CHAPTER III

Asset Liability Management – Theory and Strategies

The economic reforms going on in India since 1991 have brought about rapid changes in the structure of financial markets, more particularly in banks. The introduction of prudential accounting norms for income recognition, asset classification and provisioning on the basis of Narasimham Committee recommendation made the balance sheet of many banks unimpressive. A significant portion of the advances was classified as non-performing. The gradual regulation of interest rate has led to interest rate war, thus reducing the Spreads available to the banks. This forced the banks to focus their attention on profitability, risks and capital adequacy. The capital adequacy norms linked to risk weighted assets created the need for additional capital, which could possibly be met by approaching the capital market but only at high rate.

A policy shift was taking place in terms of business strategy from growth and market share to profits. Banks felt the need for identifying and controlling those risks which could result in serious losses and asset quality became the main focus of the banks. Banks realized the fact that assets and liabilities had to be managed with equal care for identifying and controlling those risks. The experimentation of the last two or three decades has converged into a comprehensive technique of managing the entire bank balance sheet in a cohesive and co-ordinated manner, which later came to be known as Asset-Liability Management.1
Asset Liability Management is the management of the total balance sheet dynamics and it involves quantification of risks and conscious decision-making with regard to asset-liability structure in order to maximise the interest earnings within the framework of perceived risks. The primary objective of Asset Liability Management is not to eliminate risk, but to manage it in such a way that the volatility of net interest income is minimised in the short run and economic value of the organisation is protected in the long run. The ALM function involves controlling the volatility of net income, net interest margin, capital adequacy, liquidity risk and ensuring an acceptable balance between profitability, growth and risk.

A sound ALM system follows on:

1. Reviewing of interest rate and fixation of interest/product pricing on both assets and liabilities.

2. Evaluating loan and investment portfolio in the light of liquidity risk and foreign exchange risk and examining the effect of these risks on the value and cost of liabilities.

3. Examining the probability of credit risk and contingency risk that may originate either due to rate fluctuations or otherwise and assess the quality of assets.


5. Strategic planning and budgeting for managing interest rate mismatch and maturity mismatch of assets and liabilities.
The main objectives of ALM should be:

1. Analysis of current source of funds and prudent management of these funds.
2. Matching the assets financed by different types of duration of funds and its monitoring.
3. Formulating Gap management strategies for interest mismatch for different categories of assets and liabilities.
4. Assessment of risk factors associated with assets including its cost and returns.

Through proper Asset Liability Management, liquidity, profitability and solvency of banks can be ensured and at the same time banks can manage and reduce risks such as credit risk, liquidity risk, interest rate risk, currency risk etc. The liabilities of a bank have different categories of varying cost, depending upon the tenor and maturity pattern. Similarly the assets comprise different categories with varying yield rates depending upon the maturity and risk factors. Thus the main focus of Asset Liability Management is the matching of the liabilities and assets in terms of maturity, cost and yield rates. The maturity mismatches and disproportionate changes in the levels of assets and liabilities cause both Liquidity Risk and Interest Rate Risk.

The broad areas of Asset Liability Management include:

(1) Liquidity Risk Management
(2) Interest Rate Risk Management
(3) Management of Credit and Investment portfolio
(4) Management of borrowing and lending in the money and foreign market.


**Liquidity Risk Management**

There are macro and micro level objectives of ALM and at the macro level ALM leads to the formulation of critical business policies, efficient allocation of capital and designing of products with appropriate pricing strategies. At the micro level, the objective functions of the ALM are two fold: ensuring profitability and liquidity. Profitability is ensured through price-matching and the deployment of liabilities at a rate higher than the cost whereas liquidity is ensured by grouping the assets/liabilities based on their maturity profiles. For the survival and growth of financial institutions liquidity is important and the sources of liquidity are distributed across assets and liabilities. A bank that is being managed well can derive liquidity from both sides. Maintaining profitability by matching prices and ensuring liquidity by matching the maturity level is not an easy task because a Spread is possible only when a mismatch of maturity is taken up.

A bank attains profitability through fund management i.e. acquisition and deployment of financial resources and an intricate part of fund management is liquidity management. Liquidity management is the ability of the bank to meet maturity liabilities and customer's demands for cash within the basic pricing policy framework.
A bank may face liquidity problems in many cases due to various reasons. The possible reasons are:

(1) Withdrawal of deposits or non-renewals of deposits and the failure to replace net outflow of funds creating a funding risk.

(2) Non-receipt of expected inflow of funds due to irregularities in advances and the growth of non-performing assets creating immediate liquidity problems to the banks, and

(3) The sudden demand for money owing to contingent liabilities becoming due and creating sudden drain on liquidity.

Liquidity, which is represented by the quality and marketability of the assets and liabilities exposes the banks to Liquidity Risk. Liquidity Risk normally arises due to the nature of the assets and liabilities of the banks and most of them result from the potential inability of a bank to generate cash in order to meet the commitments when they are due. Once maturity of assets exceed those of liabilities, there is inevitably Liquidity Risk. The liquidity position of a bank is normally influenced by the investment and financing decisions of the bank and the liquidity position should be continuously monitored both in the long run and also on a day today basis.

There are two methods related to situational decisions in this regard. The first is the fundamental approach, which strategically ensures liquidity for a long term in sustaining the bank. The technical
approach on the other hand has only short-term liquidity targets. As a result these two approaches mutually supplement the effort to eliminate Liquidity Risk and ensure profitability. At the strategic level the fundamental approach aims at adjusting the maturity of assets and liabilities and diversifying and broadening the sources and uses of funds. The alternative methods adopted here are asset management and liability management. Liquidity can be created by asset liquidation or liability creation as and when required. Asset management involves the methods of meeting liquidity requirements from primary and secondary reserves i.e. cash assets held to meet the Statutory Reserve Requirements (SLR) and highly liquid assets such as unsecured marketable securities respectively. Liability management involves the methods of borrowing funds when a need arises. The bank mostly invests in long-term securities and loans and for the purpose of liability management it passes a lending proposal even when there is no surplus balance. The required funds are raised from the external sources. In this case, the cost and maturity of the instruments used for borrowing funds play an important role in the liability management. The bank should certainly be careful to raise funds at a low cost and should ensure that the maturity profile of the instruments does not lead to Interest Rate Risk or Liquidity Risk. Thus while asset management tries to answer the basic question of how to deploy the surplus funds to eliminate Liquidity Risk, liability management tries to achieve the same by mobilising additional funds.
When technical approach is adopted to eliminate Liquidity Risk the bank should know its cash requirements and the cash inflows and adjust these two to ensure a safe level for its liquidity position. The two methods to assess the liquidity position in the short run are Working Fund Approach and Cash Flow Approach. Working Fund Approach concentrates on the actual cash position and depending on this the liquidity requirements of the firm is assessed. In Cash Flow Approach the changes in the deposits/withdrawals/credit accommodation etc. are assessed well in advance i.e. the cash flow is forecast and the bank is advised on its investments and borrowing requirements.

On the basis of the historical performance the banks can assess the liquidity position as a percentage of working funds available to the bank. The working fund comprises of owned funds, deposits and float funds. Due to the very nature of being the owner's capital, the liquidity of the owned fund will be nil. The liquidity position of the deposit depends on the maturity profile and the bank should categorize them into different segments based on the withdrawal pattern. All deposits are segregated into volatile funds, vulnerable funds and stable funds. The deposits like current deposits which are sure to be withdrawn during the period for which liquidity estimate is to be made are volatile funds. Due to the nature of the volatile funds the demand for funds can arise at any time and the bank must maintain 100 per cent liquidity. Vulnerable deposits such as savings deposit are likely to be
withdrawn during the planning tenure. There will be a certain level up
to which these funds are stable. As the liquidity requirements for
savings deposits will generally arise from its variable portion, the bank
need not maintain 100 per cent liquidity. The stable funds have the
least probability of being withdrawn during the planning period and
hence the liquidity to be maintained to meet the maturing stable
deposits will be lower when compared to the other two types of
deposits. The stable portion of savings deposits and most of the term
deposits by their nature are considered as stable fund.

Float funds, such as DDs, banker's cheques etc. are variable in
nature and a 100 per cent liquidity will have to be provided for the
variable component. By fixing the average cash and bank balances to
be maintained as a percentage of total working fund and range of
variance, the bank can assess the liquidity position. This percentage
level is based on forecasts, the accuracy levels of which vary depending
on the factors affecting the cash flows. The profitability and liquidity of
the bank is ensured as long as the average cash and bank balance vary
within the tolerance range and any balance beyond this range is
adjusted either by deploying the surplus funds or by borrowing funds
to meet the deficit.

In the Cash Flow Approach Method of forecasting liquidity, the
potential increase/decrease in deposits/credits is assessed on the basis
of historical data. The liquidity position is assessed based on the
forecasts made for the cash inflows and outflows. Predicting the expected cash inflows coming by way of incremental deposits and recovery of credit and the outflows by way of deposit withdrawals and loan disbursements is the critical task of liquidity management. The difficulty in the forecasting of cash flows coupled with the mismatches arising due to the maturity patterns of assets and liabilities result in the Liquidity Risk and a high degree of accuracy in the process of forecasting cash flows eliminates risk to a certain extent.

**Liquidity Management**

Assessment of the liquidity Gap and managing the Gap by adjusting the residual surplus or deficit balance is the major task of liquidity management. A bank should adjust its surplus/deficit to meet the liquidity Gap. While surplus funds can be invested in short/long term securities depending on the bank's investment policy, short-falls can be met either by disinvesting securities or by borrowing funds. The criteria for making an investment-borrowing decision will be to increase yields on investments and to lower the costs of borrowings. The investment-deposit ratio should be optimum so as to ensure that the level of the idle funds/low yield funds is not so high as to cut into the profitability of the bank.

A bank should select the best method to tackle Liquidity Risk, which is suitable to the business environment in which the bank operates. Based on the past performance the bank management should fix a tolerance limit for the Liquidity Ratio. For managing the
Liquidity Risk the bank should also consider the interest rate exposure limit. On the basis of these the bank can select the maturity patterns and the Liquidity Risk profiles of its assets and liabilities. By assuring a bank's ability to meet its liabilities as they become due, liquidity management can reduce the probability of an adverse situation developing. The bank management should measure not only the liquidity positions of banks on an ongoing basis, but also examine how liquidity requirements are likely to evolve under different assumptions. Therefore liquidity has to be tracked through maturity or cash flow mismatches. For measuring and managing net funding requirements, the use of maturity ladder and calculation of cumulative surplus or deficit of funds at selected maturity dates is adopted as a standard tool. In liquidity management, availability of time to connect the situation is of great significance and from this angle short-term liquidity problems are more serious than long-term liquidity problems.

**Interest Rate Risk**

Interest Rate Risk denotes the changes in interest income and consequent possibility of loss due to changes in the rate of interest. Indian commercial banks were moving in a phased manner since the year 1991 to an era of total deregulation with regard to interest rates. Up to eighties the Indian economy was closely regulated and both deposit and lending rates were administered by RBI. The phased deregulation of interest rate and the operational flexibility given to
banks in pricing most of the assets and liabilities have made the management of Interest Rate Risk a major strategic issue for the banks.

"A glimpse of the interest rate risk associated with the deregulation was faced by most of the banks during September 1995 when the call money rates zoomed to around 60 per cent to 70 per cent on an average and to even more than 100 per cent occasionally. The impact of volatility in call money rates also spread to the exchange market wherein the forward rate for dollar rose phenomenally. With a view to reduce the cost of forward cover on dollar and also to bail out borrowing banks from the consequences of very high call money rates, the Reserve Bank of India then initiated several measures such as reduction in CRR in phases from 15 per cent to 10 per cent (since 18 January 1997) pumping money through Securities and Trading Corporation of India, removal of CRR on increase in NRE, FCNR (B) and NRNR deposits over a base date etc."²

The changes in interest rates affect banks in a larger way. The immediate impact of changes in interest of rates is on the banks earnings by changing its Net Interest Income (NII). A long term impact of changing interest rates is on the bank's Market Value of Equity (MVE) or Net Worth, as the economic value of the bank's assets, liabilities and off-balance sheet position get affected due to the variation in market interest rates. The changes in Net Interest Income (NII) or Net Interest Margin (NIM) is viewed from 'earnings perspective' and the changes in the Market Value of Equity is viewed from 'economic value
The 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.

**Sources of Interest Rate Risk**

Interest rate fluctuations will arise due to the mixed effect of a host of other risks that comprise the Interest Rate Risk.

**Repricing Risk**

The primary and most often discussed form of Interest Rate Risk arises from timing differences in maturity (for fixed rate) and repricing (for floating rate) of bank assets, liabilities and off-balance sheet 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 fluctuation as interest rates vary.

**Yield Curve Risk**

As the economy moves through business cycles, the Yield Curve changes rather frequently. 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 ten year government bonds hedged by a short position in five year government bonds could decline sharply if the Yield Curve steepens, even if the position is hedged against parallel movements in the Yield Curve.
Rate Level Risk

During a given period, the interest rate levels are to be restructured either due to the market conditions or due to regulatory intervention. In the long run, Rate Level Risks affect decisions regarding the type and the mix of assets/liabilities to be maintained and their maturing period. The Reserve Bank of India has been lowering the statutory Cash Reserve Ratio (CRR) for banks in a phased manner from 12 per cent since the year 1996 onwards. The decrease in CRR increases the liquidity of banks, which further results in the lowering the PLR/interest rates. For all new deposits the revised interest rates will be applicable which will result in low marginal cost of funds.

Basis Risk

Even when assets and liabilities are properly matched in terms of repricing risk, banks are often exposed to Basis Risk, which arises from imperfect correlation in the adjustment of the rates earned and paid on different instruments with other similar repricing characteristics. When interest rates change, these differences can give rise to inexpedient changes in the cash flows and earning Spreads between assets, liabilities and off-balance sheet instruments of similar maturities or repricing frequencies.

Embedded Option Risk

An additional and increasingly important source of Interest Rate Risk arises from the options embedded in many bank assets, liabilities
and off-balance sheet (OBS) portfolios. Big changes in the level of interest encourage premature withdrawal of deposits on the liability side or prepayment of loans on the asset side and it creates a mismatch and gives rise to repricing risk. When funds are raised by the issue of bonds/securities it may include call/put options and these two options are exposed to a risk when the interest rates fluctuate. Bonds with put and call option may be redeemed before their original maturity as the holder will like to exercise put option in an increasing interest rate scenario while the issuer will exercise call option if interest rates have fallen.

**Volatility Risk**

In deciding on the mix of the assets and liabilities the short-term fluctuations in the pricing policies are to be considered in addition to the long run implication of the interest rate changes. In a highly volatile market, the risk will acquire serious proportions as the impact will be felt on the cash flows and profits. The volatility witnessed in the Indian call money market in 1994 explains the presence and the impact of the Volatility Risk. While some banks defaulted in maintenance of CRR, many banks borrowed funds at high rates, which had substantially reduced their profits.

**Effects of Interest Rate Risk**

Changes in interest rates can have adverse effects both on a bank’s earnings and its economic value. For assessing a bank’s
Interest Rate Risk exposure, changes in interest rate is to be viewed from two separate but complementary perspectives.

**a. Earnings Perspective**

This is the traditional approach to Interest Rate Risk assessment taken by many banks. In the earnings perspective, the focus of analysis is the impact of changes in interest rates on accrual or reported earnings. As reduced earnings or outright losses can threaten the financial stability of an institution by undermining its capital adequacy and by reducing market confidence, variation in earning is an important aspect of Interest Rate Risk analysis. Earning perspective focuses attention on Net Interest Income (i.e., the difference between total interest income and total interest expense). 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 programmes can be highly sensitive to market interest rates.

**b. Economic Value Perspectives**

Variation in market interest rates can also affect the economic value of a bank’s assets, liabilities and OBS positions. It will ultimately impact the Market Value of Equity or the value of Net Worth of the bank. 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. 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.

The Earnings and Economic Value Perspectives focus on how future changes in interest rates may affect a bank’s financial performance. The past interest rates may also have an impact on the future performance as instruments that are not marked to market may already contain embedded gains or losses due to past rate movements which may be reflected over time in the bank’s earnings.

**Interest Rate Risk Measurement**

Banks should 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. Mere identification of the presence of the Interest Rate Risk will not suffice. A system that quantifies the risk and manages the same should be put in place so that timely action can be taken. Any delay or lag in the follow-up action may lead to a change in the dimension of the
Risk i.e., lead to some other risks like Credit Risk, Liquidity Risk etc. and make the situation uncontrollable.

Risk Measurement Systems should

(i) assess all material Interest Rate Risk associated with a bank's assets, liabilities and OBS positions,
(ii) utilise generally accepted financial concepts and risk measurement techniques and
(iii) have well documented assumptions and parameters.

Once the bank is exposed to the Interest Rate Risk, the immediate step to be followed is the quantification of the same by means of a suitable methodology. Some of the approaches used to tackle Interest Rate Risk are the following:

1. **Maturity Gap Method**

The simplest techniques for measuring a bank's Interest Rate Risk exposure begin with a maturity / repricing schedule that distributes interest-sensitive assets, liabilities and OBS positions into 'time bands' according to their maturity (if fixed rate) or time remaining to their next repricing (if floating rate). This technique which is referred to as Gap Analysis is used to assess the Interest Rate Risk of current earnings. A Gap is the difference between Rate Sensitive Assets (RSA) and Rate Sensitive Liabilities (RSL) that mature or are repriced during a particular of time. The objective of this method is to stabilise / improve the Net Interest Income in the short run over discreet periods of time called the Gap periods.
The first step in Gap Analysis is to bifurcate the entire asset and liability portfolio into two distinct categories.

1. Rate Sensitive Assets and Liabilities
2. Rate Non-Sensitive Assets and Liabilities

All the RSAs and RSLs are grouped into maturity buckets based on the maturity and the time until the first possible repricing due to change in the interest rates is effected. For each time 'bucket' the Gap equals the difference between the Interest Rate Sensitive Assets (RSAs) and the Interest Rate Sensitive Liabilities (RSL).

\[ \text{RSG} = \text{RSAs} - \text{RSLs} \]

\[ \text{RSG} = \text{Rate Sensitive Gap based on maturity} \]

\[ \text{Gap Ratio} = \frac{\text{RSAs}}{\text{RSLs}} \]

The bank can use the Gap to maintain/improve its Net Interest Income for changing interest rates, otherwise adopt a speculative strategy wherein by altering the Gap effectively depending on the interest rate forecast, the Net Interest Income can be improved. During a selected Gap period, the RSG will be positive when the RSAs are more than the RSLs, negative when the RSLs are in excess of the RSAs and zero when the RSAs and RSLs are equal. In order to tackle the rising/falling interest rate structures, the Maturity Gap Method suggests various positions that the treasurer can take i.e.

i. Maintain a positive Gap when the interest rates are rising.

ii. Maintain a negative Gap when the interest rates are on a decline.
Maintain a zero Gap position for the firms to ensure a complete hedge against any movements in the future interest rates.

When interest rates change, the bank's Net Interest Income (NII) changes based on the following interrelationships.

Changes in NII = RSAs x change in average interest rate on RSA, 
\( ( = \Delta r_1) \) minus RSLs x change in average interest rate paid on RSLs 
\( ( = \Delta r_2) \), or

\[ \Delta \text{NII} = \text{Gap} \times \Delta r \]

**The Gap Related to NIM**

A better measurement of Interest Rate Risk (IRR) relates Gap to Earning Assets (EA) of a bank. The link is provided through the net interest margin (NIM) which is defined as the ratio of NII to EA

\[ \text{NIM} = \frac{\text{NII}}{\text{EA}} \]

The objective of an ALM policy will be to maintain the NIM within certain limits by managing the risks and the bank should first decide the maximum and minimum levels for the NIM. Following this will be an ALM technique which allows a bank to take various Risk exposure levels and still remain within the limits set for NIM.

The success/failure of the Maturity Gap Method depends to a large extent on the accuracy level of the forecasts made regarding the quantum and the direction of the interest rate changes. The assumption in the Gap method that the change in the interest rates is immediately affecting all the RSAs and RSLs by the same quantum is not always true in reality. Another limitation of the Gap method is that
the treasurer may not have the flexibility in managing the Gap so as to effectively produce the targeted impact on the net interest income. Simultaneously, this model ignores the time value of money for the cash flows occurring during the Gap period.

2. **Rate Adjusted Gap**

The Maturity Gap Approach assumes a uniform change in the interest rates for all assets and liabilities but this may not be the case in reality. The market perception towards a change in the interest rate may be different from the actual rise/fall in interest rates. Similarly, irrespective of any amount of fluctuation in the interest rate of the bank, the differential interest rate remains constant because of certain regulations. In the Rate Adjusted Gap technique, all the rate sensitive assets and liabilities will be adjusted by assigning weights based on the estimated change in the rate for the different assets/liabilities for a given change in interest rates.

Rate Adjusted Gap

\[
\text{Rate Adjusted Gap} = \left[ RSA_1 \times W_{A1} + RSA_2 \times W_{A2} + \ldots \right] \\
\left[ RSL_1 \times W_{L1} + RSL_2 \times W_{L2} + \ldots \right]
\]

Where, \( W_{A1}, W_{A2} = \) Weights of the corresponding RSAs

\( W_{L1}, W_{L2} = \) Weights of the corresponding RSLs

3. **Duration Analysis**

Duration Analysis concentrates on the price risk and the reinvestment risk while managing the interest rate exposure. It studies the effect of rate fluctuation on the market value of the assets and
liabilities and Net Interest Margin (NIM) with the help of duration. Frederick Macaulay observes that it is possible to blend information contained in the size and timing of all cash flows into one number called duration. Duration is the weighted average of time taken (in years) to receive all cash flows, the weights being the present values of the cash flows. The Rate Sensitive Gap calculated in Duration Analysis is based on the duration and not the maturity of the assets and liabilities. Duration Gap recognises that Interest Rate Risk arises when the timings of cash inflows and outflows differ even if the assets and liabilities are categorised as rate insensitive as per the conventional Gap technique. The Duration Gap (DGAP) is computed as the difference between the composite duration of bank assets and a marked down composite duration of its liabilities.

\[
DGAP = DA - KDL
\]

Here \( DA \) is the summation of each asset's duration weighted by its share in total assets whereas \( DGAP \) is the duration of bank equity. The impact on market value of equity due to interest rate movements can be summarized as given below:

A bank can immunise the market value of its equity by setting \( DGAP = 0 \). In reality if a bank wants to perfectly hedge its equity value, it has to set its asset duration slightly less than its liability duration to maintain positive equity.
The DGAP measure is more scientific and realistic but more sophisticated and complex in approach at the same time. A basic precondition for the use of this tool as a hedge mechanism is that all the assets and liabilities of banks have to be positioned as marked to the market. But for many banks in India, very low portions of their balance sheets are marked to the market. Therefore as for the present, the DGAP tool has less applicability in the Interest Rate Risk immunisation of a bank's balance sheet.

4. Simulation Techniques

Simulation techniques involve detailed assessments of the potential effects of changes in interest rates on earnings and economic value by simulating the future path of interest rates and their impact on cash flows. In static simulations, the cash flows arising solely from the bank's current on and off balance sheet positions are assessed and in a dynamic simulation approach, the simulation builds in more
detailed assumptions about the future course of interest rates and expected changes in a bank's business activity over that time. Many banks (especially those using complex financial instruments or otherwise having complex risk profiles) employ more sophisticated Interest Rate Risk measurement systems than those based on simple maturity repricing schedules. These more sophisticated techniques allow for dynamic interaction of payment streams and interest rates, and better capture the effect of embedded options.

5. **Value-at-Risk Approach**

Value-at-Risk methodology is a risk control method which statistically predicts the maximum potential loss a bank's portfolio could experience over a specific holding period at a certain probability. Using this method it is possible to measure the amount of risk for each produce with a common yardstick. The Value-at-Risk methodology takes into consideration the sensitivity of the current position's marginal move in the risk factors such as the interest rates, foreign exchange rates etc., the standard deviation of the historical volatality of the risk factors, and the correlation between the risk factors. VaR is used to estimate the volatality of Net Interest Income (NII) and net portfolio with a desired level of confidence. The Value-at-Risk concept has been recommended by the Basle Committee as a standard measure of risk. The Basle Committee on banking supervision has recommended that Value-at-Risk may be calculated as on 99 per cent confidence interval basis.
Regardless of the measurement system, the usefulness of each technique depends on the validity of the underlying assumption and the accuracy of the basic methodologies used to model Interest Rate Risk exposure.

The variety of the techniques range from calculations that rely simply on maturity and re-pricing charts, duration Gap analysis, static simulations based on current on and off balance sheet positions, 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. All those methods vary in their ability to capture the different forms of interest rate exposure.

**Maturity Gap: A Traditional Gap Method Implemented by RBI in the Indian Context**

The RBI issued guidelines in the year 1999 to tackle the problem of short-term liquidity. As per the Prudential Norms set by the RBI every bank has to ensure that the net outgo of funds during the coming 28 days should not exceed 20 per cent of the total outflow of cash. The Reserve Bank has also adopted Maturity Ladder for a comparative study of future cash inflows and cash outflows and all banks have been directed to prepare Liquidity Statements on the pattern of Maturity Ladder at quarterly intervals starting from the June 99 quarter. In constructing the Maturity Ladder, a bank has to allocate each cash inflow or outflow to a given calendar date from a starting point. A
maturing asset will result in cash inflow while a maturing liability will amount to cash outflow.

For constructing the Maturity Ladder, classification of available data is necessary. For example a five-year deposit with only three months left to maturity will be classified as cash outflow likely to take place in three months time. Thus maturity profile could be used for measuring the future cash flows of banks in different time buckets. (Appendix III).

The time buckets, given the Statutory Reserve Cycle of the days, have been distributed as follows.

(i) 1 to 14 days
(ii) 14 to 28 days
(iii) 29 days and above up to 3 months
(iv) Over 3 months and up to 6 months
(v) Over 6 months and up to 1 year
(vi) Over 1 year and up to 3 years
(vii) Over 3 years and up to 5 years
(viii) Over 5 years

Within each time bucket there could be mismatches depending on cash inflows and outflows. While the mismatches up to one year would be relevant since these provide early warning signals of impending liquidity problems, the main focus should be on the short term mismatches viz. 1-14 days and 15-28 days. Banks are expected to monitor their cumulative mismatches across all time buckets by
establishing internal prudential limits with the approval of the Board/Management Committee. The mismatches (negative Gap) during 1-14 days and 15-28 days in normal course may not exceed 20 per cent of the cash outflows in each time bucket. If a bank in view of its current asset-liability profile and the consequential structural mismatches needs higher tolerance level, it could operate with higher limit sanctioned by its Board/Management Committee giving specific reasons on the need for such higher limit. The discretion to allow a higher level was intended for a temporary period i.e. till 31 March, 2000. Indian banks with large branch network can afford to have larger tolerance levels in mismatches in the long term if their term deposit base is quite high. While determining the tolerance levels the banks may take into account all relevant factors based on their asset-liability base, nature of business, future strategy etc.

In case the negative Gap exceeds the prudential limit of 20 per cent outflows (1-14 days and 15-28 days), the bank may show by way of footnote as to how it proposes to finance the Gap to bring the mismatch within the prescribed limits. The Gap can be financed from market borrowings, Bills Rediscounting, Repay and deployment of foreign currency resources after conversion in to rupees etc.

In the context of poor MIS, slow pace of computerisation in banks and the absence of total deregulation, the Reserve Bank has decided to implement the simplest method of traditional Gap Analysis as a suitable method to measure the Interest Rate Risk. It is the intention
of RBI to move over to the modern techniques of Interest Rate Risk measurement like Duration Gap Analysis, Simulation and Value at Risk over time when banks acquire sufficient expertise and sophistication in acquiring and handling MIS.

The Gap or mismatch risk can be measured by calculating Gaps over different time intervals. Gap Analysis measures mismatches between rate sensitive liabilities and rate sensitive assets. An asset or liability is normally classified as rate sensitive if

(i) within the time interval under consideration, there is cash flow.

(ii) the interest rate resets/reprices contractually during the interval.

(iii) RBI changes the interest rates (interest rates on Savings Bank Deposits, DRI Advances, Export Credit, Refinance, CRR balance etc.) in cases where interest rates are administered.

(iv) it is contractually pre-payable or withdrawable before the stated maturities.

The Gap Report should be generated by grouping rate sensitive liabilities, assets and off-balance sheet positions into time buckets according to residual maturity or next repricing period whichever is earlier (vide. Appendix IV). For determining rate sensitivity, all investments, advances, deposits, borrowings, purchased funds etc. that mature / reprice within a specified time frame are deemed interest rate sensitive. Any principal repayment of loan including final principal payment and interim instalments is also rate sensitive if the bank expects to receive it within the time horizon. Certain assets and
liabilities that receive / pay rates with a reference rate are repriced at pre-determined intervals and are rate sensitive at the time of repricing. While the interest rates on term deposits are fixed during their currency, the advances portfolio of the banking system is basically floating and the interest rates on advances could be repriced any number of occasions, corresponding to the changes in PLR.

The Gaps may be identified in the following time buckets:

(i) 1-28 days
(ii) 29 days and up to 3 months
(iii) Over 3 months and up to 6 months
(iv) Over 6 months and up to 1 year
(v) Over 1 year and up to 3 years
(vi) Over 3 years and up to 5 years
(vii) Over 5 years

Each bank should set prudential limits on individual Gaps with the approval of the Board/Management Committee. The prudential limits should have a bearing on the total assets, earning assets or equity. The banks may workout earnings at risk (EaR) or Net Interest Margin (NIM) based on their views on interest rate movements and fix a prudential level with the approval of the Board/Management Committee.

**Foreign Exchange Risk**

Banks engaged in multi-currency operations are also exposed to Foreign Exchange Risk that arises out of changes in exchange rates.
Variations in earnings are caused by the indexation of revenues and expenses to exchange rates. Dealings in different currencies bring opportunities as also risks. If the liabilities in one currency exceed the level of assets in the same currency, then the currency mismatch can add value or erode value depending upon the currency movements.

Banks, having high Foreign Currency Non Reparable funds, may face the problem of erosion of profits as a result of volatility of exchange rates. Hence banks have to recognise Exchange Risk as one of the most important risk exposures and have to device suitable ways and means to effectively tackle this problem. The simplest way to avoid Currency Risk is to ensure that mismatches, if any, are reduced to zero and near zero. Banks undertake operations in foreign exchange like accepting deposits, making loan and advances and quoting prices for foreign exchange transactions. But irrespective of the strategies adopted, it may not be possible to eliminate currency mismatches altogether.

Managing Currency Risk is one more dimension of Asset-Liability Management. The banks are required to assign 100 per cent risk weight to their open position in foreign exchange with effect from 31 March, 1999. Besides they are required to fix aggregate and individual Gap limits for each currency with the approval of RBI. Thus the open position limits together with the Gap limits form the Risk Management approach to forex operations.
Credit Risk Management

The balancing of risks and returns presents a major challenge and banks are successful when the risk taken are reasonable, controlled and within their financial resources and credit competence. With the implementation of income recognition and provisioning norms, banks have started evaluating the credit weakness in loan assets and indirectly they are taking the role of risk assessors. In order to protect their market share and their profits bank can be expected to undertake high-risk-high-return activities which they may not have taken earlier and risk perception has begun to play a major role in the credit decision made by the banks.

Credit Risk arises due to the lending activities of banks and also due to the presence of other risks. The floating rate of interest charged by the bank due to interest rate fluctuations, may to a certain extent reduce the Interest Rate Risk but if the borrower is not in a position to bear this increased interest burden, it may transform into a Credit Risk for the bank. Credit Management will be the thrust area for the bank since inefficient Risk Management Models will deteriorate the asset-quality. Banks worldwide are now laying greater stress on developing Credit Risk Models. These Models have mostly been designed to enable banks to meet the international standards laid by the Bank for International Settlements (BIS). Following this lead RBI is also strengthening its guidelines for banks in order to enable them to contain their Credit Exposure / Risk with in tolerable levels.
A bank would have managed a major portion of its risks by having in place a proper ALM policy attending to its Interest Rate Risk and Liquidity Risk. These two risks when managed properly lead to enhanced profitability and adequate liquidity. The profitability and liquidity of a bank mostly depends on the forecasted cash flows and if there is any delay in cash flows by way of non-payment of instalment or loan repayments etc. all estimates regarding the Interest Rate Risk levels and liquidity may not get the desired results. Credit Risk has a close relation with Interest Rate Risk and Liquidity Risk, making it more critical to the bank. For example a wrong judgement in the Credit Risk may result in a Liquidity Risk and a highly volatile interest rate environment may lead to deterioration in the credit quality. All this makes the management of Credit Risk an essential part of ALM.

In the nationalisation era, banks were familiar mainly with Non-Payment Risk due to failure of venture and banks covered part of their Non-Payment Risk by taking guarantee from DICGC and ECGC. Banks resorted to effective compromise to tackle the problem of recovery of dues in the case of failure of the ventures. However with the introduction of Prudential Norms relating to Income Recognition, Asset Classification and Provisioning, banks are fully realising now, the impact of the Non-Payment Risk associated with credit portfolio on the profit/profitability of the banks. Hence Credit Risk Management now involves evaluating and managing the growth and diversification of loans / investments and establishing the tolerance ranges for credit
and investment i.e., the ratio of loan / investment loss allowance to total loan / investment.

Exposure to Credit Risk continues to be the leading source of problems in banks worldwide and banks are required to have a keen awareness of the need to identify, measure, monitor and control Credit Risk as well as to determine that they hold adequate capital against these risks and that they are adequately compensated for the risks incurred.

The entire exercise of Credit Risk Management can be segregated into micro and macro-level Risk Management. While the Credit Risk Management at the micro-level focuses independently on each credit transaction of the bank, the macro-level Credit Risk Management targets the total credit exposure of the bank. Credit Risk is generally made up of Transaction Risk or Default Risk and Portfolio Risk. Transaction Risk arises from individual credit transactions of the bank at a micro-level and is evaluated through technical, financial and other analysis of individual borrowers, whereas Portfolio Risk arises out of the total credit exposures of the bank at a micro-level and focuses independently on each credit transaction of the bank. At the macro-level Credit Risk Management targets the total credit exposure of the bank.

Banks in emerging markets like India, face intense challenges in managing Credit Risk. These may be determined by factors external to the bank such as delay in production schedule, frequent instability in
the business environment, wide savings in commodity/equity prices, foreign exchange rates and interest rates, legal framework less supportive of debt recovery, financial restrictions, government policies and controls, natural disasters etc. These may be aggravated by internal factors/deficiencies in the management of Credit Risk within the bank like deficiencies in appraisal of financial position of the borrowers, poor industry analysis, excessive reliance on collateral, poor controls on loan documentation, infrequent customer contact, deficiencies in loan policies/administration etc. These deficiencies can lead to loan portfolio weaknesses including over concentration of loans in one industry or sector, large portfolios of non-performing loans and credit losses.

Having evaluated the proposal and the credit worthiness of a client, the credit policy quantifies the risk involved in funding the proposal. While pricing a loan proposal, the bank has to adjust the contractual rate so that it reflects the credit-worthiness of the client. The bank should build into its pricing mechanism the probabilities of default, which will reduce the loss due to defaults. What needs to be done for this is a periodic review of the Credit Risk. Past exposure such as measure of credibility, average delay in payment of instalments and client's performance can provide crucial insights into the appraisal system employed by the bank. The above mentioned steps monitor the Credit Risk of the bank at the micro-level. The macro-level approach
using Capital Adequacy Ratio (CAR) gives a broader outlook on the Credit Risk position of the banks.

Non-Performing Assets

With the introduction of Prudential Norms relating to Income Recognition, Asset Classification and Provisioning, banks have realised the impact of non-payment risk associated with credit portfolio on the profitability of the banks. Containing the Non-Performing Assets has been in focus ever since the banking sector reforms were initiated in 1992 and all banks have been making efforts to limit the NPA levels and reduce the impact on their profitability. Non-Performing Assets (NPA) reduce the income level of banks and make it impossible for them to quote finer Prime Lending Rates (PLR). Higher level of NPA forced the banks to charge higher PLR and PLR related interest rates. This will attract high-risk borrowers which, in turn, may result in higher level of non-performing advances in future. Thus the risk of non-performance and non-payment in the credit portfolio needs to be controlled for improving the management efficiency of banks. A periodic review of the Credit Risk involved in the loan plays a vital role in controlling the Non-Performing Assets. Continuous monitoring enables the bank to assess the financial position of the borrower and thereby timely action can be taken before the NPAs become loss assets.

Non-Performing Assets have been substantially reduced since regulation was tightened in 1993, but improvement has recently slowed down and the levels of NPAs remain high compared to international
standards. In 2001, the commercial banking system's gross NPA to gross advances ratio was 11.4 per cent; net of provisions was 6.2 per cent. The high level of NPA as compared to other countries attracted the attention of public and international financial institutions which has gained further prominence in the wake of transparency and disclosure measures initiated by Reserve Bank of India in recent years. The singular reason for not realising the full profit potential of banks is the higher level of NPA. "A lasting solution to the problem of NPAs can be achieved only with proper Credit Assessment and Risk Management mechanism. It is therefore necessary that the banking system is equipped with prudential norms to minimise, if not completely avoid the problem." 

The NPA concept introduced in India by the Reserve Bank of India in the year 1992 contains Prudential Norms for the identification of NPA. If expected income is realised from an asset, it is treated as performing asset and when it fails to generate income on due date, the asset is treated as non-performing. All 'performing' assets are classified as standard assets and 'non-performing assets' are classified into sub-standard, doubtful or loss assets, depending on the period for which they have remained as NPA. When a borrower fails to repay the instalment of principal and interest within the first quarter, it becomes non-performing in the next quarter. If the past due amount of advance remains outstanding for the second quarter, it becomes non-performing in the third quarter and the past due amount remaining uncovered for
the last quarter, the amount would be classified as NPA for the whole year. According to RBI norms, NPA has been defined as a credit facility in respect of which interest has remained past due for a period of four / three / two quarters as on 31 March 1993, 31 March 1994 and 31 March 1995 respectively, and onwards. An amount under any credit facility is past due when it has not been paid within 30 days from the due date.

According to RBI directives, banks were asked to calculate two NPA figures on gross and net basis. While the gross NPA will be calculated as the percentage of bad loans of the total advances portfolio of bank, the net NPA will be arrived at after deducting provisions and claims received from the DICGC from the gross NPA figure and then calculating it as a percentage of total advances.

NPAs are closely linked with credit management and the main aim of the credit policy of a bank will be to screen out the best proposal for acceptance. The bank can in fact quantify its Credit Risk based on the level of NPAs. Credit Risk can be quantified in terms of the ratio of the percentage of earning before tax as a proportion of NPA (ENPA). However, despite continuous monitoring, banks usually do end up with a few of their credit assets turning into NPA.

**Capital Adequacy Measures**

The Committee on Banking Regulations and Supervisory Practices (Basle Committee) had, in July 1988, released an agreed framework on international convergence of capital measure and capital
standards. The committee had adopted a weighted risk assets approach which assigned weights to both on and off balance sheet exposures of a bank according to their perceived risk, as the method of measuring capital adequacy and set the minimum standard at 8 per cent to be achieved by the end of 1992.

The Reserve Bank introduced a Risk Asset Ratio System for all scheduled commercial banks (including foreign banks) in India as a capital adequacy measure in April 1992. Indian banks, which have branches abroad, will have to achieve the minimum standard of 8 per cent by 31 March 1995. The capital adequacy of a bank measures the extent to which possible losses can be absorbed by the capital. The higher the CAR (the ratio of its capital to its risk weighted assets) the better it is for the bank as more capital is available to absorb losses in the value of assets. If a bank has more risky assets on its portfolio, then its capital adequacy will be lower implying greater Credit Risk exposure and if the approach in maintaining its asset portfolio is more conservative, the ratio will be higher.

When a bank monitors its Credit Risk exposure using the CAR approach, it can maintain the Credit Risk within controllable limits. The understanding of the present level of average risk weighted assets will enable a bank to plan its deployment pattern for the next year depending on incremental working funds, profitability and capital.

The new risk based capital norms under Basle Committee on capital adequacy norms involve a new definition of eligible capital and a
risk based capital requirement and leverage requirement. Two new measures of capital have been introduced by the Basle committee, i.e., Tier I Capital or Core Capital and a broad measure called total capital that includes a component called Tier II Capital. In the Indian context Tier I Capital means paid up capital, statutory reserves and other disclosed free reserves. Capital reserves representing surplus out of sale proceeds of assets will be included in Tier I Capital and Equity investment in subsidiaries, intangible assets and losses in the current period and those brought forward from previous periods will be deducted from Tier I capital.

Tier II Capital Consists of

(i) Undisclosed Reserves and Cumulative perpetual preference shares.

(ii) Reserves arising from revaluation of assets that are undervalued on the bank's book.

(iii) General Provisions and loss reserves which are not attributable to the actual diminution in value or identifiable potential losses.

(iv) Hybrid debt capital instruments which have close similarities to equity, in particular when they are able to support losses on an ongoing basis without triggering liquidation.

(v) Subordinated debt i.e. the instruments which are fully paid up, unsecured, subordinated to the claims of other creditors, free of restrictive classes and should not be redeemable at the initiative of the holder or, without the consent of the bank's supervisory
authorities. Subordinated debt should be restricted to 50 per cent of Tier I Capital.

Total capital of banks in India now comprise Tier I and Tier II capital and Tier I Capital should not be less than 50 per cent of total capital. Indian banks were required to achieve a capital adequacy norm of four per cent by 31 March 1993 and eight per cent norm by 31 March 1996. The existing CAR of eight per cent was enhanced to nine per cent with effect from the year ending 31 March 2000.

BIS has introduced a new concept of capital for G-10 countries effective by the end of 1997 to meet market risks. Accordingly, capital now comprises Tier I + Tier II + Tier III components. Tier III capital will be in the nature of short term subordinated debt for the purpose of meeting a portion of capital requirement for market risk. Capital for market risk by way of Tier III Capital has not been introduced so far in India.

In making assessment of Credit Risk, both on balance sheet as well as off balance sheet items are converted into credit equivalent so as to reflect the term value of bank's credit exposure. The on-balance sheet items in terms of risk weightage will be classified with effect from 31 March 2000 vide Appendix V).

**Asset Liability Management System in Banks**

In the normal course, banks are exposed to Credit and Market Risks and with liberalisation in Indian financial markets, the risks associated with banking operations have become complex and large,
requiring strategic management. Banks are free to determine on their own interest rates on deposits and advances in domestic and foreign currencies as they are operating in a fairly deregulated environment.

The volatile interest rates as well as exchange rates and severe competition have brought pressure on the management of banks to maintain a good balance among Spreads, profitability and long term viability. The management of banks has to base their business decision on a dynamic and integrated Risk Management system and process as banks are exposed to several major risks in the course of their business such as Credit Risk, Interest Rate Risk, Liquidity Risk Foreign Exchange Risk, Equity / Commodity Price Risk and Operational Risk. Banks need to manage these risks in a structured manner by upgrading their Risk Management and adopting more comprehensive Asset-Liability Management (ALM). Thus ALM involves assessment of various types of risks and altering the asset liability portfolio in a dynamic way in order to manage risks.

ALM has to be supported by a management philosophy which clearly specifies the risk policies and tolerance limits. The framework needs to be built on sound methodology with necessary information system as back-up. Collecting accurate data in a timely manner will be the biggest challenge before the banks particularly those having a wide network of branches but lacking full-scale computerization. A prerequisite for this is that banks must have in place an efficient information system.
Table III (1)

Fully Computerised Branches as Percentage of Total Branches of Banks in India

<table>
<thead>
<tr>
<th>Year</th>
<th>Public Sector Banks</th>
<th>Old Private Sector Banks</th>
<th>New Private Sector Banks</th>
<th>Foreign Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>3.14</td>
<td>8.38</td>
<td>100.00</td>
<td>97.89</td>
</tr>
<tr>
<td>1997</td>
<td>5.26</td>
<td>12.01</td>
<td>100.00</td>
<td>97.96</td>
</tr>
<tr>
<td>1998</td>
<td>7.84</td>
<td>16.60</td>
<td>100.00</td>
<td>98.02</td>
</tr>
<tr>
<td>1999</td>
<td>10.31</td>
<td>23.78</td>
<td>100.00</td>
<td>97.73</td>
</tr>
<tr>
<td>2000</td>
<td>13.79</td>
<td>30.74</td>
<td>100.00</td>
<td>97.87</td>
</tr>
</tbody>
</table>

Source: RBI Bulletin December 2002 p.855

Successful implementation of the Risk Management process would require a strong commitment on the part of the senior management in the bank to integrate basic operations and strategic decision-making with Risk Management. The Board should have overall responsibility for management of risks and should decide the Risk Management policy of the bank and set limits for Liquidity, Interest Rate, Foreign Exchange and Equity Price Risks.

The Asset-Liability Committee (ALCo) consisting of the bank's senior management should be responsible for ensuring adherence to the limits set by the Board as well as for deciding the business strategy of the bank (on the assets and liabilities side) in line with the bank's budget and decided Risk Management objectives. The ALCo is a decision-making unit responsible for balance sheet planning from risk-return perspective including the strategic management of Interest Rate
and Liquidity Risks. Based on the RBI model, banks can segregate their assets and liabilities into various maturity buckets and also identify those assets and liabilities which are sensitive to interest rate movement. If adequate information is available to the ALCo of a bank on the maturity patterns of the assets and liabilities, it can set the liquidity limits for the different time buckets. Similarly, if the ALCo is able to forecast the movements of the interest rates with greater accuracy by using more sophisticated methods, it will then be in a position to ascertain the sensitivity of its assets and liabilities and take measure to prevent any adverse impact on its NIM and MVE.

In the light of the above theoretical insights an attempt has been made in chapters IV, V and VI to evaluate the efficiency of the Banking Sector in managing the Assets and Liabilities in confronting the various Risks involved in the Post-Reform Period in detail, analysing the data collected for the purpose with the help of various statistical tools from the perspectives of strategy and practice.
Notes

