

Fixed Income Securities

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Chapter - 8 Fixed Income Securities

Concept:

Those securities whose income is fixed at the time of issue are called fixed income securities. Fixed income securities can be classified into following two types according to their life or maturity.

1. Short term fixed income securities (money market instruments)
2. Long term fixed income securities (capital market instruments)

Examples of short term fixed income securities:

1. Treasury Bill (T-Bill)
2. Commercial paper
3. Certificate of Deposit (CD)
4. Banker's Acceptance (BA)
5. Repurchase Agreement (Repo)

* Treasury Bill:

- Issued at discount and Redeemed at par.
- Discount Yield (D) / Bank Discount Yield (BDY) / Bank Discount Rate

$$D = \frac{\text{Face Value} - \text{purchase price}}{\text{Face value}} \times \frac{360}{t}$$

Where,

$$\text{Discount Rc.} = FV - PP$$

t = Term to maturity

→ Bond Equivalent Yield (BEY) / Coupon Equivalent Yield / Annual Equivalent Yield

$$BEY = \frac{\text{Face value} - \text{purchase price}}{\text{purchase price}} \times \frac{365}{t}$$

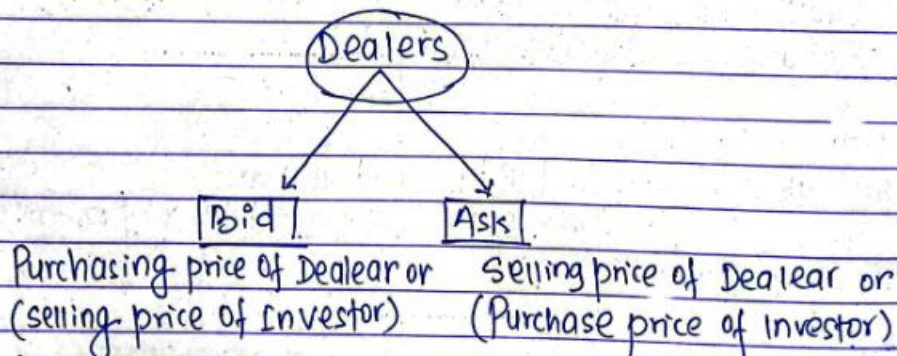
→ Maturity of T-Bill:

13 weeks → 90 days

26 weeks → 180 days

52 weeks → 360 days

→ T-Bill Quotation:



• Maturity (11/14/91) $\Rightarrow$ It indicates that the given T-bill will be matured on 14th November 1991.

• Days to maturity (170 days) $\Rightarrow$ It indicates that remaining life of T-bill from the day of quotation is 170 days.

• Bid (5.57) $\Rightarrow$ It is the annualized discount percentage at which the dealer is willing to purchase the given T-bill on the day of quotation.

Calculation of Rs. price of Bid
Suppose $FV = \text{Rs. } 1000$

We have,

$$D = \frac{FV - P}{FV} \times \frac{360}{t}$$

$$0.0557 = \frac{1000 - P}{1000} \times \frac{360}{170}$$

$$\therefore P = \text{Rs. } 973.69 \quad (\text{Purchasing price of dealer or selling price of investor})$$

• Ask (5.55) $\Rightarrow$ It is the annualized discount percentage at which the dealer is willing to sell the given T-bill on the day of quotation.

Calculation of Ask price.

Suppose $FV = \text{Rs. } 1000$

$$D = \frac{FV - P}{FV} \times \frac{360}{t}$$

$$0.0555 = \frac{1000 - P}{1000} \times \frac{360}{170}$$

$$\%P = \text{Rs. } 973.79 \quad \left(\begin{array}{l} \text{selling price of dealer or} \\ \text{purchase price of investor} \end{array} \right)$$

$$\begin{aligned} \% \text{ Dealer's Spread} &= \text{Rs. price of Ask} - \text{Rs. price of Bid} \\ &= 973.79 - 973.69 \\ &= \text{Rs. } 0.10 \end{aligned}$$

• Change $(-0.03) \Rightarrow$ It indicates the difference between the given bid and previous day's bid.

$$\begin{aligned} \% \text{ previous day's Bid} &= \text{Given bid} - \text{change} \\ &= 5.57 - (-0.03) \\ &= 5.57 + 0.03 = 5.60 \end{aligned}$$

• Ask Yield $(5.79) \Rightarrow$ It is the annualized rate of return to be earned from the given T-bill if one would purchase the given T-bill on given ask price and hold it until maturity. It is also called Bond Equivalent Yield (BEY).

Calculation of Ask Yield:

$$\begin{aligned}\% \text{ Ask Yield} &= \frac{FV - P}{P} \times \frac{365}{t} \\ &= \frac{1000 - 973.79}{973.79} \times \frac{365}{170} \\ &= 5.79\%\end{aligned}$$

Problem 8.1

Solⁿ

Given:

Face value = Rs. 100,000

Price = Rs. 96,000

Days to maturity = 180 days

$$\begin{aligned}\text{a. 180-days Discount rate} &= \frac{\text{Face value} - \text{Price}}{\text{Face value}} \\ &= \frac{100,000 - 96,000}{100,000} = 4\%\end{aligned}$$

$$\begin{aligned}\text{b. Annual Discount rate} &= \frac{\text{Face value} - \text{Price}}{\text{Face value}} \times \frac{360}{t} \\ &= \frac{100,000 - 96,000}{100,000} \times \frac{360}{180} \\ &= 8\%\end{aligned}$$

$$\begin{aligned} \text{c. 180-days Yield or HPR} &= \frac{\text{Face value} - \text{Price}}{\text{Price}} \\ &= \frac{100,000 - 96,000}{96,000} = 4.17\% \end{aligned}$$

$$\begin{aligned} \text{d. Annual Equivalent Yield} &= \frac{\text{Face value} - \text{Price}}{\text{Price}} \times \frac{365}{t} \\ &= \frac{100,000 - 96,000}{96,000} \times \frac{365}{180} \\ &= 8.45\% \end{aligned}$$

Problem 8.2

Solⁿ

Given:

Face Value = Rs. 25,000

Maturity period (t) = 91 days

Bank Discount yield (D) = 6%

a. Price of T-bill = ?

$$D = \frac{\text{Face value} - \text{price}}{\text{Face value}} \times \frac{360}{t}$$

$$0.06 = \frac{25,000 - \text{Price}}{25,000} \times \frac{360}{91}$$

$$\therefore \text{Price} = \text{Rs. } 24620.83$$

$$b. 91\text{-days HPR} = \frac{\text{Face value} - \text{Price}}{\text{Price}}$$

$$= \frac{25000 - 24620.83}{24620.83}$$

$$= 1.54\%$$

$$c. \text{Bond equivalent yield} = \frac{\text{Face value} - \text{Price}}{\text{Price}} \times \frac{365}{t}$$

$$= \frac{25000 - 24620.83}{24620.83} \times \frac{365}{91}$$

$$= 6.17\%$$

$$d. \text{Effective annual yield} = [1 + \text{HPR}]^{\frac{365}{t}} - 1$$

$$= [1 + 0.0154]^{\frac{365}{91}} - 1$$

$$= 6.32\%$$

Problem 8:3

Soln

a. Bid is an annualized discount percentage at which the dealer is willing to purchase the given T-bill on the day of quotation whereas ask is the annualized discount percentage at which the dealer is willing to sell the given T-bill on the day of quotation.

b. The change of -0.03 means the current days price has been declined by 0.03% in comparison of previous day's price.

c. 5.78 % is the annualized yield.

Problem 8.4

Soln

a. Coupon Interest Rate = $9 \frac{3}{8} = 9.375 \%$

$$\text{Annual Interest} = 1000 \times 0.09375 = \text{Rs. } 93.75$$

$$\text{Semi-annual Interest} = \frac{I}{2} = \frac{93.75}{2} = \text{Rs. } 46.875$$

b. The term-to-maturity of the bond from February 2006 is 10 years. (2016-2006)

c. Ask = $106 \frac{30}{32}$ $\rightarrow$ Points 32 points = 1 no.

$$\text{Rs. price of Ask} = \left(106 + \frac{30}{32}\right) \% \text{ of face Value}$$

$$= 106.9375 \% \text{ of } 1000$$

$$= \text{Rs. } 1069.375$$

d. Dealers spread = Rs. price of Ask - Rs. price of Bid

$$= 1069.375 - 1068.125$$

$$= \text{Rs. } 1.25$$

Working Note:

$$\begin{aligned}\text{Rs. price of Bid} &= \left(106 + \frac{26}{32}\right) \% \text{ of Face Value} \\ &= 106.8125 \% \text{ of } 1000 \\ &= \text{Rs. } 1068.125\end{aligned}$$

2076 Q.No. 13

Solⁿ

NIBL 9S 20 → 2020
↓
Abbreviate form of Name
→ Semi-annually
→ Coupon rate

a. The coupon rate is 9%. The coupon rate is paid twice in a year i.e semi-annually.

b. The bond matures in 2020. 1200 bonds were traded on that day.

c. Close = $101\frac{6}{8}$

$$\begin{aligned}\text{Rs. price of close} &= 101\frac{6}{8} \% \text{ of Face Value} \\ &= 101.75 \% \text{ of } 1000 \\ &= \text{Rs. } 1017.5\end{aligned}$$

The current yield is calculated as follows:

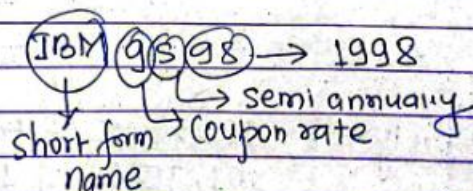
$$\begin{aligned}\text{Current yield} &= \frac{\text{Interest}}{\text{close price}} \times 100 \\ &= \frac{1000 \times 0.09}{1017.5} \times 100 \\ &= 8.85\%\end{aligned}$$

d. The net change $-\frac{1}{8}$ means that the closing price on the day of quotation has been declined by $\frac{1}{8}$ (0.125%) percentage of Rs. 1000 as compared to previous day's closing price.

$$\begin{aligned}\text{e. Previous day's close price} &= \text{close price} - \text{net change} \\ &= 1017.5 - (-0.125\% \text{ of } 1000) \\ &= 1017.5 + 1.25 \\ &= \text{Rs. } 1018.75\end{aligned}$$

2058 Func.

Soln



q. Interest on April 1 = $1000 \times 0.09 \times \frac{9}{12} = \text{Rs. } 22.5$

b. Close = 101.5

Rs. price of close = 101.5 % of face value
= 101.5 % of 1000
= Rs. 1015

c. The bond matures in 1998

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2068 Q.N.7

2065 Q.N.79

2063 Q.N.7

2068 Q.N.7

9017

q. Annual Interest = $1000 \times 0.08125 = \text{Rs. } 81.25$

Total Interest for 10 bonds = $10 \times 81.25 = \text{Rs. } 812.5$

b. The bond matures in 2022.

c. The current yield 7.9 means that annual coupon amount of Rs. 81.25 is the divisible of close price Rs. 1030.

Current Yield is calculated as follows:

$$\begin{aligned}\text{Current Yield} &= \frac{\text{Interest}}{\text{close price}} \\ &= \frac{81.25}{103\% \text{ of } 1000} \\ &= \frac{81.25}{1030} \\ &= 7.9\%\end{aligned}$$

d. close = 103

$$\% \text{ close price} = 103\% \text{ of } 1000 = \text{Rs. } 1030$$

e. The net change of $+\frac{1}{2}$ indicates that the today closing price has been increased by $\frac{1}{2}$ (0.5%) than the previous day close price.

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