

MC 2.5



**M.COM.
(ADVANCE ACCOUNTANCY)
SEMESTER - II**

**(REVISED SYLLABUS
AS PER NEP 2020)**

RISK MANAGEMENT

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April 2025, Print - 1

Published by : Director,
Centre for Distance and Online Education,
University of Mumbai,
Vidyanagari, Mumbai - 400 098.

DTP Composed : Mumbai University Press
Printed by Vidyanagari, Santacruz (E), Mumbai

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Programme Name: M.Com (Advanced Accountancy)

Course Name: RISK MANAGEMENT

Total Credits: 04

University assessment: 50

Total Marks: 100

College assessment: 50

Aims & Objectives:

- a) To outline the concept and fundamentals of risk management.
- b) To summarise various capital market and risk associated with it.
- c) To explain credit risk management process, Basel norms and concept of CAR
- d) To acquaint learners about application of risk measurement tools.

Course outcomes:

- CO1. Learners will be able to identify risk and uncertainty in business and learn to compare them, review ERM, and various financial crisis
- CO2. Learners would be able to summarise various capital markets operating in India and Associate relation to Derivatives Markets and risk associated with it.
- CO3. Learners would be able to use credit risk management process, review Basel Norms and calculate CAR
- CO4. Learners would gain practical approach on calculation of Beta and Linear VaR.

MODULE I: (2 CREDITS)

Unit 1: Foundations of Risk Management

- A) Basic risk types, The role of risk management, Enterprise Risk Management (ERM)
- B) History of financial disasters and risk management failures 2007 financial crisis

Unit 2: Capital Market Risk Management

- A) Equity, currencies & commodities markets in India, Introduction to Derivatives, Forward, Future and option contracts, Hedging through Derivatives contract
- B) Fixed-income securities, Fixed-income risk management through derivatives, Rating agencies

MODULE II: (2 CREDITS)

Unit 3: Credit Market Risk Management

- A) Introduction, Information required for evaluation of credit risk, Procedure for Credit Risk Management, Credit Lifecycle,
- B) Loan Review Mechanism guidelines on Credit Rating Framework in Banks, Introduction of Basel Norms and calculation of capital adequacy ratio (Calculation)

Unit 4: Risk Measurement

- A) Estimation of volatilities and correlations (application to volatility term structures) Monte Carlo simulations (application to interest rate forecasting), Linear Value-at-Risk (application to market, credit and operational risk)
- B) Option valuation, Risk-adjusted return on capital (RAROC) & beta calculation, Risk management of derivatives (application to convertible risk), Interest rates and measures of interest rate sensitivity

References:

- Quantitative Risk Management : A Practical Guide to Financial Risk- Thomas S. Coleman
- Investment Theory and Risk Management: Steve Peterson
- Risk Management : M/s Macmillan India Limited
- Theory & Practice of Treasury Risk Management: M/s Taxman Publications Ltd.
- Corporate Value of ERM : Sim Segal
- Risk Management : Insurance and Derivatives Dr G Kotreshwar-Himalaya Publishing House.

Programme Name: M.Com (Advanced Accountancy)

Course Name: Liquidation Accounting

Total Credits: 04

University assessment: 50

Total Marks: 100

College assessment: 50

Aims & Objectives :

- a) To outline the concept and understanding of the liquidation process.
- b) To summarise various legal aspects, and practical considerations of liquidation accounting.
- c) To explain various types of liquidation, stakeholder roles, regulatory compliance, and strategies for successful liquidation

Course outcomes:

CO1. The learners will be able to identify the liquidation reasons and process.

CO2. The learners will be able to understand the legal framework involved in liquidation accounting.

CO3. The learners will be able to explain the duties and powers of Liquidator's.

CO4. The learners will be able to identify the accounting and tax implications involved the process of liquidation.

MODULE I: (2 CREDITS)

Unit 1: Overview of Liquidation

- A. Introduction: What is liquidation -Reasons for liquidation - Types of liquidation (voluntary, involuntary, etc.)
- B. Legal Framework - Legal and regulatory framework Insolvency Bankruptcy Code - Key stakeholders (shareholders, directors, creditors) - Liquidators and their roles

Unit 2: Voluntary Liquidation Procedure

- A. Process: Initiating voluntary liquidation - Appointment of a liquidator - Board and shareholder resolutions.
- B. Liquidator's Duties and Powers - Liquidator's role and responsibilities - Liquidator's powers and limitations - Reporting to stakeholders including preparation of draft report

MODULE II : (2 CREDITS)

Unit 3: Involuntary Liquidation Process

- A. Petitions for involuntary liquidation - Court's role in involuntary liquidation - Appointing an Official Receiver
- B. Creditors and Debt Recovery - Role of creditors in involuntary liquidation - Debt recovery strategies - Handling secured and unsecured creditors (Practical problem on classification of Creditors)

Unit 4: Accounting & Tax Implications

- A. Valuation of assets and liabilities - Identifying and preserving assets - Asset realization and distribution - Preparing reports for stakeholders - Distribution of assets to creditors.
- B. Tax implications and benefits - Realization account Preparation --Piecemeal Distribution of assets - Liquidators Final Accounts

References:

- Taxmann's Insolvency and Bankruptcy Law Manual – Covering amended, updated & annotated text of the IBC along with 28+ Relevant Rules/Regulations, 85+ Guidelines/Notifications/Circular, etc. [2023]
- IBFs Resolution of Stressed Assets with Special Emphasis on Insolvency and Bankruptcy Code 2016 for Bankers Along with Important Case Laws | Knowledge Partner
- Taxmann's Law & Practice of Insolvency & Bankruptcy (2 Vols.) – The updated 'section-wise' flagship commentary, presented in an integrated, interconnected & comprehensive format
- Practical Problems on Corporate Accounting by Dr S. M. Shukla
- Corporate Accounting by Dr S. M. Shukla and K. L.Gupta
- Taxmanns Corporate Accounting

FOUNDATIONS OF RISK MANAGEMENT

Unit Structure :

- 1.0 Learning Objectives
- 1.1 What are Risks?
- 1.2 Types of Risks
- 1.3 Risk Management
- 1.4 Enterprise Risk Management (ERM)
- 1.5 History of financial disasters and risk management failures 2007 financial crisis
- 1.6 Exercise

1.0 LEARNING OBJECTIVES

By the end of this module, learners will be able to:

- Identify and differentiate among the basic types of financial and non-financial risks encountered by organizations.
- Explain the importance and functions of risk management in ensuring organizational stability and strategic success.
- Describe the framework and principles of Enterprise Risk Management (ERM) and its role in holistic risk handling.
- Analyze key financial disasters with a focus on the 2007 financial crisis, identifying the root causes and risk management failures.
- Evaluate the impact of poor risk governance on financial institutions and the global economy during the 2007 crisis.
- Apply lessons learned from historical financial disasters to modern risk management practices and strategies.

1.1 What are Risks?

Risks are simply the potential for negative outcomes. They exist everywhere, from everyday activities like walking to major business decisions. Companies should proactively manage risks, not just avoid them. Key considerations include:

- **Identifying opportunities:** What are the potential gains?
- **Defining risk tolerance:** How much risk is the company willing to accept?
- **Aligning with goals:** Do these opportunities support business objectives?

1.2 Types of Risks

1. Strategic Risk

Strategic risk refers to the potential impact on a company's overall business strategy and objectives. This type of risk can arise from various sources, including changes in market conditions, competitor actions, or shifts in customer needs.

Example

A company like Blockbuster, which dominated the video rental market, failed to adapt to the rise of online streaming services like Netflix. As a result, Blockbuster's business strategy became outdated, leading to a significant decline in sales and eventual bankruptcy.

2. Compliance Risk

Compliance risk refers to the potential for violating regulations, laws, or industry standards, resulting in penalties, fines, or reputational damage.

Example

In 2019, Facebook was fined \$5 billion by the US Federal Trade Commission (FTC) for violating a 2012 consent decree related to user data privacy. The fine was a result of Facebook's failure to comply with regulatory requirements, leading to a significant reputational damage.

3. Financial Risk

Financial risk refers to the potential impact on a company's profitability and financial stability. This type of risk can arise from various sources, including market fluctuations, credit risks, or liquidity risks.

Example

In 2008, the global financial crisis led to a significant decline in the value of mortgage-backed securities, causing massive financial losses for banks like Lehman Brothers. The company's financial risk management strategies failed to mitigate the impact of the crisis, leading to its eventual bankruptcy.

4. Operational Risk

Operational risk refers to the potential disruption to a company's daily business operations. This type of risk can arise from various sources, including process failures, system failures, or human error.

Example

In 2017, a major cyberattack on the shipping company Maersk's computer systems caused significant disruptions to its operations, resulting in estimated losses of \$300 million. The attack highlighted the importance of effective operational risk management strategies.

5. Reputational Risk

Reputational risk refers to the potential damage to a company's image and public trust. This type of risk can arise from various sources, including product failures, customer complaints, or negative publicity.

Example

In 2015, Volkswagen faced a significant reputational risk when it was discovered that the company had installed software in its vehicles to cheat on emissions tests. The scandal led to widespread negative publicity, damage to the company's reputation, and significant financial losses.

6. Security Risk

Security risk refers to the potential threat to a company's physical and digital security. This type of risk can arise from various sources, including cyberattacks, physical breaches, or natural disasters.

Example

In 2013, the retail company Target suffered a major data breach, resulting in the theft of sensitive customer information. The breach highlighted the importance of effective security risk management strategies to protect against cyber threats.

7. Quality Risk

Quality risk refers to the potential compromise on the quality of products or services. This type of risk can arise from various sources, including design flaws, manufacturing defects, or inadequate testing.

Example

In 2019, the pharmaceutical company Johnson & Johnson faced a quality risk when it was discovered that some of its opioid medications were contaminated with a potentially deadly substance. The company faced significant reputational damage and financial losses as a result of the quality control issues.

1.3 RISK MANAGEMENT

Risk management is the systematic process of identifying, assessing, and controlling potential threats that could impact an individual, organization, or society. It involves:

- **Identifying potential risks:** Recognizing and cataloging various threats and hazards.
- **Assessing the likelihood and impact of risks:** Evaluating the probability of each risk occurring and its potential consequences.
- **Developing and implementing strategies to mitigate or control risks:** Taking proactive steps to reduce the likelihood or impact of identified risks.
- Overview of the three types of risk management
- Risk management is a critical aspect of any organization's management strategy. It involves identifying, assessing, and managing potential risks that can hinder the achievement of business objectives. There are three main types of risk management: financial risk management, operational risk management, and strategic risk management.
- Financial risk management focuses on mitigating risks related to financial transactions and investments. It includes managing risks such as credit risk (the risk of loss from a borrower's failure to repay a loan), market risk (the risk of financial loss due to changes in market conditions), and liquidity risk (the risk of not having enough cash to meet financial obligations). For example, insurance companies mitigate financial risks by diversifying their investment portfolio to avoid concentrated exposure.
- Operational risk management deals with risks associated with internal processes, systems, and human error. It aims to identify and mitigate risks like supply chain risks, security risks, and business continuity risks. For instance, a manufacturing company may implement safety protocols and contingency plans to avoid operational disruptions caused by natural disasters or equipment failures.
- Strategic risk management focuses on risks relating to an organization's long-term goals and objectives. It involves assessing risks associated with competitive threats, changes in the business environment, and unclear regulatory conditions. An example of strategic risk is the risk of losing market share due to technological advancements that make a company's product obsolete. To address this risk, companies may need to adapt their business models and invest in research and development.

Type 1: financial risk management

Financial risk management is a crucial component of any organization's risk management strategy. This type of risk management focuses on identifying and mitigating risks related to financial transactions and investments. It involves assessing and managing risks such as credit risk, market risk, and liquidity risk. Credit risk refers to the potential loss that can occur when a borrower fails to repay a loan, while market risk

involves the risk of financial loss due to changes in market conditions. Liquidity risk, on the other hand, pertains to the risk of not having enough cash to meet financial obligations. Effective financial risk management helps organizations diversify their investment portfolio, implement risk controls, and ensure they have adequate cash reserves to maintain financial stability.

Definition of financial risk management

- Financial risk management is the process of identifying, analyzing, and mitigating potential financial risks that can result in capital losses for individuals and businesses. It is a crucial aspect of risk management, as it helps individuals and organizations to safeguard their finances and make informed decisions.
- The first step in financial risk management is the identification of potential risks. This involves understanding the various factors that can impact the financial stability of an individual or business, such as market fluctuations, interest rate changes, credit fluctuations, and operational issues. By recognizing these risks, individuals and businesses can proactively prepare to address them.
- Once the risks are identified, the next step is to analyze and assess their potential impact. This involves evaluating the likelihood of the risks occurring and estimating the severity of the potential losses. With this analysis, individuals and organizations can prioritize their focus on the most significant risks and allocate resources accordingly.
- The final step in financial risk management is mitigation. This involves implementing strategies to minimize the impact of potential risks. Strategies may include diversifying investments, implementing risk controls and safeguards, hedging against market fluctuations, and maintaining sufficient liquidity to meet financial obligations.
- Common types of financial risks that financial risk management addresses include credit risk, which refers to the risk of default by borrowers; liquidity risk, which involves the inability to meet financial obligations; and operational risk, which encompasses risks arising from internal processes, systems, and human errors.

Examples of financial risks and how they are managed

Financial risk management is essential for individuals and businesses to protect their financial well-being. By understanding and managing various types of financial risks, they can minimize potential losses and ensure stability.

- One common example of financial risk is market risk. It refers to the possibility of losses due to market fluctuations. To manage market risk, individuals and businesses can diversify their investment portfolios, monitor market trends, and employ hedging techniques like options and futures contracts.

- Credit risk is another significant type of financial risk. It involves the potential of borrowers defaulting on their payments. To mitigate credit risk, lenders conduct thorough credit assessments, set appropriate lending limits, and establish credit risk controls and procedures.
- Liquidity risk refers to the risk of being unable to meet financial obligations. This risk can be managed by maintaining sufficient cash reserves, establishing lines of credit, and diversifying funding sources.
- Operational risks stem from internal processes, systems, and human errors. To manage operational risk, businesses can implement robust internal controls, conduct regular risk assessments and staff training, and establish contingency plans for potential disruptions.
- Legal risks arise from legal and regulatory issues, such as lawsuits or non-compliance with applicable laws. Managing legal risks involves staying updated on relevant regulations, obtaining expert legal advice, and implementing compliance procedures.

Benefits of financial risk management

- Financial risk management plays a crucial role in ensuring the stability and success of organizations. Effectively managing financial risks comes with a multitude of benefits that can greatly impact the overall performance and competitiveness of a company.
- One of the primary benefits of financial risk management is the increased awareness of risk across the organization. By implementing comprehensive risk management strategies, organizations gain a deeper understanding of potential risks and their impact on business operations. This increased awareness enables companies to proactively identify and address risks, minimizing the likelihood of financial setbacks and enhancing decision-making processes.
- Furthermore, financial risk management helps organizations align their objectives and goals with their risk appetite. By consistently evaluating and managing risks, companies can ensure that their strategies and activities are in line with their risk tolerance. This alignment instills confidence within the organization, as stakeholders have a clear understanding of the potential risks involved and can make informed decisions to mitigate them.
- Compliance with regulatory and internal mandates is another crucial benefit of financial risk management. By identifying and addressing risks associated with regulatory requirements, organizations can reduce the likelihood of penalties, fines, and legal issues. Additionally, a robust risk management framework promotes better adherence to internal policies and procedures, ensuring a more efficient and ethical operation.
- Financial risk management also contributes to improved operational efficiency. By identifying and mitigating potential risks, companies

can streamline their processes and reduce the likelihood of disruptions. This leads to increased productivity, cost savings, and optimized resource allocation.

- Moreover, financial risk management enhances workplace safety. By proactively managing risks associated with workplace hazards, organizations can create a safer environment for their employees. This not only protects individuals from harm but also minimizes potential legal and financial liabilities.
- Lastly, effective financial risk management provides organizations with a competitive edge in the marketplace. By demonstrating a proactive approach to risk management, companies instill confidence in their stakeholders, including customers, investors, and partners. This competitive advantage can lead to increased market share, improved reputation, and long-term sustainability.

Challenges with financial risk management

- Challenges with financial risk management arise due to the inherent nature of uncertainty in financial markets and business operations. Businesses face several hurdles in effectively managing financial risks, despite their efforts to eliminate or reduce them.
- One of the main challenges is the inability to completely eliminate financial risks. No matter how well-prepared an organization is, there will always be factors beyond their control that can impact financial stability. External risks such as market fluctuations, changes in government regulations, or natural disasters can severely affect businesses. It is crucial for organizations to be aware of these risks and develop strategies to mitigate their potential harm.
- Another challenge is the need for risk awareness across the organization. It is not enough for the finance department alone to be aware of financial risks. All employees, from top management to front-line staff, should have a clear understanding of the potential risks and their implications. This requires constant communication, training, and a culture of risk awareness within the company.
- Furthermore, the complexity of financial risk management requires comprehensive strategies to mitigate harm and reduce negative outcomes. This includes diversifying investments, implementing risk controls, and purchasing relevant insurance coverage. It is essential for businesses to regularly assess and reassess their risk profiles, as well as stay up-to-date with industry best practices and regulatory requirements.

Type 2: operational risk management

- Operational risk management involves identifying, assessing, and mitigating potential risks arising from the day-to-day operations of a business. It focuses on the internal processes, systems, and human

factors that could lead to financial loss or harm to the organization. Operational risks can stem from various sources such as inadequate internal controls, human error, system failures, and legal or compliance issues. Effective operational risk management requires businesses to develop robust control mechanisms, implement preventive measures, and continuously monitor and evaluate the effectiveness of these controls. This proactive approach helps organizations identify and address potential risks before they materialize, ensuring the smooth functioning of operations and safeguarding the organization's financial stability. By implementing operational risk management strategies, businesses can enhance operational efficiency, protect their reputation, and maintain a resilient and sustainable operation in the face of uncertainties and risks.

Definition of operational risk management

- Operational risk management is a critical aspect of the broader field of risk management. It specifically focuses on identifying, assessing, and mitigating risks that arise from internal processes, systems, and people within an organization. While other types of risks, such as financial or market risks, may be associated with external factors, operational risks are unique in that they pertain to internal activities and operations.
- Unlike other types of risks, operational risks directly stem from the day-to-day activities and functions within an organization. These risks can include human errors, technology failures, fraud, legal and regulatory issues, supply chain disruptions, and natural disasters. The impact of operational risks can be significant, leading to financial losses, reputational damage, customer dissatisfaction, and even legal consequences.

For example, a manufacturing company may face an operational risk of production line breakdowns, resulting in delayed deliveries and loss of revenue. Similarly, a financial institution may encounter operational risks related to cyberattacks, which can compromise customer data and trust.

- To effectively manage operational risks, organizations employ various strategies and techniques, such as implementing internal controls, establishing risk assessment processes, conducting regular audits, and maintaining business continuity plans. By identifying potential risks and implementing appropriate risk mitigation measures, organizations can minimize the impact of operational risks and protect their financial stability and reputation.

Examples of operational risks and how they are managed

- Operational risks encompass a wide range of potential hazards that can arise from the day-to-day operations of a business. These risks can have a significant impact on the organization's financial stability, reputation, and ability to deliver products or services. Here are a few examples of operational risks and how they can be managed:

- **Supply Chain Disruptions:** A company heavily dependent on its supply chain can face operational risks such as delays, shortages, or quality issues. To manage this risk, organizations can establish relationships with multiple suppliers, conduct regular audits of suppliers' capabilities and practices, and implement backup plans in case of disruptions.
- **Delivery of Products:** Operational disruptions can also occur in the delivery of products or services to customers. For example, a transportation company may face risks associated with accidents, delivery delays, or damage to goods. To mitigate these risks, businesses can invest in proper training for drivers, perform regular vehicle maintenance, and implement real-time tracking systems.
- **IT System Failures:** With the increasing reliance on technology, operational risks related to IT system failures, cyberattacks, or data breaches have become more prevalent. To manage this risk, organizations can implement robust cybersecurity measures, regularly update their systems and software, perform backups of critical data, and conduct regular employee training on cybersecurity best practices.
- **Effective risk management** involves identifying potential risks, assessing their likelihood and severity, implementing control measures to prevent or mitigate these risks, and regularly monitoring and reviewing the effectiveness of these measures. By proactively managing operational risks, businesses can enhance their resilience and increase their chances of long-term success.

1.4 WHAT IS ENTERPRISE RISK MANAGEMENT (ERM)?

Enterprise risk management (ERM) is a methodology that looks at risk management strategically from the perspective of the entire firm or organization. It is a top-down strategy that aims to identify, assess, and prepare for potential losses, dangers, hazards, and other potentials for harm that may interfere with an organization's operations and objectives and/or lead to losses.

Key Takeaways

Enterprise risk management (ERM) is a firm-wide strategy to identify and prepare for hazards with a company's finances, operations, and objectives.

ERM allows managers to shape the firm's overall risk position by mandating that certain business segments engage with or disengage from particular activities.

Traditional risk management, which leaves decision making in the hands of division heads, can lead to siloed evaluations that do not account for other divisions.

The COSO framework for enterprise risk management identifies eight core components of developing ERM practices.

Successful ERM strategies can mitigate operational, financial, security, compliance, legal, and many other types of risks.

Understanding Enterprise Risk Management (ERM)

Enterprise risk management takes a holistic approach and calls for management-level decision making that may not necessarily make sense for an individual business unit or segment. Thus, instead of each business unit being responsible for its own risk management, firm-wide surveillance is given precedence.

It also often involves making the risk plan of action available to all stakeholders as part of an annual report. Industries as varied as aviation, construction, public health, international development, energy, finance, and insurance all have shifted to utilize ERM.

ERM, therefore, can work to minimize firm-wide risk as well as identify unique firm-wide opportunities. Communicating and coordinating between different business units are key for ERM to succeed, since the risk decision coming from top management may seem at odds with local assessments on the ground. Firms that utilize ERM will typically have a dedicated enterprise risk management team that oversees the workings of the firm.¹

While ERM best practices and standards are still evolving, they have been formalized through COSO, an industry group that maintains and updates such guidance for companies and ERM professionals.²

ERM-friendly firms may be attractive to investors because they signal more stable investments.

A Holistic Approach to Risk Management

Modern businesses face a diverse set of risks and potential dangers. In the past, companies traditionally handled their risk exposures via each division managing its own business. Enterprise risk management calls for corporations to identify all the risks they face. It also makes management decide which risks to manage actively. As opposed to risks being siloed across a company, a company sees the bigger picture when using ERM.

ERM looks at each business unit as a “portfolio” within the firm and tries to understand how risks to individual business units interact and overlap. It is also able to identify potential risk factors that are unseen by any individual unit.

Companies have been managing risk for years. Traditional risk management has relied on each business unit evaluating and handling its own risk and then reporting back to the CEO at a later date. More recently, companies have started to recognize the need for a more holistic approach.¹

A chief risk officer (CRO), for instance, is a corporate executive position that is required from an ERM standpoint. The CRO is responsible for identifying, analyzing, and mitigating internal and external risks that impact the entire corporation.

The CRO also works to ensure that the company complies with government regulations, such as Sarbanes-Oxley (SOX), and reviews factors that could hurt investments or a company's business units. The CRO's mandate will be specified in conjunction with other top management along with the board of directors and other stakeholders.

1.5 HISTORY OF FINANCIAL DISASTERS AND RISK MANAGEMENT FAILURES 2007 FINANCIAL CRISIS

Introduction :

The 2007 financial crisis, often referred to as the Global Financial Crisis (GFC), was a significant economic downturn that impacted numerous nations worldwide. It was instigated by a mix of factors, including subprime lending, securitization, and heightened leverage in the financial industry.

Causes of the Crisis

1. **Subprime Lending:** Financial institutions, including banks, provided large amounts of credit to borrowers who could not afford their mortgages. These subprime loans were subsequently bundled into securities and sold to investors, who incurred considerable losses when the real estate market collapsed.
2. **Securitization:** The extensive use of securitization enabled banks to transfer risk off their balance sheets, yet it also established a complicated network of financial instruments that were hard to appraise and manage.
3. **Excessive Leverage:** Financial entities took on an excessive amount of debt and heavily leveraged themselves, rendering them susceptible to failure when the crisis occurred.
4. **Housing Market Bubble:** The housing market experienced a considerable bubble, with prices escalating rapidly in the early 2000s. When the bubble burst, housing prices fell sharply, leaving numerous homeowners with mortgages exceeding the value of their properties.
5. **Deregulation:** The financial industry was under weak regulatory oversight, permitting financial institutions to engage in irresponsible behavior without proper scrutiny.

Consequences of the Crisis

1. **Global Recession:** The crisis resulted in a worldwide recession, with many countries facing substantial economic downturns.

2. **Job Losses:** The crisis caused widespread unemployment, with millions losing their jobs.
3. **Home Foreclosures:** A considerable number of homeowners could not manage their mortgage payments, leading to a rise in home foreclosures.
4. **Financial Institution Failures:** Several significant financial institutions collapsed, including Lehman Brothers, which declared bankruptcy in 2008.
5. **Bailouts:** Governments across the globe had to bail out ailing financial institutions, utilizing taxpayer funds to avert a total collapse of the financial system.

Lessons Learned

1. **Risk Management:** The crisis underscored the necessity of effective risk management practices within the financial sector.
2. **Regulation:** The crisis illustrated that regulation is crucial to avert irresponsible actions in the financial industry.
3. **Financial Stability:** The crisis revealed the significance of upholding financial stability, inclusive of the requirement for sufficient capital reserves and liquidity.
4. **Transparency:** The crisis emphasized the need for transparency within financial markets, including the demand for precise and clear disclosures of financial data.

Key Players

1. **Lehman Brothers:** Lehman Brothers was a prominent investment bank that went bankrupt in 2008, which initiated a global financial crisis.
2. **AIG:** AIG was a major insurance corporation that the US government bailed out in 2008 due to its considerable vulnerability to the subprime mortgage sector.
3. **Goldman Sachs:** Goldman Sachs was a key investment bank accused of playing a role in the crisis through its trading practices.

Timeline

1. **2001:** The US housing market starts to undergo a significant bubble, with rapidly increasing prices.
2. **2004:** The US Federal Reserve begins to increase interest rates, causing a slowdown in the housing market.
3. **2007:** The subprime mortgage sector starts to experience considerable losses, leading to a global financial crisis.

4. **2008:** Lehman Brothers files for bankruptcy, resulting in a worldwide panic.
5. **2009:** The Dodd-Frank Act is enacted by the US government, designed to oversee the financial sector and avert future crises.

Conclusion

The financial crisis of 2007 was a pivotal incident that underscored the necessity of sound risk management strategies, oversight, and economic stability. The crisis caused extensive unemployment, home repossessions, and a monumental rescue of the financial sector. Nevertheless, it also prompted major reforms, such as the Dodd-Frank Act, intended to inhibit future crises.

1.1 EXERCISE

Multiple Choice Questions

1. **Which of the following best illustrates a strategic risk?**
 - A. Facebook being fined for data privacy violations
 - B. Maersk's operations disrupted by a cyberattack
 - C. Blockbuster failing to adapt to online streaming trends
 - D. Target suffering a customer data breach

Correct Answer: C. Blockbuster failing to adapt to online streaming trends
2. **What type of risk was involved when Johnson & Johnson's opioid medications were found contaminated?**
 - A. Security Risk
 - B. Financial Risk
 - C. Quality Risk
 - D. Operational Risk

Correct Answer: C. Quality Risk
3. **The \$5 billion fine imposed on Facebook in 2019 was due to a failure in which type of risk management?**
 - A. Strategic Risk
 - B. Compliance Risk
 - C. Operational Risk
 - D. Reputational Risk

Correct Answer: B. Compliance Risk
4. **What is the primary difference between traditional risk management and Enterprise Risk Management (ERM)?**
 - A. Traditional risk management is more proactive than ERM
 - B. ERM focuses only on financial risks
 - C. Traditional risk management is siloed, while ERM takes a holistic, firm-wide approach
 - D. ERM focuses only on legal compliance

Correct Answer: C. Traditional risk management is siloed, while ERM takes a holistic, firm-wide approach

5. What is the role of a Chief Risk Officer (CRO) in ERM?

- A. To audit financial statements
- B. To oversee only cybersecurity threats
- C. To identify, analyze, and mitigate risks that affect the entire organization
- D. To handle marketing and communication strategies

Correct Answer: C. To identify, analyze, and mitigate risks that affect the entire organization

6. Why might investors be more attracted to firms that utilize ERM practices?

- A. ERM guarantees higher profits
- B. ERM indicates that the firm avoids all risks
- C. ERM signals more stable investments and better risk preparedness
- D. ERM ensures all decisions are made locally

Correct Answer: C. ERM signals more stable investments and better risk preparedness

Brief Answer Questions:

1. Briefly explain what reputational risk is and provide an example.
2. Describe operational risk and mention one real-world case illustrating it.
3. What is Enterprise Risk Management (ERM), and why is it important for modern businesses?
4. How does the COSO framework relate to ERM?



CAPITAL MARKET RISK MANAGEMENT

Unit Structure :

- 2.0 Learning Objectives
- 2.1 Introduction of Equity Markets
- 2.2 Introduction to Currency Markets
- 2.3 Commodities Markets
- 2.4 Derivatives
- 2.5 Fixed-Income Securities
- 2.6 Rating agencies
- 2.6 Rating agencies
- 2.7 Conclusion
- 2.8 Questions

2.0 LEARNING OBJECTIVES

By the end of this module, learners will be able to:

- Describe the structure and functioning of equity, currency, and commodity markets in India.
- Explain the basic concepts and types of derivative instruments such as forwards, futures, and options.
- Illustrate how derivative contracts are used to hedge against market risks in various asset classes.
- Understand the characteristics and valuation of fixed-income securities and their relevance in capital markets.
- Apply derivative strategies to manage risks associated with fixed-income investments.
- Analyze the role of credit rating agencies in assessing and mitigating capital market risks.

2.1 INTRODUCTION OF EQUITY MARKETS

Equity markets, also known as stock markets, are platforms where shares of publicly-traded companies are issued, bought, and sold. These markets

enable companies to raise capital by offering ownership stakes (equity) to investors in exchange for funding. Equity markets operate through formal exchanges of NSE and BSE or over-the-counter (OTC) networks.

2.1.1. National Stock Exchange (NSE)

The National Stock Exchange (NSE), established in 1992, is India's largest stock exchange by market capitalization and was the first to introduce fully automated electronic trading. Its benchmark index, the Nifty 50, tracks the performance of 50 of India's largest and most liquid companies, and it dominates the derivatives market with high trading volumes and liquidity. As of January 31, 2025, the National Stock Exchange (NSE) has **2,498 companies** listed.

2.1.2. Bombay Stock Exchange (BSE)

The Bombay Stock Exchange (BSE), founded in 1875, is Asia's oldest stock exchange and transitioned to electronic trading in 1995. Its benchmark index, the Sensex, consists of 30 blue-chip companies, and it lists more companies than NSE, making it popular among retail investors. As of January 31, 2025, BSE has **5,862 listed companies**.

2.1.3. Difference between Primary Market and secondary Market

Aspect	Primary Market	Secondary Market
Capital Raising	Companies receive funds directly.	No new capital raised; investors trade.
Issuance	New securities created (e.g., IPOs).	Existing securities traded.
Company Role	Directly involved in issuing securities.	Passive; no direct participation.
Examples	IPOs, private placements, rights issues.	Stock exchanges (NYSE, NASDAQ), OTC.
Frequency	Occasional (e.g., IPOs, bond issuances).	Continuous trading during market hours.
Price Determination	Set by company/underwriters pre-issue.	Driven by supply/demand in real-time.
Liquidity	Low (sporadic transactions).	High (easy buying/selling).
Intermediaries	Underwriters, investment banks.	Brokers, stock exchanges.
Regulation	Strict disclosure requirements (e.g., prospectus).	Focus on fair trading and transparency.

2.1.4. Importance of Equity Markets in the Indian Economy

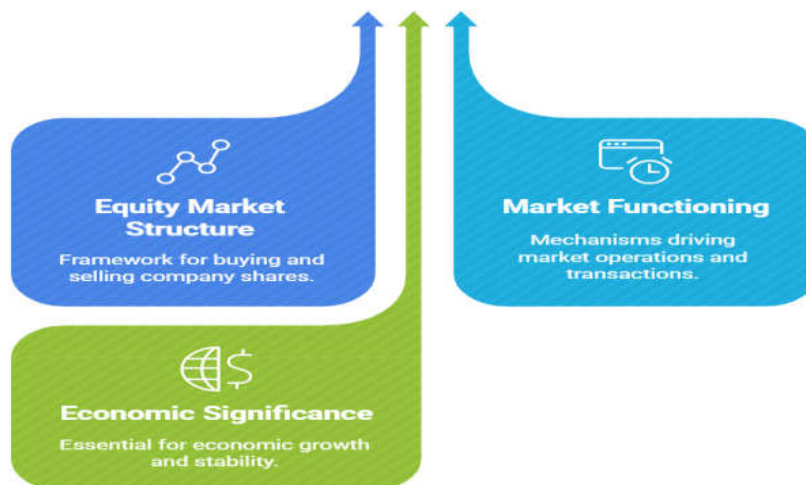
Equity markets play a crucial role in the Indian economy by facilitating capital formation, economic growth, and efficient resource allocation. Here are the key importance of equity markets in India:

1. Capital Formation and Economic Growth

Equity markets enable companies to raise capital for expansion, innovation, and business growth. This capital formation is essential for economic development as it allows businesses to invest in new projects, create jobs, and increase productivity. When companies access funds through equity markets, they can expand operations, leading to higher levels of economic activity and wealth creation.

2. Mobilization of Savings

Equity markets channel individual savings into productive investments. They provide a platform for individuals to invest their surplus funds in businesses, thereby mobilizing savings that might otherwise remain idle. This efficient allocation of resources supports overall economic development.



3. Government Revenue Generation

The equity market contributes to government revenue through various taxes, including capital gains tax, securities transaction tax, and corporate taxes paid by profitable companies. Additionally, the government can raise funds for infrastructure and social projects by issuing bonds in the market.

4. Price Discovery and Liquidity

Equity markets establish fair prices for securities through continuous trading and competition among buyers and sellers. This price discovery technique allows investors to make educated selections. Furthermore, the liquidity provided by equity markets allows investors to easily convert their investments into cash, attracting more participants to the market.

5. Investor Confidence and Market Efficiency

The performance of equity markets is often seen as a barometer of the economy's health. A thriving equity market boosts investor confidence, leading to increased investment in the economy. Well-functioning markets ensure that capital flows to the most efficient and promising businesses, promoting overall economic efficiency.

6. Employment Generation

By supporting business expansion and new ventures, equity markets contribute to job creation. When companies raise capital through equity markets, they often expand their operations, which requires additional workforce, thereby reducing unemployment rates.

7. International Investment and Market Position

Indian equity markets attract foreign portfolio investment, enhancing the country's integration with global financial markets. This international participation brings in additional capital, expertise, and diversification benefits. India's equity market has become increasingly attractive to global investors due to the country's strong growth prospects, stable policies, and improving infrastructure.

8. Corporate Governance and Accountability

Listing on equity markets imposes governance standards and transparency requirements on companies. This promotes better management practices, accountability to shareholders, and overall improvement in corporate governance standards.

The equity markets in India have evolved significantly, offering a wide range of investment opportunities and playing a pivotal role in the country's economic development. As India continues to grow as a major global economy, its equity markets will remain a critical component of its financial landscape.

2.1.5. Key Participants in Equity Markets

i. Issuers

Companies seeking capital: These are businesses at various stages of development that need funding for expansion, research, debt repayment, etc. They may be startups looking for initial funding, growing companies needing capital for expansion, or established firms seeking to finance new projects or refinance existing debt. The capital raised from equity markets provides these companies with the resources to innovate, create jobs, and contribute to economic growth.

IPO process: When a company goes public, it works with investment banks to determine share price, number of shares to issue, and marketing strategy. This involves extensive financial analysis, valuation modelling, and market research to set an appropriate price that balances the

company's funding needs with investor demand. The investment bank also helps create the necessary regulatory filings and coordinates the roadshow to generate investor interest before the shares are listed on an exchange.

Future public offerings: Established public companies may return to the market to raise additional capital by issuing more shares. These secondary offerings allow companies to access additional funds for expansion, acquisitions, or debt repayment without taking on more debt. The process is similar to an IPO but typically moves more quickly since the company is already public and has existing relationships with investors and investment banks.

ii. Investors

Institutional investors:

- **Pension funds:** Manage retirement savings for workers, needing long-term, stable returns. These funds collect contributions from employees and employers throughout workers' careers and must generate sufficient returns to meet future payout obligations. They typically invest in a diversified portfolio of equities, bonds, and alternative assets to balance risk and return over the long term.
- **Mutual funds:** Pool money from many investors to buy diversified portfolios, managed by professionals. They offer individual investors access to professionally managed portfolios with lower minimum investments than direct institutional investing. Mutual funds can be focused on specific sectors, geographic regions, or investment styles, allowing investors to customize their exposure to different market segments.
- **Hedge funds:** Use sophisticated strategies to achieve high returns, often with significant risk. These funds employ diverse strategies including leverage, short selling, derivatives, and complex trading algorithms to generate returns in both up and down markets. They typically cater to accredited investors due to their high-risk profiles and substantial minimum investments.
- **Insurance companies:** Invest premiums to fund future claims and policyholder benefits. They manage large portfolios to ensure they have sufficient reserves to meet their obligations while generating returns to enhance policyholder value. Their investment strategies must balance liquidity needs with return objectives, often focusing on investment-grade securities with predictable cash flows.
- **Sovereign wealth funds:** Managed by governments to invest national resources for future generations. These funds typically arise from natural resource revenues, fiscal surpluses, or foreign exchange reserves. They invest globally across asset classes to preserve and grow wealth for future citizens, often with long-term horizons and strategic economic development goals.

Retail investors:

- **Direct investment:** Individuals buying stocks through brokerage accounts. This allows individuals to directly own shares in companies they believe in, with the potential for capital appreciation and dividend income. Direct investors must conduct their own research or rely on external analysis to make informed decisions.
- **Indirect investment:** Participating through retirement accounts, mutual funds, or ETFs. This provides diversification and professional management without the need for direct stock selection. Indirect investors benefit from lower transaction costs and minimum investments compared to direct equity purchases.
- **Behavioral factors:** Often driven by emotional decisions, news, and personal financial goals. Retail investors may react to short-term market fluctuations based on fear or greed, rather than long-term fundamental analysis. Their investment decisions can also be influenced by life events, financial milestones, and changing risk tolerance over time.

iii. Intermediaries

Brokers:

- **Execution services:** Matching buy and sell orders efficiently. Brokers act as the middlemen between buyers and sellers, ensuring transactions are executed at the best available prices. They must navigate complex order types and market conditions to fulfill client orders promptly and cost-effectively.
- **Research provision:** Some brokers offer market analysis and stock recommendations. This research can include fundamental analysis of companies, technical analysis of price trends, and macroeconomic forecasting to help investors make informed decisions.
- **Technology platforms:** Modern brokers provide trading apps and online interfaces. These platforms offer real-time pricing, charting tools, news feeds, and educational resources to enhance the trading experience. They also provide secure access to multiple markets and asset classes from a single interface.

Investment banks:

- **Underwriting:** Guaranteeing to buy unsold shares in an IPO to ensure the company raises capital. This involves assessing the potential demand for the shares and committing the bank's own capital to cover any shortfall. Underwriting fees compensate banks for this risk and their expertise in pricing and marketing the offering.
- **Advisory services:** Helping companies structure transactions and navigate regulatory requirements. Investment banks provide expertise

in corporate finance, tax considerations, legal compliance, and market conditions to ensure transactions are structured optimally.

- **Sales and trading:** Connecting institutional investors with investment opportunities. Sales teams market securities to potential investors, while traders facilitate the actual buying and selling process, providing liquidity and market insight.

iv. Regulators

- **Legal framework:** Creating and enforcing securities laws to prevent fraud and manipulation. Regulatory bodies establish the rules that govern market participants, ensuring transparency, fairness, and integrity in financial markets. These laws cover disclosure requirements, insider trading prohibitions, and market manipulation restrictions.
- **Market oversight:** Monitoring trading activities for suspicious patterns or violations. Regulators use advanced surveillance systems to detect unusual trading activity, price manipulation, and other fraudulent behaviors. They can investigate potential violations and impose penalties to maintain market integrity.
- **Investor protection:** Ensuring companies disclose accurate information and brokers act in clients' best interests. Regulators require companies to provide comprehensive financial statements and risk disclosures, while brokers must adhere to suitability standards and avoid conflicts of interest.
- **International coordination:** Working with global regulators to address cross-border issues. As markets become increasingly global, regulators must collaborate on standards for disclosure, anti-money laundering, and market abuse prevention. They also coordinate on cross-border enforcement actions when violations involve multiple jurisdictions.

v. Exchanges

- **Trading infrastructure:** Providing the technological platform for matching orders. Exchanges operate the systems that receive, process, and match buy and sell orders from market participants worldwide. These platforms must handle high volumes of transactions with minimal latency and maximum reliability.
- **Listing requirements:** Setting standards for companies to maintain market quality. Exchanges establish criteria for companies to be listed, including minimum market capitalization, financial performance, corporate governance standards, and disclosure practices. These requirements help ensure listed companies meet basic quality standards.

- **Market data:** Publishing price information, volume statistics, and other trading data. Exchanges generate and distribute real-time and historical market data that investors, analysts, and media rely on for decision-making. This data includes not just prices but also order book information, trading volume, and market depth.
- **Clearing and settlement:** Ensuring transactions are completed properly after execution. Exchanges work with clearinghouses to guarantee transaction completion, even if one party defaults. The clearing process confirms trade details, while settlement involves the actual transfer of securities and funds between parties.

2.2 INTRODUCTION TO CURRENCY MARKETS

Currency markets, also known as foreign exchange (forex) markets, are decentralized global markets where currencies are bought, sold, and exchanged at fluctuating exchange rates. These markets operate 24 hours a day, five days a week, and facilitate the conversion of one currency to another for various economic transactions.

2.2.1 Important of Currency Markets:

1. Facilitate International Trade

Currency markets enable businesses to conduct cross-border transactions by converting currencies, making global commerce possible. They provide the mechanism for companies to pay for imports and receive payment for exports in different currencies. Without these markets, international trade would be extremely difficult due to the challenges of currency conversion.

2. Hedging Against Risk

These markets allow companies and investors to protect themselves against adverse currency fluctuations that could impact their financial positions. Businesses can use financial instruments like forward contracts and options to lock in exchange rates for future transactions. This helps manage the uncertainty and potential losses from currency volatility.

3. Price Discovery

Through supply and demand dynamics, currency markets determine the relative values of different currencies. The exchange rates reflect the collective expectations of market participants about economic conditions, interest rates, and political stability. This process helps establish fair and transparent valuations for currencies.

4. Capital Flow

Currency markets provide a mechanism for capital to flow between countries, supporting investment and economic development. They facilitate foreign direct investment and portfolio investment by enabling investors to convert currencies when investing abroad. This flow of capital

helps developing economies access foreign funds for growth and development.

5. Speculation

Currency markets offer opportunities for participants to profit from currency value movements, adding liquidity to the markets. Speculators trade currencies based on their expectations of future exchange rate changes. While speculation can increase market volatility, it also provides necessary market depth and efficiency by ensuring there are always willing buyers and sellers.

2.2.2. Participants in Currency Markets

1. **Commercial Banks:** Act as intermediaries for currency transactions, providing exchange services to businesses and individuals while also engaging in speculative trading for their own accounts.
2. **Central Banks:** The Reserve Bank of India (RBI) intervenes in currency markets to manage exchange rate volatility, maintain foreign exchange reserves, and implement monetary policy objectives.
3. **Multinational Corporations:** Use currency markets to hedge against exchange rate risks associated with international operations, convert profits back to home currency, and manage cash flows across borders. E.g. **Coca-Cola:** This global beverage company operates in over 200 countries and generates revenue in multiple currencies. It uses currency markets to hedge against exchange rate risks when converting foreign earnings back to US dollars and managing cash flows across borders.
4. **Hedge Funds and Investment Funds:** Speculate on currency movements to generate returns, often employing leverage to amplify potential profits (and risks). E.g. **Soros Fund Management:** George Soros founder Known for its successful currency speculation, such as the famous bet against the British pound in 1992 that generated over \$1 billion in profits.
5. **Retail Forex Traders:** Individual investors who trade currencies online through brokerage platforms, seeking to profit from exchange rate fluctuations. E.g. for **Individual Investors:** These are everyday people who trade currencies online through platforms like MetaTrader, OANDA, or Forex.com. They might be professionals trading part-time or full-time traders seeking to profit from exchange rate fluctuations. For **Retail Trading Platforms:** Companies like ThinkMarkets or Pepperstone provide the infrastructure for individual traders to access currency markets, often offering educational resources and trading tools.
6. **Foreign Exchange Brokers:** Facilitate transactions between market participants, matching buyers with sellers and earning commissions or spreads. E.g. ONANDA, Forex.com, IG Group and **Pepperstone**

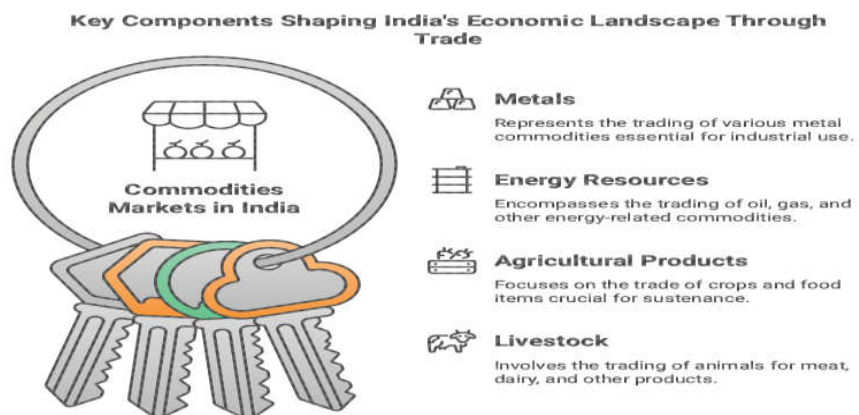
7. **Money Transfer Companies:** Specialize in facilitating currency exchange for remittances and international money transfers for individuals and businesses. E.g. Western Union, MoneyGram, Wise and Remitty.
8. **Government Agencies:** Besides central banks, other government entities may participate in currency markets to manage foreign exchange reserves or implement economic policies.

2.3 COMMODITIES MARKETS

Commodities markets in India facilitate the trading of raw materials and primary goods, including metals, energy resources, agricultural products, and livestock. These markets provide a platform for price discovery, risk management, and speculation, playing a crucial role in the country's economic landscape. Trading occurs through standardized contracts on regulated exchanges, with participants ranging from farmers and producers to investors and speculators.

2.3.1. Major Commodity Exchanges

1. **Multi Commodity Exchange (MCX):** India's largest commodity exchange, accounting for a significant portion of the country's commodity trading volume. It offers trading in metals, energy, and agricultural commodities.



2. **National Commodity and Derivatives Exchange (NCDEX):** Specializes in agricultural commodities such as cereals, pulses, and spices, with a delivery-based settlement system.
3. **Indian Commodity Exchange (ICEX):** Focuses on diamond derivatives and other select commodities including agricultural products like castor seeds, guar seeds, raw jute, and rubber, as well as non-agricultural products such as steel.
4. **National Multi-Commodity Exchange (NMCE):** Provides trading in various agricultural and non-agricultural commodities.
5. **National Stock Exchange (NSE) and Bombay Stock Exchange (BSE):** While primarily stock exchanges, they also facilitate commodity trading through their derivatives segments.

2.3.2. Importance and Trends

i. Price Discovery and Risk Management

Commodities markets in India provide a transparent platform for determining the fair market prices of various commodities based on supply and demand dynamics. Producers, consumers, and traders utilize these markets to hedge against price fluctuations, ensuring more stable cash flows and reduced financial risk. For example, farmers can lock in prices for their crops using futures contracts, protecting themselves from potential price drops after harvest.

ii. Growing Retail Participation

The commodities market has seen increasing participation from retail investors in recent years. This trend is driven by improved financial literacy and the availability of user-friendly online trading platforms that make commodity trading more accessible to the general public. Retail investors are also attracted to commodities as a portfolio diversification tool and inflation hedge.

iii. Agricultural Significance

Given India's agrarian economy, agricultural commodities form a crucial part of the commodities market. Prices of these commodities are influenced by factors such as monsoon patterns, which affect crop yields, and government policies related to minimum support prices and procurement. The commodities market helps farmers obtain better prices for their produce by providing price discovery mechanisms and reducing dependence on intermediaries.

iv. Urbanization and Industrialization

As India continues to develop, the demand for energy and metal commodities is expected to increase significantly. This growth is driven by infrastructure development projects, manufacturing expansion, and rising domestic consumption as the economy modernizes. For instance, the push for renewable energy has increased demand for metals like copper and aluminum used in solar panels and wind turbines.

2.3.3. Challenges

i. Price Volatility

Commodities markets are inherently volatile due to factors such as weather conditions affecting crop yields, global demand fluctuations, and geopolitical events. This volatility can create significant risk for market participants, especially those without proper hedging strategies. For example, during the Russia-Ukraine war in 2022, crude oil and wheat prices experienced dramatic price swings.

ii. Regulatory Changes

The commodities market in India is subject to regulatory interventions that can impact market operations and participant strategies. These include restrictions on futures trading, position limits, and changes in

margin requirements. Regulatory changes are sometimes implemented to control price inflation or address market manipulation concerns, but they can also create uncertainty for market participants.

2.4. DERIVATIVES

Derivatives are financial instruments whose value is derived from an underlying asset, such as stocks, commodities, currencies, interest rates, or even other derivatives. They do not hold intrinsic value themselves but are tied to the performance or price movements of the underlying asset.

2.4.1 Derivatives' Primary Functions:

➤ **Hedging Risk**

Hedging involves using derivatives to offset potential losses from price fluctuations in underlying assets. For example, an airline might use fuel futures contracts to lock in fuel prices, protecting against future increases that could hurt profitability. This strategy transforms uncertain market risks into known, manageable costs.

➤ **Speculation**

Speculation involves taking positions in derivatives based on expectations of future price movements without any intention of holding the underlying asset. Traders might buy options on a stock index anticipating a market rally, profiting if their prediction is correct. While speculation offers opportunities for significant gains, it also carries substantial risk since derivatives can amplify losses.

➤ **Arbitrage**

Arbitrageurs exploit price discrepancies between related financial instruments or markets using derivatives. For instance, if the price of a stock doesn't align with the price of its corresponding futures contract, arbitrageurs might simultaneously buy and sell these instruments to profit from the difference. This activity helps maintain efficient markets by ensuring prices remain consistent across different trading venues and instruments.

2.4.2. Types of Derivatives Explained Simply

➤ **Futures**

Futures are like binding agreements to buy or sell something at a set price and date in the future. They're traded on exchanges and are popular because they lock in prices, which helps businesses protect against future price changes. For example, a wheat farmer might use futures to guarantee they'll get a certain price for their wheat harvest, even before they've grown it.

➤ **Options**

Options give buyers the right, but not the obligation, to buy (call options) or sell (put options) an underlying asset at a specified price before expiration. Unlike futures, options buyers have flexibility to

choose whether to exercise their right based on market conditions. This makes them useful for both hedging and speculative strategies, with premiums representing the cost of this flexibility. E.g. Imagine you own 100 shares of XYZ stock currently trading at Rs 50 per share. You're concerned about a potential price drop but don't want to sell your shares yet. You could buy a put option with a strike price of Rs 45 that expires in three months. This gives you the right to sell your shares at Rs 45 even if the market price drops below that. If the stock price falls to Rs 35, you can exercise your put option and sell at Rs 45, limiting your loss. If the stock price stays above Rs 45, you can let the option expire and still keep your shares.

➤ **Forwards**

Forwards are like customized futures contracts that are created directly between two parties instead of through an exchange. They're flexible because you can tailor them to specific needs, like exact amounts or dates. However, they're riskier than futures because if one party doesn't fulfill their side of the deal, the other party loses out.

➤ **Swaps**

Swaps involve exchanging financial obligations between two parties. The most common type is interest rate swaps, where companies might exchange fixed interest rate payments for floating rate payments (or vice versa). This helps companies manage their risk depending on how they think interest rates might change in the future.

2.5 FIXED-INCOME SECURITIES

Fixed-income securities are financial instruments that provide a return in the form of fixed periodic payments and the return of principal at maturity. They are typically issued by governments, corporations, and other entities to raise capital. Key characteristics include a fixed payment schedule, a specified interest rate (coupon rate), and a defined maturity date.

2.5.1 Types of Fixed-Income Securities

i. **Government Bonds**

Government bonds are issued by national governments to fund public projects and obligations. They are considered low risk because they are backed by the government's taxing power. In India, government bonds include securities like the 75% RBI tax-free Bonds, which are issued by the Reserve Bank of India and offer tax benefits to investors.

ii. **Corporate Bonds**

Corporate bonds are issued by corporations to raise capital for business operations, expansion, or other purposes. The risk varies based on the company's creditworthiness, with higher risk generally offering higher returns. In India, companies like L&T Finance Limited and Shriram City Union Finance Limited issue corporate bonds to raise funds for their operations.

iii. Municipal Bonds

Municipal bonds are issued by local governments or their agencies to fund public projects such as infrastructure development, schools, and hospitals. Bonds typically offer tax advantages to investors. In India, municipal bonds are issued by municipal corporations for infrastructure projects. For example, the Mumbai Municipal Corporation has issued bonds to fund urban development projects.

iv. Mortgage-Backed Securities (MBS)

Mortgage-backed securities are financial products backed by mortgage loans. The cash flows from the mortgage payments are passed through to investors. In India, institutions like Housing Development Finance Corporation (HDFC) issue mortgage-backed securities backed by housing loans.

v. Asset-Backed Securities (ABS)

Asset-backed securities are backed by various types of loans or receivables, such as auto loans, credit card receivables, or student loans. These securities allow lenders to transfer risk to investors while providing funding for new loans. In India, companies like Bajaj Finance issue asset-backed securities backed by their auto loan portfolios.

2.6 RATING AGENCIES

Rating agencies are independent organizations that evaluate and assess the creditworthiness of financial products and financial institutions. They provide investors with an objective assessment of the likelihood that a borrower will default on its debt obligations.

2.6.1 Key Functions and Roles of Rating Agencies

i. Credit Assessment

Rating agencies analyze financial statements, industry position, economic conditions, and management quality to determine the likelihood of default. They assign credit ratings using standardized scales that help investors understand relative risk levels across different issuers and instruments.

ii. Market Confidence

Credit ratings serve as important signals to investors about the risk profile of potential investments. Positive ratings can enhance market confidence in issuers, while downgrades may trigger selling pressure and market volatility.

iii. Regulatory Compliance

Many financial regulations require institutions to hold capital based on the credit ratings of their investments. Ratings are used to determine risk weights for bank capital requirements under frameworks like Basel III.

iv. Pricing Mechanism

Higher credit ratings typically correspond to lower borrowing costs as investors demand smaller risk premiums. Ratings directly influence the interest rates and yields on debt instruments, with lower-rated securities generally offering higher returns to compensate for increased risk.

v. Information Efficiency

By conducting thorough analyses and publishing their findings, rating agencies help reduce information asymmetry between issuers and investors. Their assessments provide a standardized way to compare credit risk across different issuers and market sectors.

2.6.2. Rating Process

i. Data Collection

Rating agencies gather comprehensive financial information including income statements, balance sheets, and cash flow statements, as well as operational data about the issuer's business model, market position, and governance structure. They collect both quantitative data from official financial reports and qualitative information through management interviews and industry analyses to form a complete picture of the issuer's circumstances.

ii. Analysis

Analysts evaluate the issuer's financial health through ratio analysis, trend assessment, and comparative industry benchmarks, while also considering macroeconomic factors that might impact performance. They assess management quality, strategic positioning, competitive advantages, and potential risks specific to the issuer's industry sector to determine its ability to meet debt obligations under various economic scenarios.

iii. Rating Committee

A specialized committee of senior analysts and rating officers reviews the completed analysis, discussing different perspectives and potential risks before reaching a consensus on the appropriate credit rating. The committee ensures consistency in application of rating criteria across different issuers and maintains the agency's established standards for each rating category through rigorous debate and evidence evaluation.

iv. Ongoing Monitoring

Rating agencies continuously track issuers' performance through quarterly reports, news developments, and economic changes that might affect creditworthiness, with dedicated surveillance teams monitoring for material events. They update ratings when significant changes in financial performance, business strategy, or external conditions warrant reconsideration, typically providing market participants with advance notice of potential rating actions through watchlists or outlook changes.

2.6.3. Major Rating Agencies and Their Rating Grades:

- **International Rating Agencies**

- i. **Standard & Poor's (S&P)**

Founded in 1941, S&P is one of the largest rating agencies with a global presence. Their rating scale ranges from AAA (highest creditworthiness) to D (default). Investment-grade ratings span from AAA to BBB-, while speculative-grade ratings range from BB+ to D.

- ii. **Moody's Investors Service**

Established in 1909, Moody's is known for its detailed credit analysis. Their rating scale ranges from Aaa (highest creditworthiness) to C (default). Investment-grade ratings include Aaa through Baa3, while speculative-grade ratings start at Ba1 and go down to C.

- iii. **Fitch Ratings**

Created in 1923, Fitch operates in over 30 countries. Their rating scale is similar to S&P's, ranging from AAA to D. Investment-grade ratings are from AAA to BBB-, and speculative-grade ratings begin at BB+ and go down to D.

- **Leading Indian Rating Agencies**

- iv. **CRISIL (Credit Rating Information Services of India Limited)**

India's premier rating agency, established in 1987 as a subsidiary of S&P Global. Their rating scale is likely aligned with S&P's framework.

- v. **ICRA Limited**

Formed in 1991 as an affiliate of Moody's Investors Service. Their rating scale would typically mirror Moody's structure, with grades from Aaa to C, similar to their parent company.

- vi. **CARE Ratings**

Established in 1993, CARE provides comprehensive credit ratings across various sectors. They would follow a similar structure to international standards, likely ranging from AAA to D.

- vii. **India Ratings and Research**

A fully owned subsidiary of the Fitch Group. Their rating scale would align with Fitch's framework, ranging from AAA to D with similar investment and speculative grade distinctions.

- viii. **Brickwork Ratings India Private Limited**

Recognized for evaluating credit risks across various industries. They would follow standard rating conventions similar to other agencies.

2.7 CONCLUSION

The unit provides a comprehensive overview of various capital market components and their risk management aspects. It covers equity markets,

currency markets, commodities markets, derivatives, fixed-income securities, and rating agencies, highlighting their importance, participants, and functions in the financial ecosystem. Understanding these elements is crucial for effective capital market risk management and informed investment decision-making.

2.8 QUESTIONS

2.8.1 Fill-in-the-Blanks

1. The National Stock Exchange (NSE) was established in _____ and is India's largest stock exchange by market capitalization.
2. The Bombay Stock Exchange (BSE) is Asia's oldest stock exchange, founded in _____.
3. In the primary market, companies raise capital by issuing _____ securities, while the secondary market involves trading of existing securities.
4. Currency markets facilitate international trade by enabling the _____ of one currency to another.
5. Commodities markets in India provide a platform for price discovery, risk management, and speculation in raw materials and primary goods, with major exchanges including the Multi Commodity Exchange (MCX) and the National Commodity and Derivatives Exchange (NCDEX).
6. Derivatives are financial instruments whose value is derived from an _____ asset, such as stocks, commodities, currencies, or interest rates.

Answer. 1. 1992. 2. 1875 3. New 4. Exchange 5. underlying

2.8.2. Brief Questions

1. What are the key differences between the primary market and the secondary market?
2. How do currency markets help businesses manage exchange rate risk?
3. What are the main functions of derivatives in financial markets?
4. How do rating agencies contribute to market efficiency and investor decision-making?
5. What are the main types of fixed-income securities and how do they differ in terms of risk and return?



CREDIT MARKET RISK MANAGEMENT

Unit Structure :

- 3.0 Learning Objectives
- 3.1 Introduction
- 3.2 Basel Norms
- 3.3 Capital adequacy ratio
- 3.4 Conclusion
- 3.5 Questions

3.0 LEARNING OBJECTIVES

By the end of this module, learners will be able to:

- Understand the fundamentals of credit risk and its significance in financial institutions.
- Identify the key information required for evaluating credit risk and making informed lending decisions.
- Explain the procedure and best practices involved in effective credit risk management and the credit lifecycle.
- Describe the Loan Review Mechanism (LRM) and understand regulatory guidelines for credit rating frameworks in banks.
- Gain insights into the Basel Norms, especially Basel III, and their importance in global credit risk regulation.
- Calculate the Capital Adequacy Ratio (CAR) as per Basel guidelines and assess the capital position of a bank.

3.1 INTRODUCTION

Credit risk management is essential for financial institutions, particularly banks, as it involves systematically identifying, assessing, monitoring, and controlling potential losses from borrower defaults. This function ensures lending activities align with an institution's risk appetite and strategic objectives while protecting shareholder value and maintaining regulatory compliance. Modern credit risk frameworks combine advanced quantitative models with traditional assessments to evaluate borrower creditworthiness across economic conditions, supported by technological innovations like AI and machine learning that enable real-time portfolio monitoring. Despite these advancements, credit risk managers face challenges from complex financial products, global market

interdependencies, and economic uncertainty, while increasingly incorporating ESG factors into assessments to address climate-related risks and stakeholder expectations.



3.1.1. Information Required for Evaluation of Credit Risk

i. Borrower's Financial Information

Financial institutions require detailed financial statements including income statements, balance sheets, and cash flow statements to assess a borrower's financial health. These documents help determine the borrower's ability to generate sufficient cash flow to service debt obligations. The debt-to-income ratio is particularly critical as it indicates the proportion of income dedicated to debt repayment.

ii. Credit History

Credit reports from recognized bureaus provide insight into a borrower's payment behavior and creditworthiness. Lenders analyze payment history to identify patterns of timely or delinquent payments, while existing credit lines reveal the borrower's overall credit utilization and management of debt obligations.

iii. Employment and Business History

Stability in employment or business operations demonstrates a borrower's reliability and capacity for consistent income generation. A strong track record in their current position or business indicates experience and reduces the perceived risk of sudden income disruption.

iv. Collateral Details

The value, liquidity, and type of collateral offered serve as a safeguard for lenders in case of default. Highly liquid collateral with stable value provides greater security, while specialized or illiquid assets may require additional risk assessment.

v. Loan Purpose

Understanding the intended use of funds helps lenders assess the potential return on investment and repayment likelihood. Loans for productive purposes with clear repayment sources typically present lower risk compared to unsecured personal loans without specific collateral or purpose.

vi. Industry and Economic Factors

Market conditions, industry trends, and economic indicators can significantly impact a borrower's ability to repay. Lenders consider factors such as industry growth prospects, regulatory changes, and economic cycles when evaluating the long-term viability of a loan.

3.1.2. Procedure for Credit Risk Management

i. Credit Risk Identification

Credit risk identification involves recognizing potential sources of risk within a financial institution's loan portfolio. This includes analyzing borrower characteristics, industry sectors, economic trends, and portfolio concentration levels that might indicate higher risk exposure. The goal is to systematically pinpoint areas where credit losses could potentially occur before they materialize.

ii. Credit Risk Assessment

Credit risk assessment evaluates a borrower's creditworthiness through financial analysis, credit scoring models, and qualitative judgment. Lenders examine financial statements, cash flow stability, debt ratios, and credit history while also considering management quality, industry position, and economic environment. This comprehensive evaluation helps categorize borrowers into risk tiers and determines appropriate loan terms and pricing.

iii. Credit Risk Monitoring

Credit risk monitoring involves ongoing surveillance of borrowers' financial health and economic conditions that might affect repayment ability. This continuous process includes reviewing updated financial statements, tracking payment behavior, assessing compliance with loan covenants, and analyzing macroeconomic trends. Early warning systems help identify deteriorating credit conditions before they result in default.

iv. Credit Risk Mitigation

Credit risk mitigation implements strategies to reduce potential losses from identified risks. Common approaches include requiring collateral or guarantees, structuring loans with protective covenants, diversifying the portfolio across industries and geographies, and maintaining adequate provisions for loan losses. These measures help balance risk exposure with potential returns while ensuring compliance with regulatory capital requirements.

3.1.3. Credit Lifecycle

The following are the various stage of Credit Lifecycle explained below:

i. Application

The application stage begins when a borrower submits a formal request for credit, providing personal and financial information to the

lender. This includes completing forms, submitting documentation, and specifying the loan amount and purpose. The quality and completeness of this application form the foundation for all subsequent credit decisions.

ii. Underwriting

Underwriting involves a thorough evaluation of the borrower's creditworthiness, where lenders analyze financial statements, credit history, employment status, and other relevant factors. Underwriters assess the risk of lending to the applicant and determine appropriate terms, interest rates, and loan structures based on their findings.

iii. Approval

The approval stage occurs when the lender decides to grant credit based on the underwriting assessment. This decision includes finalizing loan terms, conditions, and amounts, and may involve setting specific requirements for collateral, payment schedules, or covenants that the borrower must agree to.

iv. Disbursement

Disbursement is when the lender releases the approved funds to the borrower according to the agreed-upon terms. This may involve transferring money directly to the borrower's account, paying a third party on the borrower's behalf, or providing funds in installments as needed for the loan's purpose.

v. Monitoring

Monitoring involves ongoing surveillance of the borrower's financial health and compliance with loan terms throughout the loan period. Lenders track payment history, financial performance, and any changes in the borrower's circumstances that might affect their ability to repay the loan.

vi. Review

The review process occurs at scheduled intervals or when specific triggers are met, where lenders formally reassess the loan's status and the borrower's creditworthiness. This may result in adjustments to loan terms, interest rates, or requirements based on changes in the borrower's situation or market conditions.

vii. Renewal

Renewal allows borrowers to extend the loan period or restructure their credit arrangements when the original terms are about to expire. This process typically involves a new underwriting assessment to determine if the borrower still meets the lender's criteria for continued credit.

viii. Closure

Closure happens when the borrower fully repays the loan according to the agreed terms, or when the lender closes the account due to default

or other contractual reasons. Proper closure includes final reconciliation of accounts, release of any collateral, and documentation of the loan's completion status.

3.1.4 Loan Review Mechanism Guidelines:

The loan review mechanism is a systematic process that banks use to evaluate the quality of their loan portfolios through comprehensive coverage of all loan categories, regular quarterly reviews, and independent assessments by risk management teams. This process involves classifying loans based on risk levels (performing, watchlist, non-performing), and requires thorough documentation of findings along with recommendations for corrective actions to address any identified risks or issues.

i. Comprehensive Coverage

The bank should review every type of loan they've given out, including personal loans, business loans, and mortgages. This means looking at all loan categories and segments to get a complete picture of the loan portfolio. The goal is to ensure no loans are overlooked and all potential risks are identified.

ii. Regular Frequency

Loan reviews should happen on a set schedule, at least once every three months (quarterly). Consistent timing helps identify problems early before they become too serious. This regular assessment allows the bank to stay updated on the status of all loans throughout the year.

iii. Independent Assessment

The review process should be conducted by a separate team within the bank that specializes in risk management. These independent assessors can provide an unbiased evaluation of loan quality. Their objectivity helps ensure that potential issues aren't missed due to familiarity or bias from the loan origination team.

iv. Risk Grading

Loans are categorized based on their level of risk, typically classified as performing, watchlist, or non-performing. Performing loans are those being repaid on time with no issues. Watchlist loans might have some concerns that need monitoring, while non-performing loans are those where borrowers have stopped making payments.

v. Reporting and Action

After each review, the team should document their findings in a clear report. They should also recommend specific actions to address any identified risks or problems. These recommendations might include modifying loan terms, requesting additional collateral, or developing strategies to help struggling borrowers get back on track.

Introduction to Basel Norms

The Basel Accords are a set of international banking regulations developed by the Basel Committee on Banking Supervision (BCBS) to promote financial stability by strengthening bank capital requirements and introducing new regulatory standards on liquidity and leverage. These accords have evolved over time to address the complexities and risks of a rapidly changing financial landscape.

3.2.1 Basel I (1988)

Basel I marked the first global attempt to improve the stability of banks by introducing capital adequacy requirements. It largely focused on credit risk and developed the notion of Risk-Weighted Assets (RWA), which assigned assets a risk-weight depending on their perceived credit risk. The framework categorized assets into different risk buckets, with risk weights ranging from 0% (for government bonds) to 100% (for commercial loans).



This system aimed to standardize how banks calculated their capital requirements through a simplified approach to measuring risk. It stipulated a minimum capital, referred to as the Capital Adequacy Ratio (CAR), of 8% of their RWA.

3.2.2 Basel II (2004)

Basel II offered a more comprehensive framework that included market risk as well as operational risk. The capital requirement remained at 8% of Risk-Weighted Assets (RWA), although the approach became more nuanced with a three-pillar approach:

1. Minimum Capital Requirements (Pillar 1)

Basel II refined the calculation of minimum capital requirements by introducing more sophisticated methods for calculating credit risk, while also incorporating capital charges for market risk and operational risk.

- **Credit Risk:** Banks could choose between different approaches based on their size and complexity:

- **Standardised Approach:** Continued the concept of Risk-Weighted Assets (RWA) from Basel I but introduced more granularity by using external credit ratings to assess the risk of different assets.
- **Internal Ratings-Based (IRB) Approach:** Larger, more sophisticated banks could use their own internal models to calculate credit risk, subject to regulatory approval.
- Banks were required to keep capital to cover losses due to fluctuations in market variables such as interest rates, stock prices, and foreign exchange rates. This was presented using Value-at-Risk (VaR) models.
- Basel II added capital costs for operational risk, which includes possible losses due to internal processes, human error, system breakdowns, or external events like fraud or cyberattacks. Banks could utilize the Basic Indicator Approach (BIA), the Standardized Approach, or the more advanced Advanced Measurement Approach (AMA) to determine their operational risk capital.

2. Supervisory Review Process (Pillar 2)

Basel II established a process to ensure that banks not only have the minimum required capital, but also examine their whole risk profile. The Internal Capital Adequacy Assessment Process (ICAAP) requires banks to examine their capital requirements based on their risk exposure.

3. Market Discipline (Pillar 3)

Recognizing the importance of transparency, Basel II introduced the concept of market discipline by bringing focus on transparent reporting by banks. This pillar sought to help market participants (investors, analysts, and counterparties) understand a bank's risk exposure, capital situation, and risk management methods, putting external pressure on banks to handle risks responsibly. This was accomplished through increased disclosure requirements, which included more extensive reporting on capital adequacy, asset risk weighting, and internal risk management practices.

10.4.3. Basel III (2010)

The 2008 Global Financial Crisis revealed significant gaps in the Basel II framework. Basel III expanded the framework with a focus on improving banks' resilience during periods of economic distress by introducing stricter capital requirements, new liquidity standards, and measures to mitigate systemic risk.

3.2.3 Key Reforms in Basel III

Increase in Capital Requirements: Basel III changed the structure of capital requirements by increasing the requirement for Common Equity Tier 1 (CET1) and Total Tier 1 Capital. While retaining the CRAR benchmark of 8%, it increased the required Total Tier 1 Capital, reducing reliance on Tier 2 Capital and improving the quality of capital.

1. **Leverage Ratio:** To limit excessive leverage and borrowing by banks, Basel III introduced a leverage ratio, which is a non-risk-weighted measure to complement the risk-based capital requirements. The leverage ratio requires banks to hold at least 3% Tier 1 Capital against their total (non-risk-weighted) exposures.
2. **Liquidity Requirements:** Basel III introduced two major liquidity standards, the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), aimed at ensuring banks maintain adequate levels of liquidity over both short and long-term horizons.
 - **Liquidity Coverage Ratio (LCR):** Requires banks to hold enough High-Quality Liquid Assets (HQLA) to meet their expected net cash outflows over a 30-day stress period.

Strengthening Banking Stability with Basel III Regulations



- **Net Stable Funding Ratio (NSFR):** Ensures banks maintain a stable funding base for their long-term assets by requiring enough Available Stable Funding (ASF) to meet their Required Stable Funding (RSF) needs over a one-year period.
3. **Macroprudential Framework:** Basel III introduced measures to address systemic risk and prevent the build-up of excessive risk in the financial system as a whole, including countercyclical capital buffers and requirements for Global Systemically Important Banks (G-SIBs).

3.2.4. Advantages of the Basel Accords

1. Enhanced Risk Management

The Basel Accords have established comprehensive frameworks for assessing and managing different types of risks (credit, market, operational). They've encouraged banks to develop more sophisticated risk models, particularly through the IRB approach in Basel II. This has promoted a culture of risk awareness throughout financial institutions.

2. Improved Capital Adequacy

The accords have set minimum capital requirements to ensure banks can absorb potential losses. Basel I established an 8% capital adequacy ratio, while Basel III increased requirements for higher-quality capital. These requirements help banks survive financial shocks and reduce insolvency risk.

3. Global Financial Stability

Standardized regulatory measures reduce banking crises risk by ensuring adequate capital and liquidity. They promote a common understanding of risk management across countries. They prevent systemic failures where one bank's collapse impacts the entire financial system.

4. Market Discipline and Transparency

Banks must disclose detailed information about their risks, capital, and risk management practices. This transparency enables market participants to make educated judgments. It creates external pressure on banks to maintain sound risk management.

5. Liquidity Management

Basel III introduced liquidity standards like the LCR and NSFR. These require banks to hold sufficient liquid assets and have stable funding sources. They help prevent liquidity crises and ensure banks can meet obligations during stress.

6. Supervisory Review Process

The supervisory review pillar requires banks to conduct internal capital assessments. Regulators evaluate banks' risk management and capital strategies. This ensures banks meet capital requirements and maintain sound risk processes.

7. Standardized Approach to Regulation

The accords provide consistent regulations across different countries. This creates a level playing field for international banks. It increases market trust and facilitates cross-border banking activities.

Strengthening Financial Stability Through Basel II Regulations



Minimum Capital Requirements

Ensures banks maintain sufficient capital to cover risks.



Supervisory Review

Involves regulatory oversight to assess bank risk management.



Market Discipline

Encourages transparency and accountability in banking practices.

8. Adaptability to Changing Financial Landscapes

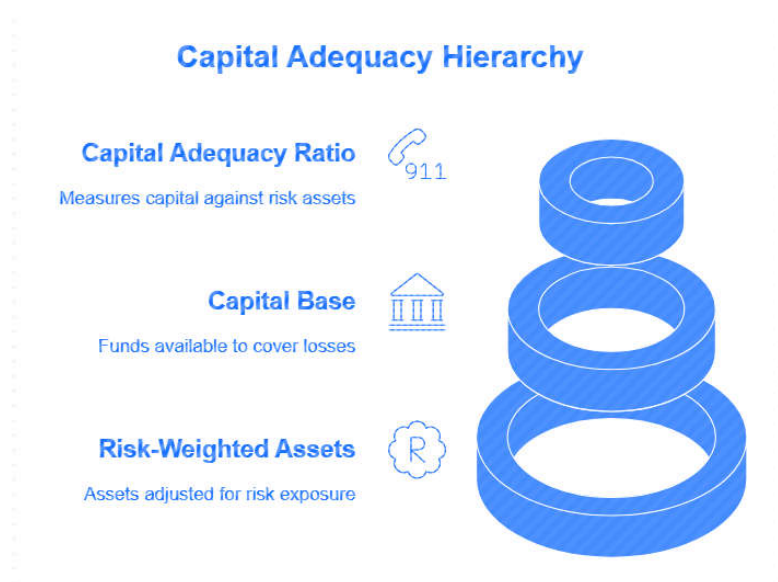
The Basel framework has evolved over time to address new risks. Basel I focused on credit risk, Basel II expanded to other risks, and Basel III responded to the 2008 crisis. This adaptability ensures the framework remains relevant as financial systems change.

9. Reduced Moral Hazard

By requiring adequate capital and liquidity, banks are incentivized to manage their own risks. This reduces reliance on government bailouts. It prevents banks from taking excessive risks expecting taxpayer rescue.

3.3 CAPITAL ADEQUACY RATIO

The Capital Adequacy Ratio (CAR), also known as the Capital to Risk (Weighted) Assets Ratio (CRAR), is a crucial metric used by financial regulators to assess a bank's ability to absorb losses while continuing to operate effectively. It calculates the ratio of a bank's capital to its risk-weighted assets.



3.3.1 Purpose:

Purpose of capital Adequacy Ratio are explained below:

1. Protecting Stakeholders:

The Capital Adequacy Ratio (CAR) safeguards depositors and creditors by ensuring banks maintain sufficient capital to absorb potential losses, thereby protecting customer deposits and fulfilling obligations to lenders. It also acts as a shield against broader economic instability by reducing the likelihood of bank failures that could cascade into systemic crises, preserving trust in financial systems and minimizing disruptions to economic activity.

2. Regulatory Compliance:

CAR aligns banks with global standards like Basel III, mandating minimum capital ratios (e.g., 8% overall CAR, including 6% Tier 1 capital) to ensure resilience. This framework creates uniformity, enabling regulators worldwide to consistently evaluate and compare banks' financial health, fostering transparency and cross-border regulatory coherence.

3. Risk Management:

By incorporating Risk-Weighted Assets (RWA), CAR incentivizes banks to assess the riskiness of loans and investments when determining capital needs, ensuring higher-risk activities are adequately capitalized. Additionally, it mandates buffers such as the Capital Conservation Buffer (2.5%) to absorb unexpected losses during economic downturns, enhancing long-term stability.

4. Promoting Financial Stability:

CAR strengthens systemic resilience by equipping the banking sector to withstand economic stress, thereby reducing systemic risk. It also promotes sustainable lending practices by tying capital requirements to risk exposure, discouraging reckless speculative behavior and ensuring credit flows align with prudent economic goals.

5. Investor and Market Confidence:

CAR provides investors and markets with transparent insights into a bank's financial robustness, boosting confidence through clear metrics that attract capital and stabilize stock valuations. Conversely, a low CAR may signal vulnerability, triggering regulatory scrutiny or eroding market trust, underscoring its role in maintaining credibility.

6. Regulatory Oversight:

Regulators use CAR to enforce corrective actions, such as dividend restrictions or recapitalization mandates, for undercapitalized banks. It also curbs excessive leverage via metrics like the Basel III leverage ratio ($\geq 3\%$), ensuring banks do not over-rely on borrowed funds and maintain sustainable capital structures.

7. Encouraging Prudent Practices:

CAR compels banks to integrate capital planning into strategic decisions, balancing growth with capital preservation to avoid overextension. It further drives proactive risk management through stress testing, enabling institutions to anticipate and mitigate adverse scenarios, fostering disciplined financial practices.

3.3.2. Key Components:

1. Tier 1 Capital (Core Capital):

- Includes equity capital (common shares, retained earnings) and disclosed reserves.

- High-quality capital that can absorb losses without disrupting operations.
2. **Tier 2 Capital** (Supplementary Capital):
- Includes subordinated debt, hybrid instruments, and undisclosed reserves.
 - Lower-quality capital that provides an additional cushion but is subordinate to Tier 1.

The Capital Adequacy Ratio (CAR) is calculated using the formula:

$$CAR = \frac{\text{Tier 1 Capital} + \text{Tier 2 Capital}}{\text{Risk-Weighted Assets}}$$

Plugging in the values from Bank XYZ:

$$CAR = \frac{150 \text{ million} + 50 \text{ million}}{1,200 \text{ million}}$$

$$CAR = \frac{200 \text{ million}}{1,200 \text{ million}}$$

$$CAR = 0.1667 \text{ or } 16.67\%$$

Question

- Bank XYZ has the following financial information:
- Tier 1 Capital: \$150 million
- Tier 2 Capital: \$50 million
- Risk-Weighted Assets: \$1.2 billion

Calculate the Capital Adequacy Ratio (CAR) for Bank XYZ and determine if it meets the minimum regulatory requirements under Basel III.

Solution

Under Basel III regulations, banks are required to maintain a minimum CAR of 10.5% (which includes an 8% minimum capital requirement plus a 2.5% conservation buffer). Bank XYZ's CAR of 16.67% exceeds this minimum requirement, indicating it has sufficient capital to absorb potential losses and maintain financial stability.

The bank's CAR also exceeds the minimum Tier 1 capital requirement of 6% under Basel III, as the Tier 1 capital alone represents: $\frac{150 \text{ million}}{1,200 \text{ million}} = 12.5\%$

This strong capital position suggests Bank XYZ is well-capitalized and has a healthy cushion to protect depositors and absorb unexpected losses.

Now calculate the CAR:

$$\text{CAR} = \frac{250 \text{ million} + 75 \text{ million}}{800 \text{ million}}$$

$$\text{CAR} = \frac{325 \text{ million}}{800 \text{ million}}$$

$$\text{CAR} = 0.40625 \text{ or } 40.625\%$$

- A bank has the following assets:
- Government bonds worth \$300 million (risk weight 0%)
- Mortgages worth \$500 million (risk weight 50%)
- Personal loans worth \$200 million (risk weight 75%)
- Corporate loans worth \$400 million (risk weight 100%)

The bank's Tier 1 Capital is \$250 million and Tier 2 Capital is \$75 million. Calculate the bank's Capital Adequacy Ratio.

Solution

First, calculate the Risk-Weighted Assets:

- Government bonds: $300\text{million} \times 0\% = 0$
- Mortgages: $500\text{million} \times 50\% = 250\text{million}$
- Personal loans: $200\text{million} \times 75\% = 150\text{million}$
- Corporate loans: $400\text{million} \times 100\% = 400\text{million}$

Total Risk-Weighted Assets:

$$0 + 250\text{million} + 150\text{million} + 400\text{million} = 800\text{million}$$

3.4 CONCLUSION

The unit covers the essential aspects of credit risk management, including evaluation procedures, management strategies, Basel norms, and capital adequacy requirements. It emphasizes how financial institutions systematically identify, assess, monitor, and control credit risks while complying with international standards like Basel III. The unit also highlights the importance of comprehensive loan review mechanisms and how capital adequacy ratios ensure financial stability and protect stakeholders.

3.5 QUESTIONS

3.5.1. Fill-in-the-Blanks

1. The Capital Adequacy Ratio (CAR) measures the ratio of a bank's capital to its _____.
2. Basel III introduced stricter capital requirements and new liquidity standards including the _____ and Net Stable Funding Ratio (NSFR).
3. Credit risk management involves systematically identifying, assessing, monitoring, and _____ potential losses from borrower defaults.
4. The loan review mechanism requires banks to classify loans based on risk levels, typically as performing, watchlist, or _____.
5. The Basel Accords were developed by the _____ to promote financial stability.

3.5.2. Brief Questions

1. What are the key components of Tier 1 and Tier 2 capital in the Capital Adequacy Ratio?
2. How does the loan review mechanism help banks manage credit risk?
3. What are the three pillars of the Basel II framework?
4. What is the purpose of the Liquidity Coverage Ratio (LCR) introduced in Basel III?
5. How do rating agencies contribute to credit risk management?



RISK MEASUREMENT

Unit Structure :

- 4.0 Learning Objectives
- 4.1 Introduction to Risk Measurement
- 4.2 Estimation of Volatilities and Correlations
- 4.3 Monte Carlo Simulations for Interest Rate Forecasting
- 4.4 Linear Value-at-Risk
- 4.5 Option Valuation
- 4.6 Risk-Adjusted Return on Capital (RAROC)
- 4.7 Beta
- 4.8 Risk Management of Derivatives
- 4.9 Interest rates and measures of interest rate sensitivity
- 4.10 Conclusion
- 4.11 Questions

4.0 LEARNING OBJECTIVES

By the end of this module, learners will be able to:

- Estimate volatilities and correlations and apply them to model volatility term structures in financial markets.
- Use Monte Carlo simulation techniques for interest rate forecasting and risk quantification.
- Apply Linear Value-at-Risk (VaR) to assess market, credit, and operational risk exposures.
- Understand the principles of option valuation and its relevance in managing financial risk.
- Evaluate Risk-Adjusted Return on Capital (RAROC) and calculate beta to measure systematic risk.
- Analyze and manage derivative-related risks, including convertible risk, and assess interest rate sensitivity using standard measures like duration and convexity.

4.1 INTRODUCTION TO RISK MEASUREMENT

Risk measurement is a cornerstone of modern financial management, enabling organizations to quantify potential losses, allocate capital efficiently, and design robust risk mitigation strategies. This unit focuses on three critical areas:

1. **Estimation of Volatilities and Correlations**
2. **Monte Carlo Simulations for Interest Rate Forecasting**
3. **Linear Value-at-Risk (VaR) for Market, Credit, and Operational Risk**

These tools are essential for understanding uncertainty in financial markets, pricing derivatives, and complying with regulatory frameworks like Basel III and Solvency II.

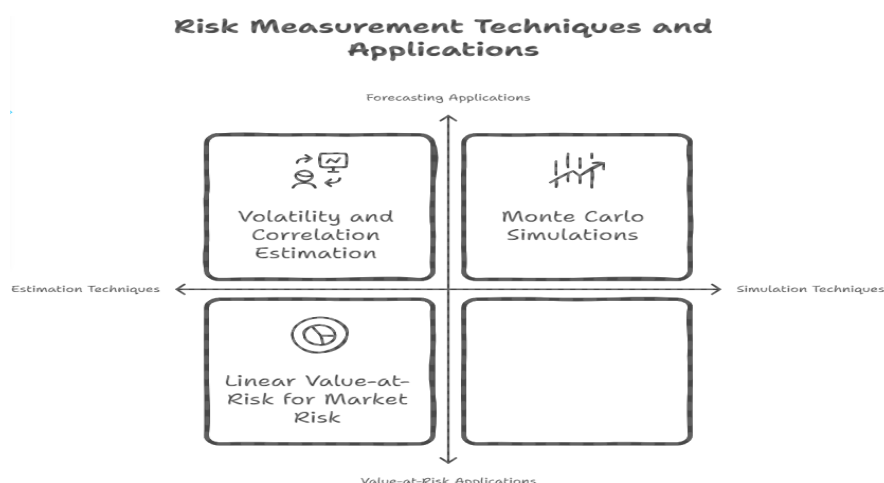
4.2 ESTIMATION OF VOLATILITIES AND CORRELATIONS

Volatility and correlation are fundamental metrics in finance for assessing risk in asset prices, interest rates, and portfolios. They help investors understand potential price fluctuations and relationships between different financial instruments, enabling better risk management and investment decisions. This note explores various methods for estimating volatilities and correlations, including historical and implied volatility, GARCH models, correlation estimation techniques, and volatility term structures.

4.2.1 Historical vs. Implied Volatility

Historical Volatility (HV)

Historical volatility is calculated from past price data using the standard deviation of returns. It provides insight into how volatile an asset has been over a specific period.



Formula:

Where:

- r_i = returns
- $\bar{r}$ = average return
- n = number of observations

Implied Volatility (IV)

Implied volatility is determined from option pricing using models like Black-Scholes.

Unlike historical volatility, implied volatility reflects market participants' expectations of future volatility.

Key Differences:

- Historical volatility looks backward at past price movements
- Implied volatility looks forward, incorporating market sentiment and expectations
- Implied volatility is often higher than historical volatility during periods of market uncertainty

4.2.2 GARCH Models

Generalized Autoregressive Conditional Heteroskedasticity (GARCH)

GARCH models are used to capture volatility clustering, where periods of high volatility are followed by high volatility and periods of low volatility are followed by low volatility.

GARCH(1,1) Model:

$$\sigma_{HV} = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (r_i - \bar{r})^2}$$

$$\sigma_t^2 = \omega + \alpha \epsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

Where:

- σ_t^2 = conditional variance at time t
- ω = constant term
- α = coefficient for the lagged squared residual
- β = coefficient for the lagged conditional variance
- ϵ_{t-1} = residual at time t-1

GARCH models are widely used for:

- Forecasting volatility term structures
- Risk management and Value-at-Risk (VaR) calculations
- Option pricing
- Portfolio optimization

4.2.3 Correlation Estimation

Rolling Window Correlation

Rolling window correlation measures dynamic correlations between assets by calculating correlations over a moving window of time.

Steps:

1. Select a window size (e.g., 21 days for approximately one month)
2. Calculate correlation coefficients for each window
3. Move the window forward by one period and repeat

EWMA Model

The Exponentially Weighted Moving Average (EWMA) model smooths correlations by giving more weight to recent observations.

Formula:

$$\rho_t = \lambda \rho_{t-1} + (1-\lambda) r_{1,t} r_{2,t}$$

Where:

- ρ_t = correlation at time t
- λ = decay factor (typically between 0.9 and 0.99)
- $r_{1,t}$ and $r_{2,t}$ = returns of assets 1 and 2 at time t

4.2.4 Volatility Term Structures

Definition

A volatility term structure plots implied volatility against time-to-maturity. It shows how market expectations of volatility change over different time horizons.

Example: VIX Curve

The VIX curve, which represents the implied volatility of the S&P 500 index, often slopes upward during market stress. This indicates that investors expect higher volatility in the future as uncertainty increases.

Interpretation

- **Normal (Upward-Sloping):** Implied volatility increases with time-to-maturity
- **Inverted (Downward-Sloping):** Implied volatility decreases with time-to-maturity
- **Flat:** Implied volatility remains relatively constant across maturities

4.3 MONTE CARLO SIMULATIONS FOR INTEREST RATE FORECASTING

Monte Carlo (MC) simulations are powerful computational tools used in finance to model stochastic (random) processes, enabling analysts to forecast interest rates and price complex derivatives. By generating numerous plausible future scenarios, MC simulations provide insights into the distribution of potential outcomes, aiding risk assessment and valuation.

4.3.1 Basics of Monte Carlo Simulations

MC simulations follow a systematic approach to model uncertainty:

1. Define a Stochastic Model:

A stochastic model mathematically describes how interest rates change over time, incorporating randomness to reflect real-world uncertainty. Common models like the **Vasicek** (mean-reverting with normal shocks) or **Cox-Ingersoll-Ross (CIR)** (mean-reverting with non-negative rates) define parameters such as long-term mean, volatility, and speed of adjustment. These frameworks allow analysts to quantify risk and price derivatives by simulating rate behavior under probabilistic assumptions.

2. Generate Random Paths:

Interest rate trajectories are simulated using **Brownian motion**, a continuous random process representing unpredictable market movements. For computational purposes, the stochastic differential equation (SDE) governing the model is discretized (e.g., via the **Euler-Maruyama** method), breaking time into small intervals to generate step-by-step rate paths. Each path represents a possible future scenario, capturing the inherent uncertainty in rate movements.

3. Compute Cash Flows/Prices:

For derivatives like swaps or options, cash flows or payoffs depend on simulated interest rate paths. For example, an interest rate swap's fixed/floating leg payments vary with the path's rates, while an option's payoff hinges on whether rates cross strike-price thresholds. These calculations are performed for each simulated path to evaluate potential outcomes under different rate scenarios.

4. Average and Discount Results:

To determine a derivative's fair value, results from all simulated paths are averaged to compute the **expected payoff** under risk-neutral assumptions. This average is then discounted to its **present value** using the risk-free rate, reflecting the time value of money. This step ensures the price accounts for both uncertainty (via averaging) and the cost of waiting for future cash flows.

4.3.2. Interest Rate Models

Two widely used models for MC simulations are:

➤ **Vasicek Model:** The Vasicek Model is a mathematical tool used to predict how interest rates might change over time. It's like a map that helps us understand possible future paths of interest rates. Interest rates don't just change randomly - they tend to move toward a long-term average value. Imagine a ball rolling on a slightly curved surface - it might bounce around, but it generally stays near the bottom of the curve. Similarly, interest rates in the Vasicek Model tend to "spring back" toward a central value when they move too far away.

➤ The model uses this formula to describe how interest rates change:

$$dr_t = a(b - r_t)dt + \sigma dW_t$$

Where:

- dr_t = The change in interest rates at time t
- a = How quickly rates return to the average
- b = The long-term average interest rate
- r_t = The current interest rate
- σ = How volatile or unpredictable the rates are
- dW_t = A random shock or surprise element

How It Works

1. The first part ($a(b - r_t)dt$) represents the "pull" toward the long-term average.
 - If rates are above average ($r_t > b$), this part becomes negative, pulling rates down.
 - If rates are below average ($r_t < b$), this part becomes positive, pushing rates up.
2. The second part (σdW_t) represents random fluctuations in the market that can push rates up or down unexpectedly.

Question: Using the Vasicek interest rate model, estimate the expected change in the short-term interest rate over the next month given the following parameters:

- Current interest rate (r_0): 3%
- Long-term mean interest rate (μ): 5%
- Speed of mean reversion (θ): 2 per month
- Volatility (σ): 2% per month

What is the expected change in the interest rate over the next month, ignoring the stochastic component?

Solution:

The Vasicek model is given by the stochastic differential equation:

$$dr_t = \theta(\mu - r_t)dt + \sigma dW_t$$

The expected change in the interest rate over a small time period dt is given by the deterministic part of the equation:

$$E[dr_t] = \theta(\mu - r_t)dt$$

Given:

- $r_t = 3\% = 0.03$
- $\mu = 5\% = 0.05$
- $\theta = 2$ per month
- $\sigma = 2\%$ per month (not needed for the expected change)
- $dt = 1$ month

Plugging in the values:

$$E[dr_t] = 2 \times (0.05 - 0.03) \times 1$$

$$E[dr_t] = 2 \times 0.02$$

$$E[dr_t] = 0.04$$

So the expected change in the interest rate over the next month is an increase of 40 basis points (0.4 percentage points), from 3% to 3.4%.

Hence the expected change in the short-term interest rate over the next month is an increase of 0.4 percentage points.

➤ **Cox-Ingersoll-Ross (CIR) Model:** The Cox-Ingersoll-Ross (CIR) Model is a mathematical tool used in finance to predict how interest rates might change over time. It was developed in 1985 as an improvement to the earlier Vasicek model, addressing some of its limitations.

Key Features

1. **Mean Reversion:** Like a ball on a spring, interest rates tend to bounce back toward a long-term average value. If rates go too high, they're pulled down; if they go too low, they're pushed up.
2. **Non-Negativity:** The model ensures interest rates can't become negative, which makes it more realistic for practical applications.

- 3. Stochastic Volatility:** The model allows the volatility of interest rates to change over time, reflecting real-world market conditions where volatility isn't constant.

Question:

Consider the Cox-Ingersoll-Ross (CIR) model for short-term interest rates with the following parameters:

- Mean reversion speed (κ) = 0.2
- Long-term mean interest rate (θ) = 0.05 (5%)
- Volatility parameter (σ) = 0.01
- Current short-term interest rate (r_0) = 0.03 (3%)

Calculate the expected value of the short-term interest rate after 1 year ($t=1$) using the CIR model.

Solution:

The expected value of the short-term interest rate under the CIR model is given by:

$$E[r_t] = r_0 e^{-\kappa t} + \theta(1 - e^{-\kappa t})$$

Plugging in the given values:

$$E[r_1] = 0.03e^{-0.2 \times 1} + 0.05(1 - e^{-0.2 \times 1})$$

First, calculate $e^{-0.2}$:

$$e^{-0.2} \approx 0.818730753$$

Then:

$$E[r_1] = 0.03 \times 0.818730753 + 0.05 \times (1 - 0.818730753)$$

$$E[r_1] = 0.0245619226 + 0.05 \times 0.181269247$$

$$E[r_1] = 0.0245619226 + 0.00906346235$$

$$E[r_1] \approx 0.033625385$$

Therefore, the expected short-term interest rate after 1 year is approximately **3.36%**.

This question tests the understanding of the mean reversion property in the CIR model and the ability to apply the formula for the expected value of the short-term interest rate.

4.3.3. Applications of Financial Modeling

i. Interest Rate Forecasting

Simulating yield curves under varying economic scenarios allows financial institutions to predict how different macroeconomic conditions might affect borrowing costs and investment returns across different maturities. This helps in making informed decisions about fixed-income investments and in developing strategies that are robust to different potential future states of the economy.

Stress-testing portfolios by analyzing tail risks involves subjecting investment portfolios to extreme but plausible market conditions to assess potential losses that could occur during financial crises. This helps risk managers understand the portfolio's vulnerability to rare events and ensures adequate capital reserves and risk mitigation strategies are in place.

ii. Derivatives Pricing

Swaps, caps, and floors are interest rate derivatives whose cash flows depend on future interest rates, requiring sophisticated models to estimate their fair value by projecting future rate paths and discounting expected cash flows appropriately.

Options, particularly path-dependent instruments like Asian options, require specialized pricing techniques because their payoff depends not just on the final underlying price but on the average price over a period, making them more complex to value than standard European or American options.

The example of pricing a 5-year European call option on interest rates illustrates how Monte Carlo simulations are used in derivatives pricing, where thousands of possible future rate paths are generated to calculate the expected payoff of the option, which is then discounted to present value to determine its price.

iii. Risk Management

Computing Value-at-Risk (VaR) or Expected Shortfall (ES) for rate-sensitive portfolios involves using statistical methods to estimate the potential loss in portfolio value over a specific time horizon at a given confidence level, helping risk managers quantify market risk and set appropriate risk limits.

4.4 LINEAR VALUE-AT-RISK

Linear Value-at-Risk (VaR) is a statistical technique used to quantify the potential loss in value of a financial portfolio over a specific time horizon at a given confidence level. Unlike non-linear VaR approaches that account for complex relationships and fat-tailed distributions, linear VaR assumes a linear relationship between risk factors and portfolio value changes. This simplification makes linear VaR computationally efficient and easier to implement, particularly for portfolios with linear instruments like stocks, bonds, and linear derivatives.

i. Application to Market Risk

In market risk management, linear VaR is widely used to estimate potential losses due to adverse movements in market prices, interest rates, exchange rates, and commodity prices. The linear assumption implies that percentage changes in asset prices are normally distributed, allowing risk managers to use historical simulation or variance-covariance methods to calculate VaR.

The variance-covariance approach, also known as the parametric approach, calculates VaR using the formula: $VaR = Z \times \sigma \times P$ where Z is the Z-score corresponding to the desired confidence level, σ is the standard deviation of returns, and P is the portfolio value. This method works well for linear portfolios but may underestimate risk for non-linear instruments like options.

ii. Application to Credit Risk

For credit risk assessment, linear VaR models estimate potential losses from defaults or credit quality deterioration in a portfolio of loans, bonds, or other credit instruments. The linear assumption implies that changes in credit spreads or default probabilities follow a normal distribution.

Credit risk linear VaR models often use the normal distribution assumption to calculate potential losses, though this approach has limitations during periods of financial stress when default correlations increase and loss distributions exhibit fat tails. More sophisticated models may incorporate macroeconomic factors and credit rating migration matrices to better capture credit risk dynamics.

iii. Application to Operational Risk

In operational risk management, linear VaR helps quantify potential losses from internal failures, fraud, legal issues, or external events. The linear approach assumes that operational loss events follow a normal distribution, allowing institutions to model loss severity and frequency using historical data.

The loss distribution approach (LDA) is commonly used, where frequency distributions (Poisson, negative binomial) and severity distributions (lognormal, gamma) are combined to estimate operational risk VaR. Regulatory frameworks like Basel III require banks to maintain capital against operational risk VaR, making this application critical for compliance and risk management.

Question:

A portfolio consists of a single asset with a current value of Rs.10,00,000. The daily returns of this asset are normally distributed with a mean of 0.05% and a standard deviation of 1.2%. Calculate the 1-day 95% Linear Value-at-Risk (VaR) for this portfolio. Also, explain what this VaR value represents in practical terms.

Solution:

To calculate the 1-day 95% Linear VaR for this portfolio, we'll use the parametric (variance-covariance) approach, which is appropriate for linear VaR when returns are normally distributed.

The formula for Linear VaR is: $VaR = Z \times \sigma \times P$

Where:

- Z = Z-score matching to the chosen confidence level (95%).
- σ = standard deviation of returns (1.2% or 0.012)
- P = portfolio value (₹1,000,000)

First, we need to find the Z-score for 95% confidence level. For a normal distribution, the Z-score for 95% confidence is approximately 1.645 (this represents the number of standard deviations from the mean that corresponds to the 95th percentile).

Now, plug in the values:

$$VaR = 1.645 \times 0.012 \times 1,000,000$$

$$VaR = 1.645 \times 12,000$$

$$VaR = 19,740$$

So, the 1-day 95% Linear VaR for this portfolio is ₹19,740.

Practical Interpretation:

This means that with 95% confidence, we expect that the portfolio will not lose more than Rs. 19,740 in a single day due to adverse market movements. In other words, there is a 5% probability that the portfolio could experience a loss greater than Rs. 19,740 in one day.

This VaR value helps risk managers understand the potential daily loss exposure of the portfolio under normal market conditions. It assumes that returns are normally distributed and that the relationship between risk factors and portfolio value is linear, which may not hold during extreme market events.

4.5 OPTION VALUATION

Option valuation involves determining the fair price of an option based on factors like the underlying asset's price, strike price, time until expiration, volatility, interest rates, and dividends. The value of an option consists of intrinsic value (the immediate exercise value) and time value (the potential for price movement before expiration). Various models like Black-Scholes or binomial models are used to calculate theoretical option prices, with market prices ultimately determined by supply and demand in the options market.

4.5.1. Key components:

- i. **Options:** Options are financial derivatives that give the holder the right but not the duty to buy (call option) or sell (put option) an underlying asset at a fixed price (strike price) on or before a certain

date (expiration date). They derive their value from the underlying asset's price movements and are used for speculation, hedging, or income generation. The two main types are calls (betting on price increases) and puts (betting on price decreases).

- ii. **Intrinsic Value:** This represents the immediate economic benefit of exercising an option. For call options, it's the underlying asset's current price minus the strike price (if the asset is above the strike). For put options, it's the strike price minus the asset's price (if the asset is below the strike). Out-of-the-money options have zero intrinsic value.
- iii. **Time Value:** This is the extra value added to an option's price beyond its intrinsic value, reflecting the potential for the underlying asset's price to move favorably before expiration. It accounts for factors like volatility, time remaining until expiration, and market uncertainty. Time value diminishes as expiration approaches (time decay), especially for out-of-the-money options.

4.5.2. Factors affecting Prices:

- i. **Underlying asset price:** The current market price of the asset directly impacts option prices; for calls, higher prices increase value, while for puts, higher prices decrease value.
- ii. **Strike price:** The predetermined exercise price determines how "in-the-money" an option is; the greater the difference between the strike and underlying price, the higher the option's intrinsic value.
- iii. **Time to expiration:** More time until expiration increases an option's value due to greater potential for price movement and reduced time decay pressure.
- iv. **Volatility of the underlying asset:** Higher volatility increases option premiums as it represents greater potential for price swings that could benefit the option holder.
- v. **Risk-free interest rate:** Changes in interest rates affect option pricing, typically increasing call option values and decreasing put option values as rates rise.
- vi. **Dividends expected during the option's life:** Expected dividends can reduce call option values (as the underlying's price typically drops on ex-dividend dates) while potentially increasing put option values.

4.6 RISK-ADJUSTED RETURN ON CAPITAL (RAROC)

Risk-Adjusted Return on Capital (RAROC) is a financial metric used by banks and financial institutions to evaluate profitability relative to the level of risk taken, incorporating factors like credit, market, and operational risks. By adjusting returns based on risk exposure, RAROC

enables organizations to allocate capital efficiently, optimize risk-return trade-offs, and ensure that investments generate adequate returns to justify their inherent risks. This framework supports informed decision-making in lending, investment strategies, and risk management practices.

Question:

A commercial bank is evaluating a potential loan opportunity. The details are as follows:

- Loan amount: ₹1,000,000
- Term: 1 year
- Interest rate: 8% per annum
- Loan fees: ₹5,000
- Probability of default: 2%
- Loss given default: 50%
- Economic capital allocation: ₹150,000
- Operating costs: ₹3,000
- Hurdle rate (required RAROC): 15%

Calculate the RAROC for this loan and determine whether the bank should proceed with this investment based on the hurdle rate.

Solution:

Step 1: Calculate Expected Return

$$\text{Expected Return} = \text{Interest income} + \text{Fees} - \text{Operating costs} = (\text{₹}1,000,000 \times 8\%) + \text{₹}5,000 - \text{₹}3,000 = \text{₹}80,000 + \text{₹}5,000 - \text{₹}3,000 = \text{₹}82,000$$

Step 2: Calculate Expected Loss

$$\text{Expected Loss} = \text{Probability of default} \times \text{Loss given default} \times \text{Loan amount} = 2\% \times 50\% \times \text{₹}1,000,000 = 0.02 \times 0.5 \times \text{₹}1,000,000 = \text{₹}10,000$$

Step 3: Calculate Risk-Adjusted Return

$$\text{Risk-Adjusted Return} = \text{Expected Return} - \text{Expected Loss} = \text{₹}82,000 - \text{₹}10,000 = \text{₹}72,000$$

Step 4: Calculate RAROC

$$\text{RAROC} = \text{Risk-Adjusted Return} / \text{Economic Capital} = \text{₹}72,000 / \text{₹}150,000 = 0.48 \text{ or } 48\%$$

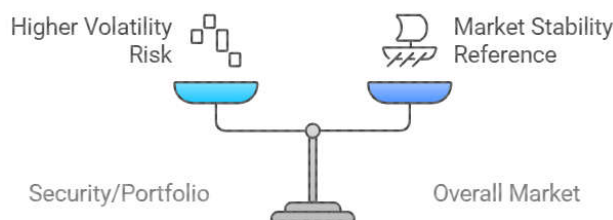
Step 5: Compare with Hurdle Rate

The calculated RAROC of 48% exceeds the hurdle rate of 15%. This indicates that the investment is expected to generate a return that adequately compensates for the risk taken, and the bank should consider proceeding with this loan opportunity.

Conclusion: The bank should approve this loan as it meets the required risk-adjusted return threshold.

4.7 BETA

Beta calculation is a fundamental concept in finance used to measure the volatility or systematic risk of a security or portfolio relative to the broader market. It is calculated by dividing the covariance of the security's returns with the market's returns by the variance of the market's returns, providing insight into how sensitive an asset is to market movements. A beta greater than 1 indicates higher volatility than the market, while a beta less than 1 suggests lower volatility, making it a critical tool for investors assessing risk and constructing diversified portfolios.



Assessing Investment Risk Relative to Market

The following table shows the monthly returns for Stock X and the market index over the past six months:

Month	Stock X Return (%)	Market Index Return (%)
1	5	3
2	-2	1
3	8	6
4	3	4
5	-4	-2
6	6	5

Calculate the beta (β) of Stock X using the given data. Show all your calculations.

Solution:

Step 1: Calculate the average returns

First, we need to calculate the average monthly returns for both Stock X and the market index.

Average Stock X Return: $(5 + (-2) + 8 + 3 + (-4) + 6) / 6 = 16 / 6 \approx 2.67\%$

Average Market Index Return: $(3 + 1 + 6 + 4 + (-2) + 5) / 6 = 17 / 6 \approx 2.83\%$

Step 2: Calculate deviations from the average

For each month, subtract the average return from the actual return for both Stock X and the market index.

Month	Stock X Deviation	Market Index Deviation
1	$5 - 2.67 = 2.33$	$3 - 2.83 = 0.17$
2	$-2 - 2.67 = -4.67$	$1 - 2.83 = -1.83$
3	$8 - 2.67 = 5.33$	$6 - 2.83 = 3.17$
4	$3 - 2.67 = 0.33$	$4 - 2.83 = 1.17$
5	$-4 - 2.67 = -6.67$	$-2 - 2.83 = -4.83$
6	$6 - 2.67 = 3.33$	$5 - 2.83 = 2.17$

Step 3: Calculate covariance and variance

Covariance measures how the stock and market move together:
 Covariance = $\Sigma[(\text{Stock X Deviation})(\text{Market Index Deviation})] / (n - 1)$

Variance measures how the market moves on its own: Variance = $\Sigma[(\text{Market Index Deviation})^2] / (n - 1)$

Let's compute these values:

Month	(Stock X Dev)(Market Dev)	(Market Dev)^2
1	$2.33 * 0.17 = 0.3961$	$0.17^2 = 0.0289$
2	$(-4.67)(-1.83) = 8.5661$	$(-1.83)^2 = 3.3489$
3	$5.33 * 3.17 = 16.8861$	$3.17^2 = 10.0489$
4	$0.33 * 1.17 = 0.3861$	$1.17^2 = 1.3689$
5	$(-6.67)(-4.83) = 32.2161$	$(-4.83)^2 = 23.3289$

Month	(Stock X Dev)(Market Dev)	(Market Dev) ²
6	3.33 * 2.17 = 7.2261	2.17 ² = 4.7089
Sum of (Stock X Dev)(Market Dev): 0.3961 + 8.5661 + 16.8861 + 0.3861 + 32.2161 + 7.2261 = 65.68		
Sum of (Market Dev)²: 0.0289 + 3.3489 + 10.0489 + 1.3689 + 23.3289 + 4.7089 = 42.83		
Covariance: 65.68 / (6 - 1) = 65.68 / 5 = 13.136		
Variance: 42.83 / (6 - 1) = 42.83 / 5 = 8.566		
Step 4: Calculate Beta		
$\beta = \text{Covariance} / \text{Variance} = 13.136 / 8.566 \approx 1.53$		
Interpretation:		
A beta of approximately 1.53 means that Stock X is 53% more volatile than the market index. When the market moves up 1%, we can expect Stock X to move up about 1.53%, and vice versa for downward movements.		

Step 4: Calculate Beta

Interpretation:

4.8 RISK MANAGEMENT OF DERIVATIVES

Derivatives are powerful financial instruments used to manage and mitigate various types of risks in investment portfolios and business operations. These instruments, including futures, options, swaps, and forward contracts, allow organizations to hedge against market volatility, interest rate fluctuations, currency movements, and commodity price changes. Effective risk management with derivatives requires understanding the specific risks being addressed and selecting the appropriate instruments and strategies.



4.8.1 Risk Management Strategies:

- i. **Delta Hedging:** This strategy involves adjusting positions to maintain a delta-neutral state, where the portfolio's value remains relatively unchanged by small movements in the underlying asset's price. Traders accomplish this by taking offsetting positions in related securities, typically the underlying asset itself or other correlated instruments, to neutralize the portfolio's sensitivity to price changes.
- ii. **Value at Risk (VaR):** VaR estimates the potential loss in value of a portfolio over a specific time horizon under normal market conditions, typically at a certain confidence level (such as 95% or 99%). This metric helps risk managers quantify the worst-case scenario they might expect in typical market conditions, allowing them to set appropriate capital reserves and risk limits.
- iii. **Stress Testing:** This evaluation method assesses how a portfolio would perform under extreme market conditions or black swan events that fall outside normal market behavior. Stress tests often involve simulating historical crises or hypothetical but plausible scenarios to ensure institutions can withstand significant market disruptions and maintain solvency.
- iv. **Margin Requirements:** These are the minimum collateral amounts traders must maintain to cover potential losses on their trading positions. Margin requirements protect brokers and exchanges by ensuring traders have sufficient funds to meet their obligations if markets move against them, reducing the risk of default and systemic risk in financial markets.
- v. **Counterparty Risk Management:** This process involves assessing the creditworthiness of counterparties and implementing measures to reduce the risk of default. Techniques include credit assessments, collateral agreements, netting arrangements, and using central clearinghouses to minimize exposure to any single counterparty and protect against potential losses from defaults.

4.9 INTEREST RATES AND MEASURES OF INTEREST RATE SENSITIVITY

Interest rates represent the cost of borrowing money or the return on lending money, serving as a fundamental economic indicator that influences financial markets, investment decisions, and overall economic activity. They play a crucial role in determining the present value of future cash flows and affect various financial instruments differently, particularly fixed-income securities.

4.9.1. Measures of Interest Rate Sensitivity

To quantify and manage this risk, several measures of interest rate sensitivity have been developed:

i. Duration

Duration is the most widely used metric of interest rate sensitivity. It represents the weighted average time until a bond's cash flows are received and provides an estimate of how much a bond's price is expected to change with a 1% change in interest rates.

- a. **Macaulay Duration:** Calculates the average time to receive a bond's cash flows, weighted by their present value. For coupon-paying bonds, it is always shorter than the bond's maturity.
- b. **Modified Duration:** Adjusts Macaulay duration to incorporate yield to maturity, providing a more accurate measure of price sensitivity to interest rate changes.
- c. **Effective Duration:** Used for bonds with embedded options (like callable or puttable bonds), it accounts for changes in cash flows that might occur with interest rate movements.
- d. **Key Rate Duration:** Measures sensitivity at specific points along the yield curve, helping to identify how interest rate changes at particular maturities affect bond prices.

ii. Convexity :

While duration assumes a linear link between bond prices and interest rates, convexity explains the curvature in this relationship.

Bonds with higher convexity experience smaller price decreases when interest rates rise and larger price increases when rates fall, making convexity a valuable measure for managing portfolios with long-term fixed-income securities.

iii. Yield Curve Analysis :

The yield curve, which plots interest rates of bonds with different maturities, provides insights into market expectations about future interest rate movements. Changes in the shape of the yield curve (steepening, flattening, inversion) can signal potential economic conditions and help investors anticipate how interest rate changes might impact their portfolios.

iv. Stress Testing :

This entails simulating multiple interest rate scenarios to determine how a portfolio might perform under different circumstances. Financial institutions use stress testing to ensure adequate capital reserves, while individual investors can identify vulnerabilities in their portfolios and make adjustments to mitigate potential risks.

4.10 CONCLUSION

Risk Measurement provides a comprehensive overview of essential risk measurement techniques in modern finance, equipping professionals with tools to quantify potential losses, allocate capital efficiently, and comply with regulatory requirements. The unit covers volatility and correlation estimation methods, Monte Carlo simulations for interest rate forecasting,

and Linear Value-at-Risk applications across market, credit, and operational risk domains. These methodologies enable financial institutions to navigate uncertainty, price derivatives accurately, and develop robust risk mitigation strategies. The practical examples and calculations throughout the unit demonstrate how these theoretical concepts translate into real-world financial decision-making, highlighting their importance in today's complex financial landscape.

4.11 QUESTIONS

4.11.1 Fill-in-the-Blanks

1. The three critical areas of risk measurement discussed in Unit 4 are Estimation of Volatilities and Correlations, Monte Carlo Simulations for Interest Rate Forecasting, and _____.
2. Historical volatility is calculated using the _____ of returns from past price data.
3. The Vasicek model for interest rates incorporates mean reversion toward a _____ average interest rate.
4. Linear Value-at-Risk (VaR) assumes a _____ relationship between risk factors and portfolio value changes.

4.11.2. Brief Questions

1. What are the key differences between historical volatility and implied volatility?
2. How does the EWMA model differ from rolling window correlation estimation?
3. What are the main applications of Monte Carlo simulations in finance?
4. How is Value-at-Risk (VaR) used in risk management?
5. What does the beta of a stock measure, and how is it interpreted?

