CHAPTER: 4

RISK MANAGEMENT AND ITS MODELS
4.1 RISK & RISK MANAGEMENT

Every one of us knows that human life and possession of assets are frequently exposed to loss or damage because of various reasons. There is a great deal of uncertainty and risk in life as well as in industry. Since people are aware of this uncertainty and risk of their lives and possessions they show a strong desire for security. The need for security is sought by taking all precautions possible to avoid or prevent the consequences of risk.

Risk Analysis, in a broad sense, is any method — qualitative and/or quantitative — for assessing the impacts of risk on decisions. Countless Risk Analysis methods are used that mix both qualitative and quantitative techniques. The goal of any of these methods is to help the decision-maker choose a course of action, given a better understanding of the possible outcomes that could occur.

Risk- is the expression of the likelihood and impact of uncertain future events with potential to influence the achievement of an organization’s objectives.

Risk analysis (RA) - the systematic use of information to identify the probability that something will occur and to assess the impact such events will have on the achievement of an organization’s objectives.

Risk management (RM) -Risk management is a systematic method of identifying, analyzing, assessing, treating, monitoring and communicating risk, in order to keep the organization’s exposure to risk at acceptable levels.

4.2 OBJECTIVES OF RISK MANAGEMENT

The objectives of banks for risk management are as follows:

1. To impose capital adequacy norms keeping in view the risk banks are required to take as the competitive market demands.
2. To level the competitive field of banks by setting common benchmarks for all banks.
3. To control and monitor 'systemic risk' that may arise due to failure of the whole banking system.
4. To develop and prescribe appropriate business and supervisory practices to sustain risks taken by banks under market commands, and

5. To protect the interest of depositors and other stakeholders of banks.

Therefore principal objective of risk management has been defined as "the effective planning of resources needed to recover financial balance and operating effectiveness after unexpected loss, thus obtaining a short-term loss of risk stability and long term risk minimization."

4.3 TYPES OF RISK IN BANKS

There are mainly two types of Risks in banks.

1. Financial Risk: Financial risk arises from any business transaction undertaken by a bank, which is exposed to potential loss. This risk can be further classified into Credit risk and Market risk

2. Nonfinancial Risk: Non-financial risk refers to those risks that may affect a bank's business growth, marketability of its product and services, likely failure of its strategies aimed at business growth etc. These risks may arise on account of management failures, competition, non-availability of suitable products/services, external factors etc. In these risk operational and strategic risk have a great need of consideration.

Credit Risk – credit risk is the risk that a borrower may default on his obligation, or unable to perform under the terms of the contract.

Market Risk – The part of overall risk of an asset, organization, position or portfolio, which is due to potential changes in the market prices of assets.

Operational Risk- Operational risk is the risk of direct or indirect loss from inadequate or failed internal processes, people, and system from external events.
FINANCIAL RISK
Financial risk arises from any business transaction undertaken by a bank, which is exposed to potential loss. This risk can be further classified into Credit risk and Market risk.

1. Credit Risk

Credit Risk is the potential that a bank borrower/counter party fails to meet the obligations on agreed terms. There is always scope for the borrower to default from his commitments for one or the other reason resulting in crystalisation of credit risk to the bank. These losses could take the
form outright default or alternatively, losses from changes in portfolio value arising from actual or perceived deterioration in credit quality that is short of default. Credit risk is inherent to the business of lending funds to the operations linked closely to market risk variables. The objective of credit risk management is to minimize the risk and maximize bank's risk adjusted rate of return by assuming and maintaining credit exposure within the acceptable parameters.

The management of credit risk includes:

a) Measurement through credit rating/ scoring,
b) Quantification through estimate of expected loan losses,
c) Pricing on a scientific basis and
d) Controlling through effective Loan Review Mechanism and Portfolio Management.

4.4 TOOLS OF CREDIT RISK MANAGEMENT

The instruments and tools, through which credit risk management is carried out, are detailed below:

a) Exposure Ceilings: Prudential Limit is linked to Capital Funds - say 15% for individual borrower entity, 40% for a group with additional 10% for infrastructure projects undertaken by the group, Threshold limit is fixed at a level lower than Prudential Exposure; Substantial Exposure, which is the sum total of the exposures beyond threshold limit should not exceed 600% to 800% of the Capital Funds of the bank (i.e. six to eight times).

b) Review/Renewal: Multi-tier Credit Approving Authority, constitution wise delegation of powers, Higher delegated powers for better-rated customers; discriminatory time schedule for review/renewal, Hurdle rates and Bench marks for fresh exposures and periodicity for renewal based on risk rating, etc are formulated.

c) Risk Rating Model: Set up comprehensive risk scoring system on a six to nine point scale. Clearly define rating thresholds and review the ratings periodically preferably at half yearly intervals. Rating migration is to be mapped to estimate the expected loss.
d) **Risk based scientific pricing:** Link loan pricing to expected loss. High-risk category borrowers are to be priced high. Build historical data on default losses. Allocate capital to absorb the unexpected loss. Adopt the RAROC framework.

e) **Portfolio Management** The need for credit portfolio management emanates from the necessity to optimize the benefits associated with diversification and to reduce the potential adverse impact of concentration of exposures to a particular borrower, sector or industry. Stipulate quantitative ceiling on aggregate exposure on specific rating categories, distribution of borrowers in various industry, business group and conduct rapid portfolio reviews.

f) **Loan Review Mechanism** This should be done independent of credit operations. It is also referred as Credit Audit covering review of sanction process, compliance status, review of risk rating, pickup of warning signals and recommendation of corrective action with the objective of improving credit quality. It should target all loans above certain cut-off limit ensuring that at least 30% to 40% of the portfolio is subjected to LRM in a year so as to ensure that all major credit risks embedded in the balance sheet have been tracked.

2. **Market Risk**

Market Risk may be defined as the possibility of loss to bank caused by the changes in the market variables. It is the risk that the value of on-/off-balance sheet positions will be adversely affected by movements in equity and interest rate markets, currency exchange rates and commodity prices. Market risk is the risk to the bank's earnings and capital due to changes in the market level of interest rates or prices of securities, foreign exchange and equities, as well as the volatilities, of those prices. The following are types of market risks;

a) **Liquidity Risk:**
Bank Deposits generally have a much shorter contractual maturity than loans and liquidity management needs to provide a cushion to cover anticipated deposit withdrawals. Liquidity is the ability to efficiently accommodate deposit as also reduction in liabilities and to fund the loan
growth and possible funding of the off-balance sheet claims. The cash flows are placed in different time buckets based on future likely behavior of assets, liabilities and off-balance sheet items. Liquidity risk consists of Funding Risk, Time Risk & Call Risk.

b) Interest Rate Risk
Interest Rate Risk is the potential negative impact on the Net Interest Income and it refers to the vulnerability of an institution's financial condition to the movement in interest rates. Changes in interest rate affect earnings, value of assets, liability off-balance sheet items and cash flow. Earnings perspective involves analyzing the impact of changes in interest rates on accrual or reported earnings in the near term. This is measured by measuring the changes in the Net Interest Income (NII) equivalent to the difference between total interest income and total interest expense.

c) Forex Risk
Foreign exchange risk is the risk that a bank may suffer loss as a result of adverse exchange rate movement during a period in which it has an open position, either spot or forward or both in same foreign currency. Even in case where spot or forward positions in individual currencies are balanced the maturity pattern of forward transactions may produce mismatches. There is also a settlement risk arising out of default of the counter party and out of time lag in settlement of one currency in one center and the settlement of another currency in another time zone. Banks are also exposed to interest rate risk, which arises from the maturity mismatch of foreign currency position.

d) Country Risk
This is the risk that arises due to cross border transactions that are growing dramatically in the recent years owing to economic liberalization and globalization. It is the possibility that a country will be unable to service or repay debts to foreign lenders in time. It comprises of Transfer Risk arising on account of possibility of losses due to restrictions on external remittances; Sovereign Risk associated with lending to government of a sovereign nation or taking government guarantees; Political Risk when political environment or legislative process of country leads to government taking over the assets of the financial entity (like nationalization,
etc) and preventing discharge of liabilities in a manner that had been agreed to earlier; Cross border risk arising on account of the borrower being a resident of a country other than the country where the cross border asset is booked; Currency Risk, a possibility that exchange rate change, will alter the expected amount of principal and return on the lending or investment.

**NON - FINANCIAL RISK:**

Non-financial risk refers to those risks that may affect a bank's business growth, marketability of its product and services, likely failure of its strategies aimed at business growth etc. These risks may arise on account of management failures, competition, non-availability of suitable products/services, external factors etc. In these risk operational and strategic risk have a great need of consideration.

**OPERATIONAL RISK**

Always banks live with the risks arising out of human error, financial fraud and natural disasters. The recent happenings such as WTC tragedy, Barings debacle etc. has highlighted the potential losses on account of operational risk. Exponential growth in the use of technology and increase in global financial inter-linkages are the two primary changes that contributed to such risks. Operational risk, though defined as any risk that is not categorized as market or credit risk, is the risk of loss arising from inadequate or failed internal processes, people and systems or from external events. In order to mitigate this, internal control and internal audit systems are used as the primary means.

Risk education for familiarizing the complex operations at all levels of staff can also reduce operational risk. Insurance cover is one of the important mitigators of operational risk. Operational risk events are associated with weak links in internal control procedures. The key to management of operational risk lies in the bank's ability to assess its process for vulnerability and establish controls as well as safeguards while providing for unanticipated worst-case scenarios.
Operational risk involves breakdown in internal controls and corporate governance leading to error, fraud, performance failure, compromise on the interest of the bank resulting in financial loss. Putting in place proper corporate governance practices by itself would serve as an effective risk management tool. Bank should strive to promote a shared understanding of operational risk within the organization, especially since operational risk is often intertwined with market or credit risk and it is difficult to isolate.

4.5 RISK MANAGEMENT IN BANKING SYSTEM

In view of growing complexity of banks ‘business and the dynamic operating environment, risk management has become very significant, especially in the financial sector. Risk at the apex level may be visualized as the probability of a banks ‘financial health being impaired due to one or more contingent factors. While the parameters indicating the banks’ health may vary from net interest margin to market value of equity, the factor which can cause the important are also numerous. For instance, these could be default in repayment of loans by borrowers, change in value of assets or disruption of operation due to reason like technological failure. While the first two factors may be classified as credit risk and market risk, generally banks have all risks excluding the credit risk and market risk as operational risk.

Risk management is the practice of defining the risk level an institution desires, identifying the risk level the institution has and using derivatives and such other financial instruments to control and adjust the level of risk that the institution is expected to bear. As risk taking is the business of banking it is necessary to adopt suitable risk management techniques to keep it at a sustainable level.

Risk management is the identification, measurement and treatment of exposures to potential accidental losses, almost always in situations where the only possible outcomes are losses or no change in status quo. The principal objective of risk management has been defined as "the effective planning of resources needed to recover financial balance and operating effectiveness after a fortuitous loss, thus obtaining a short-term loss of risk stability and long term risk minimization.” Hence risk management is essentially associated with losses and as the risk
arising from currency fluctuations has assumed increasing importance in recent years, currency risk management has gained prominence in international risk management.

Risk Management has got much importance in the Indian Economy during this liberalization period. The foremost among the challenges faced by the banking sector today is the challenge of understanding and managing the risk. The very nature of the banking business is having the threat of risk imbibed in it. Banks' main role is intermediation between those having resources and those requiring resources. The investors do not want to accept the risks attendant thereto. Hence financial intermediation becomes necessary and banks came into the scene and assured prompt repayment of funds and accepted the risk of default. As compensation, they earned a net interest margin between what they paid to the investors and what they charged from the borrowers. For management of risk at corporate level, various risks like credit risk, market risk or operational risk have to be converted into one composite measure. Therefore, it is necessary that measurement of operational risk should be in tandem with other measurements of credit and market risk so that the requisite composite estimate can be worked out.

The emphasis on risk management and the sub-categorization of risks - interest rate risk, market risk, and credit risk - are all attempts at grappling with the reality of specific risks as they affect firms and individuals. For example, for bankers, the evaluation of credit risk is paramount if they are to make profitable lending decisions. Techniques of evaluating these have evolved in Finance, which provide useful inroads into the assessment of default. Thus quite sophisticated methods of risk analysis have evolved in areas where there is commercial benefit from accurate analysis. However, such approaches do not always enhance the scientific knowledge base of the fundamental components of financial risk and how they inter-relate to one another. Financial risk modeling is the practice of measuring risks in various domains of finance viz. financial markets, banking, insurance etc. It is the most important part of pricing financial instruments and also helps in regulation of financial activities like investment banking, and lending. Financial risks can be classified broadly into the following categories:

1. Market Risk
2. Credit Risk
3. Operational Risk

**Market Risk** is the change in value of assets due to changes in the underlying economic factors such as interest rates, foreign exchange rates, macroeconomic variables, stock prices, and commodity prices. All economic entities that own assets face market risk. For example, bills receivable of software exporters that are denominated in foreign currencies are exposed to exchange rate fluctuations; while value of bonds/government securities owned by investors depend on prevailing interest rates. Organizations with huge exposures, either have a dedicated treasury department, or outsource market risk management to banks. The role of modeling in measuring market risk is to forecast the changes in the economic factors, and assess their impact on the asset value. The most popular measure for expressing market risk is Value-at-Risk, which is 'the maximum loss' from an unfavorable event, within a given level of confidence, for a given holding period. Various financial instruments like options, futures, forwards, swaps etc. can be used effectively to hedge the market risk. Availability of huge data on various markets has facilitated the development of many sophisticated models.

**Credit Risk** is the change in value of a debt due to changes in the perceived ability of counterparties to meet their contractual obligations (or credit rating). Also known as default risk or counter party risk, credit risk is faced by lending institutions like banks investors in debt instruments of corporate houses, and by parties involved in contractual agreements like forward contracts. There are independent agencies that assess the credit risk in form of credit ratings. Credit rating is an opinion (of the credit rating agency) on the ability of the organization to perform its contractual obligations (pay the principle and/or interest of the loan) on a timely basis.

**Operational Risk** is defined as the risk of loss resulting from inadequate or failed internal processes, people, and systems or from external events. In this sense all organizations face operational risk. But for a financial institution/bank operational risk can be defined as the possibility of loss due to mistakes made in carrying out transactions such as settlement failures, failures to meet regulatory requirements, and untimely collections. As of today, there is neither a concept nor a model for measuring operational risk that has gained acceptance by financial
engineers. There have been efforts by international banks and financial institutions to indigenously develop models, none of which are available in public domain. Till date insurance is the only avenue to manage (transfer) operational risk.

However, this approach struggles in the face of future uncertainty and is difficult to apply in many everyday decisions. The further into the future you look the harder it is to pin down specific cash flows. Businesses are complex systems with many feedback loops. What is the value of a satisfied customer, improved brand image, or hiring someone who has good ideas? Real decision-making relies on what people like to call "strategic" considerations. In other words, things we think are important but which we can't seem to reduce to cash flows.

We usually express what we are trying to do using objectives, which rarely have a quantified link to cash flows. Our objectives are things like "Improved customer service", "Higher awareness of our new services among our customers", and "A more motivated workforce". The value of different levels of achievement on these objectives is something we typically have only a gut feel for. It would be nice to be more scientific but gut feel is usually all we have time for, particularly as our plans and objectives often shift. In finance and business management theory it is now common to take shareholder value as the ultimate basis for decisions. This is seen as the same as the market value of a company's shares and as the net present value (NPV) of future cash flows. Though there are variations the typical accountant's way of evaluating decisions is to try to build a model that predicts cash flows and then discount these to find the NPV of each alternative in the decision. An efficient risk management system is contingent upon development of suitable system for collection of data, its analysis and presentation. This is a daunting task in operational risk measurement. Broadly, we can divide the operational risk in two parts. First - events, which cause comparatively small losses. Usually such events occur at greater frequency, e.g. errors, outages etc.; Second - events which cause huge loss and may even threaten the existence of the company are rare. Though appropriate database could have been developed for the first kind of operational risk events, so far no scientific methods of data collection, analysis and interpretation have been developed. These events have been dealt with Yule of thumb' methods evolved by the institutions over a period of time. For instance, occurrences of frauds are dealt with on such basis. While historical data can be available of frauds, the experiences gained are used to prevent occurrence of similar frauds again. This is done through ensuring compliance to existing systems.
and procedures or bringing about suitable modifications thereon. The issue of data availability and measurement is much more complex in case of rare events associated with large losses. First of all the data is not available either because the events occur rarely or might not have occurred at all in the history of the institution; or such events may not have been properly documented. The failure of Barings Bank and Long Term Capital Management (LTCM), a reputed hedge fund in USA fall in this category. Even in institutions where attempts have been made to put operational risk measurement on sound footing, access to external data has remained rather limited, forcing the institution to depend on data from internal sources which is not only inadequate but may also have subjective elements.

Another difficulty in measurement of operational risk relates to proper analysis of the available information. The post facto analysis of the loss events focuses on the factors, which work prior to or at the time of the event. Effective risk measurement system demands a statistical examination of cause and effect relationship, which may reoccur in future, and also the relationship between the loss and the control variable. In fact most of the control variables are understood to have a strong correlation with loss events purely on a priori reasoning without attempting statistical proof of such relationship.

As risk has to be managed at enterprise wide level where the composite measure of risk shall encompass all possible risks, it is necessary to align the measure of operational risk with the measures of other risks viz., credit risk and market risk. Credit/market risks can be measured using a number of measures such as value at risk (VAR), earning volatility, default and loss probabilities etc. For instance, impact of changes in asset prices on the value of the bank's trading portfolio can be easily calculated; in the case of credit risk, the changes in borrower's credit quality and the impact of interest rate changes can be captured to assess the potential loss. These measures which require good understanding of the frequency distribution of loss events, are not suitable for operational risk, while requires estimating the probability of occurrence of a loss event and the potential size of loss. Therefore, measurement of operational risk has to be developed using other methods and loss expectancy therefore will have to be worked out. This still leaves out the difficulty of alignment of operational risk measures with other risk measures. For the purpose, as suggested by RBI and also by Bank for International Settlements (BIS), risk management for all categories of risks should be developed to encompass Risk Adjusted Return
on Capital (RAROC) and capital allocation should be done accordingly. In the Indian context, this demands substantial progress in risk management systems including that for credit and market risk by banks.

### 4.6 TYPES OF RISK MANAGEMENT

1. **Financial risk management**: Financial risk management handles non-payment of clients and increased rate of interest.
2. **Market risk management**: Deals with different types of market risk, such as interest rate risk, equity risk, commodity risk, and currency risk.
3. **Credit risk management**: Deals with the risk related to the probability of nonpayment from the debtors.
4. **Quantitative risk management**: In quantitative risk management, an effort is carried out to numerically ascertain the possibilities of the different adverse financial circumstances to handle the degree of loss that might occur from those circumstances.
5. **Commodity risk management**: Handles different types of commodity risks, such as price risk, political risk, quantity risk and cost risk.
6. **Bank risk management**: Deals with the handling of different types of risks faced by the banks, for example, market risk, credit risk, liquidity risk, legal risk, operational risk and reputational risk.
7. **Nonprofit risk management**: This is a process where risk management companies offer risk management services on a non-profit seeking basis.
8. **Currency risk management**: Deals with changes in currency prices.
9. **Enterprise risk management**: Handles the risks faced by enterprises in accomplishing their goals.
10. **Project risk management**: Deals with particular risks associated with the undertaking of a project.

### 4.7 PROCESS OF RISK MANAGEMENT

To overcome the risk and to make banking function well, there is a need to manage all kinds of risks associated with the banking. Risk management becomes one of the main functions of any
banking services risk management consists of identifying the risk and controlling them, means keeping the risk at acceptable level. These levels differ from institution to institution and country to country. The basic objective of risk management is to stakeholders; value by maximizing the profit and optimizing the capital funds for ensuring long term solvency of the banking organisation. In the process of risk management following functions comprises:

**Chart – 4.2 - Risk Management Process**

**Risk Origination within the Bank**
- Credit Risk
- Market Risk
- Operational Risk

**Risk Identification**
- Identify Risks
- Understand and Analyze Risks

**Risk Assessment and Measurement**
- Assess the Risk Impact
- Measure the Risk Impact

**Risk Control**
- Recommendations for Risk Control
Banks in the process of financial intermediation are confronted with various kinds of financial and non-financial risks viz., credit, interest rate, foreign exchange rate, liquidity, equity price, commodity price, legal, regulatory, reputation, operational, etc. These risks are highly interdependent and events that affect one area of risk can have ramifications for a range of other risk categories. Thus, top management of banks should attach considerable importance to improve the ability to identify, measure, monitor and control the overall level of risks undertaken.

**4.8 RISK MANAGEMENT STRUCTURE**

A major issue in establishing an appropriate risk management organization structure is choosing between a centralized and decentralized structure. The global trend is towards centralizing risk management with integrated treasury management function to benefit from information on aggregate exposure, natural netting of exposures, economies of scale and easier reporting to top management. The primary responsibility of understanding the risks run by the bank and ensuring that the risks are appropriately managed should clearly be vested with the Board of Directors. The Board should set risk limits by assessing the bank's risk and risk-bearing capacity. At organizational level, overall risk management should be assigned to an independent Risk
Management Committee or Executive Committee of the top Executives that reports directly to the Board of Directors. The purpose of this top-level committee is to empower one group with full responsibility of evaluating overall risks faced by the bank and determining the level of risks, which will be in the best interest of the bank. At the same time, the Committee should hold the line management more accountable for the risks under their control, and the performance of the bank in that area.

The functions of Risk Management Committee should essentially be to identify, monitor and measure the risk profile of the bank. The Committee should also develop policies and procedures, verify the models that are used for pricing complex products, review the risk models as development takes place in the markets and also identify new risks. The risk policies should clearly spell out the quantitative prudential limits on various segments of banks' operations. Internationally, the trend is towards assigning risk limits in terms of portfolio standards or Credit at Risk (credit risk) and Earnings at Risk and Value at Risk (market risk). The Committee should design stress scenarios to measure the impact of unusual market conditions and monitor variance between the actual volatility of portfolio value and that predicted by the risk measures. The Committee should also monitor compliance of various risk parameters by operating Departments. A prerequisite for establishment of an effective risk management system is the existence of a robust MIS, consistent in quality. The existing MIS, however, requires substantial upgradation and strengthening of the data collection machinery to ensure the integrity and reliability of data.

The risk management is a complex function and it requires specialized skills and expertise. Banks have been moving towards the use of sophisticated models for measuring and managing risks. Large banks and those operating in international markets should develop internal risk management models to be able to compete effectively with their competitors. As the domestic market integrates with the international markets, the banks should have necessary expertise and skill in managing various types of risks in a scientific manner.

At a more sophisticated level, the core staff at Head Offices should be trained in risk modeling and analytical tools. It should, therefore, be the endeavor of all banks to upgrade the skills of
staff. Given the diversity of balance sheet profile, it is difficult to adopt a uniform framework for management of risks in India. The design of risk management functions should be bank specific, dictated by the size, complexity of functions, the level of technical expertise and the quality of MIS. The proposed guidelines only provide broad parameters and each bank may evolve their own systems compatible to their risk management architecture and expertise.

Internationally, a committee approach to risk management is being adopted. While the Asset - Liability Management Committee (ALCO) deal with different types of market risk, the Credit Policy Committee (CPC) oversees the credit /counterparty risk and country risk. Thus, market and credit risks are managed in a parallel two-track approach in banks. Banks could also set-up a single Committee for integrated management of credit and market risks. Generally, the policies and procedures for market risk are articulated in the ALM policies and credit risk is addressed in Loan Policies and Procedures.

4.9 TECHNIQUES OF RISK MANAGEMENT

1. GAP Analysis
It is an interest rate risk management tool based on the balance sheet which focuses on the potential variability of net-interest income over specific time intervals. In this method a maturity/ re-pricing schedule that distributes interest-sensitive assets, liabilities, and off-balance sheet positions into time bands according to their maturity (if fixed rate) or time remaining to their next re-pricing (if floating rate), is prepared. These schedules are then used to generate indicators of interest-rate sensitivity of both earnings and economic value to changing interest rates. After choosing the time intervals, assets and liabilities are grouped into these time buckets according to maturity (for fixed rates) or first possible re-pricing time (for flexible rates). The assets and liabilities that can be re-priced are called rate sensitive assets (RSAs) and rate sensitive liabilities (RSLs) respectively. Interest sensitive gap (DGAP) reflects the differences between the volume of rate sensitive asset and the volume of rate sensitive liability and given by, GAP = RSAs - RSLs.
The information on GAP gives the management an idea about the effects on net-income due to changes in the interest rate. Positive GAP indicates that an increase in future interest rate would increase the net interest income as the change in interest income is greater than the change in interest expenses and vice versa. (Cumming and Beverly, 2001)

2. Duration-GAP Analysis
It is another measure of interest rate risk and managing net interest income derived by taking into consideration all individual cash inflows and outflows. Duration is value and time weighted measure of maturity of all cash flows and represents the average time needed to recover the invested funds. Duration analysis can be viewed as the elasticity of the market value of an instrument with respect to interest rate. Duration gap (DGAP) reflects the differences in the timing of asset and liability cash flows and given by, $\text{DGAP} = \text{DA} - u \text{DL}$. Where DA is the average duration of the assets, DL is the average duration of liabilities, and $u$ is the liabilities/assets ratio. When interest rate increases by comparable amounts, the market value of assets decrease more than that of liabilities resulting in the decrease in the market value of equities and expected net-interest income and vice versa. (Cumming and Beverly, 2001)

3. Value at Risk (VaR)
It is one of the newer risk management tools. The Value at Risk (VaR) indicates how much a firm can lose or make with a certain probability in a given time horizon. VaR summarizes financial risk inherent in portfolios into a simple number. Though VaR is used to measure market risk in general, it incorporates many other risks like foreign currency, commodities, and equities. (Jorion, 2001)

4. Risk Adjusted Rate of Return on Capital (RAROC)
It gives an economic basis to measure all the relevant risks consistently and gives managers tools to make the efficient decisions regarding risk/return tradeoff in different assets. As economic capital protects financial institutions against unexpected losses, it is vital to allocate capital for various risks that these institutions face. Risk Adjusted Rate of Return on Capital (RAROC) analysis shows how much economic capital different products and businesses need and determines the total return on capital of a firm. Though Risk Adjusted Rate of Return can be
used to estimate the capital requirements for market, credit and operational risks, it is used as an integrated risk management tool (Crouhy and Robert, 2001)

5. Securitization

It is a procedure studied under the systems of structured finance or credit linked notes. Securitization of a bank's assets and loans is a device for raising new funds and reducing bank's risk exposures. The bank pools a group of income-earning assets (like mortgages) and sells securities against these in the open market, thereby transforming illiquid assets into tradable asset backed securities. As the returns from these securities depend on the cash flows of the underlying assets, the burden of repayment is transferred from the originator to these pooled assets.

6. Sensitivity Analysis

It is very useful when attempting to determine the impact, the actual outcome of a particular variable will have if it differs from what was previously assumed. By creating a given set of scenarios, the analyst can determine how changes in one variable(s) will impact the target variable.

7. Internal Rating System

An internal rating system helps financial institutions manage and control credit risks they face through lending and other operations by grouping and managing the credit-worthiness of borrowers and the quality of credit transactions.

4.10 RBI GUIDELINES IN RISK MANAGEMENT SYSTEMS IN BANKS

Banks in the process of financial intermediation are confronted of financial and non-financial risks viz., credit, interest rate, liquidity, equity price, commodity price, legal, regulatory, repute; etc. These risks are highly interdependent and events that affect have ramifications for a range of other risk categories. Thus, top management of banks should attach considerable importance to improve the measure, monitor and control the overall level of risks undertaken.
The broad parameters of risk management function should include:

1) Organizational structure;

2) Comprehensive risk measurement approach;

3) Risk management policies approved by the Board which should be consistent with the broader business strategies, capital strength, management expertise and overall willingness to assume risk;

4) Well laid out procedures, effective control and comprehensive framework

5) Guidelines and other parameters used to govern risk taken including detailed structure of prudential limits;

6) Strong MIS for reporting, monitoring and controlling risk;

7) Separate risk management framework independent of operational Department and with clear delineation of levels of responsibility for management of risk; and

8) Periodical review and evaluation.

4.11 BASAL COMMITTEE ACCORDS

Basel is a small, sleepy town in northwestern Switzerland, close to the borders of France and Germany. Basel is home to the Bank for International Settlements (BIS), an elite financial club formed by world's central banks. Established in 1930, it is the oldest multilateral financial institution in the world. The Basel commission for bank regulation put forward a proposal for changing banks' securitization of equity, which, among other things, involves greater differentiation of loan interest rates. No longer will only exclusively economic risks be considered in the future when checking creditworthiness. This means that, in the future, banks must deposit less equity for lower risks and as a result can guarantee better conditions than previously. In contrast to this, companies with a poorer rating result will be rated in a higher risk class, which will affect credit conditions negatively. BIS has announced the International Convergence of Capital Measurement and Capital Standards: A revised framework, commonly
known as Basel II, with the object of preventing major bank failures. Consequently, Basel II also indirectly demands a rethinking and a reorientation of medium-sized companies.

For well regulation all the banks and financial institutions could use following techniques:

– SWOT analysis
– Potential analysis
– Discounted Cash Flow analysis
– Cost effectiveness study
– Forecasts

4.12 STEPS TAKEN BY BASEL COMMITTEE FOR BANKS

In the 1980's globalization and deregulation opened the doors for global banking. Without adequate supervision and regulation the banks collapsed in one country after the other. In order to prevent such crises the Basel committee came out with sound principles based on the best international practices, which came to be known as Basel I norms. It was the first to arrive at an internationally accepted definition of bank capital as also to prescribe a minimum acceptable level of capital for banks. The norms were announced in 1988 and were adopted by banks from the end of 1992. The subsequently Asian financial crisis exposed the chinks in the Armor of Basel I and it exposed its inadequacies. Hence the Basel committee in June 1999 proposed a new set of norms to reinforce the structural soundness of the banks, particularly in the international banks. These norms, which came to be called Basel II, sought to make use of the advances in risk
management practices and technology to match the required capital more closely with the multiple risks faced by banks. To put it short and sweet the Basel norms can best be described as "one-size-fits-all". The second accord was prepared by Basel Committee on Banking Supervision, a group of central banks and the bank supervisory authorities in the G-10 countries. The countries include (Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom and United States) which developed the first standard in 1988. The Basel committee consists of officials of central banks of industrialized G-10 countries and it has been debating the new framework since 1999.

The Committee does not possess any formal supranational supervisory authority, and its conclusions do not, and were never intended to, have legal force. Rather, it formulates broad supervisory standards and guidelines and recommends statements of best practice in the expectation that individual authorities will take steps to implement them through detailed arrangements — statutory or otherwise — which are best suited to their own national systems. In this way, the Committee encourages convergence towards common approaches and common standards without attempting detailed harmonization of member countries supervisory techniques. The Committee reports to the central bank Governors of the Group of Ten countries and seeks the Governors endorsement for its major initiatives. In addition, however, since the Committee contains representatives from institutions, which are not central banks, the decisions it takes carry the commitment of many national authorities outside the central banking fraternity.

These decisions cover a very wide range of financial issues. One important objective of the Committee’s work has been to close gaps in international supervisory coverage in pursuit of two basic principles; that no foreign banking establishment should escape supervision; and that supervision should be adequate. To achieve this, the Committee has issued a long series of documents since 1975. In 1988, the Committee decided to introduce a capital measurement system commonly referred to as the Basel Capital Accord. This system provided for the implementation of a credit risk measurement framework with a minimum capital standard of 8% by end-1992. Since 1988, this framework has been progressively introduced not only in member countries but also in virtually all other countries with active international banks. In June 1999, the Committee issued a proposal for a New Capital Adequacy Framework to replace the 1988
Accord. The proposed capital framework consists of three pillars; minimum capital requirement, which seeks to refine the standardized rules set forth in the 1988 Accord; supervisory review of an institution's internal assessment process and capital adequacy; and effective use of disclosure to strengthen market discipline as a complement to supervisory efforts.