FRM Notes

MBA II yr IV SEM

Unit I: Introduction to Risk Management:

The concept of Risk, Nature, Need and scope of risk. Source, Measurement, identification and evaluation of Risk. Types of risk– Product market risk and capital market risk. Possible Risk events, Risk Indicators, Risk Management Process–pre-requisites and fundamentals. Misconceptions of Risk. An integrated approach to Corporate Risk Management. Risk management approaches and methods. A comprehensive view of Risk in Financial Institutions. Risk reporting process–internal and external.

Introduction:

Although financial risk has increased significantly in recent years, risk and risk management are not contemporary issues. The result of increasingly global markets is that risk may originate with events thousands of miles away that have nothing to do with the domestic market. Information is available instantaneously, which means that change, and subsequent market reactions, occur very quickly.

The economic climate and markets can be affected very quickly by changes in exchange rates, interest rates, and commodity prices. Counter- parties can rapidly become problematic. As a result, it is important to ensure financial risks are identified and

managed appropriately. Prepara- tion is a key component of risk management.

What Is Risk?

Risk provides the basis for opportunity. The terms *risk* and *exposure* have subtle differences in their meaning. Risk refers to the probability of loss,

while exposure is the possibility of loss, although they are often used interchangeably. Risk arises as a result of exposure.

Exposure to financial markets affects most organizations, either directly or indirectly. When an organization has financial market exposure, there is a possibility of loss but also an opportunity for gain or profit. Financial market exposure may provide strategic or competitive benefits.

Risk is the likelihood of losses resulting from events such as changes in market prices. Events with a low probability of occurring, but that may result in a high loss, are particularly troublesome because they are often not anticipated. Put another way,risk is the probable variability of returns.

Potential Size of Loss	Probability of Loss
Potential for Large Loss	High Probability o Occurrence
Potential for Small Loss	Low Probability o Occurrence

Since it is not always possible or desirable to eliminate risk,

under- standing it is an important step in determining how to manage it. Identifying exposures and risks forms the basis for an appropriate finan- cial risk management strategy.

How Does Financial Risk Arise?

Financial risk arises through countless transactions of a financial nature, including sales and purchases, investments and loans, and various other business activities. It can arise as a result of legal transactions, new projects, mergers and acquisitions, debt financing, the energy component of costs, or through the activities of management, stakeholders, competitors, foreign governments, or weather.

When financial prices change dramatically, it can increase costs, reduce revenues, or otherwise adversely impact the profitability of an organization. Financial fluctuations may make it more difficult to plan and budget, price goods and services, and allocate capital.

There are three main sources of financial risk:

1. Financial risks arising from an organization's exposure to changes in market prices, such as interest rates, exchange rates, and commodity prices
2. Financial risks arising from the actions of, and transactions with, other organizations such as vendors, customers, and counterparties in derivatives transactions

3. Financial risks resulting from internal actions or failures of the organization, particularly people, processes,and systems

These are discussed in more detail in subsequent chapters.

What Is Financial RiskManagement?

Financial risk management is a process to deal with the uncertainties resulting from financial markets. It involves assessing the financial risks facing an organization and developing management strategies consistent with internal priorities and policies. Addressing financial risks proactively may provide an organization with a competitive advantage. It also ensures that management, operational staff, stakeholders, and the board of directors are in agreement on key issues of risk.

Managing financial risk necessitates making organizational decisions about risks that are acceptable versus those that are not. The passive strategy of taking no action is the acceptance of all risks by default.

Organizations manage financial risk using a variety of strategies and products. It is important to understand how these products and strategies work to reduce risk within the context of the organization's risk tolerance and objectives.

Strategies for risk management often involve derivatives. Derivatives are traded widely among financial institutions and on organized exchanges. The value of derivatives contracts, such as futures, forwards, options, and swaps, is derived from the price of

the underlying asset. Derivatives trade on interest rates, exchange rates, commodities, equity and fixed income securities, credit, and even weather.

The products and strategies used by market participants to manage financial risk are the same ones used by speculators to increase leverage and risk. Although it can be argued that widespread use of derivatives increases risk, the existence of derivatives enables those who wish to reduce risk to pass it along to those who seek risk and its associated opportunities.

The ability to estimate the likelihood of a financial loss is highly desirable. However, standard theories of probability often fail in the analysis of financial markets. Risks usually do not exist in isolation, and the interactions of several exposures may have to be considered in developing an understanding of how financial risk arises. Sometimes, these interactions are difficult to forecast, since they ultimately depend on human behavior. The process of financial risk management is an ongoing one. Strategies need to be implemented and refined as the market and requirements change. Refinements may reflect changing expectations about market rates, changes to the business environment, or changing international political conditions, for example. In general, the process can be summarized as follows:

Identification and Evaluation of Risk

- Identify and prioritize key financial risks.
- Determine an appropriate level of risk tolerance.

- Implement risk management strategy in accordance with policy.
- Measure, report, monitor, and refine as needed.

Diversification

For many years, the riskiness of an asset was assessed based only on the variability of its returns. In contrast, modern portfolio theory considers not only an asset's riskiness, but also its contribution to the overall riskness of the portfolio to which it is added. Organizations may have an opportunity to reduce risk as a result of risk diversification.

In portfolio management terms, the addition of individual components to a portfolio provides opportunities for diversification, within limits. A diversified portfolio contains assets whose returns are dissimilar, in other words, weakly or negatively correlated with one another. It is useful to think of the exposures of an organization as a portfolio and consider the impact of changes or additions on the potential risk of the total.

Diversification is an important tool in managing financial risks. Diversification among counterparties may reduce the risk that unex- pected events adversely impact the organization through defaults. Diversification among investment assets reduces the magnitude of loss if one issuer fails. Diversification of customers, suppliers, and financing sources reduces the possibility that an organization will have its business adversely affected by changes outside management's control. Although the risk of loss

still exists, diversification may reduce the opportunity for large adverse outcomes.

Hedging and Correlation

Hedging is the business of seeking assets or events that off- set, or have weak or negative correlation to, an organization's financial exposures.

Correlation measures the tendency of two assets to move, or not move, together. This tendency is quantified by a coeffi- cient between –1 and +1. Correlation of +1.0 signifies per fect positive correlation and means that two assets can be expected to move together. Correlation of –1.0 signifies perfect negative correlation, which means that two assets can be expected to move together but in opposite directions.

The concept of *negative correlation* is central to hedging and risk management. Risk management involves pairing a finan- cial exposure with an instrument or strategy that is negatively correlated to the exposure.

A long futures contract used to hedge a short underlying expo- sure employs the concept of negative correlation. If the price of the underlying (short) exposure begins to rise, the value of the (long) futures contract will also increase, offsetting some or all of the losses that occur. The extent of the protection offered by the hedge depends on the degree of negative cor- relation between the two.

Types of risk

Risk is uncertainty, and in uncertainty lies opportunity~ Lorayne Fiorillo

Considering the post 2008 market scenario, if there's one thing almost every investor knows, it's that there's no such thing as a free lunch. If you want gains from the markets, you're going to have to stomach volatility - and looking at the way things have been going since 2008, this is ongoing volatility.

But, in the wild ride we've all been on in the past 3 years, there have been some fantastic opportunities to grow your wealth. And people who have conditioned themselves to stay strong (read: unemotional) in their investing habits, have made a lot of money, despite the risks. This is the kind of investing behavior that will help you achieve your life goals through both equity and debt investments.

Today, with interest rates at their peak, debt i.e. fixed income investments are also a great place to be investing, depending on your goal time horizon and risk appetite. With equity markets experiencing volatility, valuations can be attractive too. Hence both equity and debt are strong potential investment avenues currently. With both asset classes available for sound investment, its best to educate yourself about the risks and rewards before you go ahead and invest.

To start with, let's go over the basics and see what the different types of risks are. Then we'll talk a little bit about the risk-reward trade-off, and summarize with the one investing rule that will never fail to help you make money and achieve your goals.

So, what are the different types of investment risk?

The 2 broad types of risk are systematic and unsystematic.

Systematic risk is risk within the entire system. This is the kind of risk that applies to an entire market, or market segment. All investments are affected by this risk, for example risk of a government collapse, risk of war or inflation, or risk such as that of the 2008 credit crisis. It is virtually impossible to protect your portfolio against this risk. It cannot be completely diversified away. It is also known as un-diversifiable risk or market risk. Unsystematic risk is also known as residual risk, specific risk or diversifiable risk. It is unique to a company or a particular industry. For example strikes, lawsuits and such events that are specific to a company, and can to an extent be diversified away by other investments in your portfolio are unsystematic risk.

Within these two types, there are certain specific types of risk, which every investor must know..

1. Credit Risk (also known as Default Risk)

Credit risk is just the risk that the person you have given credit to, i.e. the company or individual, will be unable to pay you interest, or pay back your principal, on its debt obligations.

If you are investing in Infrastructure Bonds or Company Fixed Deposits right now, you should be aware of the credit / default risk involved.
Government bonds have the lowest credit risk (but it is not zero - think of Portugal, Ireland or Spain right now), while low rated corporate deposits (junk bonds) have high credit risk. Before investing in a bond or a corporate deposit, be sure to check how highly it is rated by a well known rating agency such as CRISIL, ICRA or CARE.
Remember, even a bank FD has some credit risk, as only a maximum of Rs. 1 lakh is guaranteed by the Government.

2. Country Risk

When a country cannot keep to its debt obligations and it defaults, all of its stocks, mutual funds, bonds and other financial investment instruments are affected, as are the countries it has financial relations with. If a country has a severe fiscal deficit, it is considered more likely to be risky than a country with a low fiscal deficit, ceteris paribus.

Emerging economies are considered to be more risky than developed nations.

3. Political Risk

This is also higher in emerging economies. It is the risk that a country's government will suddenly change its policies. For example, today with the continuing raging debate on FDI in retail, India's policies will not be looking very attractive to foreign investors, and stock prices are negatively affected.

4. Reinvestment Risk

This is the risk that you lock into a high yielding fixed deposit or corporate deposit at the highest available rate (currently above 9.50%), and when your interest payments come in, there is no equivalent high interest rate investment avenue available for you to reinvest these interest proceeds (for example if your interest is paid out after 1 year and the prevailing interest rate is 8% at that time).Currently as we are at an interest rate peak, it would be advisable to lock in for a longer tenor (provided your financial goal time horizon permits) to avoid facing reinvestment risk.

5. Interest Rate Risk

A golden rule in debt investing is this: Interest Rates go up, prices of bonds go down. And vice versa. So for example in our

situation today, we appear to be at an interest rate peak. This means that since interest rates are going to go down from here, prices of bonds are going to go up. So if you were to invest in debt funds now, you would be buying at a low, and can sit back and watch as your investments start to give gains as interest rates fall.

6. Foreign Exchange Risk

Forex risk applies to any financial instruments that are denoted in a currency other than your own. For example, if a UK firm has invested in India, and the Indian investment does well in rupee terms, the UK firm might still lose money because the Rupee has depreciated against the Pound, so when the firm decides to pull out its investment on maturity, it gets fewer pounds on redemption.
With the recent very sharp fall in the rupee, the forex risk of our country as an investment destination has greatly increased.

7. Inflationary Risk

Inflationary risk, or simply, inflation risk, is when the real return on your investment is reduced due to inflation eroding the purchasing power of your funds by the time they mature. For example, if you were to invest in a fixed deposit today and you were to earn a 10% interest on it in 1 year's time, then if

inflation has been 8% in that year, your real rate of return comes down to 2%, keeping purchasing power in mind.

8. Market Risk

This is the risk that the value of your investment will fall due to market risk factors, which include equity risk (risk of stock market prices or volatility changing), interest rate risk (risk of interest rate fluctuations), currency risk (risk of currency fluctuations) and commodity risk (risk of fluctuations in commodity prices).
There are other types of risk too, such as legislative risk, global risk, timing risk and more, but for the scope of this article, the ones explained above are the main ones you need to keep in mind, both on a macro (country) and a micro (individual investments) level.

Risk Management Process

The process of financial risk management comprises strategies that enable an organization to manage the risks associated with financial markets. Risk management is a dynamic process that should evolve with an organization and its business. It involves and impacts many parts of an organization including treasury, sales, marketing, legal, tax, commodity, and corporate finance.

The risk management process involves both internal and external analysis. The first part of the process involves identifying

and prioritizing the financial risks facing an organization and understanding their relevance. It may be necessary to examine the organization and its products, management, customers, suppliers, competitors, pricing, industry trends, balance sheet structure, and position in the industry. It is also necessary to consider stakeholders and their objectives and tolerance for risk.

Once a clear understanding of the risks emerges, appropriate strategies can be implemented in conjunction with risk management policy. For example, it might be possible to change where and how business is done, thereby reducing the organization's exposure and risk. Alternatively, existing exposures may be managed with derivatives. Another strategy for man- aging risk is to accept all risks and the possibility of losses.

There are three broad alternatives for managing risk:

1. Do nothing and actively, or passively by default, accept all risks.
2. Hedge a portion of exposures by determining which exposures can and should be hedged.
3. Hedge all exposures possible.

Measurement and reporting of risks provides decision makers with information to execute decisions and monitor outcomes, both before and after strategies are taken to mitigate them. Since the risk management process is ongoing, reporting and feedback can be used to refine the system by modifying or improving strategies.

An active decision-making process is an important component of risk management. Decisions about potential loss and risk reduction pro- vide a forum for discussion of important issues and the varying per- species of stakeholders.

Factors that Impact Financial Rates and Prices Financial rates and prices are affected by a number of factors. It is essen- tial to understand the factors that impact markets because those factors, in turn, impact the potential risk of an organization.

Factors that Affect Interest Rate

Interest rates are a key component in many market prices and an important economic barometer. They are comprised of the real rate plus a component for expected inflation, since inflation reduces the purchasing power of a lender's assets. The greater the term to maturity, the greater the uncertainty. Interest rates are also reflective of supply and demand for funds and credit risk.

Interest rates are particularly important to companies and governments because they are the key ingredient in the cost of capital. Most companies and governments require debt financing for expansion and capital projects. When interest rates increase, the impact can be significant on borrowers. Interest rates also affect prices in other financial markets, so their impact is far-reaching.

Other components to the interest rate may include a risk premium to reflect the creditworthiness of a borrower. For

example, the threat of political or sovereign risk can cause interest rates to rise, sometimes sub- stantially, as investors demand additional compensation for the increased risk of default.

Factors that influence the level of market interest rates include:

- Expected levels of inflation
- General economic conditions
- Monetary policy and the stance of the central bank
- Foreign exchange market activity
- Foreign investor demand for debt securities
- Levels of sovereign debt outstanding
- Financial and political stability

- Expectations theory suggests forward interest rates are repre sentative of expected future interest rates. As a result, the shape of the yield curve and the term structure of rates are reflective of the market's aggregate expectations.
- Liquidity theory suggests that investors will choose longer- term maturities if they are provided with additional yield that compensates them for lack of liquidity. As a result, liquidity theory supports that forward interest rates possess a liquidity premium and an interest rate expectation component.
- Preferred habitat hypothesis suggests that investors who usual- ly prefer one maturity horizon over another can be convinced to change maturity horizons given an appropriate premium. This suggests that the shape of the yield curve depends on the policies of market participants.
- Market segmentation theory suggests that different investors have different investment horizons that arise from the nature of their business or as a result of investment restrictions. These prevent them from dramatically changing maturity dates to take advantage of temporary opportunities in interest rates. Companies that have a long investment time horizon will therefore be less interested in taking advantage of oppor- tunities at the short end of the curve.

Factors that Affect Foreign Exchange Rates

Foreign exchange rates are determined by supply and demand for cur- rencies. Supply and demand, in turn, are influenced by factors in the economy, foreign trade, and the activities of international investors. Capital flows, given their size and mobility, are of great importance in determining exchange rates.

Factors that influence the level of interest rates also influence exchange rates among floating or market-determined currencies. Currencies are very sensitive to changes or anticipated changes in interest rates and to sovereign risk factors. Some of the key drivers that affect exchange rates include:

- Interest rate differentials net of expected inflation
- Trading activity in other currencies
- International capital and trade flows
- International institutional investor sentiment
- Financial and political stability
- Monetary policy and the central bank
- Domestic debt levels (e.g., debt-to-GDP ratio)
- Economic fundamentals

Key Drivers of Exchange Rates

When trade in goods and services with other countries was the major determinant of exchange-rate fluctuations, market participants monitored trade flow statistics closely for information about the currency's future direction. Today, capital

flows are also very important and are monitored closely.

When other risk issues are considered equal, those currencies with higher short-term real interest rates will be more attractive to international investors than lower interest rate currencies. Currencies that are more attractive to foreign investors are the beneficiaries of capital mobility.

The freedom of capital that permits an organization to invest and divest internationally also permits capital to seek a safe, opportunistic return. Some currencies are particularly attractive during times of financial turmoil. Safe-haven currencies have, at various times, included the Swiss franc, the Canadian dollar, and the U.S. dollar.

Foreign exchange forward markets are tightly linked to interest markets. In freely traded currencies, traders arbitrage between the for- ward currency markets and the interest rate markets, ensuring interest rate parity.

Theories of Exchange Rate Determination

Several theories have been advanced to explain how exchange rates are determined:

- Purchasing power parity, based in part on "the law of one price," suggests that exchange rates are in equilibrium when the prices of goods and services (excluding mobility and other issues) in different countries are the same. If local prices increase more than prices in another country for the same product, the

local currency would be expected to decline in value vis-à-vis its foreign counterpart, presuming no change in the structural relationship between the countries.

- The balance of payments approach suggests that exchange rates result from trade and capital transactions that, in turn,

  affect the balance of payments. The equilibrium exchange rate is reached when both internal and external pressures are in equilibrium.

- The monetary approach suggests that exchange rates are determined by a balance between the supply of, and demand

  for, money. When the money supply in one country increases compared with its trading partners, prices should rise and the currency should depreciate.

- The asset approach suggests that currency holdings by foreign investors are chosen based on factors such as real interest rates,

  as compared with other countries.

Factors that Affect Commodity Prices

Physical commodity prices are influenced by supply and demand. Unlike financial assets, the value of commodities is also affected by attributes such as physical quality and location.

Commodity supply is a function of production. Supply may be reduced if problems with production or delivery occur, such as crop failures or labor disputes. In some commodities, seasonal variations of supply and demand are usual and shortages are not uncommon.

Demand for commodities may be affected if final consumers are able to obtain substitutes at a lower cost. There may also be major shifts in consumer taste over the long term if there are supply or cost issues. Commodity traders are sensitive to the inclination of certain commodity prices to vary according to the stage of the economic cycle. For example, base metals prices may rise late in the economic cycle as a result of increased economic demand and expansion. Prices of these commodities are monitored as a form of leading indicator.

Commodity prices may be affected by a number of factors, including:

- Expected levels of inflation, particularly for precious metals
- Interest rates
- Exchange rates, depending on how prices are determined

- General economic conditions
- Costs of production and ability to deliver to buyers
- Availability of substitutes and shifts in taste and consumption patterns
- Weather, particularly for agricultural commodities and energy
- Political stability,particularly for energy and precious metals

Conceptual approaches for risk

In general terms, risk is part of any human effort. Once we leave to go back home, we are exposed to risks of different levels and degrees. It is significant that some new risks are completely voluntary, and some are created by us through the nature of activities.

The word *"risk"* derives from the Italian word *„risicare"*, which means *"to dare"*. In this sense, *the risk is a choice, not fate1.* From this definition it follows that the risk is not an option, but we are permanently exposed to risk in everyday life, what is really important is that each time, to gain control over it.

Nowadays there is no unanimously accepted definition of the concept of risk by all specialists in the field. Among the most commonly used definitions, we present the following:

"Risk is the possibility of obtaining favorable or unfavorable results in a future action expressed in terms of probabilities."

or

"Risk is a possible future event whose production could cause some losses."

or

"Risk is the threat that an event or action to affect in a negatve manner the capacity of an organization to achieve its planned goals.2 "

The analysis of these definitions of risk gives rise to the following conclusions:

1. Probability versus consequences. While some definitions given to risk focus only on the probability of the occurrence of an event, other definitions are more comprehensive, including both the probability of risk manifestation and the consequences of the event.
2. Risk and threat. In defining the concept, some experts have put an equal sign between risk and threat. We specify that a threat is an event with a low probability of manifestation, but with high negative consequences, since the probability of manifestation is difficult to assess in these cases. A risk is an event with a higher probability of occurrence, for which there is sufficient information to rate the probability and consequences.
3. Comparing only negative results. Some concepts about risk are focused only on negative events, while others take into account all variables, both threats and opportunities.
4. Risk is related to profitability and loss. Achieving the expected result of an activity is under the influence of random factors that accompany it in all stages of its development, regardless of the domain of activity.

In conclusion, the risk can be defined as a problem (situation, event etc.) which has not yet occurred, but can occur in the future, threatening the achievement of agreed outcomes. Viewed in this context, risk is the uncertainty in obtaining expected results and should be treated as a combination of probability and impact.

The probability of risk occurrence is the possibility that the risk materializes and it can be appreciated or determined by measurement, when the nature of risk and available information permit such evaluation.

The risk impact is a consequence of the results (objectives) when risk materializes. If the risk represents a threat, the consequence upon the results is negative and if the risk represents an opportunity, the consequence is positive.

The probability of risk occurrence and its impact on the results contribute to establish the risk value.

Based on concepts presented above, in our opinion, the risk is a permanent reality, an inherent phenomenon that accompanies all activities and actions of an organization and that occurs or not, depending on the conditions created for it. This could cause negative effects by deteriorating the quality of management decisions, reducing profit volume and affecting the organization's functionality, with consequences even in blocking the implementation of activities.

In the literature, but also in practice, besides the concept of risk other concepts are used, respectively:

Inherent risk is the risk that exists naturally in any activity and is defined as *"the risk existing before* the *implementation of internal control measures to reduce it"* or *"all risks that threat* the *entity/organization and may be internal or external risks*, *measurable or immeasurable".*

Residual risk is the risk remaining after implementation of internal control measures. Applying these measures should have as effect the limitation of inherent risk to a level accepted by the organization. The residual risk should be monitored in order to maintain it at accepted levels.

Risk appetite is the level of exposure that the organization is prepared to accept, namely the risk tolerated by the organization.

Practitioners recommend to organizations' management to bear in mind that risks can not be avoided and under these conditions to be concerned by their evaluation to keep them "under control" at levels considered acceptable, tolerated by the organization, and not to seek the total elimination of them, as this can lead to other unexpected and uncontrolled risks.

Integrated approach to risk

Integrated risk management process is designed and set by the management and implemented by the whole staff within the organization. This process is not linear, a risk management may have impact also on other risks, and control devices identified as being effective in limiting a risk and keeping it within acceptable limits, may prove beneficial in controlling other risks.

Risk management currently knows an appreciation and recognition increasingly large, both in theory and practice, which means, on the one hand the increase of number of specialists in the field, and on the other hand the interest of managers within organizations to design and implement effective risk management systems to meet the objectives.

Mastering risk determines organizational development, performance growth, both generally, of the whole organization and also of individual activities.

OSO and integrated risk management

Referring to risk management, COSO presented an initial framework methodology for implementing internal controls, built-in policies, rules, procedures and regulations that have been used by various organizations to secure control over how to run the plan and meet objectives.

Later, after the appearance of great scandals of fraud and the need to improve corporate governance processes, large corporations talked about and set up risk management departments to help implement procedures regarding the identification, assessment and risk control.

Following the emergence of these needs, Treadway Commission, COSO model promoter, initiated a program in order to develop a general methodology that can be used by organizations' management to improve risk management.

Risk management within the organizations was created on the concept of internal controls, but the focus was particularly on risk management. This was not intended to replace internal controls, but incorporating basic concepts of internal control in this process.

Thus, between risk management and internal control was preserved a strong connection interrelated with common concepts and elements.

Risk management and internal control

The main objectives of internal control/management system are to ensure the efficiency and effectiveness of activities, the reality of reporting and regulations compliance in the field. The internal control/management system is developed and monitored in order to implement by the organization's management, which is

responsible for designing adequate internal control devices in order to ensure limitation of significant risks and keeping them within acceptable limits, aiming to give the security that the organization's objectives will be met.

Risk management system was structured on components of internal control/management, structured according to COSO model, namely on five elements, whose implementation ensures that the tools/internal control devices exist and function as intended.

These components were defined as:

- *the control environment* specific to the organization is the one that sets the foundations of internal controls system, influencing the control awareness of employees and represents the basis for other components;
- *risk assessment* is carried out by management, is performed at both corporate and activity level and includes identifying and analyzing risks that affect the achievement of objectives. In general, risk assessment involves determining the level of importance of the risk, assessing the probability that the risk to occur and determining the way to manage it;
- *control activities* are policies and procedures to ensure that management's provisions are respected. By this, it is ensured that all necessary measures are taken in order to

manage risks and achieve the objectives set by management;

- *information and communication* helps other components through proper communication to employees of their responsibilities with regard to internal control and provision of relevant, reliable, comparable and understandable information so that they could perform their duties and tasks;
- *monitoring* implies the verification made by the management of the implementation means of internal controls it demanded, or by responsibles pursuing if internal controls imposed by it work and if they are sufficient so that activities or actions to take place as planned.

Objective of risk management system

COSO defines integrated risk management as *"the process conducted by the Board, management and others, applied in setting strategy and across the organization, designed to identify potential events that may affect the entity and to manage risk within the risk appetite to provide a reasonable assurance regarding the achievement of organizational objectives"7.*

From the content of this definition it follows some essential elements, characteristic to the integrated risk management, as follows:

- the process is conducted permanently throughout the organization, being circumscribed to other activities;
- the purpose is to manage risks associated with objectives and to secure expected results through their implementation;
- within the process is involved the whole staff, regardless of the hierarchical level;
- the approach starts from the strategic goals rather than from operational objectives;
- the process is applied to the entire organization and not functional structures.

The general objective of integrated risk management is to effectively manage uncertainties, risks and opportunities. The need for risk management stems from the fact that uncertainty is a reality and the reaction to uncertainty is a constant concern.

Risk management involves establishing actions to respond to risk and to implement adequate internal control devices, with which to limit the possibility of occurrence or consequences of risk, if it would materialize. In order to ensure efficiency in achieving objectives, the process must be coherent and convergent,

integrated to objectives, activities and operations carried out within the organization.

Also, regardless of the staff's hierarchical level, it should be aware of the importance of risk management has in achieving its own objectives and thus to form the necessary skills to perform monitoring and control based on principles of efficiency and effectiveness.

In order to ensure the success of this approach and to achieve an effective risk management, within the organization it needs to create a culture of risk, namely developing a risk management philosophy specific to the organization and management, and awareness of risk's negative effects at all levels of the organization.

From the above it is found that the need for internal control/management is determined by the existence of threats or opportunities in carrying out planned activities or actions with negative consequences in the organization. This requires the establishment and implementation of certain internal control devices in order to prevent or limit the risks.

Also, the need for risk management stems from the fact that risk is everywhere, in everything we want to achieve. It can not be removed; any action to eliminate risk can lead to the emergence of new risks, uncontrolled, which may affect to much greater extent the organization. In these conditions, the risk needs to be

minimized, process that can be achieved by establishing and implementing adequate internal controls.

The role of integrated risk management system

Risk management process is considered to be a set of activities and actions carried out in a certain manner and order to prevent or reduce exposure to risk, resulting from an operation or several operations.

In practice, most commonly applied concept of risk management is that managing risks should be carried out separately within departments independently organized in the organization's functional structure. This method provides simplicity and efficiency form in making decisions on risk management, but leads to actions and multiple records of the same exposure to risk and does not address correlations between different exposures.

There are other practices too, which considers that each employee must be responsible for the risk management, having the competence to identify risks and implement appropriate internal controls to mitigate the probability of their manifestations. This mean of managing risks does not lead to results and does not ensure the guarantee of conducting activities given that they were planned, because it does not ensure the requirements for exposure on the same activities, and the process is influenced by knowledge and understanding by employees of

the risk management system implemented within the organization.

These traditional risk management processes are usually fragmented, meaning they are found implemented at the operation or transaction level and are aimed at preventing losses. Managing risks in these cases *"does not consider the fact that risks are a source of competitive advantage".*

Recent research on models and risk management strategies focus on competitive advantages of risks if they are approached as a whole or at system level. In this case the system is considered to be composed of all processes and activities necessary to achieve the objectives.

This approach requires that all relevant functions within the organization (personnel, finance and accounting, manufacturing, commercial, procurement, IT, legal, internal control, internal audit, strategic development, marketing etc.) to participate in risk management process.

For implementing the integrated risk management is necessary that the organization to be viewed from the standpoint of system, both as the link of the industry in which it operates and as part of it, acting in accordance with certain principles, features being: the complexity, limitation of resources, factors that influence its activity, the nature of events, the possibilities for development.

In this view, it is considered that the risks should be managed in an integrated way, to eliminate multiple records on the same risk exposure and to analyze correlations between different exposures. This risk management approach is complex; it requires a large volume of information necessary for decision making and higher costs of administration. At the same time, making wrong decision can have a high impact on the business, or even on the organization.

The integrated risk management system, based on this concept, must be interdependent with the organization's development needs and to include the processes of development and establishment of elements concerning assessment, monitoring and risk management. At the same time, integrated risk management must be also approached in correlation with all types of risk management for each functional structure of the organization.

Integrated risk management system operates with broad categories of risk (personnel risk, financial risk, legal risk etc.), with different risks attached to various activities, risks associated with different operations or transactions, and also with external risks that may affect the development of the overall organization (risks related to legislative changes) or making one or more activities carried out within the organization.

In these conditions, implementing the concept of integrated risk management within the organization is more than necessary because the risk management process should be approached by all types of risk that are found and affect all functional structures of the organization.

The approach in this unitary manner, of the exposures, respectively as a righteous and coherent system of exposure to various risks, of connections and mutual conditioning between them, will enable effective management of risks that may affect achieving the objectives and will contribute to improve activities and performance growth within the organization.

The integrated risk management system can identify all risks that affect the implementation of processes and activities attached to an organizational goal; it can assess the overall consequences and adopt measures depending on the level of uncertainty and the existing inherent risk that affects achieving objectives set.

Also, integrated risk management allows the foundation and decision making to lower hierarchical levels of the organization and also at the top level and ensures co-ordination of activities in order to solve current problems between certain functional structures. It helps to increase efficiency within the organization also by others administrative or managerial ways, such as better allocation of resources.

The implementation of integrated risk management within the organization will provide to shareholders and potential investors, more concrete and reliable information on the risks to which it is exposed, which will allow them to base their decisions in more optimal conditions.

Once with the development of organization's activities, the old risk management systems become inadequate and risk exposures, especially the risk of fraud and error increases significantly. Implementing the integrated risk management system involves the design of evaluation criteria capable of measuring all activities related risks, by considering the relationships and connections between them and thus, to determine the exposure to any organization's risk factor or its functional structures at any time.

This risk management process, characterized by the development of integrated risk management methodology, shall include as steps: establishing the organizational context and risk management, identifying, analyzing and assessing risk, risk treatment, risk control, communication and monitoring the risk management plan.

The process should not be a linear, the risk management may impact on other risks, and measures identified as being effective in limiting a risk and keeping it within acceptable limits may prove beneficial in controlling other risks.

Integrated risk management system functions

The effectiveness of implementing an integrated risk management system, compared with traditional risk management, is determined by the fact that it reflects the integration of all activities related to risk and risk management in a single system. This system is operated and controlled from a single management level, thus eliminating duplication and disruption of communication and action that can occur within a classical system.

The functions that the integrated risk management system meet within the organization's management system can be classified as follows:

1. *defining goals and setting objectives of the organization on risk.* Setting goals represents a defining requirement for the identification, assessment and risk response planning. The organization must define properly its objectives, so to be understood and carried out by people who were assigned to.

   The basic role of integrated risk management is to provide to the management and organization's board a reasonable assurance regarding the achievement of objectives. In this respect, COSO8 states that in order to identify associated risks it should be established in advance the organization's objectives, which shall be grouped into four categories as follows:

- strategic objectives, that define the mission and long term development directions;
- operational objectives, that refers to the effective and efficient use of available resources;
- reporting objectives, that refers to reporting reality;
- objectives of compliance, that refers to comply with the regulations, standards, rules or regulations applicable to the organization.

In order to define the objectives, the key is that, first, to define strategic objectives, and then, of these, to derive other types of goals: operational, reporting and compliance.

Also, for each goal it is necessary to establish risk tolerance, accepted materiality concerning the degree of achievement of identified indicators attached to the objectives in order to be considered achieved.

1. *determining courses of action to manage risk.* To achieve risk management within the organization, the lines of action of the integrated risk management are:
2. defining the organization's strategy on risk;
3. setting activities to be achieved if the risk occurs;
4. evaluating results and measuring performances;
5. risk monitoring at corporate level;
6. reviewing corporate strategy on risk.

The strategy on risk must be coherent, contain how to recover losses caused by an adverse event and to integrate risk response measures.

Activities to be carried out if the risk materializes deal with the settlement of measures to address the consequences of risk, recover losses and identifying and implementing appropriate control devices to eliminate the causes that led to the risk occurrence.

To apply vigorously decisions taken in order to ensure effective functioning of integrated risk management will ensure continued operations and obtaining the expected results.

Monitoring risk at corporate level refers to observing the functioning of integrated risk management system, identifying and reporting existant weaknesses to adopt necessary remedial measures.

Updating the strategy on risk is necessary to be made whenever the organization changes its development strategy or strategic objectives, and also when management's risk policy changes.

Also, periodic review of risks involves the redistribution and concentration of resources in areas of interest.

1. *determining relations between integrated risk management system and other subsystems of the organization.* The organization's

management must permanently ensure the interdependence between the objectives of the organization, its functional departments and risk management.

Risk management process aims to identify and assess risks that can affect the objectives' achievement and to establish risk response measures. It should *"become part of the organization's functioning as the base of management approaches9".*

Considering that the objectives concern all levels of the organization, strategic, general and operational, being defined at strategy level, functional departments and even individual level, in a post, it is required that risk management to be aware of all the relationships that occur or develops between them or within them.

The incomplete determination of the relationship between risk management system and other subsystems of the organization, will lead to an inadequate identification and management of risks associated to the objectives with major negative consequences on the organization.

1. *setting activities, responsibilities on risk.* Seeks to identify all activities in progress within integrated risk management process and establish responsibilities for implementing each activity. Since the process involves all functions and functional departments of the organization, it is required that the activities and responsibilities on risks, defined and agreed at their level, to

be communicated to employees involved in carrying out the activities.

2. *defining performance indicators.* For each strategic objective, operational, reporting or of compliance defined at corporate level, must establish performance indicators by which to ensure measurement of the degree of achieving goals. Also, setting goals to achieve within each indicator, will allow establishing performance resulting from the risk measures imposed within each goal.
3. *allocating resources necessary to carry out activities and training the staff involved.* For each activity planned to be conducted, it must be identified the necessary resources for their achievement, respectively financial, human, material and information resources. Resources necessary in order to accomplish the activities must be available and approved in budgets.
4. *communication and consultation on the results*, performance evaluation *related to risk compared to objectives planned.* Communication involves on time and clear transmission of necessary information about risk, as follows:
5. the responsibles for risk management communicate information about the process content and also on management decisions relating to any measure on risk;
6. the responsibles for risk of functional structures communicate information on risks associated to objectives established, and on how risks are managed.

7. the entire staff reports information on identified risks and whose management needs to be achieved.

   The consultation on the results aims to provide information on risk exposure, after their evaluation and the implementation of control measures. The role is to establish the effectiveness of control measures applied.

   Performance evaluation of risk aims to determine performance obtained due to the risk response compared to the costs involved for implementing control measures taken to reduce risk and maintain its level within the risk appetite.

1. *monitoring effects and reviewing formulated strategy.* It involves evaluating the efficiency and effectiveness of risk management process within the organization and conducted according to the results obtained to carry out the appropriate review of the risk strategy, in order to ensure the minimization of adverse events and appropriate integration of measures to respond to risk.

   In our opinion, we believe that the implementation and operation of an integrated risk management is neccesary, it can be done through ongoing monitoring of risk and integration risk response measures, based on risk strategies, which ensure the objectives achievement and deliver the expected results, in case of an event causing loss.

The firm implementation of decision taken, as the effect of the effective operation of integrated risk management system, gives premises for further activities and obtaining performance across the organization.

Knowing threats that affect the achievement of the goals will allow their classification according to the level of materialization, the extent of impact on the objectives and costs involved for the measures necessary in order to minimize risk effects. Establishing a hierarchy of threats will lead to establish an order of priorities in resource allocation.

Unit II: Measurement and Management of Risk:

Value at risk (VaR): The concept, computation, stresses testing, back testing. Cash flow at risk (CaR): VaR and CaR to make investment decisions. Managing risk when risk is measured by VaR or CaR- Non-Insurance methods of Risk Management-Risk Avoidance, Loss Control, Risk Retention and Risk Transfer- Asset-Liability Management (ALM): evolution & concept, RBI guidelines - Capital Adequacy. Management of interest rate risk, liquidity risk, credit risk and exchange rate risk

What Is Value at Risk (VaR)?

Value at risk (VaR) is a statistic that measures and quantifies the level of financial risk within a firm, portfolio or position over a specific time frame. This metric is most commonly used by investment and commercial banks to determine the extent and occurrence ratio of potential losses in their institutional portfolios.

Risk managers use VaR to measure and control the level of risk exposure. One can apply VaR calculations to specific positions or whole portfolios or to measure firm-wide risk exposure.

Understanding Value at Risk (VaR)

VaR modeling determines the potential for loss in the entity being assessed and the probability of occurrence for the defined loss.

One measures VaR by assessing the amount of potential loss, the probability of occurrence for the amount of loss, and the timeframe.

For example, a financial firm may determine an asset has a 3% one-month VaR of 2%, representing a 3% chance of the asset declining in value by 2% during the one-month time frame. The conversion of the 3% chance of occurrence to a daily ratio places the odds of a 2% loss at one day per month.

Using a firm-wide VaR assessment allows for the determination of the cumulative risks from aggregated positions held by different trading desks and departments within the institution. Using the data provided by VaR modeling, financial institutions can determine whether they have sufficient capital reserves in place to cover losses or whether higher-than-acceptable risks require them to reduce concentrated holdings.

Example of Problems with Value at Risk (VaR) Calculations

There is no standard protocol for the statistics used to determine asset, portfolio or firm-wide risk. For example, statistics pulled arbitrarily from a period of low volatility may understate the potential for risk events to occur and the magnitude of those events. Risk may be further understated using normal distribution probabilities, which rarely account for extreme or black-swan events.

The assessment of potential loss represents the lowest amount of risk in a range of outcomes. For example, a VaR determination of 95% with 20% asset risk represents an expectation of losing at least 20% one of every 20 days on average. In this calculation, a loss of 50% still validates the risk assessment.

The financial crisis of 2008 that exposed these problems as relatively benign VaR calculations understated the potential occurrence of risk events posed by portfolios of subprime mortgages. Risk magnitude was also underestimated, which resulted in extreme leverage ratios within subprime portfolios. As a result, the underestimations of occurrence and risk magnitude left institutions unable to cover billions of dollars in losses as subprime mortgage values collapsed

- Value at risk (VaR) is a statistic that measures and quantifies the level of financial risk within a firm, portfolio or position over a specific time frame.
- This metric is most commonly used by investment and commercial banks to determine the extent and occurrence ratio of potential losses in their institutional portfolios.
- Investment banks commonly apply VaR modeling to firm-wide risk due to the potential for independent trading desks to unintentionally expose the firm to highly correlated assets

What Is Stress Testing?

Stress testing is a computer simulation technique used to test the resilience of institutions and investment portfolios against possible future financial situations. Such testing is customarily used by the financial industry to help gauge investment risk and the adequacy of assets, as well as to help evaluate internal processes and controls. In recent years, regulators have also required financial institutions to carry out stress tests to ensure their capital holdings and other assets are adequate.

Stress Testing for Risk Management

Companies that manage assets and investments commonly use stress testing to determine portfolio risk, then set in place any hedging strategies necessary to mitigate against possible losses. Specifically, their portfolio managers use internal proprietary stress-testing programs to evaluate how well the assets they manage might weather certain market occurrences and external events.

Asset and liability matching stress tests are widely used, too, by companies that want to ensure they have the proper internal controls and procedures in place. Retirement and insurance portfolios are also frequently stress-tested to ensure that cash flow, payout levels, and other measures are well aligned.

What Is Back testing

Backtesting is considered to be an important tool in a Financial trader's toolbox, without which they wouldn't even think of diving into the markets. Think about it, before you buy anything, be it a mobile phone or a car, you would want to check the history of the brand, its features etc. and check if it is worth your money. The same principle applies to trading. But what is backtesting?

In simple words, backtesting a trading strategy is the process of testing a trading hypothesis/strategy on prior time periods. Instead of applying a strategy for the time period forward (to judge performance), which could take years, a trader can simulate his or her trading strategy on relevant past date.

Cash Flow at Risk

A **cash flow** is a real or virtual movement of money:

- a cash flow in its narrow sense is a payment (in a currency), especially from one central bank account to another; the term 'cash flow' is mostly used to describe payments that are expected to happen in the future, are thus uncertain and therefore need to be forecast with cash flows;
- a cash flow is determined by its time t, nominal amount N, currency CCY and account A; symbolically $CF = CF(t,N,CCY,A)$.

- it is however popular to use *cash flow* in a less specified sense describing (symbolic) payments into or out of a business, project, or financial product.

Cash flows are narrowly interconnected with the concepts of **value**, *interest rate* and **liquidity**. A cash flow that shall happen on a future day t_N can be transformed into a cash flow of the same value in t_0.

VaR / CFaR: Differences in a Nutshell

Most finance professionals are familiar with the concept of Value at Risk (VaR), since it is widely used by financial institutions to estimate the potential loss of market values on a portfolio. The Cash Flow at Risk (CFaR) approach is a close cousin of VaR, measuring potential shortfalls of cash flow impacting the P&L statement and, consequently, earnings per share. Both can be used to estimate worst case risk scenarios, but CFaR provides a more precise and tailored way to measure risk for corporates. Here's why:

1. Corporates care about risk over a longer time horizon. While financial institutions have the ability to quickly trade in and out of the market in response to short term changes in balance sheet fair values, corporates are locked into prices until their annual budget processes or contract renewals. Only then do they have an opportunity to lock in new prices. CFaR is a more suitable approach to modeling risk because it measures the potential cash

flow shortfalls over a much longer time horizon than VaR, and it incorporates longer term changes in market prices.

2. Not all risks are the same. The Hong Kong dollar pegged to the U.S. dollar is less risky than, say, the price of oil. A good CFaR model enables corporates to leverage correlations between asset classes and their differing volatilities to formulate actionable hedging strategies that can translate into significant savings. Rather than overstating their risk by simply hedging all their exposures, companies can look at correlations between various asset classes, test their hedging assumptions, and tweak their hedging decisions, By analyzing exposures in this manner, companies can avoid over hedging and reduce as much as 40-60% of their transaction costs.

Risk measures such as VaR and CFaR are valuable in understanding exposures and developing solid risk management programs. But CFaR is more applicable for corporates as it more closely aligns with how they need to analyze their exposures from a P&L perspective and manage their risk over time.

Non-Insurance methods in Risk Management

It contains concepts like –

- Risk Avoidance and Types
- Loss Control and Types
- Risk Retention and Types

Risk Avoidance

- It means, avoiding the activities where the risk in involved.
- Generally, a firm will abandon the activities or assets that will lead to loss.
- This technique is applied when the risk is known or loss is already known and it is not serious in nature.

- There are two types of Risk Avoidance –

(I) Risk Transfer and (II) Risk Aversion. (I). Risk Transfer

- It it simply selling of asset where the risk is involved, thereby we are transferring the risk to another owner We say that, transfer of ownership of asset will reduce the risk associated with it.

(II) Risk Aversion

- It is a situation where an individual chooses the lesser risks involved projects from available other projects. We can define it as - " investor gives preference to less risky investment projects

when compared to other projects though they are identical in rate of returns”

Loss Control

● Loss Control refers to techniques adopted by organizations to control the unavoidable risks.

● They control by adopting techniques like loss reduction, loss prevention etc.

● There are three types of Loss Control –

(I). Severity Reduction:- Here the focus is on reduction of Severity of losses

(II). Separation: - It will focus on Reducing the amount of loss associated with Specific Risks.

(III). Duplication Here, a firm makes an arrangement of duplicate equipments to replace the damaged one’s.

● This is more used in production units to minimize the loss caused by Equipment damage.

● Loss Control becomes a major factor in decision making for a risk manager either in investment or loss reduction prospects.

● Benefits of Loss Control –

A. Reduction of losses

B. Over all of cost of risk management will reduce

C. Better Decision making

D. Helps to take right decisions on projects

E. This helps more in cases where the exact risks cannot be

expressed in monetary terms.

Risk Retention –

● Here the firm, retains the part of losses or all the losses that are resulting from risk exposure. (Firm bears the losses)

● The losses are paid off from firm's net income or funds etc.

● This technique is mostly used by Large organisations

● Types of Risk Retention :

(I). Planned Retention : Here the risk is already identified, and then appropriate plans and efforts are for assumptions of such risks. Most convenient technique for risk management.

(II) Unplanned Retention: Here a risk retention without recognition of Exact Risk involved.

(III). Unfunded Retention:- No funds are made available to cover up losses

(IV). Funded Retention :- Funds are made available in advance to cover up the losses. It is done so by, - using credit, Reserve Funds, Self-Insurance, Captive Insurance. Under self-Insurance : some fixed amount of funds are already made available for losses incurred from risk and does not involve in transfer of assets. Under Captive - Insurance : Firm follows both risk retention and risk transfer techniques. Here the Payment of losses is made by insurers.

Asset/Liability Management

What Is Asset/Liability Management?

Asset/liability management is the process of managing the use of assets and cash flows to reduce the firm's risk of loss from not paying a liability on time. Well-managed assets and liabilities increase business profits. The asset/liability management process is typically applied to bank loan portfolios and pension plans. It also involves the economic value of equity.

Understanding Asset/Liability Management

The concept of asset/liability management focuses on the timing of cash flows because company managers must plan for the payment of liabilities. The process must ensure that assets are available to pay debts as they come due and that assets or earnings can be converted into cash. The asset/liability management process applies to different categories of assets on the balance sheet.

[Important: A company can face a mismatch between assets and liabilities because of illiquidity or changes in interest rates; asset/liability management reduces the likelihood of a mismatch.]

Factoring in Defined Benefit Pension Plans

A defined benefit pension plan provides a fixed, pre-established pension benefit for employees upon retirement, and the employer carries the risk that assets invested in the pension plan may not

be sufficient to pay all benefits. Companies must forecast the dollar amount of assets available to pay benefits required by a defined benefit plan.

Assume, for example, that a group of employees must receive a total of $1.5 million in pension payments starting in 10 years. The company must estimate a rate of return on the dollars invested in the pension plan and determine how much the firm must contribute each year before the first payments begin in 10 years.

Examples of Interest Rate Risk

Asset/liability management is also used in banking. A bank must pay interest on deposits and also charge a rate of interest on loans. To manage these two variables, bankers track the net interest margin or the difference between the interest paid on deposits and interest earned on loans.

Assume, for example, that a bank earns an average rate of 6% on three-year loans and pays a 4% rate on three-year certificates of deposit. The interest rate margin the bank generates is 6% - 4% = 2%. Since banks are subject to interest rate risk, or the risk that interest rates increase, clients demand higher interest rates on their deposits to keep assets at the bank.

The Asset Coverage Ratio

An important ratio used in managing assets and liabilities is the asset coverage ratio which computes the value of assets available to pay a firm's debts. The ratio is calculated as follows:

Tangible assets, such as equipment and machinery, are stated at their book value, which is the cost of the asset less accumulated depreciation. Intangible assets, such as patents, are subtracted from the formula because these assets are more difficult to value and sell. Debts payable in less than 12 months are considered short-term debt, and those liabilities are also subtracted from the formula.

The coverage ratio computes the assets available to pay debt obligations, although the liquidation value of some assets, such as real estate, may be difficult to calculate. There is no rule of thumb as to what constitutes a good or poor ratio since calculations vary by industry.

Asset - Liability Management System in banks - Guidelines Over the last few years the Indian financial markets have witnessed wide ranging changes at fast pace. Intense competition for business involving both the assets and liabilities, together with increasing volatility in the domestic interest rates as well as foreign exchange rates, has brought pressure on the management of banks to maintain a good balance among spreads, profitability and long-term viability. These pressures call for structured and comprehensive measures and not just ad hoc action. The Management of banks has to base their business decisions on a dynamic and integrated risk management system and process, driven by corporate strategy. Banks are exposed to several major risks in the course of their business - credit risk, interest rate risk,

foreign exchange risk, equity / commodity price risk, liquidity risk and operational risks.

2. This note lays down broad guidelines in respect of interest rate and liquidity risks management systems in banks which form part of the Asset-Liability Management (ALM) function. The initial focus of the ALM function would be to enforce the risk management discipline viz. managing business after assessing the risks involved. The objective of good risk management programmes should be that these programmes will evolve into a strategic tool for bank management.

3. The ALM process rests on three pillars: · ALM information systems => Management Information System => Information availability, accuracy, adequacy and expediency · ALM organisation => Structure and responsibilities => Level of top management involvement · ALM process => Risk parameters => Risk identification => Risk measurement => Risk management => Risk policies and tolerance levels.

4. ALM information systems Information is the key to the ALM process. Considering the large network of branches and the lack of an adequate system to collect information required for ALM which analyses information on the basis of residual maturity and behavioural pattern it will take time for banks in the present state to get the requisite information. The problem of ALM needs to be

addressed by following an ABC approach i.e. analysing the behaviour of asset and liability products in the top branches accounting for significant business and then making rational assumptions about the way in which assets and liabilities would behave in other branches. In respect of foreign exchange, investment portfolio and money market operations, in view of the centralised nature of the functions, it would be much easier to collect reliable information. The data and assumptions can then be refined over time as the bank management gain experience of conducting business within an ALM framework. The spread of computerisation will also help banks in accessing data.

5. ALM organisation 5.1 a) 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. b) The Asset - Liability Committee (ALCO) consisting of the bank's senior management including CEO 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 sides) in line with the bank's budget and decided risk management objectives. c) The ALM desk consisting of operating staff should be responsible for analysing, monitoring and reporting the risk profiles to the ALCO. The staff should also prepare forecasts (simulations) showing the effects of various possible changes in market conditions related to the balance

sheet and recommend the action needed to adhere to bank's internal limits.

5.2 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. Each bank will have to decide on the role of its ALCO, its responsibility as also the decisions to be taken by it. The business and risk management strategy of the bank should ensure that the bank operates within the limits / parameters set by the Board. The business issues that an ALCO would consider, inter alia, will include product pricing for both deposits and advances, desired maturity profile of the incremental assets and liabilities, etc. In addition to monitoring the risk levels of the bank, the ALCO should review the results of and progress in implementation of the decisions made in the previous meetings. The ALCO would also articulate the current interest rate view of the bank and base its decisions for future business strategy on this view. In respect of the funding policy, for instance, its responsibility would be to decide on source and mix of liabilities or sale of assets. Towards this end, it will have to develop a view on future direction of interest rate movements and decide on a funding mix between fixed vs floating rate funds, wholesale vs retail deposits, money market vs capital market funding, domestic vs foreign currency funding, etc. Individual banks will have to decide the frequency

for holding their ALCO meetings.

5.3 Composition of ALCO The size (number of members) of ALCO would depend on the size of each institution, business mix and organisational complexity. To ensure commitment of the Top Management, the CEO/CMD or ED should head the Committee. The Chiefs of Investment, Credit, Funds Management / Treasury (forex and domestic), International Banking and Economic Research can be members of the Committee. In addition the Head of the Information Technology Division should also be an invitee for building up of MIS and related computerisation. Some banks may even have sub-committees.

5.4 Committee of Directors Banks should also constitute a professional Managerial and Supervisory Committee consisting of three to four directors which will oversee the implementation of the system and review its functioning periodically.

5.5 ALM process: The scope of ALM function can be described as follows: · Liquidity risk management · Management of market risks (including Interest Rate Risk) · Funding and capital planning · Profit planning and growth projection · Trading risk management The guidelines given in this note mainly address Liquidity and Interest Rate risks.

Capital Adequacy

What Is Capital Adequacy Ratio – CAR?

The capital adequacy ratio (CAR) is a measurement of a bank's available capital expressed as a percentage of a bank's risk-weighted credit exposures. The capital adequacy ratio, also known as capital-to-risk weighted assets ratio (CRAR), is used to protect depositors and promote the stability and efficiency of financial systems around the world. Two types of capital are measured: tier-1 capital, which can absorb losses without a bank being required to cease trading, and tier-2 capital, which can absorb losses in the event of a winding-up and so provides a lesser degree of protection to depositors.

Unit III :Techniques and Tools of Risk Management- Forward & Future contracts

Derivatives : The concept of Derivatives and types of Derivatives. The role of Derivative securities to manage risk and to exploit opportunities to enhance returns. Individuals, speculators, hedgers, arbitrageurs and other participants in Derivatives Market. **Forward Contracts**: Definition, features and pay-off profile of Forward contract. Valuation of forward contracts. Forward Contracts to manage Commodity price risk, Interest rate risk and exchange rate risk. Limitations of Forward contract. **Futures contracts:** Definition. Clearing house, margin requirements, marking to the market. Basis and convergence of future price to spot price. Valuation of Futures contract. Differences between forward contracts and futures contracts. Risk management with Futures contracts–the hedge ratio and the portfolio approach to a risk–minimizing hedge.

Introduction:-

Derivative is a product whose value is derived from the value of one or more basic variables, called bases (underlying asset, index, or reference rate), in a contractual manner. The underlying asset can be equity, forex, commodity or any other asset. For example, wheat farmers may wish to sell their harvest at a future date to

eliminate the risk of a change in prices by that date. Such a transaction is an example of a derivative. The price of this derivative is driven by the spot price of wheat which is the "underlying".

Products, Participants and Functions Derivative contracts have several variants. The most common variants are forwardss, futures, options and swaps. The following three broad categories of participants - hedger, speculators and arbitrageurs trade in the derivative market. Hedgers face risk associated with the price of an asset. They use futures or options markets to reduce or eliminate this risk. Speculators wish to bet on future movements in the price of an asset. Futures and options contract can give them an extra leverage; that is, they can increase both the potential gains and potential losses in a speculative venture. Arbitrageurs are in business to take advantage of a discrepancy between prices in two different markets. If, for example, they see the futures price of an asset getting out of line with the cash price, they will take offsetting positions in the two markets to lock in profit.

Origin of Derivatives Markets It is difficult to trace the main origin of futures trading since it is not clearly established as to where and when the first forwards market came into existence. Historically, it is evident that the development of futures markets followed the development of forwards markets. It is believed that

the forwards trading has been in existence since 12th century in England and France. Forwards trading in rice was started in 17th century in Japan, known as Cho-at-Mai a kind (rice trade-on-book) concentrated around Dojima in Osaka, later on the trade in rice grew with a high degree of standardisation. In 1730, this market got official recognition from the Tokugawa Shogurate. As such, the Dojima rice market became the first futures market in the sense that it was registered on organised exchange with the standardised trading norms. The butter and eggs dealers of Chicago Produce Exchange joined hands in 1898 to form the Chicago Mercantile Exchange for futures trading. The exchange provided a futures market for many commodities including pork bellies (1961), live cattle (1964), live hogs (1966), and feeder cattle (1971). The International Monetary Market was formed as a division of the Chicago Mercantile Exchange in 1972 for futures trading in foreign currencies. In 1982, it introduced a futures contract on the S&P 500 Stock Index. Many other exchanges throughout the world now trade futures contracts. Among them are the Chicago Rice and Cotton Exchange, the New York Futures Exchange, the London International Financial Futures Exchange, the Toronto Futures Exchange and the Singapore International Monetary Exchange. They grew so rapidly that the number of shares underlying the option contracts sold each day exceeded the daily volume of shares traded on the New York Stock Exchange. The S&P 500 stock indices while the American Stock Exchange trades options on the Major Market Stock Index, and

the New York Stock Exchange trades options on the NYSE Index. Most exchanges offering futures contracts now also offer options on these futures contracts. Thus, the Chicago Board of Trades offers options on corn futures, the Chicago Mercantile Exchange offers options on live cattle futures, the International Monetary Market offers options on foreign currency futures, and so on. The basic cause of forwards trading was to cover the price risk. In earlier years, transporting goods from one were market to other markets took many months. For example, in the 1800s, food grains produced in England were sent through ships to the United States which normally took few months. Sometimes, during this time, the price crashed due to unfavourable events before the goods reached the destination. In such cases, the producers had to sell their goods at loss. Therefore, the producers sought to avoid such price-risk by selling their goods forwards, or on a "to arrive" basis. The basic idea behind this move at that time was simply to cover future price risk. On the opposite side, the speculator or Oiiier commercial firms seeking to offset their price-risk came forwards to go for such trading. In this way, the forwards trading in commodities came into existence. In the beginning, these forwards trading agreements were formed to buy and sell food grains in the future for actual delivery at Ehe pre-determined price. Later on, these agreements became transferable, and during the American Civil War period, i.e., 1860 to 1865, it became commonplace to sell and resell such agreements where actual delivery of produce was not necessary.

Gradually, the traders realised that the agreements were easier to buy and sell if the same were standardised in terms of quantity, quality and. place of delivery relating to food grains. In the nineteenth century this activity was centred in Chicago which was the main food grains marketing centre in the United States. In this way, the modern futures contracts first came into existence with the establishment of the Chicago Board of Trade (CBOT) in the year 1848, and today, it is the largest futures market of the world. In 1865, the CBOT framed the general rules for such trading which later on became a trendsetter for so many other markets. In 1874, the Chicago Produce Exchange was established which provided the market for butter, eggs, poultry, and other perishable agricultural products. In the year 1877, the London Metal Exchange came into existence, and today, it is the leading market in metal trading both in spot as well as forwards. In the year 1895, the butter and egg dealers withdrew from the Chicago Produce Exchange to form separately the Chicago Butter and Egg Board, and thus, in 1919 this exchange was renamed as the Chicago Mercantile Exchange (CME) and was reorganised for futures trading. Since then, so many other exchanges came into existence throughout the world, which trade in futures contracts. Although financial derivatives have been in operation since long, they have become a major force in financial markets in the early 1970s. The basic reason behind this development was the failure of Brettonwood System and the break-down of the fixed exchange rate regime. As a result, a new exchange rate regime, i.e., floating

rate (flexible) system, based upon market forces, came into existence. But due to pressure of demand and supply on different currencies, the exchange rates were constantly changing, and often, substantially. As a result, the business firms faced a new risk, known as currency or foreign exchange risk. Accordingly, a new financial instrument was developed to overcome this risk in the new financial environment. Another important reason for the instability in the financial market was fluctuation in the shortterm interests. This was mainly due to the fact that one of the government at that time tried to manage foreign exchange fluctuations through short-term interest rates and by maintaining money supply targets, but which were contrary to each other. Further, the increased instability of short-term interest rates created adverse impact on long-term interest rates and hence, the instability in bond prices

because they are largely determined by long-term interest rates. The result is that it created another risk, named interest rate risk, for both the issuers and the investors of debt instruments. Interest rate fluctuations had not only created instability in bond prices, but also in other longterm assets such as, company stocks and shares. Share prices are determined on the basis of expected present values of future dividends payments discounted at the appropriate discount rate. Discount rates are usually based on long-term interest rates in the market. So increased instability in the longterm interest rates resulted in enhanced fluctuations in the share prices in the stock markets. Further, volatility in stock

prices is reflected in the volatility in stock market indices which causes systematic risk or market risk. In the early 1970s, it was witnessed that the financial markets were highly unstable. As a result, many financial derivatives have emerged as the means to manage the different types of risks stated above, and also of taking advantage of it. Hence, the first financial futures market was the International Monetary Market, established in 1972 by the Chicago Mercantile Exchange, which was followed by the London International Financial Futures Exchange in 1982. For further details see the 'Growth of Futures Market'

BENEFITS OF DERIVATIVE MARKET

1.First, prices in an organised derivatives market reflect the perception of market participants about the future and lead the prices of underlying to the perceived future level. The prices of derivatives converge with the price of the underlying at the expiration of the derivative contract. Thus, derivatives help in discovery of future as well as current prices.

2. Second, the derivatives market helps to transfer risks from those who have them but may not like them, to those who have an appetite for them.

3. Third, derivatives, due to their inherent nature, are linked to the underlying cash markets. With the introduction of derivatives,

the underlying market witnesses higher trade volumes because of participation by more players who would not otherwise participate for lack of an arrangement to transfer risk.

4. Fourth, speculative trades shift to a more controlled environment of derivatives market. In the absence of an organised derivatives market, speculators trade in the underlying cash markets. Margining, monitoring and surveillance of the activities of various participants become extremely difficult in these kind of mixed markets.

5. Fifth, an important incidental benefit that flows from derivatives trading is that it acts as a catalyst for new entrepreneurial activity. The derivatives have a history of attracting many bright, creative, well-educated people with an entrepreneurial attitude. They often energise others to create new businesses, new products and new employment opportunities, the benefit of which are immense.

6. Finally, derivatives markets help increase savings and investment in the long run. Transfer of risk enables market participants to expand their volume of activity.

7. The most important services provided by the derivatives is to control, avoid, shift and manage efficiently different types of risks, through various strategies like hedging, arbitraging. Spreading

etc. Derivatives assist the holders to shiftor suitably modify the risk

8.Derivatives serve as barometers of the future trends in prices which result in the discovery of new prices both on the spot and futures markets. Further, they help in disseminating conferrer information regarding the futures markets trading of various commodities and securities etc., to the society, which enable to discover or form suitable or correct or true equilibrium prices in the markets. As a result, they assist in appropriate and superior allocation of resource in the society.

9. As we see that, in derivatives trading, no immediate full amount of the transaction is required, because most of them are based on margin trading. As a result, large number of traders, speculator arbitrageurs operates in such markets. So, derivatives trading enhance liquidity and reduce transaction costs in the markets for underlying assets.

10. The derivatives assist the investors, traders and managers of large pools of funds to devise strategies so that they may make proper asset allocation, increase their yields and achieve other investment goals.

11. It has been observed from the derivatives trading in the market that the derivatives smoothen out price fluctuations,

squeeze the price spread, integrate price structure at different point of time and remove gluts and shortages in the markets

12. The derivatives trading encourage the competitive trading in the markets, different risk taking preference of the market operators like speculators, hedgers, traders, arbitrageurs, etc. resulting in increase in trading volume in the country. They also attract young investors, professionals an other experts who will act as catalysts to the growth of financial markets.

13. Lastly, it is observed that derivatives trading develop the market towards "complete markets". Complete market concept refers to that situation where no particular investors are belter off than others, or patterns of returns of all additional securities are spanned by the already existing securities in it, or there is no further scope of additional security.

14. All said and done, we can say it is the speculators-friendly market.

Uses of Financial Derivative

1. Spot price is getting converted in to Future prices. It helps in discovering future as well as current prices.

2. Derivatives help to transfer risks from those who dislike to take

risk to those who like to take risks.

3. Assured returns attract many investors.

4. Investors can ensure normal or speculative or arbitrage profit, whichever they like.

5. In futures, the long-buying investors cannot go for putting down stock market price movements as it is due to MTM arrangement. So many long contracts in futures and many call contracts in option will create more open interest for the underlying counter. This open interest is healthy sign for the stock price appreciation as if it shows many people are willing to buy the stock.

TYPES OF FINANCIAL DERIVATIVES

Forwards:

A forwards contract is a customized contract between two entities, where settlement takes place on a specific date in the future at today's pre-agreed price.

Futures

A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future asset at a certain price. Futures contracts are special types of forwards contracts in the

sense that the former are standardised exchange-traded contracts.

Options

Options are of two types-calls and puts. Calls give the buyer the right but not the obligation to buy a given quantity of the underlying asset, at a given price on or before a given future date. Puts give the buyer the right, but not the obligation to sell a given quantity of the underlying asset at a given price on or before a given date

Swaps

Swaps are private agreements between two parties to exchange cash-flows in the future according to a prearranged formula. They can be regarded as portfolios of forwards contract. The two commonly used swaps are:

Interest Rate Swaps: These entail swapping only the interest related cash flows between the parties in the same currency.

Currency Swaps: These entail swapping both principal and interest between the parties, with the cash-flows in one direction being in a different currency than those in the opposite direction.

Forwards Contracts

A forwards contract is a simple customised contract between two parties to buy or sell an asset at a certain time in the future for a certain price. Unlike futures contracts, they are not traded on an exchange, rather they are traded in the over-the-counter market, usually between two financial institutions or between a financial institution and one of its clients. Example: An Indian company buys Automobile parts from USA with payment of one million dollars due in 90 days. The importer, thus, is short of dollars that is, it owes dollars for future delivery. Suppose the present price of a dollar is ` 48. Over the next 90-days, however, dollar might rise against ` 48. The importer can hedge this exchange risk by negotiating a 90-day forwards contract with a bank at a price ` 50. According to forwards contract, in 90-days the bank will give importer one million dollar and importer will give the bank 50 million rupees hedging a future payment with forwards contract. On the due date the importer will make a payment of ` 50 million to the bank and the bank will pay one million dollar to importer, whatever rate of the dollar is after 90-days. This is a typical example of forwards contract on currency. The basic features of a forwards contract are given below:

1. Forwards contracts are bilateral contracts, and hence, they are exposed to counter-party risk. There is risk of non-performance of obligation either of the parties. So, these are riskier than to futures

contracts.

2. Each contract is custom-designed, and hence, is unique in terms of contract size, expiration date, the asset type, quality, etc.

3. In forwards contract, one of the parties takes a long position by agreeing to buy the asset at a certain specified future date. The other party assumes a short position by agreeing to sell the same asset at the same date for the same specified price. A party with no obligation offsetting the forwards contract is said to have an open position. A party with a closed position is, sometimes, called a hedger.

4. The specified price in a forwards contract is referred to as the delivery price. The forwards price for a particular forward contract at a particular time is the delivery price that would apply if the contract were entered into at that time. It is important to differentiate between the forwards price and the delivery price. Both are equal at the time the contract is entered into. However, as time passes, the forwards price is likely to change whereas the delivery price remains the same.

5. In the forwards contract, derivative assets can often be contracted from the combination of under lying assets, such assets are oftenly known as synthetic assets in the forwards market.

In the forwards market, the contract has to be settled by delivery of the asset on expiration date. In case the party wishes to reverse the contract, it has to go to the same counterparty compulsorilys which may dominate and command the price it wants as being in a monopoly situation.

7. In the forwards contract, covered parity or cost-of-carry relations are relation between the prices of forwardss and underlying assets. Such relations further assist in determining the arbitrage-based forwards asset prices.

8. Forwards contracts are very popular in foreign exchange market as well as interest rate bearing instruments. Most of the large and international banks quote the forwards rate through their 'forwards desk' lying within their foreign exchange trading room. Forwards foreign exchange quotes by these banks are displayed with the spot rates.

9.As per the Indian Forwards Contract Act 1952, different kinds of forwards contracts can be done like hedge contracts, transferable specific delivery (TSD) contracts and nontransferable specify delivery (NTSD) contracts. Hedge contracts are freely transferable and do not specify, any particular lot, consignment or variety for delivery. Transferable specific delivery contracts are though freely transferable from one party to another, but are concerned with a specific and pre-determined consignment. Delivery is mandatory. Nontransferable specific delivery contracts, as the

name indicates, are not transferable at all, and as such, they are highly specific. In brief, a forwards contract is an agreement between the counter parties to buy or sell a specified quantity of an asset at a specified price, with delivery at a specified time (future) and place. These contracts are not standardised, each one is usually being customised to its owner's specifications.

Futures Contracts

Like a forwards contract, a futures contract is an agreement between two parries to buy or sell a specified quantity of an asset at a specified price and at a specified time and place. Futures contracts are normally traded on exchange, which sets the certain standardised norms for trading in the futures contracts.

Example: A silver manufacturer is concerned about the price of silver, since he will not be able to plan for profitability. Given the current level of production, he expects to have about 20,000 ounces of silver ready in next two months. The current price of silver on May 10 is ` 1052.5 per ounce, and July futures price at FMC is ` 1068 per ounce, which he believes to be satisfied price. But he fears that prices in future may go down. So he will enter into a futures contract

Standardization: One of the most important features of futures contract is that the contract has certain standardised specification, i.e., quantity of the asset, quality of the asset, the date and month of

delivery, the units of price quotation, location of settlement, etc. For example, the largest exchange on which futures contracts are traded are the Chicago Board of Trade (CBOT) and the Chicago Mercantile Exchange (CME).

They specify about each term of the futures contract. Clearing House: In the futures contract, the exchange clearing house is an adjunct of the exchange and acts as an intermediary or middleman in futures. It gives the guarantee for the performance of the parties to each transaction. The clearing house has a number of members all of whom have offices near to the clearing house. Thus, the clearing house is the counter party to every contract.

Settlement Price: Since the futures contracts are performed through a particular exchange, at the close of the day of trading, each contract is mark-to-market. For this the exchange establishes a settlement price. This settlement price is used to compute the profit or loss on each contract for that day. Accordingly, the members' accounts are credited or debited. Daily

Settlement and Margin: Another feature of a futures contract is that when a person enters into a contract, he is required to deposit funds with the broker, which is called the margin. The exchange usually sets the minimum margin required for different assets, but the broker can set higher margin limits for his clients, which depend upon the credit-worthiness of the clients. The basic

objective of the margin account is to act as collateral security in order to minimise the risk of failure by either party in the futures contract.

Tick Size: The futures prices are expressed in currency units, with a minimum price movement called a tick size. This means that the futures prices must be rounded to the nearest tick, The difference between a futures price and the cash price of that asset is known as the basis. The details of this mechanism will be discussed in the forthcoming chapters.

Cash Settlement: Most of the futures contracts are seeded in cash by having the short or long to make a cash payment on the difference between the futures price at which the contract was entered and the cash price at expiration date. This is done because it is inconvenient or impossible to deliver sometimes, the underlying asset. This type of settlement is very much popular in stock indices futures contracts.

Delivery: The futures contracts are executed on the expiry date. The counter parties with a short position are obligated ro make delivery to the exchange, whereas the exchange is obligated to make delivery to the longs. The period during which the delivery of the contract varies from contract to contract,

Regulation: The important difference between futures and

forwards markets is that the futures contracts are regulated through an exchange, but the forwards contracts are self-regulated by the counterparties themselves. Commission have been established in various countries to regulate futures markets, both in stocks and commodities. Any such new futures contracts and changes to existing contracts must by approved by the respective Commissions.

Questions

1.What are Financial Derivatives ? Explain different Types of Financial Derivatives

2. Discuss how derivatives can be used as instruments for Risk Management

3.Explain the different types of individuals in the future contract

4. What are the Features of Forward Contract ?

5.Explain in details about Forward rate Agreement

6.What are the Features of Future Contracts? Explain

7.What are the Differences between Futures and Forward contracts

8.Consider the three months futures contract on S&P 500. Suppose that the stock underlying the index provided a dividend yield of 1% P.a that the current value of the index is 400 and the risk free rate of interest is 6% p.a. Calculate the future Price

9.The spot price of silver is 45 per ounce. The Storage costs are Rs 0.34 per ounce p a payable quarterly in advance. Assuming that interest rate are 10% per annum for all maturities. Calculate the

price of silver for delivery in 6 months.

10. The price of equity share of L G phones ltd Company is Rs 25. the Risk free rate is 10% pa the company is Rs 25. The company does not pay any dividends but follows continuous compounding. An investors desire to enter into a 1 yr forward contract. Calculate forward Contract value.

11. A 6 Months Future contract on the S&P 500.Assume that the Stocks Underlying the index provide a dividends yield of 3% per Annum The present value of index is 1100 and the Continuously Compunding risk Free Interest is 6% Pa Calculate the future Price.

12. Consider the three Months Future contract on the S & P 500 Suppose that the Stock underling the index provided a dividends yield of 1% P A that the current value of the index is 600 and Rf is 6% P a Calculate Future Price

13.The Current Spot price of Nifty is Rs 1500. The stock underlying this Index Provides an yield of 3 %P a The continuously Compounding rate of Interest is 6%. What is the price of a 4 Months Nifty?

14.An Investor Purchased a sensex at 4400 in a market lot size of 100 futures. on the Maturity date the sensex is 4500 Find out the profit or loss. Determine his position if the sensex is 4450 on the maturity Date.

Unit IV: Techniques and Tools of Risk Management- SWAPS: Definition – types of Swaps - Evolution of Swap Market - Features of Swap - Types of Financial Swaps: Currency Swap - types, Interest Rate Swap, Equity Index Swap, Commodity Swap - Credit Risk in Swap and Credit Swap - Using Swap to Manage Risk - Pricing and Valuing Swap (Including Problems).

Swaps are derivative instruments that represent an agreement between two parties to exchange a series of cash flows over a specific period of time. Swaps offer great flexibility in designing and structuring contracts based on mutual agreement. This flexibility generates many swap variations, with each serving a specific purpose.

There are multiple reasons why parties agree to such an exchange:

- Investment objectives or repayment scenarios may have changed.
- There may be increased financial benefit in switching to newly available or alternative cash flow streams.
- The need may arise to hedge or mitigate risk associated with a floating rate loan repayment.

Interest Rate Swaps

The most popular types of swaps are plain vanilla interest rate swaps. They allow two parties to exchange fixed and floating cash flows on an interest-bearing investment or loan.

Businesses or individuals attempt to secure cost-effective loans but their selected markets may not offer preferred loan solutions. For instance, an investor may get a cheaper loan in a floating rate market, but he prefers a fixed rate. Interest rate swaps enable the investor to switch the cash flows, as desired.

Assume Paul prefers a fixed rate loan and has loans available at a floating rate (LIBOR+0.5%) or at a fixed rate (10.75%). Mary prefers a floating rate loan and has loans available at a floating rate (LIBOR+0.25%) or at a fixed rate (10%). Due to a better credit rating, Mary has the advantage over Paul in both the floating rate market (by 0.25%) and in the fixed rate market (by 0.75%). Her advantage is greater in the fixed rate market so she picks up the fixed rate loan. However, since she prefers the floating rate, she gets into a swap contract with a bank to pay LIBOR and receive a 10% fixed rate.

Paul borrows at floating (LIBOR+0.5%), but since he prefers fixed, he enters into a swap contract with the bank to pay fixed 10.10% and receive the floating rate.

Benefits: Paul pays (LIBOR+0.5%) to the lender and 10.10% to the bank, and receives LIBOR from the bank. His net payment is 10.6% (fixed). The swap effectively converted his original floating

payment to a fixed rate, getting him the most economical rate. Similarly, Mary pays 10% to the lender and LIBOR to the bank and receives 10% from the bank. Her net payment is LIBOR (floating). The swap effectively converted her original fixed payment to the desired floating, getting her the most economical rate. The bank takes a cut of 0.10% from what it receives from Paul and pays to Mary.

Currency Swaps

The transactional value of capital that changes hands in currency markets surpasses that of all other markets. Currency swaps offer efficient ways to hedge forex risk.

Assume an Australian company is setting up a business in the UK and needs GBP 10 million. Assuming the AUD/GBP exchange rate at 0.5, the total comes to AUD 20 million. Similarly, a UK-based company wants to set up a plant in Australia and needs AUD 20 million. The cost of a loan in the UK is 10% for foreigners and 6% for locals, while in Australia it's 9% for foreigners and 5% for locals. Apart from the high loan cost for foreign companies, it might be difficult to get the loan easily due to procedural difficulties. Both companies have a competitive advantage in their domestic loan markets. The Australian firm can take a low-cost loan of AUD 20 million in Australia, while the English firm can take a low-cost loan of GBP 10 million in the UK. Assume both loans need six monthly repayments.

Both companies then execute a currency swap agreement. At the start, the Australian firm gives AUD 20 million to the English firm and receives GBP 10 million, enabling both firms to start a business in their respective foreign lands. Every six months, the Australian firm pays the English firm the interest payment for the English loan = (notional GBP amount * interest rate * period) = (10 million * 6% * 0.5) = GBP 300,000 while the English firm pays the Australian firm the interest payment for the Australian loan = (notional AUD amount * interest rate * period) = (20 million * 5% * 0.5) = AUD 500,000. Interest payments continue until the end of the swap agreement, at which time the original notional forex amounts will be exchanged back to each other.

Benefits: By getting into a swap, both firms were able to secure low-cost loans and hedge against interest rate fluctuations. Variations also exist in currency swaps, including fixed vs. floating and floating vs.floating. In sum, parties are able to hedge against volatility in forex rates, secure improved lending rates, and receive foreign capital.

Commodity Swaps

Commodity swaps are common among individuals or companies that use raw materials to produce goods or finished products. Profit from a finished product may suffer if commodity prices vary, as output prices may not change in sync with commodity prices. A commodity swap allows receipt of payment linked to the commodity price against a fixed rate.

Assume two parties get into a commodity swap over one million barrels of crude oil. One party agrees to make six-monthly payments at a fixed price of $60 per barrel and receive the existing (floating) price. The other party will receive the fixed and pay the floating.

If crude oil rises to $62 at the end of six months, the first party will be liable to pay the fixed ($60 *1 million) = $60 million and receive the variable ($62 * 1 million) = $62 million from the second party. Net cash flow in this scenario will be $2 million transferred from the second party to the first. Alternatively, if crude oil drops to $57 in the next six months, the first party will pay $3 million to the second party.

Benefits: The first party has locked in the price of the commodity by using a currency swap, achieving a price hedge. Commodity swaps are effective hedging tools against variations in commodity prices or against variation in spreads between the final product and raw material prices.

Credit Default Swaps

The credit default swap offers insurance in case of default by a third-party borrower. Assume Peter bought a 15-year long bond issued by ABC, Inc. The bond is worth $1,000 and pays annual interest of $50 (i.e., 5% coupon rate). Peter worries that ABC, Inc. may default so he executes a credit default swap contract with Paul. Under the swap agreement, Peter (CDS buyer)

agrees to pay $15 per year to Paul (CDS seller). Paul trusts ABC, Inc. and is ready to take the default risk on its behalf. For the $15 receipt per year, Paul will offer insurance to Peter for his investment and returns. If ABC, Inc. defaults, Paul will pay Peter $1,000 plus any remaining interest payments. If ABC, Inc. does not default during the 15-year long bond duration, Paul benefits by keeping the $15 per year without any payables to Peter.

Benefits: The CDS works as insurance to protect lenders and bondholders from borrowers' default risk.

Zero Coupon Swaps

Similar to the interest rate swap, the zero coupon swap offers flexibility to one of the parties in the swap transaction. In a fixed-to-floating zero coupon swap, the fixed rate cash flows are not paid periodically, but just once at the end of the maturity of the swap contract. The other party who pays floating rate keeps making regular periodic payments following the standard swap payment schedule.

A fixed-fixed zero coupon swap is also available, wherein one party does not make any interim payments, but the other party keeps paying fixed payments as per the schedule.

Benefits: The zero coupon swap (ZCS) is primarily used by businesses to hedge a loan in which interest is paid at maturity or by banks that issue bonds with end-of-maturity interest payments.

Total Return Swaps

A total return swap gives an investor the benefits of owning securities, without actual ownership. A TRS is a contract between a total return payer and total return receiver. The payer usually pays the total return of agreed security to the receiver and receives a fixed/floating rate payment in exchange. The agreed (or referenced) security can be a bond, index, equity, loan, or commodity. The total return will include all generated income and capital appreciation.

Assume Paul (the payer) and Mary (the receiver) enter into a TRS agreement on a bond issued by ABC Inc. If ABC Inc.'s share price rises (capital appreciation) and pays a dividend (income generation) during the swap's duration, Paul will pay Mary those benefits. In return, Mary has to pay Paul a pre-determined fixed/floating rate during the duration.

Benefits: Mary receives a total rate of return (in absolute terms) without owning the security and has the advantage of leverage. She represents a hedge fund or a bank that benefits from the leverage and additional income without owning the security. Paul transfers the credit risk and market risk to Mary, in exchange for a fixed/floating stream of payments. He represents a trader whose long positions can be converted to a short-hedged position while also deferring the loss orgain to the end of swap maturity.

The Bottom Line

Swap contracts can be easily customized to meet the needs of all parties. They offer win-win agreements for participants, including intermediaries like banks that facilitate the transactions. Even so, participants should be aware of potential pitfalls because these contracts are executed over the counter without regulations.

Problems

1. Bhatki Ltd & Sita Ltd have Borrowed Rs 50Lakhs each the requried intrest rate are as follows

Company	Fixed Rate	Floating Rate
Bhatki Ltd	14.0%	LIBOR+0.2%
Sita Ltd	15.3%	LIBIOR+0.5%

Bkakti Ltd is interested t Borrow at floating rate and Sita Ltd at Fixed Rate. you are required to Construct a Swap so that the bank will get 0.1% profit and Profits are share Equally.

2..Company ABC and PQR have been offered the following rates per annum on a RS 100 Lacs 10Ys Loans

Company	Fixed Rate	Floating Rate
ABC	10%	MIBOR+0.5%
PQR	11.8%	LIBOR+1.0%

Company ABC requires a floating Rate and PQR requires a Fixed Rate calculate the value of Swaps with Equal Profits

Unit V: Techniques and Tools of Risk Management: Options

Definition of an option. Types of options: call option, put option, American option and European option. Options in the money, at the money and out of the money. Option premium, intrinsic value and time value of options. Pricing of call and put options at expiration and before expiration. Options on stock indices and currencies. The Binominal option pricing model (BOPM): assumptions - single and two period models. The Black & Scholes option pricing model (BSOPM): assumptions

What Are Options?

Options are contracts that give the bearer the right, but not the obligation, to either buy or sell an amount of some underlying asset at a pre-determined price at or before the contract expires. Options can be purchased like most other asset classes with brokerage investment accounts.

Options are powerful because they can enhance an individual's portfolio. They do this through added income, protection, and even leverage. Depending on the situation, there is usually an option scenario appropriate for an investor's goal. A popular example would be using options as an effective hedge against a declining stock market to limit downside losses. Options can also be used to generate recurring income. Additionally, they are often used for speculative purposes such as wagering on the direction of a stock

- An option is a contract giving the buyer the right, but not the obligation, to buy (in the case of a call) or sell (in the case of a put) the underlying asset at a specific price on or before a certain date.
- People use options for income, to speculate, and to hedge risk.
- Options are known as derivatives because they derive their value from an underlying asset.
- A stock option contract typically represents 100 shares of the underlying stock, but options may be written on any sort of underlying asset from bonds to currencies to commodities.

Options as Derivatives

Options belong to the larger group of securities known as derivatives. A derivative's price is dependent on or derived from the price of something else. Options are derivatives of financial securities—their value depends on the price of some other asset. Examples of derivatives include calls, puts, futures, forwards, swaps, and mortgage-backed securities, among others.

Call and Put Options

Options are a type of derivative security. An option is a derivative because its price is intrinsically linked to the price of something else. If you buy an options contract, it grants you the right, but not

the obligation to buy or sell an underlying asset at a set price on or before a certain date

A call option gives the holder the right to buy a stock and a put option gives the holder the right to sell a stock. Think of a call option as a down-payment for a future purchase.

Call Option Example

A potential homeowner sees a new development going up. That person may want the right to purchase a home in the future, but will only want to exercise that right once certain developments around the area are built.

The potential home buyer would benefit from the option of buying or not. Imagine they can buy a call option from the developer to buy the home at say $400,000 at any point in the next three years. Well, they can—you know it as a non-refundable deposit. Naturally, the developer wouldn't grant such an option for free. The potential home buyer needs to contribute a down-payment to lock in that right.

With respect to an option, this cost is known as the premium. It is the price of the option contract. In our home example, the deposit might be $20,000 that the buyer pays the developer. Let's say two years have passed, and now the developments are built and zoning has been approved. The home buyer exercises the option and buys the home for $400,000 because that is the contract purchased.

The market value of that home may have doubled to $800,000. But because the down payment locked in a pre-determined price, the buyer pays $400,000. Now, in an alternate scenario, say the zoning approval doesn't come through until year four. This is one year past the expiration of this option. Now the home buyer must pay the market price because the contract has expired. In either case, the developer keeps the original $20,000 collected.

Put Option Example

Now, think of a put option as an insurance policy. If you own your home, you are likely familiar with purchasing homeowner's insurance. A homeowner buys a homeowner's policy to protect their home from damage. They pay an amount called the premium, for some amount of time, let's say a year. The policy has a face value and gives the insurance holder protection in the event the home is damaged.

What if, instead of a home, your asset was a stock or index investment? Similarly, if an investor wants insurance on his/her S&P 500 index portfolio, they can purchase put options. An investor may fear that a bear market is near and may be unwilling to lose more than 10% of their long position in the S&P 500 index. If the S&P 500 is currently trading at $2500, he/she can purchase a put option giving the right to sell the index at $2250, for example, at any point in the next two years.

If in six months the market crashes by 20% (500 points on the index), he or she has made 250 points by being able to sell the index at $2250 when it is trading at $2000—a combined loss of just 10%. In fact, even if the market drops to zero, the loss would only be 10% if this put option is held. Again, purchasing the option will carry a cost (the premium), and if the market doesn't drop during that period, the maximum loss on the option is just the premium spent.

Buying stock gives you a long position. Buying a call option gives you a potential long position in the underlying stock. Short-selling a stock gives you a short position. Selling a naked or uncovered call gives you a potential short position in the underlying stock.

Buying a put option gives you a potential short position in the underlying stock. Selling a naked, or unmarried, put gives you a potential long position in the underlying stock. Keeping these four scenarios straight is crucial.

People who buy options are called holders and those who sell options are called writers of options. Here is the important distinction between holders and writers:

1. Call holders and put holders (buyers) are not obligated to buy or sell. They have the choice to exercise their rights. This limits the risk of buyers of options to only the premium spent.

2. Call writers and put writers (sellers), however, are obligated to buy or sell if the option expires in-the-money (more on that below). This means that a seller may be required to make good on a promise to buy or sell. It also implies that option sellers have exposure to more, and in some cases, unlimited, risks. This means writers can lose much more than the price of the options premium.

Why Use Options

Speculation

Speculation is a wager on future price direction. A speculator might think the price of a stock will go up, perhaps based on fundamental analysis or technical analysis. A speculator might buy the stock or buy a call option on the stock. Speculating with a call option—instead of buying the stock outright—is attractive to some traders since options provide leverage. An out-of-the-money call option may only cost a few dollars or even cents compared to the full price of a $100 stock.

Hedging

Options were really invented for hedging purposes. Hedging with options is meant to reduce risk at a reasonable cost. Here, we can think of using options like an insurance policy. Just as you insure your house or car, options can be used to insure your investments against a downturn.

Imagine that you want to buy technology stocks. But you also want to limit losses. By using put options, you could limit your downside risk and enjoy all the upside in a cost-effective way. For short sellers, call options can be used to limit losses if the underlying price moves against their trade—especially during a short squeeze.

How Options Work

In terms of valuing option contracts, it is essentially all about determining the probabilities of future price events. The more likely something is to occur, the more expensive an option would be that profits from that event. For instance, a call value goes up as the stock (underlying) goes up. This is the key to understanding the relative value of options.

The less time there is until expiry, the less value an option will have. This is because the chances of a price move in the underlying stock diminish as we draw closer to expiry. This is why an option is a wasting asset. If you buy a one-month option that is out of the money, and the stock doesn't move, the option becomes less valuable with each passing day. Since time is a component to the price of an option, a one-month option is going to be less valuable than a three-month option. This is because with more time available, the probability of a price move in your favor increases, and vice versa.

Accordingly, the same option strike that expires in a year will cost more than the same strike for one month. This wasting feature of options is a result of time decay. The same option will be worth less tomorrow than it is today if the price of the stock doesn't move.

Volatility also increases the price of an option. This is because uncertainty pushes the odds of an outcome higher. If the volatility of the underlying asset increases, larger price swings increase the possibilities of substantial moves both up and down. Greater price swings will increase the chances of an event occurring. Therefore, the greater the volatility, the greater the price of the option. Options trading and volatility are intrinsically linked to each other in this way.

On most U.S. exchanges, a stock option contract is the option to buy or sell 100 shares; that's why you must multiply the contract premium by 100 to get the total amount you'll have to spend to buy the call.

American and European Options

American options can be exercised at any time between the date of purchase and the expiration date. European options are different from American options in that they can only be exercised at the end of their lives on their expiration date. The distinction between American and European options has nothing to do with geography, only with early exercise. Many options on stock

indexes are of the European type. Because the right to exercise early has some value, an American option typically carries a higher premium than an otherwise identical European option. This is because the early exercise feature is desirable and commands a premium.

There are also exotic options, which are exotic because there might be a variation on the payoff profiles from the plain vanilla options. Or they can become totally different products all together with "optionality" embedded in them. For example, binary options have a simple payoff structure that is determined if the payoff event happens regardless of the degree. Other types of exotic options include knock-out, knock-in, barrier options, lookback options, Asian options, and Bermudan options. Again, exotic options are typically for professional derivatives traders.

Options Expiration & Liquidity

Options can also be categorized by their duration. Short-term options are those that expire generally within a year. Long-term options with expirations greater than a year are classified as long-term equity anticipation securities or LEAPs. LEAPS are identical to regular options, they just have longer durations.

Options can also be distinguished by when their expiration date falls. Sets of options now expire weekly on each Friday, at the end

of the month, or even on a daily basis. Index and ETF options also sometimes offer quarterly expiries.

Reading Options Tables

More and more traders are finding option data through online sources. (For related reading, see "Best Online Stock Brokers for Options Trading 2019") While each source has its own format for presenting the data, the key components generally include the following variables:

- Volume (VLM) simply tells you how many contracts of a particular option were traded during the latest session.
- The "bid" price is the latest price level at which a market participant wishes to buy a particular option.
- The "ask" price is the latest price offered by a market participant to sell a particular option.
- Implied Bid Volatility (IMPL BID VOL) can be thought of as the future uncertainty of price direction and speed. This value is calculated by an option-pricing model such as the Black-Scholes model and represents the level of expected future volatility based on the current price of the option.
- Open Interest (OPTN OP) number indicates the total number of contracts of a particular option that have been opened. Open interest decreases as open trades are closed.
- Delta can be thought of as a probability. For instance, a 30-delta option has roughly a 30% chance of expiring in-the-

money. Delta also measures the option's sensitivity to immediate price changes in the underlying. The price of a 30-delta option will change by 30 cents if the underlying security changes its price by one dollar.

- Gamma (GMM) is the speed the option is moving in or out-of-the-money. Gamma can also be thought of as the movement of the delta.
- Vega is a Greek value that indicates the amount by which the price of the option would be expected to change based on a one-point change in implied volatility.
- Theta is the Greek value that indicates how much value an option will lose with the passage of one day's time.
- The "strike price" is the price at which the buyer of the option can buy or sell the underlying security if he/she chooses to exercise the option.

Buying at the bid and selling at the ask is how market makers make their living.

Long Calls/Puts

The simplest options position is a long call (or put) by itself. This position profits if the price of the underlying rises (falls), and your downside is limited to loss of the option premium spent. If you simultaneously buy a call and put option with the same strike and expiration, you've created a straddle.

This position pays off if the underlying price rises or falls dramatically; however, if the price remains relatively stable, you

lose premium on both the call and the put. You would enter this strategy if you expect a large move in the stock but are not sure which direction.

Basically, you need the stock to have a move outside of a range. A similar strategy betting on an outsized move in the securities when you expect high volatility (uncertainty) is to buy a call and buy a put with different strikes and the same expiration—known as a strangle. A strangle requires larger price moves in either direction to profit but is also less expensive than a straddle. On the other hand, being short either a straddle or a strangle (selling both options) would profit from a market that doesn't move much.

Options Risks

Because options prices can be modeled mathematically with a model such as the Black-Scholes, many of the risks associated with options can also be modeled and understood. This particular feature of options actually makes them arguably less risky than other asset classes, or at least allows the risks associated with options to be understood and evaluated. Individual risks have been assigned Greek letter names, and are sometimes referred to simply as "the Greeks."

What Is the Binomial Option Pricing Model?

The binomial option pricing model is an options valuation method developed in 1979. The binomial option pricing model uses an iterative procedure, allowing for the specification of nodes, or points in time, during the time span between the valuation date and the option's

Basics of the Binomial Option Pricing Model

With binomial option price models, the assumptions are that there are two possible outcomes, hence the binomial part of the model. With a pricing model, the two outcomes are a move up, or a move down. The major advantage to a binomial option pricing model is that they're mathematically simple. Yet these models can become complex in a multi-period model.

In contrast to the Black-Scholes model, which provides a numerical result based on inputs, the binomial model allows for the calculation of the asset and the option for multiple periods along with the range of possible results for each period (see below).

The advantage of this multi-period view is that the user can visualize the change in asset price from period to period and evaluate the option based on decisions made at different points in time. For a U.S-based option, which can be exercised at any time before the expiration date, the binomial model can provide insight as to when exercising the option may be advisable and when it

should be held for longer periods. By looking at the binomial tree of values, a trader can determine in advance when a decision on an exercise may occur. If the option has a positive value, there is the possibility of exercise whereas, if the option has a value less than zero, it should be held for longer periods.

Calculating Price with the Binomial Model

The basic method of calculating the binomial option model is to use the same probability each period for success and failure until the option expires. However, a trader can incorporate different probabilities for each period based on new information obtained as time passes.

A binomial tree is a useful tool when pricing American options and embedded options. Its simplicity is its advantage and disadvantage at the same time. The tree is easy to model out mechanically, but the problem lies in the possible values the underlying asset can take in one period time. In a binomial tree model, the underlying asset can only be worth exactly one of two possible values, which is not realistic, as assets can be worth any number of values within any given range.

For example, there may be a 50/50 chance that the underlying asset price can increase or decrease by 30 percent in one period. For the second period, however, the probability that the underlying asset price will increase may grow to 70/30.

For example, if an investor is evaluating an oil well, that investor is not sure what the value of that oil well is, but there is a 50/50 chance that the price will go up. If oil prices go up in Period 1 making the oil well more valuable and the market fundamentals now point to continued increases in oil prices, the probability of further appreciation in price may now be 70 percent. The binomial model allows for this flexibility; the Black-Scholes model does not.

What Is the Black Scholes Model?

The Black Scholes model, also known as the Black-Scholes-Merton (BSM) model, is a mathematical model for pricing an options contract. In particular, the model estimates the variation over time of financial instruments. It assumes these instruments (such as stocks or futures) will have a lognormal distribution of prices. Using this assumption and factoring in other important variables, the equation derives the price of a call option.

The Basics of the Black Scholes Model

The model assumes the price of heavily traded assets follows a geometric Brownian motion with constant drift and volatility. When applied to a stock option, the model incorporates the constant price variation of the stock, the time value of money, the option's strike price, and the time to the option's expiry.

Also called Black-Scholes-Merton, it was the first widely used model for option pricing. It's used to calculate the theoretical value of options using current stock prices, expected dividends, the option's strike price, expected interest rates, time to expiration and expected volatility.

The formula, developed by three economists—Fischer Black, Myron Scholes and Robert Merton—is perhaps the world's most well-known options pricing model. The initial equation was introduced in Black and Scholes' 1973 paper, "The Pricing of Options and Corporate Liabilities," published in the *Journal of Political Economy*.[1] Black passed away two years before Scholes and Merton were awarded the 1997 Nobel Prize in economics for their work in finding a new method to determine the value of derivatives (the Nobel Prize is not given posthumously; however, the Nobel committee acknowledged Black's role in the Black-Scholes model)

The Black-Scholes model makes certain assumptions:

- The option is European and can only be exercised at expiration.
- No dividends are paid out during the life of the option.
- Markets are efficient (i.e., market movements cannot be predicted).
- There are no transaction costs in buying the option.

- The risk-free rate and volatility of the underlying are known and constant.
- The returns on the underlying asset are normally distributed.

While the original Black-Scholes model didn't consider the effects of dividends paid during the life of the option, the model is frequently adapted to account for dividends by determining the ex-dividend date value of the underlying stock.

The Black Scholes Formula

The mathematics involved in the formula are complicated and can be intimidating. Fortunately, you don't need to know or even understand the math to use Black-Scholes modeling in your own strategies. Options traders have access to a variety of online options calculators, and many of today's trading platforms boast robust options analysis tools, including indicators and spreadsheets that perform the calculations and output the options pricing values.

The Black Scholes call option formula is calculated by multiplying the stock price by the cumulative standard normal probability distribution function. Thereafter, the net present value (NPV) of the strike price multiplied by the cumulative standard normal distribution is subtracted from the resulting value of the previous calculation.

In mathematical notation:

\begin{aligned} &C = S_t N(d _1) - K e ^{-rt} N(d _2)\\ &\textbf{where:}\\ &d_1 = \frac{ln\frac{S_t}{K} + (r+ \frac{\sigma ^{2} _v}{2}) \ t}{\sigma_s \ \sqrt{t}}\\ &\text{and}\\ &d_2 = d _1 - \sigma_s \ \sqrt{t}\\ &\textbf{where:}\\ &C = \text{Call option price}\\ &S = \text{Current stock (or other underlying) price}\\ &K = \text{Strike price}\\ &r = \text{Risk-free interest rate}\\ &t = \text{Time to maturity}\\ &N = \text{A normal distribution}\\ \end{aligned}$C = StN(d1) - Ke - rtN(d2)$**where:**$d1 = \sigma s\ t ln KSt + (r + 2\sigma v2)\ tandd2 = d1 - \sigma s\ t$

where:*C*=Call option price*S*=Current stock (or other underlying) price*K*=Strike price*r*=Risk-free interest rate*t*=Time to maturity*N*=A normal distribution

Problems:

1.A put and Call Options each have a termination date of 3 months and an excerise price of Rs 5. the intrest rate for 3 months is 1.5%
a) If Put has the market price of Rs 2 and share is worth of Rs 4. What is the value of the Call?
b)If the put has the market price of Rs 1 and the call is RS 2 what is the price of the share
c) If call has the market price of Rs 6 and Market Price of the share is RS 8 what is the Value of put.

2.The Share price of a Pharmacy ltd are currently sold for RS 50. there is a call option available at Strike price of RS 46 for a period of 6 months. Find out the value of the call given that Interest is 12% and Std Dev is 20%. Apply Blacks and Schools Model.

3. The Share price of a P ltd are currently sold for RS 50. there is a call option available at Strike price of RS 4 for a period of 6 months. Find out the value of the call given that Interest is 10% and Std Dev is 30%. Apply Blacks and Schools Model.
4. The Share price of a X ltd are currently sold for RS 28. there is a call option available at Strike price of RS 30 for a period of 4 months. Find out the value of the call given that Interest is 10% and Std Dev is 30%. Apply Blacks and Schools Model.

5. The following information is related to some Options. State weather each one of this is In the Money, At the Money or Out of

the Money

Option	Stock Price	Exercise Price
Call	58	55
Call	40	40
Put	112	100
Put	104	110
Put	12	15
Call	37	35