

# SUMMARY SHEET



## Bonds





# EduTap Hall of Fame



**RBI Grade B 2020 - 21**

**198 Selections Out of 257**



Mr. Ajil



Mr. Aman Choudhary



Mr. Arun Sharma



Ms. Ila Sahu



Mr. Nishant Yadav



Ms. Ojaswi Dale



Mr. Parimal S Athaley



Ms. Resmarani Sahoo



Mr. Ryan Varghese



Mr. Shubham



Mr. Somya Atre



Ms. Srishti Dabas



Ms. Twinkle Dahiya



Mr. Vaibhav Nayer

**SEBI Grade A 2020**

**63 Selections Out of 80**



Mr. Gaurav



Mr. Abhishek



Mr. Abhishek



Mr. Adesh



Mr. Adil



Miss. Gopika



Mr. Harsh



Miss. Akansha



Mr. Amit Meena



Mr. Dhruv



Mr. Digant



Mr. Durga Parsad



Mr. Hitesh



Mr. Johnson

**NABARD Grade A 2020**

**65 Selections Out of 69**



Mr. Gourav Kumar



Mr. Sayed Saif



Mr. Vinay Jadhav



Mr. Ratan Singh



Mr. Vishal Singla



Mr. Mohan Das



Miss. Garima



Mr. Amandeep



Miss. Arpita



Mr. Krishan Kumar



Mr. Shivam



Mr. Karan Sharma



Miss. Shivani Bhosle



Mr. Prasad

## Important Points

1. This Summary Sheet shall only be used for Quick Revision after you have read the Complete Notes
2. For Building Concepts along with examples/concept checks you should rely only on Complete Notes
3. It would be useful to go through this Summary sheet just before the exam or before any Mock Test
4. Questions in the exam are concept based and reading only summary sheets shall not be sufficient to answer all the questions

## 1 Summary Points

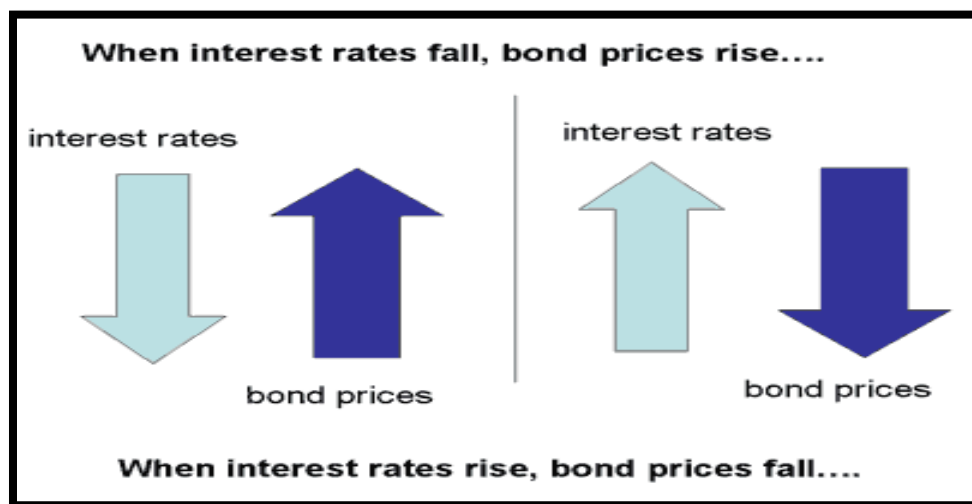
- A **Bond** is a financial **debt instrument** used to raise money by the **issuer** of the bond (e.g., Companies, sovereign government, states, etc.) from the lenders (e.g., retail investors, institutional investors, etc.) who invests in it to earn regular interest payments at a predetermined rate (**coupon rate**) and schedule until the **date of the maturity** of the bond when the initial borrowed amount (**face value**) is repaid by the issuer.
- **Basic Comparison between Debt and Equity**

Debt	Equity
Denotes funds owned by the company towards another party	Denotes funds raised by the company by issuing shares
Are Loan funds of the issuing entity	Are Own funds of the issuing entity
Reflects Obligation	Reflects Ownership
Holders of the instrument are the creditors/lenders	Holders of the instrument are the Proprietors
Types are term loans, debentures, bonds, etc.	Types are Shares and Stocks
Only predetermined Interest is earned by the holder	Dividends and any profits earned
Fixed and regular returns	Variable and irregular returns
Collateral is essential to secure loan, but funds can be raised otherwise too depending on the credit rating of the issuer	Collateral not required
Less Risky	High Risk factor comparatively
Gets primary claim on assets in case of bankruptcy	In case of liquidation of company, equity holders are paid at last after payment of all liabilities

## ➤ Characteristics of Bonds

**Example:** Company XYZ issues Rs. 1000 bonds which give a coupon rate of 10% per annum. The bonds are issued on 1<sup>st</sup> January 2017 and the duration is 10 years with the maturity date as 1<sup>st</sup> Jan 2027

- **Face Value/ Par Value/ Principal:** Denotes the amount of money a holder gets after the bond matures. In above example, Rs. 1000 is the face value.
- **Coupon/ Interest Rate:** Denotes the amount that bond holder receives as interest payments at a certain rate at regular interval. It can be paid monthly, quarterly, or yearly depending on the bond. Depending on interest rates, there can be two types of bonds i.e., **fixed-rate bond** (interest rate is fixed) and **floating-rate bond** (flexible interest rate that is marked to market rates through an index). In above example, it is 10%.
- **Maturity:** Denotes date in the future on which the investor's principal amount is repaid. In above example, maturity is in 10 years.
- **Issuer:** Denotes the entity that borrows money or issues bond to raise funds. In above example, Company XYZ is the issuer.
- **Bond Price:** It is different than the face value of the bond. It denotes the present discounted value of future cash streams generated by the bond. This computed value represents price of the bond which keeps on fluctuating on daily basis depending on the supply and demand at any moment. **Bond Price is dependent on the prevailing interest rates in the market depending on which it can either sell at premium or discounted rate.**



- ✓ **Yield:** Represents the returns earned on a bond. Formula for Yield is:

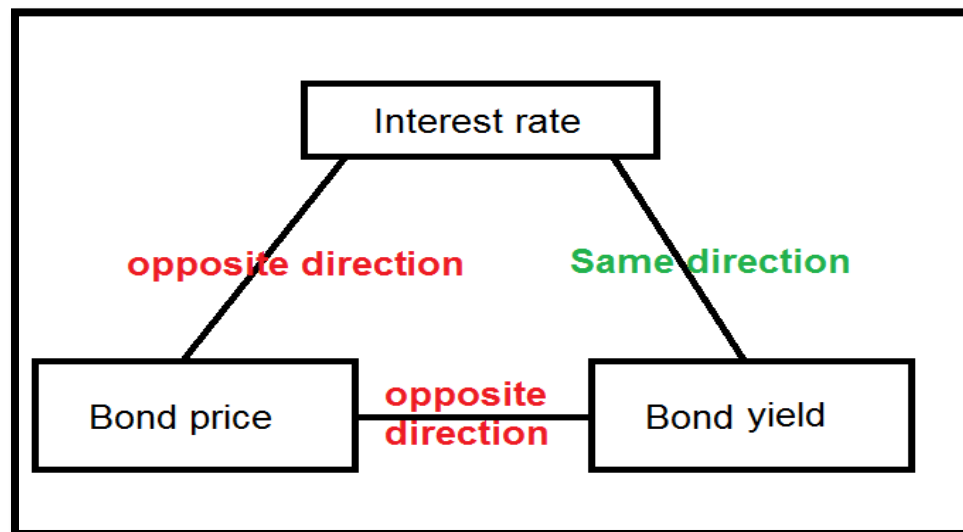
$$\text{Yield} = \text{Coupon amount} / \text{Price}$$

- ✓ **Yield to Maturity:** Denotes total internal rate of return of an investment in a bond if the investor holds the bond until maturity and if all payments are made as scheduled.



✓ **Relationship between Bond Price, Yield, and Interest Rate**

- ✓ Price of bond is inversely related to Interest Rates
- ✓ Price of Bond is inversely related to yields
- ✓ Yields are directly related to Interest Rates



- **Government Bonds:** Marketable securities issued by any sovereign government such as **treasury bills** (maturity in less than a year), **treasury bonds** (maturity in more than 10 years) and **treasury notes** (maturity in 1 to 10 years). Generally considered extremely safe instruments to invest with few exceptions (in case of developing countries).
- **Corporate Bonds:** Represent bonds issued by the corporate sector in the economy. Tend to give higher yields as there is a higher risk of a company defaulting than a government. Yields are dependent on the credit rating of the company bonds. **Higher the credit rating lesser the yield provided and vice-versa.**
- **Zero Coupon Bonds:** Denotes debt security that doesn't pay interest (coupon payments) but is traded at a deep discount, rendering profit at the maturity when the bond is redeemed at its full face value
- **Perpetual Bonds (Consol or prep):** Represents bond with no maturity date where issuers pay coupon payments regularly and do not have to redeem the principal. The formula for the present value of a perpetual bond is:

$$\text{Present value} = D / r$$

Where:

**D** = periodic coupon payment of the bond

**r** = discount rate applied to the bond

➤ **Bond Type Specifics:** Complex Bonds get classified depending on its type of **issuer, priority, coupon rate, and redemption features**

- ✓ **Bond Issuer:** Credit quality of a bond determines the risk factor inherent in the bond. Bonds can be issued by corporate as well as government in which case government bonds are less risky
- ✓ **Bond Priority:** Priority indicates your place in line should the company default on payments. This can be **unsubordinated (senior) security** i.e., first in line to receive payment if company goes into liquidation and **subordinated (junior) debt security** i.e., after senior debt holders get paid
- ✓ **Coupon Rate:** Depending on the coupon rate applied bonds get distinguished. These can be **fixed- rate bonds, floating rate bonds, inverse floater bonds** (variable coupon rate that changes in direction opposite to that of short-term interest rates) and **zero-coupon bonds**
- ✓ **Redemption Features:** Based on redemption features bonds could get further classified. Following can be three types:
  - **Callable or a redeemable bond:** Gives the bond issuer the right but not the obligation to redeem their issue of bonds before the bond's maturity date
  - **Convertible bonds:** Gives bondholders the right but not the obligation to convert their bonds into a predetermined number of shares at predetermined dates prior to the bond's maturity
  - **Puttable bonds:** Gives bondholders the right but not the obligation to sell their bond back to the issuer at a predetermined price and date

➤ **Bond Pricing Formula:**

$$\text{Bond Price} = C * \left[ \frac{1 - \left[ \frac{1}{(1+i)^n} \right]}{i} \right] + \frac{M}{(1+i)^n}$$

Where, **C** = Coupon payment

**N** = number of payments,

**I** = interest rate or required yield,

**M** = value at maturity or par value

- **Example:** Calculate the price of a bond with a par value of \$1000 to be paid in 10 years, a coupon rate of 10%, and a required yield of 6% where coupon payments are made annually, semiannually, and quarterly.

**Solution:**

Case 1: Annually

C (Coupon Value) = 100

N (Number of periods) = 10

i (Current yield) = 6%

M (Maturity Value) = 1000

$$\text{Bond Price} = 100 * [1 - (1 / (1+.06)^{10})] / .06 + 1000 / (1+.06)^{10}$$
$$= 1294.05$$

Case 2: Semiannually

C (coupon Value)= 50

N (Number of Periods)= 20

i(Current Yield) = 3%

M (Maturity Value)= 1000

$$\text{Bond Price} = 50 * [1 - (1 / (1+.03)^{20})] / .03 + 1000 / (1+.03)^{20}$$
$$= 1297$$

Case 3: Quarterly

C (coupon Value)= 25

N (Number of Periods)= 40

i(Current Yield) = 1.5%

M (Maturity Value)= 1000

$$\text{Bond Price} = 25 * [1 - (1 / (1+.015)^{40})] / .015 + 1000 / (1+.015)^{40}$$
$$= 1299.1$$

➤ **Bond Pricing Formula of Zero Coupon Bonds:**

$$\text{Zero Coupon Bond Price} = \frac{M}{(1+i)^n}$$

Where, n = number of payments

i = interest rate or required yield

M = value at maturity or par value

- **Example:** Calculate the price of a zero-coupon bond that is maturing in 5 years, has a par value of \$2000, and a required yield of 8% when coupon payment is made annually and semiannually.

**Solution:** Case 1: Annually

$$n = 5$$

$$i = 8\% \text{ or } .08$$

$$M = 2000$$

$$\text{Bond Price} = 2000 / (1+.08)^5$$

$$= 1361$$

Case 2: Semiannually

$$n = 10$$

$$i = 4\% \text{ or } .04$$

$$M = 2000$$

$$\text{Bond Price} = 2000 / (1+.04)^{10}$$

$$= 1352$$

- **Yield to Maturity Formula for bonds:**

$$\text{YTM} = \frac{\text{Coupon Interest Payment} + (\text{Face Value} - \text{Market Price}) / n}{(\text{Face Value} + \text{Market Price}) / 2}$$

Where Coupon Payment is Interest Payment on Bond  
Face Value is the Par Value  
Market Price is Price of Bond  
N = number of time periods

- **Example:** Calculate the yield to maturity of a bond with a par value of \$1000 to be paid in ten years, a coupon rate of 10%, and a current bond price of 1297 where coupon payments are made semi-annually

**Solution:** Coupon Interest = Coupon rate is 10% but since Coupon payment is semi-annual so it would be 5% of 1000 = 50

$$\text{Face Value} = 1000$$

$$\text{Marker Price} = 1297$$



$n = 10$  years but since its semiannual payment so periods become  $10 * 2 = 20$

Putting the values in Formula we get

$$YTM = (50 + (1000 - 1297) / 20) / (1000 + 1297) / 2$$

$$= .03 \text{ or } 3\%$$

Since above yield is semiannual so annual yield is  $3 * 2 = 6\%$

➤ **Formula for calculating Yield for Zero-Coupon Bonds:**

$$i (\text{Yield}) = (M / \text{Bond Price})^{1/n} - 1$$

Where  $n$  = number of payments

$i$  = interest rate, or required yield

$M$  = value at maturity, or par value

Bond Price is the purchase price of Bond

- **Example:** Determine the yield of a zero-coupon bond that is maturing in five years, has a par value of \$2000, and a price of a bond is 1352 where the coupon payment is Semi-Annually

**Solution:**  $i = (2000 / 1352)^{1/10} - 1$

$$i = 4\%$$

But since the payments are made semi-annually, hence the annual yield is  $i * 2 = 4 * 2 = 8\%$

- **Yield to Call:** Denotes the **yield** of a bond if you were to buy and hold the security until the **call** date, but this **yield** is valid only if the security is called prior to maturity. Formula to Calculate YTC is

$$YTC = \frac{\text{Coupon Interest Payment} + \frac{\text{Call Price} - \text{Market Value}}{\text{Number of Years Until Call}}}{\frac{\text{Call Price} + \text{Market Value}}{2}}$$

- **Holding Period Return:** This calculates the returns earned from bond investment over the holding period. This holding period needs to be less than maturity period of the bond. The formula for that is,

Holding Period Return =

$\text{Income} + (\text{End of Period Value} - \text{Initial Value}) / \text{Initial Value}$

Annualized HPR =

$\{[(\text{Income} + (\text{End of Period Value} - \text{Initial Value})) / \text{Initial Value} + 1]^{1/t} - 1\}$

where  $t$  = number of years.

- **Example:** Bond X was held for three years, during which it appreciated from \$100 to \$150 and provided \$5 in distributions. Find the HPR.

**Solution:** Income = 5 (from distributions)

End value = 150

Initial Value = 100

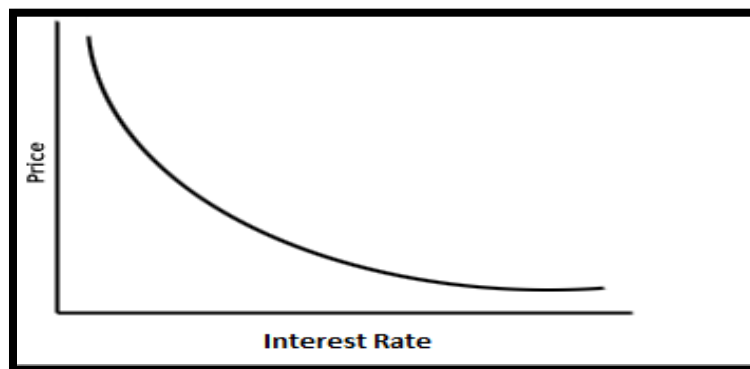
$t = 3$  years

Annualized HPR =  $\{[5 + (150 - 100)] / 100 + 1\}^{1/3} - 1$

= 15.73%

- **Relationship between Bond Value and Interest Rates**

Burton Gordon Malkiel has mentioned certain properties of Bonds and its relationship with interest rates, yield, maturity date and coupon rate. They are:



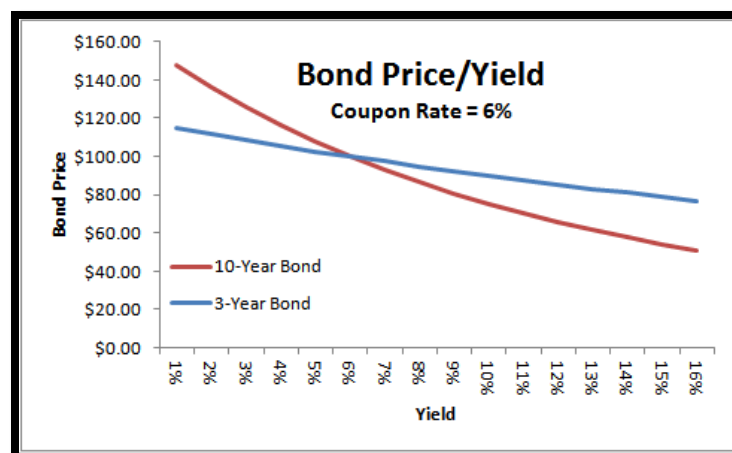
1. **Malkiel's Property 1:** Market Interest Rate and Bond Values are inversely related.  
As market interest rate increases the bond prices fall
2. **Malkiel's Property 2:** The relation between Interest Rate and Bonds is inverse but is not a straight line but kind of convex

➤ **Relationship between Bond Value and Yield:** According to Malkiel, yield and Market rate of interest moves in same direction. Hence, both the properties 1 and 2 that hold true for interest rates also hold for yields

➤ **Relationship between Bond Value and Maturity of the bond:**



1. **Malkiel's Property 3:** Longer the time to Maturity of the Bond, the greater is the change in its value in response to given change in required rate of return



2. **Malkiel's Property 4:** Prices of Long-term bonds fluctuate more to interest rate change or the Yield than the prices of short-term bond

➤ **Relationship between Bond Value and Coupon Rate:**

This mentions **Malkiel's Property 5:** Prices of High Coupon Bonds are less sensitive to changes in interest rates than prices of low coupon bonds

- **Duration of Bond:** Represents the number of years it takes for the price of a bond to be repaid by its internal cash flows. Bonds with higher durations carry more risk and have higher price volatility than bonds with lower durations.
- **Duration of a Zero-coupon bond:** Here, Duration is equal to the maturity period of the bond
- **Duration of a Vanilla bond or non-zero-coupon bond:** In this, duration would always be less than its time to maturity. A formula called **Macauley Duration** is used to compute duration of a non-zero-coupon bond.

**Formula for Duration**

$$\text{Duration} = (\text{PV1} * \text{Time Period1} + \text{PV2} + \text{Time Period2} + \text{PV3} + \text{Time Period3} \dots \dots \dots n) / B_0$$

**Where**

**PV is the Present value of the cash flow in the corresponding year**

**Time period is the year for which present value has been calculated**

**B<sub>0</sub> is bond price**

**N = Maturity in years**

- **Example:** An 8% bond of Rs. 1000 has maturity period of 3 years. The current price of bond is 950. If the YTM of the bond is 10% then find the duration.

**Solution:** Here N = 3 years, B<sub>0</sub> = 950

The cash flows for 3 years would be

Cash flow in first year = 8% of 1000 = 80

Cash flow in second year = 8% of 1000 = 80

Cash flow in third year = 8% of 1000 + 1000 = 80 + 1000 = 1080

Cash Flow	Present Value	Time Period	PV*Time
Year 1 = 80	$80 / (1+r)^1$ Yield given to be 10% so $r = 10\%$ or $.1$ $= 80 / (1+.1)$ 72.77	1	72.72
Year 2 = 80	$80 / (1+r)^2$ $= 80 / (1+.1)^2$ = 66.08	2	132.16
Year 3 = 1080	$1080 / (1+r)^3$ $= 1080 / (1+.1)^3$ = 811.08	3	2433.24
<b>Total</b>			2638.12

**Duration** =  $2638.12 / B_0 = 2638 / 950 = 2.77$  years

➤ **More Type of Bonds:** Following are some additional types of bonds in addition to what we have discussed earlier

1. **Serial Bonds:** Serial bonds are issued by an organization with different maturity dates. This is done to enable the company to retire the bonds in instalments rather than all together. It is less likely to disturb the cash position of the firm than if all the bonds were retired together.
2. **Term Bonds:** Terms bonds are opposite of Serial Bonds as in this the bonds mature at once rather in installment
3. **Sinking Fund Bonds:** Sometimes, an organization plans the issue of its bonds in such a way that there is no burden on the company at the time of retiring bonds. The company sets apart an amount annually for retirement of bonds. The annual installment is usually fixed and put in a sinking fund through the trustees. The money in sinking fund is used to pay the amount at maturity. Sinking fund bonds are commonly used as a measure of industrial financing.

4. **Registered Bonds and Bearer Bonds:** **Registered bonds** are bonds that are issued in the names & addresses of their holders. The issuing company issues interest payments in the form of checks payable to their registered owners and delivered to their homes. Bonds payable to whoever holds them (the bearer) are called **Bearer bonds** (Unregistered bonds). Since there is no recordkeeping in Bearer bonds, whoever holds the title to the bond upon payment date will be presumed its rightful owner. Thus, as a result, lost or stolen bearer bonds are difficult to trace and replace.
5. **Mortgage Bonds:** A mortgage bond is a promise by the bond issuing authority to pledge real property as additional security. If the company does not pay its bondholders the interest or the principal, when it falls due, the bondholders have the right to sell the security and get back their dues. These can be of 2 types
  - a. **An open-end mortgage bond** permits the bond issuing company to issue additional bonds using the same property as mortgage. If additional bonds are issued, they get the ranking of junior bonds, and the prior issue gets the first priority in receiving payments in case of default by the company
  - b. **In close end mortgage bonds**, the company can make only one issue of bonds using a particular property as mortgage and while those bonds exist, new bonds cannot be issued.
6. **Collateral Trust Bonds:** A collateral trust bond is issued generally when two companies exist and are in the relationship of parent and subsidiary. The collateral that is provided in these bonds is the personal property of the company which issues the bonds. **A typical example of such bonds is when a parent company requires funds, it issues collateral bonds by pledging securities of its own subsidiary company. The collaterals are generally in the form of intangible securities like shares or bonds.** These bonds have a priority charge on the shares or bonds which are used as collaterals.
7. **Equipment Trust Bonds:** Equipment Trust Bonds is the issue of bonds with equipment like machinery as security.
8. **Supplement Credit Bonds:** **When additional pledge is guaranteed to the bondholders their bonds are categorized as supplemental by an additional non-specific guarantee.** Normally these would be guaranteed by 2 entities. Such bonds are classified as: Guaranteed Bonds, Joint Bonds and Assumed Bonds
  - a. **Guaranteed Bonds:** Guaranteed Bonds are issued as bonds secured by the issuing company, and they are guaranteed by another company. **For example**, sometimes, a company takes assets through a lease. The leasing company guarantees the bonds of the bond issuing company regarding interest and principal amount due on bonds.
  - b. **Joint Bonds:** Joint bonds are guaranteed bonds secured jointly by two or more companies. These bonds are issued when two or more companies need finance and decide to raise the funds together through bonds



- c. **Assumed Bonds:** These bonds are the result of a decision between two companies to amalgamate or merge together. For example, Company-X decides to merge into Company-Y. X's issue of bonds prior to merger then becomes the obligation of Company-Y when merger is affected. These are called assumed bonds as Company-Y did not originally issue them but as a result of merger the debt was passed on to them.
- 9. **Income Bonds:** Such bonds offer interest to the bondholders only when the firm earns a profit. If profit is not declared in a particular year, interest on bonds is cumulated for a future period when the company can sufficiently earn and make a profit.
- 10. **Bonds with Warrants:** Bonds with warrants are also called **Warrant Bonds**. Each bond has one warrant attached to it and it gives the right to the bondholder to pay a subscription price and exchange the bonds for equity shares. This right is given, for a limited period of time. These warrants sometimes are detachable.
- 11. **Foreign Bonds:** Bonds raised in India by foreign companies but for Indian investor will be called a 'foreign bond'. A foreign company who wants to raise money from India can issue bonds and such bonds will be called foreign bonds. These bonds may be issued by American company, Japanese company, or company in any other country.