Financial Management

MS109

UNIT 2 THE MATHEMATICS OF FINANCE

MBA Second Semester

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In this unit you will learn to explore the basic factors that affect all investment values. The Basic Valuation Model are based on the idea that money has a "time value".

Simple Interest

Simple interest is the interest which is computed only on the principal amount, which is borrowed or deposited. Simple interest is a function of principal amount (borrowed or deposited),rate of interest annually and the number of year for which the principal is borrowed or lent.

Mathematical Formula :

Simple Interest = P x R x N

 where

'P' = principal .

'R'= rate of interest per annum.

 'N'= number of years.

COMPOUND INTEREST

Compound interest is the interest which is received on the principal amount and on the interest as well . The Interest for one period gets added back to the original principal to get the principal for the next year.

Symbolically ,

CA = P (1+ r/n)$^{n \times t}$

where,   CA = amount at the end of 't' period

 P = principal amount at the beginning of the 't' period.

r = rate of interest

t = time period in years

 n = number of compounding in a year.

If interest is compounded half yearly   : CA = P (1+ r/2)2 x t

If interest is compounded quarterly: t CA = P (1+ r/4)4 x t

If interest is compounded monthly :   CA = P (1 + r/12)12 x t

If interest is compounded daily :   CA = P (1+ r/365) 365 x t

Discounted Cash Flow Analysis

It involves calculations and financial decision making by considering at the cash flow from a business activity, where the principal behind the concept is that "the money received in future is less valuable than the money received today".

PRESENT VALUE (PV)

O The method of calculating the present value (PV) of a series of Future cash flow is called 'discounting' techniques.

O *Calculation of PV of a Single Amount*: The formula to calculate the P.V of a certain amount to be received after some future periods is :

Present Value = [Future Value (1 / (1+r))^n]

O The present value 'PV' of a future value 'F.V' due at the due at the end of 'n' conversion period at the rate 'r' , is given by the above formula, where 'r' is referred to as the rate of return, discount rate or the cost of capital or opportunity cost.

O The term $(1/1+r)^n$ is referred to as discount factor or PVF (present value factor) and is always less than 1, indicating that a future amount has a smaller P.V.

P.V can also be represented by this formula for calculations :

$$PV = FV_n \times (PVIF_{r, n})$$

Future Value

O Suppose we invest Rs5000 for five years in a savings account that pays 10% interest per year. If we reinvest the interest income, then how much our investment will grow after five years?

O Above problem is called the future value problem. We want to know the value in the future of an amount today. It is also called the compounding problem. Compounding is the process of finding the future value of cash inflow or outflow by using the concept of compound interest.

FUTURE VALUE OF A SINGLE CASH FLOW

O The process of investing money and also re-investing the interest earned is called compounding. The future value of an investment after 'n' years when the interest rate is 'r' percentage is :

$$FV_n = PV (1+r)^n \quad \text{or}$$

$$FV_n = PV \times FVIF_{(r,n)}$$

where,

FV= future value PV= present value 'r'= annual rate of interest 'n'= number of periods $(1+r)^n$ = is future value interest factor(FVIF) or future value factor.

FUTURE VALUE OF A SERIES OF UNEVEN CASH FLOW

Some financial instrument generates cash flow which are not constant and vary from period to period. Example : dividend on stock , cash flow generated from business activity are irregular flows .

Compound value of a series of uneven cash inflow or outflow can be calculated by the following

formula :

$$FV = CF_0 (1+r)^n + CF_1 (1+r)^{n-1} + CF_2 (1+r)^{n-2} + ... + CF_n$$
OR

$$FV = CF_0 \times FVIF_{(r,n)} + CF_1 \times FVIF_{(r, n-1)} + ...+ CF_n$$

Where, CF_n = Cash flow Compounded for 0 periods

CF_0 = Cash flow Compounded for the whole 'n' period.

'n' = number of periods from time 0 to the reference date given .

What is an Annuity?

Annuity is a series of regular cash flow for a specific duration. Example: If you have taken a loan for 30 years, you have to make 12 instalments each year for 30 years , i.e., it makes for 360 payments. Now, if we need to find the present value of the payments, we have to calculate the P.V of each of the 360 payment individually, which is time consuming and rigorous as well .

Perpetuity

Perpetuity are a lot similar to annuity, but the major difference is that it occurs indefinitely , that is, the financial payment go on forever . Since the financial payments made under this worth less the farther they are in the future , and this put a limit to the value of a perpetuity.

Loan Amortization

Loan is an amount raised at an interest and repayable at a specified period. Payment of loan is known as amortization . The gradual writing off of an asset or an account over a period is called 'Amortization'. The borrower of loan is usually interested to know the amount of equal instalment to be paid every year to pay back the complete loan along with interest.

Sinking Fund

Sinking fund is a fund which is created out of fixed payments which are made in each period to accumulate a future sum after a specified period.

References
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