CHAPTER 2

CONCEPTS OF VALUE & RETURN

Q.1. 'Generally individuals show a time preference for money.' Give reasons for such a preference.

A.1. Individuals generally prefer possession of a given amount of cash now, rather than the same at some future time. The main reason for the time preference or time value of money is the availability of investment opportunities. Other reasons are uncertainty of cash flows and preference for current consumption of goods, commodities and services.

Q.2. 'An individual's time preference for money may be expressed as a rate.' Explain.

A.2. Time preference rate of money can be expressed as an interest rate. Interest rate gives money its value, and facilitates the comparison of cash flows occurring at different time periods. The minimum interest rate in the absence of any risk is known as risk-free rate. It is a compensation for time. If an individual is exposed to some degree risk, he would expect a rate of return higher than the risk-free rate from the investment compensating him for both time and risk. The rate added to compensate risk is known as risk premium.

The interest rate permits the individual to convert different amounts offered at different time to amounts of equivalent value in the present, i.e., a common point of reference for decision.

Q.3. Why is the consideration of time important in financial decision making? How can time value be adjusted? Illustrate your answer.

A.3. Most financial decisions, such as the purchase of assets or procurement of funds, affect the firm's cash flows in different time periods. Cash flows occurring in different time periods are not comparable. Hence, it is required to adjust cash flows for their differences in timing and risk. The value of cash flows to a common time point should be calculated. To maximize of owner's equity, it's extremely vital to consider the timing and risk of cash flows. The choice of the risk-adjusted discount rate (interest rate) is important for calculating the present value of cash flows.

For instance, if time preference rate is 10 percent, it implies that an investor can accept receiving Rs 100 if he is offered Rs 110 after one year. Rs 110 is the future value of Rs 100 today at 10% interest rate. Thus, the individual is indifferent between Rs 100 and Rs 110 a year from now as he/she considers these two amounts equivalent in value. You can also say that Rs 100 today is the present value of Rs 110 after a year at 10% interest rate.

Q.4. Is the adjustment of time relatively more important for financial decisions with short-range implications or for decisions with long-range implications? Explain.

A.4. Time value adjustment is important for both short-term and long-term decisions. If the amounts involved are very large, time value adjustment even for a short period will have significant implications. However, *other things being same*, adjustment of time is relatively more important for financial decisions with long range implications than with short range implications**.** Present value of sums far in the future will be less than present value of sums in near future.

Q.5. Explain the mechanics of calculating the present value of cash flows.

A.5. The present value of a future cash flow (inflows or outflows) is the amount of current cash that is of equivalent value to the decision maker today. The process of determining present value of a future payment (or receipts) or a series of future payments (or receipts) is called discounting. The compound interest rate used for discounting cash flows is called discount rate.

Present value for a lump sum amount can be worked out by using following formulae:

$$PV = \frac{\text{Fn}}{(1+\text{i})^{\text{n}}} = \text{Fn}\left[\frac{1}{(1+\text{i})^{\text{n}}}\right]$$

The term in parentheses is the Present Value Factor (PVF, of Re 1, which can also be traced from the pre-calculated present value factor table).

Example: You wish to receive Rs 5,000 after five years in State Bank of India at 8% interest rate per annum by creating a fixed deposit. How much amount will you have to invest today?

$$\text{PV} = \frac{5{,}000}{(1.08)^{5}} = 5{,}000\left[\frac{1}{(1.08)5}\right] = 5{,}000 \times 0.681 = \text{Rs}3{,}402$$

Present value of an annuity (i.e., constant and equal periodic amount for a certain number of years) can be worked out using the following formula:

$$\text{PV} = \text{A}\left[\frac{(1+\text{i})^{\text{n}} - 1}{\text{i}(1+\text{i})^{\text{n}}}\right] = \text{A}\left[\frac{1}{\text{i}} - \frac{1}{\text{i}(1+\text{i})^{\text{n}}}\right]$$

The term in parentheses is the present value factor of an annuity of Re 1, which is available from PVAF table. Here, A is a constant flow each year.

Example: You will receive Rs 1,250 each year for six years. If the interest rate is 10% p.a., what is the present value of the amounts received?

$$\text{PV} = 1{,}250\left[\frac{1}{0.10} - \frac{1}{0.10(1.10)^{6}}\right] = 1{,}250[10 - 0.5645] = 1{,}250 \times 9.4355 = \text{Rs}11{,}794$$

Q.6. What happens to the present value of an annuity when the interest rate rises?

A.6. As the formulae given in A.5 above show, as the interest rate rises, the present value of a lump sum or an annuity declines. The present value factor declines with higher interest rate, other things remaining the same.

Q.7. What is multi-period compounding? How does it affect the annual rate of interest? Give an example.

A.7. If the interest is paid (or received) more than once in a year, it is known as multi-period compounding; the interest compounded more than once in a year. The actual rate of interest paid or received is called effective rate of interest. The effective interest rate would be higher than the nominal interest rate (since compounding is done more than once).

The effective rate of interest is calculated by using following formulae:

$$\text{EIR} = \left[1 + \frac{\text{i}}{\text{m}}\right]^{\text{nm}} - 1$$

Example: Suppose the annual interest rate is 12%. If the compounding is done annually, half yearly and quarterly, what are the effective rates of interest? You can use the above formula. The calculated rates are:

Annual compounding: 12%
Half-yearly Compounding: 12.36%
Quarterly Compounding: 12.55%

Q.8. What is an annuity due? How can you calculate the present and future values of an annuity due? Illustrate.

A.8. A series of cash flows (i.e., receipts or payments) starting at the *beginning* of each period for a specified number of periods is called an Annuity due. This implies that the first cash flow has occurred *today*. The future value, i.e., compound value of an annuity due is:

$$FV = A\,(CVAF_{n,i})\,(1 + i)$$

For example, if you deposit Rs.1, 000 in a saving account at the beginning of the each year for 4 years to earn 6% p.a., then the future value is:

$$FV= 1{,}000(4.375)\,(1.06) = Rs.\ 4{,}637$$

Notice that 4.375 is the future value factor for an annuity of Re 1 occurring at the end of the period.

The present value of an annuity due i:

$$Fn = A\,(PVAF_{n,i})\,(1 + i)$$

For example, the present value of Rs1,000 deposited in saving account at the beginning of each year for 4 years to earn interest 6% p.a. is:

$$PV = 1{,}000\,(3.170)\,(1.06) = Rs.\ 3{,}487$$

Q.9. How does discounting and compounding help in determining the sinking fund and capital recovery?

A.9. Sinking fund is a fund which is created out of fixed payments each period to accumulate to a future some after a specified period. For this purpose, the compound value of an annuity can be used to calculate an annuity to be deposited to a sinking fund for 'n' period at 'i' rate of interest to accumulate to a given sum. The equation is:

$$A = FV\left[\frac{1}{CVAF_{n,i}}\right] = FV\left[SFF_{n,i}\right]$$

It means that $SFF_{n,I}$ is a reciprocal of compound value of an annuity factor, i.e., $CVAF_{n,i.}$ Example: A company will need Rs 500,000 after seven years to redeem debentures. How much amount should it transfer each year to accumulate a fund of Rs 500,000 after seven years if the interest rate is 9%?

$$A = 500{,}000\left[\frac{1}{\frac{(1.09)^7 - 1}{0.09}}\right] = 500{,}000\left[\frac{1}{9.200}\right]$$

$$= 500{,}000 \times 0.1087 = Rs54{,}345$$

Capital recovery is the annuity of an investment for a specified time at a given rate of interest. The present value of an annuity formula can be used to determine annual cash flow to be earned to recover a given investment. The equation is :

$$A = P\left[\frac{1}{PVAF_{n,i}}\right] = P\left[CRF_{n,i}\right]$$

The capital recovery factor is a reciprocal of the present value annuity factor, i.e., $PVAF_{n,i.}$. Example: You have made an investment of Rs 300,000 for a period of five years. If the rate of interest is 11%, how much cash flow should you earn each year?

$$A = 300{,}000\left[\frac{1}{\frac{1}{0.11} - \frac{1}{0.11(1.11)^5}}\right] = 300{,}000\left[\frac{1}{3.700}\right]$$

$$= 300{,}000 \times 0.271 = Rs81{,}171$$

Q.10. Illustrate the concept of the internal rate of return.

A.10. The rate of return on an investment (based on its cash flows) is called internal rate of return (IRR). Since IRR depends on the cash flow patterns specific or *internal* to a project, it's called internal rate of return. It is a rate where NPV is zero. Hence, IRR can be calculated manually by trial and error.

Example: A bank offers you to deposit Rs. 1,000 today and promises to pay Rs. 1,762 at the end of 5 years. What rate of return are you earning?

$P = FV\ (PVF_{5,I}) = 1{,}000\ = 1{,}762\ (PVF_{5,I})\ PVF_{5,i} = 0.567$

The PVF table shows that at 12 % column and period 5, the factor is 0.567. Hence, the internal rate of return is 12%. You can also use the following formula (and a scientific calculator) to calculate IRR:

$$1{,}000(1+\text{IRR})^5 = 1{,}762$$

$$(1+\text{IRR})^5 = \frac{1{,}762}{1{,}000} = 1.762$$

$$\text{IRR} = 1.762^{1/5} - 1 = 0.12 \text{ or } 12\%$$

If the factor value lies between two interest percentages, then actual rate can be worked out by using interpolation.