DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE MATERIALS

HS 200 BUSINESS ECONOMIICS

VISION OF THE INSTITUTION

To mould true citizens who are millennium leaders and catalysts of change through excellence in education.

MISSION OF THE INSTITUTION

NCERC is committed to transform itself into a center of excellence in Learning and Research in Engineering and Frontier Technology and to impart quality education to mould technically competent citizens with moral integrity, social commitment and ethical values.

We intend to facilitate our students to assimilate the latest technological know-how and to imbibe discipline, culture and spiritually, and to mould them in to technological giants, dedicated research scientists and intellectual leaders of the country who can spread the beams of light and happiness among the poor and the underprivileged.

ABOUT DEPARTMENT

- Established in: 2002
- Course offered : B.Tech in Computer Science and Engineering

  M.Tech in Computer Science and Engineering

  M.Tech in Cyber Security
- Approved by AICTE New Delhi and Accredited by NAAC
- Affiliated to the University of Dr. A P J Abdul Kalam Technological University.

DEPARTMENT VISION

Producing Highly Competent, Innovative and Ethical Computer Science and Engineering Professionals to facilitate continuous technological advancement.

DEPARTMENT MISSION

1. To Impart Quality Education by creative Teaching Learning Process
2. To Promote cutting-edge Research and Development Process to solve real world problems with emerging technologies.
3. To Inculcate Entrepreneurship Skills among Students.
4. To cultivate Moral and Ethical Values in their Profession.
5.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1: Graduates will be able to Work and Contribute in the domains of Computer Science and Engineering through lifelong learning.

PEO2: Graduates will be able to Analyse, design and development of novel Software Packages, Web Services, System Tools and Components as per needs and specifications.

PEO3: Graduates will be able to demonstrate their ability to adapt to a rapidly changing environment by learning and applying new technologies.

PEO4: Graduates will be able to adopt ethical attitudes, exhibit effective communication skills, Teamworkandleadership qualities.

PROGRAM OUTCOMES (POS)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1: Ability to Formulate and Simulate Innovative Ideas to provide software solutions for Real-time Problems and to investigate for its future scope.

PSO2: Ability to learn and apply various methodologies for facilitating development of high quality System Software Tools and Efficient Web Design Models with a focus on performance

optimization.

PSO3: Ability to inculcate the Knowledge for developing Codes and integrating hardware/software products in the domains of Big Data Analytics, Web Applications and Mobile Apps to create innovative career path and for the socially relevant issues.

COURSE OUTCOMES

CO1	To familiarize the prospective engineers with elementary Principles of Economics and Business Economics.
CO2	To acquaint the students with tools and techniques that are useful in their profession in Business Decision Making which will enhance their employability.
CO3	To apply business analysis to the "firm" under different market conditions.
CO4	To apply economic models to examine current economic scenario and evaluate policy options for addressing economic issues.
CO5	To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate.
CO6	To prepare and analyse various business tools like balance sheet, cost benefit analysis and rate of returns at an elementary level.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	**3**	**2**	**1**	**2**	**2**	**1**					**3**	**3**
CO2	**3**	**3**	**1**	**2**	**3**	**1**				**2**	**3**	**3**
CO3	**3**	**3**	**1**	**3**	**3**	**1**				**2**	**3**	**3**
CO4	**3**	**2**	**1**	**2**	**2**	**1**				**2**	**3**	**3**
CO5	**3**	**3**	**1**	**3**	**3**	**2**		**2**	**2**	**3**	**3**	**3**
CO6	**3**	**3**	**2**	**3**	**3**	**2**		**2**	**2**	**3**	**3**	**3**

Note: H-Highly correlated=3, M-Medium correlated=2, L-Less correlated=1

MAPPING OF COURSE OUTCOMES WITH PROGRAM SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1			
CO2	2	1	
CO3	2	1	
CO4			
CO5	3	2	
CO6	3	2	

Note: H-Highly correlated=3, M-Medium correlated=2, L-Less correlated=1

SYLLABUS

Course code	Course Name	L-T-P - Credits	Year of Introduction
HS200	**Business Economics**	**3-0-0-3**	**2016**

Prerequisite: Nil

Course Objectives

- To familiarize the prospective engineers with elementary Principles of Economics and Business Economics.
- To acquaint the students with tools and techniques that are useful in their profession in Business Decision Making which will enhance their employability;
- To apply business analysis to the "firm" under different market conditions;
- To apply economic models to examine current economic scenario and evaluate policy options for addressing economic issues
- To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate;
- To prepare and analyse various business tools like balance sheet, cost benefit analysis and rate of returns at an elementary level

Syllabus

Business Economics - basic concepts, tools and analysis, scarcity and choices , resource allocation, marginal analysis, opportunity costs and production possibility curve. Fundamentals of microeconomics - Demand and Supply Analysis, equilibrium, elasticity, production and production function, cost analysis, break-even analysis and markets. Basics of macroeconomics - the circular flow models, national income analysis, inflation, trade cycles, money and credit, and monetary policy. Business decisions - investment analysis, Capital Budgeting decisions, forecasting techniques and elementary Balance Sheet and taxation, business financing, international investments

Expected outcome .

A student who has undergone this course would be able to

i. make investment decisions based on capital budgeting methods in alignment with microeconomic and macroeconomic theories.

ii. able to analyse the profitability of the firm, economy of operation, determination of price under various market situations with good grasp on the effect of trade cycles in business.

iii. gain knowledge on Monetary theory, measures by RBI in controlling interest rate and emerging concepts like Bit Coin.

iv. gain knowledge of elementary accounting concepts used for preparing balance sheet and interpretation of balance sheet

Text Books

1. Geetika, Piyali Ghosh and Chodhury, *Managerial Economics*, Tata McGraw Hill, 2015
2. Gregory Mankiw, *Principles of Macroeconomics*, Cengage Learning, 2006.
3. M.Kasi Reddy and S.Saraswathi, *Economics and Financial Accounting*. Prentice Hall of India. New Delhi.

References:

1. Dornbusch, Fischer and Startz, *Macroeconomics*, McGraw Hill, 11th edition, 2010.
2. Khan M Y, *Indian Financial System*, Tata McGraw Hill, 7th edition, 2011.
3. Samuelson, *Managerial Economics*, 6th edition, Wiley
4. Snyder C and Nicholson W, *Fundamentals of Microeconomics*, Cengage Learning (India), 2010.
5. Truett, Managerial Economics: Analysis, Problems, Cases, 8th Edition, Wiley
6. Welch, *Economics: Theory and Practice* 7th Edition, Wiley
7. Uma Kapila, *Indian Economy Since Independence, 26th Edition: A Comprehensive and Critical Analysis of India's Economy*, 1947-2015
8. C Rangarajan, *Indian Economy, Essays on monetary and finance*, UBS Publishers'Distributors, 1998
9. A.Ramachandra Aryasri, *Managerial Economics and Financial Analysis,* Tata McGraw- Hill, New Delhi.
10. Dominick Salvatore, *Managerial Economics in Global Economy,* Thomas Western College Publishing, Singapore.
11. I.M .Pandey, *Financial Management,* Vikas Publishing House. New Delhi.
12. Dominick Salvatore, *Theory and Problems of Micro Economic Theory.* Tata Mac Graw- Hill, New Delhi.
13. T.N.Hajela.*Money, Banking and Public Finance.* Anne Books. New Delhi.
14. G.S.Gupta. *Macro Economics-Theory and Applications.* Tata Mac Graw- Hill, New Delhi.
15. Yogesh, Maheswari, *Management Economics* , PHI learning, NewDelhi, 2012
16. Timothy Taylor , *Principles of Economics*, 3rdedition, TEXTBOOK MEDIA.
17. Varshney and Maheshwari. *Managerial Economics*. Sultan Chand. New Delhi

Course Plan	Contents	Hours	Sem. Exam Marks
I	**Business Economics** and its role in managerial decision making-meaning-scope-relevance-economic problems-scarcity Vs choice (2 Hrs)-Basic concepts in economics-scarcity, choice, resource allocation-Trade-off-opportunity cost-marginal analysis-marginal utility theory, Law of diminishing marginal utility -production possibility curve (2 Hrs)	4	15%
II	**Basics of Micro Economics I** Demand and Supply analysis-equillibrium-elasticity (demand and supply) (3 Hrs.) -Production concepts-average product-marginal product-law of variable proportions-Production function-Cobb Douglas function-problems (3 Hrs.)	6	15%
FIRST INTERNAL EXAMINATION			
III	**Basics of Micro Economics II** Concept of costs-marginal, average, fixed, variable costs-cost curves-	6	15%

	shut down point-long run and short run (3 Hrs.)-Break Even Analysis-Problem-Markets-Perfect Competition, Monopoly and Monopolistic Competition, Oligopoly-Cartel and collusion (3 Hrs.).		
IV	**Basics of Macro Economics** - Circular flow of income-two sector and multi-sector models- National Income Concepts-Measurement methods-problems-Inflation, deflation (4 Hrs.)-Trade cycles-Money-stock and flow concept-Quantity theory of money-Fischer's Equation and Cambridge Equation - velocity of circulation of money-credit control methods-SLR, CRR, Open Market Operations-Repo and Reverse Repo rate-emerging concepts in money-bit coin (4 Hrs.).	8	15%

SECOND INTERNAL EXAMINATION			
V	**Business Decisions I**-Investment analysis-Capital Budgeting-NPV, IRR, Profitability Index, ARR, Payback Period (5 Hrs.)- Business decisions under certainty-uncertainty-selection of alternatives-risk and sensitivity- cost benefit analysis-resource management (4 Hrs.).	9	20%
VI	**Business Decisions II** Balance sheet preparation-principles and interpretation-forecasting techniques (7 Hrs.)-business financing-sources of capital-Capital and money markets-international financing-FDI, FPI, FII-Basic Principles of taxation-direct tax, indirect tax-GST (2 hrs.).	9	20%
END SEMESTER EXAM			

Question Paper Pattern

Max. marks: 100, Time: 3 hours

The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed

QUESTION BANK

MODULE I				
Q:NO:	**QUESTIONS**	**CO**	**KL**	**PAGE NO:**
1	What is business economics and its role in managerial decision making ?	CO1	K2	13
2	Explain the meaning of the term Business economics.	CO1	K2	13
3	What is the role of Business economics in managerial decision making?	CO1	K3	15
4	Explain the relevance of Business economics.	CO1	K3	16
5	Differentiate between (a) micro economics and (b) macro economics	CO1	K2	14
6	What do you mean by an economic problem?	CO1	K2	14
7	What do you mean by opportunity cost?	CO1	K2	17
8	Explain the term: Trade-off.	CO1	K2	17
9	Explain the terms:(a)Total revenue(b)Average revenue(c)Marginal revenue.	CO1	K2	18
10	Explain the terms:(a)Total cost(b)Average cost(c)Marginal cost.	CO1	K2	18
11	Explain production possibility curve?	CO1	K4	19
12	What is meant by resource allocation?	CO1	K2	20
MODULE II				
1	Explain the meaning of the term Demand. What are the factors affecting demand?	CO2	K2	21
2	How will you classify demands?	CO2	K2	22
3	What is meant by supply? Explain the significance of equilibrium.	CO2	K3	23
4	What is meant by (a)Total (b)Average and (c) Marginal product.	CO2	K2	24
5	What is law of demand? Explain with a neat sketch.	CO2	K2	23
6	What is law of supply? Explain with a neat sketch.	CO2	K2	23
7	What is meant by a production function?	CO2	K2	26
8	What is meant by (a) Returns to scale and (b) Return to a factor.	CO2	K2	27

9	What is meant by law of variable proportions?	CO2	K2	27
10	Explain Cobb-Douglas production function?	CO2	K2	27
11	Why Cobb-Douglas production function is considered as a better measure of productivity?	CO2	K3	27
12	Explain with neat sketches in detail the concept of marginal analysis.	CO2	K4	28
	MODULE III			
1	What do you mean by (1) Total Cost (2) Average Cost (3) Marginal Cost	CO3	K2	29
2	What is meant by fixed cost? How will you classify fixed cost? Give examples.	CO3	K2	29
3	What is meant by variable cost? Classify it with examples.	CO3	K2	30
4	Draw the short run cost curves.	CO3	K2	30
5	Explain shut down point with a neat sketch.	CO3	K2	30
6	Explain long run cost-output relationship with a neat sketch.	CO3	K2	31
7	A firm's total cost function is given by the equation, $TC= 5000+6Q+10Q^2$. Determine (a) Total fixed cost (b) Average fixed cost (c) Total variable cost (d) Average variable cost (e) Marginal cost.	CO3	K4	29
8	What is meant by break-even point? Sketch break even chart.	CO3	K2	31
9	What do you mean by Margin of safety? What are the advantages and disadvantages of break-even point.	CO3	K2	31
10	What are the features of perfect competition?	CO3	K2	31
11	What are the features of monopolistic competition?	CO3	K2	31
12	What are the features of monopoly?	CO3	K2	32
13	What are the features of oligopoly?	CO3	K2	33
14	What is meant by cartel and collusion?	CO3	K2	33
15	A company sells their product at Rs. 650 per unit, the fixed cost is Rs. 82,000 and variable cost is Rs. 240 per unit.(a) What is the BEP? (b) What volume is needed to generate a profit of Rs. 10,250?	CO3	K4	33
	MODULE IV			
1	What do you mean by Macro economics? Why is it significanct?	CO4	K2	34
2	What is meant by stock? Give few examples.	CO4	K2	35

3	What is meant by flow? Give few examples.	CO4	K2	35
4	Compare between stock and flow concepts.	CO4	K3	35
5	Explain circular flow of Income in a two sector economy.	CO4	K2	34
6	Explain circular flow of Income in a multi sector economy.	CO4	K2	36
7	What is meant by National Income? Define GNP and GDP.	CO4	K2	37
8	What is meant by NNP and NDP? What is depreciation?	CO4	K2	37
9	What is (a) Personal Income (2) Disposable Income and (3) Per-capita Income.	CO4	K2	38
10	Explain expenditure method of measuring National Income?	CO4	K2	39
11	Explain Income method of measuring National Income?	CO4	K2	39
12	Explain production method of measuring National Income?	CO4	K2	39
13	What is Inflation? Explain factors causing Inflation?	CO4	K2	40
14	What is Deflation? Explain factors causing Deflation?	CO4	K2	40
15	How to control Inflation and Deflation?	CO4	K3	40
16	Explain Quantity theory of money?	CO4	K2	41
	MODULE V			
1	What do you mean by Capital? Classify.	CO5	K2	42
2	What are the factors affecting working capital?	CO5	K2	42
3	What is meant by Investment Analysis?	CO5	K2	42
4	What is meant by capital budgeting?	CO5	K2	43
5	Explain the importance of capital budgeting.	CO5	K3	43
6	What are the factors affecting capital investment decisions.	CO5	K2	42
7	Explain capital budgeting process.	CO5	K2	43
8	State the advantages and disadvantages of ARR method.	CO5	K3	45
9	State the advantages and disadvantages of payback period method.	CO5	K3	44
10	State the advantages and disadvantages of NPV method.	CO5	K3	45
11	State the advantages and disadvantages of IRR method.	CO5	K3	46
12	State the advantages and disadvantages of PI method.	CO5	K3	47
13	Explain (1)Risk(2)Uncertainty and (3) Certainty	CO5	K2	48

MODULE VI				
1	What is meant by taxation? Why taxation is essential?	CO6	K2	57
2	What are the principles/canons of taxation?	CO6	K2	57
3	What is meant by direct tax? State it's advantages and disadvantages.	CO6	K2	58
4	What is meant by indirect tax? State it's advantages and disadvantages.	CO6	K2	58
5	What are the features of GST?	CO6	K2	59
6	Explain the Indian taxation system.	CO6	K2	58
7	What is FDI? Is it favorable to our economy. Explain	CO6	K2	57
8	Explain FPI and FII. Compare FPI with FDI.	CO6	K3	57
9	'Foreign investments result in unhealthy competitions'. Do you agree?. State your views.	CO6	K4	57
10	What are the features of a money market?	CO6	K2	56
11	What are the features of a capital market?	CO6	K2	56
12	Compare between capital and money markets.	CO6	K3	56
13	Explain the short term source of funds for a business.	CO6	K2	55

APPENDIX 1

CONTENT BEYOND THE SYLLABUS

ECONOMICS

- If I have Rs.100 in my hand, should I have a chicken biryani or use it to have a haircut?
- If the government wishes to start a new project with certain cores of rupees, should they invest in road development or in poverty eradication programs?
- What are the different methods by which a person, family, society and a nation acquire wealth and how do they spend them in different areas like food, shelter, entertainment etc?

Economics is a social science that tries to deal with these kinds of problems. We have got a fixed amount of resources in our hand and how we can efficiently use these resources to gain maximum is the basic problem in many aspects of life. Economics studies these problems. Definitions given by various economists are:-

--Economics is a science which studies human behavior as a relationship between ends and scarce means which have alternative uses.

--An enquiry into the nature and causes of wealth of nations.

BUSINESS ECONOMICS

Faris is appointed as the manager of a smartphone company. As the manager, Faris has to come across different problems like:-

a) How many numbers of smartphones should be produced in an year?

b) How many quantities in different versions of the smartphone should be produced?

c) In what proportion, the total available capital has to be distributed to manufacture different versions of the product?

d) How many employees have to be employed in different divisions of the company to fasten the production process and gain maximum profit?

Maximizing gain from the given resources like capital, labor, land, technology, time, skills etc is the main objective of a business firm. So in order to maximize the gain and to address the problems as mentioned above, a manager has to make use of economic theories and analytical tools in decision making process.

Business economics is the branch of economics that deals with the application of economic theories, principles, analytical tools etc to the decision making process within a business unit, thereby to attain the desired economic goals.

Economics

Microeconomics: It deals with economic matters within a business unit like revenue, cost, savings of workers etc

Macro economics: It deals with economic matters that can affect a business, but determined by outside environment. Eg:- national income, inflation rate, govt.policies etc

ECONOMIC PROBLEM IN A BUSINESS UNIT

You are appointed as the manager of a business unit, say a mobile phone company. The company has to acquire certain number of employees, electronic equipment's, technology etc to manufacture and distribute mobile phones into the market. There are 3 basic problems that we have to face as a decision maker. The Economic problem Sometimes called the basic or central economic problem Asserts that an economy's Finite resources are insufficient to satisfy all human wants and needs. It assumes that human wants are unlimited, but the means to satisfy human wants are scarce.

Three questions arise from this:

- What to produce?

  This question deals with selecting the type of supply and the quantity of the supply of products.

  Eg:-What type of smartphones should the company produce? How many smartphones should be produced in a year?
- How to produce?

  This question deals with procedures and methods used while making the product.

  Eg. "Should the company use more workers, or should they invest in more
- machinery?" For whom to produce?

  This question deals with distributing goods that have been produced, focusing on efficiency and equity. We have to identify those people for whom the products are to produced and it should be distributed to them.

SCOPE OF BUSINESS ECONOMICS IN MANEGIRAL POSITION

As a manager, imagine in what all areas should we use business economics in a business organization? Scope identifies those areas where the theories of business economics can be used. It includes:-

- Demand Analysis and Forecasting: - It is the process of identifying how many units of products of our company will be demanded by the customers in a certain period of time. Accurate estimates of demand is necessary for proper business planning. If forecasting is not done properly, the company may ether produce excess or fewer numbers of smartphones which may result in profit loss. A demand forecast can serve as a guide to management for maintaining and strengthening market position and enlarging profits.
- Cost and production Analysis: - To minimize the expenses while manufacturing smartphones, the company should analyze those areas where costs are incurred. A study of economic costs, combined with the data drawn from the firm's accounting records, can yield significant cost estimates which are useful for management decisions. Cost analysis helps in profit planning, cost control and pricing policies. Production analysis and production function analyze various inputs (capital, raw material, labor etc) and outputs(no.of units produced).
- Pricing Decisions, policies and practices.

  ----Should we sell our smartphones for rs.5000 or Rs.7000 or Rs.10000 or for any other amount? Pricing is an important area of business economic. Revenue of a firm depends a lot upon the price at which the commodities are sold in the market. Economic principles play a part while deciding the price of the commodity, pricing Method, price forecasting etc.
- Profit Management:- Business firms are generally organized for purpose of making profits and in the long run profits earned are taken as an important measure of the firm's success. If knowledge about the future were perfect, profit analysis would have been a very easy task. However, in a world of uncertainty, expectations are not always realized so that profit planning and measurement constitute a difficult area of business economic. The important aspects covered under this area are : Nature and Measurement of profit, Profit policies and Technique of Profit Planning like Break-Even Analysis.
- Capital Management: - We need to find huge capital investments for the smooth running of our firm. We will have many options like investing from the owner's account, issuing shares, Opting for bank loans etc. But which one should the management choose at a certain point of time? For what all purposes should the company use this capital? Capital management implies planning and control of capital expenditure. The main topics dealt with are: Cost of capital, Rate of Return and Selection of Projects.

SIGNIFICANCE OF BUSINESS ECONOMICS

- Business economics is concerned with those aspects of traditional economics which are relevant for business decision making in real life.
- It also incorporates useful ideas from other disciplines such as psychology, sociology, etc, if they are found relevant to decision making.
- Business economics helps in reaching a variety of business decisions in complicated environment. Certain examples are :
    - What products and services should be produced?
    - What input and production technique should be used?
    - How much output should be produced and at what prices it should be sold?
    - What are the best sizes and locations of new plants?
    - When should equipment be replaced?
    - How should the available capital be allocated?
- Business economics makes a manager a more competent model builder.
- At the level of the firm where its operations are conducted though functional areas, such as finance, marketing, personnel and production, business economics serves as an integrating agent by coordinating the activities in these different areas.
- Business economics analyses the interaction between the firm and society, and accomplishes the key role of an agent in achieving its social and economic welfare goals.

SCARCITY

- Scarcity is the fundamental economic problem of having seemingly unlimited human wants in a world of limited resources. Scarcity refers to shortage of resources. It states that society has insufficient productive resources to fulfill all human wants and needs.
- We may wish to have heavy meals on every day, but our income may not be sufficient enough for that. Thus there is a scarcity or shortage of resource (here income/salary) which forces us to resort to normal meals on some days.
- Scarcity leads to another concept in economics called choice.

CHOICE

- A person liked 4 shirts displayed in a textile shop. He wished to buy all the four, but he had only Rs.2000 in his hand. Thus, he had to select only two out of them. Here the person has made a choice out of the four alternatives.
- A company wishes to invest in project A and project B and each one costs Rs.30,000. But the company

has got only Rs. 40,000 as cash. Thus a choice has to be made between Project A and Project B.

- Choice involves decision making. It can include judging the merits of multiple options and selecting one or more of them. People should make choices because the resources available to them are not sufficient enough to satisfy all their desires.

TRADE OFF

- When one item is selected out of the four, we have to sacrifice the other three to get the selected one. Trade off means sacrificing some benefits or products to obtain some other benefits or products.

ALLOCATION OF RESOURCES

- A company with Rs.1 crore in hand and about 100 employees, wishes to manufacture two kinds of products, product A and product B. Here the company can allocate Rs.60 lakhs & 70 employees to manufacture product A, and Rs.40 lakhs & 30 employees to manufacture product B. Here the company has divided its available resources towards different alternatives.
- Utilizing the available resources in different alternatives is called allocation of resources.

UTILITY

- A bottle of water can quench our thirst. A car helps us to travel from one place to another. Every product has got the capacity to fulfill one or more of our needs, thereby giving us a certain amount of satisfaction.
- Utility denotes that quality in a good or service by virtue of which our wants are satisfied. In, other words utility is defined as the want satisfying power of a commodity.
- Utility is the quality of a good to satisfy a want.
- Utility is the quality in commodities that makes individuals want to buy them.
  - We can say a bottle of water has utility of 20 utile.
  - Ordinal utility theory says that utility cannot be measured in quantities, but can only be compared with one another.

FEATURES OF UTILITY

- Utility is Relative: Utility of a good never remains the same. It varies with time and place. A tube light has got utility at night but not so in the morning.
- Utility is Subjective: Utility is subjective because it deals with the mental satisfaction of a man. The same commodity may have different utility for different persons. A pen has got certain amounts of

utility for literate and illiterate persons.

- Utility and usefulness: Utility and usefulness are different. A commodity having utility need not be useful. Cigarette and liquor are harmful to health, but if they satisfy the want of an addict then they have utility for him. Use of liquor or drugs may not be proper from the moral point of views. But as these intoxicants satisfy wants of the addicts, they have utility for them.

MARGINAL UTILITY

- Suppose on a hot day, we wish to have some cold ice-cream. After finishing the first cup of ice-cream, we will feel a certain amount of satisfaction or in economic terms it gives a certain amount of utility. This utility can be named as the marginal utility of first cup of ice-cream. Immediately after finishing the first cup, we started to have another cup as well. On finishing the second cup, we may feel certain amount of satisfaction/utility, which can be named as the marginal utility of the second cup of ice-cream. If this process is continued, we will obtain the marginal utilities for 3^{rd}, 4^{th}, 5^{th} etc cup of ice-creams. On analyzing the same, we can see that the utility/satisfaction derived out of second cup will be less than the first one. As more and more units are consumed, marginal utility of each unit diminishes.
- Marginal Utility is the utility derived from the additional unit of a commodity consumed.
- Total utility is the sum total of marginal utilities of all units of a commodity consumed at a particular time.
- The change that takes place in the total utility by the consumption of an additional unit of a commodity is called marginal utility.
- As in our case of consuming more and more cups of ice-creams, we have:-

Number of units of ice-cream consumed	Marginal utility (MU)	Total utility
1	20	20
2	15	35
3	10	45
4	05	50
5	00	50
6	-5	45

Total utility (TU) = $MU_1+MU_2+ MU_3 +MU_4 + \ldots\ldots\ldots\ldots$

$MU = \Delta TU / \Delta Q$

ΔTU: change in total utility.

ΔQ: change in units consumed

Marginal utility can be measured from total utility,

$MU_{(n+1)}^{th}$ unit $= TU_{(n+1)}^{th} - TU_{n}^{th}$

- The marginal utility of each successive units or ice-cream goes on decreasing. At one stage it reaches zero, showing no utility at all. Beyond that point, ice-cream creates a negative impact on the person.

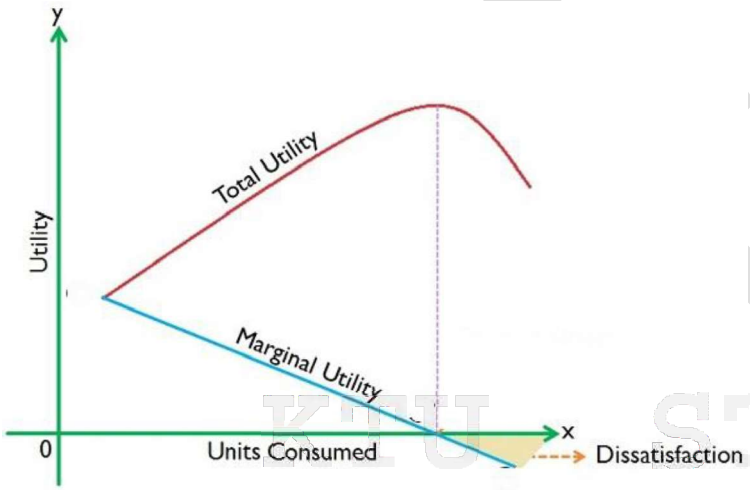
LAW OF DIMINISHING MARGINAL UTILITY

- As the quantity consumed of a commodity increases continuously, the utility derived from each successive unit decreases, consumption of other commodities remaining the same.

- Marginal utility of each successive unit consumed diminishes with increase in consumption. (Analyze the case of consuming more and more cups of ice cream once again)

ASSUMPTIONS OF THE LAW

- Utility can be measured in cardinal number system such as 1,2,3 etc
- Continuous consumption of the commodity is assumed.
- No change in income of the consumer, his tastes, character, fashion etc
- No change in the price of the commodity and its substitutes.
- Marginal utility of money remains constant.
- Suitable quantity of the commodity is consumed.
- Marginal Utility of every commodity is independent.
- Every unit of the commodity being used is of same quality and size.



Utility curve

Total utility increases at first, reaches a maximum level and then decreases.

Marginal utility decreases throughout, reaching zero at one stage and later moving to negative values showing dissatisfaction for the product.

(check the table for more clarification)

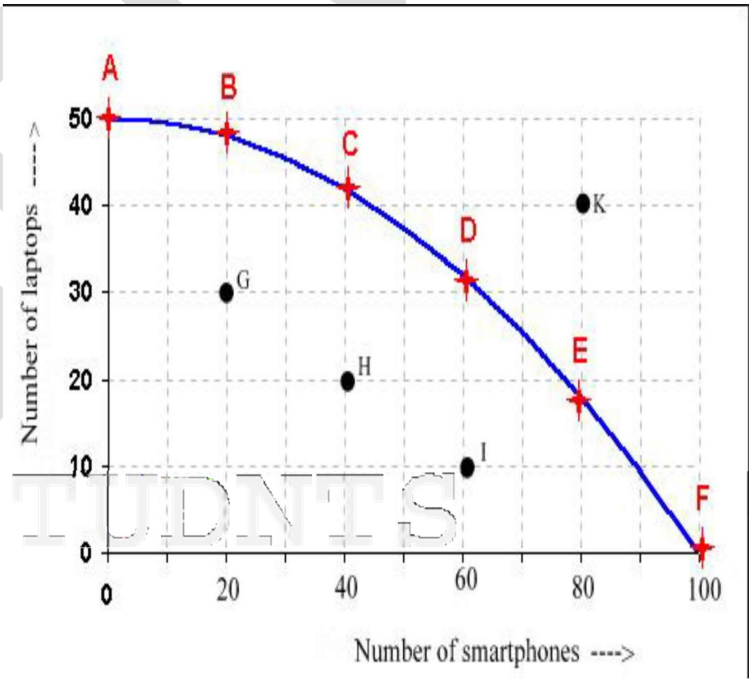
PRODUCTION POSSIBILITY CURVE

- Suppose we have a fixed amount of resources (capital, labor etc) in our hand. We wish to produce smartphones and laptops using these resources. Since we have only a fixed number of resources, we have to allocate these resources into two sections to manufacture these two products. If all the resources are used to produce only one commodity, then we cannot produce a single unit of the other commodity. If the resources are allocated in different proportions, then the number of laptops and smartphones produced will vary depending upon that proportion.
- Initially, all the resources are used to produce laptops. At that point, the number of laptops produced will be 50 and the number of smartphones produced will be zero. In the next stage, small amount of resources are allocated to the smartphone section and the remaining portion to the laptop section. Thus, the number

of smartphones manufactured will increase by a small amount and that of laptops will decrease by a small amount. If more and more resources are allocated to smartphones, then the number of smartphones will increase and that of laptops will decrease. At last, a stage will be reached where no laptops can be produced at all.

- A production possibility frontier (PPF) or production possibility curve (PPC) is a graphical representation of the alternative combinations of the amounts of two goods or services that an economy can produce by transferring resources employed at full efficiency from one good or service to the other.
- A production possibility frontier (PPF) or production possibility curve (PPC) is a graphical representation of possible combinations of two goods that can be produced with constant resources and technology, such that more of one good could be produced only by diverting resources from the other good, resulting in less production of it. Production possibility frontier (PPF) represents the point at which an economy is most efficiently producing its goods and services and, therefore, allocating its resources in the best way possible.

POINTS	NUMBER OF SMARTPHONES PRODUCED	NUMBER OF LAPTOPS PRODUCED
A	0	50
B	20	47
C	40	42
D	60	31
E	80	18
F	100	0



- A, B, C, D, E and F show various combinations of number of laptops and smartphones that can be produced when the resources are **utilized at full efficiency**..
- G, H and I show combinations of smartphones: laptops as (20:30), (40:20) and (60:10) respectively. But from the table we can see that 47 laptops can be produced with 20 smartphones, 42 laptops can be produced with 40 smartphones and 31 laptops can be produced with 60 smartphones. We have not attained such combinations at the points G, H and I. So these points correspond **to under utilization of resources.**

DEMAND

- **Demand** for a commodity is constituted by 3
- components:- Desire for the product
- Ability to pay for the product
- Willingness to pay for the product
- Quantity demanded is a term used in economics to describe the total amount of goods or services demanded at any given point of time, at a given price.

DETERMINANTS OF DEMAND

- Determinants of demand refer to the influencing factors of demand. It includes:-

PRICE OF THE PRODUCT

When the price of a product rises, the quantity demanded of that product falls. That also means that, when prices drop, demand will grow. People base their purchasing decisions on price if all other things are equal. Eg :- When shirts go on sale, you might buy three instead of one. The quantity that you demand increases because the price has fallen.

INCOME EFFECT

The income of a consumer affects his/her purchasing power, which, in turn, influences the demand for a product. Increase in the income of a consumer would automatically increase the demand for products by him/her, while other factors are at constant, and vice versa.

For example, if the salary of Mr. X increases, then he may be able to buy more chocolates for his children.

PRICES OF RELATED GOODS OR SERVICES:

Refer to the fact that the demand for a specific product is influenced by the price of related goods to a greater extent. Related goods can be of two types, namely, substitutes and complementary goods, which are explained as follows:

a) **Substitutes or supplementary effect**: Refer to goods that satisfy the same need of consumers but at a different price. For example, tea and coffee, groundnut oil and sunflower oil are substitute to each other. The increase in the price of a good results in increase in the demand of its substitute with low.

b) Complementary Goods or complementary effect:

Refer to goods that are consumed simultaneously or in combination. In other words, complementary goods are consumed together. For example, pen and ink, car and petrol, etc are used together. Therefore, the demand for complementary goods changes simultaneously. The complementary goods are inversely related to each other. For example, increase in the prices of petrol would decrease the

demand of cars.

- **Tastes and preference of customers**

  The tastes and preferences of consumers are affected due to various factors, such as life styles, customs, common habits, and change in fashion, standard of living, religious values, age, etc

  A change in any of these factors leads to change in the tastes and preferences of consumers. Consequently, consumers reduce the consumption of old products and add new products for their consumption. For example, if there is change in fashion, consumers would prefer new and advanced products over old- fashioned products, provided differences in prices are proportionate to their income.

- **Expectations of future price**

  Expectations of consumers about future changes in the price of a product affect the demand for that product in the short run. For example, if consumers expect that the prices of petrol would rise in the next week, then the demand of petrol would increase in the present. On the other hand, consumers would delay the purchase of products whose prices are expected to be decreased in future, especially in case of non-essential products.

- **Advertisement effect**

  Consumers are highly sensitive about advertisements as sometimes they get attached to advertisements by their favorite celebrities. This results in the increase demand for a product.

- **Number of buyers in the market.**

  The number of consumers affects overall, or aggregate, demand. As more buyers enter the market, demand rises. That's true even if prices don't change.

- **Government Policy:**

  Government policies can affect the demand for a product. For example, if a product has high tax rate, this would increase the price of the product. This would result in the decrease in demand for a product.

- **Climatic Conditions**:

  The demand of ice-creams and cold drinks increases in summer, while tea and coffee are preferred in winter.

- **Distribution of National Income**

  If income is equally distributed among people in the society, the demand for products would be higher than in case of unequal distribution of income. However, the distribution of income in the society varies widely. The high income segment of the society would prefer luxury goods, while the low income segment would prefer necessary goods.

- **Growth of Population**:

  High growth of population would result in the increase in the demand for different products

LAW OF DEMAND

Other things remaining the same, the higher the price of a good, the smaller is the quantity demanded; and the lower the price of a good, the larger is the quantity demanded.

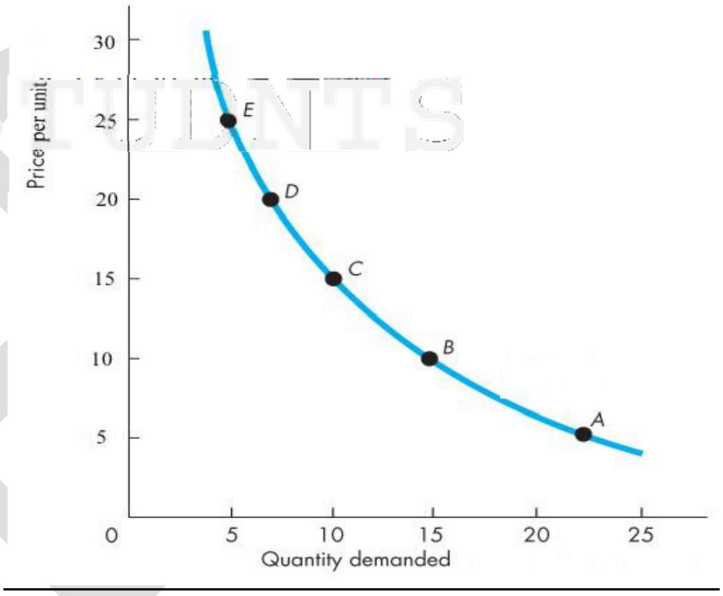
Other factors to be same means that we assume there is no change in tastes & preference of customers, no change in income, no change in price of related goods etc.

- Following are the different quantities of chocolates a boy is willing to buy at different prices.

Demand schedule

Points	Price per unit	Quantity demanded
A	5	22
B	10	15
C	15	10
D	20	7
E	25	5

Demand curve



-----There is an inverse relation between price and quantity demanded.

The quantity demanded decreases for an increase in price because of:-

a) Substitution effect : when the price of product' A' increases ,people will buy its substitutes thereby reducing the demand of product A

b) Income effect: - When the price of product' A' increases, it will reduce the real income or purchasing power of people, thereby reducing the demand of product A

LAW OF SUPPLY

The quantity supplied of a good or service is the amount that producers plan to sell during a given time period at a particular price

Other things remaining the same, the higher the price of a good, the greater is the quantity supplied; and lower the price of a good, the smaller is the quantity supplied.

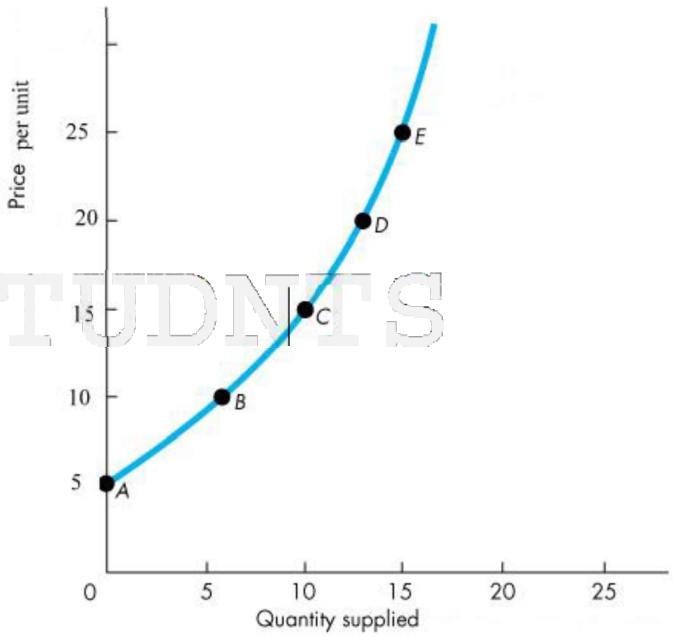
The supply curve shows the relationship between the quantity supplied of a good and its price when all other influences on producers' planned sales remain the same.

Supply schedule

Following table shows different quantities of chocolates that a person is ready to sell under different prices per unit.

Points	Price per unit	Quantity supplied
A	5	0
B	10	6
C	15	10
D	20	14
E	25	17

Supply curve



As the price per unit of the product increases, the supplier is willing to sell more and more chocolates as he will get more profit from each chocolate.

MARKET EQUILIBRIUM

Equilibrium is a situation in which opposing forces balance each other. Equilibrium in a market occurs when the price balances the plans of buyers and sellers. Buyers may demand different quantity of goods at different prices. Sellers may supply demand different quantity of goods at different prices. If buyers demand and sellers supply same quantity of goods at a particular price, then we can say that an equilibrium is created.

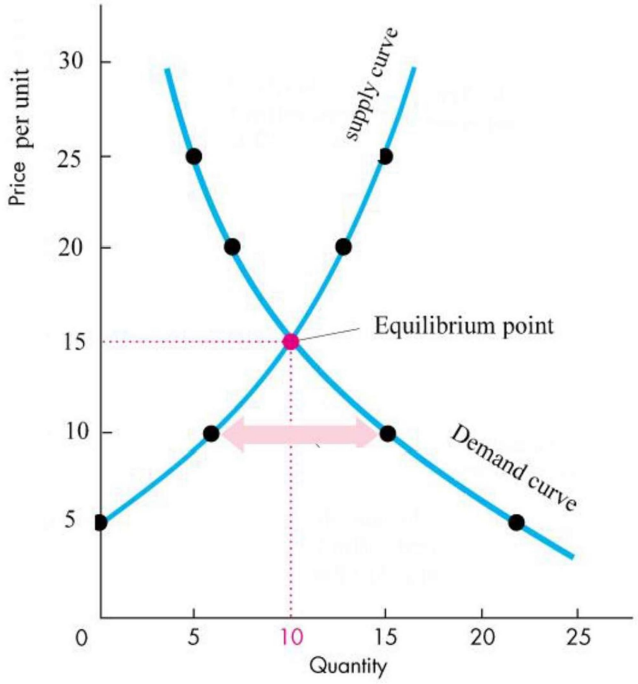
The equilibrium price is the price at which the quantity demanded equals the quantity supplied.

The equilibrium quantity is the quantity bought and sold at the equilibrium price.

Curve

Schedule

Price per unit	Quantity supplied	Quantity demanded
5	0	22
10	6	15
15	10	10
20	14	7
25	17	5



At Rs.10 per unit, the supplier will sell only 6 units but the customer demands 15 units. That means there is a shortage of supply and excess demand.

At Rs.20 per unit, the supplier is ready to sell 14 units but the customer demands only 7 units. That means there is a excess of supply and shortage of demand.

At Rs.15 per unit, the supplier will sell 10 units and the customer also demands 10 units. That means there plans of both customer and supplier will meet at this point. Here equilibrium price is Rs.15 and equilibrium quantity is 10.

EXCEPTIONS TO THE LAW OF DEMAND

- **Inferior goods/ Giffen goods**

  A Giffen good is a good for which demand increases as the price increases, and falls when the price decreases, unlike the law of demand

- **Goods having prestige value**

  Few goods like diamond can be purchased only by rich people. The prices of these goods are so high that they are beyond the capacity of common people. The higher the price of the diamond the higher the prestige value of it.

  In this case, a consumer will buy less of the diamonds at a low price because with the fall in price, its prestige value goes down. On the other hand, when price of diamonds increase, the prestige value goes up and therefore, the quantity demanded of it will increase.

- **Price expectation**

  When the consumer expects that the price of the commodity is going to fall in the near future, they do not buy more even if the price is lower.

  On the other hand, when they expect further rise in price of the commodity, they will buy more even if the price is higher. Both of these conditions are against the law of demand.

- **Fear of shortage**

  When people feel that a commodity is going to be scarce in the near future, they buy more of it even if there is a current rise in price.

  For example: If the people feel that there will be shortage of L.P.G. gas in the near future, they will buy more of it, even if the price is high.

- **Change in fashion**

  The law of demand is not applicable when the goods are considered to be out of fashion.

  If the commodity goes out of fashion, people do not buy more even if the price falls. For example: People do not purchase old fashioned shirts and pants nowadays even though they've become cheap. Similarly, people buy fashionable goods in spite of price rise.

- **Basic necessities of life**

  In case of basic necessities of life such as salt, rice, medicine, etc. the law of demand is not applicable as the demand for such necessary goods does not change with the rise or fall in price.

PRODUCTION FUNCTION

- Availability of any product in the market depends upon the production of that commodity. Production of commodities depends upon various inputs like capital, labor, land, materials, technology, time, managerial efficiency etc. In order to increase the level of output we have to increase the level of these input factors.

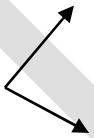
Thus there exists a relationship between these input factors and the total output produced.

- Production function is a mathematical expression that analyzes the relationship between various input factors like capital, labor, land, materials, technology, time, managerial efficiency etc with the total quantity of output produced.
- A General form of production function can be expressed as Q = f (K, L, T, t, e, etc),

  Read as Total quantity of output (Q) is a function of capital(K), labour (L), technology (T), time (t), managerial efficiency (e) , etc.
- In order to simplify the analysis we consider only capital and labour does the production function can be expressed as Q = f (K, L)
- That means, we consider only capital and labour in our discussion.

Short run production function

Production function can be of two types



Long run production function In the short run, labor is the only variable input, capital remains constant

In the long run, both capital and labor can be varied together or one at a time.

SHORT RUN LAWS OF PRODUCTION OR LAW OF VARIABLE PROPORTION

1. Law of variable proportion examines what will happen to the total output when more and more units of one input (labor) are combined with a fixed quantity of the other input.
2. Consider an example. A business unit has got 4 machines at their site. Let's see what will happen if more and more labors are used to work with these 4 machines. Here capital is kept constant and labour is varied.
3. Law of variable proportion says that when more and more units of a variable input is combined with fixed quantities of other inputs, the total product may increase on increasing rate at first but then increases at a diminishing rate and eventually the total output decrease

LONG RUN LAWS OF PRODUCTION

- Both labor and capital can be varied. Cobb- Douglas Production function is a widely used production function when both capital and labor are varied.
- Imagine, a person had started a new business unit, producing packaged potato chips. The total packets of potato chips produced (or the total quantity of output) depend upon various factors (inputs) like number of machines (capital) used in the business unit, number of workers in the unit (labors) etc. So, it is necessary to derive a relationship between input factors capital and labor with the total output.

- Cobb- Douglas Production function was proposed by two Economists named Charles Cobb and Paul Douglas. It is a widely used production function. It helps us to calculate how the variations in physical inputs like capital, labor etc can change the level of output in a business firm.

MARGINAL PRODUCT OF CAPITAL

In the first example, we had calculated the total output when the capital was 10 units and labor was 30 units. If we increase the **capital alone** by one unit, that means the capital is made to 11 units and labor is kept at 30 units, the total output will increase by a certain amount.

Marginal product of capital gives the measure of change in total output level due to one unit change in the **level of capital**

For example , when the capital was 10 units and labour was 30 units, we got the total output (Q) as 86 units. when the capital is 11 units and labour is 30 units, we can calculate the total output (Q) as

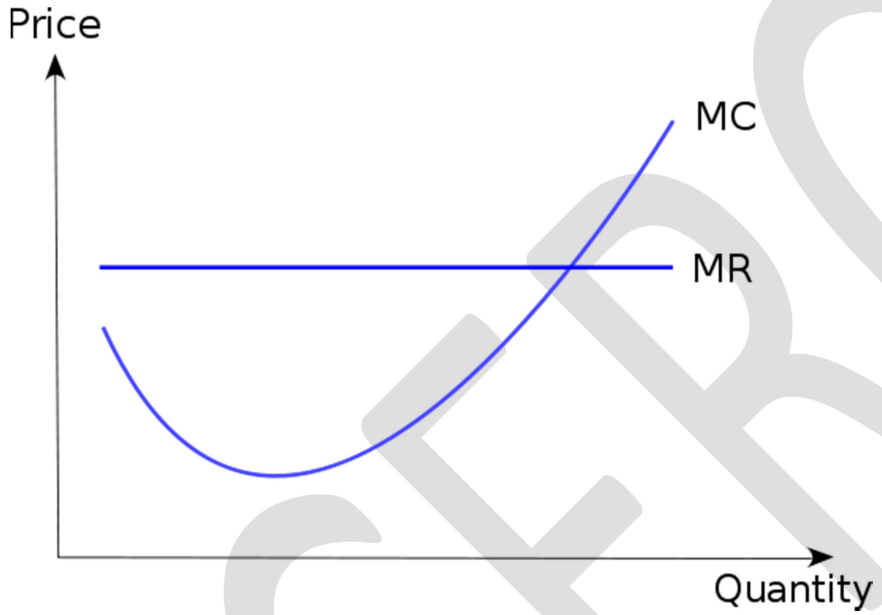
$Q = 4\,(11)^{0.3}\,(30)^{0.7} \Longrightarrow Q = 89$ units.

Change in total output = 89-86 = 3 units

Here the marginal product of capital = 3 units

MARGINAL COST

In economics, marginal cost is the change in the total cost that arises when the quantity produced is incremented by one unit, that is, it is the cost of producing one more unit of a good. In general terms, marginal cost at each level of production includes any additional costs required to produce the next unit MR-Marginal Revenue, MC-Marginal Cost



AVERAGE COST

In economics, average cost and/or unit cost is equal to total cost divided by the number of goods produced (the output quantity, Q). It is also equal to the sum of average variable costs (total variable costs divided by Q) plus average fixed costs (total fixed costs divided by Q). Average costs may be dependent on the time period considered (increasing production may be expensive or impossible in the short term. for example) average costs affect the supply curve and are a fundamental component of supply and demand

FIXED COST

In economics, fixed costs, indirect costs or overheads are business expenses that are not dependent on the level of goods or services produced by the business. They tend to be time-related, such as salaries or rents being paid

per month, and are often referred to as overhead costs. This is in contrast to variable costs, which are volume-related (and are paid per quantity produced). The relation between fixed cost and variable cost can be modeled by an analytical formula.

DEFINE VARIABLE COST

A variable cost is a corporate expense that varies with production output. Variable costs are those costs that vary depending on a company's production volume; they rise as production increases and fall as production decreases. Variable costs differ from fixed costs such as rent, advertising, insurance and office supplies, which tend to remain the same regardless of production output. Fixed costs and variable costs comprise total cost.

COST CURVE

In economics, a cost curve is a graph of the costs of production as a function of total quantity produced. In a free market economy, productively efficient firms use these curves to find the optimal point of production (minimizing cost), and profit maximizing firms can use them to decide output quantities to achieve those aims. There are various types of cost curves, all related to each other, including total and average cost curves, and marginal ("for each additional unit") cost curves, which are equal to the differential of the total cost curves.

SHUDOWN POINT

A shutdown point is a point of operations where a company experiences no benefit for continuing operations or from shutting down temporarily; it is the combination of output and price where the company earns just enough revenue to cover its total variable costs. If a company can produce revenue greater or equal to its total variable costs, it can use the additional revenue to pay down its fixed costs, assuming fixed costs, such as lease contracts or other lengthy obligations, will still be incurred when it shuts down. In other words, when a company can earn a positive contribution margin, it should remain in operations despite an overall loss.

SHORT RUN AND LONG RUN.

In microeconomics, the long run is the conceptual time period in which there are no fixed factors of production, so that there are no constraints preventing changing the output level by changing the capital stock or by entering or leaving an industry. The long run contrasts with the short run, in which some factors are variable and others are fixed, constraining entry or exit from an industry. In macroeconomics, the long run is the period when the general price level, contractual wage rates, and expectations adjust fully to the state of the economy, in contrast to the short run when these variables may not fully adjust.

LONG RUN

In the long run, firms change production levels in response to (expected) economic profits or losses, and the land, labour, capital goods and entrepreneurship vary to reach associated long-run average cost. In the simplified case of plant capacity as the only fixed factor, a generic firm can make these changes in the long run:

- enter an industry in response to (expected) profits
- leave an industry in response to losses
- increase its plant in response to profits
- decrease its plant in response to losses

BREAK EVEN ANALYSIS

Break-even analysis entails the calculation and examination of the margin of safety for an entity based on the revenues collected and associated costs. Analyzing different price levels relating to various levels of demand, an entity uses break-even analysis to determine what level of sales are needed to cover total fixed costs. A demand-side analysis would give a seller greater insight regarding selling capabilities.

MARKET.

A market is one of the many varieties of systems, institutions, procedures, social relations and infrastructures whereby parties engage in exchange. While parties may exchange goods and services by barter, most markets rely on sellers offering their goods or services (including labour) in exchange for money from buyers. It can be said that a market is the process by which the prices of goods and services are established. Markets facilitate trade and enable the distribution and allocation of resources in a society. Markets allow any trade-able item to be evaluated and priced.

PERFECT COMPETITION MARKET

Perfect competition is a market structure in which the following five criteria are met:

1) All firms sell an identical product;

2) All firms are price takers - they cannot control the market price of their product;

3) All firms have a relatively small market share;

4) Buyers have complete information about the product being sold and the prices charged by each firm; and

5) The industry is characterized by freedom of entry and exit. Perfect competition is sometimes referred to as "pure competition".

IMPERFECT MARKET

Imperfect competition, in which a competitive market does not meet the above conditions, is very common. Examples of imperfect competition include oligopoly, monopolistic competition, monopsony and oligopoly.

In an oligopoly, there are many buyers for a product or service but only a few sellers. The cable television industry in most areas of the United States is a prototypical oligopoly. While an oligopolistic market is competitive - the few active firms within an industry compete with one another - it falls well short of perfect competition in several key areas. The firms involved usually sell similar products, but they are not identical. Because of the small number of firms, a singular firm has the power to influence market prices; in fact, collusion, an underhanded tactic in which competing firms join forces to manipulate market prices, has historically been rampant in oligopolies. By its very nature, an oligopoly provides large market share to each firm. Perfect knowledge does not exist, and the barriers to entry are typically high, ensuring the number of players remains small.

Monopolistic competition describes a market that has a lot of buyers and sellers, but whose firms sell vastly different products. Therefore, the condition of perfect competition that products must be identical from firm to firm is not met. The restaurant, clothing and shoe industries all exhibit monopolistic competition; firms within those industries attempt to carve out their own sub-industries by offering products or services not duplicated by their competitors. In many ways, monopolistic competition is closer than oligopoly to perfect competition. Barriers to entry and exit are lower, individual firms have less control over market prices and consumers, for the most part, are knowledgeable about the differences between firms' products.

Monopsony and oligopsony are counterpoints to monopoly and oligopoly. Instead of being made up of many buyers and few sellers, these unique markets have many sellers but few buyers. The defense industry in the U.S. constitutes a monopsony; many firms create products and services and attempt to sell them to a singular buyer, the
U.S. military. An example of an oligopsony is the tobacco industry. Almost all of the tobacco grown in the world is purchased by less than five companies, which use it to produce cigarettes and smokeless tobacco products. In a monopsony or an oligopsony, it is the buyer, not the seller, who has the ability to manipulate market prices by playing firms against one another.

LARTEL

In economics, a cartel is an agreement between competing firms to control prices or exclude entry of a new competitor in a market. It is a formal organization of sellers or buyers that agree to fix selling prices, purchase prices, or reduce production using a variety of tactics.[1] Cartels usually arise in an oligopolistic industry, where the number of sellers is small or sales are highly concentrated and the products being traded are usually commodities. Cartel members may agree on such matters as setting minimum or target prices (price fixing), reducing total industry output, fixing market shares, allocating customers, allocating territories, bid rigging, establishment of common sales agencies, altering the conditions of sale, or combination of these. The aim of such collusion (also called the cartel agreement) is to increase individual members' profits by reducing competition. If the cartelists do not agree on market.

CIRCULAR FLOW OF INCOME

- The circular flow of income and expenditure refers to the process whereby the national income and expenditure of an economy flow in a circular manner continuously through time.

CIRCULAR FLOW IN A TWO SECTOR ECONOMY:

- We begin with a simple hypothetical economy where there are only two sectors, the household and business.

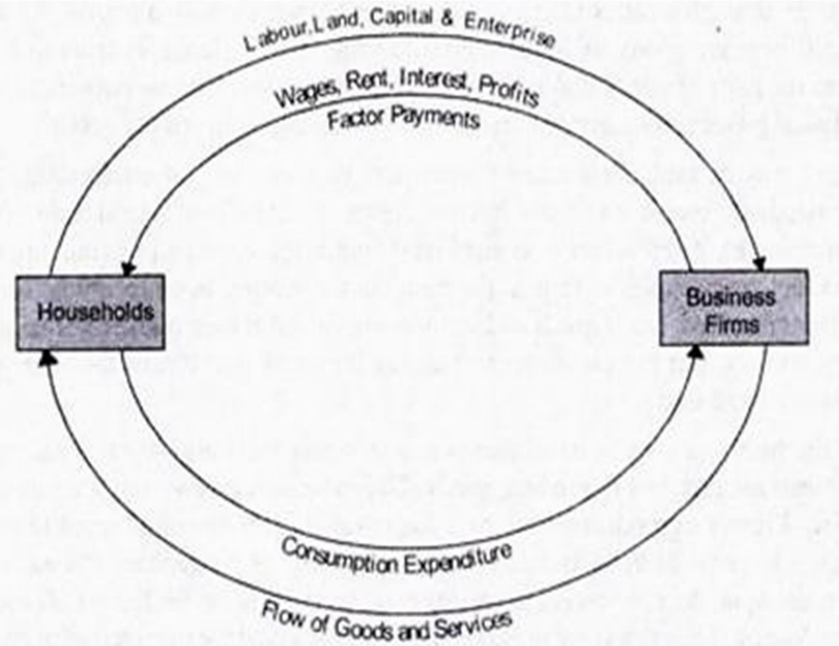
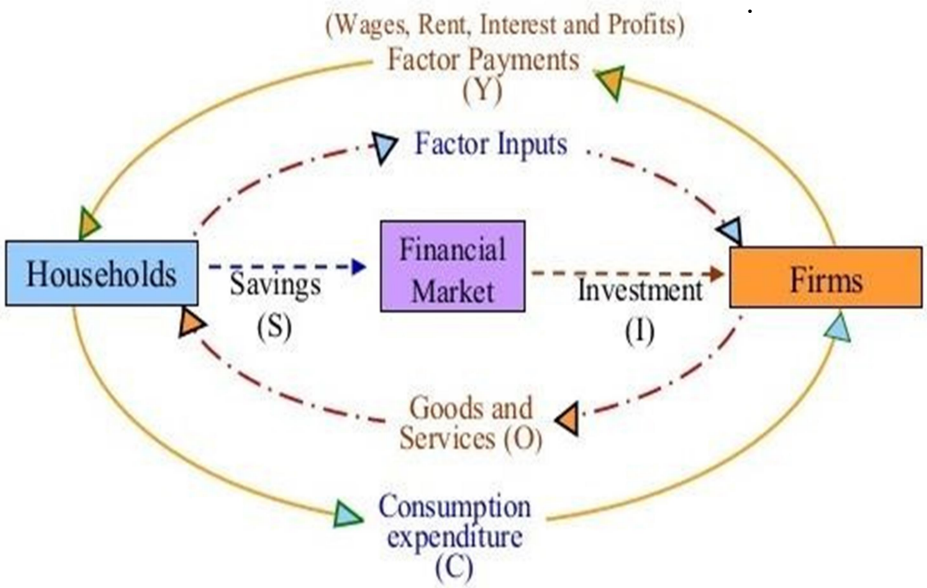


Fig. 6.1. *Circular Flow of Income in a Simple Two Sector Economy*

- .The household sector provides all the factors of production, that is, land, labour and capital to the business sector.
- In return, the business sector provides salaries, rent dividend etc as income to the household sector
- Using the factors of production, business sector produces various goods and services. These goods and services are delivered to the household sector.
- In return, household sector has to pay for the used up goods and services. Thus a consumption expenditure flows from household sector to business sector.
- We assume that goods and services from business sector are completely sold and used by the household sector. If Y denotes total income and E denotes total expenditure, then here Y = E.

CIRCULAR FLOW WITH SAVING AND INVESTMENT ADDED

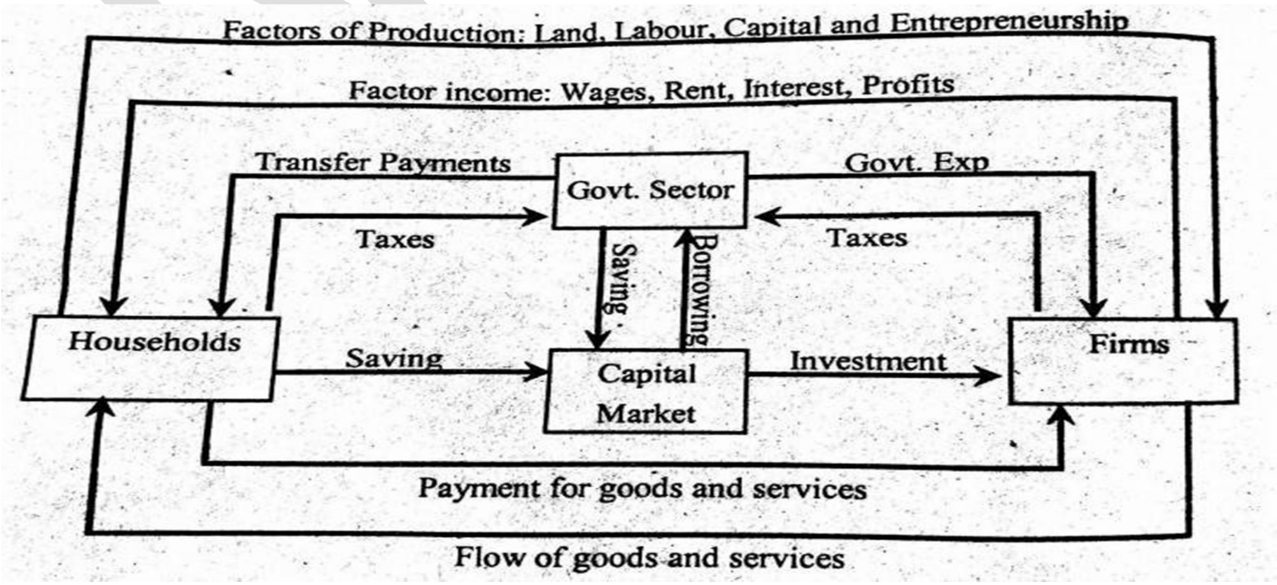
- The actual economy is not as explained above. Households will not spend their entire income as expenditure. A part of income is saved in capital markets., The capital market refers to a number of financial institutions such as commercial banks, savings banks, loan institutions, the stock and bond markets, etc. These capital markets provide funds to the business sector as investments.
- The households supply saving to the capital market and the firms, in turn, obtain investment funds from the capital market. In an economy, “inflows” and “leakages” occur in the expenditure and income flows
- Injection mean introduction of income into the circular flow
- Here leakages are Savings (S) and injections are investments (I) which equals each other.



CIRCULAR FLOW IN A THREE- SECTOR ECONOMY:

To the two sector model, we add the government sector so as to make it a three-sector closed model of circular flow of income and expenditure. For this, we add taxation and government purchases (or expenditure) in 3 sector model.

- First, take the circular flow between the household sector and the government sector. Taxes in the form of personal income tax and commodity taxes paid by the household sector flows from household to government.
- Government pays salaries to its employees, makes transfer payments in the form of old age pensions, unemployment relief, sickness benefit, etc., and also spends on them to provide certain social services like education, health, housing, water, parks and other Facilities. All such expenditures by the government flow from government sector to household sector.

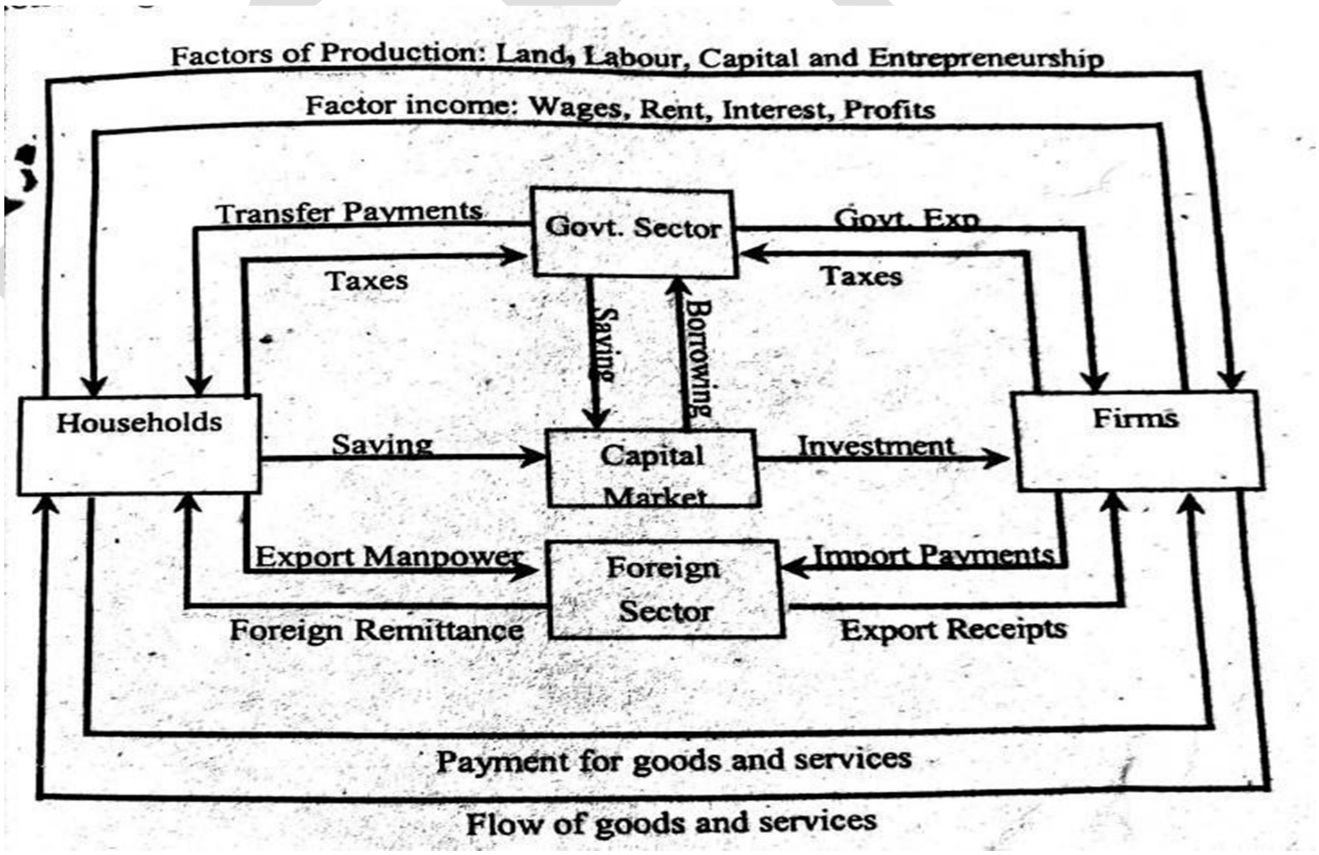


- Next take the circular flow between the business sector and the government sector.
- Subsidies to the business unit and payment for goods and services purchased by the government (government expenditures) flow from government sector to business sector.
- In the three sector flow, Taxation (T) is a leakage from the circular flow and government expenditures (G) are injections into the circular flow.
- If T >G, government can save the surplus in financial markets.,
- If T <G, government has to borrow from financial markets to meet its expenses.

CIRCULAR FLOW IN A FOUR-SECTOR ECONOMY: (OPEN ECONOMY)

Foreign sector is added as fourth sector in the circular flow of income and expenditure.

- Households supply manpower (labours) to foreign countries and in return, salaries are received from those countries (foreign remittance)
- Firms supply goods to foreign countries and receive export receipts. Also when goods are bought from foreign nations.



Export receipts (E) are an injection into the economy Import payments (M) are leakages from the economy

THE WHOLE ANALYSIS OF ALL SECTORS CAN BE SHOWN AS:-

- Total injections = Investments (I) + Government expenditure (G) + Export Receipts (E)
- Total leakages = Savings (S) + Taxes (T) + Import payments (M)
- If leakages = injections , then economy is in equilibrium.
- If leakages > injections , then economy is in a bad state.
- If leakages < injections , then economy is in good condition.

INFLATION

- It is defined as a sustained increase in the general level of prices for goods and services in a county, and is measured as an annual percentage change.
- Purchasing power of money decreases during inflation: Suppose 1 kg of a commodity costs Rs.10.By the course of time, inflation had occurred and price increased to Rs. 20/kg. power of Rs.10 was only ½ kg of the product
- We can say that during inflation, the value of money decreases.

CAUSES OF INFLATION

- Demand-Pull Inflation – If there are only a few number of products in the market and a greater number of people require them, then sellers will sell those products to those customers who are ready to pay higher prices. Thus the price of the product increases.
- Inflation is caused by the overall increase in demand for goods and services, which bids up their prices. This theory can be summarized as "too much money chasing too few goods". In other words, if demand is growing faster than supply, prices will increase. This usually occurs in rapidly growing economies.
- Cost-Push Inflation – Inflation is caused when companies' costs of production go up. When this happens, they need to increase prices to maintain their profit margins. Increased costs can include things such as wages, taxes, or increased costs of natural resources or imports.
- Monetary Inflation – Inflation is caused by an oversupply of money in the economy. If people have a lot of money in their hands, then they will be ready to pay any price for products they want. Thus suppliers will charge huge prices for their products.

- Increase in public expenditure:- when the expenditure of government increases , more and more goods will be used by them which creates an overall shortage in the availability of goods. Then there will be huge demand for the remaining goods and sellers will charge high prices for them.
- Increase in disposable income: - When the personal income of people increases, they will be ready to pay huge amounts to get the limited number of products in the market.
- Shortage of factors of production: - When the production of goods in country decreases, people who pay higher prices for the available products will only get them and thereby prices increases.
- Occurrence of natural calamities and artificial scarcities

MEASURES TO CONTROL INFLATION

- Inflation is caused by the failure of aggregate supply to equal the increase in aggregate demand. Inflation can, therefore, be controlled by increasing the supplies of goods and services and reducing money incomes in order to control aggregate demand. There are 3 methods to control inflation.

--MONETARY POLICY ---FISCAL POLICY --- OTHER MEASURES

1. **MONETARY MEASURES:**

- Monetary measures aim at reducing money supply. If the availability of money with the people is decreased, then people will not be willing to pay high prices for the products and thereby prices will come down. Monetary policy can be helpful in controlling inflation due to demand- pull factors

(a) **CREDIT CONTROL:**

- It refers to the methods adopted by the central bank of a nation to reduce the tendency of people to take more and more loans from banks. If credit control techniques are applied, then the tendency to take loans will decrease which will lead to decrease in availability of money .
- During inflation, central bank will increase the rate of CRR. If the central bank decides to increase the CRR, the available amount with the banks comes down. As a result, public will get only lesser amounts as loans from commercial banks. Thus the availability of money with the public can be reduced.

- **REPO RATE**
- The rate at which the RBI lends money to commercial banks is called repo rate. Whenever banks have any shortage of funds they can borrow from the RBI. Current repo rate is 6.25%
- During inflation repo rates will be increased. Thus banks have to pay higher interest rates for the money borrowed from RBI. As a result, banks will lend money to the public at even higher prices. This reduces tendency of people to take loans and availability of money with the public can be reduced.

- **REVERSE REPO RATE**
- It is the rate at which the RBI borrows money from commercial banks. Banks are always happy to lend money to the RBI since their money are in safe hands with a good interest. Current reverse repo rate is 6%
- During inflation, Reverse repo rate is increased. An increase in reverse repo rate can prompt banks to deposit more funds with the RBI to earn higher returns on idle cash. Thus only less amount of funds will be available to the public as loans.
- **SLR (STATUTORY LIQUID RATIO)**
- Banks have to invest certain percentage of their deposits in specified liquid assets like gold, financial securities like Central Government or State Government securities. This percentage is known as SLR. Current SLR percentage is 20.5%
- During inflation, SLR is increased so as to reduce the availability of cash with commercial banks.
- Open market operations:
- It refers to the buying and selling of government securities like treasury bills etc to people and banks thereby reducing the money supply with the public

DEMONETISATION OF CURRENCY:

- Demonetization of currency of higher denominations is usually adopted when there is abundance of black money in the country.

ISSUE OF NEW CURRENCY:

- The most extreme monetary measure is the issue of new currency in place of the old currency. Under this system, one new note is exchanged for a number of notes of the old currency. The value of bank deposits is also fixed accordingly. Such a measure is adopted when there is an excessive issue of notes and there is hyperinflation in the country.

FISCAL MEASURES:

- Monetary policy alone is incapable of controlling inflation. It should, therefore, be supplemented by fiscal measures. Fiscal measures are highly effective for controlling government expenditure, personal consumption expenditure, and private and public investment. The principal fiscal measures are the following:

(a) **REDUCTION IN UNNECESSARY EXPENDITURE:**

- The government should reduce unnecessary expenditure on non-development activities in order to control inflation. This will also put a check on private expenditure which is dependent upon government demand for goods and services.

***(b)* INCREASE IN TAXES**:

- To cut personal consumption expenditure, the rates of personal, corporate and commodity taxes should be raised and even new taxes should be levied, but the rates of taxes should not be so high as to discourage saving, investment and production. Rather, the tax system should provide larger incentives to those who save, invest and produce more.

***(c)* INCREASE IN SAVINGS:**

- Another measure is to increase savings on the part of the people. This will tend to reduce liquid cash with the people, and hence personal consumption expenditure. But due to the rising cost of living, people are not in a position to save much voluntarily.

***(d)* SURPLUS BUDGETS:**

- An important measure is to adopt anti-inflationary budgetary policy. For this purpose, the government should give up deficit financing and instead have surplus budgets. It means collecting more in revenues and spending less.

***(e)* PUBLIC DEBT:**

- At the same time, it should stop repayment of public debt and postpone it to some future date till inflationary pressures are controlled within the economy. Instead, the government should borrow more to reduce money supply with the public.

OTHER MEASURES:

The other types of measures are those which aim at increasing aggregate supply and reducing aggregate demand directly.

(a) TO INCREASE PRODUCTION:

- One of the foremost measures to control inflation is to increase the production of essential consumer goods like food, clothing, kerosene oil, sugar, vegetable oils, etc.

(b) PRICE CONTROL:

- Price control and rationing is another measure of direct control to check inflation. Price control means fixing an upper limit for the prices of essential consumer goods. They are the maximum prices fixed by law and anybody charging more than these prices is punished by law. But it is difficult to administer price control.

(c) RATIONING:

- Rationing aims at distributing consumption of scarce goods so as to make them available to a large number of consumers.

DEFLATION

- Deflation is a decrease in the general price level of goods and services
- Deflation is a contraction in the supply of circulated money within an economy, and therefore the opposite of inflation. In times of deflation, the purchasing power of currency and wages are higher than they otherwise would have been.
- To control deflation, monetary measures should be adopted just opposite to that of inflation.

INVESTMENT ANALYSIS

- An investment is an asset or item that is purchased with the hope that it willgenerate income in the future.
- Eg:- Buying the shares of a company , real estate, buying gold hoping that its value will increase in the future, buying new machines in a business unit which helps to increase the production level and thereby earn profits, etc
- Capital budgeting, or investment analysis, is the planning process used to determine whether an organization's long term investments are profitable or not.

Examples of *Capital budgeting*

- A car manufacturer considering investment in a new plant.
- An Airline planning to buy a fleet of jet aircraft.
- A pharmaceutical firm deciding to invest in Research and Development.
- A firm planning to launch a new product line
- A firm planning to invest in new technology

Capital budgeting decisions are important and crucial to a firm due to following reasons:

- Substantial outlays: Capital expenditure decisions involve investment of substantial amount of funds. It is therefore necessary for a firm to make such decisions after careful analysis.

1. **Long-term impact**: Capital budgeting decisions define the strategic direction of a firm in the sense that their effects continue for a long period of time, thereby reducing a firm's flexibility. These decisions not only affect the future benefits and costs of the firm but also influence the rate of growth and direction of growth of the firm. A firm's growth, and even its ability to remain competitive and to survive, depends on good capital budgeting decisions.
2. **Irreversibility:** Most of the capital budgeting decisions are difficult and expensive to reverse. Once they are taken, the firm may not be in a position to reverse them back
3. **Complexity of decision**: The capital investment decisions involve an assessment of future events, which in fact is difficult to predict. Further, it is quite difficult to estimate in quantitative terms all the benefits or the costs relating to a particular investment decision.

CAPITAL BUDGETING PROCESS

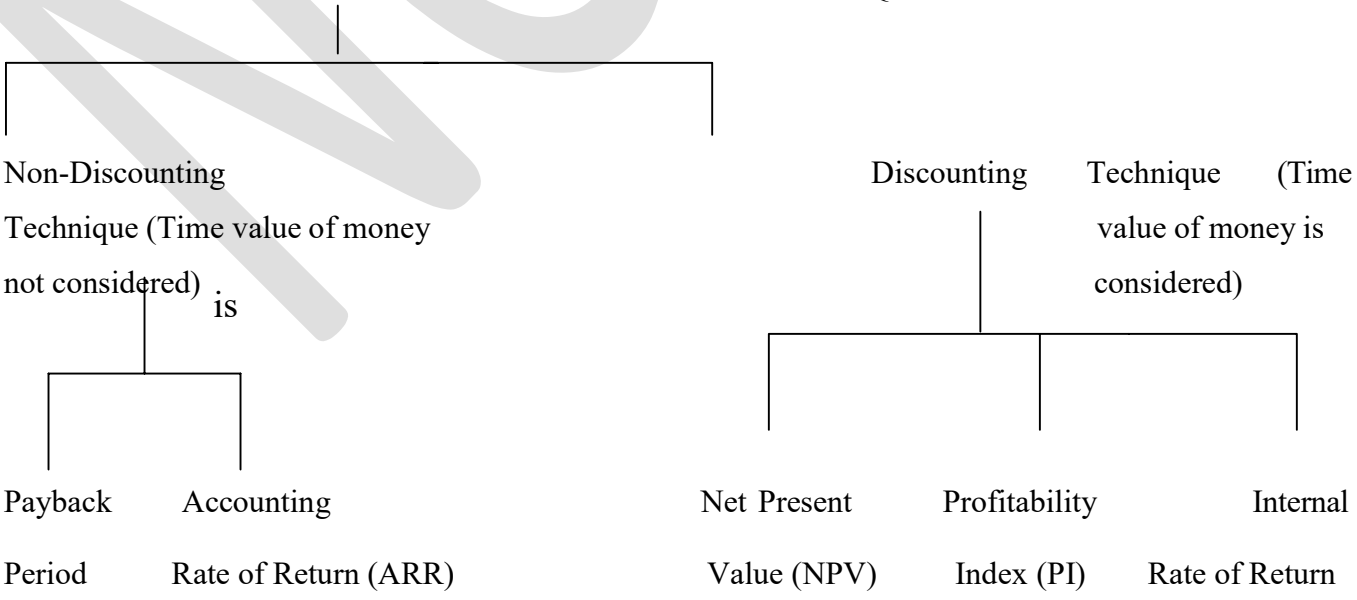
The capital budgeting process involves six distinct and interrelated steps:-

1. Identifying potential investments: Capital budgeting process begins with an idea and ends with implementation and monitoring. Ideas for investment projects can come from virtually anywhere within the firm.
2. Review and Analysis: Once a project proposal is identified, a formal review and analysis is performed to evaluate its economic viability.
3. Decision making and selection: The decision making and selection process follows the detailed analysis. A go/no-go decision on the project is made after a detailed analysis and appraisal of the project in order to determine whether the project is worthwhile.
4. Project financing: Once a project is selected, suitable financing arrangements have to be made.
5. Implementation: The implementation of a project involves several stages such as project and engineering designs, negotiations and contracting, construction, training and plant commissioning
6. Performance review: Once a project is commissioned, performance review is done periodically. In a Performance review, the actual performance of the project is compared with the projected performance. Actions may be required if actual outcomes differ from projected ones.

Capital budgeting consists of various techniques used by managers such as:

1. Accounting Rate of Return (ARR)
2. Internal Rate of Return (IRR)
3. Profitability Index

4. CAPITAL BUDGETING TECHNIQUES



PAYBACK PERIOD

- Mr. X has started a business by investing Rs.100000. Each year, he receives certain amount as revenue from the business. The initial motive of Mr.X will be to recover his Rs.100000 from the business. He will be eager to know after how many years he will be able to recover his initial investment.
- The payback period is the length of time required to recover the cost of an investment.
- The payback period method is the simplest of all capital budgeting techniques. It is based on the convention that a business enterprise would consider the recovery of the original investment in a project as the first and foremost concern.
- Longer payback periods are typically not desirable for investment positions. According to the payback period criterion, the shorter the payback period of a project, the more desirable would be the project. The rationale behind this is that the shorter the payback period, the less risky is the project, and the greater is its liquidity.

DECISION RULE

- In the case of mutually exclusive projects, project having shorter payback period is selected subject to the condition that such payback period is less than the maximum acceptable payback period for the firm.
- For independent projects, projects with payback periods less than the maximum standard payback for the firm will be accepted and all other projects will be rejected.

ADVANTAGES

- Pay back method is simple to understand and easy to use.
- It takes less time to calculate as compared to other methods.
- Payback method takes into account the risk of a project by stressing on earlier cash inflows. Projects that take longer to pay off are obviously riskier than those that recover the initial investments more quickly due to uncertainty in the future cash inflows.
- The method, by stressing earlier cash inflows, also considers the liquidity dimension in the selection criteria. This is important in situations of liquidity crunch and high cost ofcapital.
- Because of its ability to measure a project's risk, the payback method is particularly suitable in the case of industries where the risk of technological obsolescence is very high and such risky investments as oil drilling.

DISADVANTAGES

- The payback method fails to consider the time value of money.
- It ignores the cash flows beyond the payback period. This leads to discrimination against the shareholders than a project with shorter payback period with insignificant cash inflows after the payback period.

DECISION RULE

A firm can set a target ARR for acceptance of a project. In that case the decision rule would be:

- In the case of mutually exclusive projects, the project with the highest ARR is selected provided that the rate is higher than the pre-specified target rate.
- In the case of independent projects, if the calculated ARR is equal to or more than the pre- specified target ARR, the project is accepted. If the calculated ARR is less than the pre- specified target rate of return, the project is rejected.

MERITS

- The method is simple in concept and application.
- The method considers the returns over the entire life of the project and therefore serves as a measure of profitability.

DEMERITS

- It is based on accounting profits and not on cash flows
- It ignores time value of money.
- The method considers only the rate of return and not the life of the project or the size of the investment required for each project.
- It ignores the risk and liquidity associated with a project. Numerical problems

DISCOUNTING METHODS

Time value of money

- Money has got a time value. Consider an example. A person has got the option of either receiving Rs.100 today or receiving Rs.100 after one year. Naturally, the person will go for the option of receiving Rs.100 today itself. It is because , receiving Rs.100 after one year is associated with a lot of risk. If he can buy 3 kg of a commodity with that Rs.100 today, he may be able to buy only 2 kg of that commodity after 1 year for Rs.100 because the prices may have gone up. Also if we have Rs.100 today, we can invest it any business opportunities and earn Rs.110 after 1 year. That means Rs.110 received after one year will be equivalent to Rs.100 received today. Here Rs.110 is called the future value and Rs.100 is the present value. Present value (PV) can be calculated by :- $PV = \frac{FV}{(1 + r)^n}$

NET PRESENT VALUE METHOD (NPV)

- Net Present Value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows.
- The Net Present Value (NPV) of a project is the sum of the present value of all its cash flows, both inflows and outflows, discounted at a rate consistent with the projects risk.

- So under the net present value method, the present values of all cash inflows are compared against the present value of cash outflows (cost of investment). The difference between the present value of cash inflows and cash outflows is the net present value.

THE FOLLOWING STEPS ARE INVOLVED IN THE COMPUTATION OF NPV:

- Estimate the cash flows: Estimate the cash flows of the project for the life.
- Determine the minimum required rate of return: To discount the cash flows the minimum required rate of return should be selected. This is generally the cost of capital of the firm or the opportunity cost, after making adjustments for the project's risk.
- Compute the value of NPV: The net present value of the project is determined by finding out the algebraic sum of present value of cash inflows and present value of cash outflows.

DECISION RULE

- The general decision rule for NPV is that if NPV of a project is positive accept the project and if NPV is negative reject the project. That is, NPV ≥ 0 Accept NPV < 0 Reject
- So in the case of mutually exclusive projects, project with highest NPV is accepted subject to the condition that NPV should be positive. In the case of independent projects, all projects with positive NPV will be accepted and projects with negative NPV will be rejected. What does NPV imply?A firm's goal in choosing investment projects is to maximize shareholder wealth. Conceptually the discount rate, r, in NPV equation represents the opportunity cost or the highest rate of return the investors can obtain on an investment with the same risk as the risk of the specific project. When the NPV of a project is zero, that project is providing a rate of return exactly equal to the shareholder's required return. Such projects will preserve the wealth of the shareholders. When the NPV of a project is positive, such a project is offering an expected return that is higher than the shareholder's requirement. Such a project will create value to the shareholders. Conversely, if the NPV of a project is negative, such a project will destroy the wealth of the shareholders. So the NPV, in effect, represents the amount of additional value created by an investment. The NPV rule, thus, is clearly in clearly in consistent with the value- creation goal of a firm.

MERITS OF NPV

- It takes into account the time value of money.
- It considers the cash flow stream over the entire life of the project.
- It is in conformity with the basic financial objective of wealth maximization of shareholders.
- The method is most suitable when cash inflows are not uniform.
- When risk adjusted discount rate is used, it takes into account risk of a project.

DEMERITS

1. It involves complicated and tedious calculations.

2. The application of this technique necessitates forecasting cash flows and discount rate. The accuracy of the method depends on accurate estimation of these two factors, which may be quite difficult in practice.

3. The method may not provide satisfactory results in the case of two projects having different useful lives and size of investment.

Numerical problems on NPV

1) Mr. X has 3 investment proposals in front of him. The cost of each proposal is Rs. 50000. The future cash inflows associated with each proposal are given below.

a) Rank the proposals based on NPV if the cost of capital is 10%

b) Which all projects can be selected if more than one project can be selected?

c) Which project can be selected if these proposals are mutually exclusive?

Year	Cash inflows		
	Proposal A	Proposal B	Proposal C
1	17000	15000	10000
2	20000	19000	10000
3	14000	10000	10000
4	10000	13000	10000
5	5000	9000	10000

Proposal A

Year	Cash inflow	PV of cash inflow
1	15000	$15000/ (1+ 0.10)^1 = 13636.36$
2	19000	$19000/ (1+0.10)^2 = 15702.47$
3	10000	$10000/ (1+0.10)^3 = 7513.14$

Given,Cost of investment = Rs. 50000

Sum of PV of cash inflows = Rs. 51320.13

NPV = Sum of PV of cash inflows - total cost

= 51320.13– 50000

= Rs. 1320.13

NPV of proposal B = Rs. 1320.13

4	13000	13000/ (1+0.10)^4 = 8879.17
5	9000	9000/ (1+0.10)^5 = 5588.29
		Sum = 51320.13

Proposal b

Year	Cash inflow	PV of cash inflow
1	10000	10000/ (1+ 0.10)^1 = 9090.90
2	10000	10000/ (1+0.10)^2 = 8264.46
3	10000	10000/ (1+0.10)^3 = 7513.14
4	10000	10000/ (1+0.10)^4 = 6830.13
5	10000	10000/ (1+0.10)^5 = 6209.21
		Sum of PVs = 37907.84

Given,Cost of investment = Rs. 50000

Sum of PV of cash inflows = Rs. 37907.84

NPV = Sum of PV of cash inflows - total cost

= 37907.84– 50000

= Rs. – 12092.16

NPV of proposal C = – 12092.16

Proposal	NPV	Rank
A	Rs. 2436.61	1
B	Rs. 1320.13	2
C	Rs. – 12092.16	3

a) Proposal A and proposal B can be selected as their NPV s are greater than zero

b) Proposal A has highest NPV, so it has to be selected.

PROFITABILITY INDEX (BENEFIT-COST RATIO)

- One of the limitations of NPV method is that it ignores the differences in initial investments required for the projects and also the differences in the life spans. Two projects having different investment outlays cannot be compared by net present value method because it indicates the NPV in absolute terms.

- Profitability Index (or Benefit-Cost Ratio) is defined as the present value of the future cash inflows divided by the initial investment. Profitability Index (PI) indicates the net benefits expected from the project per rupee of investment. Profitability index is formally expressed as follows:

- Profitability Index = $\frac{\text{PV of cash inflow}}{\text{PV of cash outflow (initial investment)}}$

- The method is more suitable in a situation where there is capital rationing or capital is scarce. In such a case, a project with highest PI is accepted.
- For example, consider two Projects X and Y having initial investment of Rs.10,000 and Rs.1,00,000 respectively. Further, assume that the present values of cash inflows of these projects are Rs.20,000 and Rs.1,50,000 respectively. Their NPV and PI will be:

	Project X (Rs)	Project Y (Rs)
Initial investment (Cost)	(-) 10,000	(-) 1,00,000
Present value of cash inflows (Benefits)	20,000	1,50,000
NPV	10,000	50,000
Profitability Index	2.00	1.50

- If we consider only absolute figures of NPV, Project Y appears better than Project X. But in fact Project X is better because, for each rupee of investment Project X brings Rs.2 cash inflows in present value terms, while Project Y is bringing only Rs.1.50 cash inflows in present value terms. Thus, accepting Project X would create more value to the shareholders than accepting Project Y. Decision rule (Selection criteria)
- A project for which PI is more than one is accepted and a project for which PI is less than one is rejected.

MERITS

- The method uses the concept of time value of money.
- It considers the cash flow stream over the entire life of the project.
- It is in conformity with the basic financial objective of wealth maximization of shareholders.
- It is a better project evaluation technique than NPV when the projects are having different investment outlays and in situations where there is capital rationing.

DEMERITS

- When the investment outlay is spread over more than one period, this criterion cannot be used. The method may lead to incorrect decisions when projects are mutually exclusive and indivisible

INTERNAL RATE OF RETURN

- The internal rate of return (IRR) of a project is that discount rate at which the sum of the present value of cash inflows of the project is equal to the sum of the present value of cash outflows. In other words, the internal rate of return of a project is the discount rate at which the net present value (NPV)of the project is zero.
- In the numerical problem for NPV, we had calculated r as 10%. If the value of r is varied, NPV also changes and for a particular value of r , NPV will become zero. This value of r at which NPV= 0 denotes IRR.
- In the Net Present Value method, NPV is calculated at a known discount rate, which is usually the cost of capital or opportunity cost. In the IRR method, the NPV is set to zero to determine the effective discount rate which satisfies this condition.
- IRR is computed by a trial and error method, specially when the cash inflows are not even.Interpretation of IRR
- IRR is the rate of return earned on the initial investment in the project. It is the rate of return earned on the uncovered investment balance in the project.

DECISION RULE

- In the case of mutually exclusive projects, accept the project with highest IRR provided that it is higher than the cost of capital.
- In the case of independent projects, accept the project if its IRR is higher than the cost of capital and reject if its IRR is less than the cost of capital.

MERITS

- It takes into account the time value of money
- It considers the cash flow stream over the entire investment horizon.
- It is in conformity with the basic financial objective of wealth maximization of shareholders.Demerits

- The method involves tedious and complicated calculations.
- If there are more than one cash*outflows* interspersed between the cash inflows, there can be multiple IRRs, the interpretation of which is difficult.
- The IRR approach can be misleading when two mutually exclusive projects with different inflow/outflow patterns are compared.
- One of the basic assumptions of IRR is that all future cash inflows of the project will be reinvested at a rate equal to IRR. It may not be possible for a firm to reinvest intermediate cash flows at IRR, which usually will be quite high.

COMPARISON BETWEEN NPV AND IRR METHODS

SIMILARITIES

- Both consider time value of money.
- Both lead to the same acceptance or rejection decision when:
- the projects are economically independent; i.e the projects can be accepted or rejected without reference to any other projects and
- the cash flows of the projects are conventional; i.e the first cash flow (initial investment) is negative and the subsequent cash flows are positive.
- Difference Under the NPV method, the minimum required rate of return (cost of capital) is assumed to be known. But in case of IRR technique, the rate is to be determined through trial and error to arrive at the rate at which NPV is zero.
- In the case of mutually exclusive projects, both methods may give contradictory results in terms of acceptance or rejection under the following conditions:
- if projects have different life expectations;
- if the projects have different sizes of investment or
- if the cash flow patterns of the of the projects differ over time ; for example, the cash flows of one project increase over time , while those of another decrease.

- The IRR method implies that future inflows will be reinvested at the internal rate of return of the project. On the other hand, in the NPV method, the future cash inflows are assumed reinvested at the cost of capital.

DECISION MAKING PROCESS

- Decision making is an integral part of business. Every day various decisions must be taken in a business unit. In case of capital budgeting decisions (huge investment decisions) ,we may not be able to predict the results of our decisions in all cases. We have 3 types of decision making circumstances:-

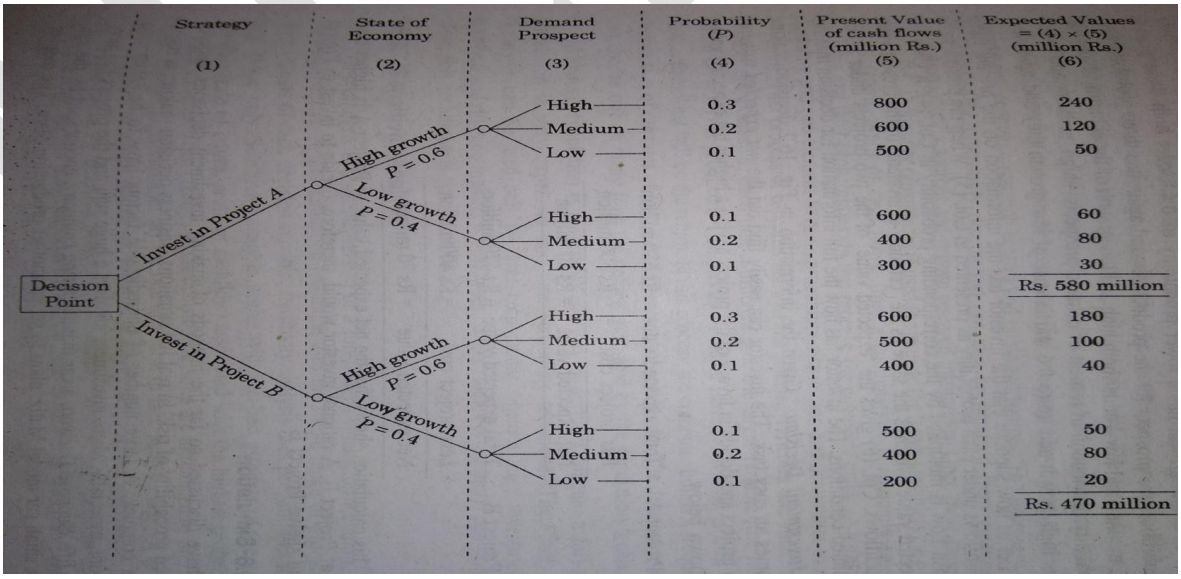
1. Decision making under certainty
2. Decision making under risk
3. Decision making under uncertainty

DECISION MAKING UNDER RISK

- Here, the business decision is expected to yield more than one result and the probability associated with each result is known to the decision maker. Eg:- A company has decided to double its advertisement expenses. Then there is a 10% chance that the sales may get more than doubled, 40% chance that the sales may get doubled and 50% chance that sales may get less than doubled. Thus decision to double the advertisement expenses falls under the category of decision making under risk. To make decisions under risk conditions, a decision tree can be used.

DECISION TREE

- A decision tree is a graphical method of representing all managerial decisions in a sequence and their expected outcomes under different states of the economy.
- Suppose an investor wishes to invest in either of the two projects –Project A or Project B , each costs Rs.400 million. The cash inflows of the two projects depend upon the condition of the Indian economy (whether economy has a high growth or low growth). The cash inflow also depends upon the demand of the product associated with project A and project B. Thus the project can have a high demand, medium demand or a low demand. If the decision maker is aware of the probabilities of each demand prospect and the cash inflows associated with each case, he can develop a decision tree as follows.



DECISION MAKING UNDER UNCERTAINTY

- Here there is more than one outcome to a business decision and the probability of no outcome is known to the decision maker.
- The techniques used for decision making under this section are Maximin criteria, Minmax criteria, Hurwicz criteria and Laplace criteria.

COST – BENEFIT ANALYSIS (CBA)

- A cost-benefit analysis is a process by which business decisions are analyzed, the benefits of a given situation or business-related action is summed, and then the costs associated with taking that action are subtracted.
- Prior to erecting a new plant or taking on a new project, managers conduct a cost-benefit analysis as a means of evaluating all the potential costs and revenues that may be generated if the project is completed. The outcome of the analysis will determine whether the project is financially feasible or if another project should be pursued.
- The final step is to quantitatively compare the results of the aggregate costs and benefits to determine if the benefits outweigh the costs. If so, then the rational decision is to go forward with project. In not, a review of the project is warranted to see if adjustments can be made to either increase benefits and/or decrease costs to make the project viable. If not, the project may be abandoned.
- If total benefits are denoted as B and total costs are denoted as C, then ratio B/C analysis whether to accept or reject the project. If $B/C > 1$, the project can be accepted. If $B/C < 1$, the project has to be abandoned

BALANCE SHEET

- A balance sheet is a financial statement that summarizes a company's assets, liabilities and shareholders' equity at a specific point in time.It gives an account of what the company owns and owes, as well as the amount invested by shareholders.

Uses of balance sheet

- It shows the financial position of the business concern.
- It shows what the firm owes to others and also what others owe to the firm.
- It shows the nature and value of the assets.
- It also reflects the liquidity of a firm.

Characteristics

- It is a statement and not an account
- It is always prepared on a particular date, and thus shows the position of the company at that date.
- The headings are Liabilities and Assets.
- It shows the financial position of the business concern.
- It shows what the firm owes to others and also what others owe to the firm.
- The totals of Liabilities and Assets always are equal.

- Balance sheet always adheres to the following formula:

Assets = Liabilities + Shareholder's Equity

This equation is known as Basic Accounting Equation. The terms in this equation are explained below.

ASSETS

An asset is a resource or property having a monetary/economic value possessed by an individual or entity, which is capable of producing some future economic benefit.

Current Assets: Assets which are easily convertible into cash.

- Eg:- stock of products, inventory, marketable securities, short-term investments, fixed deposits in banks, accrued incomes(income earned but not received yet), bank balances, Sundry debtors(people who have to pay money to the business firm), prepaid expenses etc.
- Current assets are generally of a shorter life span. Current assets can also be termed as liquid assets.

Fixed Assets: Fixed assets are of a fixed nature in the context that they are not readily convertible into cash. They require elaborate procedure and time for their sale and converted into cash.

- *Eg:-Land, building, plant, machinery, equipment, furniture etc.*
- Other names used for fixed assets are non-current assets, long-term assets or hard assets. Generally, the value of fixed assets generally reduces over a period of time (known as depreciation)

Intangible Assets: Intangible assets cannot be seen, felt or touched physically by us.

- *Eg:- goodwill, franchise agreements, patents, copyrights, brands, trademarks etc.*

LIABILITY

- In simple words, liability is an obligation of the entity to transfer cash or other resources to another party.
- **Current Liability** is one which the entity expects to pay off within one year from the reporting date.
- **Non-Current Liability** is one which the entity expects to settle after one year from the reporting date.

Current liability
Bank Overdraft (Extra money borrowed from bank account)
Short Term Bank Loan
Sundry Creditors (People from whom company has taken a benefit without complete payments)
Tax Payables

Non-Current liability
LongTerm Bank Loan
Debenture

We have the Basic Accounting Equation as:-

Assets = Liabilities + Shareholders' Equity

- Initially,the company is not in existence. Since the business has not yet started it has neither assets nor liabilities.
- Now, Mr B accounting we have to consider the businessman and the business as two separate

factors. This is known as Dual entity Concept.

When Mr.B invests the amount, the business will have Assets

= Liabilities + Shareholders' Equity

- 50000(cash) = 0 + 50000(owner's investment) ---------- (Equation is satisfied)
- He purchased some goods for Rs. 10000 to the business. Now, the cash is reduced by RS. 10000 and goods worth Rs. 10000 will be added to the business. New equation will be:-
- 40000(cash) + 10000(goods)= 0 + 50000(owner's investment) (Equation is satisfied)
- He purchased furniture worth Rs. 15000. This will reduce the cash by Rs.15000and will increase furniture asset by same amount.
- 40000(cash) + 10000(goods) = 0 + 50000(owner's investment)----------(Equation is satisfied)
- He sold goods for cash Rs.8000.This will reduce his goods by Rs. 8000 and increase the cash by same amount.
- 48000(cash) + 2000(goods) = 0 + 50000(owner's investment)---------- (Equation is satisfied)
- He bought goods on credit from Mr.C for Rs. 30000.This will increase the stock of goods by Rs. 30000 and his creditors by same amount.
- 48000(cash) + 32000(goods) = 30000(creditors) + 50000(owner's investment) ----(Equation is satisfied)
- He opened a bank account for his business by depositing Rs.5000 . Now bank balance will increase by 5000 and cash balance will reduce by same amount.
- 43000(cash)+32000(goods)+50000(bankbalance)= 30000(creditors) + 50000(owner's investment)-- (Equation is satisfied)
- He sold goods worth Rs.20000 on credit to Mr.Y. This will increase the debtors by Rs. 20000 and decrease the stock of goods of worth the same amount.
- 43000(cash) + 12000(goods) + 50000(bank balance) + 20000(debtors) = 30000(creditors) + 50000(owner's investment)--------(Equation is satisfied)
- He also sold goods to Mr. K for Rs.4000 .This transaction will increase the cash by Rs.4000 and reduce the worth of goods by same amount.
- 47000(cash) + 8000(goods) + 5000(bank balance) + 20000(debtors) = 30000(creditors) + 50000(owner's investment) ---- (Equation is satisfied)
- He took loan of Rs.20000 from bank for business purposes. Then we have :- 67000(cash) + 8000(goods) + 5000(bank balance) + 20000(debtors) =- 30000(creditors) + 20000 (bank loan) 50000(owner's investment)---------- (Equation is satisfied)
- Thus whatever transaction takes place, the basic accounting equation will always be satisfied.

BUSINESS FORECASTING

Forecasting *is the process of making predictions of the future based on past and present data and most commonly by analysis of trends.*

Business Forecasting ⟶ Qualitative forecasting and

Qualitative forecasting

- Used when past data are not available.
- Applied to intermediate or long-range decisions.
- Examples: - Delphi technique, Nominal Group Technique (NGT), sales force opinions, executive opinions, market research, opinion and judgment and historical life-cycle analogy.

Quantitative forecasting

- Some of the patterns in the past data are expected to continue into the future.
- Applied to short- or intermediate-range decisions.
- Examples: - Associative forecasting or trend projection, last period demand, simple and weighted-Period moving averages, simple exponential smoothing, Poisson process model based forecasting and multiplicative seasonal indexes.

NOMINAL GROUP TECHNIQUE

- Nominal Group Technique is similar to the Delphi technique in that it utilizes a group of participants, usually experts. After the participants respond to forecast-related questions, they rank their responses in order of perceived relative importance. Then the rankings are collected and aggregated. Eventually, the group should reach a consensus regarding the priorities of the ranked issues.

SALES FORCE OPINIONS

- The sales staff is often a good source of information regarding future demand. The sales manager may ask for input from each sales-person and aggregate their responses into a sales force composite forecast. Caution should be exercised when using this technique as the members of the sales force may not be able to distinguish between what customers say and what they actually do. Also, if the forecasts will be used to establish sales quotas, the sales force may be tempted to provide lower estimates.

EXECUTIVE OPINIONS

- Sometimes upper-levels managers meet and develop forecasts based on their knowledge of their areas of responsibility. This is sometimes referred to as a jury of executive opinion.

MARKET RESEARCH

- In market research, consumer surveys are used to establish potential demand. Such marketing research usually involves constructing a questionnaire that solicits personal, demographic, economic, and marketing information. On occasion, market researchers collect such information in person at retail outlets and malls, where the consumer can experience—taste, feel, smell, and see—a particular product. The researcher must be careful that the sample of people surveyed is representative of the desired consumer target.

ASSOCIATIVE FORECASTING AND TREND PROJECTION

- In this technique, we develop an association between an independent variable and a dependent variable.
- There is always an association between sales of bikes in an area and percentage of the young population living in that area.
- Cool Drinks sales can be related to temperature.
- Increase in energy cost leads to price increases in products and services.
- Thus in all these cases we can see an association between one variable and another. We have to form a general linear regression equation between the two variables by which we can forecast the future trends.

BUSINESS FINANCING

- Analyses the different methods to obtain investments for business purposes.
- Business financing can be made possible through financial markets or by international investments.
- **Financial Markets**-The financial market is a broad term describing any marketplace where trading of securities including equity shares, bonds, currencies etc occurs.
- **Financial markets are of 2 types--- Capital market and Money market.**

INTERNATIONAL INVESTMENTS

- Investments made by a company or individual in one country towards business interests in another country.
- **Foreign Direct Investment (FDI)** as the name suggests is investing directly in another country. A foreign company which is based in some other country like France invests in India either by setting up a wholly owned subsidiary or getting into a joint venture
  With some company based in India and then conducts its business in India.
- **Examples:** Various software companies like IBM India which is initially based in Unites States but has opened its subsidiaries in different part of India. Maruti Suzuki is yet another example in which Suzuki of Japan had joint ventured with MarutiUdyog Ltd.

BASIS FOR COMPARISON	MONEY MARKET	CAPITAL MARKET
Meaning	A segment of the financial market where lending and borrowing of short term securities are done.	A section of financial market where long term securities are issued and traded.
Institutions	Central bank, Commercial bank, Non-bank financial institutions, bill brokers, acceptance houses, and so on.	Commercial banks, Stock exchange, etc
Risk Factor	Low	Comparatively High
Liquidity (convertibility to cash)	High	Low
Purpose	To fulfill short term credit needs of the business.	To fulfill long term credit needs of the business.
Time Horizon	Within a year	More than a year

BASIS FOR COMPARISON	MONEY MARKET	CAPITAL MARKET
Merit	Increases liquidity of funds in the economy.	Mobilization of Savings in the economy.
Return on Investment	Less	Comparatively High

Foreign Portfolio Investment (FPI)

- Is similar to FDI in a way that this is also direct investment but investment is onlyin financial assets such as stocks, bonds etc. of a company located in another country. When a foreigner buys shares of Indian Based Company, it is a FPI. In contrast to FDI, a portfolio investment is an investment made by an investor who is not involved in the management and day-to-day business of a company.
- **Example:** Any foreign company or individual invests in the shares of Infosys (based in India).

Foreign Institutional Investor (FII)

- Is an investor or group of investors who bring FPIs. Institutional investors include insurance companies, pension funds and mutual funds. They participate in the secondary market of economy. To participate in the market of India, FIIs must register themselves with Securities and Exchange Board of India (SEBI).

FDI	FPI
Investment in productive assets (whose value increase over time) like plant and machinery, new unit or subsidiary for a business	Investment in financial assets like stocks, bonds, mutual funds, etc.
Investment gives investors ownership right as well as managemer right	Investment gives investors only ownership right and not management right
Investors cannot depart from the country easily	Investors can easily depart from the country
FDI is more important for a country	FPI is less important as compared to FDI

Taxation

- Taxation refers to compulsory or coercive money collection by a levying authority, usually a government.
- ***Principles of taxation*** are a set of criteria which act as a guide to the government when designing and implementing a new tax.

They are:

1. Taxes should be proportional to peoples' income.
2. Taxes should be certain, not arbitrary.
3. Taxes should be levied at a convenient time.

4. The cost of the collection of the tax should be as low as possible.
5. Tax assessment and determination should be easy to understand by an average tax payer.
6. Taxes should be just enough to generate revenue required.

Direct Tax	Indirect Tax
• Taxes that cannot be transferred or shifted to another person. • Eg:- Income tax has to be paid by the individual himself who earns taxable income . • The liability as well as the burden to pay tax resides on the same individual • Involve higher administration cost Examples:- • **Income Tax:** Levied on and paid by the same person according to tax brackets as defined by the income tax department. • **Corporate Tax:** Paid by companies and corporations on their profits. • **Wealth Tax:** Levied on the value of property that a person holds	• Taxes which can be shifted from one person to another person. • charging higher prices for the commodity by including taxes in the final price. • Liability to pay the tax lies on a person who then shifts the tax burden to another individual. • Lower administration costs. Examples:- • **Excise Duty:** Payable by the manufacturer who shifts the tax burden to retailers and wholesalers. • **Sales Tax:** Paid by a shopkeeper or retailer, who then shifts the tax burden to customers by charging sales tax on goods and services.
• Estate Duty: Paid by an individual in case of inheritance. • Gift Tax: An individual receiving the taxable gift pays tax to the government.	• Custom Duty: Import duties levied on goods from outside the country ultimately paid for by consumers and retailers. • Entertainment Tax: Liability is on the cinema owners, who transfer the burden to cinemagoers. • Service Tax: Charged on services rendered to consumers, such as food bill in a restaurant.

GST (GOODS AND SERVICE TAX)

- The Indian constitution divides taxation powers between centre and states. Both levels of government have some exclusive areas where they can levy tax. There are two important problems with the current arrangement.

- Consider a shirt manufactured in UP. The central government, therefore, levies its indirect tax called central excise at the factory gate. Subsequently, a shirt reaches a retail outlet and is bought by a consumer. The state government, at this stage, levies a tax on consumption named value added tax (VAT).
- So, we have a tax at the factory gate which adds to the cost of the shirt and another tax on the final price.
- When these shirts are transported to another states to trading purposes, each state will levy tax on it at different stages. Thus, multiple taxes are levied on the same commodity at different places and different stages.
- Thus, India is politically one country, but economically it is fragmented. GST will put an end to this concept. It will create single economic zone in the entire country.
- Goods and Services Tax (GST) is an indirect tax reform which aims to remove tax barriers between states and create a single market. Once this step is taken, the tax barriers between states, and centre and states will disappear.
- Goods and Services Tax (GST) is an indirect taxation in India merging most of the existing tax system into single system of taxation.

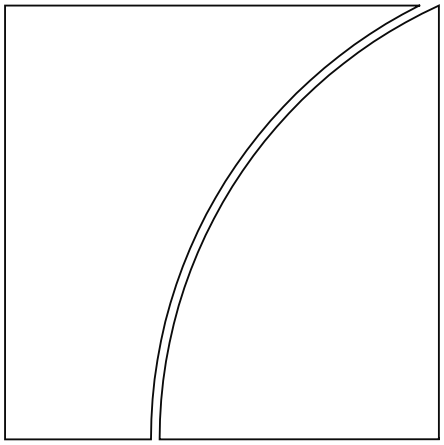
A dual GST system is planned to be implemented in India as proposed by the Empowered Committee under which the GST will be divided into two parts:

- ✓ State Goods and Services Tax (SGST)
- ✓ Central Goods and Services Tax (CGST)

ADVANTAGES

- ✓ It will lower the cost of goods and services, give a boost to the economy and make the products and services globally competitive
- ✓ GST will be levied only at the final destination of consumption based on VAT principle and not at various points
- ✓ It will also help to build a transparent and corruption-free tax administration

Committee on Payments and Market Infrastructures



Digital currencies

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Executive summary

Central banks typically take an interest in retail payments as part of their role in maintaining the stability and efficiency of the financial system and preserving confidence in their currencies. Innovations in retail payments can have important implications for safety and efficiency; accordingly, many central banks monitor these developments. The emergence of what are frequently referred to as "digital currencies" was noted in recent reports by the Committee on Payments and Market Infrastructures (CPMI) on innovations and non-banks in retail payments. A subgroup was formed within the CPMI Working Group on Retail Payments to undertake an analysis of such "currencies"[1] and to prepare a report for the Committee.

The subgroup has identified three key aspects relating to the development of digital currencies[2]. The first is the assets (such as bitcoins) featured in many digital currency schemes. These assets typically have some monetary characteristics (such as being used as a means of payment), but are not typically issued in or connected to a sovereign currency, are not a liability of any entity and are not backed by any authority. Furthermore, they have zero intrinsic value and, as a result, they derive value only from the belief that they might be exchanged for other goods or services, or a certain amount of sovereign currency, at a later point in time. The second key aspect is the way in which these digital currencies are transferred, typically via a built-in distributed ledger. This aspect can be viewed as the genuinely innovative element within digital currency schemes. The third aspect is the variety of third-party institutions, almost exclusively non-banks, which have been active in developing and operating digital currency and distributed ledger mechanisms. These three aspects characterise the types of digital currencies discussed in this report.

A range of factors are potentially relevant for the development and use of digital currencies and distributed ledgers. Similar to retail payment systems or payment instruments, network effects are important for digital currencies, and there are a range of features and issues that are likely to influence the extent to which these network effects may be realised. It has also been considered whether there may be gaps in traditional payment services that are or might be addressed by digital currency schemes. One potential source of advantage, for example, is that a digital currency has a global reach by design. Moreover, distributed ledgers may offer lower costs to end users compared with existing centralised arrangements for at least some types of transactions. Also relevant to the emergence of digital currency schemes are issues of security and trust, as regards the asset, the distributed ledger, and the entities offering intermediation services related to digital currencies.

This report considers the possible implications of interest to central banks arising from these innovations. First, many of the risks that are relevant for e-money and other electronic payment instruments are also relevant for digital currencies as assets being used as a means of payment. Second, the development of distributed ledger technology is an innovation with potentially broad applications. Wider use of distributed ledgers by new entrants or incumbents could have implications extending beyond payments, including their possible adoption by some financial market infrastructures (FMIs), and more broadly by other networks in the financial system and the economy as a whole. Because of these

[1] Although "digital currencies" typically do have some, but not all the characteristics of a currency, they may also have characteristics of a commodity or other asset. Their legal treatment can vary from jurisdiction to jurisdiction. Use of the term "digital currencies" in the report is not meant to indicate any particular view of what digital currencies are or what policy towards them should be.

[2] A further note on terminology: this report uses the term "digital currencies", because, while recognising that the term is not perfect, the term is used widely and reflects the concept that these are assets that are represented in digital form. Previous CPMI reports used the term "virtual currencies", reflecting their existence in a virtual rather than physical form; virtual currencies in particular are prevalent in certain online environments. Moreover, these schemes are frequently referred to as "cryptocurrencies", reflecting the use of cryptography in their issuance, and in the validation of transactions.

considerations, it is recommended that central banks continue monitoring and analysing the implications of these developments, both in digital currencies and distributed ledger technology.

1. Introduction

Digital currencies, and especially those which have an embedded decentralised payment mechanism based on the use of a distributed ledger,[3] are an innovation that could have a range of impacts on various aspects of financial markets and the wider economy. These impacts could include potential disruption to business models and systems, as well as facilitating new economic interactions and linkages. In particular, the potential implications of digital currencies and distributed ledgers on retail payment services seem to be especially important, as these schemes have the potential to facilitate certain retail payment transactions (eg for e-commerce, cross-border transactions and person-to-person payments), and possibly make them faster and less expensive for end users such as consumers and merchants. However, the implications for payment system efficiency are still to be determined, and potential risks may arise from the operation of these schemes. In addition, they may also raise a number of policy issues for central banks and other authorities. In the near term, the policy issues for central banks are likely to centre on the payment system implications. However, should digital currencies and distributed ledgers become widely used (potentially also for large-value transactions or for other asset types beyond funds transfers), their impact on other areas of responsibility for central banks, such as payment system oversight and regulation, financial stability and monetary policy, might become more prominent.

Currently, digital currency schemes are not widely used or accepted, and they face a series of challenges that could limit their future growth. As a result, their influence on financial services and the wider economy is negligible today, and it is possible that in the long term they may remain a product for a limited user base on the fringes of mainstream financial services. However, the operation of some digital currency schemes in recent years indicates the feasibility of using distributed ledgers for peer-to-peer value transfers in the absence of a trusted third party. As such, various features of distributed ledger technology may have potential to improve some aspects of the efficiency of payment services and financial market infrastructures (FMIs) in general. In particular, these improvements might arise in circumstances where intermediation through a central party is not currently cost-effective.

The Committee on Payments and Market Infrastructures (CPMI) has a mandate to promote "the safety and efficiency of payment, clearing, settlement and related arrangements, thereby supporting financial stability and the wider economy."[4] The CPMI's focus extends beyond FMIs and includes, inter alia, retail payment instruments or schemes, both within and across jurisdictions. Retail payments play a key role within both the financial system and the rest of the economy and they have been subject to particular attention by the CPMI, reflecting the interest of member central banks in this issue. Recent work of the CPMI in this field includes the reports *Innovations in retail payments* (2012) and *Non-banks in retail payments* (2014). In the latter report, decentralised digital currencies were briefly discussed.

Taking into account the CPMI's mandate and the potential implications of digital currencies and distributed ledgers in these areas, the CPMI agreed in November 2013 that there was a need to closely monitor new developments in this field. In February 2015, it was decided that the Working Group on Retail Payments would carry out further analytical work in the area of digital currencies. This report responds to the CPMI mandate and provides an initial analysis of the main factors influencing the development of digital currencies and distributed ledgers, as well as an overview of the potential implications, with a particular emphasis on the payment system implications.

The report is structured as follows: after this introduction, the second section provides an overview of the key features of digital currencies, including how they differ from traditional forms of electronic money (e-money); the third section elaborates on the main factors influencing the development

[3] The term "distributed ledger" is used throughout the document as this is a term commonly used to describe the main innovation that allows decentralised payment mechanisms to be implemented.

[4] Committee on Payments and Market Infrastructures (CPMI), Charter, September 2014, http://www.bis.org/cpmi/charter.pdf.

of digital currencies and distributed ledgers from both the demand and supply sides; the fourth section details some of the potential implications of these schemes should the degree of their acceptance increase substantially; finally, the fifth section identifies potential areas for further work. The report's first annex lists relevant documents published by CPMI central banks on digital currencies and distributed ledgers.

2. Key features and uses of digital currencies

Money denominated in a particular currency (money in a traditional sense) includes money in a physical format (notes and coins, usually with legal tender status) and different types of electronic representations of money, such as central bank money (deposits in the central bank that can be used for payments) or commercial bank money.

Electronic money (e-money), defined in the CPMI's *A glossary of terms used in payments and settlement systems* as "value stored electronically in a device such as a chip card or a hard drive in a personal computer", is also commonly used around the world. Some jurisdictions have developed specific legislation regulating e-money (eg the E-Money Directive in the EU). E-money balances according to the legislation applicable in a particular jurisdiction (e-money in a narrow sense) are usually denominated in the same currency as central bank or commercial bank money, and can easily be exchanged at par value for them or redeemed in cash. Since the mid-1990s, the CPMI has studied the development of e-money and the various policy issues associated with it.[5] These categories (cash, central or commercial bank money, and e-money in a narrow sense) are traditionally perceived as "money" in a specific currency, giving rise to a currency's single character.[6]

Subsequent definitions of e-money have widened the concept to include a variety of retail payment mechanisms, possibly extending to digital currency schemes. While digital currencies may meet the broad conceptual definition of e-money, in most jurisdictions they typically do not satisfy the legal definition of e-money. For example, in many jurisdictions, the value stored and transferred must be denominated in a sovereign currency to be considered e-money; however, in many cases digital currencies are not denominated in or even tied to a sovereign currency, but rather are denominated in their own units of value. In the case of the EU, the legal definition of e-money includes the requirement that the balances issued should be a claim on the issuer, issued on receipt of funds. Given this, units of digital currencies in some schemes will not be considered e-money in a legal sense as they are not issued in exchange for funds (even though they can be subsequently bought and sold), and may not be issued by any individual or institution.

Hundreds of digital currency schemes based on distributed ledgers currently exist, are in development or have been introduced and have subsequently disappeared. These schemes share several key features, which distinguish them from traditional e-money schemes.

First, in most cases, these digital currencies are **assets** with their value determined by supply and demand, similar in concept to commodities such as gold. However, in contrast to commodities, they have zero intrinsic value. Unlike traditional e-money, they are not a liability of any individual or institution, nor are they backed by any authority. As a result, their value relies only on the belief that they might be exchanged for other goods or services, or a certain amount of sovereign currency, at a later point in time. The establishment or creation of new units (ie the management of the total supply), is typically determined by a computer protocol. In those cases, no single entity has the discretion to manage the supply of units

[5] Bank for International Settlements (BIS), *Implications for central banks of the development of electronic money*, October 1996.

[6] For a detailed explanation of this perception of "singleness" in relation to central and commercial bank money (mainly based on the confidence that banks have the ability to convert their sight liabilities into central bank money upon demand), see CPMI, *The role of central bank money in payment systems*, August 2003.

over time – instead, this is often determined by an algorithm. Different schemes have different long-run supplies and different predetermined rules for the creation and issuance of new units. These predetermined rules help to create scarcity in the supply. These schemes tend not to be denominated in or tied to a sovereign currency, such as the US dollar or the euro. Using Bitcoin as an example, a bitcoin is the unit of value that is transferred.

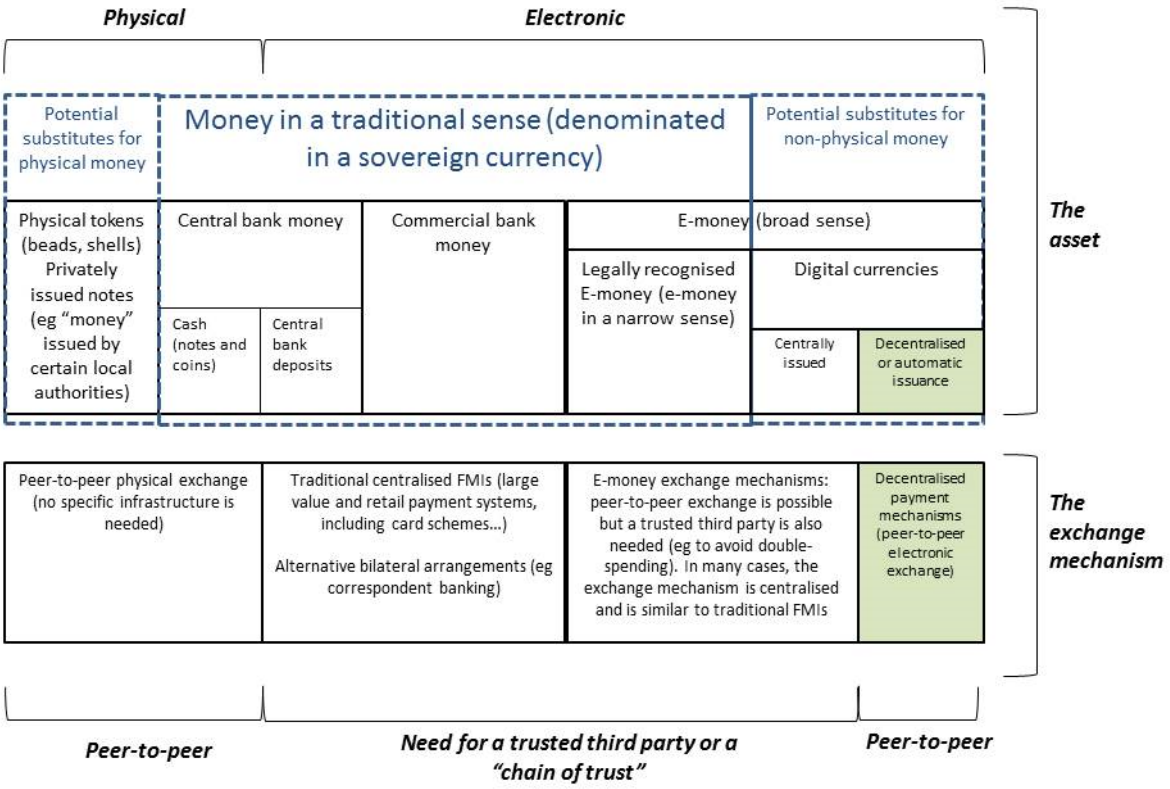
The second distinguishing feature of these schemes is the way in which value is transferred from a payer to a payee. Until recently, a peer-to-peer exchange between the parties to a transaction in the absence of trusted intermediaries was typically restricted to money in a physical format. Electronic representations of money are usually exchanged in centralised infrastructures, where a trusted entity clears and settles transactions. The key innovation of some of these digital currency schemes is the use of **distributed ledgers** to allow remote peer-to-peer exchanges of electronic value in the absence of trust between the parties and without the need for intermediaries. Typically, a payer stores in a digital wallet his/her cryptographic keys that give him/her access to the value. The payer then uses these keys to initiate a transaction that transfers a specific amount of value to the payee. That transaction then goes through a confirmation process that validates the transaction and adds it to a unified ledger of which many copies are distributed across the peer-to-peer network. The confirmation process for digital currency schemes can vary in terms of speed, efficiency and security. In effect, distributed ledgers replicate the peer-to-peer exchange of value, although on a remote basis over the internet.

Closely related to the way in which value is transferred is *the way in which transactions are recorded and in which value is stored*. As mentioned above, the transfer is completed when the ledger that is distributed across the decentralised network is updated. The amount of information that is stored in the ledger can vary from a bare minimum – such that the identity of payers and payees is difficult to ascertain and only the distribution of value across network nodes is kept – to a wealth of information that can include details about the payer, payee, transactions and balances. In many cases today, digital currency schemes require very little information to be kept in the ledger.

Another distinguishing feature of these schemes is their **institutional arrangements**. In traditional e-money schemes, there are several service providers that are essential to or embedded in the operation of an e-money scheme: the issuers of e-money, the network operators, the vendors of specialised hardware and software, the acquirers of e-money, and the clearer(s) of e-money transactions. In contrast, many digital currency schemes are not operated by any specific individual or institution (though some are promoted actively by certain intermediaries). This differs from traditional e-money schemes that have one or more issuers of value that represent liabilities on the issuers' balance sheets. Moreover, the decentralised nature of some digital currency schemes means that there is no identifiable scheme operator, a role that is typically played by financial institutions or other institutions that specialise in clearing in the case of e-money. There are a number of intermediaries, however, that supply various technical services. These intermediaries may provide "wallet" services to enable users of the digital currency to transfer value, or may offer services to facilitate the exchange between digital currency units and sovereign currencies, other digital currency units or other assets. In some instances, these intermediaries store the cryptographic keys to the value for their customers.

Figure 1 illustrates the separation between the two basic aspects of digital currency schemes (the asset side and the decentralised exchange mechanism based on a distributed ledger), and aims to provide a framework to help explain where e-money and digital currencies could be placed in relation to other types of money.

Taxonomy of money and exchange mechanisms Figure 1



The potentially disruptive innovations associated with digital currency schemes refer not only to the "asset aspect" (digital currencies issued automatically which are not a liability of any party), but more significantly to the "payment aspect" (payment mechanisms based on a distributed ledger that allow peer-to-peer transfers without the involvement of trusted third parties). While these two aspects are closely linked together in some digital currency schemes (eg Bitcoin), this is not necessary in all cases. There are different ways in which digital currencies and distributed ledgers could operate in principle, with differing degrees of interaction with existing infrastructures and payment service providers.

Some digital currency schemes based on a distributed ledger aim to create a network that would work in isolation from, or with only a marginal connection to, existing payment mechanisms. Users of the system would directly open accounts in a single distributed ledger and send and receive peer-to-peer payments denominated in the digital currency native to the network. The only connection with the existing payment system would arise in exchanges and trading platforms, where the digital currency units would be exchanged for sovereign currency, usually at free-floating rates that reflect supply and demand (minus a service fee charged by the exchanges/trading platforms).

In other instances, digital currencies based on distributed ledgers could be used by traditional payment service providers (such as banks) with the aim of improving the efficiency of certain processes. This could involve using distributed ledgers to set up a decentralised payment mechanism between payment system participants to improve back office clearing and settlement processes, whereas front office services between these service providers and end users might remain unaltered (end users might even be unaware that digital currencies and distributed ledgers are being used to complete a payment denominated in sovereign currency).

The use of distributed ledgers in isolation is also conceivable. Distributed ledgers could in principle be re-engineered and adapted to new or existing payment systems without necessarily involving the issuance of a digital currency (the distributed ledgers might in principle be adapted to be used with sovereign currency).

3. Factors influencing the development of digital currencies

Digital currencies based on the use of a distributed ledger represent a genuinely new development in the payments landscape. Nevertheless, many of the factors that have spurred the development of digital currencies have also stimulated innovation in more traditional payment methods. Reduced cost and increased speed, including in the areas of e-commerce and cross-border transactions, are some of the factors underpinning both digital currency development and broader payment system innovation. In particular, it is worth highlighting the role of technology in driving the development of digital currencies and other innovations. The CPMI report Innovations in retail payments (2012) identified technological advances as a key enabling factor for changes in payment services, with an impact on both the demand for and supply of these services.

However, a range of factors also exist that are more idiosyncratic to digital currencies based on distributed ledgers – particularly related to their decentralised attributes.

3.1 Supply side factors

On the supply side, the development of digital currencies based on the use of a distributed ledger has been mostly driven by **private sector non-banks**.[7] For the most part, banks have tended not to engage directly with digital currency intermediaries – indeed, some have sought to avoid interaction as a result of perceptions of risk and uncertainty over legal or compliance issues (such as AML/CFT). Only relatively recently have there been reports that private banks are exploring potential business opportunities arising from digital currencies and distributed ledgers – for example, by investing in companies that specialise in providing digital currency services, offering their customers interfaces to digital currency exchanges or exploring the use of decentralised ledgers for back office applications. When considering whether to implement such digital currency-linked services, banks, or any other participant involved, may need to assess whether such implementation might pose security challenges.

The drivers that have led these entities to develop digital currency schemes are also diverse, and underlie many of the differences in design between various initiatives. One distinction relates to commercial versus not-for-profit motives. Where **commercial motives** are the main driver, the entity might be seeking to earn profits from digital currency schemes in a number of different ways. These profits can come from the issuing of digital currency units (ie seigniorage-like revenue), from a capital gain on the digital currency units associated with the scheme and from transaction fees from payment intermediation. Digital currencies can also form part of a larger business model where the digital currency scheme is mainly created to generate revenues through the sale of other items or services.

A number of digital currency schemes based on distributed ledgers have been developed with particular **non-profit motives** in mind. These might include the utility gained from experimentation and innovation for its own sake, ideological motivations related to the desire to create and/or use alternative methods to existing financial infrastructure, or facilitating financial inclusion.

[7] A non-bank in this report is defined as "any entity involved in the provision of retail payment services whose main business is not related to taking deposits from the public and using these deposits to make loans": see CPMI, *Non-banks in retail payments*, September 2014.

Some of the supply side factors that may have an influence on the future development of digital currencies based on the use of a distributed ledger are:

- **Fragmentation**: Currently, more than 600 digital currencies are in circulation, with different protocols for transaction processing and confirmation, and with different approaches to the growth in the supply of digital currency units. This diversity may represent a barrier to the use and acceptance of these schemes, as fragmentation in various initiatives could be an obstacle to achieving the critical mass necessary to realise the network effects that are common to all payment networks.
- **Scalability and efficiency:** Due to their limited scale and acceptance, the number of transactions currently being processed in digital currency schemes is orders of magnitude smaller than those handled by widely used retail payment systems. It remains to be seen if and to what extent digital currency schemes would be able to evolve in order to process a significantly higher number of transactions. The increased efficiency of these schemes cannot be taken for granted; some of the most important digital currency schemes seem to be resource-intensive in terms of the energy and computing power required to process a small number of transactions. Improvements in processing power and speed and the tendency for computing and hardware costs to decrease imply that scalability and efficiency issues might be addressed over time. Other digital currency schemes purportedly require fewer resources to operate.
- **Pseudonymity:**[8] The degree of anonymity provided by some digital currency schemes may discourage a range of financial system participants from direct use or from providing facilities for digital currency use to their customers, as AML/CFT requirements may be difficult to satisfy in relation to digital currency transactions. It is important to note that digital currency transactions are typically observable on a public ledger and to the extent that they are not intentionally disguised (eg via so-called anonymisers or mixers), although aspects of these ledgers may be difficult to analyse.
- **Technical and security concerns:** Digital currencies based on the use of a distributed ledger have to build consensus among network participants to ensure the uniqueness of the ledger (ie that there is a single version of the ledger – with the history of transactions and balances – distributed across the network). The acceptance of digital currencies can be affected if differing versions of the ledger can coexist during long periods of time, or if the procedures to achieve consensus are flawed. Malicious actors may seek to profit by introducing fraudulent transactions into the ledger and inducing other participants to verify the falsified ledger.
- **Business model sustainability:** Building a sustainable business model in the long term might be a particular challenge for some digital currency schemes. In some cases, the incentives for certain actors that support the scheme (eg by verifying transactions and incorporating them into the ledger) are directly related to the issuance of the currency, which might be capped or decrease over time. At the same time, the cost incurred by those actors might be significant in some digital currency schemes. In those cases, it is an open question whether the right incentives will remain for the scheme to operate when the supply of new digital currency units diminishes or disappears. It is also possible that transaction fees could be raised to compensate for the loss of revenue in the form of new digital currency units, but this might affect demand and the long-term sustainability of the scheme. Notably, not all schemes follow the same model, and the costs associated with the operation of the network and transaction fees vary across different initiatives.

It needs to be emphasised that, to a large extent, these factors seem more related to the procedures and specific technical implementations of the various digital currency schemes than to the

[8] Digital currency schemes based on distributed ledgers are typically described as enabling "pseudonymous" rather than anonymous transactions, since the distributed ledger is generally publicly available and may facilitate tracing a transaction recorded on the ledger to a particular counterparty.

broader concept of distributed ledgers. Competing schemes, all of them based on distributed ledger technologies, may have differing degrees of efficiency, anonymity or technical security, or may follow diverging business models depending on their design.

3.2 Demand side factors

In order to increase acceptance and use, digital currencies based on distributed ledgers have to provide end users with benefits over traditional services. Some of the potential factors that could have an influence in the evolution of demand for digital currencies and their related payment mechanisms are:

- **Security:** An important demand side factor in relation to the use of digital currencies based on distributed ledgers is the risk of loss for users. Security breaches may undermine users' confidence in the digital currency scheme – these may not only involve the scheme itself but also may affect the intermediaries that an end user deals with in order to transact with digital currency units. Somewhat analogous to cash, if a user loses specific information that provides him/her with "ownership" of digital currency units stored in a distributed ledger, then those units are likely to be unrecoverable. Some users of digital currencies have relied upon intermediaries for holding and storing information relevant to their ownership of digital currency units, and so must trust these intermediaries to mitigate end user risk of loss from hacking, operational failures or misappropriation.
- **Cost:** It has been argued that digital currencies based on distributed ledgers may offer lower transaction fees than other payment methods. In some schemes, the processing of the payments is rewarded by newly issued units, which may also have the potential for earning "capital gains" measured in sovereign currency units, rather than by transaction fees. For this reason, digital currency schemes may be an attractive alternative for some individuals or entities, especially in cross-border payments that generally involve paying high fees to payment service providers. Additionally, transactions in these schemes do not require intermediaries to facilitate payments, which might have a bearing on processing costs. However, the transaction costs in these schemes are not always transparent, and other costs may exist, such as conversion fees between the digital currency and a sovereign currency if the user does not wish to maintain balances denominated in digital currency units.
- **Usability:** Ease of use is generally critical for the adoption of payment methods and mechanisms, and can reflect factors such as the number of steps in the payment process, whether this process is intuitive and/or convenient and the ease of integration with other processes. Use of digital currencies and distributed ledgers may depend on some usability advantages compared with existing methods. Currently, many providers are trying to improve and facilitate the user's experience in digital currency schemes.
- **Volatility and risk of loss:** If users choose to hold the digital currency asset received as payment then they may face costs and losses associated with price and liquidity risks. These risks are not insubstantial given the volatility and market dislocations that have been witnessed for some of the better known digital currency schemes. While some users have sought to make speculative gains from this volatility, for most the variability of exchange rates can represent an obstacle to wider adoption. The extent to which price volatility would diminish if digital currency schemes were widely used is an open question, as is the long-run risk of loss from holding digital currencies with zero intrinsic value.
- **Irrevocability:** Digital currency schemes based on a distributed ledger often lack dispute resolution facilities and offer irrevocability of the payment, which reduces the payee's risk of having the payment reversed due to fraud or chargebacks. While this feature may be attractive for payees (such as merchants), it could also deter adoption and use by payers (such as consumers).

- **Processing speed:** It has been argued that digital currencies based on distributed ledgers have the potential to clear and settle transactions faster than traditional systems, although the processing speed of the various schemes varies according to their technical details. However, it should be noted that a range of innovations unrelated to digital currencies – such as faster retail payment systems – are also aiming to address this increasing demand for improved payment speed. Additionally, real-time gross settlement systems already underpin the wholesale financial markets and provide capabilities for very fast payment and settlement of large-value payments.
- **Cross-border reach:** Digital currencies based on distributed ledgers are basically open networks with a global scope. These schemes do not distinguish between users based on location, and therefore allow value to be transferred between users across borders. Moreover, the speed of a transaction is not conditional on the location of the payer and payee. Further, in the context of restrictions that may be placed on cross-border transactions by national authorities, the decentralised nature of these digital currency schemes means that it is difficult to impose such restrictions on transactions.
- **Data privacy/pseudonymity:** Some digital currency schemes based on distributed ledgers have the scope to allow transactions to be made without disclosing personal details or sensitive payment credentials (although this is not an essential feature of distributed ledgers). The attractiveness of pseudonymity and the avoidance of banks and authorities may be partly driven by the desire to circumvent laws and regulation. In this respect, combined with their global reach, digital currency schemes are potentially vulnerable to illicit use. However, there are also legitimate reasons why users may prefer to use anonymous payment methods (eg when the payee is not trusted to protect the information disclosed: this may arise in person-to-person online sales where the parties commonly have no previous experience of interaction).
- **Marketing and reputational effects:** Digital currency schemes based on distributed ledgers are widely viewed as an innovative and interesting payment method. At the margin, merchants may see benefits in accepting payments through a digital currency scheme to the extent that it boosts demand for their goods and services. Similarly, users may be attracted to these schemes due simply to the newness of the technology.

These factors are relevant not only for direct use of digital currencies and distributed ledgers by end users, but potentially also for indirect use (eg when a payment service provider uses a digital currency scheme as its back-end payment infrastructure).

3.3 Role of regulation

Regulatory arrangements may have an influence on the development and use of digital currencies. In general, the recent development of digital currencies and the novelty of their design mean that they may not be specifically regulated and do not fit easily into existing regulatory definitions and structures. Indeed, the borderless online nature of digital currencies, and the absence of an identifiable "issuer" of the instrument, pose particular challenges to attempts at regulation that a national authority might make (although other identifiable third-party providers might be more easily regulated).

Borderless, online and generally unregulated systems do not involve layers of correspondent banks and can potentially make transactions faster, more convenient and feasible at lower cost. On the other hand, these types of system have also raised important concerns by law enforcement authorities about the use of these systems for illegal activity, as well as compliance with AML/CFT obligations that apply to traditional payment methods and intermediation. The Financial Action Task Force (FATF) has published a range of reports on digital currencies. In 2014, it published an extensive report on digital currency issues, noting that "convertible virtual currencies that can be exchanged for real money or other

virtual currencies are potentially vulnerable to money laundering and terrorist financing",[9] while more recently it published guidance on a risk-based approach to virtual currency payments products and services, observing that establishing some guidance across jurisdictions treating similar products and services consistently according to their function and risk profile is essential for enhancing the effectiveness of the international AML/CFT standards.[10]

Regulation naturally imposes costs on payment system providers and intermediaries; digital currency providers may benefit from not being subject to these costs. Regulatory costs may arise in particular from obligations placed upon the issuer of a payment or financial instrument; several countries have begun to adjust existing regulations or pass new regulations to address concerns of law enforcement and other authorities. Some developers and users of digital currencies have opposed such developments, seeing them as inconsistent with the emergence of new technologies that are less regulated than the traditional payments industry. Others have seen lack of regulation as an impediment to the growth of public confidence in digital currencies, as some actors may refrain from investing in this new technology due to legal uncertainty and/or lack of protection for users.

In this context, the main types of regulatory responses to the challenge of digital currencies are explored in Box 1.

[9] Financial Action Task Force, *Virtual Currencies: Key Definitions and Potential AML/CFT Risks*, June 2014.

[10] Financial Action Task Force, *Guidance for a Risk-Based Approach to Virtual Currencies*, June 2015.

Box 1

Regulatory issues and approaches

Regulatory issues for digital currencies based on distributed ledgers cover three main fields: consumer protection**,** prudential and organisational rules for the different stakeholders, and specific operating rules as payment mechanisms (eg settlement finality as in EU regulation).

Given the nature of digital currencies, which are typically online and therefore not limited to national jurisdictions, a coordinated approach at a global level may be important for regulation to be fully effective. However, this does not preclude certain actions at the national level, for which at least five general categories of actions can be identified:

- *Information/moral suasion*: rather than interfering directly with the development of digital currencies, authorities could decide to use moral suasion towards users and investors in order to highlight the relevant risks and to influence the market.
- *Regulation of specific entities*: via such an institutional approach, authorities could establish a limited set of regulations for specific types of entity (eg those that enable interaction between digital currencies and traditional payment instruments and/or the real economy). Firms that might be subject to specific regulation include intermediaries providing digital currency-related services such as exchanges, merchant acceptance facilities and "digital wallet" applications enabling users to store and transact in their units of the digital currency.
- *Interpretation of existing regulations*: some authorities may be able to assess whether existing regulatory arrangements might be applied to digital currencies and digital currency intermediaries. One example is in the area of taxation law, where authorities have made determinations of how tax legislation might apply to digital currency arrangements.
- *Broader regulation*: although jurisdictional issues are likely to be a challenge, authorities might seek to take a broader approach to regulation, potentially reflecting a functional approach such that regulatory obligations that apply to traditional payment methods and intermediaries also apply to digital currency schemes and digital currency intermediaries. As an example, authorities might seek to ensure that AML/CTF requirements apply to digital currency transactions and counterparties, or that the same consumer protection arrangements apply to transactions conducted with digital currencies as to other payment methods used by consumers.
- *Prohibition*: authorities could seek to ban the use of digital currencies in their respective jurisdictions. Practically, this could imply a ban on any digital currency-based financial activities, as well as digital currency exchanges or digital currency acceptance by retailers.

These categories can provide a general framework for the analysis and classification of actions undertaken by national authorities. Table 1 gives an overview of that classification, based on inputs from CPMI members (*Note: the following table does not attempt to provide a comprehensive overview of the current situation*).

Broad classification of the main types of regulatory action Table 1

Main options	Type of actions / Country examples
Information/moral suasion	• Public warnings • Investor/buyer information • Research papers *Most countries have issued these types of warnings, research or information notes.*
Specific stakeholder regulation	• Regulation of digital currency administrators (record-keeping, reporting, AML/TF). *Example: United States.* • Regulation of digital currency exchangers (record-keeping, reporting, prudential measures, AML/TF). *Examples: United States, France, Canada, Singapore, Sweden.* • Consumer protection measures (payment guarantee, redeemability etc).
Interpretation of existing regulations	• Application of regulation based on "interpretation" of how existing framework (eg tax law treatment) may be applied to digital currencies or digital currency intermediaries. *Example: United States*.
Overall regulation	• Dedicated regulation, covering all three aspects (consumer protection, prudential/organisational rules for stakeholders, and specific operating rules as payment systems).
Prohibition	• Ban (or amount cap) on retail Bitcoin transactions. • Ban on digital currency acceptance by retailers. • Ban on digital currency-based financial instruments. *Examples: China, Belgium.* • Ban on digital currency exchangers. • Ban on Bitcoin transactions between banks. *Examples: China, Mexico.*[11]

4. Implications for central banks of digital currencies and their underlying decentralised payment mechanisms

The development of digital currencies based on the use of distributed ledgers raises a number of potential policy issues for central banks and other public authorities. Those of particular relevance to central banks stem from the central banks' role in the payment system, the extent to which they have supervisory responsibilities for institutions that may provide digital currency services themselves or provide clearing services to other firms that provide such digital currency services, their conduct of monetary policy, their issuance of physical currency and their role in maintaining financial stability.

Although some of these issues are relevant today, other issues arise not from what digital currencies and distributed ledgers are currently, but from what they represent – a technology for settling peer-to-peer payments without trusted third parties and that may involve a non-sovereign "currency". It is important to highlight that a *widespread* adoption of these schemes would need to take place for some implications to materialise. Notwithstanding the media interest that has tended to surround these

[11] The fact that banks in Mexico are not allowed to conduct transactions with digital currencies such as Bitcoin is not an explicit regulatory response to the emergence of this type of asset. Rather, it is a consequence of the fact that financial institutions in Mexico must restrict themselves to trading and operating the assets permitted by Mexican regulation – and digital currencies such as Bitcoin are not included in this list.

schemes, for the time being they are not widely used and thus their impact on the mainstream financial system is negligible. It is possible that these schemes may remain a niche product for a limited user base. If this is the case, most of the implications below would continue to be more theoretical than real. If, however, there is a widespread adoption of digital currencies or of distributed ledgers (also applied to sovereign currencies) with potential impacts on the operations and balance sheets of banks and even central banks, some of the implications below may materialise.

4.1 Implications stemming from central banks' role in the payment system

In their roles as operators and/or overseers of payment systems and other FMIs, and as catalysts of payment system development and innovation, central banks typically have a responsibility to promote safe and efficient payment systems. In particular, the safety of payment systems is often predicated on how well risks are managed; accordingly, this subsection focuses on the implications of risks that may arise from digital currencies based on distributed ledger technology, drawing upon a set of risks, most of which are inherent in retail payment systems.

One key risk that receives some attention relates to consumer protection. For example, projecting the future value of digital currencies is difficult. As mentioned earlier, most digital currencies are denominated in their own units of value, do not have intrinsic value but instead depend upon user perceptions of value, are not tied to a sovereign currency, and, in many cases, are not a liability of any person or institution. Therefore, their value is based solely on users' expectations that they can exchange these units for something else of value, such as goods and services, or sovereign currencies, at a later date. These expectations can change greatly, and introduce greater volatility and risk of loss in the value of the units than is typically observed in the value of sovereign currencies in foreign exchange markets.[12]

Another consumer protection issue is the risk of fraud. Most digital currencies are designed to mimic cash transactions and so are relatively anonymous. These currencies are typically stored in digital wallets. These wallets have specific security features that protect them, such as the use of cryptography, which requires specific codes to access the units of value in the wallets. If these codes are stolen, the units of value could be stolen from the wallets. Third-party service providers can offer end users wallet services and provide additional protection.

Like traditional retail payment systems, a digital currency's payment mechanism is also subject to various risks. Whereas in traditional retail payment systems these risks are usually faced by financial institutions, in digital currency schemes end users, as direct participants, may face those risks. In particular, digital currencies are subject to operational risk. The extent of this risk will depend on the design of the mechanism. Many digital currencies' payment mechanisms are designed such that an exact copy of the records of transactions and wallet balances are stored on many computers around the world. This differs from traditional retail payment systems, where these records are more centrally stored at trusted entities such as financial institutions. These different payment mechanisms may reduce some types of operational risk (eg the failure of a specific node in the network need not alter the overall functioning of the scheme), but may increase others (eg the potential for there to be divergence between nodes in the network in relation to the currently "agreed" version of the ledger).

The system's decentralised setup and its open and flexible governance structure mean that it may be difficult to anticipate possible disruptions (eg hacking attacks on exchange platforms). This, in turn, may have some influence on the exchange rate of the digital currency. Moreover, the governance structure of digital currencies and their payment mechanisms may impact design improvements and security

[12] Sovereign currencies may face similar issues, but a significant difference in relation to digital currency schemes is that, in the latter, there is not a credible monetary authority committed to maintaining the value of the currency. Additionally, laws and regulations enforce the acceptance of sovereign currency for repaying debts (eg sovereign currency is usually required for paying taxes).

enhancements. Typically, changes to the payment mechanism require some form of consensus building by the users, without a central entity or set of governance arrangements. The way in which consensus is achieved can vary by digital currency. As a result, on the one hand, there can be delays in improvements if the decision-making process takes too much time, leaving the system more vulnerable to certain types of operational risks or other risks of fraud. On the other hand, the open source character of digital currencies allows all interested parties to contribute to improving the protocol, incentivised by self-interest in the functioning of the digital currency.

Legal risk may also be present in digital currencies and their payment mechanisms. Because digital currencies are meant to mimic cash, payments are generally final and irrevocable as soon as they are confirmed. There may be no legal structure or clarity of rights and obligations of various parties involved in a transaction. For example, liability issues may not be clearly understood in the event of fraud, counterfeiting, loss or theft. Alternatively, consumer protection may be in place more generally but may be difficult to enforce. Third-party service providers that support the use of digital currencies may provide some clarity through contractual arrangements with users.

The institutional arrangements related to the payment mechanism may introduce some degree of settlement risk. Because digital currency transactions are meant to replicate cash transactions, settlement is generally quick, and in some cases, instantaneous. Most mechanisms are designed such that there is no extension of credit for settlement. Thus, on the surface, there may be little liquidity or credit risk introduced by the system. However, third-party institutions that provide support for the use of digital currencies may need to manage liquidity in digital currencies and one or more sovereign currencies, especially as end users load or empty their digital currency wallets through conversions to or from sovereign currencies. Thus, these institutions have to manage liquidity effectively in order to execute transactions on behalf of customers, possibly introducing some settlement risk into the system.

The relative anonymity of digital currencies may make them especially susceptible to money laundering and other criminal activities. The usefulness of a digital currency for such purposes will depend on how much record-keeping the mechanism maintains about the transactions, how involved third-party service providers are in the transactions, whether such third parties comply with anti-money laundering requirements, and how easy it is to move digital currency across borders and convert that currency into sovereign currency.

A deeper analysis of the details of distributed ledgers could provide more information about the impact of this technology on retail payment systems, their functioning and associated risks.

4.2 Implications for financial stability and monetary policy

Impact on financial market infrastructures

The distributed ledger technology underlying many digital currency schemes could have a much broader application beyond payments. Decentralised mechanisms that exchange value based on a distributed ledger technology alter the basic setup of aggregation and netting on which many FMIs rely. In particular, it is conceivable that distributed ledgers could have an impact on the pledging of collateral or on the registration of shares, bonds, derivatives trades and other assets. The use of distributed ledgers may also induce changes in trading, clearing and settlement as they could foster disintermediation of traditional service providers in various markets and infrastructures. These changes may result in a potential impact on FMIs beyond retail payment systems, such as large-value payment systems, central securities depositories, securities settlement systems or trade repositories. The development of "smart" contracts based on distributed ledger technology capable of executing payments under certain conditions may create the possibility of making variation margin payments on an individual contract basis. This could significantly alter how bilateral margining and clearing works today, with net positions and collateral pools.

Impact on broader financial intermediaries and markets

Digital currencies and technology based on distributed ledgers could, if widely used, challenge the intermediation role of current actors in the financial system, especially banks. Banks are financial intermediaries that fulfil a role as delegated monitor of borrowers on behalf of depositors. Banks also typically perform liquidity and maturity transformation in the channelling of money from depositors to borrowers. If digital currencies and distributed ledgers were to become widespread, any ensuing disintermediation might have an impact on the mechanisms for saving or accessing credit. It is unclear who would take up the roles of traditional financial intermediaries in an economy based on the use of these schemes or whether these services could be provided at all in such a context.

Implications for central bank seigniorage revenue

A widespread substitution of banknotes with digital currencies could lead to a decline in central bank non-interest paying liabilities. This, in turn, could lead central banks to substitute interest paying liabilities, reduce their balance sheets, or both. The result could be a reduction in central bank earnings that constitute central bank seigniorage revenue. This is also an issue that was analysed in depth in the context of the development of e-money. In particular, the previous analysis suggests a number of options that the central bank could consider to offset the loss of seigniorage revenue and to increase its balance sheet. A deeper analysis of the impact of digital currencies on seigniorage could build on this previous body of work. In any case, a substantial substitution would need to take place for any significant impact to materialise.

Implications for monetary policy

If the adoption and use of digital currencies were to increase significantly, the demand for existing monetary aggregates and the conduct of monetary policy could be affected, although at present, the use of private digital currencies appears too low for these risks to materialise. The impact of digital currencies in these areas would have many similarities with the potential impact of e-money. As discussed in depth in the 1990s[13], the effect of digital currencies on the implementation of monetary policy will depend on the change in demand for bank reserves (eg a substitution away from the existing banking system for deposits and payments, towards digital currencies) and the degree of economic and financial interconnection between the users of sovereign currency and the users of the digital currency. If the substitution is large and the interconnection is weak, then monetary policy may lose efficacy.

In addition, a significant expansion of digital currencies could also raise a number of technical issues regarding the appropriate definition of monetary aggregates, especially if the digital currencies were not denominated in the sovereign currency. In a monetary policy regime heavily focused on the growth of monetary aggregates, such measurement difficulties could create some complications for monetary policy implementation.

A deeper analysis of the possible impact of digital currencies and the broader use of distributed ledgers (also applied to sovereign currencies) could explore these issues in more detail.

4.3 Potential issuance of digital currency by central banks

The 1996 BIS report on e-money[14] contemplated central banks issuing e-money as a policy option in response to its widespread adoption by the public and the associated weakening of control over monetary policy and loss of seigniorage revenue.

[13] See eg BIS, *Implications for central banks of the development of electronic money*, October 1996.

[14] BIS, *Implications for central banks of the development of electronic money*, October 1996.

The distinction between digital currencies and e-money lies in the associated technological innovation and its impact on the concept of settlement. Settlement in this context means a common agreement that a transaction has taken place. E-money is technologically similar to existing payment systems in that a trusted central party operates a ledger to which everyone in the system refers; settlement still requires a trusted central entity.

The emergence of distributed ledger technology could present a hypothetical challenge to central banks, not through replacing a central bank with some other kind of central body but mainly because it reduces the functions of a central body and, in an extreme case, may obviate the need for a central body entirely for certain functions. For example, settlement might no longer require a central ledger held by a central body if banks (or other entities) could agree on changes to a common ledger in a way that does not require a central record-keeper and allows each bank to hold a copy of the (distributed) common ledger. Similarly, in some extreme scenarios, the role of a central body that issues a sovereign currency could be diminished by protocols for issuing non-sovereign currencies that are not the liability of any central institution.

This raises the question of how central banks could respond to an increasing use of distributed ledger technology to settle transactions. One option is to consider using the technology itself to issue digital currencies. In a sense, central banks already issue "digital currency" in that reserve balances now only exist in electronic form and are liabilities of the central bank. The question is whether such digital liabilities should be issued using new technology and be made more widely available than at present. This raises a wide range of questions, including the impact on the payments system, the privacy of transactions, the impact on private sector innovation, the impact on deposits held at commercial banks, the impact on financial stability of making a risk-free digital asset more widely available, the impact on the transmission of monetary policy, the technology which would be deployed in such a system and the extent to which it could be decentralised, and what type of entities would exist in such a system and how they should be regulated. Within the central bank community, the Bank of Canada and the Bank of England have begun research into a number of these topics.

5. Conclusions

Digital currencies and distributed ledgers are an innovation that could have a range of impacts on many areas, especially on payment systems and services. These impacts could include the disruption of existing business models and systems, as well as the emergence of new financial, economic and social interactions and linkages. Even if the current digital currency schemes do not persist, it is likely that other schemes based on the same underlying procedures and distributed ledger technology will continue to emerge and develop.

The asset aspect of digital currencies has some similarities with previous analysis carried out in other contexts (eg there is analytical work from the late 1990s on the development of e-money that could compete with central bank and commercial bank money). However, unlike traditional e-money, digital currencies are not a liability of an individual or institution, nor are they backed by an authority. Furthermore, they have zero intrinsic value and, as a result, they derive value only from the belief that they might be exchanged for other goods or services, or a certain amount of sovereign currency, at a later point in time. Accordingly, holders of digital currency may face substantially greater costs and losses associated with price and liquidity risk than holders of sovereign currency.

The genuinely innovative element seems to be the distributed ledger, especially in combination with digital currencies that are not tied to money denominated in any sovereign currency. The main innovation lies in the possibility of making peer-to-peer payments in a decentralised network in the absence of trust between the parties or in any other third party. Digital currencies and distributed ledgers

are closely tied together in most schemes today, but this close integration is not strictly necessary, at least from a theoretical point of view.

This report describes a range of issues that affect digital currencies based on distributed ledgers. Some of these issues may work to limit the growth of these schemes, which could remain a niche product even in the long term. However, the arrangements also offer some interesting features from both demand side and supply side perspectives. These features may drive the development of the schemes and even lead to widespread acceptance if risks and other barriers are adequately addressed.

There are different ways in which these systems might develop: either in isolation, as an alternative to existing payment systems and schemes, or in combination with existing systems or providers. These approaches would have different implications, but both could have significant effects on retail payment services and potentially on FMIs. There could also be potential effects on monetary policy or financial stability. However, for any of these implications to materialise, a substantial increase in the use of digital currencies and/or distributed ledgers would need to take place. Central banks could consider – as a potential policy response to these developments – investigating the potential uses of distributed ledgers in payment systems or other types of FMIs.

Annex 1: Relevant literature

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