ACCOUNTING & FINANCSE FOR BANKING

PDF File LEARNING SESSIONS

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SIMPLE INTEREST

- When money is lent, the borrower usually pays a fee to the lender. This fee is called 'interest'.
- the interest can be simple interest or compound interest.
- "Simple interest” is the amount of interest calculated as a fixed percentage of the amount borrowed or lent at the start and is paid or received at the end of the contracted period.

The formula for calculating simple interest is as follows:

Interest = Principal x Rate x Time

Where:

- **Interest'** is the total amount of interest paid,
- **Principal'** is the amount lent or borrowed
- **Rate'** is the percentage of the principal chargeable as interest for one year. (The rate is expressed as a decimal fraction, so 100 must divide percentages)
- **Time'** is the time in years of the loan or deposit.

Ex: A person purchases a car by obtaining a loan on simple interest. The car costs Rs 1,50,000 and the interest rate on the loan is 10 per cent per annum (simple). If, the loan is to be paid back after two years, calculate:

1. The amount of total interest to be paid,
2. The total amount to be paid back after 2 years,

COMPOUND INTEREST

if the interest is charged more than once during the period and the interest is reinvested, we need to compound the interest.

Under compounding, the interest is payable periodically on the principal and accumulated part of interest.

$$A = p(1 + r)^n$$

P = Principal (Initial amount you borrowed or deposited)

r = Annual rate of interest (per cent)

n = Number of years the amount of deposit

A = Amount of money accumulated (Interest + principal)

What if the interest is paid more frequently?

Annually = P (1 + r) = Annual compounding

Quarterly = $p\left(1 + \frac{r}{4}\right)^4$ = Quarterly compounding

Monthly = $p\left(1 + \frac{r}{12}\right)^{12}$ = Monthly compounding

Special Note: When interest is compounded continually (in other words, when n approaches infinity) the compound interest equation takes the form A = Pe^{rt} where, e is approximately 2.71828 (the exponential number).

The Rule of 72

- Allows you to determine the **approximate number of years before your money doubles with yearly compounding**
- Divide the number 72 by the percentage rate you are paying on your debt (or earning on your investment).

Ex: You borrowed Rs 1,000 at 6 per cent interest. Then, 72 divided by 6 is 12. That makes 12 the approximate number of years it would take for your debt to double to Rs 2,000, if you did not make any payment.

Que: The population of an industrial town is increasing by 8 per cent every year. If the present population is 1 million, estimate the population five years hence. Also, estimate the population three years ago.

FIXED AND FLOATING INTEREST RATES

There are two different modes of interest. They are

1. Fixed Rates

2. Floating Rates also called as variable rates.

Fixed Rate: In the fixed rate, the rate of interest is fixed. It will not change during entire period of the loan.

- For example, if a home loan, taken at an interest rate of 13 per cent, is repayable in 15 years, the rate will remain the same during the entire tenure of 15 years even if the market rate increases or decreases.
- The fixed rate is, normally, higher than floating rate, as it is not affected by market fluctuations.

Floating Rate: In the floating rate or variable rate, the rate of interest changes, depending upon the market conditions. Under floating rate, the interest rate is usually linked to a benchmark rate which could be the base rate of the bank or any other benchmark rate of the banking industry.

It may increase or decrease depending upon the change in the benchmark rate.

FRONT-END AND BACK-END INTEREST RATES

If the **interest is deducted from the principal amount and only the net amount is disbursed**, it is called **front-end interest.**

For example, when the bank discounts a bill, the interest applicable for the tenure of the bill is calculated and is deducted from the bill amount along with other charges and the net amount is paid to the customer.

Back-end interest rate which means that the full amount of the loan is disbursed and the interest is charged subsequently on monthly/ quarterly/ agreed basis.

For example, in a term loan, the interest is calculated on the actual daily balances in the account during a period and applied at the end of the period.

the front-end interest application results in effective interest rate being more as the borrower gets less amount for use whereas, the interest is applied on the full amount.

ANNUITIES

Series of fixed payments made over a period of time such as rent or car payments or have received a series of payments over a period of time, such as bond coupons. These are called annuities.

There are two basic types of annuities: ordinary annuities and annuities due.

Ordinary Annuity: Payments are required at the end of each period. For example, straight bonds usually make coupon payments at the end of every six months until the bond's maturity date.

Annuity Due: Payments are required at the beginning of each period. E.g. Rent is to be paid when you first move in at the beginning of the month, and then on the first of each month thereafter.

CALCULATING THE FUTURE VALUE OF AN ORDINARY ANNUITY

- Using future value of annuity formula one can calculate the future value of amount if one is depositing a fixed amount at a fixed frequency for a fixed period at a given rate.
- The future value of an ordinary annuity formula is useful for finding out how much you would have in the future by investing at your given interest rate.
- If you are making payments on a loan, the future value is useful for determining the total cost of the loan.

In order to calculate the future value of the annuity, we have to calculate the future value of each cash flow.

Let us assume that you are receiving 1,000 every year for the next five years, and you invest each payment at 5 per cent.

$$\text{FV (ordinary annuity)} = C\left[\frac{(1+i)^n-1}{i}\right]$$

C= Cash flow per period

i = interest rate

n = number of payments

CALCULATING THE PRESENT VALUE OF AN ORDINARY ANNUITY

If you would like to determine today's value of a series of future payments, you need to use the formula that calculates the present value of an ordinary annuity.

The PV of ordinary annuity **calculates the present value of the coupon payments** that you will receive in the future.

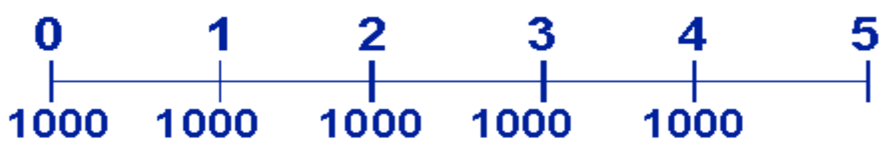
$$PV\ of\ Ordinary\ Annuity = C\left[\frac{(1+r)^n-1}{r(1+r)^n}\right]$$

- C = Cash flow per period

- r = discount rate
- n = number of payments

CALCULATING THE FUTURE VALUE OF AN ANNUITY DUE

When you are receiving or paying cash flows for an annuity due, your cash flow schedule would appear as follows:



$$FV\ of\ Annuity\ Due = C\left[\frac{(1+i)^n - 1}{i}\right] \times (1+i)$$

CALCULATING THE PRESENT VALUE OF AN ANNUITY DUE

For the present value of an annuity due, we need to discount the formula one period forward, as the payments are held for a lesser amount of time.

$$PV\ of\ Annuity\ Due = C\left[\frac{(1+r)^n - 1}{r(1+r)^n}\right](1+r)$$

REPAYMENT OF A DEBT

- A debt is required to be repaid as per the terms of the contract with lender.
- In banking industry in India, the following three methods of repayment are common.

a) Equal monthly/ quarterly installment of principal plus the interest applied during the period.
b) Equated monthly/ quarterly installment covering both the principal and the interest.
c) Bullet/ balloon repayment under which the entire loan amount is repaid at the end of the period with accumulated interest. Alternatively, the interest is paid periodically, as and when applied, and the principal amount of the loan is paid at the end of the contract period.

Equal monthly/quarterly installment of principal plus the interest applied during the period.

Ex: our friend has borrowed Rs 1,000 from you and wants to repay you on a monthly basis rather than the whole amount all at once at the end of the year. The important point here is that he will owe you less in principal each month. The applicable rate of interest 8% p.a. means 0.667% per month.

Balance	Principal Payment	Interest Payment	Total Payment
1000	83.33	6.67	90
916.67	83.33	6.114189	89.44419
833.34	83.33	5.558378	88.88838
750.01	83.33	5.002567	88.33257
666.68	83.33	4.446756	87.77676
583.35	83.33	3.890945	87.22094
500.02	83.33	3.335133	86.66513
416.69	83.33	2.779322	86.10932
333.36	83.33	2.223511	85.55351
250.03	83.33	1.6677	84.9977
166.7	83.33	1.111889	84.44189
83.37	83.33	0.556078	83.88608
	999.96	**43.35647**	**1043.316**

Equated monthly/quarterly installment covering both the principal and the interest

Under this system, the principal and the interest thereon are repaid through equal monthly installment over the fixed tenure of the loan.

The EMI is fixed based on the loan amount, interest rate and the repayment tenure.

The formula for calculation of EMI given the loan, term and interest rate is:

$$EMI = \frac{P \times r \times (1+r)^n}{(1+r)^n - 1}$$

where P = principal (amount of loan), r = rate of interest per instalment period, n = no. of instalments in the tenure.

Que: for a loan of Rs 1,00,000, at an interest rate of 12% p.a., to be repaid in 2 years, the EMI is ______.

Bullet/ balloon repayment under which the entire loan amount is repaid at the end of the period (creation of sinking fund)

If the entire loan amount is repaid at the end of the period with accumulated interest, the amount can be easily calculated by applying the formula for compound interest.

If the interest is paid periodically, as and when applied, the last installment will be equal to the loan amount and the interest for the last period.

Usually, a sinking fund is created to repay the loan under this method so that funds are readily available for repayment

Sinking fund

A sinking fund is a kind of fund in which a fixed amount is deposited at a regular interval. So, the sinking fund is like a recurring deposit. After some years this fund turns into a huge collection of funds that are further used to repay the previous debt taken by the government or a company.

Problem based on Sinking Fund

Que: If you wish an annuity to grow to Rs 10,00,000 over 5 years so that you can replace your car, what monthly deposit would be required if you could invest at 8% annually?

Q2. An annuity consists of monthly repayments of Rs 600 made over 20 years.
(a) What is the present value of the annuity?
(b) How much money is paid?
(c) What is the future value of the payments?
(assume 14 per cent)

Q1: Simple rate of interest or flat rate of interest is the amount which is paid every year as a _______ of the amount borrowed.

A.) fixed percentage
B.) varying percentage
C.) fluctuating percentage
D.) percentage as per discretion of the lender

Q2: The compound interest equation $P = A \times e^{rt}$ is applicable in case of:

A.) continuous compounding
B.) daily compounding
C.) weekly compounding
D.) fortnightly compounding

Q3: X borrowed Rs.10000 from the bank at 12% p.a for one year, payable on equated monthly installment basis. What is the amount of EMI?

A.) 888.5
B.) 877.5
C.) 880.5
D.) 878.2

Q4: A opened a recurring account with a bank to deposit Rs.16000 by the end of each year at 10% interest rate. How much he would get at the end of 3rd year?

A.) Rs.59260
B.) Rs.56920
C.) Rs.52690
D.) Rs.52960

Q5: Repayment of house loan instalment for a pre-determined period on EMI basis is an example of:

A.) single cash flow
B.) annuity
C.) perpetuity
D.) any of these

Q6: X wants to receive Rs.40000 per annum for 20 years by investing at 5%. How much will have to invest now?

A.) Rs.498488
B.) Rs.489495
C.) Rs.493128
D.) Rs.489954

Q7: Z borrowed Rs.65600 for 2 years at 5% p.a., to be returned in 2 equal annual instalments. What will be the amount of instalment?

A.) Rs.35280
B.) Rs.35320
C.) Rs.35690
D.) Rs.35820

Q8: The rule of 72 determined the no. of years during which an amount ________ at a given rate of interest:

A.) becomes double
B.) becomes half
C.) remains same
D.) becomes triple

Q9: Z raised a house loan of Rs. 10 lacs at 12% rate of interest repayable in 10 years. Calculate the EMI?

A.) 14654.17
B.) 14799.21
C.) 14347.82
D.) 14315.82

Q10: When a fund is created to meet the need of a specified amount in future and it is accumulated by means of equal periodic deposits, it is called ______ fund:

A.) mutual fund
B.) sinking fund
C.) accumulated fund
D.) any of the above