rate volatility. The interest rate risk when viewed from these two perspectives is known as 'earnings perspective' and 'economic value' perspective, respectively. Management of interest rate risk aims at capturing the risks arising from the maturity and repricing mismatches and is measured both from the earnings and economic value perspective. (a) Earnings perspective involves analysing the impact of changes in interest rates on accrual or reported earnings in the near term.

This is measured by measuring the changes in the Net Interest Income (NII) or Net Interest Margin (NIM) i. e. the difference between the total interest income and the total interest expense. (b) Economic Value perspective involves analysing the changes of impact of interest on the expected cash flows on assets minus the expected cash flows on liabilities plus the net cash flows on off-balance sheet items. It focuses on the risk to networth arising from all repricing mismatches and other interest rate sensitive positions. The economic value perspective identifies risk arising from long-term interest rate gaps.

BCBS Principles for Interest Rate Risk Management Board and senior management oversight of interest rate risk Principle 1: In order to carry out its responsibilities, the board of directors in a bank should approve strategies and policies with respect to interest rate risk management and ensure that senior management takes the steps necessary to monitor and control these risks. The board of directors should be informed regularly of the interest rate risk exposure of the bank in order to assess the monitoring and controlling of such risk.

Principle 2: Senior management must ensure that the structure of the bank's business and the level of interest rate risk it assumes are effectively managed, that appropriate policies and procedures are established to control and limit these risks, and that resources are available for evaluating and controlling interest rate risk. Principle 3: Banks should clearly define the individuals and/or committees responsible for managing interest rate risk and should ensure that there is adequate separation of duties in key

elements of the risk management process to avoid potential conflicts of interest.

Banks should have risk measurement, monitoring and control functions with clearly defined duties that are sufficiently independent from position-taking functions of the bank and which report risk exposures directly to senior management and the board of directors. Larger or more complex banks should have a designated independent unit responsible for the design and administration of the bank's interest rate risk measurement, monitoring and control functions. Adequate risk management policies and procedures

Principle 4: It is essential that banks' interest rate risk policies and procedures are clearly defined and consistent with the nature and complexity of their activities. These policies should be applied on a consolidated basis and, as appropriate, at the level of individual affiliates, especially when recognising legal distinctions and possible obstacles to cash movements among affiliates. Principle 5: It is important that banks identify the risks inherent in new products and activities and ensure these are subject to adequate procedures and controls before being introduced or undertaken.

Major hedging or risk management initiatives should be approved in advance by the board or its appropriate delegated committee. Risk measurement, monitoring and control functions Principle 6: It is essential that banks have interest rate risk measurement systems that capture all material sources of interest rate risk and that assess the effect of interest rate changes in ways that are consistent with the scope of their activities. The assumptions

underlying the system should be clearly understood by risk managers and bank management.

Principle 7: Banks must establish and enforce operating limits and other practices that maintain exposures within levels consistent with their internal policies. Principle 8: Banks should measure their vulnerability to loss under stressful market conditions – including the breakdown of key assumptions – and consider those results when establishing and reviewing their policies and limits for interest rate risk. Principle 9: Banks must have adequate information systems for measuring, monitoring, controlling and reporting interest rate exposures.

Reports must be provided on a timely basis to the bank's board of directors, senior management and, where appropriate, individual business line managers. Internal controls Principle 10: Banks must have an adequate system of internal controls over their interest rate risk management process. A fundamental component of the internal control system involves regular independent reviews and evaluations of the effectiveness of the system and, where necessary, ensuring that appropriate revisions or enhancements to internal controls are made.

The results of such reviews should be available to the relevant supervisory authorities. Information for supervisory authorities Principle 11: Supervisory authorities should obtain from banks sufficient and timely information with which to evaluate their level of interest rate risk. This information should take appropriate account of the range of maturities and currencies in each bank's portfolio, including off-balance sheet items, as well as other relevant

factors, such as the distinction between trading and non-trading activities.

Capital adequacy

Principle 12: Banks must hold capital commensurate with the level of interest rate risk they undertake. Disclosure of interest rate risk Principle 13: Banks should release to the public information on the level of interest rate risk and their policies for its management. Sources, effects and measurement of interest rate risk Interest rate risk is the exposure of a bank's financial condition to adverse movements in interest rates. Accepting this risk is a normal part of banking and can be an important source of profitability and shareholder value.

However, excessive interest rate risk can pose a significant threat to a bank's earnings and capital base. Changes in interest rates affect a bank's earnings by changing its net interest income and the level of other interest-sensitive income and operating expenses. Changes in interest rates also affect the underlying value of the bank's assets, liabilities and off-balance sheet instruments because the present value of future cash flows (and in some cases, the cash flows themselves) change when interest rates change.

A.

Sources of Interest Rate Risk Repricing risk: As financial intermediaries, banks encounter interest rate risk in several ways. The primary and most often discussed form of interest rate risk arises from timing differences in the maturity (for fixed rate) and repricing (for floating rate) of bank assets, liabilities and off-balance-sheet (OBS) positions. While such repricing mismatches are fundamental to the business of banking, they can expose a

bank's income and underlying economic value to unanticipated fluctuations as interest rates vary.

For instance, a bank that funded a long-term fixed rate loan with a short-term deposit could face a decline in both the future income arising from the position and its underlying value if interest rates increase. These declines arise because the cash flows on the loan are fixed over its lifetime, while the interest paid on the funding is variable, and increases after the short-term deposit matures. Yield curve risk: Repricing mismatches can also expose a bank to changes in the slope and shape of the yield curve.

Yield curve risk arises when unanticipated shifts of the yield curve have adverse effects on a bank's income or underlying economic value. For instance, the underlying economic value of a long position in 10-year government bonds hedged by a short position in 5-year government notes could decline sharply if the yield curve steepens, even if the position is hedged against parallel movements in the yield curve.

Basis risk: Another important source of interest rate risk (commonly referred to as basis risk) arises from imperfect correlation in the adjustment of the rates earned and paid on different instruments with otherwise similar repricing characteristics. When interest rates change, these differences can give rise to unexpected changes in the cash flows and earnings spread between assets, liabilities and OBS instruments of similar maturities or repricing frequencies. Optionality: An additional and increasingly important source of interest rate risk arises from the options embedded in many bank assets, liabilities and OBS portfolios.

Formally, an option provides the holder the right, but not the obligation, to buy, sell, or in some manner alter the cash flow of an instrument or financial contract. Options may be stand alone instruments such as exchange-traded options and over-the-counter (OTC) contracts, or they may be embedded within otherwise standard instruments. While banks use exchange-traded and OTC-options in both trading and non-trading accounts, instruments with embedded options are generally most important in non-trading activities.

They include various types of bonds and notes with call or put provisions, loans which give borrowers the right to prepay balances, and various types of non-maturity deposit instruments which give depositors the right to withdraw funds at any time, often without any penalties. If not adequately managed, the asymmetrical payoff characteristics of instruments with optionality features can pose significant risk particularly to those who sell them, since the options held, both explicit and embedded, are generally exercised to the advantage of the holder and the disadvantage of the seller. Moreover, an increasing array of options can involve significant leverage which can magnify the influences (both negative and positive) of option positions on the financial condition of the firm.

B. Effects of Interest Rate Risk

As the discussion above suggests, changes in interest rates can have adverse effects both on a bank's earnings and its economic value. This has given rise to two separate, but complementary, perspectives for assessing a bank's interest rate risk exposure.

Earnings perspective: In the earnings perspective, the focus of analysis is the impact of changes in interest rates on accrual or reported earnings. This is the traditional approach to interest rate risk assessment taken by many

banks. Variation in earnings is an important focal point for interest rate risk analysis because reduced earnings or outright losses can threaten the financial stability of an institution by undermining its capital adequacy and by reducing market confidence.

In this regard, the component of earnings that has traditionally received the most attention is net interest income (i. e. the difference between total interest income and total interest expense). This focus reflects both the importance of net interest income in banks' overall earnings and its direct and easily understood link to changes in interest rates. However, as banks have expanded increasingly into activities that generate fee-based and other non-interest income, a broader focus on overall net income – incorporating both interest and non-interest income and expenses – has become more common.

The non-interest income arising from many activities, such as loan servicing and various asset securitisation programs, can be highly sensitive to market interest rates. For example, some banks provide the servicing and loan administration function for mortgage loan pools in return for a fee based on the volume of assets it administers. When interest rates fall, the servicing bank may experience a decline in its fee income as the underlying mortgages prepay.

In addition, even traditional sources of non-interest income such as transaction processing fees are becoming more interest rate sensitive. This increased sensitivity has led both bank management and supervisors to take a broader view of the potential effects of changes in market interest rates on

bank earnings and to factor these broader effects into their estimated earnings under different interest rate environments. Economic value perspective: Variation in market interest rates can also affect the economic value of a bank's assets, liabilities and OBS positions.

Thus, the sensitivity of a bank's economic value to fluctuations in interest rates is a particularly important consideration of shareholders, management and supervisors alike. The economic value of an instrument represents an assessment of the present value of its expected net cash flows, discounted to reflect market rates. By extension, the economic value of a bank can be viewed as the present value of bank's expected net cash flows, defined as the expected cash flows on assets minus the expected cash flows on liabilities plus the expected net cash flows on OBS positions.

In this sense, the economic value perspective reflects one view of the sensitivity of the net worth of the bank to fluctuations in interest rates. Since the economic value perspective considers the potential impact of interest rate changes on the present value of all future cash flows, it provides a more comprehensive view of the potential long-term effects of changes in interest rates than is offered by the earnings perspective.

This comprehensive view is important since changes in near-term earnings – the typical focus of the earnings perspective – may not provide an accurate indication of the impact of interest rate movements on the bank's overall positions. Embedded losses: The earnings and economic value perspectives discussed thus far focus on how future changes in interest rates may affect a bank's financial performance. When evaluating the level of interest rate risk

it is willing and able to assume, a bank should also consider the impact that past interest rates may have on future performance.

In particular, instruments that are not marked to market may already contain embedded gains or losses due to past rate movements. These gains or losses may be reflected over time in the bank's earnings. For example, a long term fixed rate loan entered into when interest rates were low and refunded more recently with liabilities bearing a higher rate of interest will, over its remaining life, represent a drain on the bank's resources. C.

Measuring Interest Rate Risk

The techniques available for measuring interest rate risk range from calculations that rely on simple maturity and repricing tables, to static simulations based on current on- and off-balance sheet positions, to highly sophisticated dynamic modelling techniques that incorporate assumptions about the behaviour of the bank and its customers in response to changes in the interest rate environment. Some of these general approaches can be used to measure interest rate risk exposure from both an earnings and an economic value perspective, while others are more typically associated with only one of these two perspectives.

In addition, the methods vary in their ability to capture the different forms of interest rate exposure: the simplest methods are intended primarily to capture the risks arising from maturity and repricing mismatches, while the more sophisticated methods can more easily capture the full range of risk exposures. Gap analysis: Simple maturity/repricing schedules can be used to generate simple indicators of the interest rate risk sensitivity of both

earnings and economic value to changing interest rates. When this approach is used to assess the interest rate risk of current earnings, it is typically referred to as gap analysis.

Gap analysis was one of the first methods developed to measure a bank's interest rate risk exposure, and continues to be widely used by banks. To evaluate earnings exposure, interest rate sensitive liabilities in each time band are subtracted from the corresponding interest rate sensitive assets to produce a repricing " gap" for that time band. This gap can be multiplied by an assumed change in interest rates to yield an approximation of the change in net interest income that would result from such an interest rate movement.

The size of the interest rate movement used in the analysis can be based on a variety of factors, including historical experience, simulation of potential future interest rate movements, and the judgement of bank management. A negative, or liability-sensitive, gap occurs when liabilities exceed assets (including off-balance sheet positions) in a given time band. This means that an increase in market interest rates could cause a decline in net interest income. Conversely, a positive, or asset-sensitive, gap implies that the bank's net interest income could decline as a result of a decrease in the level of interest rates.

Limitations of Gap Analysis: Although gap analysis is a very commonly used approach to assessing interest rate risk exposure, it has a number of shortcomings. First, gap analysis does not take account of variation in the characteristics of different positions within a time band. In particular, all

positions within a given time band are assumed to mature or reprice simultaneously, a simplification that is likely to have greater impact on the precision of the estimates as the degree of aggregation within a time band increases.

Moreover, gap analysis ignores differences in spreads between interest rates that could arise as the level of market interest rates changes (basis risk). In addition, it does not take into account any changes in the timing of payments that might occur as a result of changes in the interest rate environment. Thus, it fails to account for differences in the sensitivity of income that may arise from option-related positions. For these reasons, gap analysis provides only a rough approximation to the actual change in net interest income which would result from the chosen change in the pattern of interest rates.

Finally, most gap analyses fail to capture variability in non-interest revenue and expenses, a potentially important source of risk to current income.

Duration A maturity/repricing schedule can also be used to evaluate the effects of changing interest rates on a bank's economic value by applying sensitivity weights to each time band. Typically, such weights are based on estimates of the duration of the assets and liabilities that fall into each time band. Duration is a measure of the percent change in the economic value of a position that will occur given a small change in the level of interest rates.

Duration may also be defined as the weighted average of the time until expected cash flows from a security will be received, relative to the current price of the security. The weights are the present values of each cash flow

divided by the current price. In its simplest form, duration measures changes in economic value resulting from a percentage change of interest rates under the simplifying assumptions that changes in value are proportional to changes in the level of interest rates and that the timing of payments is fixed.

Modified duration is standard duration divided by $1 + r$, where r is the level of market interest rates – is an elasticity. As such, it reflects the percentage change in the economic value of the instrument for a given percentage change in $1 + r$. As with simple duration, it assumes a linear relationship between percentage changes in value and percentage changes in interest rates. In other words, Modified Duration = Macaulay's Duration/($1+r$), where Macaulay's Duration = $\sum \frac{C_t}{(1+r)^t} / P$

$C_t/(1+r)^t$ to the power t C_t = Rupee value of cash flow at time t T = Number of periods of time until the cash flow payment r = Periodic yield to maturity of the security generating cash flow and k = the number of cash flows Duration reflects the timing and size of cash flows that occur before the instrument's contractual maturity. Generally, the longer the maturity or next repricing date of the instrument and the smaller the payments that occur before maturity (e. g. coupon payments), the higher the duration (in absolute value).

Higher duration implies that a given change in the level of interest rates will have a larger impact on economic value. Duration-based weights can be used in combination with a maturity/ repricing schedule to provide a rough approximation of the change in a bank's economic value that would occur

given a particular change in the level of market interest rates. Specifically, an “average” duration is assumed for the positions that fall into each time band. The average durations are then multiplied by an assumed change in interest rates to construct a weight for each time band.

In some cases, different weights are used for different positions that fall within a time band, reflecting broad differences in the coupon rates and maturities (for instance, one weight for assets, and another for liabilities). In addition, different interest rate changes are sometimes used for different time bands, generally to reflect differences in the volatility of interest rates along the yield curve. The weighted gaps are aggregated across time bands to produce an estimate of the change in economic value of the bank that would result from the assumed changes in interest rates.