Certified Credit Risk Manager Sample Material

V-Skills Certifications

A Government of India
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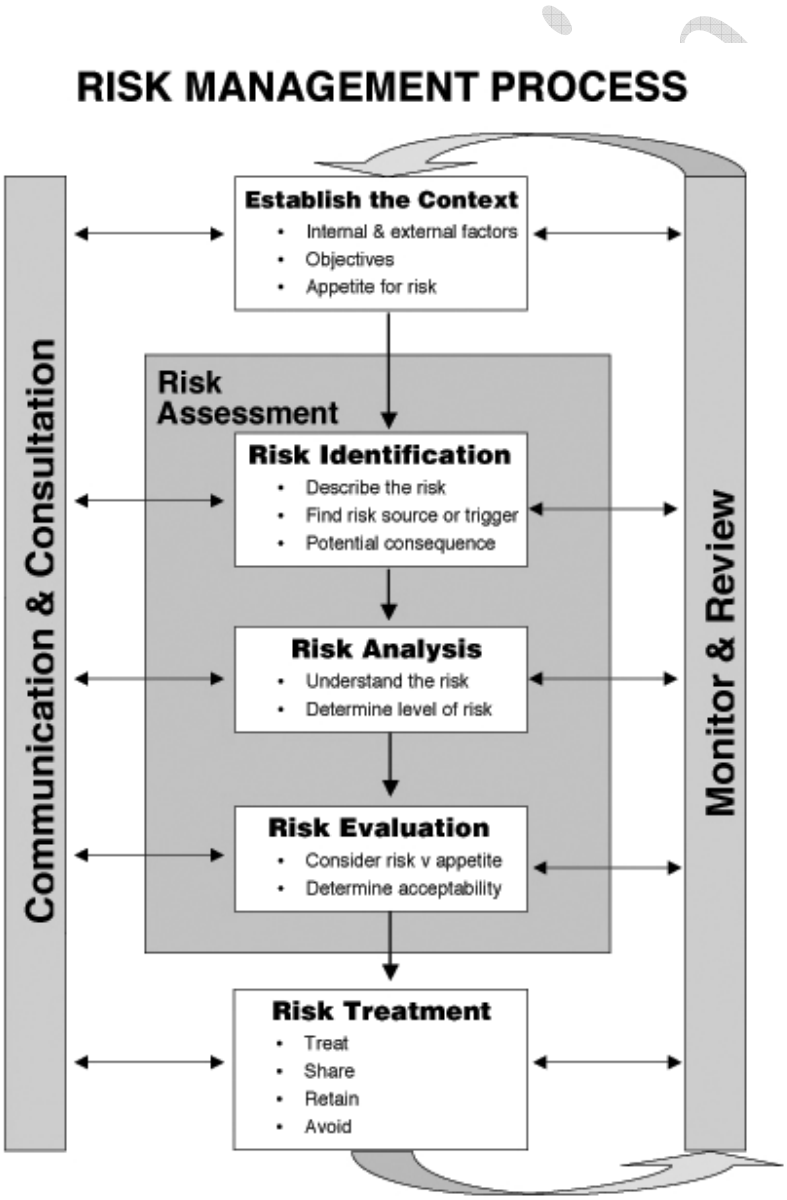
V-Skills

1. INTRODUCTION

1.1. Credit Risk Basics

Credit risk is the possibility for a loss to occur due to the failure of a borrower to meet its contractual obligation to repay a debt. For example, a homeowner may stop making mortgage payments. This is also called 'default risk' or 'counter-party risk', and pertinent credit events may include bankruptcy, failure to pay, loan restructuring, loan moratorium, or accelerated loan payments. In the wake of the 2008 financial crisis, numerous major financial institutions experienced severe losses. These were all due to inefficient risk management.



Some other important types of financial risks that an institution faces are:

- ✓ **Operational Risk:** Loss occurred due to a business' operations i.e. process, human resources, systems, external events. Operational risk also comes about through external events such as political, legal, and fraud risks.

- ✓ **Market Risk:** Risk caused by unexpected changes in market factors such as interest rates, stock prices, commodity prices, and foreign exchange rates. In the following sections of this book, the primary base of credit risk and its analysis will be discussed. This will include understanding what credit risk is, how to identify risk, and mitigating risk from businesses and portfolios.

1.2. Essentials of Credit Risk Analysis

Among the various financial risks that a company or a bank comes across, the most important are liquidity risk and credit risk. Credit risk is an inherent part of a commercial bank's intermediary operations. Credit is the primary source of business for a bank and it is based on this that a bank's quality and performance are judged. Many financial institutions and banks have suffered in the recent past as a result of poor loan quality. The credit risk management process of a bank is believed to be a good indicator of the quality of the bank's loan portfolio. Banks are successful when the risks they take are reasonable, controlled and within their financial resources and competence.

Credit risk involves the risks that come with a borrower not fulfilling his/her obligations on time. Even when all the assets of a balance sheet match up exactly with all the liabilities, the only risk remaining on it would be credit risk. Credit risk exposure is measured by the current mark to market value. The magnitude of credit risk depends on the likelihood of default by the counter party the potential value of outstanding contracts the extent to which legally enforceable netting arrangements allow the value of offsetting contracts the value of the collateral held against the contracts.

Principles in Credit Risk Management

A company has to follow three key principles in its credit risk management which are selection, limitation and diversification.

Selection

The first requirement is to whom to lend. This is usually based on customer's request. A model loan request would be in terms of filing all the information required which elicit information about the amount of loan, purpose of loan, repayment and collateral. Information on the organization of the business, trade area and other banking relationships would be required.

The 6 C's of Credit

The evaluation of the loan request by the bank involves the 6 C's of credit.

- ✓ **Character (borrower's personal characteristics such as honesty, attitudes about willingness and commitment to pay debts):** Even though the loan is for the business, the person responsible for paying back the loan is the borrower. It is the borrower's reputation that the bank will be considering. If one have missed payments or defaulted on a loan or declared bankruptcy in the past, it does not disqualify the person from getting a loan. But trying to hide these facts can destroy character in the eyes of the banks.

- ✓ **Capacity (the success of business):** The banks will look at your business's balance sheet and cash flow statement to see how much a business can afford to borrow. They will also ask for financial statements to see what kind of debt can be handled. Most small business loans tend to be based on the individual's or company's ability to repay the loan, not on the cash flow of the business. Loan officers tend to consider loan applications more favorably if: (a) introducing a new product or service with an obvious demand; (b) there is little competition; (c) your market is composed of small independent businesses; and (d) a lower rate of failure in your type of business.

- ✓ **Capital (financial condition):** most banks require that one should put up a percentage of the loan (just as one would for car loans or buying a house), usually 20 percent.

- ✓ **Collateral:** Collateral represents a repayment source in the worst case scenario. Most banks require that the loan be 100 percent collateralized. This means that the business has to have enough collateral to cover 100 percent of the loan amount. If a loan for Rs.50lacs is needed, then a car, equipment, building, and inventory must to possessed that add up to Rs. 50 lacs.

- ✓ **Conditions (economic condition):** The condition and terms of the loan are another factor where the amount needed, time period and purpose are recognized.

- ✓ Compliance (laws and regulations)

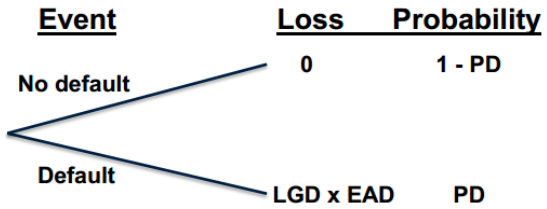
Most common risk metric is the adequacy of loan loss provisions and the size of the loan loss reserve in relationship to the total exposures of the bank. Allowance for loan losses creates a cushion of credit losses in the bank's credit portfolio. Primarily it is intended to absorb the bank's expected loan losses. Historically credit decisions were made in a case by case basis.

Growing sophistication and automation of lending and the increasing complexity of credit products have spawned the development of computational approaches to credit assessment and evaluation of individual retail and commercial borrowers.

Introduction of bank-wide credit risk software has accelerated in part driven by regulatory pressures, as regulators demanded improved analysis and oversight of the risk assessment process.

Estimating Credit Losses

- ✓ **Probability of Default (PD):** The likelihood that the borrower will fail to make full and timely repayment of its financial obligations.
- ✓ **Exposure At Default (EAD):** The expected value of the loan at the time of default.
- ✓ **Loss Given Default (LGD):** The amount of the loss if there is a default, expressed as a percentage of the EAD.
- ✓ **Recovery Rate (RR):** The proportion of the EAD the bank recovers



Expected Loss = (1-PD) x 0 + PD x LGD x EAD = PD x LGD x EAD

Banks are expected to hold reserves against expected credit losses which are considered a cost of doing business. The most basic model of expected loss considers two outcomes: default and non-default.

In the event of non-default, the credit loss is 0. In the event of default, the loss is loss given default (LGD) times the current exposure (EAD).

Statistical approaches are used to estimate the distribution of possible loss values. For individual products in default, loss amounts are not deterministic due to uncertainty about LGD and collateral value. For a portfolio of credit products with defaults, loss amounts are also uncertain due to correlation of defaults between products.

Credit loss distributions tend to be largely skewed as the likelihood of significant losses is lower than the likelihood of average losses or no losses. Active loan portfolio management embracing diversification of exposures across industries and geographic areas can reduce the variability of losses around the mean.

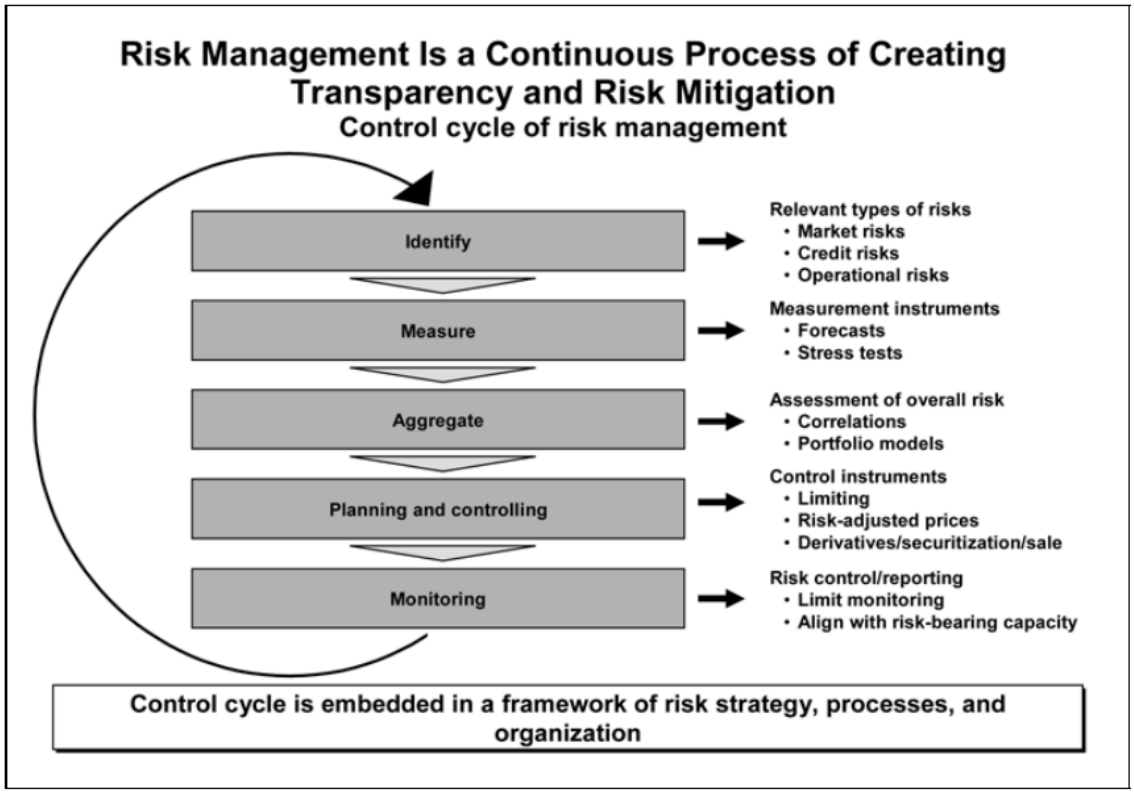
Table 1.3 **Different approaches to the credit evaluation process**

Approach	Methodology
Judgmental methods	applies the assessor's experience and understanding of the case to the decision to extend or refuse credit
Expert systems (e.g. lending committees)	uses a panel approach to judge the case or formalises judgmental decisions via lending system and procedures
Analytic models	uses a set of analytic methods, usually on quantitative data, to derive a decision
Statistical models (e.g. credit scoring)	uses statistical inference to derive appropriate relationships for decision making
Behavioural models	observes behaviour over time to derive appropriate relationships for reaching a decision
Market models	relies on the informational content of financial market prices as indicators of financial solvency

Unexpected Loss represents the minimum loss level for a given confidence level a UL(a) is the maximum loss a bank will suffer a% of the time.

1.3. Managing Risk

The management of risk is a continual process entailing the identification of problem areas, ascertaining the amount of backlash, correlation to other related variables, and controlling and monitoring of intended plans. Without vigilance, the effects of risk can become a heavy burden on any business. The risk management cycle contains identification, measurement, aggregation, planning and management, as well as monitoring of the risks arising in a business. Risk management is thus a continuous process to increase transparency and to manage risks. The following flow-chart clearly lays out the cycle of risk management.



Risk Management Cycle

- ✓ **Identifying the types of risks:** A bank's risks have to be identified before they can be measured and managed. Typically banks distinguish the following risk categories: credit risk, market risk, operational risk. There are further types of risks, such as strategic risks, or reputational risks, which cannot usually be included in risk measurement for lack of consistent methods of quantification.
- ✓ **Measure the amount of risk:** The consistent assessment of the three types of risks is an essential prerequisite for successful risk management. While the development of concepts for the assessment of market risks has shown considerable progress, the methods to measure credit risks and operational risks are not as sophisticated yet due to the limited availability of historical data. Credit risk is calculated on the basis of possible losses from the credit portfolio. Potential losses in the credit business can be divided into:

- ✓ **Expected losses:** These are derived from the borrower's expected probability of default and the predicted exposure at default less the recovery rate, i.e. all expected cash flows, especially from the realization of collateral. The expected losses should be accounted for in income planning and included as standard risk costs in the credit conditions.
- ✓ **Unexpected losses:** These losses result from deviations in losses from the expected loss. Unexpected losses are taken into account only indirectly via equity cost in the course of income planning and setting of credit conditions. They have to be secured by the risk coverage capital.
- ✓ **Aggregating the risks:** When aggregating risks, it is important to take into account correlation effects which cause a company's overall risk to differ from the sum of the individual risks. This applies to risks both within a risk category as well as across different risk categories.
- ✓ **Planning and controlling of risk:** Risk management has the function of planning the overall risk position and actively managing the risks based on these plans. Managing should be taken to mean the selective limitation of risk positions as well as the mitigation, or possibly increase, of these positions by means of financial instruments or suitable techniques. These instruments or techniques affect the risk of the individual position and/or influence changes in the risk position in the overall portfolio as a result of portfolio effects. The most commonly utilised tools for managing risk are:
    - ✓ risk-adjusted pricing of individual loan transactions
    - ✓ setting of risk limits for individual positions or portfolios
    - ✓ use of guarantees, derivatives, and credit insurance
    - ✓ securitization of risks buying and selling of assets
- ✓ **Risk monitoring:** Monitoring of risk is used to study whether the risks that truly incurred lie within the prescribed range, thus ensuring an institution's capacity to endure these risks. Going further, the effectiveness of the measures implemented in risk controlling is measured, and new impulses are generated if necessary.

Obstacles to Credit Risk Management

The task of credit risk management is difficult in developing markets because of intervening matters such as

- ✓ Government controls
- ✓ Political pressures
- ✓ Production difficulties
- ✓ Financial restrictions
- ✓ Market disruptions
- ✓ Delays in production schedules
- ✓ Frequent instability in the business environment
- ✓ Unreliable financial information
- ✓ Debt recovery is not supported by the legal framework

Deficiencies in Credit Risk Management

The common faults experienced in credit risk management are,

- ✓ Absence of written policies
- ✓ Absence of portfolio concentration limits
- ✓ Poor industry analysis
- ✓ Inadequate financial analysis of borrowers
- ✓ Credit rationing contributing to deterioration of loan quality

- ✓ Excessive reliance on collateral
- ✓ Concentration of lending authority
- ✓ Inadequate checks and balances in the credit process
- ✓ Absence of loan supervision
- ✓ Failure to control and audit the credit process effectively

Companies should maintain a desirable relationship among loans and other liabilities and capital. Loan quality is fostered by sound credit policy. A company's credit taking objectives usually encompass,

- ✓ Regulatory environment
- ✓ Availability of funds
- ✓ Selection of risk
- ✓ Loan portfolio balance
- ✓ Term structure of liabilities

Lending Limitation

In view of the unforeseen changes in the financial conditions of companies, industries, geographical areas or whole countries, a system of limits for different types and categories of lending have to be set. While companies could adopt credit limits in different ways and at different levels the essential requirement is to establish maximum amount that may be loaned to any one borrower or group of connected borrowers and to any one industry or type of economic activity.

Loans may be classified by size and limits put on large loans in terms of their proportion to total lending. The rationale of these limits is to limit the company exposure to losses from loans to any one borrower or to a group whose financial conditions are interrelated. A system of credit limits, restricts losses to a level which does not compromise a company's solvency.

Lending limits have to be set taking into account capital and resources. Any limit on credit has to be accompanied by a general limit on all risk assets. This would enable the business to hold a minimum proportion of assets such as cash and government securities whose risk of default is zero.

Diversification

Diversification involves the spread of lending over different types of borrowers, different economic sectors and different geographical regions. To a certain extent credit limits which help avoid concentration of lending ensures minimum diversification. The spread of lending is likely to reduce serious credit problems. Size however confers an advantage in diversification because large businesses can diversify by industry as well as region.

Lending to foreign governments, their agencies or to foreign private sector companies has added a new dimension to credit risk. Country risk involving the assessment of the present and future economic performance of countries and the stability and character of the government has to supplement credit risk assessment or the creditworthiness of individual borrower. In line with the basic principles of limitation and diversification of credit risk management, credit limit have to be set for individual countries and particular regions of the world.

Methods for Reduction of Credit Risk

Companies can reduce credit risk by,

- ✓ Raising credit standards to reject risky loans
- ✓ Obtain collateral and guarantees
- ✓ Ensure compliance with loan agreement
- ✓ Transfer credit risk by selling standardized loans
- ✓ Transfer risk of changing interest rates by hedging in financial futures, options or by using swaps
- ✓ Create synthetic loans through a hedge and interest rate futures to convert a floating rate loan into a fixed rate loan
- ✓ Make loans to a variety of firms whose returns are not perfectly positively correlated

Collateral

'Collateral' is an asset normally movable property pledged against the performance of an obligation. A 'pledge' is mortgage of a movable property which requires delivery of possession whereas hypothecation does not require delivery.

Examples of collateral are accounts receivable, inventory, banker's acceptance, time draft like post-dated cheque accepted by importer's bank (used by foreign traders to make payments) buildings, marketable securities and third party guarantee.

Bank can sell the collateral if the borrower defaults. While collateral reduces the bank's risk it enhances costs in terms of documentation and monitoring the collateral.
The factors that determine suitability of collateral are,

- ✓ **Standardization:** Standardization helps in identifying the nature of asset that is being used as collateral.
- ✓ **Durability:** Durability refers to useful life or ability to withstand wear and tear. Durable assets make better collateral.
- ✓ **Identification:** Identification is possible, if the collateral has definite characteristics like a building or a serial number (motor vehicle).
- ✓ **Marketability:** Marketable collateral alone is of value to the bank if it has to sell it. Marketability must be distinguished from liquidity.
- ✓ **Liquidity:** Liquidity refers to quick sale with little or no loss from current value.
- ✓ **Stability of value:** The value of collateral should remain stable during the currency of the loan.

1.4. Types of Credit Risk

Obligor risks are studied to understand the probability of credit loss (viz. credit risk) from a single customer. The construction of a healthy credit portfolio requires careful selection of obligor risks.

Operational Risks

Operational risk is defined as the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems, or from external events. The definition also includes legal risks resulting from regulatory actions and private settlements. Risks resulting from strategic business decisions and loss or damage of reputation are not included.

A classification of operational risk types is provided in the below table with the Basel II definition:

- ✓ **Internal fraud:** Losses due to acts of a type intended to commit fraud, misappropriate property or circumvent regulations, the law or company policy, excluding diversity/discrimination events, which involves at least one internal party.
- ✓ **External fraud:** Losses due to acts of a type intended to defraud, misappropriate property or circumvent the law, by a third party.
- ✓ **Employment practices and workplace safety:** Losses arising from acts inconsistent with employment, health or safety laws or agreements, from payment of personal injury claims, or from diversity/discrimination events.
- ✓ **Clients, products and business practices:** Losses arising from an unintentional or negligent failure to meet a professional obligation to specific clients (including fiduciary and suitability requirements), or from the nature or design of a product.
- ✓ **Damage to physical assets:** Losses arising from loss or damage to physical assets from natural disaster or other events. Business disruption and system failures: Losses arising from disruption of business or system failure.
- ✓ **Execution, delivery and process management:** Losses from failed transaction processing or process management, from relations with trade counterparts and vendors.

Examples of operational risk include a bank robbery, fraud, forgery, technology risk, hacking damage, failure of a major computer system, a human error where an equity sale order of a customer is entered as a buy order, money laundering, model errors, earthquakes, and so on.

Table: Classification of operational risk event types.

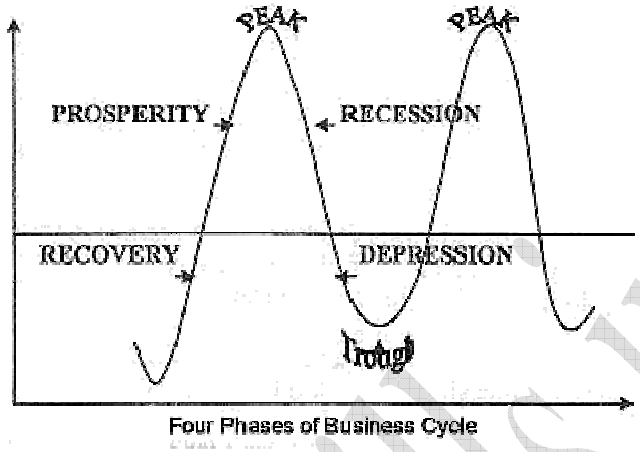
Event type category (Level 1)	Categories (Level 2)
Internal fraud	Unauthorized activity
	Theft and fraud
External fraud	Theft and fraud
	Systems security
Employment practices and workplace safety	Employee relations
	Safe environment
	Diversity and discrimination
Clients, products and business practices	Suitability, disclosure and fiduciary
	Improper businesses or market practices
	Products flaws
	Selection, sponsorship and exposure
	Advisory activities
Damage to physical assets	Disasters and other events
Business disruption and system failures	Systems
Execution, delivery and process management	Transaction capture, execution and maintenance
	Monitoring and reporting
	Customer intake and documentation
	Client account management
	Trade counterparts
	Vendors and suppliers

Operational risk has a close relation with insurance risk, where the loss probabilities also depend both on the frequency and the severity of the events. The resulting risk depends strongly on the type of activity. Payment and settlement activities are considered as more risky than retail brokerage. Both frequency and severity can be reduced by increased risk management and internal controls. Increased supervision and control will certainly reduce the number of human errors. It is an important incentive of the Basel II Capital Accord to put in place a properly implemented operational risk management system that can manage and contain operational risk events at an early stage. Detailed contracts drawn up by a legal specialist, e.g., may reduce legal risk, while effective fraud detection systems can avoid large losses.

External Risks

External risks are those risks that cannot be controlled by the business itself. Such risks include natural disasters, government regulation changes, political instability, technological changes etc. In this section, two major external risks are discussed in detail: Business Cycle and Economic Variables.

Business Cycle: The business cycle is the recurring up-and-down movements in economic activity, measured by fluctuations in real GDP and other macroeconomic variables (discussed in the next section). Business Cycle (or Trade Cycle) is categorized into four phases:-



- ✓ **Prosperity Phase:** When there is an increase in output, income, employment, prices and profits, it results in a higher standard of living. The features of this phase are:-
  - ✓ Increase output and trade.
  - ✓ Increase in demand.
  - ✓ Increase in income and employment.
  - ✓ Rising interest rates.
  - ✓ Inflation.
  - ✓ Increase in bank credit.
  - ✓ Overall business optimism.
  - ✓ A high level of Marginal efficiency of capital and investment.

- ✓ **Recession Phase:** After reaching the peak, the path down toward depression is termed as Recession Phase. Here, the economic activities become slow. As the demand starts falling, the overproduction and future investment plans slow down as well. There is a steady decline in the output and the relevant profits. This reduces investment and the banks and the people try to get greater liquidity, and therefore credit also contracts. Because of falling business activity, income stops and unemployment increases. The increase in unemployment causes a sharp decline in income and aggregate demand.

- ✓ **Depression Phase:** In continuation to recession, there is a fall in the standard of living and depression sets in. The features of this phase are :-
  - ✓ Decrease in volume of output.
  - ✓ Decrease in income and increase in unemployment.
  - ✓ Decline in consumption and demand.
  - ✓ Fall in interest rate.
  - ✓ Deflation.
  - ✓ Contraction of bank credit.

- ✓ Negative business sentiment.
- ✓ Fall in Marginal efficiency of capital and investment.

- ✓ **Recovery Phase:** The phase following depression where expansion begins is termed as Recovery or Revival Phase. During this time, there are expansions and there is a rise in economic activities. As the demand starts going up, production increases. This results in an increase in investment. There is an increase in output, income, employment, prices and profits. The business sentiment starts to improve and investment grows which brings about the recovery of the economy. With this, the banks expand credit and business expands. There is an increase in employment, production, income and aggregate demand, prices and profits start rising, and business expands. The revival turns into the prosperity phase again.

Economic Variables

- ✓ **Inflation:** This is an event in which there is a rise in the general level of prices of goods and services in an economy over a period of time. When this happens, each unit of currency buys lesser goods and services. As a result, inflation also causes erosion in the purchasing power of money. There are many different factors that determine the rate of inflation.
  - ✓ Cost-push inflation arises when external factors have an adverse impact on the supply of goods or services (disruptions to the flow of oil or other commodities, impact of bad weather on the supply and availability of food, which cause prices to rise).
  - ✓ Demand-pull inflation takes place in strong economies with strong demand for goods and services. This causes their prices to rise. A strong economy often results in shortages of labour in particular sectors and results in higher wages causing faster inflation.

- ✓ **Interest Rate:** An interest rate is the cost that a borrower pays a lender for borrowing a principal sum for a period of time. The rate a percentage payable per annum on the amount borrowed. There are numerous interest rates with differences in rates depicting many factors. These include:
  - ✓ the time period of a loan
  - ✓ its terms and conditions and flexibility
  - ✓ whether the loan is unsecured
  - ✓ if the loan is secured the strength of the security used as backing for a loan
  - ✓ the risk assessment of the borrower which takes account of financial circumstances and credit history
  - ✓ the purpose of the loan and viability of any business or investment plans or proposals
  - ✓ whether the interest rate is fixed for the term of the loan or floats (changes) as economic and financial circumstances change the currency of the transaction.

Interest rates on individual loans show the level of risk involved. The higher the risk the more lenders expect for their money. Hence, interest rates are structured with interest rates rising as the perceived level of risk increases. For instance, financial institutions will levy farmers a higher interest rate for unsecured loans such as overdrafts than for loans backed by an asset such as land.

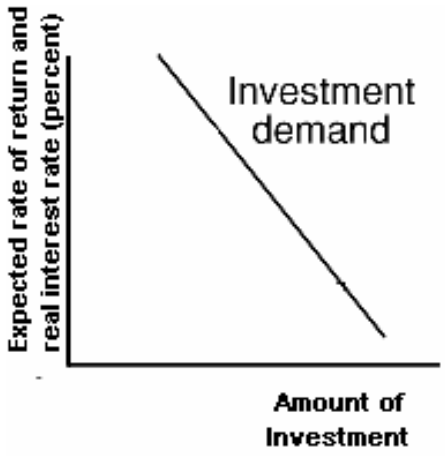


Figure: Correlation between Interest Rate and Investment

- ✓ **Monetary policy:** It is the process by which the central bank controls the money supply, by using its authority to change short-term interest rates. The purpose is to ensure economic stability by targeting a good rate of economic growth to promote employment and ensure low inflation. The RBI is responsible for conducting monetary policy. The RBI's main role is to control inflation, maintain full employment, and promote economic prosperity.

- ✓ **Exchange rates:** An exchange rate between two currencies is the rate at which one currency is exchanged for the other. There are many factors that determine the exchange rate of a particular currency. In most cases, these factors include economic conditions, the rate of inflation, the level of interest rates, and the balance of payments.

  Changes in international commodity prices have an adverse effect on the exchange rates of the currencies of particular countries and this is the case in India with its large agricultural sector having a major impact on economic prospects and the balance of payments.

- ✓ **Fiscal policy:** This policy is the used for government spending and revenue (tax) decisions to influence economic conditions and the economic outlook. It is used in conjunction with monetary policy, the other major lever of economic policy.

  Every year, spending and tax changes are detailed in government. Individual taxes may be newly established, eliminated, or changed to improve the economic efficiency or to improve particular sectors. The fiscal policy is however concerned with overall revenue and spending decisions which have the objective of ensuring an environment conducive to economic prosperity.

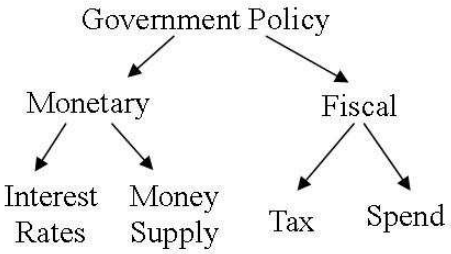


Figure: Breakdown of Government Policy

A primary focus of the annual budget is on the bottom line. This is the surplus or deficit that is created from total government revenue and spending. When conditions of the economy are weak, then the government increases its own spending, cuts taxes, and incur budget deficits in order to provide economic stimulus. This was the course of action implemented by many global governments to help to minimise the detrimental impact of the global economic crisis in 2008.

Industry Risks

Industry Life Cycle

The industry life cycle model, presented by Michael Porter, says that the industry is the most significant entity of the business environment.

The model of the industry life cycle represents an industry through the stages of birth, growth, maturity and decline. The industry life cycle is a systematic way of viewing patterns of structural changes across various industries. The changes in pattern the cycle is brought about by industry output changes. This change in industrial structure is driven by the interplay between consumer demand and technology throughout the industry life cycle. Price and non-price factors are of varying importance at different phases of the life cycle. Costs are of crucial importance to the firm at each phase of the industry life cycle but firms are driven to focus on costs in different ways at different phases.

The model of the industry life cycle shown below shows the curved line which traces the total output of a typical industry change over time. The total output of the industry is measured along the Y axis, and the X axis is the passage of time.

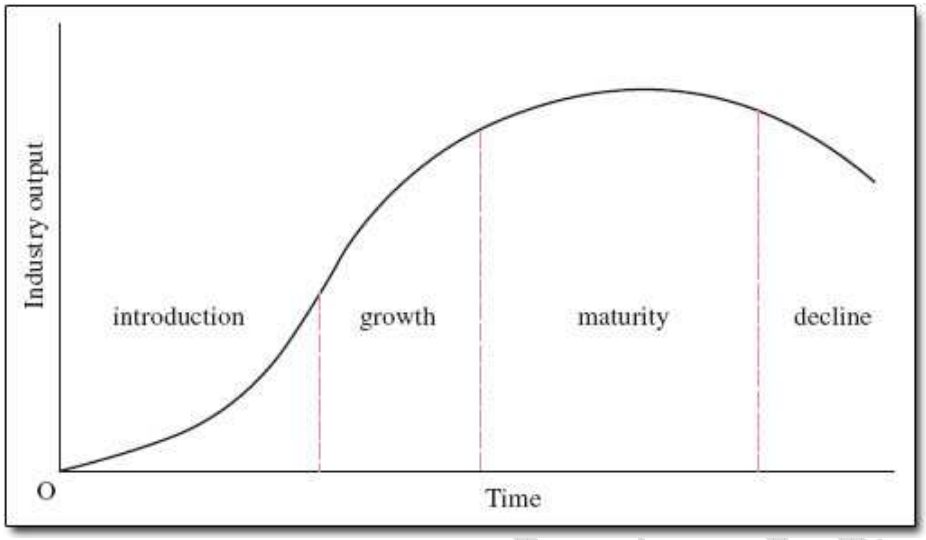


Diagram: Industry Life Cycle

- ✓ **Introduction Stage:** This is the most expensive phase for new innovations. The size of the market is small, and sales are low. The cost of research and development, testing, and marketing can be high, especially in a competitive sector.

- ✓ **Growth Stage:** This phase is fuelled by a strong growth in sales and profits. As the industry starts to benefit from economies of scale in production and the profit margins will increase. This allows businesses to invest more funds to maximize the potential of this growth stage.

- ✓ **Maturity Stage:** Here, the industry is established and the aim is to maintain the market share. During this time, the most competition takes place within the industry and businesses invest wisely. The industry also considers any modifications or improvements to the production processes which might provide a competitive edge.

- ✓ **Decline Stage:** The market soon starts to shrink in size due to saturation or because the consumers start finding alternatives to the commodities or services. While this decline may be inevitable, it may still be possible for industries to make profits by switching to less-expensive production methods and cheaper markets.

Financial Risks

Banks take positions on the market for investments or to hedge their positions partially to reduce risk. The market positions via cash or derivative products make the bank vulnerable to large and unexpected adverse market movements. Classical sources of market risk are large movements in equity prices, foreign exchange rates, commodity prices and interest rates:

- ✓ **Equity risk:** Stock prices are volatile and can show significant fluctuations over time. The equity risk on the portfolio denotes the possible downward price movements of the equity in the portfolio. The main products subject to equity risk are common stocks (voting and non-voting), convertible securities, commitments to buy or sell equities and derivative pr

- ✓ **Currency risk:** Currency risk arises from price changes of one currency against another. It occurs when making investments in different currencies, especially when making cross-border investments. When a European bank invests in US stocks, the risk arises from equity risks on the stocks, but also from exchange rate risk on the euro/dollar rate. Gold is either seen as a commodity or as a currency. In terms of volatility, it behaves more like a currency. Currency risk is applicable to products and commitments in a foreign currency. The currency risk is perceived lower in fixed-currency regimes than floating regimes, but even in such cases devaluations or revaluations that change the parity value of the currencies and changes from fixed to floating regimes represent currency risk.
- ✓ **Commodity risk:** Commodity risk arises from uncertain future market price changes of commodities. A commodity is a physical product that can be traded on the secondary market. Examples of commodities are agricultural products (grains, cattle), precious metals (silver, copper) and minerals (iron ore, gas, and electricity). Prices depend significantly on changes of supply and demand. Commodity markets can be less liquid than interest rate and currency markets, which makes the risk management of commodities more complex.
- ✓ **Interest rate risk:** The price of some investments depends on the interest rate. Interest rates are expressed as levels or as the difference with respect to a chosen benchmark or reference rate (e.g., government rate, LIBOR or swap rate). The difference (yield spread) can be due to credit quality (credit spread), liquidity (liquidity spread), tax reasons (tax spread) or the maturity (term spread).

A particular example are bonds with a fixed rate for a given time period. When interest rates move up from 4% to 6%, a bond with a coupon of 4% is less interesting and loses value. The loss is higher if the remaining life time or maturity of the bond contract is longer. On the other hand, if the interest rate decreases, bond prices will move up. A standard interest rate risk measure is the duration, which is the cash flow weighted maturity. It indicates how prices change when all interest rates on different maturities move up by 1%. The interest rate risk is specifically important for debt securities and interest-related products in the trading book. Not only the level of the interest rate induces risk, but also changes of interest rates between various products (e.g., firm vs. government bond spreads) and at different maturities.

Interest rate risk is also present on the bank's assets and liabilities, which is often treated separately from the interest rate changes causing price changes. A standard measure for market risk is value at risk (VaR). This is the maximum loss on the portfolio within a given time horizon with a given small probability. Market risk is typically expressed on a period of days to weeks. In contrast to credit risk with a much lower frequency and that is typically measured on a yearly basis, market prices are much more frequently available, which allows for a more frequent verification of the risk measure.

For some products like bonds, one may wonder whether they are subject to credit risk or market risk specifications. One makes a split up in the trading book and banking book risk management and rules.

- ✓ The trading book of the bank consists of positions in financial instruments and commodities that are held with the intent of trading or to hedge other elements of the trading book.
- ✓ The trading book is subject to market risk measurement and management standards.
- ✓ The trading book positions are frequently and accurately valued and are actively managed.

- ✓ Trading book positions are held for short-term resale or with the aim to benefit from actual or expected short-term price movements.

The banking book typically refers to positions that are held to maturity and is subject to credit risk management rules. The banking book positions correspond to the role of financial intermediary of the bank. A bond held for short-term trading is booked on the trading book; a bond held to maturity on the banking book. Explicit rules exist that define the difference between the trading and banking book to avoid regulatory arbitrage and cherry picking of the most convenient risk measurement approach.

The bank is also exposed to sources of risk other than credit, market and operational risk. These three types of risk are explicitly treated in the first pillar of the Basel II Capital Accord. Nevertheless, pillar 2 demands that banks have sufficient capital to cover all types of risk, without making explicit which types of risk these can be. Other types of risk include:

- ✓ **Liquidity risk:** Liquidity risk is the risk that a bank will not be able to efficiently meet both expected and unexpected current and future cash flows and collateral needs without affecting daily operations or the financial condition of the firm.

  Liquidity problems arise when there are differences at future dates between assets and liabilities in the balance sheet. Such gaps need to be anticipated to ensure the cost of funding at normal cost and to avoid extreme high funding costs by "last minute actions." The positive liquidity gaps (assets-liabilities) need to be funded timely to avoid excessive costs due to emergency funding. Negative gaps involve interest rate risk. The liquidity risk gap analysis is done for each period in time. It indicates for each period whether there will be large cash outflows that need action.

  For assets and liabilities with fixed cash flows, the liquidity risk gap analysis is a rather straightforward exercise for the current assets. More difficult are the projections on future loan productions and funding availabilities. Important issue is products with uncertain cash flows like revolving credits, off-balance sheet credit lines and savings deposits. The latter are especially important for banks with important retail activities due to the size it represents on the balance sheet.

  These uncertainties make liquidity gap analysis a complex exercise. Loans may grow faster than deposits and banks need to be able to have either sufficient borrowing capacity or sell other, liquid assets. New products can have different characteristics as well: internet depositors may change easily and rapidly large amounts of deposits to other investment types.

Extreme liquidity risk is the risk that the liquidity position is reduced by unforeseen events, like damage to the bank's reputation, reputation contagion, macroeconomic circumstances, monetary policy changes.