ACCOUNTING & FINANCE FOR BANKERS

JAIIIB

PAPER-2

MODULE A

BUSINESS MATHEMATICS AND FINANCE

VISIT: AMBITIOUSBABA.COM
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Unit 2- Calculation of YTM
Unit 3- Capital Budgeting
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Unit 1- Calculation of Interest and Annuities

Introduction:

People will earn money for their livelihood i.e. to spend on rent, food, clothing, education etc. along with this they need money to meet some extra expenditure like marriage in family, purchasing of vehicle, house or set up their own business and so on. Some people will manage with their own money, but most people have to borrow money for such contingencies.

Meaning of Interest:

➢ Interest can be defined as the price paid by a borrower for the use of a lender’s money.
  • It is compensation paid to the depositor.
  • In another words, it is excess of money paid or received on deposits or borrowings.
  • Interest is the price paid by a borrower for the use of a lender’s money. If you borrow (or lend) some money from (or to) a person for a particular period you would pay (or receive) more money than your initial borrowing (or lending).

Reasons for Charging Interest:

There are a variety of reasons for charging the interest, they are-

Time value of money:

• Time value of money means that the value of a unity of money is different in different time periods. The sum of money received in future is less valuable than it is today.
• In other words the worth of rupees received after some time will be less than a rupee received today.
• Since a rupee received today has more value, rational investors would prefer current receipts to future receipts. If they postpone their receipts, they will certainly charge some money i.e. interest.

Opportunity Cost:
The lender has a choice between using his money in different investments. If he chooses one, he forgoes the return from all others.

In other words, lending incurs an opportunity cost due to the possible alternative uses of the lent money.

**Inflation:**

- Most economies generally exhibit inflation. Inflation is a fall in the purchasing power of money.
- Due to inflation, a given amount of money buys fewer goods in the future than it will now. The borrower needs to compensate the lender for this.

**Liquidity Preference:**

- People prefer to have their resources available in a form that can immediately be converted into cash rather than a form that takes time or involves expenditure to realize.

**Risk Factor:**

- There is always a risk that the borrower will go bankrupt or otherwise default on the loan.
- Risk is one determinable factor in fixing rate of interest.
- A lender generally charges more interest rate (risk premium) for taking more risk.

**Types of Interest**

**Interest can be of two types:**

- Simple Interest
- Compound Interest

**Simple Interest:**

- SI is interest earned on only the original amount, called Principal, lent over a period of time at a certain rate.
- Formula for SI = \( \frac{PRT}{100} \),
- For ex: Rs.1000 deposited for one year at the rate of 8% p.a. interest will be Rs.8.

**Compound Interest**
Cl is interest earned on any previous interests earned as well as on the Principal lent. It is Interest on interest.

- Formula: \( Cl = P(1+i)^n - P \)  \( A = P(1+i)^n \)
- For ex: Rs. 1000 deposited for in year at the rate of 8% Cl p.a. interest will be- Rs.80

## Compound Interest conversion:

<table>
<thead>
<tr>
<th>Conversion period</th>
<th>Description</th>
<th>No. of conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Day</td>
<td>Compounded daily</td>
<td>365</td>
</tr>
<tr>
<td>1 Month</td>
<td>Compounded Monthly</td>
<td>12</td>
</tr>
<tr>
<td>3 Month</td>
<td>Compounded Quarterly</td>
<td>4</td>
</tr>
<tr>
<td>6 Month</td>
<td>Compounded Semiually</td>
<td>6</td>
</tr>
<tr>
<td>12 Month</td>
<td>Compounded yearly</td>
<td>1</td>
</tr>
</tbody>
</table>

## compound Vs Simple Interest:

<table>
<thead>
<tr>
<th>Basis</th>
<th>Simple Interest</th>
<th>Compound Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculation</td>
<td>Easy to understand simple to calculate</td>
<td>Difficult to calculate</td>
</tr>
<tr>
<td>Constancy</td>
<td>Principal money remains same for all the years</td>
<td>Principal varies</td>
</tr>
<tr>
<td>Suitability</td>
<td>Suitable for short term deposits</td>
<td>Suitable for long term deposits</td>
</tr>
<tr>
<td>Formula</td>
<td>SI= PRT/ 100</td>
<td>CI= P(1+i)n - p</td>
</tr>
<tr>
<td>Accrual</td>
<td>Interest will not accrue to the principal</td>
<td>Interest accrues every time to principal</td>
</tr>
</tbody>
</table>

## Types of Interest for Bank Deposits:

<table>
<thead>
<tr>
<th>Type of Deposit</th>
<th>Type of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Account</td>
<td>Interest Type</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Saving Account</td>
<td>Simple</td>
</tr>
<tr>
<td>Current Account</td>
<td>No Interest</td>
</tr>
<tr>
<td>Fixed Deposit</td>
<td>Simple</td>
</tr>
<tr>
<td>Reinvestment</td>
<td>Compound</td>
</tr>
<tr>
<td>Recurring Deposit</td>
<td>Compound</td>
</tr>
</tbody>
</table>

**Effective Rate of Return:**

- If interest is compounded more than once a year the effective interest rate for a year exceeds the per annum interest rate, then $ERR > NR$
- When compounding is done annually - $ERR = NR = (1+i)^n - 1$
- **For Ex:** The effective rate of return for 10% CI p. a, when compounded semi-annually, quarterly and monthly will be:
  - Half yearly = $(1+.05)^2 - 1 = 10.25%$
  - Quarterly = $(1+.025)^4 - 1 = 10.38%$
  - Monthly = $(1+.0083)^{12} - 1 = 10.47%$

---

**Daily Product Method**

**Introduction:**

Finance is the life blood of trade, commerce and industry. Now-a-days, banking sector acts as the backbone of modern business. Development of any country mainly depends upon the banking system. With a bank people can open saving account, current account, fixed deposit account and recurring deposit account.

**Meaning of Saving Account:** (SA)

- A deposit account held at a bank or other financial institution that provides principal security and a modest interest rate.
- Savings account funds are considered one of the most liquid investments outside of demand accounts and cash.

**RBI Guidelines on Saving Account**

Savings bank account interest calculation by banks in India as per the new RBI guidelines is based on daily products, i.e. the balances outstanding as at the end of the day. The old method which banks used to calculate interest on savings interest was based on minimum balance kept in the a/c from 10th of any month and last working day of that month. But as per the revised RBI guidelines; the old method was changed (with effect from 01st April 2010). RBI deregulated the
interest calculated on savings account which permitted banks to set their own rate of interest on the savings bank account.

**New Vs Old method of Interest calculation on SB**

Let’s understand the savings interest calculation (New Vs. Old) with an example. We’ll assume a/c statements as given in below are in INR.

<table>
<thead>
<tr>
<th>Date</th>
<th>Particular</th>
<th>Debit</th>
<th>Credit</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1-2013</td>
<td>By Op Balance</td>
<td>300000</td>
<td></td>
<td>300000</td>
</tr>
<tr>
<td>12-1-2013</td>
<td>To down payment</td>
<td>50000</td>
<td></td>
<td>250000</td>
</tr>
<tr>
<td>20-1-2013</td>
<td>By Cheque(000456)</td>
<td>80000</td>
<td></td>
<td>330000</td>
</tr>
<tr>
<td>28-1-2013</td>
<td>To ABC Co,</td>
<td>90000</td>
<td></td>
<td>240000</td>
</tr>
</tbody>
</table>

**Calculating Interest as per the OLD method:**

Following formula was applicable till 31st March 2010:

\[
\text{Savings Interest (Old Method)} = \text{Minimum balance between 10th and last working day of that month} \times \text{Rate of Interest} \times \frac{1}{\text{No. of Months in a Year}}
\]

So old rate of interest you’d received = \(240000 \times 4 \times \frac{1}{12} \times 100 = 800\) INR

**Calculating Interest as per the NEW Method:**

Applicable From 01 Apr 2010 as per the RBI guidelines:

<table>
<thead>
<tr>
<th>Date</th>
<th>Particular</th>
<th>Debit</th>
<th>Credit</th>
<th>Balance</th>
<th>No. of Days (B)</th>
<th>Product (A*B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1-2013</td>
<td>By Op Balance</td>
<td>300000</td>
<td></td>
<td>300000</td>
<td>11</td>
<td>3300000</td>
</tr>
<tr>
<td>12-1-2013</td>
<td>To down payment</td>
<td>50000</td>
<td></td>
<td>250000</td>
<td>8</td>
<td>2000000</td>
</tr>
<tr>
<td>20-1-2013</td>
<td>By Cheque(000456)</td>
<td>80000</td>
<td></td>
<td>330000</td>
<td>8</td>
<td>2640000</td>
</tr>
<tr>
<td>28-1-2013</td>
<td>To ABC Co,</td>
<td>90000</td>
<td></td>
<td>240000</td>
<td>4</td>
<td>960000</td>
</tr>
</tbody>
</table>

\[
\text{Savings Interest (New Method)}:
\]

\[
\text{(Total Products} \times \text{Rate of Interest/ 365)}
\]
So, the interest you’ll receive = \(89,00,000 \times 0.04/365 = 975.34 \text{ INR}\)

The new guideline has bought happiness to the account holder since he’ll see more balance in the account at the end of the month.

**Equated Monthly Installment**

**Meaning of EMI (Equated Monthly Installment)**

An Equated Monthly Installment (EMI) is "A fixed payment amount made by a borrower to a lender at a specified date. Equated monthly installments are used to pay off both interest and principal each month, so that over a specified number of years, the loan is paid off in full." common types of loans, such as real estate mortgages, the borrower makes fixed periodic payments can be paid with the help of EMI. EMIs differ from variable payment plans, in which the borrower is able to pay higher payment amounts at his or her discretion. In EMI plans, borrowers are usually only allowed one fixed payment amount each month.

**Factors to be known about EMI:**

- The repayment of a loan is done by paying an EMI to the bank. The EMI depends on three factors: loan amount, interest rate and the duration of the loan.
- The EMI is decided when the loan is sanctioned and remains constant throughout the period of the loan, provided there is no change in any of the factors on the basis of which it is calculated.
- The EMI has an interest and a principal portion. Through the principal, the borrower repays the loan each month. Through the interest, he pays the bank the interest due on the outstanding loan amount.
- The EMIs are structured in such a way that the interest portion forms a major part of the payment that is made in the initial years. In the later years, the principal component becomes high.
- The EMI can change in the case of an alteration in interest rates or if there is a prepayment. It is also possible to keep the EMI constant and increase or decrease the tenure of the loan to reflect the changes in interest rates or loan prepayment.

**Formula for EMI Calculation:**

Following is formula used to determine the EMI.
Where,
E = Installment Amount
P = Principal Loan Amount
R = Rate of Interest; for EMI, Rate of Interest has to be divided by 12
N = Number of installments

Let us understand calculation of EMI with following example-

For Ex: Mr. Goyal has taken personal loan of Rs. 100000 for 12 months at CI of 10% p.a. Calculate the EMI that has to be paid by him = Rs. 8885.19

**Fixed and Floating Interest Rates**

*There are two different modes of Interest. They are*-

- Fixed Rates
- Floating Rates also called as variable rates.

**What is Fixed Interest Rate?**

People who opt for Fixed Interest Rate mean that they have to repay the home loan is fixed and equal instalments as per the loan tenure. The advantage of fixed interest rate is that it would not change even if there are fluctuations or changes in the Indian financial market conditions or trends. Fixed Interest rate becomes the first preference when the financial market is down. Consumers take the opportunity by blocking or fixing the interest rate as per their preference. In simple terms, if you think that financial market will not drop down below a certain point or foresee a rise in the interest rates, then choosing fixed interest rate shall be the best option to avail.

**What is Floating Interest Rate?**

Interest rate which is volatile and keeps on changing as per market scenario is termed as Floating Interest Rate. This type of interest rate depends on the base rate offered by several lenders, so whenever the base rate changes, the interest rate gets automatically revised. As compared to fixed interest rate, floating rates are comparatively cheaper. Fixed interest rates are 1%-2.5% higher than the floating interest rate. The increase and decrease in the floating interest rate is temporary, as it varies as per the market trends. As home loan is a long-term association with the lender, sometimes it becomes difficult to plan for the financials.
Comparison between Fixed and Floating Interest Rate

<table>
<thead>
<tr>
<th>Fixed Interest Rate</th>
<th>Floating Interest Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Interest Rate</td>
<td>Lower Interest Rate</td>
</tr>
<tr>
<td>Not affected by financial market conditions</td>
<td>Affected by changes in the financial market</td>
</tr>
<tr>
<td>Fixed EMI's</td>
<td>EMI's change as per interest rate or MCLR</td>
</tr>
<tr>
<td>Budget planning possible</td>
<td>Difficult to budget or manage financials</td>
</tr>
<tr>
<td>Sense of security</td>
<td>Generates savings</td>
</tr>
<tr>
<td>Suitable for short/medium term (3-10 years)</td>
<td>Suitable for long term (20-30 years)</td>
</tr>
<tr>
<td>Lesser risk</td>
<td>Higher risk</td>
</tr>
</tbody>
</table>

**Front-End and Back-End Interest Rates**

**What Is the Front-End Ratio?**

The front-end ratio, also known as the mortgage-to-income ratio, is a ratio that indicates what portion of an individual’s income is allocated to mortgage payments. The front-end ratio is calculated by dividing an individual's anticipated monthly mortgage payment by his/her monthly gross income. The mortgage payment generally consists of principal, interest, taxes, and mortgage insurance (PITI). Lenders use the front-end ratio in conjunction with the back-end ratio to determine how much to lend.

**What Is the Back-End Ratio?**

The back-end ratio, also known as the debt-to-income ratio, is a ratio that indicates what portion of a person’s monthly income goes toward paying debts. Total monthly debt includes expenses, such as mortgage payments (principal, interest, taxes, and insurance), credit card payments, child support, and other loan payments.

**Annuities**

**What are Annuities?**

At some point in your life, you may have had to make a series of fixed payments 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.

**Ordinary Annuity:** Payment are required at the end of each period. For an illustration, 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. Rent is an illustration of annuity due. You are usually required to pay rent when you first move in at the beginning of the month, and then on the first of each month thereafter.

Since the present and future value calculations for ordinary annuities and annuities due are slightly different, we will first discuss the present and future value calculation for ordinary annuities.

**Calculating the Future Value of an Ordinary Annuity**

**Period**

commonly a period will be a year but it can be any time interval you want as long as all inputs are consistent.

**Number of Periods (t)**

number of periods or years Perpetuity for a perpetual annuity t approaches infinity. Enter p, P, perpetuity or Perpetuity for t

**Interest Rate (R)**

is the annual nominal interest rate or "stated rate" per period in percent. \( r = R/100 \), the interest rate in decimal

**Compounding (m)**

is the number of times compounding occurs per period. If a period is a year then annually=1, quarterly=4, monthly=12, daily = 365, etc.

**Continuous Compounding**

is when the frequency of compounding (m) is increased up to infinity. Enter c, C, continuous or Continuous for m.

**Payment Amount (PMT)**

The amount of the annuity payment each period

**Growth Rate (G)**

If this is a growing annuity, enter the growth rate per period of payments in percentage here. \( g = G/100 \)

**Payments per Period (Payment Frequency (q))**

How often will payments be made during each period? If a period is a year then annually=1, quarterly=4, monthly=12, daily = 365, etc.

**Future Value of an Annuity**

\[
FV = PMT \left(\frac{(1+i)^n-1}{i}\right) \left(1+iT\right) = PMT \left(\frac{(1+i)^n-1}{i}\right) \left(1+iT\right)
\]
where \( r = \frac{R}{100} \), \( n = mt \) where \( n \) is the total number of compounding intervals, \( t \) is the time or number of periods, and \( m \) is the compounding frequency per period \( t \), \( i = \frac{r}{m} \) where \( i \) is the rate per compounding interval \( n \) and \( r \) is the rate per time unit \( t \). If compounding and payment frequencies do not coincide, \( r \) is converted to an equivalent rate to coincide with payments then \( n \) and \( i \) are recalculated in terms of payment frequency, \( q \).

If type is ordinary, \( T = 0 \) and the equation reduces to the formula for **future value of an ordinary annuity**

\[
FV = PMT \left[ \left(1 + i\right)^n - 1 \right]
\]

otherwise \( T = 1 \) and the equation reduces to the formula for **future value of an annuity due**

\[
FV = PMT \left[ \left(1 + i\right)^n - 1 \right] \left(1 + i\right)
\]

**Calculating The Present Value of an Ordinary Annuity**

An ordinary annuity is a series of equal payments, with all payments being made at the end of each successive period. An example of an ordinary annuity is a series of rent or lease payments. The present value calculation for an ordinary annuity is used to determine the total cost of an annuity if it were to be paid right now.

*The formula for calculating the present value of an ordinary annuity is:*

\[
P = PMT \left[ \left(1 - \left(\frac{1}{1 + r}\right)^n \right) / r \right]
\]

Where:

- \( P \) = The present value of the annuity stream to be paid in the future
- \( PMT \) = The amount of each annuity payment
- \( r \) = The interest rate
- \( n \) = The number of periods over which payments are to be made
For example, ABC International has committed to a legal settlement that requires it to pay 50,000 per year at the end of each of the next ten years. What would it cost ABC if it were to instead settle the claim immediately with a single payment, assuming an interest rate of 5%? The calculation is:

\[ P = \frac{50,000 \times (1 - \frac{1}{(1+0.05)^{10}})}{0.05} \]

\[ P = 386,087 \]

As another example, ABC International is contemplating the acquisition of a machinery asset. The supplier offers a financing deal under which ABC can pay 500 per month for 36 months, or the company can pay 15,000 in cash right now. The current market interest rate is 9%. Which is the better offer? The calculation of the present value of the annuity is:

\[ P = \frac{500 \times (1 - \frac{1}{(1+0.0075)^{36}})}{0.0075} \]

\[ P = 15,723.40 \]

In the calculation, we convert the annual 9% rate to a monthly rate of 3/4%, which is calculated as the 9% annual rate divided by 12 months. Since the up-front cash payment is less than the present value of the 36 monthly lease payments, ABC should pay cash for the machinery.

While this formula can be quite useful, it can yield misleading results if actual interest rates vary during the analysis period.

**Calculating The Future value of an Annuity Due**

Future value is the value of a sum of cash to be paid on a specific date in the future. An annuity due is a series of payments made at the beginning of each period in the series. Therefore, the formula for the future value of an annuity due refers to the value on a specific future date of a series of periodic payments, where each payment is made at the beginning of a period. Such a stream of payments is a common characteristic of
payments made to the beneficiary of a pension plan. These calculations are used by financial institutions to determine the cash flows associated with their products.

The formula for calculating the future value of an annuity due (where a series of equal payments are made at the beginning of each of multiple consecutive periods) is:

\[
P = \left( PMT \left( \frac{(1 + r)n - 1}{r} \right) \right)(1 + r)
\]

Where:

- \( P \) = The future value of the annuity stream to be paid in the future
- \( PMT \) = The amount of each annuity payment
- \( r \) = The interest rate
- \( n \) = The number of periods over which payments are to be made

This value is the amount that a stream of future payments will grow to, assuming that a certain amount of compounded interest earnings gradually accrue over the measurement period. The calculation is identical to the one used for the future value of an ordinary annuity, except that we add an extra period to account for payments being made at the beginning of each period, rather than the end.

For example, the treasurer of ABC Imports expects to invest 50,000 of the firm's funds in a long-term investment vehicle at the beginning of each year for the next five years. He expects that the company will earn 6% interest that will compound annually. The value that these payments should have at the end of the five-year period is calculated as:

\[
P = \left( 50,000 \left( \frac{(1 + .06)5 - 1}{.06} \right) \right)(1 + .06)
\]

\[P = 298,765.90\]

As another example, what if the interest on the investment compounded monthly instead of annually, and the amount invested were 4,000 at the end of each month? The calculation is:
P = (4,000 [((1 + .005)60 - 1) / .06])(1 + .005)

P = 280,475.50

The .005 interest rate used in the last example is 1/12th of the full 6% annual interest rate.

**Calculating the Present value of An annuity Due**

The present value of an annuity due is used to derive the current value of a series of cash payments that are expected to be made on predetermined future dates and in predetermined amounts. The calculation is usually made to decide if you should take a lump sum payment now, or to instead receive a series of cash payments in the future (as may be offered if you win a lottery).

The present value calculation is made with a discount rate, which roughly equates to the current rate of return on an investment. The higher the discount rate, the lower the present value of an annuity will be. Conversely, a low discount rate equates to a higher present value for an annuity.

The formula for calculating the present value of an annuity due (where payments occur at the *beginning* of a period) is:

\[ P = \left( PMT \left[ \left( 1 - \frac{1}{1 + r^n} \right) / r \right] \right) \times (1+r) \]

Where:

- \( P \) = The present value of the annuity stream to be paid in the future
- \( PMT \) = The amount of each annuity payment
- \( r \) = The interest rate
- \( n \) = The number of periods over which payments are made

This is the same formula as for the present value of an ordinary annuity (where payments occur at the *end* of a period), except that the far right side of the formula
adds an extra payment; this accounts for the fact that each payment essentially occurs one period sooner than under the ordinary annuity model.

For example, ABC International is paying a third party $100,000 at the beginning of each year for the next eight years in exchange for the rights to a key patent. What would it cost ABC if it were to pay the entire amount immediately, assuming an interest rate of 5%? The calculation is:

\[
P = (\$100,000 \left[ (1 - (1 / (1 + .05)8)) / .05 \right]) \times (1+.05)
\]

\[
P = $678,637
\]

The factor used for the present value of an annuity due can be derived from a standard table of present value factors that lays out the applicable factors in a matrix by time period and interest rate. For a greater level of precision, you can use the preceding formula within an electronic spreadsheet.

**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.

- Equal monthly/quarterly installment of principal plus the interest applied during the period.
- Equated monthly/quarterly installment covering both the principal and the interest.
- 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.**

Your friend has borrowed Rs 1000 from you and wants to repay you on a payment basis rather than the whole amount all at once 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.

**The principal payment each month will be 83.33 (1000 divided by 12)**

**First month:** Interest = 1000*0.667%*1=6.67 plus 83.33 for a total payment of Rs 90. The principal owed at the end of the month is 916.67.

**Second month:** Interest= Rs 916.67* 0.667%*1= Rs 6.11 plus Rs 83.33 for a total payment of Rs 89.44

**Third Month:** Interest=Rs 833.34*0.667%*1= Rs 5.56 plus Rs 83.33 for a total payment of Rs 88.89.

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**Unit 2- Calculation of YTM**

**Meaning of Debt**

Debt means a sum of money due by one party to another. Most business need a mix of debt and equity to run their operations. **This is called the capital structure of that firm/company.**

Debts can arise through bank borrowings, fixed deposits, bonds or other instruments. Where the amount is fixed and specific, and does not depend upon any future valuation to settle it.

**Bonds**

Debt Capital Consists of mainly bonds and debentures.

**What are Bonds?**

Bonds are issued by organizations generally for a period of more than one year to raise money by borrowing.

Organizations in order to raise capital issue bond to investors which is nothing but a financial contract, where the organization promises to pay the principal amount and interest (in the form of coupons) to the holder of the bond after a certain date. (Also called maturity date). Some Bonds do not pay interest to the investors, however it is mandatory for the issuers to pay the principal amount to the investors.

**Why Investment is Important?**

Every individual needs to put some part of his income into something which would benefit him in the long run. Investment is essential as unavoidable circumstances can arise anytime and anywhere. One needs to invest money into something which would
guarantee maximum returns with minimum risks in future. Money saved now will help you overcome tough times in the best possible way.

**Characteristics of a Bond**

- **Face value**: Also known as, the par value and stated on the face of the bond. It represents the amount borrowed by the firm, which it promises to repay after a specified period.

- **Coupon rate**: A bond carries a specific rate of interest, which is also called as the coupon rate.

- **Market value**: A bond may be traded on a stock exchange. Market value is the price at which the bond is usually bought or sold in the market. Market value may be different from the par value or the redemption value.

- **Redemption Value**: The value, which the bondholders gets on maturity. Is called the redemption value, A bond is generally issued at a discount (less than par value) and redeemed at par.

- **Maturity date**: Maturity date refers to the final date for the payment of any financial product when the principal along with the interest needs to be paid to the investor by the issuer.

**Types of Bonds**

*Following are the types of bonds:*

**Fixed Rate Bonds**

In Fixed Rate Bonds, the interest remains fixed throughout the tenure of the bond. Owing to a constant interest rate, fixed rate bonds are resistant to changes and fluctuations in the market.

**Floating Rate Bonds**

Floating rate bonds have a fluctuating interest rate (coupons) as per the current market reference rate.

**Zero Interest Rate Bonds**

Zero Interest Rate Bonds do not pay any regular interest to the investors. In such types of bonds, issuers only pay the principal amount to the bond holders.

**Inflation Linked Bonds**

Bonds linked to inflation are called inflation linked bonds. The interest rate of Inflation linked bonds is generally lower than fixed rate bonds.

**Perpetual Bonds**
Bonds with no maturity dates are called perpetual bonds. Holders of perpetual bonds enjoy interest throughout.

**Subordinated Bonds**
Bonds which are given less priority as compared to other bonds of the company in cases of a close down are called subordinated bonds. In cases of liquidation, subordinated bonds are given less importance as compared to senior bonds which are paid first.

**Bearer Bonds**
Bearer Bonds do not carry the name of the bond holder and anyone who possesses the bond certificate can claim the amount. If the bond certificate gets stolen or misplaced by the bond holder, anyone else with the paper can claim the bond amount.

**Covered bond**
Covered bond are backed by cash flows from mortgages or public sector assets. Contrary to asset-backed securities the assets for such bonds remain on the issuers balance sheet.

**A Government Band**
A government band, also called Treasury bond, is issued by a national government and is not exposed to default risk.

**Optionality In Bonds**
Occasionally a bond may contain an embedded option; that is, it grants option-like features to the holder or the issuer:

- **Callability:** Some bonds give the issuer the right to repay the bond before the maturity date on the call dates. This is call option. These bonds are referred to as callable bonds. Most callable bonds allow the issuer to repay the bond at par. With some bonds, the issuer has to pay a premium, the so-called call premium.

- **Putability:** Some Bonds give the holder the right to force the issuer to repay the bond before the maturity date on the put dates. This is put option. These are referred to as retractable or putable bonds.

**Valuation of Bonds**
A security/Bond can be regarded simply as an asset that pay a series of dividends or interests over a period. Therefore, the value of any security can be defined as the present value of these future cash streams, i.e, the intrinsic value of an assets is equal to the present value of the benefits associated with it. It is quite clear that the holder of a bond receives a
fixed annual interest payment for a certain value (equal to par value) at the time of maturity. Therefore the intrinsic value of the present value of a bond is

\[ V_0 = \sum_{t=1}^{n} \frac{I}{(1 + kd)^t} + \frac{F}{(1 + kd)^n} \]

\( V_0 \) = intrinsic value of the bond

\( I \) = Annual interest payable on the bond

\( F \) = Redeemable value of the bond

\( n \) = Maturity period of the bond

\( kd \) = Cost of capital

**Note:** Solving the problems related to bond valuation, usually Present value Interest Factor of Annuity pertaining to the applicable interest rate are provided. PVIF represents the discount value of one Rupee for the period concerned and interest rate while PVIFA represents the present value of an ordinary annuity for the period concerned and interest rate. Example- PVIF (10%, 6) means present value of one Rupee to be received after 6 periods at the interest rate of 10% period. PVIFA (10%,6) means present value of an ordinary annuity one Rupee per period for 6 period at the interest rate of 10% per period.

**Example:**

A bond, whose par value is Rs 1000, bears a coupon rate of 12% and has a maturity period of 3 years. The required rate of return on the bond is 10%. What is the value of this bond?

**Solution**-

Annual interest payable = 1000* 12% = 120

Principle repayment at the end of 3 years = Rs 1000

The value of the bond

120(PVIFA 10%, 3yrs) + 1000 (PVIF 10%, 3 yrs)

= 120(2.487) + 1000(0.751)

= 298.44 + 751

= 1049.44

---

**Bond Value with Semi- Annual Interest**
If the Bond carries a semi-annual, as the amount of the half-yearly interest can be reinvested, the value of such bonds would be more the value of bonds with an annual interest payment. Hence, by multiplying the numbers of years to maturity by two and dividing the (i) annual interest payment, (ii) discount rate by two we can modify bond valuation formula as follows:

\[
V_0 = \sum_{t=1}^{2n} \frac{I/2}{(1 + kd/2)^t} + \frac{F}{(1 + kd/2)^n}
\]

Example:

A bond, whose par value is Rs 1000 bears a coupon rate of 12% payable semiannually and has a maturity period of 3 years. The required rate of return on bonds is 10%. What is the value of this bond?

Solution-

Semi-annual interest payable = 1000*12%/2 = 60

Principal repayment at the end or 3 years = 1000

The value of the bond

= 60(PVIFA 10%/2, 6dps) + 1000(PVIF 10%/2, 6pds)

= 60 (5.0746) + 1000 (0.746)

= 304.48 + 746

= 1050.48

**Current Yield on Bond**

Current yield represents the prevailing interest rate that a bond or fixed income security is delivering to its owners.

The formula for current yield is defined as follows:

\[
CY = \frac{\text{Annual interest payment}}{\text{Current Bond Price}}
\]

For example, let’s assume a particular bond is trading at par, or 100 cents on the dollar, and that it pays a coupon rate of 3%. In this case, the bond’s current yield will also be 3% (as shown below).
However, let's now assume that the same bond is trading at a discount to its par value. For the sake of example, let’s say investors can now purchase the bond for just 95 cents on the dollar. In this case, even though the bond will still be paying a 3% coupon, its current yield will actually be slightly higher (as shown below):

\[ CY = \frac{3}{95} = 3.16\% \]

As another example, let’s say the bond is trading at a premium to its face value -- 110 cents on the dollar. In this case, even though the bond will still be paying a 3% coupon, its current yield will actually be quite a bit lower (as shown below):

\[ CY = \frac{3}{110} = 2.73\% \]

Use our Yield to Call (YTC) Calculator to measure your annual return if you hold a particular bond until its first call date.

Use our Yield to Maturity (YTM) Calculator to measure your annual return if you plan to hold a particular bond until maturity.

**Yield-To- Maturity of Bond**

It is the rate of return earned by an investor, who purchases a bond and holds it until the maturity. The YTM is the discount rate, which equals the present value of promised cash flows to the current market price/ Purchase price.

**Example:**

Consider a Rs 1000 par value bond, whose current market price is Rs 850/-. The bond carries a coupon rate of 8% and has the maturity period of 9 yrs. What would be the rate of return that an investor earns if he purchase the bond and holds until maturity?

**Solution:**

If \( k_d \) is the yield to maturity then,

\[ 850 = 80 \times (PDVIFA \ k_d \%, \ 9 \ yrs) + 1000 \times (PDVF k_d, \ 9yrs) \]

To calculate the value of \( k_d \), we have to try several values:

\[ = 80(PDVA 12\%, \ 9) + 1000(PDVF 12\%, \ 9) \]
\[ = 80*5.328+1000*(0.361) \]
\[ =426.24+361=787.24 \]

Since, the above value is less than 850, we have to try with value less than 12%. Let us try with \( k_d=10\% \)

\[ = 80(PDVF 10\%,9) + 1000(PDVF 10\%,9) \]
Form the above it is clear that $k_d$ lies between 10% and 12%. We have to use linear interpolation in the range of 10% and 12%. Using it, we find that $k_d$ is equal to the following:

$$k_d = 10\% + (12\% - 10\%) \frac{884.72 - 850}{884.72 - 787.24}$$

$$k_d = 10\% + 2\% \frac{34.72}{97.48}$$

$$k_d = 10.71\%$$

Therefore, the yield to maturity is 10.71%.

**Duration of Bond**

**WHAT IS THE DURATION OF A BOND?**

The duration of a bond expresses the sensitivity of the bond price to changes in the interest rate. In other words, the bond duration measures the movement in the price of the bond for every 1% change in the interest rate.

The unit of bond duration is expressed in years. Also, the price of the bond and the interest rates are inversely related. Therefore, if a bond has a duration of 5 years, it signifies that for every 1% increase in the interest rate, the price of the bond will fall by 5% and vice-versa. The greater is the bond duration, the greater will be the amplification in the movement of bond price for every single unit of change of the interest rates.

*There is a simple way of computing the desired duration period:*

- Determine the cash flows from holding the bond.
- Determine the present value of these cash flows by discounting the flows with discount rate. (YTM)
- Multiply each of the present values by respective numbers of years left before the present value is received.
- Sum these products up and divide by the present value to get the duration of the bond.

**Properties of Duration**

- Duration is less than the term to maturity
• Bond’s duration will be equal to its term to maturity if and only if it is a zero coupon bond
• The duration of perpetual bond is equal to \((1+r)/r\), where \(r=\)current yield of the bond’
• Longer a coupon paying bond’s term to maturity, the greater the difference between its term to maturity and duration.
• Duration and YTM are inversely related.
• Larger the coupon rate, smaller the duration of a bond
• An increase in the frequency of coupon payments decrease the duration, while a decrease in frequency of coupons increases it.
Duration of a bond declines as the bond approaches maturity.

**Bond Price Volatility**

The sensitivity of the bond price to changes in the interest rates is called “Bond Volatility”. Bond prices and YTM are inversely related. Therefore, instantaneous changes in market yields cause prices to changes in the opposite direction. The extent of change in the bond princes for a change in YTM measures the interest rate risk of a bond. The interest rate risk is a function of the interest rate elasticity. Interest rate elasticity (IE) can be defined as:

\[
IE= \frac{\text{Percentage change in price for bond In period t}}{\text{Percentage change in yield to maturity for bond}}
\]

Interest rate elasticity is always a negative number, due to the inverse relationship between YTM and bond prices.

Bond price elasticity can also be computed with the help of following mathematical formula:

\[
IE= \frac{D \times \text{YTM}}{1+\text{YTM}}
\]

The above equation suggests that the duration and interest rate elasticity of a bond are directly related. Anything that causes the duration of a bond to increase will also increase the bond’s interest rate elasticity.

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**Unit 3- Capital Budgeting**

**Capital Budgeting**

Capital budgeting is a process of evaluating investments and huge expenses in order to obtain the best returns on investment.

An organization is often faced with the challenges of selecting between two projects/investments or the buy vs replace decision. Ideally, an organization would like to invest in all profitable projects but due to the limitation on the availability of capital an organization has to choose between different projects/investments.

**Capital budgeting as a concept affects our daily lives. Let’s look at an example-**

Your mobile phone has stopped working! Now, you have two choices: Either buy a new one or get the same mobile repaired. Here, you may conclude that the costs of repairing the
mobile increases the life of the phone. However, there could be a possibility that the cost to buy a new cell phone would be lesser than its repair costs. So, you decide to replace your cell phone and you proceed to look at different phones that fit your budget!

**Future Value**

Money has a time value, i.e. a given sum of money has greater value if it is received earlier as it can be profitability invested. To illustrate, consider an investor, who is evaluating an investment opportunity that requires an immediate outlay is Rs 100000 that will generate income in subsequent years. In deciding whether to go ahead with the investment, the investor will be concerned with how much income generation will be there in future. A rational investor will be unwilling to undertake the investment if he knows that he will receive less than what he can earn as interest.

Thus, if the project has the life of one year, P is the immediate outlay and r is the rate of interest, his return should be more than the sum F, where

\[ F = P(1+r) = (100000)(1+.10) = 1,10000 \] (current rate of interest r=10%)

And if the project has the life of 2 yrs and the return is only at the end of 2 yrs his return should be more than the sum F, where

\[ F = P(1+r)^2 = 100000(1+.10)^2 = 121000 \]

Clearly, if the investor has choose the project, he has to compare the yield on the investment to the yield from project’s cash flow, i.e. if the project has the life of two years then his return should be more 1,21,000.

Future value of Rs 100000 in year 20 = \[ 1,00,000(1+0.10)^{20} = 6,72,750 \]

**Present Value and Discounting**

The Present value of a sum of money to be received in the future is calculated by dividing the future sum by \((1+r)^n\) as follows:

\[ \text{Present Value} = \frac{P}{(1+r)^n} \]

The use of present time as a common reference point rather than some future point of time is particularly useful when comparing projects of different lengths of life. For Example, if two projects are to be compared, one that has an expected life of five years and the other having an expected life of nine year, it is easier to convert the cash flows to their present value than to a future value.

**Discounted cash flow Techniques for Investment Appraisal**

This chapter sets out two main discounting techniques of investment appraisal namely the **net present value (NPV) method and the internal rate of return (IRR) methods**. Two main assumptions that are made in discussing the two techniques, are as follows:
• That the sums of moneys, resulting from an investment, that accrue in future, are know with certainty.
• That there is no inflation.

**Net present value**

NPV method involves comparing the present value of the future cash flows of an investment opportunity with the cash outlay that is required to finance the opportunity. In this ways, we determine whether the investment opportunity provides a surplus, when the cash flows are measured in present value terms. The stages involved in using the NPV method are as follows:

• Estimate all future net cash flows (revenue minus cost) associated with an investment opportunity.
• Convert these net cash flow figures to their present value equivalents by discounting at the appropriate discount rate;
• Add all the present value figures of future cash flows;
• Subtract from this value, the initial cost of investment.

\[
NPV = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + ... + \frac{C_T}{(1+r)^T}
\]

\(-C_0 = \text{Initial Investment}\)
\(C = \text{Cash Flow}\)
\(r = \text{Discount Rate}\)
\(T = \text{Time}\)

Net Present Value (NPV) is a formula used to determine the present value of an investment by the discounted sum of all cash flows received from the project. The formula for the discounted sum of all cash flows can be rewritten as

\[
NPV = \sum_{i=1}^{n} \frac{\text{Cash Flow}_i}{(1+r)^i} - \text{Initial Investment}
\]

When a company or investor takes on a project or investment, it is important to calculate an estimate of how profitable the project or investment will be. In the formula, the -C0 is the initial investment, which is a negative cash flow showing that money is going out as opposed to coming in. Considering that the money going out is subtracted from the discounted sum of cash flows coming in, the net present value would need to be positive in order to be considered a valuable investment.
How is NPV calculated?

NPV tells you whether a certain project will generate cash flows according to your expectations or not. Using an assumed rate of return and investment horizon, it brings to light any adjustments required in your current investment to achieve a positive return.

NPV can be calculated by using the following formula:

\[ \text{NPV} = \frac{C_n}{(1+r)^n}, \text{where } n=\{0-N\} \]

Where

- \( C_n \): difference of cash flows
- \( r \): discount rate
- \( n \): time in years

You need to follow selection criteria with regards to the usage of NPV. Calculation of NPV will result in three possible outcomes:

**Positive NPV:** In this situation, the present value of cash inflows is greater than the present value of cash outflows. This is an ideal situation for investment.

**Negative NPV:** In this situation, the present value of cash inflows is less than the present value of cash outflows. This is not an ideal situation and any project with this NPV should not be accepted.

**Zero NPV:** In this situation, the present value of cash inflows equals the present value of cash outflows. You may or may not accept the project.

**Internal Rate of Return (IRR)**

The internal rate of return (IRR) is a discounting cash flow technique which gives a rate of return earned by a project. The internal rate of return is the discounting rate where the total of initial cash outlay and discounted cash inflows are equal to zero. In other words, it is the discounting rate at which the net present value (NPV) is equal to zero.

How is the Internal Rate of Return computed?

For the computation of the internal rate of return, we use the same formula as NPV. To derive the IRR, an analyst has to rely on trial and error method and cannot use analytical
methods. With automation, various software (like Microsoft Excel) is also available to calculate IRR. In Excel, there is a financial function that uses cash flows at regular intervals for calculation.

\[
\text{IRR} = \frac{(\text{Cash flows}) - \text{Initial Investment}}{(1+r)^i}
\]

Where:
Cash flows = Cash flows in the time period
\( r = \) Discount rate
\( i = \) Time period

The rate at which the cost of investment and the present value of future cash flows match will be considered as the ideal rate of return. A project that can achieve this is a profitable project. In other words, at this rate the cash outflows and the present value of inflows are equal, making the project attractive.

**How is IRR used for capital budgeting?**

- If the same costs apply for different projects, then the project with the highest IRR will be selected. If an organization needs to choose between multiple investment options wherein the cost of investment remains constant, then IRR will be used to rank the projects and select the most profitable one. Ideally, the IRR higher than the cost of capital is selected.
- In real life scenarios, since the investment in any project will be huge and will have a long-term effect, an organization uses a combination of various techniques of capital budgeting like NPV, IRR and payback period to select the best project.

**Illustration**

Let us say a company has an option to replace its machinery. The cost and return are as follows:

Initial investment = Rs.5,00,000
Incremental increase per year = Rs.2,00,000
Replacement value = Rs.45,270
Life of asset = 3 years

If we assume IRR to be 13%, the computation will be as follows.
<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flows</th>
<th>Discounted cash flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-500000</td>
<td>(500000) (5,00,000 * 1)</td>
</tr>
<tr>
<td>1</td>
<td>200000</td>
<td>176991</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2,00,000 * [1/1.13])</td>
</tr>
<tr>
<td>2</td>
<td>200000</td>
<td>156229 (2,00,000 * [1/1.13]^2)</td>
</tr>
<tr>
<td>3</td>
<td>200000</td>
<td>138610</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2,00,000 * [1/1.13]^3)</td>
</tr>
<tr>
<td>4</td>
<td>45270</td>
<td>27765 (45,270 * [1/1.13]^4)</td>
</tr>
</tbody>
</table>

The total of the column Discounted Cash Flows approximately sums up to zero making the NPV equal to Zero. Hence, this discounted rate is the best rate.

As can be seen from the above, using the rate of 13%, the cash flows, both positive and negative become minimum. Hence, it is the best rate of return on investment.

The cost of capital of the company is 10%. Since the IRR is higher than the cost of capital, the project can be selected.

If the company has another opportunity to invest the money in a project that gives a 12% return, the company will still go in for the machinery replacement since it gives the highest IRR.

**NPV and IRR Compared**

NPV and IRR methods have the advantage that they take into account the time value of money and thus, they are viewed as being superior to the non-discounting technique.
In addition, these two techniques have the advantage that they focus on cash flows rather than on accounting profits.

Given that both the NPV and IRR are characterised by these advantages, it may be thought that either is equally acceptable, in terms of providing decision advice, which will help to meet the goals of the organization. However, while the two techniques are clearly, similar they do not always guarantee to provide the same investment decision advice. We therefore, need to make a comparison of the two techniques to understand which one is superior. This is particularly important because, as we will see, is more reliable. The preference of decision makers for the IRR results from the fact that the business people are more used to thinking in terms of rates of return. However, in some situations, the use of the IRR approach may lead to inappropriate investment decision guidance.

**Investment Opportunities with capital Rationing**

In situations, Where the funds for investment are rationed, it will not be possible to undertake all investment opportunities that have a positive NPV or for which the IRR is greater than the cost of capital. Even where the projects are not mutually exclusive, capital rationing raise problems for both the NPV method and the IRR method.

**Risk Adjusted Discount Rate Approach for NPV Determination**

This approach to investment decision making process is an attempt to deal with the problem caused by an absence of certainty in relation to the cash flows in a manner that takes account of the risk attitudes of those people on whose behalf the decision is being made. When faced with a situation of risk, investors who are averse risk will require a higher rate of return to compensate them for taking on that risk. The higher the level of risk, the grater must be the rate of return. The risk –adjusted rate of return approach puts this simple concept into practice. *This method involves the following steps:*

- The decision makers should determine the rate of return that would be required for taking on investment with zero risk.
- Then add on to this rate of return, a risk premium, to take account of the risk factor of the investment under consideration.
- Rate of return, when calculated this way, is used as the discount rate in the NPV calculation.

**Non- Discounted Cash Flow Techniques**

*Payback period method:*
As the name suggests, this method refers to the period in which the proposal will generate cash to recover the initial investment made. It purely emphasizes on the cash inflows, economic life of the project and the investment made in the project, with no consideration to time value of money. Through this method selection of a proposal is based on the earning capacity of the project. With simple calculations, selection or rejection of the project can be done, with results that will help gauge the risks involved. However, as the method is based on thumb rule, it does not consider the importance of time value of money and so the relevant dimensions of profitability.

**Payback period = Cash outlay (investment) / Annual cash inflow**

**Accounting rate of return method (ARR):**

This method helps to overcome the disadvantages of the payback period method. The rate of return is expressed as a percentage of the earnings of the investment in a particular project. It works on the criteria that any project having ARR higher than the minimum rate established by the management will be considered and those below the predetermined rate are rejected.

This method takes into account the entire economic life of a project providing a better means of comparison. It also ensures compensation of expected profitability of projects through the concept of net earnings. However, this method also ignores time value of money and doesn’t consider the length of life of the projects. Also it is not consistent with the firm’s objective of maximizing the market value of shares.

**ARR = Average profit after tax/Average Investment**

**IMPORTANCE OF CAPITAL BUDGETING**

**Long term investments involve risks:** Capital expenditures are long term investments which involve more financial risks. That is why proper planning through capital budgeting is needed.

**Huge investments and irreversible ones:** As the investments are huge but the funds are limited, proper planning through capital expenditure is a pre-requisite. Also, the capital investment decisions are irreversible in nature, i.e. once a permanent asset is purchased its disposal shall incur losses.

**Long run in the business:** Capital budgeting reduces the costs as well as brings changes in the profitability of the company. It helps avoid over or under investments. Proper planning and analysis of the projects helps in the long run.

**SIGNIFICANCE OF CAPITAL BUDGETING**

- Capital budgeting is an essential tool in financial management
Capital budgeting provides a wide scope for financial managers to evaluate different projects in terms of their viability to be taken up for investments.
It helps in exposing the risk and uncertainty of different projects.
It helps in keeping a check on over or under investments.
The management is provided with an effective control on cost of capital expenditure projects.
Ultimately the fate of a business is decided on how optimally the available resources are used.

Unit 4- Depreciation and its Accounting

Depreciation

Depreciation is a charge to profit and loss account for the fall in value of an asset during each year of its use.

- Depreciation is a part of the opening cost.
- It is a reduction in the value of the asset.
- The decrease in the value of an asset is due to its use, caused by wear and tear, or by other reasons.
- The decrease in the value of an asset is gradual and continuous.

Causes of Depreciation

- Wear and tear due to actual use
- Obsolescence
- Accidents
- Fall in market price
- Efflux of time

Need for Depreciation

- To know the correct profit
- To show correct financial position
- To make provision for replacement of asset

Factors of Depreciation

For calculating depreciation, the basic factors are:
• The cost of the asset;
• The estimated resident or scrap value at the end of its life;
• The estimated number of year of its commercial life.

**Methods of Depreciation**

*The following are the various methods for providing depreciation:*

• Fixed percentage on original cost or fixed instalment or straight line method.
• Fixed percentage on diminishing balance or reducing instalment methods or written down value method.
• Sum of years digits method.

**Accounting Entries**

*The accounting entries to be made on account of providing depreciation are:*

Depreciation account – Dr. 3000
To asset account - 3000

The depreciation account goes to the debit of profit and loss account and the asset appears at its reduced value in the balance sheet. An alternative entry is:

Depreciation account – Dr. 3000
To provision for depreciation Account- Dr. 3000

In this case, depreciation account goes to the debit of profit and loss account. The value of assets continue to be the same for every year in the balance sheet and the provision for depreciation is deducted from the value of asset and net value of asset is shown in the balance sheet. In other words, the provision for depreciation may appear in the balance sheet.

**Straight line Method**

According to the Straight line method, the cost of the asset is written off equally during its useful life. Therefore, an equal amount of depreciation is charged every year throughout the useful life of an asset. After the useful life of the asset, its value becomes nil or equal to its residual value. Thus, this method is also called Fixed Installment Method or Fixed percentage on original cost method.

When the amount of depreciation and the corresponding period are plotted on a graph it results in a straight line. Hence, it is known as the Straight line method (SLM).
This method is more suitable in case of leases and where the useful life and the residual value of the asset can be calculated accurately. However, where the repairs are low in the initial years and increase in subsequent years, this method will increase the charge on profit.

Also, while applying this method, the period of use of the asset should be considered. If an asset is used only for 3 months in a year then depreciation will be charged only for 3 months. However, for the Income Tax purposes, if an asset is used for more than 180 days full years’ depreciation will be charged.

**Advantages**

- It is the simplest method of calculating depreciation.
- It is easy to understand, as there is no variation in the amount of depreciation charged from year to year.

**Disadvantages**

- The depreciation is equal for all the year, however, the expenditure on repairs and renewal goes on increasing as the asset gets older, resulting in higher amount charged to profit and loss account on account of depreciation and repairs in the subsequent years.

**Formula:**

**Amount of Depreciation** = \((\text{Cost of Asset} - \text{Net Residual Value}) / \text{Useful Life}\)

**The rate of Depreciation** = \((\text{Annual Depreciation} \times 100) / \text{Cost of Asset}\)

**Journal Entries for Straight Line Method of Depreciation**

<table>
<thead>
<tr>
<th>Date</th>
<th>Particulars</th>
<th>Amount (Dr.)</th>
<th>Amount (Cr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Purchase of asset</td>
<td>Asset A/c</td>
<td>Dr.</td>
<td>xx</td>
</tr>
</tbody>
</table>
### Example

Q. Abhinav purchased a machine on 1 Apr 2015 for ₹400000. The useful life of the machine is 3 years and its estimated residual value is ₹40000. At the end of its useful life, the machine is...
sold for 50000. Prepare the necessary ledger accounts in the books of Abhianv for the year ending 31st December every year. Use SLM.

Ans: In the books of Abhinav

**Machinery A/c**

<table>
<thead>
<tr>
<th>Date</th>
<th>Particulars</th>
<th>Amount</th>
<th>Date</th>
<th>Particulars</th>
<th>Amount</th>
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<td></td>
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<tr>
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<td>31 Dec</td>
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<td>90000</td>
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<td>31 Dec</td>
<td></td>
</tr>
<tr>
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<td>2017</td>
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<td>190000</td>
<td>By Depreciation A/c 120000</td>
<td></td>
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<tr>
<td></td>
<td>31 Dec By balance c/d</td>
<td>31 Dec</td>
<td>70000</td>
<td>190000</td>
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<td>2018</td>
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<td>190000</td>
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<td>31 Mar</td>
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<td>2018</td>
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<td>70000</td>
<td>By Depreciation A/c 300000</td>
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### Depreciation A/c

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<td>31 Dec</td>
<td>By Profit &amp; Loss A/c</td>
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<tr>
<td></td>
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<tr>
<td>31 Dec</td>
<td>To Machinery A/c</td>
<td>120000</td>
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<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>31 Dec</td>
<td>By Profit &amp; Loss A/c</td>
<td>120000</td>
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</table>

- **2015**
  - 31 Dec: To Machinery A/c, 90000
  - 31 Dec: By Profit & Loss A/c, 90000

- **2016**
  - 31 Dec: To Machinery A/c, 120000
  - 31 Dec: By Profit & Loss A/c, 120000
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<th>Date</th>
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<td>120000</td>
<td>31 Dec</td>
<td>By Profit &amp; Loss A/c</td>
<td>120000</td>
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<tr>
<td>31 Mar</td>
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<td>30000</td>
<td>31 Dec</td>
<td>By Profit &amp; Loss A/c</td>
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**Working Notes:**

Calculation of amount of depreciation

Depreciation = \( \frac{\text{Cost of Asset} - \text{Net Residual Value}}{\text{Useful life}} \)

\[ = \frac{400000 - 40000}{3} = 120000 \text{ p.a.} \]
**Diminishing Balance Method or Written-down Value Method**

According to the Diminishing Balance Method, depreciation is charged at a fixed percentage on the book value of the asset. As the book value reduces every year, it is also known as the Reducing Balance Method or Written-down Value Method.

Since the book value reduces every year, hence the amount of depreciation also reduces every year. Under this method, the value of the asset never reduces to zero.

When the amount of depreciation charged under this method and the corresponding period are plotted on a graph it results in a line moving downwards.

This method is based on the assumption that in the earlier years the cost of repairs to the assets is low and hence more amount of depreciation should be charged. Also, in the later years, the cost of repairs will increase and therefore less amount of depreciation shall be provided. Hence, this method results in an equal burden on the profit every year during the life of the asset.

**Amount of depreciation=Book Value× Rate of Depreciation/100**

**Advantage**

- This method is recognised under the Income-Tax Act and the Companies Act.
- The total expenditure on repairs and renewal and depreciation on asset are equal in all year, as in the initial years the depreciation will be more and less and in later years the expenditure on repairs will be high and depreciation less, through both may not exactly compensate the decrease/increase in the other.

**Disadvantage**

- The asset can never be reduced to zero value on the books
- Difficult to understand, as there is variation in the depreciation charged from year to year.

**Journal entry for Diminishing Balance Method of Depreciation**

<table>
<thead>
<tr>
<th>Date</th>
<th>Particulars</th>
<th>Amount (Dr.)</th>
<th>Amount (Cr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Purchase of asset</td>
<td>Asset A/c</td>
<td>Dr. xx</td>
</tr>
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</table>
To Cash/ Bank / Creditor’s A/c xx

(Being asset purchased)

2. Charge Depreciation
   Depreciation on Asset A/c Dr. xx
   To Asset A/c xx

(Being depreciation charged on book value of asset)

3. Transfer Depreciation
   Profit & Loss A/c Dr. xx
   To Depreciation on Asset A/c xx

(Being depreciation on asset transferred to profit and loss account)
Example on Diminishing Balance method

Q. M/s. Srivastav and sons purchased a machine on 1 Apr 2015 for ₹400000 from ABC & Co. and paid ₹100000 on its installation. The useful life of the machine is 3 years and its estimated residual value is ₹40000. On 31st March 2018, M/s. Srivastav and sons sell the machinery for ₹250000.

Charge depreciation as per the W.D.V. method @10 % p. a. Prepare the necessary ledger accounts in the books of Anil for the year ending 31st December every year.

Ans: In the books of M/s. Srivastav and sons

Machinery A/c

<table>
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<tr>
<th>Date</th>
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<th>Amount</th>
<th>Date</th>
<th>Particulars</th>
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<td>400000</td>
<td>31 Dec</td>
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<td>To Cash A/c (installation exp.)</td>
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<td>462500</td>
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<tr>
<td>2016</td>
<td>1 Jan</td>
<td>To balance b/d</td>
<td>462500</td>
<td>31 Dec</td>
<td>By Depreciation A/c</td>
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<td>31 Dec</td>
<td>By balance c/d</td>
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<td></td>
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<td>2017</td>
<td>1 Jan</td>
<td>To balance b/d</td>
<td>416250</td>
<td>31 Dec</td>
<td>By Depreciation A/c</td>
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<td>31 Dec</td>
<td>By balance c/d</td>
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<td>To balance b/d</td>
<td>374625</td>
<td>31 Mar</td>
<td>By Depreciation</td>
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### A/c

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<td>By Profit &amp; Loss A/c (loss on sale)</td>
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401625

### Depreciation A/c

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<td>37500</td>
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2016

2016
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<td>By Profit &amp; Loss A/c</td>
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<td>2018</td>
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<td></td>
<td>2018</td>
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<tr>
<td>31 Mar</td>
<td>To Machinery A/c</td>
<td>9366</td>
<td>31 Dec</td>
<td>By Profit &amp; Loss A/c</td>
<td>9366</td>
</tr>
</tbody>
</table>

**Working Notes:**

**Calculation of amount of depreciation**

Amount of depreciation = \( \text{Book Value} \times \frac{\text{Rate of Depreciation}}{100} \)

- 2015: Depreciation = \( 500000 \times \frac{10}{100} \times \frac{9}{12} = 37500 \)
- 2016: Depreciation = \( 462500 \times \frac{10}{100} = 46250 \)
• 2017: Depreciation = 416250 x 10/100 = 41625
• 2018: Depreciation = 374625 x 10/100 x 3/12 = 9366

Calculation of loss on sale of machinery

Loss = Book Value on 1 Jan 2018 – depreciation for 3 months – cash received

= 374625 – 9366 - 250000 = 115259

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</table>
Unit 5 - Foreign Exchange Arithmetic

Foreign Exchange

Foreign Exchange is the trading of one currency for another. For example, one can swap the U.S. dollar for the Indian Rupees. Foreign exchange transactions can take place on the foreign exchange market, also known as the Forex Market.

Fundamentals of Foreign Exchange

There are three fundamental aspects of this general mechanism of foreign exchange.

- Almost every country has its own currency (legal tender, distinctive unit of account) and the useful possession of the currency, can normally be had only in that country, in which it passes.
- The exchange from one currency for another is, mostly, put though by the banks by means of bookkeeping entries carried out in the two centres concerned.
- Almost all exchanges of one currency for another are affected with the help of credit instruments.

Indian Forex Market

The exchange rate movements in the Indian forex market do not necessarily follow the international trend, particularly in the short run. The main reason for this is the restriction on the free flow of capital into or out of the country. Prior to the method ‘Liberalised Exchange Rate Management System’ (LERMS) the Reserve Bank fixed the buying and selling rates and the market would remain within the ceiling and the floor, thus fixed by the Reserve Bank. However, at present, the forces of demand and supply in the local Interbank market derive the Exchange rate.

Direct and Indirect Quote

The quote is direct when the price of one unit of foreign currency is expressed in terms of the domestic currency.

The quote is indirect when the price of one unit of domestic currency is expressed in terms of Foreign currency.

Since the US dollar (USD) is the most dominant currency, usually, the exchange rates are expressed against the US dollar. However, the exchange rates can
also be quoted against other countries’ currencies, **which is called as cross currency.**

Now, a lower exchange rate in a direct quote implies that the domestic currency is appreciating in value. Whereas, a lower exchange rate in an indirect quote indicates that the domestic currency is depreciating in value as it is worth a smaller amount of foreign currency.

**Some Basic Exchange Rate Arithmetic**

**Cross Rate**

If a person wants to remit Euros from India, and as a banker, and for argument sake, rupees/ Euros are not normally quoted and therefore, what we have to do is first buy dollars against the rupees and the same dollars will be disposed off overseas to acquire the Euros.

If a rate in Mumbai market are US 1 Dollar= Rs 60.8450/545 and rates in London market are US 1 Dollar=Euros 0.7587 we will gets US 1 dollar for Rs 60.8545 and for one Us dollar we will get Euro 0.7587, thus we can form a sort of chain rule as under:

How many Rs.= 1 Euro

If 0.7587 Euro= US 1 dollar

Therefore, 1 Euro= Rs. 60.8545/0.7587

Or 1 Euro= Rs. 80.21

If an export customer has a bill for 100000 pound, the bank has purchase the Pound from him and give an equivalent amount in rupees to the customer. Presuming the inter-bank market quotations for spot delivery are as follows:

US 1 dollar= Rs 60.8450/545

The London market is quoting cable (STG/DLR) as

1 pound= US 1.9720/40 Dollar

The bank has to sell pound in the London market at US 1.9720, ie. The market’s buying rate for Pound 1. The US dollars so obtained have to be disposed off in the local inter-bank market at US 1 dollar= Rs 60.8450 (market’s buying rate) for US dollar.

By chain rule, we get:

Pound 1= 1.9720*60.8450

= Rs 119.9863
Chain Rule

Calculation of the cross rate is based on common sense approach. However, it can be reduced to a rule known as the chain rule with similar steps.

Value Date

The value date is a date on which the exchange of currencies actually takes place. Based on this concept, we have the following types of exchange rates.

Cash/ready: it is the rate when an exchange of currencies takes place on the date of the deal.

TOM: When the exchange of currencies takes place on the place on the next working day, i.e., tomorrow it is called the TOM rate.

Forward Rate: If the exchange of currencies takes place after period of spot date, it is called the forward rate. Forward rates generally are expressed by indicating a premium/discount for the forward period.

Premium: When a currency is costlier in forward or say, for a future value date, it is said to be at a premium. In the case of the direct method of quotations, the premium is added to both the selling and buying rate.

Discount: If currency is cheaper in the forward of for a future value date, it is said to be at a discount. In the case of a direct quotation, the discount is (deducted) subtracted from both the rates, i.e, buying and selling rates.

Forward Exchange Rates

The forward exchange rate (also referred to as forward rate or forward price) is the exchange rate at which a bank agrees to exchange one currency for another at a future date when it enters into a forward contract with an investor.

Forward Rate

The Exchange rate for settlement on a date beyond the spot is naturally different and the same is called the forward rate.

Forward rate has two components:

- Spot Rate
- Forward point reflecting the interest rate differentials adjustment for different settlement dates.

(i) Forward Point

Let us suppose that spot rate of US$/Euro is
Spot     Euro 1= US$ 1.3180  
The exchange rate three months forward is  
3 months     Euro 1= US $1.3330  
The difference of 150 points referred to is the forward point

**The following factors determine the forward point:**

- Supply and demand for the currency for the settlement date. If there are more buyers for a particular date then sellers, the forward point will be different from the situation if there were more sellers than buyers for that particular settlement date.
- Market view, i.e. expectations, about the future and developments likely to take place in interest rates and foreign exchange.
- The interest rate differential between the countries. For the period in question, whose currencies are being exchanged.

**Calculating forward points**

We can the approximate forward points for a given forward period with the help of the following information:

- Spot exchange rate= 15000
- Interest rate differential= 3% per annum
- Forward period= 90 days
- No. of days in a year (360 or 365)= 365 days

**The formula is as**

\[ \text{Spot rate} \times \text{Interest rate differential} \times \text{Forward period} / 100 \times \text{No. of days in the year} \]

\[ 1500 \times 3 \times 90 / 100 \times 360 = 0.01125 \]

Forward differential, is also known as the “Swap Rate”. Three months forward rate for a US$/ Euro can be calculated by adjusting spot rate with the forward differential.

**Interest differential from forward points:**

The formula for calculating the interest rate differential from the forward point is as under:

**Interest rate differential** = Forward points × No. of days in the year × 100 / Spot rate × Forward period
Continuing the above example, we have

\[=0.01125 \times 360 \times 100 / 1.50 \times 90 = 3\% \text{ annum}\]

**Forward differential formula**  = Spot rate - Forward rate

(ii) Arbitrage

Arbitrage is an operation by which one can make risk free profits by undertaking offsetting transactions. Arbitrage can be in interest rates, i.e. borrow in one centre and lend in another at a higher rate. Arbitrage can occur in exchange rates also. However, with the present day efficient communication system, arbitrage opportunities are very rare.

In the above example forward rate, i.e Euro 1 = US dollar 1.5436, would perfectly offset the interest rate differential and can be calculated as follows:

Principal + interest of US dollar investment = US $ 159
Principal + interest of Euro loan = Euro 103
Therefore, Euro 103
Or Euro 1 = US$ 159/103 = US$ 1.5436
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