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Financial Management

SOMETIMES IT'S NOT ABOUT THE MONEY, BUT RATHER THE PROCESS OF MANAGING THE MONEY

Finance is the art and science of managing money

Art: Finance involves creativity, intuition, and judgment in decision-making, especially in areas like investment strategies, business growth, and personal financial planning.

Science: It relies on systematic processes, data analysis, and mathematical models to manage risks, optimize returns, and achieve financial goals.

Personal Finance vs Corporate Finance

Personal finance is all about how much money an individual spend, how much he/she save and how he/she invest their savings.

Corporate Finance is about how firms raise money from investor, how firms invest such money to make profit, how firms decide whether to re-invest such profits into the business or give them back to the investors.

Finance

Finance is the life blood of business. The term, finance must be understood clearly as it has different meaning and interpretation in various context.

- The time and extent of the availability of finance in any organization indicates the health of a concern.
- Every organization, may it be a company, college, school, bank or university requires finance for running its day-to-day affairs. As every organization previews stiff competition, it requires finance not only for survival but also for strengthening itself.
- Finance is said to be the circulatory system of the economy body, making possible the required cooperation between the innumerable units of activity.

Some Popular Definitions of Finance

According to F.W. Paish, Finance may be defined as the provision of money at the time it is wanted.

In the words of John J. Hampton, the term finance can be defined as the management of the flows of money through an organization, whether it be a corporation, school, bank or government agency.

The Encyclopedia Britannica defines finance as "the act of providing the means of payment". Hence the financial aspect of corporate planning may be described as the management of money.

An analysis of the aforesaid definition, makes it clear that finance directs the flow of economic activity and facilitates the smooth operation.

- Finance provides the required stimulus for continued business operations of all categories.
- Finance is essential for expansion, diversification, modernization,
- establishment, of new projects and so on.
- The financial policy of any organization to a greater extent, determines not only its existence, and survival but also the performance and success of that organization.

FINANCIAL MANAGEMENT

Financial Management means planning, organizing, directing and controlling the financial activities such as procurement and utilization of funds of the enterprise. It means applying general management principles to financial resources of the enterprise.

For any business, it is important that it expects the investments to be made in such a manner that returns are higher than the cost of finance.

In a nutshell, financial management reduces the cost of finance, ensures sufficient availability of funds, and effective utilization of funds.

Objective of Financial Management

The process of decision-making by finance managers must be goal-oriented. The goal orientation of the finance manager must be well defined because the evaluation of the opportunities faced by him and the decisions that are taken depend to a great extent on the goal of the finance manager.

Thus, a good objective of financial management should have the following characteristics:

Continuation

- It should be clear and unambiguous.
- It comes with a clear and timely measure that can be used to evaluate the success or failure of a decision.
- It should be consistent with the long-term existence of the firm.

Continuation

A clear understanding of the objective of financial management is a pre-requisite as the objectives provide a framework for optimal financial decision-making.

The overall goal of any firm will not serve the purpose, but rather an operationally useful criteria is required, which helps in choosing the best out of several exclusive opportunities in the given circumstances based on available data.

Continuation

Several goals of financial management have been cited, Eg: the Maximization of sales revenue, net profit, return on investment, size of firm, percentage of market share, etc.

The problem is to identify one out of these several goals which will give the best reflection of the effect of the decision-making on shareholders' interest.

Accordingly, the following two are considered as the objectives of the financial management:

Continuation

1. Maximization of Profits of the firms.
2. Maximization of shareholders' wealth.

The critical evaluation of these objectives are discussed below:

Continuation

Maximization of the Profits of the Firms: For any business firm, maximization of profits is often considered as the implied objective and therefore it is natural to retain the maximization of profit as the goal of financial management also. Various financial decisions are taken to maximize the profits of the firm. These profits can be measured in terms of total accounting profits available to the shareholders.

Some arguments in favour of Profit maximization as the objective of financial management are:

- The profit is regarded as a yardstick for the economic efficiency of any firm.
- If all business firms of the society works are working towards profit maximization, then the economic resources of the society as a whole would be most efficiently, economically, and profitably used.
- The profit maximization by one firm, if targeted by all, will ensure maximization of the welfare of the society.

Various problems associated with profit maximization as the objective of financial management are:

- The profit maximization overlooks the interest of other parties than shareholders.
- The profit maximization concentrates on profitability only and ignores the financing aspect of that decision and the risk associated with it.
- It ignores the timings of costs and returns and thereby ignores the time value of money.
- The profit maximization as an objective is vague and ambiguous.

Continuation

Profit maximization borrows the concept of profit from the field of accounting and thus tends to concentrate on the immediate effect.

So, profit maximization fails to be an operationally feasible objective of financial management. A goal as already stated should be precise, well defined and must be capable of taking cognizance of all possible costs and benefits of all the alternatives being evaluated. One such goal is termed the maximization of shareholders' wealth. better than solely profit maximisation.

Continuation

Maximization of shareholders' Wealth: In the theory of Financial Management, it is well accepted that the objective of financial management is maximization of shareholders' wealth. This objective is generally expressed in terms of the maximization of the value of a share of a firm.

The shareholders' wealth is represented by the present value of all the future cash flows in the form of dividends or other benefits expected from the firm. The market price of the share reflects this value.

Continuation

Therefore, economic value of shareholders' wealth is the market price of the share which is the present value of all future dividends and benefits expected from the firm.

Maximization of shareholders' wealth as an objective of financial management implies that the financial decisions will be taken in such a way that the shareholders receive the highest combination of dividends and an increase in the market price of shares. In other words, shareholders' proportional ownership of a firm represented by a share should be maximized.

Continuation

All financial decisions are therefore evaluated in terms of their effect on the firm's future cash flows and hence on the market price of the share. The underlying assumption in this approach is that shares are traded in efficient capital market where the effect of a decision is truly reflected in the market price of a share.

Some points in favour of wealth maximization as the objective of financial management are:

- The goal of wealth maximization as reflected in the market price of shares makes the interest of shareholders compatible with the management. With this objective managers will allocate the available economic resources in the best possible way within the given constraints of risk.
- Further, this goal has a long-term perspective as the market price of a share reflects all expected future benefits flowing from a firm to its shareholders, and therefore management cannot emphasize short-term profit at the cost of long-term perspective.

Continuation

- In operational terms, This goal seems to be more practical. It implies that the market price of a share is linked to three basic financial decisions i.e., investment, financing, and dividend. The link between these decisions and the value of the shares can be made by recognizing that the market price of the share is the present value of its expected cash flows, discounted back at a rate that reflects both the riskiness of the project and the financing mix used to finance it.
- Moreover, investors forms expectations based on the current and expected future cash flows. These expectations are reflected in the market price of shares.

Various problems associated with wealth maximization as the objective of financial management are:

The main problem is the assumption underlying this goal i.e., there is an efficient capital market wherein the effect of a decision is truly reflected in the market price of a share. In practice, the share price in the market is subject to the influence of so many extraneous factors like economic political scenarios in the country, and speculative activities. All these factors are assumed to be constant in this objective.

Continuation

This objective seems to be uncontroversial on theoretical grounds but in practice, there are three stakeholders in any firm i.e., the shareholders, the professional managers, and the creditors. The objectives of these three stakeholders are often very different resulting in conflict among them. Managers may take decisions that are in their best interest at the cost of unhappy shareholders and creditors.

Profit Maximization	Wealth Maximization
Considers total profit	Considers all future cash flows
Does not consider risk	Considers risk of a decision
Does not consider effect of earning per share, dividend paid, or any other return to shareholders	Considers earnings per share, dividends paid or any other return to shareholders
May opt to pay no dividend and reinvest retained earnings	May pay regular dividend

Conclusion

The shareholders would certainly prefer an increase in wealth against the generation of increasing flow of profits to the firm. Moreover, the market price explicitly reflects the shareholder' expected return and considers the long-term prospects of the firm. Therefore, wealth maximization is viewed as a proper goal of financial management. The profit maximization can be considered as a part of the wealth maximization strategy but should never be permitted to over-shadow the latter. Thus, the objective of shareholders' wealth maximization has been taken as the primary goal of financial decision-making.

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Functions of Financial Management

1. **Estimating the Capital requirements of the concern:**

The Finance Manager should exercise maximum care in estimating the financial requirements of his firm. To do this most effectively, he will have to use long-range planning techniques. This is because every business enterprise requires funds not only for long-term purposes for investment in fixed assets but also for short-term to have sufficient working capital. He can do his job properly if he can prepare budgets for various activities to estimate the financial requirements of his enterprise.

Continuation

Carelessness in this regard is sure to result in either deficiency or surplus of funds. If his concern is suffering because of insufficient capital, it cannot successfully meet its commitments in time, whereas if it has acquired excess capital, the task of managing such excess capital may not only prove very costly but also tempt the management to spend extravagantly.

Continuation

2. Determination of capital composition:

The Capital Structure of an enterprise refers to the kind and proportion of different securities. The Financial Manager can decide the kind and proportion of various sources of capital only after the requirement of Capital Funds has been decided. The decisions regarding an ideal mix of equity and debt as well as short–term and long-term debt ratios will have to be taken in light of the cost of raising finance from various sources, the period for which the funds are required, and so on.

Care should be taken to raise sufficient long-term capital in order to finance the fixed assets as well as the extension program of the enterprise in such a wise manner as to strike an ideal balance between the own funds and the loan funds of the enterprise.

to

Continuation

3. Choice of sources of funds:

The capital structure finalized by the management decides the final choice between the various sources of finance. The important sources are share-holders, debenture-holders, banks and other financial institutions, public deposits and so on.

The final choice actually depends upon a careful evaluation of the costs and other conditions involved in these sources.

For instance, although public deposits carry higher rate of interest than on debentures, certain enterprises prefer them to debentures, as they do not involve the creation of any charge on any of the company's assets. Likewise, companies that are not willing to dilute ownership may prefer other sources instead of investors in its share capital.

4. Investment of funds:

The Financial Manager must prudently invest the funds procured, in various assets in such a judicious manner as to optimize the return on investment without jeopardizing the long-term survival of the enterprise. Two important techniques— (i) Capital Budgeting; and (ii) Opportunity Cost Analysis—can guide him in finalizing the investment of long-term funds by helping him in making a careful assessment of various alternatives.

Continuation

A portion of the long-term funds of the enterprise should be earmarked for investment in the company's working capital. He can make proper decisions regarding the investment of funds only when he succeeds in striking an ideal balance between the conflicting principles of safety, profitability, and liquidity. He should not attach all the importance only to the canon of profitability. This is particularly because of the fact that the company’s solvency will be in jeopardy, in case major portion of its funds are locked up in highly profitable but unsafe projects.

5. Disposal of surplus:

The Financial Manager should decide the extent of the surplus that is to be retained for ploughing back and the extent of the surplus to be distributed as dividends to shareholders. Since decisions about the disposal of surplus constitute a very important area of Financial Management, he must carefully evaluate such influencing factors as— (a) the trend of earnings of the company; (A) the trend of the market price of its shares; (c) the extent of funds required for meeting the self-financing needs of the company; (d) the prospects; (e) the cash flow position, etc.

Continuation

6. Management of cash:

Cash is absolutely necessary for maintaining enough liquidity. The Company requires cash to—(a) pay off creditors; (b) buy stock of materials; (c) make payments to labourers; and (d) meet routine expenses. It is the responsibility of the Financial Manager to make the necessary arrangements to ensure that all the departments of the Enterprise get the required amount of cash in time to promote a smooth flow of all operations.

each department has enough cashflow

Continuation

Shortage of cash on any occasion is sure to damage the creditworthiness of the enterprise. At the same time, it is not advisable to keep idle cash also. Idle cash should be invested in near-cash assets that are capable of being converted into cash quickly without any loss during emergencies. The Financial Manager can assess the exact requirements of cash during various periods by preparing a cash-flow statement in advance.

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7. Financial controls: The finance manager has not only to plan, procure and utilize the funds but he also has to exercise control over finances. This can be done through many techniques like ratio analysis, financial forecasting, cost and profit control, etc.

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Scope of Financial Management

Some of the major scope of financial management are as follows:

1. Investment Decision
2. Financing Decision
3. Dividend Decision
4. Working Capital Decision

Continuation

1. Investment Decision:

The investment decision involves the evaluation of risk, measurement of cost of capital, and estimation of expected benefits from a project. Capital budgeting and liquidity are the two major components of investment decisions. Capital budgeting is concerned with the allocation of capital and commitment of funds in permanent assets that would yield earnings in future.

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Continuation

Capital budgeting also involves decisions concerning the replacement and renovation of old assets or investment in new assets. The finance manager must maintain an appropriate balance between fixed and current assets to maximize profitability and maintain desired liquidity in the firm.

Capital budgeting is a very important decision as it affects the long-term success and growth of a firm. At the same time, it is a very difficult decision because it involves the estimation of costs and benefits which are uncertain and unknown.

Continuation

2. Financing Decision:

While the investment decision involves decision concerning the composition or mix of assets, the financing decision is concerned with the financing mix or financial structure of the firm. The raising of funds requires decisions regarding the methods and sources of finance, relative proportion and choice between alternative sources, time of floatation of securities, etc. In order to meet its investment needs, a firm can raise funds from various sources.

Continuation

The finance manager must develop the best finance mix or optimum capital structure for the enterprise to maximize the long-term market price of the company's shares. A proper balance between debt and equity is required so that the return to equity shareholders is high and their risk is low.

The use of debt or financial leverage affects both the return and risk to the equity shareholders. The market value per share is maximized when risk and return are properly matched. The finance department has also to decide the appropriate time to raise the funds and the method of issuing securities.

Continuation

3. Dividend Decision:

To achieve the wealth maximization objective, an appropriate dividend policy must be developed. One aspect of dividend policy is to decide whether to distribute all the profits in the form of dividends or to distribute a part of the profits and retain the balance. While deciding the optimum dividend payout ratio (proportion of net profits to be paid out to shareholders) the finance manager should consider the investment opportunities available to the firm, plans for expansion and growth, etc. Decisions must also be made concerning dividend stability, form of dividends, i.e., cash dividends or stock dividends, etc.

4. Working Capital Decision:

Working capital decision is related to the investment in current assets and current liabilities. Current assets include cash, receivables, inventory, short-term securities, etc. Current liabilities consist of creditors, bills payable, outstanding expenses, bank overdrafts, etc. Current assets are those assets which are convertible into a cash within a year. Similarly, current liabilities are those liabilities, which are likely to mature for payment within an accounting year.

current assets and current laibilties have different definitions.

Interface of Financial Management with Other Functional Areas

should function well with other areas as well.

The finance function cannot work effectively unless it draws on the disciplines that are closely associated with it. Financial management is an integral part of overall management and not merely a staff function. It is not only confined to fundraising operations but extends beyond it to cover the utilization of funds and monitoring its uses. These functions influence the operations of other crucial functional areas of the firm such as production, marketing, accounting, etc.

Hence, decisions in regard to financial matters must be taken after giving thoughtful consideration to the interests of various business activities. The finance manager has to see things as a part of a whole and make financial decisions within the framework of overall corporate objectives and policies.

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Marketing-Finance Interface

There are many decisions, which the Marketing Manager takes which have a significant financial implications. For example, he should have a clear understanding of the impact the credit extended to the customers is going to have on the profits of the company. Otherwise in his eagerness to meet the sales targets he is liable to extend liberal terms of credit, which is likely to put the profit plans out of gear. Similarly, he should weigh the benefits of keeping a large inventory of finished goods in anticipation of sales against the costs of maintaining that inventory.

Other key decisions of the Marketing Manager, which have financial implications, are:

- Pricing
- Product promotion and advertisement
- Choice of product mix
- Distribution policy.

Production-Finance Interface

The Production Manager controls a major part of the investment in the form of equipment, materials and men. He should so organize his department so that the equipment under his control is used most productively, the inventory of work-in-process or unfinished goods and stores and spares is optimized, and the idle time and work stoppages are minimized. If the production manager can achieve this, he would be holding the cost of the output under control and thereby help in maximizing profits. ,

He has to appreciate the fact that whereas the price at which the output can be sold is largely determined by factors external to the firm like competition, government regulations, etc. the cost of production is more amenable to his control. Similarly, he would have to make decisions regarding make or buy, buy or lease etc. for which he has to evaluate the financial implications before arriving at a decision.

Accounting – Finance Interface

Finance relates to accounting. The accounting process produces one of the essential raw materials needed to make financial decisions, financial data. Accounting is a tool for handling only the financial aspects of business operations. It is geared to the financial ends of business only because these are measurable on the scale of money values. Finance concerns with accounting because financial accounting is one branch of accounting.

Financial status is concluded from the accounting records (i.e. balance sheet, profit and loss account). Account keeps the record of the organizations income, expenditure, and asset liabilities and by evaluating those transactions finance decides for investment like where to invest. How much funds to invest? Etc. In a short form, it can be said that where account ends up keeping records, finance starts the work by evaluating them.

Top Management-Finance Interface

The top management, which is interested in ensuring that the firm's long-term goals are met, finds it convenient to use the financial statements as a means for keeping itself informed of the overall effectiveness of the organization. The finance function has a strong linkage with the functions of the top management. Strategic planning and management control are two important functions of the top management. Finance function provides the basic inputs needed for undertaking these activities.

Economics – Finance Interface relation between finance and econ

The field of finance is closely related to economics. Financial managers must understand the economic framework and be alert to the consequences of varying levels of economic activity and changes in economic policy. They must also be able to use economic theories as guidelines for efficient business operation. The primary economic principle used in managerial finance is marginal analysis, the principle that financial decisions should be made, and actions taken only when the added benefits exceed the added costs. Nearly all-financial decisions ultimately come down to an assessment of their marginal benefits and marginal costs.

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Time Value of Money

‘A bird in hand is worth two in the bush’

What is the Time Value of Money?

- The time value of money is a basic financial concept that holds that money in the present is worth more than the same sum of money to be received in the future.
- This is true because the money that you have right now can be invested and earn a return, thus creating a larger amount of money in the future. (Also, with future money, there is the additional risk that the money may never actually be received, for one reason or another.)
- The time value of money is sometimes referred to as the net present value (NPV) of money.

Relevance of Time Value of Money

Recognition of Time value of Money in financial decision making is extremely important.

Why it is Important?

- Wealth maximization as an objective of financial management is superior to profit maximization because among other things, the former incorporates the timing of benefits received while the latter ignores it.
- Moreover, considering the objective of Wealth maximization, financial management is future oriented.

- A financial decision taken today has implications over a number of years i.e, spreads over a number of years in future. For eg: Purchase of fixed asset, raising of capital through bank borrowings, debentures etc.
- In order to arrive at a decision, meaningful comparison must be made between inflows and outflows of cash.
- Thus to have logical comparison between the cash flows that accrue that different point of time, it is necessary to convert the sums of money to a common point of time.

Rationale of time value of money

Conceptually, 'Time value of money' means unit of money has different value at different point of time.

- The value of a sum of money received today is more than its value received after sometime.
- Conversely, the sum of money received in future is less valuable than it is received today.
- Accordingly, a rational investor would prefer current receipt as to future receipt.
- The time value of money can also be referred to as time preference for money.

Reasons for time preference of money

- Reinvestment opportunities for the funds which are received at a early date. The funds so invested will earn a rate of return. This would not be possible if funds are received at a later date.
- Thus, the time preference of money is generally expressed in terms of a rate of return or more popularly known as a discount rate.
- The expected rate of return also depends on the time value of money will vary from individual to individual depending on his/her perception.

Another reason for preference for current money is that there is certainty, whereas future money has uncertainty. The creditor may become insolvent.

Besides uncertainty, every person has a preference for present consumption. The current money may be required for specific purposes like buying consumer durables. Moreover, under an inflationary situation, money received today has more purchasing power.

What is cash flow?

- The term cash flow refers to the net amount of cash and cash equivalents being transferred in and out of a company.
- Cash received represents inflows, while money spent represents outflows.
- A company's ability to create value for shareholders is fundamentally determined by its ability to generate positive cash flows or, more specifically, to maximize long-term free cash flow (FCF).
- FCF is the cash generated by a company from its normal business operations after subtracting any money spent on capital expenditures (CapEx).

Types of Cash Flows for TVM Calculations

There are four major types of time value of money calculations. These calculations include the future value of a lump sum, the future value of an annuity, the present value of a lump sum, and the present value of an annuity. Calculating the time value of money will include the used of discounted cash flows.

Future Value of a Lump Sum

The calculation for the future value of a lump sum is used when a business wants to calculate how much money it will have at some point in the future if it makes one deposit with no future deposits or withdrawals, given an interest rate and a certain period of time. Calculating future value is also called compounding.

Future Value of an Annuity

The calculation for the future value of an annuity is used when a business wants to calculate how much money it will have at some point in the future if it makes equal, consecutive deposits over a period of time, given an interest rate and a certain period of time. Annuities can be in the form of an ordinary annuity or an annuity due. This is true when calculating the present value of an annuity as well.

The most notable difference in ordinary annuities and annuities due is the way they pay out. The payments come at the end of the period or the beginning.

- With ordinary annuities, the payments come at the end of each payment period.
- With annuities due, the payment comes at the beginning.

In general, loan payments are made at the end of a cycle and are ordinary annuities. In contrast, insurance premiums are typically due at the beginning of a billing cycle and are annuities due.

Present Value of a Lump Sum

The calculation for the present value of a lump sum is used when a business wants to calculate how much money it should pay for an investment today if it will generate a certain lump sum cash flow in the future, given an interest rate and a certain period of time. Calculating the present value is also called discounting.

Present Value of an Annuity

The calculation for the present value of an annuity is used when a business wants to calculate how much money it should pay for an investment today if it will generate a stream of equal, consecutive payments for a certain time period in the future, given an interest rate and a certain period of time.

The relationship between Present Value (PV) and Future Value (FV)

The relationship between PV and FV arises because of the existence of the interest rate and time gap. The interest rate and the time gap between PV and FV tie the both in a mathematical relationship:

$FV = PV \times (1+r)^n$ (1.1)

$PV = FV/(1+r)^n$ (1.2)

For example: A deposit of ₹1000 is made in a bank for three years with interest at 10% p.a. The FV of this deposit is:

$$FV = PV \times (1+r)^n \qquad (1.1)$$

$$= ₹1000 \ (1+.10)^3 = ₹\ 1331$$

Similarly, the PV of ₹1331 receivable after three years and considering the interest at 10% is as follows:

$$PV = FV/(1+r)^n \qquad (1.2)$$

$$= ₹1331/(1+0.10)^3 = ₹\ 1000$$

Concepts of FV and PV are applied in financial decision making . The cash flows of different periods can be made comparable either:

i) By compounding the present value to a future date i.e, by finding out the FV of a present money, or

ii) By discounting the future money to present date i.e, by finding out the PV of a future money.

Compounding Technique

The compounding technique is used to find out the FV of a present money. It is the same as the concept of compound interest, wherein the interest earned in the preceding year is reinvested at a prevailing rate of interest for the remaining period. Thus, the accumulated amount (principal + interest) at the end of a period becomes the principal amount for calculating the interest for the next period.

The compounding technique to find out the FV of a present money can be explained with reference to :

1. The FV of a single present cash flow, and
2. The FV of a series of cash flows.

The FV of a single present cash flow:

It may be computed as follows:

$FV = PV (1+r)^n$ Equation (1.1)

Where, FV = Future Value

PV= Present Value

r= % rate of interest, and

N= Time gap after which FV is to be ascertained.

It has been already observed that FV depends upon the combination of three variables i.e, the PV, the r and the n. If any one of these three variables change, the FV will also change.

There can be infinite number of combinations of these three variables and therefore, there can be corresponding infinite number of FVs.

For example: One may be interested to find out the FV of:

₹1000 at 10% after 7 years

₹ 5000 at 11% after 9 years or

₹ 50000 at 16% after 3 years and so on.

Every time equation (1) needs to be followed to find out FV.

To avoid the tedious calculation, Mathematician have developed easier way to find out the value of (1+r)^n for various combinations of r and n in the form of Compound interest table.

table has calcu;ation of re.1 with different cobination of n,r.

By selecting a combination of r and n, one can find the amount to which Re. 1 will grow by the end of ‘n’ years at ‘r’ rate of interest.

The pre-calculated values taken from compound interest table when multiplied by the relevant PV will give FV of that amount at ‘r’ rate of interest after ‘n’ years.

For example: Find out the FV of ₹ 5000 invested for 10 years @ 5% rate of interest

From the Compound Interest Table the value for (1+.05)^10 can be observed i.e, 1.629, which is known as the Compound value factor (CVF)

Therefore,

FV = ₹5000 x 1.629 = ₹ 8145

It can be re-written as: FV = PV x $CVF_{(r,n)}$ (1.1A)

FV of a Series of Equal Cash Flows/ Annuity

Quite often the decision may result in the occurrence of cash flows of the same amount every year for several years consecutively, instead of a single cash flow.

For example, A deposit of ₹ 1,000 each year is to be made at the end of each year for the next 3 years from today. This may be referred to as an annuity deposit of ₹1,000 for three years.

An annuity is thus, a finite series of equal cash flows made at regular intervals

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An annuity is thus, a finite series of equal cash flows made at regular intervals

In this case, each cash flows is to be compounded to find out its FV. The total FVs of all these cash flows will be the total FV of the annuity.

The FV of an annuity also depends upon three variables:

Annual amount; Rate of interest; Time period.

In order to find out the FV of an annuity, a pre-calculated mathematical table is available for various combinations of ‘r’ and ‘n’

For example: The FV of an annuity of ₹ 1,000 for 3 years at 10% may be computed as follows:

Find out the relevant figure from The Compound Value of Annuity Factor (CVAF) table (which is the intersection of ‘r’ and ‘n’) [3.310]

Multiply this figure with ₹ 1,000 to compute the FV of the annuity i.e, ₹ 3,310

Thus, FV= Annuity amount x $CVAF_{(r,n)}$

Discounting Technique

previous: compuonding technique

This process is just the reverse of the compounding technique. As there are FVs of sums invested now, calculated as per the compounding techniques, there are also the present values of a cash flow scheduled to occur in the future. The present value (PV) is calculated by discounting technique by applying Eq. (1.2) i.e,

$PV = FV/(1+r)^n$

This technique can be explained in terms of :

i) The PV of a future sum,

ii) The PV of a future series.

The PV of a Future Sum

- The PV of a Future Sum will be worth less than the future sum because one foregoes the opportunity to invest and thus forgoes the opportunity to earn interest during that period.
- This interest forgone is the cost to the investor and the future expected money must be adjusted for this cost.
- As the length of time for which one has to wait for the future money increases, the cost attached to the delay also increases, reflecting the compounded value of the lost opportunities.

In order to compute the PV of a future money, this opportunity cost of the money is to be deducted from the future money.

For example: ₹ 1,080 is receivable at the end of one year from now and the expected rate of interest which a person can earn on his investment is 8% p.a. then the PV can be calculated as:

$PV = FV/(1+r)^n$

$= 1,080/ (1+.08)^1 = 1,000$

Thus, PV of a future money depends on three variables i.e, the FV, rate of interest and time period, for which there can be infinite number of combinations.

Similar with FV, Mathematicians have calculated tabulated values of the factor $1/(1+r)^n$ for different combinations of 'r' and 'n', which is also known as Present Value of Future Sum denoted as $PVF_{(r,n)}$

Thus Eq. (1.2) can be re-written as:

PV= FV x $PVF_{(r,n)}$ (1.2A)

For example, in order to find out the PV of ₹ 1,500 receivable after 3 years and the rate of interest is 10%,

We need $PVF_{(10\%,3)}$

= .751 (Tabulated Value)

Thus, PV= ₹ 1,500 x .751 = ₹1.126.50.

Points to remember:

i) For a given period, the higher the interest rate, the lower will be the PVF, accordingly lower PV

ii) For a given interest rate, longer the time period, lesser will be the PVF, accordingly lower PV

The PV of a series of equal future cash flows or Annuity

A decision taken today may result in a series of future cash flows of the same amount over a period of number of years.

For example: A service agency offers the following options for a 3-year contract: i) Pay only ₹ 2,500 now and no more payment during next 3 years, or ii) Pay ₹ 900 each at the end of first year, second year and third year from now. A client having a rate of interest at 10% p.a. can choose an option based on the PV of both the options

900 is the future value

Option I: Payment of ₹ 2,500 is already in terms of PV, therefore do not require any adjustment

Option II: The customer has to pay an annuity of ₹ 900 for 3 years

Year 1 : PV = 900/(1+0.10)^1 = 818

Year 2: PV = 900/(1+0.10)^2 = 744

Year 3: PV =900/(1+0.10)^3 =676

Total = 2238

In this case Option should be selected by client as he will be paying a lower amount of ₹ 2238 in real terms as against ₹ 2500 payable in option I

The same computation can be made by using Present Value Annuity Factor based on the tabulated values computed by Mathematicians for easy computations by using different combinations of ‘r’ and ‘n’

Thus, PV = FV x $PVAF_{(r,n)}$

prsent value= future value * equvant from tablea

Points to Remember

1. Both PV and FV are two sides of the same coin. This is evident from the basic equation

$FV = PV\ (1+r)^{n}$

In this situation, either the FV or the PV can be made the dependent variable and can be found by taking the other as the independent variable.

2. For single cash flow, the CVF will be greater than one , while the PVF will be less than one.

3. The FV is the compounded value and is inclusive of the interest for the interval period. However, the PV is the discounted value and is exclusive of the interest for the interval period.

difference between PV and FV

In addition to the types of cash flows already discussed, there can be some other types of cash flows also. These can also be compounded or discounted to FV or PV respectively. For this, the techniques of compounding or discounting can be applied with some modifications.

Perpetuity

A perpetuity may be defined as an infinite series of equal cash flows occurring at a regular intervals. It has indefinitely long life.

If a deposit of ₹ 1000 is made in a savings bank account at 3.5% for an indefinite period then the yearly interest of ₹35 is a perpetuity of interest income so long as the initial deposit of ₹ 1,000 remains unchanged. In order to find out the PV of a perpetuity, the PV of each of the infinite number of cash flows should be added.

If the first occurrence of the perpetuity takes place after 1 year from today then the PV of the perpetuity may be calculated with the help of the following equation:

$$PV = \text{Cash flow}/(1+r)^{1} + \text{Cash flow}/(1+r)^{2} + \ldots\ldots\ldots + \text{Cash flow}/(1+r)^{\infty}$$

Conceptually, it is difficult or rather impossible to find out the PV of a perpetuity. But, Mathematically, it is the easiest stream of the cash flows to value.

Mathematically, infinite summation adds up to the simple version

PV_p = Annual Cash Flow/r, Equation (1.5)

Where, PV_p is the present value of a perpetuity.

NUMERICAL

Find out the present value of an investment which is expected to give a return of ₹ 2,500 p.a. indefinitely and the rate of interest is 12% p.a.

Solution:

ANNUAL CASH FLOW: 2.5K
PRESENT VALUE: WE NEED TO FIND
INDEFINITLY -> INFINITE TAK.

Using Eq (1.5)

PV_p = Annual Cash Flow/ r = ₹ 2,500 / .12 = ₹ 20,8333.33

Annuity Due

The discussion on FV or the PV of an annuity was based on the presumption that the cash flows occur at the end of each period starting from now. However, in practice the cash flow may occur in the beginning of each period. Such situation is known as annuity due.

In ordinary annuity of n years, first cash flow will occur at the end of first year from now and the last cash flow will occur at the end of nth year.

In case of annuity due, the first cash flow occur now and the last cash flow will occur in the beginning of the nth year i.e, at time n-1. So, both the types of annuity have ‘n’ cash flows. However, the valuation methods are different. The valuation methods of an annuity due is explained below:

FV of an Annuity Due:

FV = Annuity Amount x $CVAF_{(r,n)}$ x (1+r) …. (1.6)

PV of an Annuity Due:

PV = Annuity Amount x $PVAF_{(r,n)}$ x (1+r) …. (1.7)

MATHEMATICAL TABLES

Table A 1: *Factors for Compounded Value of a Given Amount i.e., $CVF_{(r\%,n)}$*

Period *n*	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100
2	1.020	1.040	1.061	1.082	1.102	1.124	1.145	1.166	1.188	1.210
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611
6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772
7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949
8	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144
9	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358
10	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594
11	1.116	1.243	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853
12	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138
13	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.056	3.452
14	1.149	1.319	1.513	1.732	1.930	2.261	2.579	2.937	3.342	3.797
15	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177
16	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595
17	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054
18	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560
19	1.208	1.457	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116
20	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.728
25	1.282	1.641	2.094	2.666	3.386	4.292	5.427	6.848	8.623	10.835
30	1.348	1.811	2.427	3.243	4.322	5.743	7.612	10.063	13.268	17.449

Table A 1: *Factors for Compounded Value of a Given Amount i.e., $CVF_{(r\%,n)}$*

Period n	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	1.110	1.120	1.130	1.140	1.150	1.160	1.170	1.180	1.190	1.200
2	1.232	1.254	1.277	1.300	1.322	1.346	1.369	1.392	1.416	1.440
3	1.368	1.405	1.443	1.482	1.521	1.561	1.602	1.643	1.685	1.728
4	1.518	1.574	1.630	1.689	1.749	1.811	1.874	1.939	2.005	2.074
5	1.685	1.762	1.842	1.925	2.011	2.100	2.192	2.288	2.386	2.488
6	1.870	1.974	2.082	2.195	2.313	2.436	2.565	2.700	2.840	2.986
7	2.076	2.211	2.353	2.502	2.660	2.826	3.001	3.185	3.379	3.583
8	2.305	2.476	2.658	2.853	3.059	3.278	3.511	3.759	4.021	4.300
9	2.558	2.773	3.004	3.252	3.518	3.803	4.108	4.435	4.785	5.160
10	2.839	3.106	3.395	3.707	4.046	4.411	4.807	5.234	5.695	6.192
11	3.152	3.479	3.836	4.226	4.652	5.117	5.624	6.176	6.777	7.430
12	3.498	3.896	4.335	4.818	5.350	5.936	6.580	7.288	8.064	8.916
13	3.883	4.363	4.898	5.492	6.153	6.886	7.699	8.599	9.596	10.699
14	4.310	4.887	5.535	6.261	7.076	7.988	9.007	10.147	11.420	12.839
15	4.785	5.474	6.254	7.138	8.137	9.266	10.539	11.974	13.590	15.407
16	5.311	6.130	7.067	8.137	9.358	10.748	12.330	14.129	16.172	18.488
17	5.895	6.866	7.986	9.276	10.761	12.468	14.426	16.672	19.244	22.186
18	6.544	7.690	9.024	10.575	12.375	14.463	16.879	19.673	22.901	26.623
19	7.263	8.613	10.197	12.056	14.232	16.777	19.748	23.214	27.252	31.948
20	8.062	9.646	11.523	13.743	16.367	19.461	23.106	27.393	32.429	38.338
25	13.585	17.000	21.231	26.462	32.919	40.874	50.658	32.669	77.388	95.396
30	22.892	29.960	39.116	50.950	66.212	85.850	111.065	143.371	184.675	237.376

Table A 1 Factors for Compounded Value of a Given Amount i.e. $CVF_{n,i}$

Period n	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	1.210	1.220	1.230	1.240	1.250	1.260	1.270	1.280	1.290	1.300
2	1.464	1.488	1.513	1.538	1.562	1.588	1.613	1.638	1.664	1.690
3	1.772	1.816	1.861	1.907	1.953	2.000	2.048	2.097	2.147	2.197
4	2.144	2.215	2.289	2.364	2.441	2.520	2.601	2.684	2.769	2.856
5	2.594	2.703	2.815	2.392	3.052	3.176	3.304	3.436	3.572	3.713
6	3.138	3.297	3.463	3.635	3.815	4.001	4.196	4.398	4.608	4.827
7	3.797	4.023	4.259	4.508	4.768	5.042	5.329	5.629	5.945	6.275
8	4.595	4.908	5.239	5.590	5.960	6.353	6.767	7.206	7.669	8.157
9	5.560	5.987	6.444	6.931	7.451	8.004	8.595	9.223	9.893	10.604
10	6.727	7.305	7.926	8.549	9.313	10.086	10.915	11.806	12.761	13.786
11	8.140	8.912	9.749	10.657	11.642	12.708	13.862	15.112	16.462	17.921
12	9.850	10.872	11.991	13.215	14.552	16.012	17.605	19.343	21.236	23.298
13	11.918	13.264	14.749	16.386	18.190	20.175	22.359	24.759	27.395	30.287
14	14.421	16.182	18.141	20.319	22.737	25.420	28.395	31.961	35.339	39.373
15	17.449	19.742	22.314	25.196	28.422	32.030	36.062	40.565	45.587	51.185
16	21.113	24.084	27.446	31.243	35.527	40.357	45.799	51.923	58.808	66.541
17	25.547	29.384	33.758	38.741	44.409	50.850	58.165	66.461	75.862	86.503
18	30.912	35.848	41.523	48.039	55.511	64.071	73.869	85.071	97.862	112.454
19	37.404	43.735	51.073	59.568	69.389	80.730	93.813	108.890	126.242	146.190
20	45.258	53.357	62.820	73.864	86.736	101.720	119.143	139.380	162.852	190.047
25	117.388	144.207	176.857	216.542	264.698	323.040	393.628	478.905	581.756	705.627
30	304.471	389.748	497.904	634.820	807.793	1025.904	1300.477	1645.504	2078.208	2619.937

Table A2: *Factors for Compounded Value of an Annuity i.e.* $CVAF_{(r\%,\ n)}$

Period n	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.010	2.020	2.030	2.040	2.050	2.060	2.070	2.080	2.090	2.100
3	3.030	3.060	3.091	3.122	3.152	3.184	3.215	3.246	3.278	3.310
4	4.060	4.122	4.184	4.246	4.310	4.375	4.440	4.506	4.573	4.641
5	5.101	5.204	5.309	5.416	5.526	5.637	5.751	5.867	5.985	6.105
6	6.152	6.308	6.468	6.633	6.802	6.975	7.153	7.336	7.523	7.716
7	7.214	7.434	7.662	7.898	8.142	8.394	8.654	8.923	9.200	9.487
8	8.286	8.583	8.892	9.214	9.549	9.897	10.260	10.637	11.028	11.436
9	9.369	9.755	10.159	10.583	11.027	11.491	11.978	12.448	13.021	13.579
10	10.462	10.950	11.464	12.006	12.578	13.181	13.816	14.487	15.193	15.937
11	11.567	12.169	12.808	13.486	14.207	14.972	15.784	16.645	17.560	18.531
12	12.683	13.412	14.192	15.026	15.917	16.870	17.888	18.977	20.141	21.384
13	13.809	14.680	15.618	16.627	17.713	18.882	20.141	21.495	22.953	24.523
14	14.947	15.974	17.086	18.292	19.599	21.015	22.550	24.215	26.019	27.975
15	16.097	17.293	18.599	20.024	21.579	23.276	25.129	27.152	29.361	31.772
16	17.258	18.639	20.157	21.825	23.657	25.673	27.888	30.324	33.003	35.950
17	18.430	20.012	21.762	23.698	25.840	28.213	30.840	33.750	36.974	40.545
18	19.615	21.412	23.414	25.645	28.132	30.906	33.999	37.450	41.301	45.599
19	20.811	22.841	25.117	27.671	30.539	33.760	37.379	41.446	46.018	51.159
20	22.019	24.297	26.870	29.778	33.066	36.786	40.995	45.762	51.160	57.275
25	28.243	32.030	36.459	41.646	47.727	54.865	63.249	73.106	84.701	98.347
30	34.785	40.568	47.575	56.805	66.439	79.058	94.461	113.283	136.308	164.494

Table A2: *Factors for Compounded Value of an Annuity i.e., CVAF$_{(r\%,n)}$*

Period n	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.110	2.120	2.130	2.140	2.150	2.160	2.170	2.180	2.190	2.200
3	3.342	3.374	3.407	3.440	3.473	3.506	3.539	3.572	3.606	3.640
4	4.710	4.779	4.850	4.921	4.993	5.066	5.141	5.215	5.291	5.368
5	6.228	6.353	6.480	6.610	6.742	6.877	7.014	7.154	7.297	7.442
6	7.913	8.115	8.323	8.536	8.754	8.977	9.207	9.442	9.683	9.930
7	9.783	10.089	10.405	10.730	11.067	11.414	11.772	12.142	12.523	12.916
8	11.589	12.300	12.757	13.233	13.727	14.240	14.773	15.327	15.902	16.499
9	14.164	14.776	15.416	16.085	16.786	17.518	18.285	19.086	19.923	20.799
10	16.722	17.549	18.420	19.337	20.304	21.321	22.393	23.521	24.709	25.959
11	19.561	20.655	21.814	23.004	24.349	25.733	27.200	28.755	30.404	32.150
12	22.713	24.133	25.650	27.271	29.002	30.850	32.824	34.931	37.180	39.580
13	26.212	28.029	29.985	32.089	34.352	36.786	39.404	42.219	45.244	48.497
14	30.095	32.393	34.883	37.581	40.505	43.672	47.103	50.818	54.841	59.196
15	34.405	37.280	40.417	43.842	47.580	51.660	56.110	60.965	66.261	72.035
16	39.190	42.753	46.672	50.980	55.717	60.925	66.649	72.939	79.850	87.442
17	44.501	48.884	53.739	59.118	65.075	71.673	78.979	87.068	96.022	105.931
18	50.396	55.750	61.725	68.394	75.836	84.141	93.406	103.740	115.266	128.117
19	56.939	63.440	70.749	78.969	88.212	98.603	110.285	123.414	138.166	154.740
20	64.203	72.052	80.947	91.025	102.44	115.380	130.033	146.628	165.418	186.688
25	114.413	133.334	155.620	181.871	212.793	249.214	292.105	342.603	402.042	471.981
30	199.021	241.333	293.199	356.787	434.745	530.321	647.439	790.748	966.712	1181.882

Table A2: *Factors for Compounded Value of an Annuity i.e., CVAF*$_{(r\%,\ n)}$

Period n	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.210	2.220	2.230	2.240	2.250	2.260	2.270	2.280	2.290	2.300
3	3.674	3.708	3.743	3.778	3.813	3.843	3.883	3.918	3.954	3.990
4	5.446	5.524	5.604	5.684	5.766	5.848	5.931	6.016	6.101	6.187
5	7.589	7.740	7.893	8.048	8.207	8.368	8.533	8.700	8.870	9.043
6	10.183	10.442	10.708	10.980	11.259	11.544	11.837	12.136	12.442	12.756
7	13.321	13.740	14.171	14.615	15.073	15.546	16.032	16.534	17.051	17.583
8	17.119	17.762	18.430	19.123	19.842	20.588	21.361	22.163	22.995	23.858
9	21.714	22.670	23.669	24.712	25.802	26.940	28.129	29.369	30.664	32.015
10	27.274	28.657	30.113	31.643	33.253	34.945	36.723	38.592	40.556	42.619
11	34.001	35.962	38.039	40.238	42.566	45.030	47.639	50.399	53.318	56.405
12	42.141	44.873	47.787	50.985	54.208	57.738	61.501	65.510	69.780	74.326
13	51.991	55.745	59.778	64.110	68.760	73.750	79.106	84.853	91.016	97.624
14	63.909	69.009	74.528	80.496	86.949	93.925	101.465	109.612	118.411	127.912
15	78.330	85.191	92.669	100.815	109.687	119.346	129.860	141.303	153.750	167.285
16	95.779	104.933	114.983	126.011	138.109	151.375	165.922	181.868	199.337	218.470
17	116.892	129.019	142.428	157.253	173.636	191.733	211.721	233.791	258.145	285.011
18	142.439	158.403	176.187	195.994	218.045	242.583	269.885	300.252	334.006	371.514
19	173.351	194.251	217.710	244.033	273.556	306.654	343.754	385.323	431.868	483.968
20	210.755	237.986	268.783	303.601	342.945	387.384	437.568	494.213	558.110	630.157
25	554.230	650.944	764.596	898.092	1054.791	1238.617	1454.180	1706.803	2002.608	2348.765
30	1445.111	1767.044	2160.459	2640.916	3227.172	3941.953	4812.891	5873.231	7162.785	8729.805

Table A3 : *Factors for Present Value of a Future Amount i.e., PVF*

Table A3 : Factors for Present Value of a Future Amount i.e. PVF $_{(n,i)}$

Period n	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.889	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.838	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.276	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149
25	0.780	0.610	0.478	0.375	0.295	0.233	0.184	0.146	0.116	0.092
30	0.742	0.552	0.412	0.308	0.231	0.174	0.131	0.099	0.075	0.057

Table A3 : *Factors for Present Value of a Future Amount i.e., PVF* $_{(r\%,n)}$

Period n	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.226	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026
25	0.074	0.059	0.047	0.038	0.030	0.024	0.020	0.016	0.013	0.010
30	0.044	0.033	0.026	0.020	0.015	0.012	0.009	0.007	0.005	0.004

Table A3 : Factors for Present Value of a Future Amount i.e. PVF $_{(r\%,n)}$

Period n	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	0.826	0.820	0.813	0.806	0.800	0.794	0.787	0.781	0.775	0.769
2	0.683	0.672	0.661	0.650	0.640	0.630	0.620	0.610	0.601	0.592
3	0.564	0.551	0.537	0.524	0.512	0.500	0.488	0.477	0.466	0.455
4	0.466	0.451	0.437	0.423	0.410	0.397	0.384	0.373	0.361	0.350
5	0.386	0.370	0.355	0.341	0.328	0.315	0.303	0.291	0.280	0.269
6	0.319	0.303	0.289	0.275	0.262	0.250	0.238	0.227	0.217	0.207
7	0.263	0.249	0.235	0.222	0.210	0.198	0.188	0.178	0.168	0.159
8	0.218	0.204	0.191	0.179	0.168	0.157	0.148	0.139	0.130	0.123
9	0.180	0.167	0.155	0.144	0.134	0.125	0.116	0.108	0.101	0.094
10	0.149	0.137	0.126	0.116	0.107	0.099	0.092	0.085	0.078	0.073
11	0.123	0.112	0.103	0.094	0.086	0.079	0.072	0.066	0.061	0.056
12	0.102	0.092	0.083	0.076	0.069	0.062	0.057	0.052	0.047	0.043
13	0.084	0.075	0.068	0.061	0.055	0.050	0.045	0.040	0.037	0.033
14	0.069	0.062	0.055	0.049	0.044	0.039	0.035	0.032	0.028	0.025
15	0.057	0.051	0.045	0.040	0.035	0.031	0.028	0.025	0.022	0.020
16	0.047	0.042	0.036	0.032	0.028	0.025	0.022	0.019	0.017	0.015
17	0.039	0.034	0.030	0.026	0.023	0.020	0.017	0.015	0.013	0.012
18	0.032	0.028	0.024	0.021	0.018	0.016	0.014	0.012	0.010	0.009
19	0.027	0.023	0.020	0.017	0.014	0.012	0.011	0.009	0.008	0.007
20	0.022	0.019	0.016	0.014	0.012	0.010	0.008	0.007	0.006	0.005
25	0.009	0.007	0.006	0.005	0.004	0.003	0.003	0.002	0.002	0.001
30	0.003	0.003	0.002	0.002	0.001	0.001	0.001	0.001	0.000	0.000

Table A4 : *Factors for Present Value of a Future Annuity i.e., PVAF*

Period n	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.783	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.312	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.789	5.582	5.389	5.206	5.033	4.868
8	7.652	7.326	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.858	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.746	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.560	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.002
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.352	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514
25	22.023	19.524	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077
30	25.808	22.397	19.601	17.292	15.373	13.765	12.409	11.258	10.274	9.427

Table A4 : Factors for Present Value of a Future Annuity i.e. PVAF $_{n,i}$

Period n	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.850	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.487	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.303	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.669	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.893	7.366	6.938	6.50	6.198	5.877	5.585	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870
25	8.422	7.843	7.330	6.873	6.464	6.097	5.766	5.467	5.195	4.948
30	8.694	8.005	7.496	7.003	6.566	6.177	5.829	5.517	5.235	4.979

Table A4 : *Factors for Present Value of a Future Annuity i.e., PVAF* $_{(r\%,n)}$

Period n	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	0.826	0.820	0.813	0.806	0.800	0.794	0.787	0.781	0.775	0.769
2	1.509	1.492	1.474	1.457	1.440	1.424	1.407	1.392	1.376	1.361
3	2.074	2.042	2.011	1.981	1.952	1.923	1.896	1.868	1.842	1.816
4	2.540	2.494	2.448	2.404	2.362	2.320	2.280	2.241	2.203	2.166
5	2.926	2.864	2.803	2.745	2.689	2.635	2.583	2.532	2.483	2.436
6	3.245	3.167	3.092	3.020	2.951	2.885	2.821	2.759	2.700	2.643
7	3.508	3.416	3.327	3.242	3.161	3.083	3.009	2.937	2.868	2.802
8	3.726	3.619	3.518	3.421	3.329	3.241	3.156	3.076	2.999	2.925
9	3.905	3.786	3.673	3.566	3.463	3.366	3.273	3.184	3.100	3.019
10	4.054	3.923	3.799	3.682	3.570	3.465	3.364	3.269	3.178	3.092
11	4.177	4.035	3.902	3.776	3.656	3.544	3.437	3.335	3.239	3.147
12	4.278	4.127	3.985	3.851	3.725	3.606	3.493	3.387	3.286	3.190
13	4.362	4.203	4.053	3.912	3.780	3.656	3.538	3.427	3.322	3.223
14	4.432	4.265	4.108	3.962	3.824	3.695	3.573	3.459	3.351	3.249
15	4.489	4.315	4.153	4.001	3.859	3.726	3.601	3.483	3.373	3.268
16	4.536	4.357	4.189	4.033	3.887	3.751	3.623	3.503	3.390	3.283
17	4.576	4.391	4.219	4.059	3.910	3.771	3.640	3.518	3.403	3.295
18	4.608	4.419	4.243	4.080	3.928	3.786	3.654	3.529	3.413	3.311
19	4.635	4.442	4.263	4.097	3.942	3.799	3.664	3.539	3.421	3.311
20	4.657	4.460	4.279	4.110	3.954	3.808	3.673	3.546	3.427	3.316
25	4.721	4.514	4.323	4.147	3.985	3.834	3.694	3.564	3.442	3.329
30	4.746	4.534	4.339	4.160	3.995	3.842	3.701	3.569	3.447	3.332

Question 1:

A student is awarded a scholarship and two options are placed before him.

i) To receive Rs. 1100 now or ii) receive Rs. 100 p.m. at the end of each for next 12 months. iii) to receive Rs. 500 after 4 months, Rs. 500 at the end of 8^{th} months and Rs. 200 at the end of the year. Which option be chosen if the interest rate is 12% p.a.?

Question 2:

A DDB is issued for Rs. 5000 today and will mature after 6 years for Rs. 20,000. Find out the implicit rate of interest.

Question 3:

In setting up an educational fund, a person agrees to make five annual payments of Rs. 5000 each into a college fund program. The first payment is to be made 12 years from now, and the college fund program wishes that upon making the last payment, the amount available should have grown to Rs. 30,000. What should be the minimum rate of return on this fund?

Question 4:

Rs. 1000 is deposited into an interest-bearing account that pays 10% interest compounded yearly. The investor's goal is Rs. 1500. How many years must the principal earn compound interest before the desired amount is realized?

Question 5:

Assume that a deposit is to be made at year zero into an account that will earn 8% compounded annually. It is desired to withdraw Rs. 5000 three years from now and Rs. 7000 six years from now. What is the size of the year zero deposit that will produce these future payments?

Question 6:

A potential investor is considering the purchase of a bond that has the following characteristics: the bond pays 8% per year on its Rs. 1000 principal or face value. The bond will mature in 20 years. At maturity, the bondholder will receive interest for year 20 plus Rs. 1000 face value. What is the maximum purchase price that should be paid for this bond if the investor requires a 10% rate of return?

Question 7:

A company offers to refund an amount of Rs. 44650 at the end of 5 years for a deposit of Rs. 6000 made annually. Find out the implicit rate of interest offered by the company.

Question 8:

What is the minimum amount that a person should be ready to accept today from a debtor who otherwise has to pay a sum of Rs. 5000 today, Rs. 6000, Rs. 8000, Rs. 9000, and Rs. 10,000 at the end of year 1,2, 3, 4 respectively from today. The rate of interest may be taken at 14%.