Time Value of Money

Study Session 1

LOS 1 : Introduction

- Time value of Money is the first and the most important chapter of Finance.
- Anything connected with Finance is based on the "TIME VALUE OF MONEY"
- ₹ 100 today is Not Equal to ₹ 100 a year later.
- Three Factors determines the Time Value of Money:

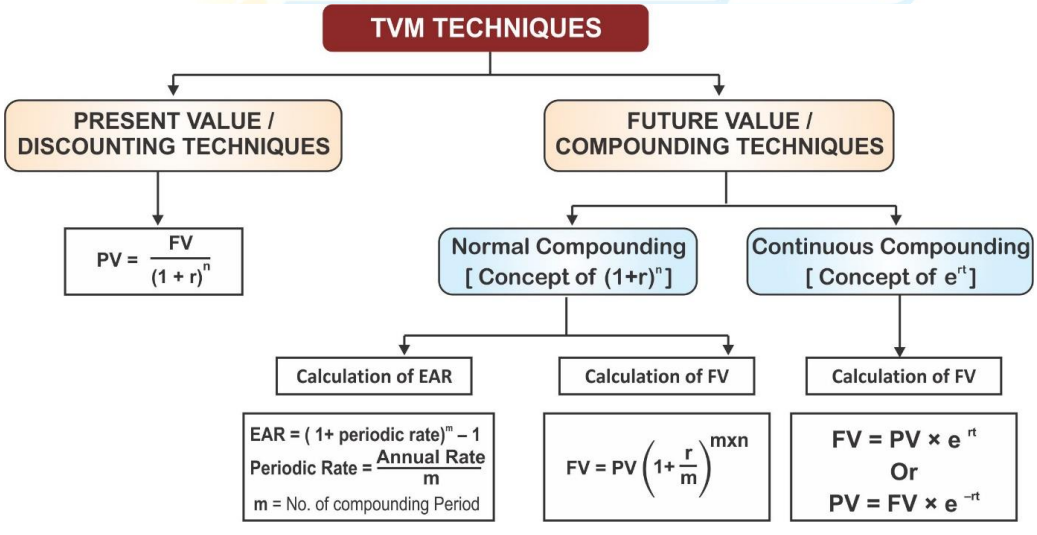
Expected Inflation Rate

+

Real Rate of Return on Risk free Investment

+

Risk Premium



LOS 2 : Future Value of a Single Cash Flow

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

Example:

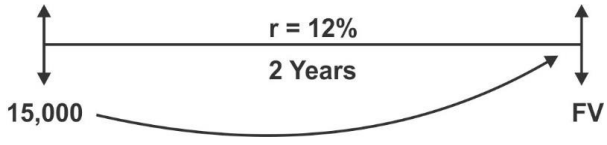
You invest ₹ 15,000 for two years that pays you 12% p.a. how much will you have at the end of two years?

Solution:

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

$= 15,000 \times (1 + 0.12)^{2}$

= 18,816



LOS 3 : Present Value of a Single Cash Flow

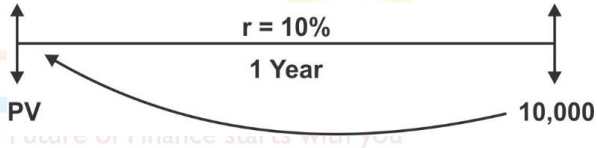
$$FV = PV \times (1 + r)^{n} \text{ or } PV = \frac{FV}{(1+r)^{n}}$$

Example:

You need ₹ 10,000 for buying a mobile next year. You can earn 10% on your money. How much do you need to invest today?

Solution:

FV = 10,000
r = 10%
n = 1 year



$PV = \frac{FV}{(1+r)^{n}} \Rightarrow \frac{10,000}{(1+0.10)^{1}} \Rightarrow 9090.91$

LOS 4 : Future Value of a Multiple Unequal Cash Flow

Example:

Suppose you receive ₹ 1000 today, another ₹ 1200 a year later and ₹ 1300 two year later. How much will you have three years from today? Interest Rate @ 10%

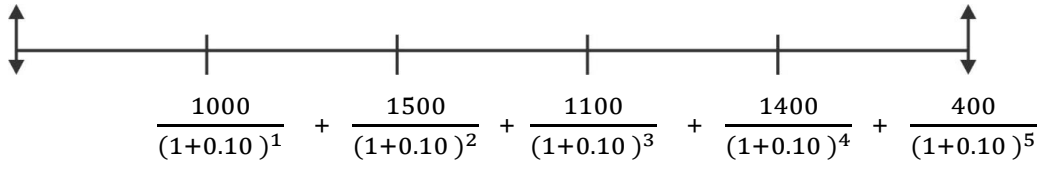
Solution:

$1000 \times (1 + 0.10)^{3} = 1331$
$1200 \times (1 + 0.10)^{2} = 1452$
$1300 \times (1 + 0.10)^{1} = 1430$
4213

LOS 5 : Present Value of a Multiple Unequal Cash Flow

Example:

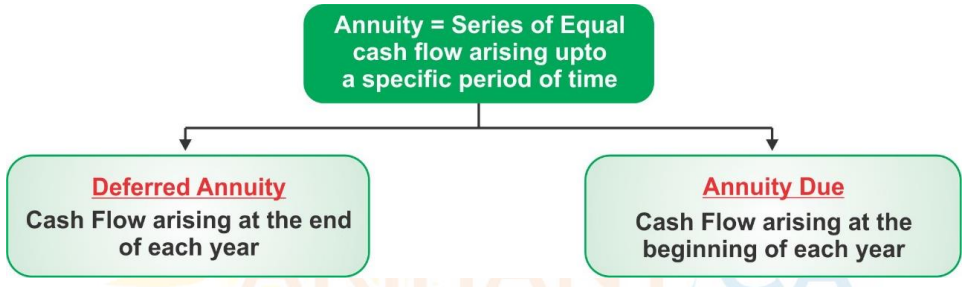
Mr. X receives ₹ 1000, 1500, 1100, 1400 & 400 at the end of year 1, 2, 3, 4 & 5. Rate = 10%, Calculate PV.



$$\frac{1000}{(1+0.10)^1} + \frac{1500}{(1+0.10)^2} + \frac{1100}{(1+0.10)^3} + \frac{1400}{(1+0.10)^4} + \frac{400}{(1+0.10)^5}$$

PV = **4179.30**

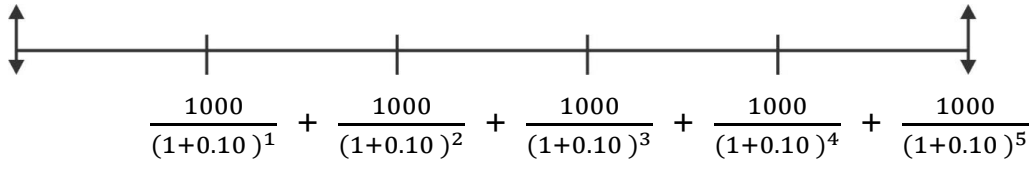
LOS 6 : Present Value of a Multiple Equal Cash Flow (Period Defined)



a) Present Value of Multiple Equal Cash Flow (Period Defined) :- (at the end of each year)

Example:

Mr. X will receive ₹ 1000 at the end of each year upto 5 years, Rate = 10%. Find Present Value.



$$\frac{1000}{(1+0.10)^1} + \frac{1000}{(1+0.10)^2} + \frac{1000}{(1+0.10)^3} + \frac{1000}{(1+0.10)^4} + \frac{1000}{(1+0.10)^5}$$

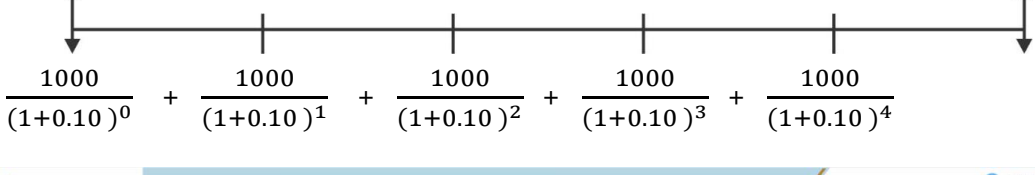
Or

PV = 1000 [PVAF @ 10% for 5 years] $\Rightarrow$ 1000 × 3.791 $\Rightarrow$ **3791**

b) Present Value of Multiple Equal Cash Flow (Period Defined) :- (at the Beginning of each year)

Example:

Mr. X will receive ₹ 1000 starts from today upto 5 years. Rate = 10%. Find Present Value.



$$\frac{1000}{(1+0.10)^0} + \frac{1000}{(1+0.10)^1} + \frac{1000}{(1+0.10)^2} + \frac{1000}{(1+0.10)^3} + \frac{1000}{(1+0.10)^4}$$

Or

PV = 1000 [1 + PVAF @ 10%, (5 – 1) years]

= 1000 × [1 + 3.17] ⇒ 4170

Note: If question is silent always assume Deferred Annuity.

LOS 7 : Present Value of Equal Cash Flow upto infinity (Perpetuity/ Indefinite): (Series of equal Cash Flow arising upto infinite or forever)

$$PV = \frac{\text{Annual Cash Flow}}{\text{Discount Rate}}$$

Example:

Mr. X will receive ₹ 1000 at the end of each year upto infinity, Rate = 10%. Find Present Value.

Solution:

$$PV = \frac{1000}{0.10} \Rightarrow 10{,}000$$

LOS 8: Present Value of Growing Cash Flow upto Infinity (Growing Perpetuity)

$$PV = \frac{CF_1}{\text{Discount Rate} - \text{Growth Rate}}$$

Where CF_1 = Cash Flow at the end of year 1.

Example:

Mr. X will receive ₹ 1000 at the end of year 1, thereafter cash flow will grow by 8% every year upto infinity, Rate = 10%. Find Present Value.

Solution:

$$PV = \frac{1000}{0.10 - 0.08} \Rightarrow 50{,}000$$