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Ans to the Q. No - 01

Time value of Money —

The time value of money is the concept that a sum of money is worth more now than the same sum will be at a future date due to its earnings potential in the interim. The time value of money is a core principle of finance. A sum of money in the hand has greater value than the same sum to be paid in the future. The time value of money is also refferred to as the present discounted value.

The most fundamental

formula for the time value of money takes into account the following: the future value of money, the present value of money, the interest rate, the number of compounding periods per year and the numbers of years.

Based on these variables, the formula fo TVM is -

$$FV = PV\left(1 + \frac{i}{n}\right)^{n \times t}$$

where,

FV = Future value of money.

PV = present value of money.

i = Interest rate

n = Number of compounding periods per year

t = Numbers of years.

Money has time value. In simpler terms, the value of a certain amount of money today is more valuable than its value tomorrow. It is not because of the uncertainty involved with time but purely on account of timing. The difference in the value of money today and tomorrow is referred to as the time value of money.

Time value of Money comprises one of the most significant concepts in finance. The idea focuses on identifying the real value of cash flows expected in the future due to the business or individual investment decisions made from time to time.

Techniques use in time value of money

The time value of money suggests a preference of having money as of now than at a future point of time.

The concept of time value of money helps in arriving at the comparable value of the different rupee amounts arising at different points of time into equivalent values at a particular point of time.

The techniques of time value of money —

01. Compounding Technique
02. Discounting or present value Technique

01. compounding Technique. —

The compounding technique is used to find out the future value of different cash flows occurring at different points of time. According to this technique, interest earned on the initial principal or cash outflow becomes part of the principal or cash outflow becomes part of the principal for calculating interest for the next period. As a result interest is earned on interest as well as on the initial principal. This interest earned on interest is known as compunding effect and hence compounding technique.

02. Discounting technique —

Discounting technique is used to make cash flows occurring over different future periods comparable at the present time. In this technique present worth of future cash flows are calculated.

Ans to the Q. NO - 2

EAR —

Effective Annual Rate (EAR) is the rate of interest actually earned on an investment or paid on a loan as a result of compounding the interest over a given period of time. It is usually higher than the nomial rate and is used to compare different financial products that calculate annual interest with different compounding periods - weekly, monthly, yearly, etc. Increasing the number of compounding periods makes the effective annual interest rate increase as time goes by.

The effective annual rate

is normally higher than the nomial rate because the nomial rate quotes a yearly percentage rate regardless of compounding. Increasing the number of compounding periods increases the effective annual rate as compared to the nomial rate.

The formula for the EAR is —

Effective Annual Rate = (1 + (nominal interest rate / number of compounding periods))^(number of compounding periods) − 1.

Discounting

In relation to the time value of money, which argues that a dollar today is worth more than a dollar tomorrow, discounting can be defined as the act of estimating the present value of a future payment or a series of cash flows that are to be received in the future. Discounting is a key element in valuing future cash flows.

The companies opt for different types of discount rates. As a result, depending on their nature and intended use, multiple discount rates apply to investments.

→ Weighted Average cost of capital

→ Cost of Equity

→ Cost of Debt.

→ Hurdle Rate.

→ Risk - Free Rate

To derive a discounted value or the present value, the following equation can be used –

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

Where,

FV = FV is used to denote the future value of cash flow.

r = r is used to denote the discount rate

t = t is used to denote the time period that an investment

Compounding —

Compounding is the process in which an asset's earnings, from either capital gains or interest, are reinvested to generate additional earnings over time. This growth, calculated using exponential functions, occurs because the investment will generate earnings from both its initial principal and the accumulated earnings from preceding periods.

Compounding, therefore, differs from linear growth, where only the principal earns interest each period.

Compounding typically refers

to the increasing value of an asset due to the interest earned on both a principal and accumulated interest. This phenomenon, which is a direct realization of the time value of money.

The generalized formula for compound interest is :

$$FV = PV \times \left(1 + \frac{i}{n}\right)^{nt}$$

where,

FV = Future value

PV = present value

i = Annual interest rate

n = Number of compounding periods per time period

t = The time period

Annuity —

An annuity is a contract between you and an insurance company in which we make a lump-sum payment or series of payments and in return, receive regular disbursements, beginning either immediately or at some point in the future.

An annuity is a financial product that provides certain cash flows at equal time intervals. Annuities are created by financial institutions, primarily life insurance companies, to provide regular income to a client.

There are several types

of annuities that are classified according to frequency and types of payments. The primary types of annuities are —

01. Fixed Annuities
02. Variable annuities
03. Life annuities
04. perpetuity

The general formula for annuity valuation is —

$$PV = \frac{P}{(1+r)} + \frac{P}{(1+r)^2} + \cdots + \frac{P}{(1+r)^n}$$

where,

PV = present value of the annuity
P = fixed payment
r = Interest rate
n = Total number of periods of annuity payments.

Amortization Schedule →

An amortization schedule is a table that provides both loand and payment details fore a reducing term loan.

Details typically include the original loan amount, the loan balance at each payment, the interest rate, the amortization period, the total payment amount, and the proportion of each payment that is made up of interest vs. principal. Amortization schedules can be easily generated using several basic Microsoft Excel functions.

The amortization schedule refers to the allocation of loan

payments over interest and principal for a determined period of time until a loan is paid off.

This schedule is a very common way to break down the loan amount in the interest and the principal. Most people think that by making a minimum payment for their loan, they lower the principal amount. This depends on the duration of the loan.

Ans to the Q. NO - 3

Here,

$PV = 500000$

$i = 8\%$

$= .08$

$n = 10$ years

We know,

$$FV = PV\ (1+i)^n$$

$$= 500000\ (1 + .08)^{10}$$

$$= 1,079,462.50$$

So the value of the investment after the period will be 1,079,462.50

Ans to the Q. NO - 4

Given that,

Company A, invests = 300000

The cashflow = 100000

and company B invests = 400000

The cashflow = 105000

We know,

$$PBP_{(company\ A)} = \frac{\text{Initial investment}}{\text{cash inflows}}$$

$$= \frac{300000}{100000}$$

$$= 3 \text{ years}$$

$$PBP_{(company\ B)} = \frac{\text{Initial investment}}{\text{cash flows}}$$

$$= \frac{400000}{10,5000}$$

$$= 3.81 \text{ years}$$

Since company B shows 3.81 years and company A show 3 years, it means company A can have returnes on investment faster than company B, so company A is acceptable.