

## IAT - 2 Solutions

1. a) The growth of ABC company at present is 21%. This is assumed to continue for the next 5 years and after that it is assumed to have a growth rate of 10% indefinitely. The dividend paid for the year 1997-98 is 32%. The required rate of return is 20% and the present price is Rs 57, what is the estimated price according to the two stage model

Sol.

$$g_1 = 21\%$$

$$n = 5 \text{ years}$$

$$g_2 = 10\%$$

$$D_0 = 32\%$$

$$= 10 \times 32\%$$

$$= 3.2$$

$$D_1 = 3.2(1+0.2)$$

$$= 3.872$$

$$r = 20\%$$

$$\begin{aligned}
 P_0 &= D_1 \left[ \frac{1 - \left( \frac{1+g_1}{1+r} \right)^n}{r-g_1} \right] + D_1 \left[ \frac{(1+g_1)^{n-1} (1+g_2)}{r-g_2} \right] \left[ \frac{1}{(1+r)^n} \right] \\
 &= 3.872 \left[ \frac{1 - \left( \frac{1+0.21}{1+0.20} \right)^5}{0.20-0.21} \right] + 3.872 \left[ \frac{(1+0.21)^5 - 1}{0.1} (1+0.1) \right] \left[ \frac{1}{(1+0.2)^5} \right] \\
 &= 3.872 \left[ \frac{1 - 1.0423}{-0.01} \right] + 3.872 \left[ \frac{2.357}{0.1} \right] \left[ \frac{1}{2.488} \right] \\
 &= 3.872 \left[ \frac{-0.423}{-0.01} \right] + 3.872(23.57)(0.4018) \\
 &= 16.378 + 36.65 \\
 &= 53.0206
 \end{aligned}$$

1. b) Explain the macro economic factors affecting stock price

Sol. A macroeconomic factor is economic, natural, geopolitical or other factors that affect the economy of a country.

1) GDP or Gross Domestic Product

2) Inflation

3) Unemployment Rate

4) Retail sales

5) Industrial Output

2a) Arun buys a bond with 5 years to maturity. The bond has a coupon rate of 8.5%, and is priced at 954/- in the market. The bond has a face value of the 1000/- and YTM of 10%. What is the duration of the bond? Also calculate modified duration of the bond. What does it signify.

Sol  $n=5$   $Cr = 8.5 \times 1000 = 85$   $FV = 1000$   $YTM = 10\%$

| Year | CIF  | PVIF @ 10% | PV of CIF     | Proportion | time         |
|------|------|------------|---------------|------------|--------------|
| 1    | 85   | 0.909      | 77.265        | 0.081      | 0.081        |
| 2    | 85   | 0.826      | 70.21         | 0.074      | 0.148        |
| 3    | 85   | 0.751      | 63.83         | 0.0676     | 0.2028       |
| 4    | 85   | 0.683      | 58.055        | 0.061      | 0.244        |
| 5    | 1085 | 0.621      | 673.78        | 0.714      | <u>3.57</u>  |
|      |      |            | <u>943.14</u> |            | <u>4.245</u> |

Modified duration of Bond =  $\frac{D}{1+y}$

$\frac{4.245}{1+0.10} = 3.85$

Sania buys a bond with 4 years to maturity. The bond has a coupon rate of 9% and is priced 100/- in the market

-> what is the duration of bond?

-> what will be the % change in the price of the bond if the interest rate rises to 10%.

| Year | CIF | PVIF @ 9 | PV of CIF     | Proportion | time          |
|------|-----|----------|---------------|------------|---------------|
| 1    | 9   | 0.914    | 8.253         | 0.082      | 0.082         |
| 2    | 9   | 0.842    | 7.578         | 0.075      | 0.15          |
| 3    | 9   | 0.772    | 6.948         | 0.069      | 0.20          |
| 4    | 109 | 0.708    | 77.172        | 0.772      | <u>3.0884</u> |
|      |     |          | <u>99.951</u> |            | <u>3.5204</u> |

Modified Duration =  $\frac{D}{1+y} = \frac{3.5204}{1+0.10} = 3.20$

2b. Anand own 1000/- face value Bond with 5 year maturity. The bond has annual coupon of 75 which is currently price @ 970/- given an appropriate discount rate 10%. Should Anand hold or sell the bond.

sol.  $FV = 1000 = M$

$$n = 5$$

$$C = 75$$

$$M = 970$$

$$r = 10\%$$

$$\begin{aligned} PV &= [C \times PVIFA(r, n)] + [M \times PVIF(r, n)] \\ &= 75 \times PVIFA(10, 5) + 1000 \times PVIF(10, 5) \\ &= 75 \times 3.7908 + 1000 \times 0.6209 \\ &= 905.21 \end{aligned}$$

Anand should sell the bond as market price is more than PV of Bond.

c. ABC earning and dividends have been growing at a rate of 18% per annum. Its growth rate is expected to continue for 4 years. After that the growth will fall to 12% for the next 4 years. Thereafter the growth rate is expected to be 6% forever. If the last dividend / share was Rs. 2 and the investors rate of return on ABC is 15%. What is the intrinsic value / share.

Sol  $D_0 = 2$        $g_1 = 18\%$        $g_3 = 6\%$   
 $r = 15\%$        $g_2 = 12\%$

Calculation of total present value of dividend

| Year | Dividend $D_t = D_0(1+g_t)$ | PVIF @ 15% | PV of Cash Flow |
|------|-----------------------------|------------|-----------------|
| 1    | $2(1+0.18) = 2.36$          | 0.870      | 2.053           |
| 2    | $2.36(1+0.18) = 2.78$       | 0.756      | 2.101           |
| 3    | $2.78(1+0.18) = 3.28$       | 0.658      | 2.158           |
| 4    | $3.28(1+0.18) = 3.87$       | 0.572      | 2.213           |
| 5    | $3.87(1+0.12) = 4.33$       | 0.497      | 2.122           |
| 6    | $4.33(1+0.12) = 4.84$       | 0.432      | 2.090           |
| 7    | $4.84(1+0.12) = 5.43$       | 0.376      | 2.041           |
| 8    | $5.43(1+0.12) = 6.07$       | 0.327      | 1.984           |
|      |                             |            | <hr/> 16.762    |

$$P_8 = \frac{D_9}{(r-g_3)} = \frac{6.43}{0.15-0.06} = 71.49$$

Calculation of PV constant growth rate =  $\frac{71.49}{(1+0.15)^8} = 23.43$

$P_0 =$  Total present value of Dividend + Present value of Constant Growth

$$P_0 = 16.762 + 23.43$$

$$P_0 = 40.192$$

3a) Explain briefly the Dow theory

The Dow theory originally proposed by Charles H. Dow the editor of Wall Street Journal, oldest and best known theory. Dow formulated a hypothesis that the stock market does not move on a random basis but is influenced by three distinct cyclical trends that guide its direction.

The market has three movements

→ Primary movement (Tides)

→ Secondary Reactions (waves)

→ Minor movements (Ripples)

→ Primary movements Bull and Bear Trends.

Limitation

\* It does not explain why the two averages should be able to forecast future stock prices.

3b) Consider Rs 100 par value bond carries a coupon of 14% and maturity after 10 years is 80/- what is the YTM bond? what will be the RYTM if the re-investment rate is applicable for future cash flows is 10%.

sol. Face value = 100      n = 10      P<sub>1</sub> = 80      Cr = 14%

$$YTM = \frac{C + \left(\frac{M-P}{N}\right)}{\frac{M+P}{2}} \times 100$$

$$= \frac{14 + \left[\frac{100-80}{10}\right]}{\frac{100+80}{2}} \times 100 \Rightarrow \frac{14}{90} \times 100 = 17.7\%$$

RYTM      FV of Bond = 14 × FVIFA(10, 10) + 100  
 = 14 × 15.937 + 100 = 323.11

$$PV(1+r)^n = FV \text{ of Bond}$$

$$80(1+r)^{10} = 323.11$$

$$(1+r)^{10} = \frac{323.11}{80}$$

$$1+r = (4.03)^{1/10}$$

$$1+r = 1.14$$

$$r = 0.14 \Rightarrow 14\%$$

2c) How do you propose to test the super strong form of market efficiency.

Sol. Market efficiency refers to how well prices reflect all available information. The efficient markets hypothesis (EMH) argues that markets are efficient, leaving ~~no~~ room to make excess profits by investing since everything is already fairly and accurately priced.

Strong form efficiency is the most stringent version of the efficient market hypothesis (EMH) investment theory, stating that all information in a market, whether public or private, is accounted for in a stock's price. This degree of market efficiency implies that profits exceeding normal returns cannot be realized regardless of the amount of research or information investors have access to.

Strong form efficiency is a component of the EMH and is considered part of the random walk theory. It states that the price of securities and therefore the overall market, are not random and are influenced by past events. Strong form efficiency is one of the three different degrees of the EMH, the others being weak and semi-strong efficiency. Each one is based on the same basic theory but varies slightly in terms of stringency.

## 4. Case study

Mr. Madar set up a magnum securities in 1995 has a stock broking firm, which acquired membership of Bombay stock exchange. Till 2010, the bulk of income of magnum securities came from stock broking. Magnum securities has recently set up a debt division. Madar sees a great potential in the debt market. After graduating from a premier business school, you have worked in a mutual fund organization looking after its debt schemes. Recently Madar met you at a investment conference, where you gave a talk on debt funds. Mr. Madar has requested you to use following data on bond A which is currently one of the most actively traded bonds.

### Bond A

|                   |         |
|-------------------|---------|
| Face value        | 100     |
| Coupon rate       | 15%     |
| Years to maturity | 6 years |
| Redemption value  | 100     |
| Yield to maturity | 18%     |

→ What is duration of bond A  
→ Calculate the modified duration

| sol | Year | CIF | PVIF @ 18% | PV of CIF     | Proportion | time         |
|-----|------|-----|------------|---------------|------------|--------------|
|     | 1    | 15  | 0.847      | 12.705        | 0.142      | 0.142        |
|     | 2    | 15  | 0.718      | 10.77         | 0.120      | 0.24         |
|     | 3    | 15  | 0.609      | 9.135         | 0.102      | 0.306        |
|     | 4    | 15  | 0.516      | 7.74          | 0.08       | 0.32         |
|     | 5    | 15  | 0.437      | 6.555         | 0.07       | 0.35         |
|     | 6    | 115 | 0.370      | 42.55         | 0.475      | 9.85         |
|     |      |     |            | <u>89.455</u> |            | <u>4.208</u> |

$$\text{Duration} = 4.208$$

$$\text{Md of Bond} = \frac{D}{1+y} = \frac{4.208}{1+0.18} = \frac{4.208}{1.18}$$

$$= 3.5611$$