

Chapter-1 Basics of Risk management

Certificate in Risk Management



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Chapter – 1 Basics of Risk Management

Introduction

This session provides an introduction to risk management. Every organization takes risks in order to achieve its objective of maximizing its shareholders' wealth. Risk-taking is most effective when the leaders of an organization appreciate the risks associated with the activities and know how to develop practical responses that suit the culture, resources and goals of the organization.

Learning Objective

After reading this chapter you will:

- Understand the Basics of risk management and various aspects related to it
- Explain the relationship between risk and return
- Explain the various types of market condition indicators and how they explain risk
- Explain various types of risk involved with different types of investments

1.1 Definition of risk

Risk can be defined as the potential loss of value of an asset due to some current or future occurrence of an event. The objective of the companies is maximization of shareholders' wealth. Hence, the possibility of the growth rate of the shareholders' wealth falling short of the set targets can be considered as the risk that corporate faces. The shareholders' wealth is reflected in the market value of the company's shares. Hence, for a company the risk faced is reflected in the possibility of the actual market value of its shares being different from the expected market value.

Thus, in brief risk can be defined as the possibility of the actual outcome being different from the expected outcome. Risk management is increasingly recognized as being concerned with both positive and negative aspects of risk. In addition to defining Business risk appetite; one can also define a level of variation to manage that risk. This variation is known as Risk Tolerance. Depending upon the level of diversification, risk can broadly be divided as - systematic risk (non-diversifiable) and unsystematic risk (diversifiable).

Systematic risk - Systematic risk arises on account of the economy-wide uncertainties and the tendency of individual securities to move together with the change in the market. This type of risk is also known as market risk. Systematic risk influences a large number of assets. Any political event, for example, could affect several of the assets in one's portfolio. This systematic risk includes such occurrences as inflation, war and fluctuating interest rates, stock market crash or a collapse of the banking system in a country —generally, those events that influence the entire economy.

The examples of systematic or market risk is:

- The government changes the interest rate policy.
- The RBI promotes a restrictive credit policy.
- The government is less rigid for the foreign exchange controls and declares full convertibility of Indian rupee.

Unsystematic risk - Unsystematic risk is sometimes referred to as "specific risk". This kind of risk affects a very small number of assets. Diversification is the only way to protect from

the unsystematic risk. Unsystematic risk arises from the unique uncertainties of individual securities (hence, also called unique risk). This risk is specific to an organization.

Some examples of unsystematic risk are:

- Strikes, fire or a natural disaster
- The R&D expert leaves the company
- The government increases custom duty on the material used by the company

Types of Risks

Financial firms face four common risks: market risk, credit risk, operational risk, and liquidity risk. These have been explained in detail below-

i. Market risk

Also known as systematic risk, it is the risk that the value of the portfolio of the firm will change with the movements in the market. It is also referred to as price risk. It cannot be distinctly separated from other risks as it results from the interplay of all other risks. Interest rate risk and exchange rate risk contribute the most to the pressure of market risk. It arises when financial institutions actively trade assets and liabilities (or derivatives) rather than holding them as long-term investment.

Market risk is contrasted with 'specific risk', which measures the risk of a fall in the firm's investment due to a change in a specific sector or industry when compared to a market wide move.

Market risk can broadly be divided into-

- **Equity risk:** It is the risk that the prices in the stock market will change, thus bringing down the value of the firm's Portfolio. The standard deviation of the Securities prices over a period of time are one measure for equity risk.
- **Interest rate risk:** It is the risk of an adverse effect of interest rate movement of a firm's profits or balance sheet, thus decreasing the relative value of the firm's assets or increasing the value of its liabilities.
- **Currency risk:** Risk of change in the price of one currency against another, Particularly prominent for import or export driven firms.

- **Commodity risk:** Risk that the commodity prices in the market will change.
- **Equity index risk:** It is the risk that the index prices (stock or other) will fluctuate.

Market Risk Measurement

There are two principal approaches to risk measurement

- 1) **Scenario Analysis:** It is the process of analyzing the changes in underlying factors of portfolio (e.g. Interest rate, exchange rates, and prices) and revalues the portfolio.
- 2) **Value-At-Risk (VaR):** It analyses the asset return distributions and predicted return parameters to estimate potential portfolio losses. For a given probability and a given time horizon, value-at-risk indicates an amount of money.

ii. Credit risk

Credit risk is the potential loss if the counter party of a trade agreement does not pay, or carry through the contract. In a bank's portfolio, losses occur from default due to inability or unwillingness of a customer or counterparty to meet commitments in relation to lending, trading, settlement and other financial transactions. Alternatively, losses result from reduction in portfolio value arising from actual or perceived deterioration in credit quality.

Therefore the credit risk is dependent on factors like credit quality, credit period allowed and the efforts the company puts to make collections i.e. the conversion period. Firms may lengthen (or shorten) the credit period based on the requirements and the ability of the borrower to repay. The credit risk faced by banks is reflected through their NPA (Non-Performing Assets), and some firms write off irrecoverable debts as bad debts.

Credit risk can broadly be divided into:

- **Transaction risk:** Transaction risk is the exposure of the cash flows (in or from the firm) to changes in the exchange rate. It is dependent on the time between the conception of the contract (or the time of entering into the contract) and the settlement of the contract. If the period between the two is very long, then the firm is more exposed to transaction risk. Transaction risk is more pronounced for firms operating in

different countries (they have to deal in different currencies) as exchange rates can fluctuate significantly over a short period of time.

- **Concentration risk:** This risk represents the overall spread of a bank's outstanding accounts over the number or variety of borrowers to whom the bank has lent the money. Concentration ratio is used to explain this particular risk. It is the percentage of the outstanding accounts which each bank loan in a portfolio of bank represents.

For example, if a bank has 5 outstanding loans of equal value, each loan would have a credit ratio of .2; if it had 4, it would be .25.

Credit risk Measurement

There are two approaches for credit risk measurement –

- 1) Measurement of risk through credit rating/scoring
- 2) Quantifying the risk through estimating expected losses i.e. the amount of Loan loss that a bank would experience over a chosen time horizon and unexpected loan losses i.e. the amount by which actual losses exceed the expected losses.

iii. Operational risk

Operational risk primarily focuses on risks arising from failures in processes, systems, and people, and can also include things such as fraud, legal risk, etc. This definition is based on the underlying causes of operational risk. It seeks to identify why a loss happened and at the broadest level includes the breakdown by four causes: people, processes, systems and external factors.

According to Basel II, operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk.

Operational risk can broadly be divided into-

- **System Risk:** It is the risk that occurs due to the failure of processes and Transactions.
- **Agency cost risk:** It is the risk that occurs due to the fraud and mismanagement.

The Basel committee has identified the following types of operational risk:-

- Execution delivery and process management
- External fraud
- Clients, products and business practices
- Internal fraud
- Damage to physical assets
- Employment practices and workplaces safety
- Business disruption and system failure

The Basel II definition of operational risk includes the legal risk faced by banks and other financial institutions.

Operational Risk Measurement

There are three main approaches to measure the operational risk:

- 1) **Basic Indicator Approach:** The most basic approach allocates operational risk capital using a single indicator as a proxy for an institution's overall operational risk exposure.
- 2) **The Standardized Approach:** In Standardized approach, the capital charge for each business line is calculated by multiplying gross income by a factor (denoted beta) assigned to that business line. In this approach gross income is measured for each business line, not the whole institution.
- 3) **Advanced Measurement Approaches:** It is used an allocation mechanism for the purpose of determining the regulatory capital requirement for internationally active banking subsidiaries that are not deemed to be significant relative to the overall banking group but are themselves subject to this Framework.

iv. Liquidity risk

Liquidity risk refers to the risk of a possible bankruptcy arising due to the inability of the firm to meet its financial obligations. It arises when the banks are unable to generate cash to cope with a decline in deposits or increase in assets. It originates from the mismatches in the maturity pattern of assets and liabilities.

It can be also defined as the ability to convert an asset into other form without losing its value substantially. It is not the same as the price of the firm's product dropping to zero; price drop means that the market thinks that the product is of no value. But under liquidity risk, the firm finds nobody to trade its products with. This could also be because of under-developed or low volume markets. Liquidity risk also refers to the possibility of having excess funds, i.e. the risk of having more funds than it can profitably deploy.

A firm can lose liquidity because of many reasons like it is not doing well on the sales front, its credit rating fell down drastically, or if it experiences unexpected cash outflow.

Factors to be taken into consideration while determining liquidity of the bank's future stock of assets and liabilities include –

- Their potential marketability
- Renewal of assets and liabilities
- Acquisition of new assets and liabilities
- Normal growth in asset and liability accounts.

Liquidity risk in banks manifest in different dimensions:

- **Funding risk:** It needs to replace net out flows .Due to unanticipated Withdrawal/nonrenewal of deposit.
- **Market Liquidity Risk:** It needs to liquidate a sizable amount of asset affect the Price in considerable (unfavorable manner) because of limited trade of market Where assets are traded.

Liquidity risk Measurement

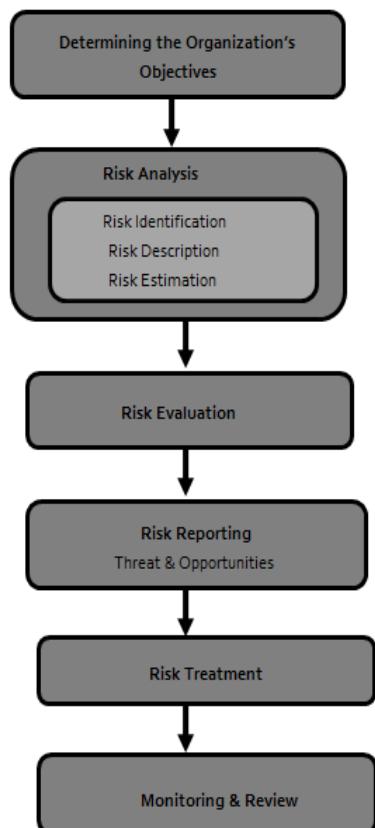
- 1) **Stock Based Approach:** Measures the stock of financial assets that can be promptly be liquidate to face a possible liquidity shock.
- 2) **Cash Flow Based Approach:** It compares cash outflow and inflow, grouping them in homogeneous maturity buckets.
- 3) **Hybrid Approach:** Potential cash flows coming from the sale of financial assets are add to actual expected cash flows.

1.2 Risk Management Process

The risk management function involves a logical sequence of steps. These steps are:

- i. Determining the Organization's Objectives
- ii. Identifying risk
- iii. Risk description
- iv. Risk Estimation
- v. Risk Evaluation
- vi. Risk Reporting
- vii. Risk Treatment
- viii. Monitoring & Review

The process of financial risk management has to be flexible because a company's risk profile keeps changing. Risk Management Process flow is given



Risk Management Process Table

| | |
|---|--|
| Organization's objectives | Providing a framework for an organization that enables future activity to take place in a consistent and control manner. |
| Risk identification | Identify organization's exposure to Uncertainty. |
| Risk description | Identify the risk in more structure format by using a table. |
| Risk estimation | It can be quantitative or qualitative in terms of the probability of occurrence and the possible consequence. |
| Risk evaluation | After analysis of risk, compare the estimated risks against risk criteria like cost and benefits, socio-economic, legal etc. |
| Risk reporting (threats & opportunities) | Internal reporting - different levels within organization need different information about risk management process. External reporting – organization needs to inform to its stakeholders its risk management policies and the effectiveness. |
| Risk treatment | Implement the measures to modify the risk. It includes risk control/mitigation ,risk avoidance , risk transfer , risk financing etc. |
| Risk monitoring and review | Review structure to ensure that risk are effectively identified, analyzed, and implemented the measures. It identifies opportunities for improvement. |

Financial risk management

Corporate risk management refers to the process of a company managing its risks at an acceptable level. According to mark Dorfman, risk management is "the logical development and execution of a plan to deal with potential losses". The aim of risk management is to maintain overall and specific risks at the desired levels, at the minimum cost.

Financial risk management has become an extremely important discipline for corporations, financial institutions and many government enterprises. There has been a revolution in the financial services industry over the past 30 years caused by the confluence of several factors. These include advances in information technology, deregulation, liberalization and globalization. An impact of these changes has been the development of new models for risk management. Old-fashioned methods have been replaced by sophisticated scientific approaches.

Financial risk management aims at identifying sources of risk in a firm, and managing them. Typically management of risk in a firm involves the use of one or more of the derivative instruments. Quantification of the potential losses in an investment and taking appropriate action (or inaction) with respect to the firms' objectives and risk tolerance is broadly the function of risk management. Financial risk management is the practice of creating value in a firm by using financial instruments to manage exposure to risk. Similar to general risk management, financial risk management requires identifying the sources of risk, measuring risk, and plans to address them. As a specialization of risk management, financial risk management focuses on when and how to hedge using financial instruments to manage costly exposures to risk.

1.3 Hedging Risk

While diversification is a way to reduce the risk, corporate risk management has over a period of time developed various risk management tools. Hedging is one of the very powerful tools in reducing risk. Hedging is the term used to reduce risk by using derivatives. The main aim of the right hedging policy is to strike a balance between uncertainty and the risk of opportunity loss. Hedging means that an organization enters into a transaction activity whose probable changes in financial prices will nullify the movements of their

business to such changes. Any investment done to reduce or cancel the risk involved in another investment is called a hedge.

Hedging is a strategy which helps in the minimization of the exposure to an unpredictable and unwanted business risk and also allows the businesses to make profits from an investment activity. Hedging means identifying two oppositely correlated assets as far as returns are concerned. One can hedge the risk by buying one of the assets while simultaneously selling the other. While complete hedging may not always be possible, sometimes residual risks remain.

The decision that has to be made while hedging is to decide the balance between uncertainty and opportunity loss, because when risks are hedged, the uncertainty of the investment is reduced but so is the chance to benefit if the market changes in a way that is beneficial to the investment. The firms should therefore hedge risks that they think are going to lead to extreme losses and that too with a fair amount of certainty. Because when a firm hedges its losses, it incurs greater costs and therefore decreases shareholder income. It may also put a cap on the future gain.

Relationship between Risk and Return

Return: return is the motivation for investing. Investors want to maximize their returns subject to their tolerance for risk. There could be two types of returns: realized returns or actual returns and expected returns.

A close relationship exists between risk and return. The return required for a given value of risk varies directly with the risk the instrument carries. Thus as a general rule we can say that as the risk increases so does the expected return.

- **Capital asset pricing model – CAPM**

CAPM is an extension of the portfolio theory. It is a model that provides a framework to determine the required rate of return on an asset and indicates the relationship between risk and return of the asset. The required rate of return specified by CAPM helps in valuing the asset. It also helps in comparing the expected rate of return with its required rate of return and thereby, determining whether the asset is fairly valued.

Mathematically,

$$\text{Required (or expected) return} = R_f + ((R_m - R_f) * \text{beta})$$

CAPM model puts forward the two ways in which an investor needs to be compensated. These are: time value of money and risk. In the formula, the time value of money is represented by the risk-free (R_f) rate. R_f compensates the investors for placing money in any investment over a period of time. The other half of the formula represents risk and calculates the amount of compensation, which the investor needs for taking on additional risk. For calculating a risk measure (beta) is used that compares the returns of the asset to the market over a period of time and to the market premium ($R_m - R_f$).

The CAPM is based on the following nine assumptions:

- **Utility maximization-** Investors try to maximize their own utilities; they are risk-averse.
- **Decision basis -** Investors make their decisions only on the basis of risk and return.
- **Expectations-** Investors have homogeneous expectations regarding return and risk (variance and covariance) of the assets.
- **One-period time horizon-** Investors have identical time horizons of one period.
- **Information efficiency-** Information is free and simultaneously available to all market participants.
- **Risk-free asset-** Investors can borrow or invest in an unlimited amount of risk-free assets.
- **Markets without friction-** No taxes, transaction fees, restrictions on short positions or other market restrictions exist.
- **Capital market equilibrium-** The sum of all instruments is given and in possession of the investors. All instruments are marketable, and the assets are divisible to any degree. Supply and demand are not influenced by anything other than price.

The CAPM proposes that the expected return of a security or a portfolio equals the rate on a risk-free security plus the risk premium. If this expected return is not meeting the required return, then the investment alternative should not be undertaken.

The expected return of a stock can be calculated using the CAPM model: if the risk-free rate is 2%, the beta (risk measure) of the stock is 1 and the expected market return over the period is 5%, the stock is expected to return 5% ($2\% + 1(5\% - 2\%)$).

CAPM tells us that if someone invest in the above mentioned stock, should be getting at least 4% return on investment.

- **Beta: knowing the risk**

Beta is a standardized statistical measure of a security's systematic risk. Beta is a measure of a stock's volatility in relation to the market. The market portfolio has a beta of 1.0, and various individual stocks are ranked according to how much they deviate from the market. The market portfolio is the reference for measuring the volatility of individual risky securities. Since a risk free security has no volatility, it has zero beta.

A stock that fluctuates more than the market over a given time period will have a beta above 1.0. While if a stock moves less than the market, then the stock's beta is supposed to be less than 1.0. Beta denotes the riskiness of an investment alternative. Though the high-beta value stocks are riskier but they provide higher returns, on the other hand low-beta stocks are less risky but also give lower returns. Beta plays an important role in determining the cost of capital for a firm.

A measure of security's or portfolio's volatility. A beta of 1 means that the security or portfolio is neither more nor less volatile or risky than the wider market. A beta of more than 1 indicates greater volatility and a beta of less than 1 indicates less. Beta is an important component of the Capital Asset Pricing Model, which attempts to use volatility and risk to estimate expected returns.

1.4 Risk in Banks

Risk faced by banks

Losses due to bad loans are the biggest reason for losses for a bank, sometimes even leading to the collapse of the bank itself, like in the case of Barings bank, which failed to manage its credit portfolio well. Effective management of credit portfolio means reducing the probability of defaults on the loans, and minimizing the amounts of expected and unexpected losses.

Unexpected and expected losses for a bank are constructed based on the historic performance of the bank. Credit research teams, which work on huge piles of reliable historic data, compile the estimates of losses for a bank. Banks try to cover up these losses in the pricing of their loans.

The spread of the bank (interest received on loans minus interest paid on deposits) tends to increase as the bank lends to more risky counter parties, as it charges more interest when the risk of counter party default is high.

Types of Risk

Default risk: This is the most fundamental risk in the banking business, the probability that the counter party will default.

Recovery risk: The bank tries to allot to the fact that it might not be able to recover much on the amount lent if the counter party defaults. The chance that it will not recover much is factored for, and is included in the pricing of the loan.

Migration risk: It is the risk that the credit quality of the counter party will default in the time between the advancement of the loan till the maturity of the loan.

For example, a bank lends to a paper-producing firm, which is rated at AA. However new environment consciousness prevents the cutting of trees, therefore the firm is facing difficult times to route its raw material. This brings down the rating of the firm to BB. The ability to repay of the firm also reduces. The bank factors in this risk also while pricing its loans.

Concentration risk: The amount that the bank lends to similar clients, clients who are positively correlated is reduced as much as possible. This is to ensure that if a particular client or industry does not do well, the others in the portfolio offset those losses. The concentration risk is minimized by lowering the limits on the lending to the various sectors or clients, as a part of portfolio credit management.

Settlement risk: In spite of the delivery versus payment (dvp) guidelines followed by many banks, there is always an exposure to settlement risk. It is the risk that the bank will fulfill its part of the contract and the other counter party will not oblige the contract in time, thus increasing the credit exposure of the bank.

Issue risk: When a bank invests in the bonds (securities) issued by another firm (i.e. the bank buys the bonds issued by the firm), it is effectively like the bank is lending the invested amount to the firm. Total risk is equal to the sum of two types of risk, security.

- **Capital Regulations & Allocation and Risk Aggregation in banks**

Basel I laid down the first capital adequacy norms for banks. It laid down the condition that banks should maintain a capital of at least 8% of the total advances they make. The Basel convention addressed only the credit risk faced by the banks.

The Basel II convention takes the capital adequacy norms further and tries to incorporate market risk and operational risk alongside credit risk. It maintains the minimum amount of capital a bank should have is dependent not only on its credit risk exposure, also on its market risk and operational risk exposures.

Risk Aggregation - Most of internally active banks have developed internal processes and techniques to assess and evaluate their own capital needs in the light of their risk profiles and business plans. Such banks take into account both qualitative and quantitative factors to assess economic capital.

The Basle committee now recognizes that capital adequacy in relation to economic risk is a necessary condition for the long-term soundness of banks.

RAROC (Risk Adjusted Return on Capital) - the RAROC is allowed all the business streams of a financial institution to be evaluated on an equal footing. It is measured to determine both the expected and unexpected losses using var.

- **Asset-Liability Management (ALM) in Banks**

The objective of ALM is to assure a bank's liquidity, solvency and efficiency concerning capital and liabilities structure and asset structure. Traditionally financial companies

financed their assets through their liabilities, for example a bank would finance its assets (loans) through its liabilities (deposits). The difference between these, the assets and the liabilities is the capital outlay that the firm makes. It measures the market risk of the bank.

For most firms, the percentage of the capital, as a percentage of their liabilities (or assets) is falling down. Therefore a small change in the value of the assets or liabilities will have a big impact on the value of the capital of the firm. This effect will become more pronounced if the values of the assets and the liabilities are not moving in tandem (for e.g. Through interest rate fluctuations, the value of assets goes down and that of liabilities goes up). This gives rise to asset-liability risk.

ALM is a strategy used by the banks and the financial institutions. Here the assets as well as the liabilities are designed in such ways, which match the cash flows, duration and maturities of both assets and liabilities.

ALM simulation scope extends to both interest rate risk and business risk.

. Simulations have various outputs:

- They provide projected values of target variables for all scenarios.
- They measure the exposure of the bank to both interest rate and business risk.
- They serve to 'optimize' the risk and return trade-off, measured by the expected values and the distributions of the target variables across scenario

Techniques for ALM include gap analysis and duration analysis. Through these analyses the gap in the value and the maturity periods of the assets and liabilities are analyzed and are optimized. Through the use of new techniques like securitization, the firms can remove assets or liabilities off their balance sheet.

1) Gap Analysis - Gap analysis is a technique of asset-liability management that can be used to assess interest rate risk or liquidity risk. Implementations for those two applications differ in minor ways, so people distinguish between interest rate gaps and liquidity gaps.

Gap Analysis for measuring Liquidity risk-

- An incremental GAP analysis divides all banks assets and liabilities into different time buckets.
- The periodic incremental GAP is defined as the difference between assets and liabilities in each time bucket.

Gap Analysis for measuring Interest rate risk-

- The interest rate GAP analysis divides a bank's interest rate sensitive assets (RSA) and liabilities (RSL) into different time buckets. It measures the risk that arises from interest rate mismatch between the different time buckets.
- GAP analysis measures the effect of potential interest rate changes on net interest income/capital.

Gap analysis can warn of exposure to more complex movements, including tilts and bends. It is basic ALM technique that verifies the duration matching of assets and liabilities.

- 2) **Duration Analysis**-Duration analysis is used to quantify the interest rate risk associated with bonds. There are assets and future cash flows, which are not marketable. Such assets and future cash flows can be converted into marketable securities. This process of conversion of non-marketable assets into marketable ones is called securitization.

Summary

- This session touches upon the various aspects of risk management and discusses various types of risks involved with various investments.
- It has briefed upon the three major types of risks: market risk, operational risk and credit risk.
- Also the concepts related to risk and return have been explained in detail in the session with the help of CAPM model.
- Risk modeling has been defined in the session. Risk modeling is the use of mathematical economics to find the average risk of a portfolio.
- Capital regulations on banks and other financial institution by Basel committee have also been discussed.
- It has given an introduction to the various terms common to the concept of risk management which will be dealt in detail in the subsequent modules such as risk modeling and asset liability management.

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