Formula's

1. Calculation of simple interest = \[ P \times R \times T \]
   \( P \) - principal
   \( R \) - rate
   \( T \) - time

2. Compound Interest:
   - Annually \( A = P (1 + \frac{R}{100})^T \)
   - Half yearly \( A = P \left(1 + \frac{\frac{R}{2}}{100}\right)^{2T} \)
   - Quarterly \( A = P \left(1 + \frac{\frac{R}{4}}{100}\right)^{4T} \)
   - Monthly \( A = P \left(1 + \frac{\frac{R}{12}}{100}\right)^{12T} \)

3. Equated monthly instalments [EMI] = \( \frac{P \times R}{(1 + R)^n - 1} \)
   \( P \) - principal
   \( R \) - rate of interest per month
   \( n \) - no. of instalments

4. Ordinary annuity
   \( FV = C \left[ \frac{(1+i)^n - 1}{i} \right] \)
   \( FV \) - future value
   \( PV \) - present value

   \( PV = C \left[ \frac{(1+i)^n - 1}{x(1+i)^n} \right] \)

   \( C \) - cash flow per period
   \( i \) - interest rate per period
   \( n \) - no. of payments

   Annuity due
   \( FV = C \left[ \frac{(1+i)^n - 1}{i} \right] \times (1+i) \)
   \( PV = C \left[ \frac{(1+i)^n - 1}{x(1+i)^n} \right] \times (1+i) \)

5. Present value \( PV = \frac{CF}{(1+i)^n} \)
   \( CF \) - cash flow
   \( i \) - rate of interest
   \( n \) - number of periods
6. **Sinking fund**

- **Future value of annuity**
  \[ F = A \left( \frac{(1+i)^n - 1}{i} \right) \]
  
  \( F \) - future value of annuity
  \( A \) - annual payment
  \( n \) - number of years
  \( i \) - rate of interest

- **Present value of annuity**
  \[ R = \frac{A}{(1 + i)^n} \]

3. **Bond value**

- **Bond value** = par value x coupon rate [PVIFA, R%, i] + principal [PVIF, R%, i]
  
  \( R \) - rate of interest
  \( i \) - year

6. **Duration of bond**

- \[ \text{Duration} = \frac{\text{PV of interest payments} \times t}{\text{Market value}} \]

9. **Modified duration**

- \[ \text{Modified duration} = \frac{\text{Duration}}{1 + \text{Yield}} \]

- Percentage change in price = - modified duration x change in rate

10. **Current yield on bond**

- \[ \text{Current yield} = \frac{\text{Coupon interest}}{\text{Current market price}} \]

11. **Yield to maturity**

- a) Calculate current yield
- b) Coupon rate (PVIFA, Kd%, year) + principal amount
  - Kd is the yield to maturity by assuming...

12. **Intrinsic value of bond**

- \[ V_o = \sum_{t=1}^{n} \frac{I}{(1+Kd)^t} + \frac{F}{(1+Kd)^n} \]
  
  \( V_o \) - intrinsic value of bond
  \( I \) - annual interest payable on the bond
  \( F \) - redeemable value of bond
  \( n \) - maturity period of the bond
  \( Kd \) - cost of capital

13. **Net present value (NPV)**

- \[ \text{NPV} = \sum \frac{C}{(1+i)^n} \]
  
  \( C \) - cash flow
  \( n \) - no. of years
  \( i \) - discount rate
  \( p \) - initial investment
(14) **Amortization formula**

\[ R = \frac{A}{1 - (1 + r)^{-n}} \]

- \( R \) - periodic payment of an annuity whose present value is \( A \)
- \( n \) - period
- \( r \) - rate of interest

(15) **Internal Rate of Return (IRR)**

\[ IRR = R_1 + \frac{NPV_1}{(NPV_1 - NPV_2)(CR_2 - R_1)} \]

- \( R_1 \) - discount rate which is low
- \( R_2 \) - discount rate which is too high
- \( NPV_1 \) - NPV at discount which is too low
- \( NPV_2 \) - higher

\[ IRR = \frac{C_n - I}{(1 + r)^n} \]

- \( C \) - net cash inflow per year
- \( n \) - no. of years
- \( r \) - discount rate
- \( I \) - initial investment

(16) **Depreciation**

**Straight Line method**

Annual depreciation = \( \frac{\text{cost} - \text{Residual value}}{\text{Estimated useful life}} \)

\( N \) = Year
\( p \) = price of depreciation asset
\( S \) = salvage value

\[ \text{Sum of Years Digits method (10 years)} \]

\[ 55 \]
RATIO ANALYSIS

1. Gross Profit Ratio = \frac{\text{Gross Profit}}{\text{Sales}} \times 100

2. Net Profit Ratio = \frac{\text{Net Profit (PAT)}}{\text{Sales}} \times 100

3. Current Ratio = \frac{\text{Current Assets}}{\text{Current Liability}}

4. Liquid Ratio = \frac{\text{Current Assets} - \text{Stock}}{\text{Current Liability} - \text{BOD}}

5. Operating Ratio = \frac{\cos + \text{Operating Expense (including debenture int.)}}{\text{Sales}} \times 100

6. Stock turnover Ratio = \frac{\cos}{\text{Sales} - \text{Gross Profit}}

   OR

   = \frac{\cos}{\text{Sales} - \text{Opening Stock} + \text{Purchase} - \text{Closing Stock}}

7. Debtors Ratio = \frac{\text{Debtors} + \text{B/R}}{\text{Credit Sales}} \times 365

8. Creditors Ratio = \frac{\text{Creditors} + \text{B/P}}{\text{Credit Purchase}} \times 365

9. Gearing Ratio = \frac{\text{Preference Share Capital} + \text{Debenture}}{\text{Equity Share Capital}} \times 100

10. Return on Capital Employed
    \frac{\text{Net Profit (PBIT)}}{\text{Share Capital} + \text{Reserves} + \text{loan} + \text{Debenture} - \text{Fictitious Asset}} \times 100

11. Return on Share Holders Fund
    \frac{\text{Net Profit (PAT)}}{\text{Share Capital} + \text{Reserves} - \text{Fictitious Asset}} \times 100

12. Return on Equity Fund
    \frac{\text{Net Profit (PAT)} - \text{Preference Share Dividend}}{\text{Equity Share Capital} + \text{Reserves} - \text{Fictitious Asset}} \times 100
(13) Return on Equity Capital
\[ \text{Return on Equity Capital} = \frac{\text{Net Profit (PAT)} - \text{Preference Share Dividend}}{\text{Equity Share Capital}} \times 100 \]

(14) Earning Per Share
\[ \text{Earning Per Share} = \frac{\text{Net Profit (PAT)} - \text{Preference Share Dividend}}{\text{Number of Equity Share}} \]

(15) Proprietary Ratio
\[ \text{Proprietary Ratio} = \frac{\text{Share Capital + Reserves – Fictitious Asset}}{\text{Total Assets – Fictitious Asset}} \times 100 \]

(16) Debt Equity Ratio
\[ \text{Debt Equity Ratio} = \frac{\text{Loan + Debenture}}{\text{Share Capital + Reserves – Fictitious Asset}} \times 100 \]

(17) Long Term Fund to Total Asset Ratio
\[ \text{Long Term Fund to Total Asset Ratio} = \frac{\text{Share Capital + Reserves + Loan + Debenture – Fictitious Asset}}{\text{Total Assets – Fictitious Asset}} \times 100 \]

(18) Interest Coverage Ratio
\[ \text{Interest Coverage Ratio} = \frac{\text{Net Profit (PBIT)}}{\text{Interest}} \]

(19) Debentures Turnover
\[ \text{Debentures Turnover} = \frac{\text{Debentures}}{\text{Debentures Turnover Ratio}} \]

(20) Long Term Fund to Fixed Assets
\[ \text{Long Term Fund to Fixed Assets} = \frac{\text{Share Capital + Reserves (Loan + Deb) - Fixed Assets}}{\text{Fixed Assets}} \times 100 \]
### FINANCIAL RATIOS AND THEIR INTERPRETATION

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>CATEGORY</th>
<th>TYPES OF RATIO</th>
<th>INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Liquidity ratios</td>
<td><strong>Net Working Capital</strong> = Current assets-current liabilities other than bank</td>
<td>It measures the liquidity of a firm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>borrowings</td>
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<td></td>
<td></td>
<td><strong>Current ratio</strong> = Current Assets - Current Liabilities</td>
<td>It measures the short term liquidity of a firm. A firm with a higher ratio has</td>
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<td></td>
<td></td>
<td></td>
<td>better liquidity. A ratio of 1.33:1 is considered safe.</td>
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<tr>
<td></td>
<td></td>
<td><strong>Acid test or Quick ratio</strong> = Quick assets - Current Liabilities</td>
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<tr>
<td>2</td>
<td>Turnover ratios</td>
<td><strong>Inventory Turnover ratio</strong> = Costs of goods sold / Average inventory</td>
<td>This ratio indicates how fast inventory is sold. A firm with a higher ratio has</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>better liquidity.</td>
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<td></td>
<td></td>
<td><strong>Debtor Turnover ratio</strong> = Net credit sales / Average debtors</td>
<td>This ratio measures how fast debts are collected. A high ratio indicates shorter</td>
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<td></td>
<td></td>
<td></td>
<td>time lag between credit sales and cash collection.</td>
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<td></td>
<td><strong>Creditor’s Turnover ratio</strong> = Net credit purchases / Average Creditors</td>
<td>A high ratio shows that accounts are to be settled rapidly.</td>
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<tr>
<td>3</td>
<td>Capital Structure</td>
<td><strong>Debt-Equity ratio</strong> = Long term debt - shareholders Equity</td>
<td>This ratio indicates the relative proportions of debt and equity in financing</td>
</tr>
<tr>
<td></td>
<td>Ratios</td>
<td></td>
<td>the assets of a firm.</td>
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<td></td>
<td></td>
<td></td>
<td>A ratio of 1:1 is considered safe.</td>
</tr>
<tr>
<td>4</td>
<td>Coverage ratios</td>
<td>Debt to Total capital ratio = Long term debt / Permanent Capital or Total debt / Permanent capital + Current liabilities or Total Shareholder’s Equity / Total Assets</td>
<td>It indicates what proportion of the permanent capital of a firm consists of long-term debt. A ratio 1:2 is considered safe.</td>
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</tr>
<tr>
<td>5</td>
<td>Profitability ratios</td>
<td>Interest Coverage = (Earning before Interest &amp; Tax) / Interest</td>
<td>A ratio used to determine how easily a company can pay on outstanding debt. A ratio of more than 1.5 is satisfactory.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dividend Coverage = (Earning after tax) / Preference Dividend</td>
<td>It measures the ability of the firm to pay dividend on preference shares. A high ratio is better for creditors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total Coverage ratio = (Earning before interests and tax) / Total &amp; fixed charges</td>
<td>It shows the overall ability of the firm to fulfill its liabilities. A high ratio indicates better ability.</td>
</tr>
<tr>
<td>6</td>
<td>Expenses</td>
<td>Operating ratio =</td>
<td>Operating ratio shows the</td>
</tr>
<tr>
<td>Ratios</td>
<td>Cost of Goods sold + other expenses</td>
<td>Return on Assets (ROA) = Net Profit after Taxes * 100 Total Assets</td>
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<tr>
<td></td>
<td>Sales</td>
<td>Or (Net Profit after Taxes + Interest) * 100 Total Assets</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Or (Net profit after Taxes + Interest) * 100 Tangible Assets</td>
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<td></td>
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<td>Or (Net Profit after Taxes + Interest) * 100 Total Assets</td>
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<td></td>
<td></td>
<td>Or (Net Profit after Taxes + Interest) * 100 Fixed Assets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost of Goods sold ratio = Cost of Goods sold Sales</td>
<td>It measures the profitability of the total funds per investment of a firm.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Specific Expenses ratio = Specific Expenses Sales</td>
<td>Return on Capital Employed (ROCE) = (Net Profit after Taxes) * 100 total capital employed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Or (Net Profit after Taxes + Interest) * 100 Total Capital Employed</td>
<td></td>
</tr>
</tbody>
</table>

**operational efficiency of the business.**

Lower operating ratio shows higher operating profit and vice versa.

It measures the cost of goods sold per sale.

It measures the specific expenses per sale.

It measures profitability of the firm with respect to the total capital employed.

The higher the ratio, the more efficient use of capital employed.
<table>
<thead>
<tr>
<th>Shareholder’s ratios</th>
<th>Earnings per Share (EPS) = (Net Profit after Taxes + Interest) / Total Capital Employed - Intangible assets</th>
<th>It measures the profit available to the equity holders on a per share basis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dividend Payout ratio (D/P) = Total Dividend To Equity / Total capital employed</td>
<td>It shows what percentage share of the net profit after taxes and preference dividend is paid to the equity holders.</td>
<td></td>
</tr>
<tr>
<td>Or Dividend per Ordinary Share Earnings per Share</td>
<td>A high D/P ratio is preferred from investor’s point of view.</td>
<td></td>
</tr>
<tr>
<td>Activity Ratios</td>
<td>inventory turnover = Sales / Average Closing Inventory</td>
<td>It measures how quickly inventory is sold.</td>
</tr>
<tr>
<td></td>
<td>Debtors turnover = Cost of Goods manufactured / Average Work in Process Inventory</td>
<td>A firm should neither have a high ratio nor a low ratio.</td>
</tr>
<tr>
<td>Assets Turnover Ratios</td>
<td>Fixed Assets turnover = Cost of Goods Sold / Fixed Assets</td>
<td>It measures the efficiency of a firm in managing and utilizing its assets.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Higher the ratio, more efficient is the firm in utilizing its assets.</td>
</tr>
</tbody>
</table>
Problems - Simple Interest

1. X borrowed a sum of Rs. 10,000 from Y at 12% p.a. interest rate for 2 years. What is the amount of total interest payable.

   Simple interest = $\frac{P \times R \times T}{100}$
   
   $= \frac{10,000 \times 12 \times 2}{100}$
   
   $= 2,400$

2. B borrowed Rs. 20,000 from A at 10% p.a. interest rate for 3 years. What is total amount payable by B to A.

   Simple interest = $\frac{P \times R \times T}{100}$
   
   $= \frac{20,000 \times 10 \times 3}{100}$
   
   $= 6,000$ interest

   Then borrowed amount is $20,000 + 6000$ int
   
   $= 26,000$ repaid by B to A.

3. X deposited Rs. 1200 with a non-Bank finance company at 14% p.a. compounded interest rate for 2 years. What is the amount of interest for 1st, 2nd and 3rd int. amt in the 2 years.

   For 1st year
   
   $1200 \times 14 = 168$
   
   Second year
   
   $1200 + 168 = 1368$
   
   Third year
   
   $1368 \times 14 = 19232$

4. An amount of Rs 20,000 gets accumulated to Rs 32,000 at the end of 3rd year at Simple Interest. Calculate the rate of interest.

   We can assume simple int rate 10%, 15%, 20%, 25%

   If we can take 20%. Then simple int = $\frac{P \times R \times T}{100}$
   
   $= \frac{20,000 \times 20 \times 3}{100}$
   
   $= 12,000$

   Then 20,000 + 12,000 int
   
   $= 32,000$

5. X had deposited some amount with the bank at 7% for 3 years, which becomes Rs 48000. What amount was deposited.

   Assume amt 37000, 38000, 39000 & 40,000

   If we take 40,000 x 7% x 3 years
   
   $= 4800$

   40,000 + 4800 = 48800

   So amount deposited is 49000.
Problems  Compound Interest

6 Mr. K had deposited Rs. 20000 with his bank at 12% interest for 2 years. What will be the amount he is likely to receive, if compounding is annually, half yearly.

\[ P = A \left( 1 + \frac{r}{n} \right)^{nt} \]

\[ \text{annually} \]
\[ = 20000 \left( 1 + \frac{12}{100} \right)^2 \]
\[ = 20000 \times 1.2544 \]
\[ = 25088 \]

\[ \text{Half yearly} \]
\[ P = A \left( 1 + \frac{r}{n} \right)^{nt} \]
\[ = 20000 \left( 1 + \frac{0.12}{2} \right)^{2 \times 2} \]
\[ = 20000 \times 1.2624 \]
\[ = 25250 \]

7 Mr. K had deposited Rs. 40000 with his bank at 12% interest for 2 years. What will be the amount he is likely to receive, if compounding is quarterly & monthly.

\[ P = A \left( 1 + \frac{r}{n} \right)^{nt} \]

\[ \text{Quarterly} \]
\[ = 40000 \left[ 1 + \frac{0.12}{4} \right]^{4 \times 2} \]
\[ = 40000 \times 1.2667 \]
\[ = 50670 \]

\[ \text{Monthly} \]
\[ P = A \left( 1 + \frac{r}{n} \right)^{nt} \]
\[ = 40000 \left[ 1 + \frac{0.12}{12} \right]^{12 \times 2} \]
\[ = 40000 \times 1.2687 \]
\[ = 50789 \]
Other problems on simple & compound interest

8. What annual rate of simple interest was paid if Rs 10,000 earned Rs 1100 in interest in 2 years & 3 months?

Simple Int (SI) = \( \frac{P \times R \times T}{100} \)

\[ R = \frac{SI \times 100}{P \times T} \]

\[ = \frac{1100 \times 100 \times 12}{(24+9) \times 15000} = \frac{132000}{360000} = 4\% \]

Annual rate 4%.

9. A sum of money at simple interest amounts to Rs 2800 in 2 years and to Rs 3250 in 5 years. Find the sum and the rate of interest.

We assume a sum for 4 years, Rs 2500 at 6%.

\[ \text{Second year } 2500 \times 6\% \times 2 = 300 \]
\[ 2500 + 300 = 2800 \]

At 6% for 5 years:
\[ 2500 \times 6\% \times 5 = 750 \]
\[ 2500 + 750 = 3250. \]

10. Z needs Rs 15,000 for the marriage of his daughter at the end of 5th year. Considering that the interest rate is 10% at present, what amount will he have to deposit in the bank for with yearly compounding? (Hint: Discount factor 1.61051)

\[ \frac{150000}{1.61051} = 93138.21 \]

11. A certain amount was invested on Jan 1, 2015 such that it generated a periodic payment of Rs 10,000 at the beginning of each month of the calendar year 2015. The interest rate on the investment was 13.24%. Calculate the original investment and the interest earned.

Payment: Rs 10,000

\( n = 12 \)

\( i = 13.24/12 = 1.017 \)

Original investment = PV of annuity due on Jan 1, 2015

\[ = 10000 \left( \frac{1 - (1 + 1.017)^{-12}}{1.017} \right) \times (1 + 1.017) \]

\[ = 10000 \times (1 - 0.9608) = 183073.26 \]

Interest earned = Rs 183073.26 - 10000

\[ = 123073.26 \]

\[ = 6926.80 \]
13. What is the present worth of Rs 132 due in 2 years at 5% Simple Interest per annum?
   ➜ Present worth be Rs. x
   
   Then SI = Rs \{(132 - x)\}
   
   \(x \times 5 \times 2/100 = 132 - x\)
   
   \(10x = 13200 - 100x\)
   
   \(110x = 13200\)
   
   \(x = 120\).

14. If a sum of money doubles itself in 8 years at Simple Interest, the rate percent per annum is
   ➜ Sum = \(\alpha\) then Simple Int. = \(\alpha\)
   
   Rate = \((100 \times \alpha) / (\alpha \times 8) = 12.5\%\).

15. Find the Simple Interest on the Rs 2000 at 25\% p.a. per annum for the period from 4\textsuperscript{th} Feb 2013 to 18\textsuperscript{th} April 2013.
   ➜ Calculate no. of days.
   
   Time = (24+31+18) days
   
   = 73/365 years
   
   = 1/5 years

   \(P = 2000\)

   \(R = 25/\%\)

   \(SI = 2000 \times 25/\% \times 1/5 \times 100\)

   = 25

16. What will be the difference between Simple & Compound Interest @ 10\% per annum on the sum of Rs 18,000 for 4 years?
   ➜ SI = \(10000 \times 10/100 \times 4 = 400\)

   \(CI = (10000(1+10/100)^4 - 10000) = 464.10\)

   Diff = 464.10 - 400 = 64.10

17. **Equated Monthly Installments (EMI)**

   Principal Amount = 180,000

   Rate of Int. - 10\% Annually then \(10/100 / 12 = 0.00833\)

   No. of tenure - 12 months

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

   \(= (180000 \times 0.00833) \times \frac{(1+0.00833)}{(1+0.00833)^12 - 1}\)

   = 8792
1. Z decides to invest Rs 30,000 every year at 10\% interest rate for 4
   years. What amount will he get at the end of 4 years.

Future value of ordinary annuity

\[ FV = C \times \frac{(1+i)^n - 1}{i} \]

\[ = 30,000 \times \frac{(1+0.10)^4 - 1}{0.10} \]

\[ = 139,230 \]

2. Z wants to invest Rs 30,000 per annum at 10\% for 4 years. He
   wants to know the present value of the amount he would get
   at the end of 4th year.

Present value of ordinary annuity

\[ PV = C \times \frac{1}{r} \times \frac{1 - \frac{1}{(1+r)^n}}{} \]

\[ = 30,000 \times \frac{1}{0.10} \times \frac{1 - \frac{1}{(1+0.10)^4}}{} \]

\[ = 95036 \]

3. If a 7\% coupon bond is trading for Rs 97.5, it has a current
   yield of \( \frac{7}{97} \times \frac{100}{97.5} \) = 7.18\%

Current yield

\[ \text{current yield} = \frac{\text{coupon rate}}{\text{current market price}} \]

4. A coupon bond pays annual interest, has a par value of Rs 1000,
   matures in 4 years, has a coupon rate of 12\%, and has yield to maturity of 12\%.
   The current yield on this bond is \( \frac{7.1}{100} \times \frac{100}{92} = 7.18\% \)

Current yield (cy)

\[ \text{cy} = \frac{\text{coupon rate}}{\text{market value}} \]

Market value

\[ \text{market value} = \text{par value} \times \text{coupon rate} \times (\text{PVIF}A_{12\%}, 4 \text{ years}) + \text{principal} \times (\text{PVIF}A_{12\%}, 4 \text{ years}) \]

\[ = 1000 \times 10 \times (\text{PVIF}A_{12\%}, 4 \text{ years}) + 1000 \times \text{PVIF}_{12\%, 4 \text{ years}} \]

\[ = 1000 \times 0.367 + 1000 \times 0.6836 \]

\[ = 939.70 \]

939.70 \times 10.7 \times 1000 = 10.65\%
problems on annuity, value, bond, current yield & YTM

1. Z decides to invest Rs 30,000 every year at 10.7% interest rate for next 4 years. What amount will he get at the end of 4 years.

Future value ordinary annuity

\[ FV = C \times \frac{(1+i)^n - 1}{i} \]

\[ = 30,000 \times \frac{(1 + \frac{10.7}{100})^4 - 1}{\frac{10.7}{100}} \]

\[ = 139,230. \]

2. Z wants to invest Rs 30,000 per annum at 10.7% for 4 years. He is interested to know the present value of the amount he would get at the end of 4th year.

Ordinary present annuity

\[ = C \times \frac{(1+i)^n - 1}{i(1+i)^n} \]

\[ = 30,000 \times \frac{1 (1 + \frac{10.7}{100})^{-4} - 1}{\frac{10.7}{100} (1 + \frac{10.7}{100})^{-4}} \]

\[ = 95036. \]

3. If a 7% coupon bond is trading at Rs 975, it has a current yield \( b \). -- \( b \)

Current yield = \( \frac{\text{Coupon Rate}}{\text{Current Market Price}} \)

Assume face value 1000 if not given.

\[ \text{Current Yield} = \frac{7}{975} \times \frac{1000 \times 7}{975} = 7.18\% \]

4. Coupon bond pays annual interest, has a par value of Rs 1000 makes in 4 years, has a coupon rate & 7%, and has yield to maturity of 12.7.

The current yield on this bond is \( \ldots \).

Current yield \( CY = \frac{\text{Coupon Int}}{\text{Market Value (b)}} \)

Market value (b) = par value x coupon rate (PVIFA 12.7%, 4 yrs) + principal (PVIF 12.7%, 4 yrs)

\[ = 1000 \times 7 \times (PVIFA 12.7\%, 4\text{ yrs}) + 1000 \times (PVIF 12.7\%, 4\text{ yrs}) \]

\[ = 1000 \times 3.037 + 1000 \times 0.636 \]

\[ = 3037 + 636 \]

\[ = 3673. \]

\[ \frac{939.70 \times 10}{939.70} = 10.65\% \]
A coupon bond that pays interest annually has a par value of Rs. 1000 matures in 5 years and has a yield to maturity of 10%.

The intrinsic value of a bond today will be ______ if the coupon rate is 7%.

-\[\text{par value} \times \text{coupon rate} \times \left[ \text{PVIFA} \left( \frac{7}{2}, 1 \right) \right] + \text{principal} \times \left[ \text{PVIF} \left( \frac{7}{2}, 5 \right) \right] = 1000 \times 7\% \times 3.8491 + 1000 \times 0.7136 = 265.40 + 1000 = 1265.40\]

-\[\text{par value} \times \text{coupon rate} \times \left[ \text{PVIFA} \left( \frac{3}{2}, 5 \right) \right] + \text{principal} \times \left[ \text{PVIF} \left( \frac{3}{2}, 5 \right) \right] = 40 \times 7.922 + 1000 \times 0.6136 = 316.88 + 613.6 = 929.48\]

A coupon bond that pays interest semi-annually (Half-yearly) has a par value of Rs. 1000 matures in 5 years and has a yield to maturity of 9.1%. The intrinsic value of a bond today will be ______ if the coupon rate is 8%.

-\[\text{par value} \times \text{coupon rate} \times \left[ \text{PVIFA} \left( \frac{8}{2}, 5 \times 2 \right) \right] + \text{principal} \times \left[ \text{PVIF} \left( \frac{8}{2}, 5 \times 2 \right) \right] = 1000 \times 8\% \times 7.922 + 1000 \times 0.6136 = 6336 + 613.6 = 6949.6\]

A bond, with a par value of Rs. 25000 and a coupon rate of 8%, matures over 10 years, and interest is payable semi-annually. The required rate of return on the bond is 10%. What is the value of the bond?

-\[25000 \times 8\% / 2 = 1000\]

-\[1000 \times \left[ \text{PVIFA} \left( \frac{8}{2}, 10 \times 2 \right) \right] + 25000 \times \left[ \text{PVIF} \left( \frac{8}{2}, 10 \times 2 \right) \right] = 1000 \times 11.4701 + 25000 \times 0.6813 = 11470.1 + 17032.5 = 28402.6\]

A bond has the face value of Rs. 10000 and coupon rate of 10%. It is quoted at Rs. 9200 in the secondary market. What is the current yield of the bond?

-\[\frac{10000 \times 10\%}{9200} = 10.87\%\]

A like to put money in an account today to make sure you and child

has enough money in 10 years to buy a car. If you would like to give

your child Rs. 10,00,000 in 10 years, and you know you can get 5% interest

per year from saving account during that time, how much should you put in the account now?

-\[\text{present value PV} = \frac{CF}{(1+r)^n} = \frac{10,00,000}{(1.05)^{10}} = 613913\]
(5) Calculate the present value on Jan 1, 2015 of an annuity of 5000 paid at the end of each month for the calendar year. The annual interest rate is 12%.

\[ \text{Annual Payment} = 5000 \]
\[ \text{Number of periods} = 12 \]
\[ \text{Rate of interest} = \frac{12}{12} = 1\% \]

\[ \text{Present Value} = 5000 \times \frac{1 - (1 + 0.01)^{-12}}{0.01} = 5000 \times \frac{1 - 0.9045}{0.01} = 5000 \times 9.9029 = 49,514.50 \]

(6) £ was invested on Jan 1, 2015 such that it generated a periodic payment of £10,000 at the beginning of each month for the calendar year 2015. The interest rate on the investment was 12%. Calculate the original investment and the interest earned.

\[ \text{Investment} = 10,000 \]
\[ \text{Period} = 12 \]
\[ \text{Present Value} = 10,000 \times \frac{1 - (1 + 0.01)^{-12}}{0.01} \times (1 + 0.01) = 10,000 \times \frac{1 - 0.9045}{0.01} \times 1.01 = 10,000 \times 9.9029 \times 1.01 = 101,842.89 \]
\[ \text{Interest Earned} = 101,842.89 - 113,673.20 = 12,826.31 \]

(7) A bond whose par value is Rs1000 bears a coupon rate of 12% and has a maturity period of 3 years. The required rate of return on bond is 10%. What is the value of this bond?

\[ \text{Annual Interest Payable} = 1000 \times 0.12 = 120 \]
\[ \text{Principal Repayment at the end of 3 years} = \text{Rs}1000 \]
\[ \text{Value of bond} = 120 \times (\text{PVIFA} 10\%, 3\text{years}) + 1000 = 120 \times (2.487) + 1000 \times 0.751 \]
\[ = 298.44 + 751 \]
\[ = 1049.44 \]

* How to calculate PVIF on calculator: *

Assume int rate is 10%, year 5 years.
Add \( \frac{1}{10} \) and click on button first time.
Again = button second time.
Again = button third time.
Again = button fourth time.
Again = button fifth time time, 8 years.
And will shown as PVIF.

PVIF = 0.620
Yield to maturity (YTM)

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

Yield to Maturity (Kd)

\[ 850 = 80 \times \text{PVIFA}(10\%, 9) + 1000 \times \text{PVIF}(10\%, 9) \]

Calculating Kd with some different values:

\[ Kd = 10\% \]

\[ 850 = 80 \times \text{PVIFA}(10\%, 9) + 1000 \times \text{PVIF}(10\%, 9) \]

\[ = 80 \times 5.328 + 1000 \times 0.361 \]

\[ = 426.24 + 361 \]

\[ = 787.24 \]

Above value is less than 850, try with value less than 12%.

\[ Kd = 10\% \]

\[ 850 = 80 \times \text{PVIFA}(10\%, 9) + 1000 \times \text{PVIF}(10\%, 9) \]

\[ = 80 \times 5.759 + 1000 \times 0.424 \]

\[ = 851.72 \]

From above two cases we have clear that Kd lies between 10-12%. Now we have to use linear interpolation in the range of 10% & 12%.

Using it we find that Kd is equal to the following:

\[ \frac{(851.72 - 850)}{(884.72 - 787.24)} \]

\[ = \frac{34.72}{97.48} \]

\[ = 0.71 \]

Yield to Maturity is 10.71%.

Duration of Bond

The face value of the bond is Rs 1000, its coupon rate is 8%, and time to maturity is 9 years. Calculate the duration of the bond and find the YTM is 10%. Calculate modified duration.

\[ \text{Duration of Bond} = \frac{\sum \text{CF} \times \text{PVF}}{\text{PV of CFs}} \]

<table>
<thead>
<tr>
<th>T</th>
<th>CF</th>
<th>PVF</th>
<th>CF x PVF</th>
<th>CF x PVF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1000</td>
<td>0.909</td>
<td>909</td>
<td>909</td>
</tr>
<tr>
<td>2</td>
<td>1000</td>
<td>0.826</td>
<td>826</td>
<td>1652</td>
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<td>3</td>
<td>1000</td>
<td>0.751</td>
<td>750</td>
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<td>1000</td>
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<td>3008</td>
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<td>1000</td>
<td>0.618</td>
<td>618</td>
<td>618</td>
</tr>
<tr>
<td>6</td>
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<td>7</td>
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<td>498</td>
<td>498</td>
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<tr>
<td>8</td>
<td>1000</td>
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<td>446</td>
<td>446</td>
</tr>
<tr>
<td>9</td>
<td>1000</td>
<td>0.398</td>
<td>398</td>
<td>398</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>54866</td>
</tr>
</tbody>
</table>

Duration of Bond = \[ \frac{54866}{9999} = 3.49 \]

Modified Duration of Bond = \[ \frac{3.49}{1 + 10\%} = 3.14 \]
Problems on Depreciation

1. On Jan 01, 2000, Miss Shiv Mohan Enterprise purchased a plant costing Rs 41,000 and spent Rs 4,000 on its erection. The estimated effective life of the plant is 10 years and scrap value is Rs 5,000. Advise the depreciated value at the end of 3rd year under Straight Line method (SLM).

\[\begin{align*}
41,000 + 4,000 &= 45,000 \\
45,000 - 5,000 &= 40,000 \\
\frac{40,000}{10} &= 4,000 \\
4,000 \times 3 \text{rd year} &= 12,000 \\
45,000 - 12,000 &= 33,000
\end{align*}\]

2. A firm had purchased machinery worth Rs 50,000 on April 19, 2002. Its useful economic life is expected to be 5 years at the end of which it will have a scrap value of Rs 14,000. What will be amount of depreciation?

\[\begin{align*}
50,000 - 14,000 &= 36,000 \\
\frac{36,000}{5} &= 7,200
\end{align*}\]

3. A firm had purchased a truck for a sum of Rs 2,200 on Jan-01,2001 and it charges depreciation at 20% per annum on Fixed price written down value method. The truck was sold on July 01, 2002 for Rs 1,600. Advise the amount of profit or loss on the truck.

\[\begin{align*}
22,000 \times \frac{20}{100} &= 4,400 \\
16,600 \times \frac{20}{100} &= 3,320 \\
\frac{3,320}{2} &= 1,660
\end{align*}\]

4. A firm had expected the useful life of 5 years for a machinery at a cost with scrap value of Rs 2,000. The machinery is sold at the end of 3rd year for Rs 1,000, what is the profit or loss to the firm on the sale if it is charged on SLM basis.

\[\begin{align*}
28,000 - 20,000 &= 18,000 \\
\frac{18,000}{5} &= 3,600 \\
3,600 \times 3 &= 10,800 - 20,000 &= 8,200 \\
9,000 - 8,200 &= 2,000 \text{ loss.}
\end{align*}\]
5) A machinery costs Rs. 21000. Its economic life is given as 5 years for a firm. Its salvage value is Rs. 4000. What is the amount of annual depreciation?

\[
\text{Depreciation} = \frac{\text{Cost} - \text{Salvage Value}}{\text{Life}} = \frac{21000 - 4000}{5} = \frac{17000}{5} = 3400 \text{ Rupees per year.}
\]

6) A machinery costs Rs. 21000. Its economic life is given as 5 years for a firm. Its salvage value is Rs. 4000. What is the written down value after 3 years?

\[
\text{Depreciation in the first year} = \frac{21000 - 4000}{5} = \frac{17000}{5} = 3400 \text{ Rupees.}
\]

\[
\text{Depreciation in the second year} = \frac{17000 - 3400}{5} = \frac{13600}{5} = 2720 \text{ Rupees.}
\]

\[
\text{Depreciation in the third year} = \frac{13600 - 2720}{5} = \frac{10880}{5} = 2176 \text{ Rupees.}
\]

\[
\text{Written down value after 3 years} = 21000 - (3400 + 2720 + 2176) = 21000 - 6396 = 14604 \text{ Rupees.}
\]
Foreign Exchange Arithmetic

1. In London market, the US $ and Euro rate is 1 US $ = 0.70 Euro. In Mumbai, the US $ and Rupee (INR) rate is 1 US $ = Rs 46.20. Calculate the Euro/Rupee rate.

\[
\begin{align*}
\frac{1}{0.70} & = 1.4285 \\
\frac{1}{46.20} & = 0.02164 \\
\frac{1.4285}{0.02164} & = Rs 66.67
\end{align*}
\]
Ratio Analysis

1. A borrowers firm submits to the commercial bank the balance sheet with following particulars:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital &amp; Reserve</td>
<td>24 lacs</td>
</tr>
<tr>
<td>Trade Creditors</td>
<td>12 lacs</td>
</tr>
<tr>
<td>Bank Cash Credit</td>
<td>20 lacs</td>
</tr>
<tr>
<td>Security for Electricity</td>
<td>4 lacs</td>
</tr>
<tr>
<td>Stocks</td>
<td>30 lacs</td>
</tr>
<tr>
<td>Cash &amp; Bank Balance</td>
<td>6 lacs</td>
</tr>
<tr>
<td>Sales</td>
<td>120 lacs</td>
</tr>
</tbody>
</table>

Current Ratio = \[ \frac{\text{Current Assets}}{\text{Current Liabilities}} \]

Current Ratio = \[ \frac{\text{Stocks + Bank Cash Credit}}{\text{Trade Creditors + Book Debt + Sec for Electricity}} \]

Quick/Acid Test Ratio = \[ \frac{\text{Liquid Assets}}{\text{Current Liabilities}} \]

Liquid Assets Not Included Stocks & Prep. Expenses

Stock Turnover Ratio = \[ \frac{\text{Cost of Goods Sold during Year (COGS)}}{\text{Average Inventory (IA)}} \]

Debt Equity Ratio = \[ \frac{\text{External Equity}}{\text{Total Long Term Debt}} \]

Debtor's Turnover Ratio = \[ \frac{\text{Credit Sales or Total Sales}}{\text{Average Account Receivable}} \]

Debtor's Turnover Ratio = \[ \frac{\text{Credit Sales or Total Sales}}{\text{Average Account Receivable}} \]

Ans: 1.4 months
A partnership firm wants to shift their dealing from another bank to your branch a provides the following details about their balance sheet:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partners Capital</td>
<td>16</td>
</tr>
<tr>
<td>Loan from NBFC</td>
<td>12</td>
</tr>
<tr>
<td>Bank Limit</td>
<td>28</td>
</tr>
<tr>
<td>Trade Creditors</td>
<td>4</td>
</tr>
<tr>
<td>Land &amp; Building/Plant</td>
<td>24</td>
</tr>
<tr>
<td>Investment in Nscs</td>
<td>8</td>
</tr>
<tr>
<td>Stocks</td>
<td>14</td>
</tr>
<tr>
<td>Bills receivables</td>
<td>8</td>
</tr>
<tr>
<td>Cash in hand</td>
<td>4</td>
</tr>
<tr>
<td>General Reserves</td>
<td>4</td>
</tr>
<tr>
<td>Loan from friends</td>
<td>6</td>
</tr>
<tr>
<td>Bills Payable</td>
<td>5</td>
</tr>
<tr>
<td>Provisions</td>
<td>2</td>
</tr>
<tr>
<td>Vehicles</td>
<td>8</td>
</tr>
<tr>
<td>Pre-operative Exp.</td>
<td>2</td>
</tr>
<tr>
<td>Consumable Stores</td>
<td>2</td>
</tr>
<tr>
<td>Sundry debtors</td>
<td>10</td>
</tr>
<tr>
<td>Salds</td>
<td>200</td>
</tr>
</tbody>
</table>

**Current Ratio**

\[
\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}
\]

\[
= \frac{60 + 50 + 11}{50 + 50} = \frac{121}{100} = 1.21
\]

**Debt Equity Ratio**

\[
\text{Debt Equity Ratio} = \frac{\text{Net Long Term Debt}}{\text{Long Term Fund}}
\]

\[
= \frac{Nsc + Loan from NBFC}{\text{Partners Capital + General Reserve}}
\]

\[
= \frac{8 + 12}{16 + 4} = \frac{20}{20} = 1.1
\]

**Acid Test Ratio (Quick Ratio)**

\[
\text{Quick Ratio} = \frac{\text{Current Assets} - \text{Stocks} - \text{Bank Cash} \text{ Credit}}{\text{Current Liabilities}}
\]

\[
= \frac{60 + 50 + 11}{50 + 50} = \frac{121}{100} = 1.21
\]

**Stock Turnover Ratio**

\[
\text{Stock Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}
\]

\[
\text{Ans} = 14.3 \text{ times}
\]

**Debtors Velocity Ratio**

\[
\text{Debtors Velocity Ratio} = \frac{\text{Credit Sales}}{\text{Debtors turnover period}}
\]

\[
\text{Ans} = 10.3 \text{ months}
\]

**Creditors Velocity Ratio**

\[
\text{Creditors Velocity Ratio} = \frac{\text{Credit Receivables}}{\text{Credit Payment Period}}
\]

\[
\text{Ans} = 0.9 \text{ months}
\]
Mr XYZ had the following trial balances as on 31/3/03

- Capital: 1100
- Bank Credit: 1330
- Creditors: 280
- Stocks: 120
- Cash: 0.6
- Purchases: 350
- Net Profit: 6.4

Net Profit Ratio = \( \frac{\text{Net Profit before Tax}}{\text{Sales}} \) x 100
= \( \frac{6.4}{5} \) x 100
= 80%

Gross Profit = Sales - Cost of Sales
= 5.4 - 100

Debt Collection Period = \( \frac{\text{Account Receivable}}{\text{Average Monthly Credit Sales}} \)
= \( \frac{1005}{5} \) x 12
= 20.52

Quick Ratio
= 65

Current Ratio
= 1.36

Debt Equity Ratio
= 0.82

Return on Equity
= 41.41%

Stock Turn Over Ratio
= 4.2 times
| Year | 1% | 2%  | 3%  | 4%  | 5%  | 6%  | 7%  | 8%  | 9%  | 10% | 11% | 12% | 13% | 14% | 15% | 16% | 17% | 18% | 19% | 20% |
|------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0    | 1  | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 1    | 0.98022 | 0.96092 | 0.94129 | 0.92137 | 0.90118 | 0.88071 | 0.86006 | 0.83924 | 0.81835 | 0.79738 | 0.77634 | 0.75522 | 0.73403 | 0.71276 | 0.69141 | 0.67000 | 0.64852 | 0.62706 | 0.60565 |
| 2    | 0.96092 | 0.92137 | 0.88071 | 0.86006 | 0.85909 | 0.84804 | 0.83752 | 0.82656 | 0.81533 | 0.79381 | 0.77104 | 0.74798 | 0.72467 | 0.70111 | 0.67730 | 0.65324 | 0.62891 | 0.60427 | 0.57938 |
| 3    | 0.94129 | 0.88071 | 0.86006 | 0.84804 | 0.84311 | 0.83168 | 0.82054 | 0.80959 | 0.79871 | 0.78789 | 0.77704 | 0.76619 | 0.75522 | 0.74402 | 0.73251 | 0.72074 | 0.70869 | 0.69635 | 0.68373 |
| 4    | 0.92137 | 0.86006 | 0.84804 | 0.83168 | 0.81869 | 0.80644 | 0.79432 | 0.78240 | 0.77053 | 0.75864 | 0.74666 | 0.73458 | 0.72241 | 0.71001 | 0.69731 | 0.68436 | 0.67116 | 0.65769 | 0.64393 |
| 5    | 0.90118 | 0.84311 | 0.81869 | 0.80644 | 0.79432 | 0.78240 | 0.77053 | 0.75864 | 0.74666 | 0.73458 | 0.72241 | 0.71001 | 0.69731 | 0.68436 | 0.67116 | 0.65769 | 0.64393 | 0.63005 | 0.61598 |

**Note:** Present Value Factor of a Lump Sum (PVF) at Re 1
### Discount Table

<table>
<thead>
<tr>
<th>Year</th>
<th>15%</th>
<th>20%</th>
<th>25%</th>
<th>30%</th>
<th>35%</th>
<th>40%</th>
<th>45%</th>
<th>50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.8635668</td>
<td>0.8333333</td>
<td>0.8000000</td>
<td>0.7692311</td>
<td>0.7407411</td>
<td>0.7142857</td>
<td>0.6909091</td>
<td>0.6695656</td>
</tr>
<tr>
<td>2</td>
<td>0.7581444</td>
<td>0.7244444</td>
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<td>0.6410256</td>
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<td>3</td>
<td>0.6657616</td>
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</tr>
<tr>
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<td>0.3846154</td>
<td>0.3589744</td>
<td>0.3352941</td>
<td>0.3137254</td>
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</tr>
<tr>
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<tr>
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</tr>
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<td>0.1669077</td>
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<tr>
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<tr>
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\[
V_n = \frac{1}{1 + r}
\]

\[
V_n = \text{is the present worth of an amount of 1 at the end of term.}
\]

**Internal Rate of Return**

\[
\text{Internal Rate of Return} = \text{Lower Discount Rate} + \text{Diff. between two Discount rates} \\
\text{Present worth of cash flow at the lower discount rate} - \text{absolute difference between the present worth of cash flow at the two discount rates}
\]

\[
\text{Absolute difference between the present worth of cash flow at the two discount rates}
\]
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**Note:** The table contains numerical data with columns labeled from 1 to 25 and rows labeled from 1 to 25. Each cell contains a number.