Management of Interest Rate Risk in Indian Banking

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Abstract

In a move towards effective management of interest rate risk in Indian banking, in addition to the existing return on Interest Rate Sensitivity under Traditional Gap Analysis, a new return is being introduced to monitor the interest rate risk using Duration Gap Analysis (DGA), called Interest Rate Sensitivity under Duration Gap Analysis (IRSD). The DGA involves bucketing of all Risk Sensitive Assets (RSA) and Risk Sensitive Liabilities (RSL) as per residual maturity/re-pricing dates in various time bands and computing the Modified Duration Gap (MDG). One of the important things to note is that the RSA and RSL include the rate-sensitive off-balance sheet assets and liabilities as well. MDG can be used to evaluate the impact on the Market Value of Equity (MVE) of the bank under different interest rate scenarios. The past few years have seen banks' foray into financing long-term assets, such as home loans and infrastructure projects. Banks have been allowed to raise funds through long-term bonds with a minimum maturity of five years to the extent of their exposure of residual maturity of more than five years to the infrastructural sector. This article attempts to illustrate the significance of interest rate risk management and approaches towards its management in the Indian context.

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Keywords: Interest Rate Risk Management, Duration Gap Analysis, Maturity Gap Analysis, Risk Sensitivity, Modified Duration Gap, Banking Risk

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Introduction

Banks perform the essential function of channeling funds from the savers (surplus economic units) to users (deficit economic units). In this though looking like a simple economic activity, banks are exposed to very many risks; the prime being the liquidity risk. Banks can broadly be said to perform some basic functions, viz.; (a) maturity transformation (b) risk transformation and (c) convenience denomination. Under maturity transformation, the financial institutions more often the banks convert the short-term liabilities into long-term assets. By converting the risk investments into relatively less risky ones they perform the risk transformation and by matching small deposits with the large loans and vice versa they perform the function of convenience denomination. In addition, banks experience risk due to macroeconomic outlook as slowdown in economic growth coupled with high inflation, soaring interest rates and depreciating currency.

Presently, the Reserve Bank monitors the interest rate risk of banks through a monthly return on interest rate sensitivity using the Traditional Gap Analysis (TGA). The focus of the TGA is to measure the level of a bank's exposure to interest rate risk in terms of sensitivity of its NII to interest rate movements over usually a one-year time horizon. It involves bucketing of all Rate-Sensitive Assets (RSA) and Rate-Sensitive Liabilities (RSL) and off-balance sheet items as per residual maturity/re-pricing date in various time bands and computing Earnings at Risk (EaR) or the loss of income under different interest rate scenarios over one year.

In addition to the existing return on Interest Rate Sensitivity under Traditional Gap Analysis, a new return is being introduced to monitor the interest rate risk using Duration Gap Analysis (DGA), called Interest Rate Sensitivity under Duration Gap Analysis (IRSD). The DGA involves bucketing of all Risk Sensitive Assets (RSA) and Risk Sensitive Liabilities (RSL) as per residual maturity/re-pricing dates in various time bands and computing the Modified Duration Gap (MDG). One of the important things to note is that the RSA and RSL include the rate-sensitive off-balance sheet assets and liabilities as well. MDG can be used to evaluate the impact on the Market Value of Equity (MVE) of the bank under different interest rate scenarios. The past few years have seen banks' foray into financing long-term assets, such as home loans and infrastructure projects. Banks have been allowed to raise funds through long-term bonds with a minimum maturity of five years to the extent of their exposure of residual maturity of more than five years to the infrastructural sector. Hence, the time buckets *viz*;

'over 5 years and up to 7 years', 'above 7 years and up to 10 years' and 'over 10 years and up to 15 years' and 'over 15 years', have been incorporated in the new return.

The step-by-step approach for computing modified duration gap has been detailed in the Reserve Bank circular (DBOD.No.BP.BC.59/21.04.098/2010-11) dated November 4, 2010. Banks will be required to compute their interest rate risk position, in each currency (including Rupees) by applying DGA to RSA and RSL items in that currency, where either the assets/liabilities are 5 per cent or more of the bank's total global assets/liabilities. The interest rate risk position in all other residual currencies has to be computed separately on an aggregate basis. The framework prescribed is aimed at determining the impact on the MVE arising from changes in the value of interest rate sensitive positions across the whole bank *i.e.*, both in the banking and trading books. Banks are required to submit the report on interest rate sensitivity as per DGA in the stipulated format on a monthly basis with effect from April 30, 2012. Given this background, this article attempts to illustrate the significance of interest rate risk management and approaches towards its management in the Indian context.

Interest Rate Risk

Owing to the very nature of business, banks are required to accept the interest rate risk not by chance but by choice. When a bank's assets and liabilities do not reprice at the same time, the result is a change in net interest income. The change in the value of assets and the change in the value of liabilities will also differ, causing a change in the value of stockholder's equity. Banks typically focus on either Net interest income or the market value of stockholders' equity. Interest rate risk can be defined as the potential loss from unexpected changes in interest rates, which can significantly alter a bank's profitability and market value of equity. IRR is the risk of a decline in earnings due to the movements of interest rates. It can also be explained as risk arising from the mismatching of the maturity and the volume of banks' assets and liabilities as part of their asset transformation function. The amount at risk is a function of the magnitude and direction of interest rate changes and the size and maturity structure of the mismatch position. If interest rates rise, the cost of funds increases more rapidly than the yield on assets, thereby reducing net income. If the exposure is not managed properly, it can erode both the profitability and shareholder value.

Interest rate risk is the risk where changes in market interest rates affect a bank's financial position. Changes in interest rates impact a bank's earnings through changes in its Net

Interest Income (NII). Changes in interest rates also impact a bank's Market Value of Equity (MVE) or Net Worth through changes in the economic value of its rate-sensitive assets, liabilities and off-balance sheet positions.

Broadly, interest rate risk, according (BCBS) 2004) could be classified as (1) Repricing risk, (2) Basis risk (3) Yield curve risk and (4) Embedded option risk.

Figure-1: Types of Interest Rate Risks

Repricing Risk

Repricing Risk arises on account of mismatches in rates and can be measured by the measure of risk in different time buckets. If interest rates change, the bank will have to reinvest the cash flows from assets or refinance rolled-over liabilities at a different interest rate in the future. If interest rates change, the market values of assets and liabilities also change. The longer is duration, the larger is the change in value for a given change in interest rates. An increase in rates, ceteris paribus, increases a bank's interest income but also increases the bank's interest expense. Illustration presented here below explains the occurrence of repricing risk due to change in interest rates.

Table-1: Interest rate risk due to mismatched repricing periods of assets/liabilities

Liabilities			**Assets**			**Spread**
Capital (INR Crore)	@ ROI	Maturity	Investment (INR crore)	@ ROI	Maturity	(INR Crore)
Scenario-1 500	8%	91 days	500	Fixed Rate 10%	91 days	Profit 2% (2.49)
Scenario-2 500	9%	91 days	500	Fixed Rate 8%	91 days	Loss 1% (1.24)
Scenario-3 500 **A case of Asset Sensitivity**	8%	91 days	500	Float Rate 10%(1st month)	60 days	Profit 2% (1.64)
				Float Rate 11%(2nd month)	30 days	Profit 3% (1.23)
					Total:	2.87
Scenario-4 500 **A case of Liability Sensitivity**	9%	5 years	500	Fixed Rate 10%	5 years	Profit 1% (25)

Basis Risk

When the costs of liabilities and the yields of assets are linked to different benchmarks resulting in a floating rate and there is no simultaneous matching movement in the benchmark rates leads to basis risk. Interest rates on assets and liabilities do not change in the same proportion. Interest rates movement is based on market perception of risk and also market imperfections. Therefore, basis risk arises when interest rates of different assets and liabilities change in different magnitudes. The `basis' form of Interest Rate Risk (IRR) results from the imperfect correlation between interest adjustments when linked to different index rates despite having the same re-pricing characteristics. Basis risk arises when the benchmark rates like base rate, bank rate, repo rates, and deposit rates are altered.

Embedded Option Risk

Embedded option risk arises due to the risks arising out of prepayment of loans and bonds (with put or call options) and / or premature withdrawal of deposits before their stated maturity dates. Presented here below is the illustration of the embedded option risk.

Table-2: Illustration for Embedded Option Risk

Liabilities			Assets			Spread
Capital (INR Crore)	@ ROI	Maturity	Loan (INR Crore)	@ ROI	Maturity	(INR Crore)
Scenario-1 100	8%	90 days	100	10%	90 days	Profit 2%(0.49)
Scenario-2 100	8%	90 days	100	10%	90 days	2%(0.164) for 30 days
				Int. Rates decline after 30 days to 9%	60 days	1%(0.164) for 60 days
				Total		0.328

Yield Curve Risk

Risks caused due to the change in the yield curve from time to time depending on the repricing and various other factors. Yield Curve is the relation between the interest rate (and or cost of borrowing) and the time to maturity of the debt for a given borrower in a given currency. The shape of the yield curve is influenced by supply and demand. The yield curve may also be flat or hump-shaped, due to anticipated interest rates being steady or short-term volatility outweighing long-term volatility. The risk of experiencing an adverse shift in market interest rates associated with investing in a fixed income instrument.

Table-3: Illustration for Yield Curve Risk

Liabilities			Assets			Spread
Capital (INR Crore)	@ ROI	Maturity	Loan (INR Crore)	@ ROI	Maturity	(INR Crore)
Scenario-1 100 Reference: 91 day T-Bill @12.5%	13.5%	3 year fixed (quarterly repriced)	100	Loan 16% Reference: 364 day T-Bill @13%	3 year float (quarterly repriced)	Profit 2.5% (2.5)
Scenario-2 100 Reference: 91 day T-Bill @14%	15%	90 days	100	16% Reference: 364 day T-Bill @13%	90 days	Profit 1.0% (1)

Need for Effective Management of IRR

Several macroeconomic factors like; level of fiscal deficit, inflation level, capital flows, exchange rates and balance of payments positions and other factors affect the interest rates to fluctuate. India's large fiscal deficit and signs of economic revival are factors that are expected to contribute to a rise in rates. In addition, as the fiscal situation is not improving, there is the possibility of higher monetization of public debt that could change inflationary expectations and push up the long rate.

On the asset side of a bank balance sheet, the bulk of corporate credit in India tends to be in the form of floating-rate loans. These are effectively of a low duration. On the liability side of the balance sheet, for the commercial banking system as a whole in India, short-term time deposits and demand deposits, constitute about 50 percent of total deposits. Duration mismatches between loans and advances on the asset side and deposits on the liability side are typically not very large. On the other hand, the bulk of government bonds are fixed-rate products. They have a higher duration than the typical credit portfolio. Movement of interest rates thus normally has a bigger impact on the investment portfolio of a bank. The relatively flat yield curve in recent years has reduced interest margins from the traditional 'maturity transformation' function of banking. This may have encouraged banks to look at their investment portfolios as a source of profit. This tendency, as well as difficulties in creating sound processes for handling credit portfolios, has led some banks to hold government securities in excess of reserve requirements.

Approaches to Measure and Manage IRR

The interest rate risk can thus be viewed from two perspectives, *viz*., 'earnings perspective', and 'economic value perspective'. Generally, the former is measured using the Traditional Gap Analysis (TGA) and the latter is measured using more sophisticated Duration Gap Analysis (DGA). Some of the well-known approaches to quantify IRR are; (i) Maturity Gap Analysis (ii) Rate Adjusted Gap (iii) Duration Gap Analysis (iv) Value-at-Risk (VaR) (v) Hedging (vi) Sensitivity Analysis and (vii) Simulation and Game theory.

Maturity Gap Analysis

Maturity Gap Analysis (MGA) distributes interest rate sensitive assets, liabilities and OBS positions into a certain number of predefined time bands according to their maturity(if fixed rate) or time remaining to their next repricing(if floating rate). This asset-liability management technique aims to tackle the interest rate risk and highlights the gap that is between the RSAs and RSLs, the maturity periods of the same and the gap period. The objective MGA is to improve the net interest income in the short run over discreet periods of time called the gap periods. Under MGA, the risk sensitive assets and risk sensitive liabilities are grouped into 'maturity buckets' based on maturity and the time until the first possible repricing due to change in the interest rates. The gap is then calculated by considering the difference between the absolute values of the RSAs and RSLs.

Rate Sensitive Gap (RSG) = RSAs-RSLs

Three Options under the gap analysis:

(1) RSA>RSL= Positive Gap; (2) RSL>RSA= Negative Gap; (3) RSL=RSA= Zero Gap

1. Maturity Gap Analysis: A case of positive gap

Liability (Crores)	Rate %	Increased Rate%	Decreased Rate%	Asset (Crores)	Rate %	Increased Rate%	Decreased Rate%
200				200			
1800*	10	11	9	800*	12	13	11
3000	11	11	11	1000*	14	15	13
				1000*	16	17	15
				2000	18	18	18
5000				5000			
Int Expense	510	528	492	Int income	756	784	728
NII=					246	256	236

A case of Positive Gap:
RSAs= Rs2800, RSLs=Rs1800 GAP=Rs2800-RS1800=Rs1000

2. Maturity Gap Analysis: A case of negative gap

Liability (Crores)	Rate %	Increased Rate%	Decreased Rate%	Asset (Crores)	Rate %	Increased Rate%	Decreased Rate%
200				200			
1800*	10	11	9	800*	12	13	11
3000	11	11	11	1000	14	14	14
				1000	16	16	16
				2000	18	18	18
5000				5000			
Int Expense	510	528	492	Int income	756	764	748
NII=					246	236	256

A case of Negative Gap:
RSAs= Rs800, RSLs=Rs1800 GAP=Rs800-Rs1800=(-)Rs1000

3. Maturity Gap Analysis: A case of zero gap

Liability (Crores)	Rate %	Increased Rate%	Decreased Rate%	Asset (Crores)	Rate %	Increased Rate%	Decreased Rate%
200				200			
1800*	10	11	9	800*	12	13	11
3000	11	11	11	1000*	14	15	13
				1000	16	16	16
				2000	18	18	18
5000				5000			
Int Expense	510	528	492	Int income	756	774	738
NII=					246	246	246

A case of Zero Gap:
RSAs= Rs1800, RSLs=Rs1800 GAP=Rs1800-Rs1800=0

Impact of Interest Rate Volatility on the Net Interest Income [Illustration-1]

IMPACT OF INCREASE / DECREASE IN RATE OF INTEREST ON NII				
COL1	COL2	COL3	COL4	COL5
Maturity pattern	RSL - OUTFLOWS	RSA - INFLOWS	GAP - RSA - RSL	CHANGE IN NII FOR
				0.25 % DECREASE
1- 14 DAYS	18785.27	15920.09	-2865.18	7.16
15 - 28 DAYS	31772.55	31161.34	-611.21	1.53
29 DAYS - 3 MTS	68403.39	77914.78	9511.39	(-23.78)
3-6 MONTHS	87629.72	90673.27	3043.55	(-7.61)
6-ONE YEAR	101260.22	98917.23	-2342.99	5.86
ONE - 3 YEARS	108310.71	106316.51	-1994.2	4.99
3-5 YEARS	114558.21	124538.91	9980.7	(-24.95)
ABOVE 5 YRS	134964.33	137905.36	2941.03	-7.35

Impact of Interest Rate Volatility on the Net Interest Income [Illustration-2]

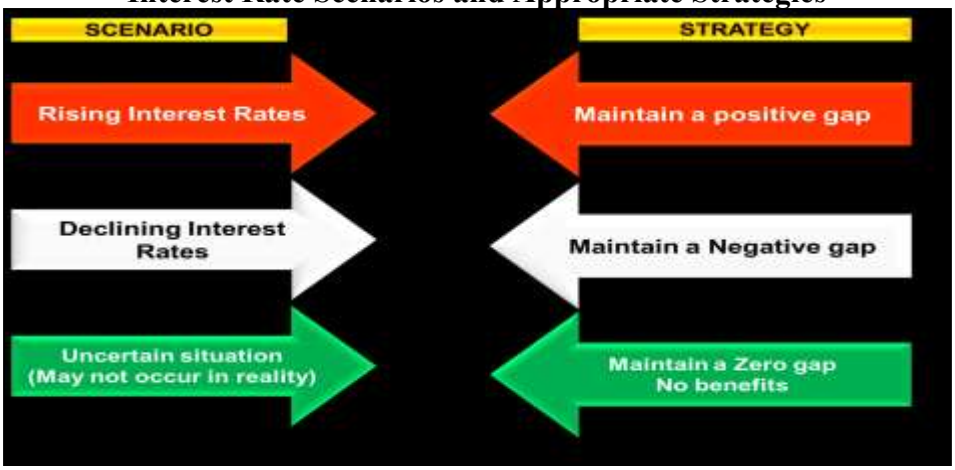
Maturity pattern	RSL-Outflows	RSA-Inflows	GAP (RSA-RSL	Change in NII for 0.5% decrease
1-14 days	15145	12360	-2785	13.93
15-28 days	26555	22555	-4000	20.00
29 days-3 months	61250	52650	-8600	43.00
3-6 months	80000	78000	-2000	10.00
6-One year	95000	93500	-1500	7.50
1-upto 3 years	105000	102000	-3000	15.00
3-upto 5 years	111000	118000	7000	(-)35.00
Above 5 years	115000	125000	10000	(-)50.00

Based on the understanding of the nature of the risk sensitive gap during different scenarios, the following abstract about the desirable mismatches to gain advantage during such scenarios could be structured.

Scenario	Rising interest rate scenario	Stable interest rate scenario	Falling interest rate scenario
Positive mismatch in IRS	Favourable	No impact	Adverse
Negative mismatch in IRS	Adverse	No impact	Favourable
No mismatch in IRS	No impact	No impact	No impact

Different strategies that are to be adopted for different interest rate scenarios is presented here below.

Interest Rate Scenarios and Appropriate Strategies



Factors Affecting Net Interest Income are (i) Changes in the level of interest rates (ii) Changes in the composition of assets and liabilities and (iii) Changes in the volume of earning assets and interest-bearing liabilities outstanding

Limitations of Maturity Gap Analysis

- To a larger extent depends on the accuracy level of the forecasts made regarding the quantum and the direction of the interest rate changes
- While gap measurement is easy, gap management is quite difficult.
- It assumes that change in interest rates immediately affects all RSAs and RSLs
- Ignores Time Value of Money

Rate Adjusted Gap

Though MGA assumes a uniform change in the interest rates for all assets and liabilities, in reality, however, it may not be the case, primarily due to two reasons. Firstly, the market perception towards the change in interest rate may be different from the actual rise/fall in the interest rates. Secondly, the reason for differential rise/fall in interest rates of assets/liabilities can be the presence of certain regulation.

Rate Adjusted Gap = $(RSA_1 * W_{A1} + RSA_2 * W_{A2} + \ldots\ldots)$

$- (RSL_1 * W_1 + RSL_2 * W_2 + \ldots\ldots)$

Where, W_{A1} , W_{A2}, …. are Weights of the corresponding RSAs

W_{L1} , W_{L2}, …. are Weights of the corresponding RSLs

Thus, by assigning weights the gap could be altered from positive to negative vice versa. Having done away with the assumption of a uniform change in interest rates of

assets/liabilities, the Rate Adjusted Gap (RAG) methodology seems to be superior to the MGA. In RAG, all the rate sensitive assets and liabilities are adjusted by assigning weights based on the estimated change in the rate for different assets/liabilities for a given change in interest rates.

Duration Gap Analysis

Duration Gap Analysis (DGA) concentrates on the price risk and the reinvestment risk while managing the interest rate exposure. While managing these two risks, duration analysis studies the effect of rate fluctuation on the market value of the assets and liabilities and Net Interest Margins (NIM) with the help of duration. Duration is an average life of asset/s (or liability/ies) cash flows. Duration is a measure of the percentage change in the economic value of a position that occurs given a small change in level of interest rate. The concept of duration helps in immunizing the interest rate risk by holding an investment until the end of duration instead of maturity. It concentrates on the price risk and the reinvestment risk while managing the interest rate exposure. It also measures the effect of rate fluctuation on the market value of the assets and liabilities and Net Interest Margin (NIM) with the help of duration.

An illustration of Duration Gap Analysis

Liabilities	Amount (crore)	Duration in Mnths	Interest Rate(%)	Increased Int. Rate(%)	Decreased Int. Rate(%)	Assets	Amount (crore)	Duratio n in Mnths	Interest Rate(%)	Increased Int. Rate(%)	Decreased Int. Rate(%)
Equity	200					Cash	200				
ST Depos	1800	5.5	11.5	13.5	9.5	ST Loans	1800	2.75	12.5	14.5	10.5
LT Depos	2500	23.7	15	15	15	LT Loans	2000	24	16.5	16.5	16.5
Others	500	11.5	11	13	9	Investm	1000	10.5	13.5	13.5	11.5
	5000						5000				
						Int					
Int. Expe			637	683	591	Income			690	746	634
NII			53	63	43						
NIM			0.0106	0.0126	0.0086						

Using the Duration analysis to assess the sensitivity of the market value of Assets and Liabilities

$$Ds \times S = (D \times A) - (DL \times L)$$

Where,

Ds = Duration Gap / Duration of Surplus

DA = Duration of Assets, DL = Duration of Liabilities A = Assets L = Liabilities

S = Surplus / Gap

Substituting L = A – S in the above eqn. We get

$$Ds = DL + (A / S) \times (DA - DL)$$

When there is a market fluctuation,

$$MV = \frac{-D(\Delta r) \times \text{Current MV}}{(One + r)}$$

Where, ΔMV = Change in the market value, D = Duration of assets or liabilities

Δ r = Change in the interest rate, r = Current interest rate, MV = Market Value

Then, **New MV = Current MV + MV**

The steps for an effective DGA are as below:

- Forecast interest rates
- Estimate the market values of bank assets, liabilities and stockholders' equity
- Estimate the weighted average duration of assets and the weighted average duration of liabilities
- Incorporate the effects of both on- and off-balance sheet items. These estimates are used to calculate duration gap
- Forecasts changes in the market value of stockholders' equity across different interest rate environments

Limitations of DGA

Managing interest rate risk by simply changing the composition of the assets and liabilities though feasible involves considerable transaction costs, unwanted size of the balance sheet and lack of flexibility. Further, forecast of future cash flows is a prerequisite for computation of duration. The accuracy of these forecasts in case of loans is relatively low due to defaults and prepayments unlike in bonds. Since the impact of rate fluctuations will be varying depending on the nature of assets, it will be necessary to identify different cash flows. Once the duration is fixed for a portfolio, the duration will not decline in tandem with the passage of time. In other words, a passage of one year in time will not result in a decline of duration by one year. Hence, it requires continues rebalancing of a portfolio. This increases the transaction costs. Some of the weaknesses of DGA include (i) It is difficult to compute duration accurately (ii) "Correct" duration analysis requires that each future cash flow be discounted by a distinct discount rate (iii) A bank must continuously monitor and adjust the

duration of its portfolio (iv) It is difficult to estimate the duration on assets and liabilities that do not earn or pay interest and (v) Duration measures are highly subjective.

Value at Risk

Value at Risk (VaR) offers an alternative framework for risk measurement. To calculate the VaR with respect to interest rate risk of a bank, at a 99 percent level of significance for a one-year horizon, we are required to go through the following steps:

1. Model the data generating process for the spot yield curve,
2. Simulate *N* draws from the yield curve on a date one year away,
3. Reprice assets and liabilities at each of these draws,
4. Compute the 1st percentile of the distribution of profit/loss seen in these *N* realizations.

This procedure is difficult to implement, primarily because the existing state of knowledge on the data generating process for the yield curve is weak. The procedure that is adopted can be interpreted as a limited and much simplified version of VaR. Firstly; the focus is on parallel shifts of the yield curve as the prime source of risk. This is the assumption made in existing BIS proposals. It is a simplification because it ignores risks that arise from other types of fluctuations of the yield curve. Secondly, the BIS proposal suggests that the distribution of one-year changes in the long rate should be utilized to read off the 1st percentile point. This is yet again a simplification, given the fact that a daily time-series of overlapping one-year changes in the long rate exhibits violations of independence. Thirdly, we need to compute the profit/loss consequences of this interest rate shock. Further, we are aware that the profit/loss associated with a 1st percentile event on the interest rate process is not the 1st percentile of the distribution of profit/loss, given the non-linearities of transformation in computing NPV. The procedure normally adopted, that is widely used in industry, and consistent with existing BIS proposals, may at best be interpreted as a poor approximation of VaR at a 99 percent level of significance on a one-year horizon. If VaR is the correct tool for interest rate risk measurement, this framework clearly entails substantial model risk.

Hedging

Hedging is another approach of managing interest rate risk with the use of derivative securities like; swaps, futures and options. This approach has been found to a better approach in situations especially where there is a maturity mismatch. For example, when liabilities are

mostly short-term in nature and assets are long-term, the easier method of financing the assets, rather than trying to match the maturing periods, is by the use of derivative securities.

Sensitivity Analysis

It allows management to incorporate the impact of different spreads between asset yields and liability interest costs when rates change by different amounts. The sensitivity of an asset/liability can be assessed by the quantum of increase/decrease in the value of the assets/liabilities of varying maturities due to the interest rate fluctuations. Based on the sensitivity, all the assets/liabilities are rearranged. The sensitivity model than suggests the assessment of the gap between the assets and liabilities having a similar sensitivity index to the interest rate fluctuations. Further action will be taken to manage help so as to restrict the interest rate risk.

Some of the steps for an effective sensitivity analysis are as below:

- Forecast future interest rates
- Identify changes in the composition of assets and liabilities in different rate environments
- Forecast when embedded options will be exercised
- Identify when specific assets and liabilities will reprice given the rate environment
- Estimate net interest income and net income
- Repeat the process to compare forecasts of net interest income and net income across different interest rate environments

In the case of Earnings Sensitivity Analysis (ESA), Earnings-at-Risk is the potential variation in net interest income across different interest rate environments, given different assumptions about balance sheet composition, when embedded options will be exercised, and the timing of repricing. It demonstrates the potential volatility in earnings across these environments. The greater is the potential variation in earnings (earnings at risk), the greater is the amount of risk assumed by a bank, or the greater is the maximum loss, the greater is risk.

Simulation and Game theory

Simulation is done by varying the interest rate structures to predict the short/medium/long term implications of the same. A simulation of performance under alternative interest rate scenarios is made and the resulting volatility in NII / NIM / ROA / ROE / MVE is assessed. A financial model incorporating inter-relationship of assets, liabilities, prices, costs, volume,

mix and other business related variables is made. Computer generated scenarios about future and response to that in a dynamic way are made use of for the simulation analysis.

For simulation technique, data requirement is enormous in terms of (i) Maturity and repricing (ii) Rate scenarios (iii) Alternative management response under different scenarios (iv) Yield curves (v) Prepayment tables (vi) Behavioural pattern of assets and liabilities and (vii) Consistency of assumptions. Some of the advantages of Simulation technique are (a) Forward looking (b) Dynamic (c) Lessens the role of crisis management (d) Increases the value of strategic planning (e) Enhances capability of analysis (f) Interpretation easy and (g) Timing of cash flows captured accurately. At the same time, some of the disadvantages of Simulation technique are (1) Accuracy depends on quality of data, strength of the model and validity of assumptions (2) Time consuming (3) Huge investment in computer (4) Requires highly skilled personnel and (5) Analysis paralysis

Benefits from IRR management

Effective IRR management offers several benefits namely; (1) Defined financial targets based on corporate risk tolerances (2) Reduced earnings volatility (3) Improved cash flow forecasting (4) Improved corporate credit ratings (5) Defined risk management and hedge methodologies. Based on the quantity of interest rate risk and quality of interest rate risk management, evaluate the adequacy of the bank's capital. Determine the component rating for sensitivity to market risk. Determine further the effect of interest rate and earnings on the business in a macroscopic view.

Current Indian Scenario

Interest rate risk measurement can be done by inspecting assets and liabilities classified into maturity buckets, and computing the 'gap' between assets and liabilities, in each time bucket. A bank can compute the gap statement where each component is classified into a time bucket based on time to repricing. In India, this 'interest rate risk statement' is computed by banks and submitted to the regulator, the Reserve Bank of India. The statement is, however, not required to be made public. Public disclosure consists of what is called 'the liquidity statement,' which shows the maturity distribution where each component is classified based on the time to maturity. If gap analysis had to be undertaken by independent analysts, then this would require imputation of the interest rate risk statement using public disclosures.

While gap analysis reveals mismatches at various maturities, it does not offer a mechanism for reducing them into a single scalar measure of the vulnerability of the bank, and in judging the economic significance of the vulnerability. Indian banks are required to disclose a statement on the maturity pattern of their assets and liabilities classified in different time buckets. The time bands used in the 'statement of structural liquidity' are 1–14 days, 15 to 28 days, 29 days to 3 months, 6 months to 1 year, 1 to 3 years, 3 to 5 years and greater than 5 years. Relative differences in each maturity bucket – represents the sensitivity in that band.

Globally, banks often use interest rate derivatives to hedge interest rate risk. In India, though the Reserve Bank of India (RBI) guidelines advise banks to use forward rate agreements and interest rate swaps to hedge interest rate risks, these markets are quite shallow. The measurement and monitoring of interest rate risk in most banks, especially in public sector banks, which constitute 75 percent of the banking system, remains largely, focused on the earnings approach. While some banks show an awareness of modern notions of interest rate risk, most banks appear to focus on the traditional 'earnings perspective.' The interest rate risk statement is also based on the earnings approach. Banks are required to submit this statement to the RBI.

Conclusion

With respect to IRR monitoring and control issues, it is requisite on the part of banks to capture all material IRR exposures, whether in their trading or banking books, within their management systems. Operating limits and related practices for keeping IRR exposures within levels consistent with internal policies have to be clearly established and enforced. Moreover, all IRR modeling assumptions and parameters must be well documented and updated with reasonable frequency. Stress testing should be regularly used to assess the bank's interest rate sensitivity and examine the appropriateness of key modeling assumptions. Stress test results must be contemplated when establishing and reviewing IRR policies and procedures. A bank should have adequate information systems for reporting accurate IRR exposure information on a timely basis to its board of directors and senior management. Finally, effective IRR management systems require regular evaluations by independent auditors, whether internal or external. The banks need to be aware that banks' IRR management techniques continue to evolve, so certain details of their guidelines will need to be updated. However, the principle that banks' own assessments of their IRR exposures

should form the basis of supervisory oversight is a defining characteristic of future supervisory efforts.

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