

# Valuation of Bonds/Debentures, Preference Shares



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# Bond Valuation

- Important Terms: Security Descriptor, Coupon Rate, Par Value (or Issue Price), Maturity Value, Period, Credit Rating.
  - Types of Bonds: Treasury Bills, Central & State Government Securities, Bank Securities, Statutory Corporation Bonds, PSU Securities, Municipal Bonds, Institutional Bonds, Corporate Securities.
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# Bond Valuation

- The Value of any bond or any asset, real or financial – is equal to the present value of the cash flows expected from it.
- Hence, determining the value of a bond requires – (a) an estimate of expected cash flows; (b) an estimate of the required return.

# Important Bond Terms

- ◆ A bond is a long-term debt instrument issued by a corporation or government.
- The maturity value (MV) [or face value] of a bond is the stated value.

# Important Bond/Debenture Terms

- ◆ The bond's coupon rate is the stated rate of interest; the annual interest payment divided by the bond's face value.
- The discount rate is dependent on the risk of the bond and is composed of the risk-free rate plus a premium for risk.

# Different Types of Bonds

A perpetual bond is a bond that *never* matures. It has an infinite life.

$$V = \frac{I}{(1 + k_d)^1} + \frac{I}{(1 + k_d)^2} + \dots + \frac{I}{(1 + k_d)^\infty}$$

$$= \sum_{t=1}^{\infty}$$

$$\frac{I}{(1 + k_d)^t}$$

$$\text{or } I (\text{PVIFA}_{k_d, \infty})$$

$$V = I / k_d$$

**[Reduced Form]**

# Perpetual Bond Example

AVP is a Perpetual Bond has a Rs. 1,000 face value and provides a 16% coupon. The appropriate discount rate is 10%.  
What is the value of the perpetual bond?

$$I = \text{Rs } 1,000 \times (0.16) = \text{Rs } 160.$$

$$k_d = 10\%.$$

$$V = I / k_d \quad [\textit{Reduced Form}]$$
$$= \text{Rs } 160 / 10\% = \text{Rs } 1600.$$

# Different Types of Bonds

A non-zero coupon-paying bond is a coupon-paying bond with a finite life.

$$V = \frac{I}{(1 + k_d)^1} + \frac{I}{(1 + k_d)^2} + \dots + \frac{I + MV}{(1 + k_d)^n}$$

$$= \sum_{t=1}^n \frac{I}{(1 + k_d)^t} + \frac{MV}{(1 + k_d)^n}$$

$$V = I (\text{PVIFA}_{k_d, n}) + MV (\text{PVIF}_{k_d, n})$$



# Coupon Bond Example

Dipesh Food Bonds (DFB) has a Rs.1,000 face value and provides an 8% annual coupon for 30 years. The appropriate discount rate is 10%. What is the value of the *coupon bond*?

$$\begin{aligned} V &= \text{Rs.}80 (\text{PVIFA}_{10\%, 30}) + \text{Rs.}1,000 (\text{PVIF}_{10\%, 30}) = \\ &\text{Rs.}80 (9.427) + \text{Rs.}1,000 (.057) \\ &= \text{Rs.}754.16 + \text{Rs.}57.00 \\ &= \text{Rs.}811.16. \end{aligned}$$

# Another Example

- Security Descriptor: NIRM12
- Issued by: Nirma Ltd.
- Maturity Date: 25-07-2012
- Coupon Rate: 8.60% (annual payments)
- Issue Date: 27-07-2002
- Issue Price: Rs. 100.00
- Current Credit Rating: ICRA AA+
- What is its value if your expected rate of return is 11%?

**Source of Information: [www.nseindia.com](http://www.nseindia.com)**

# 96 Different Types of Bonds

A zero-coupon bond is a bond that pays no interest but sells at a deep discount from its face value; it provides compensation to investors in the form of price appreciation.

$$V = \frac{MV}{(1 + k_d)^n} = MV (PVIF_{k_d, n})$$

# Zero-Coupon (or Deep-Discount) Bond Example

*DATE* Bond has a Rs.1,000 face (i.e., maturity) value and a 30-year life. The appropriate discount rate is 10%. What is the value of the *zero-coupon bond*?

$$\begin{aligned} V &= \text{Rs.1,000 (PVIF}_{10\%, 30}) \\ &= \text{Rs.1,000 (.057)} \\ &= \text{Rs.57.00} \end{aligned}$$

# Another Example

- Security Descriptor: ICIC10B
- Issued by: ICICI
- Maturity Date: 31-08-2012
- Coupon Rate: 0
- Issue Date: 31-08-2005
- Issue Price: Rs. 100.00
- Maturity Price: Rs. 165.00
- What is its value if your expected rate of return is 10%?

Source of Information: [www.nseindia.com](http://www.nseindia.com)

# 102 Semiannual Compounding

Most bonds *in the Bond markets* (including International) pay interest twice a year.

## Adjustments needed:

- (1) Divide  $k_d$  by 2
- (2) Multiply  $n$  by 2
- (3) Divide  $I$  by 2



# Preferred Shares Valuation

Preferred Stock is a type of stock that promises a (usually) fixed dividend.



Preference shares has preference over common equity shares in the payment of dividends and claims on assets.



# Perpetual Preferred Stock Valuation

$$V = \frac{\text{Div}_P}{(1 + k_P)^1} + \frac{\text{Div}_P}{(1 + k_P)^2} + \dots + \frac{\text{Div}_P}{(1 + k_P)^\infty}$$

$$= \sum_{t=1}^{\infty} \frac{\text{Div}_P}{(1 + k_P)^t} \quad \text{or} \quad \text{Div}_P (\text{PVIFA}_{k_P, \infty})$$

This reduces to a perpetuity!

$$V = \text{Div}_P / k_P$$



# Preferred Stock Example

Preference Shares of Yogi Fan Belts Ltd. has an 8%, Rs.100 par value issue outstanding. The appropriate discount rate is 10%. What is the value of the preferred stock?

$$\text{Div}_p = \text{Rs.100} ( 8\% ) = \text{Rs.8.00.}$$

$$k_p = 10\%.$$

$$\begin{aligned} V &= \text{Div}_p / k_p = \text{Rs.8.00} / 10\% \\ &= \text{Rs.80} \end{aligned}$$

# Calculating Rates of Return (or Yields)

Steps to calculate the rate of return (or yield).

1. Determine the expected cash flows.
2. Replace the intrinsic value ( $V$ ) with the market price ( $P_0$ ).
3. Solve for the *market required rate of return* that equates the discounted cash flows to the market price.

# Determining Bond YTM

Determine the Yield-to-Maturity (YTM) for the coupon-paying bond with a finite life.

$$P_0 = \sum_{t=1}^n \frac{I}{(1 + k_d)^t} + \frac{MV}{(1 + k_d)^n}$$
$$= I (\text{PVIFA}_{k_d, n}) + MV (\text{PVIF}_{k_d, n})$$

$$k_d = \text{YTM}$$

# Determining the YTM

Vijay wants to determine the YTM for an issue of outstanding bonds (par value is Rs.1000) of *DATE*. *DATE* has an issue of 10% annual coupon bonds with 4 years left to maturity. The bonds have a current market value of *Rs.1,250*.

*What is the YTM?*

# YTM Solution (Try 9%)

$$\text{Rs.1,250} = \text{Rs.100}(\text{PVIFA}_{9\%,4}) + \text{Rs.1,000}(\text{PVIF}_{9\%,4})$$

$$\text{Rs.1,250} = \text{Rs.100}(3.240) + \text{Rs.1,000}(.708)$$

$$\text{Rs.1,250} = \text{Rs.324} + \text{Rs.708}$$

$$= \text{Rs.1,032}$$

*[Rate is too high!]*

## YTM Solution (Try 5%)

$$\text{Rs.1,250} = \text{Rs.100}(\text{PVIFA}_{5\%,4}) + \text{Rs.1,000}(\text{PVIF}_{5\%,4})$$

$$\text{Rs.1,250} = \text{Rs.100}(3.546) + \text{Rs.1,000}(0.823)$$

$$\begin{aligned} \text{Rs.1,250} &= \text{Rs.354.60} + \text{Rs.823.00} \\ &= \text{Rs.1,177.60} \\ & \text{[Rate is high!]} \end{aligned}$$

# YTM Solution (Interpolate)

$$.04 \left[ X \begin{bmatrix} .05 & \text{Rs.1177} \\ \text{YTM} & \text{Rs.1250} \\ .09 & \text{Rs.1032} \end{bmatrix} \text{Rs.-73} \right] \text{Rs.145}$$

$$X = \frac{(\text{Rs.-73})(0.04)}{\text{Rs.145}}$$

$$X = .0201$$

$$\text{YTM} = .0500 - .0201 = .0299 \text{ or } 2.99\%$$

# Another Example

- Security Descriptor: GRSM12
- Issued by: Grasim Industries Ltd.
- Maturity Date: 17-09-2012
- Coupon Rate: 12.60% (annual payments)
- Issue Date: 17-09-1999
- Issue Price: Rs. 100.00
- Maturity Price: Rs. 105.00
- Current Credit Rating: CARE AA+
- Current Market Price: 116.62
- What is its yield-to-maturity?

**Source of Information: [www.nseindia.com](http://www.nseindia.com)**



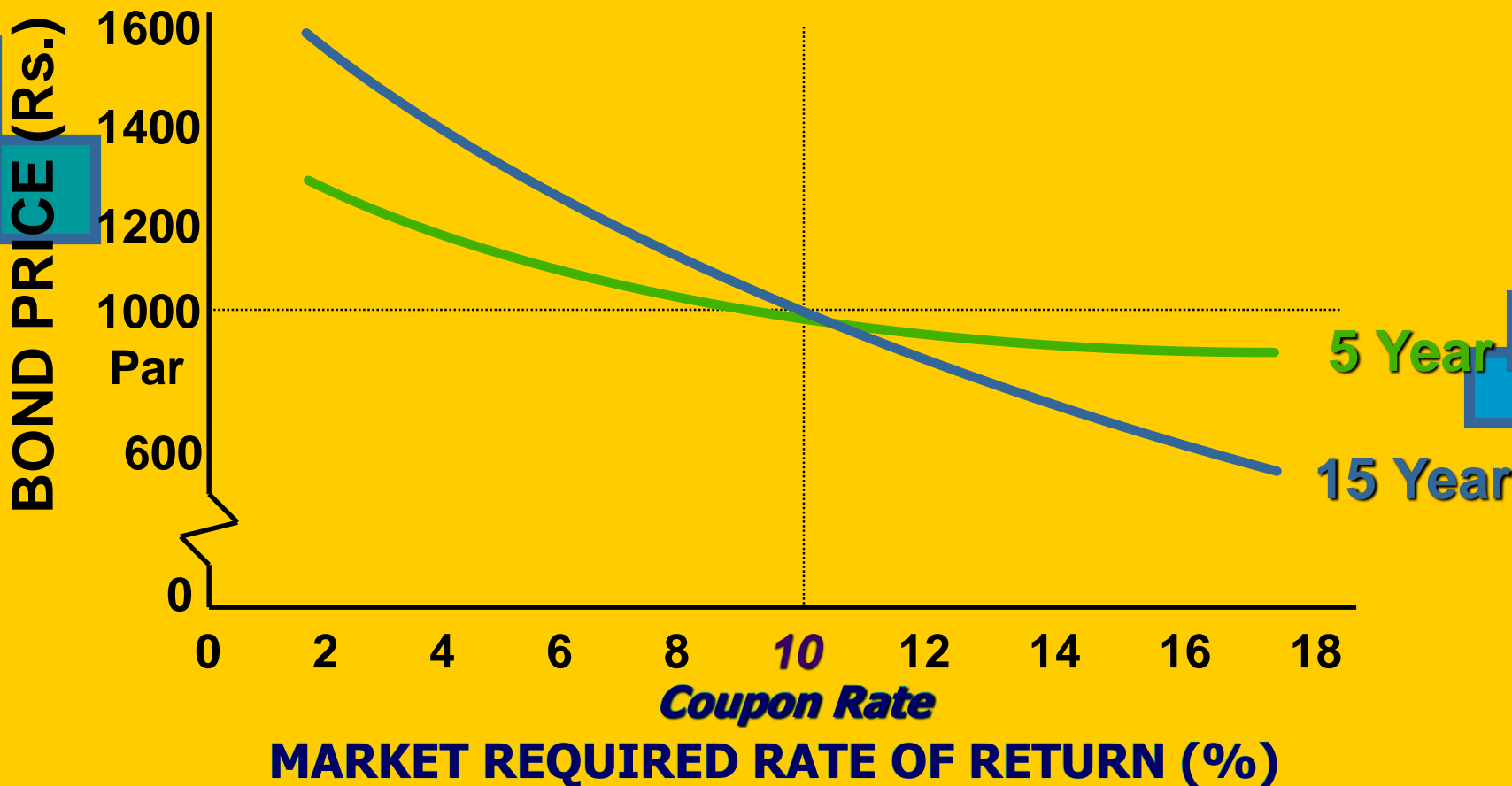
## 9.5 Bond Price-Yield Relationship

Discount Bond -- The market required rate of return exceeds the coupon rate ( $P_0 > \text{Par}$ ).

Premium Bond -- The coupon rate exceeds the market required rate of return ( $P_0 < \text{Par}$ ).

Par Bond -- The coupon rate equals the market required rate of return ( $P_0 = \text{Par}$ ).

# Bond Price-Yield Relationship

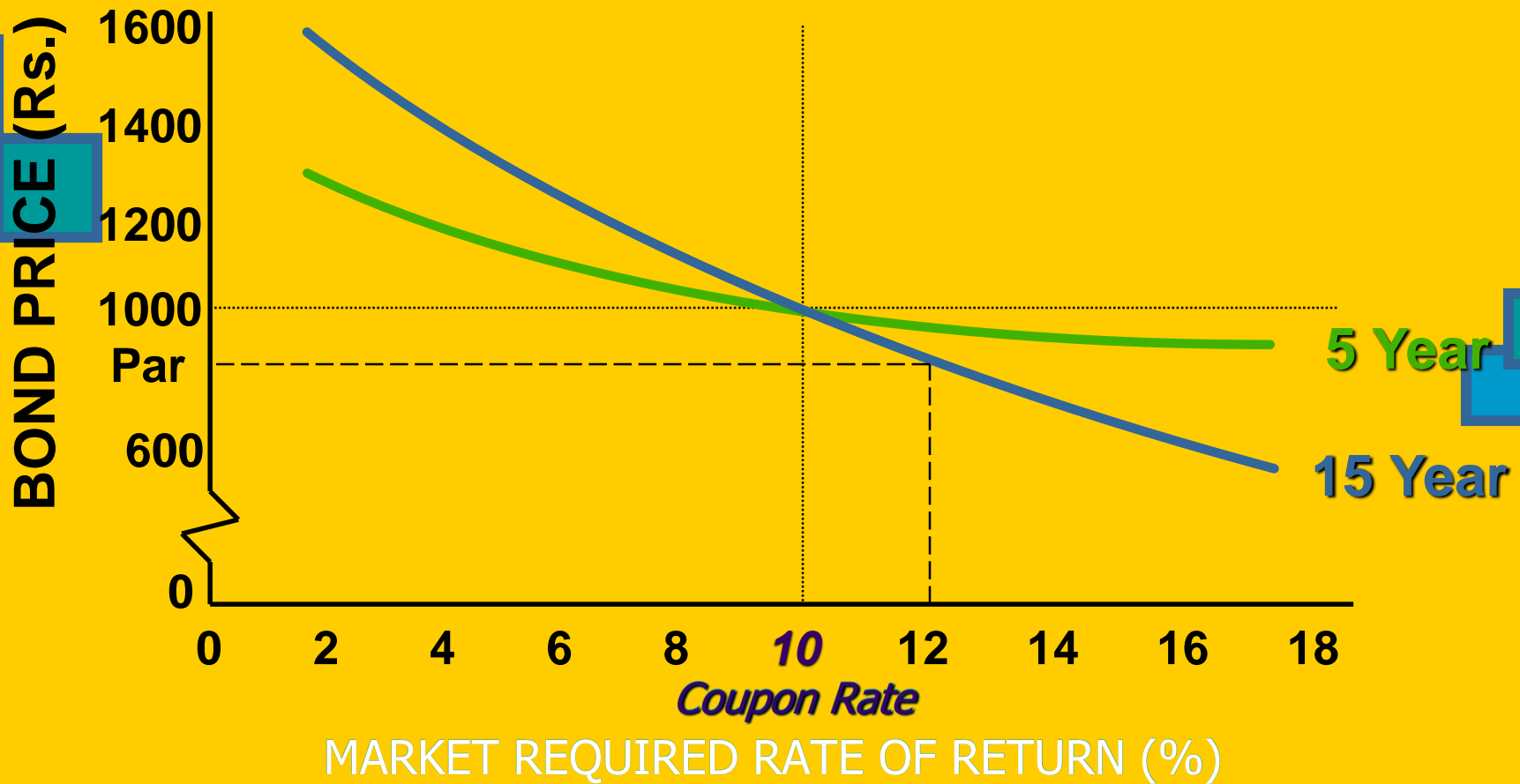


# Bond Price-Yield Relationship

When interest rates *rise*, then the market required rates of return *rise* and bond prices will *fall*.

Assume that the required rate of return on a 15-year, 10% coupon-paying bond *rises* from 10% to 12%. What happens to the bond price?

# Bond Price-Yield Relationship





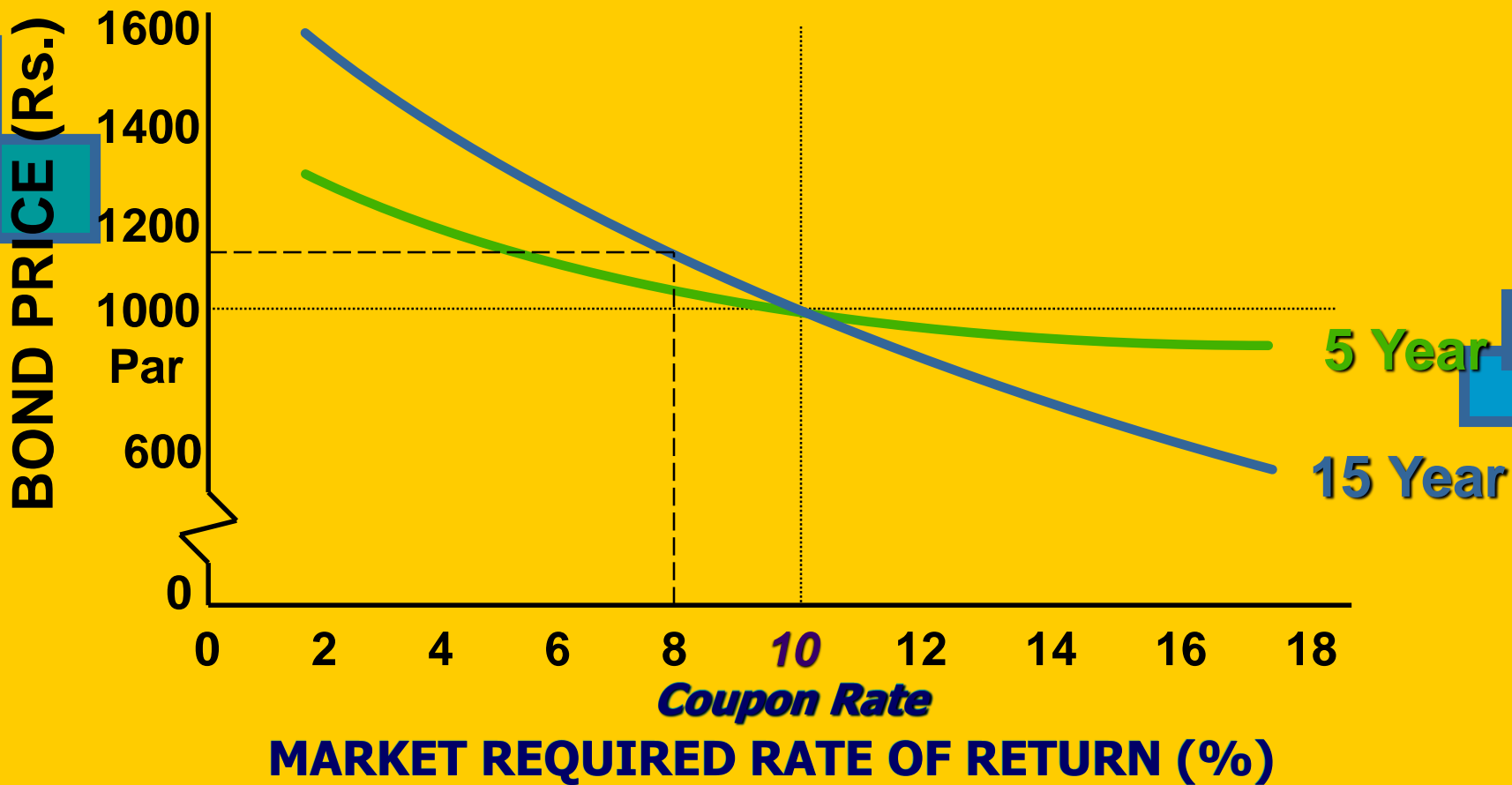
# Bond Price-Yield Relationship

When interest rates *fall*, then the market required rates of return *fall* and bond prices will *rise*.

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Assume that the required rate of return on a 15-year, 10% coupon-paying bond *falls* from 10% to 8%. What happens to the bond price?

# Bond Price-Yield Relationship

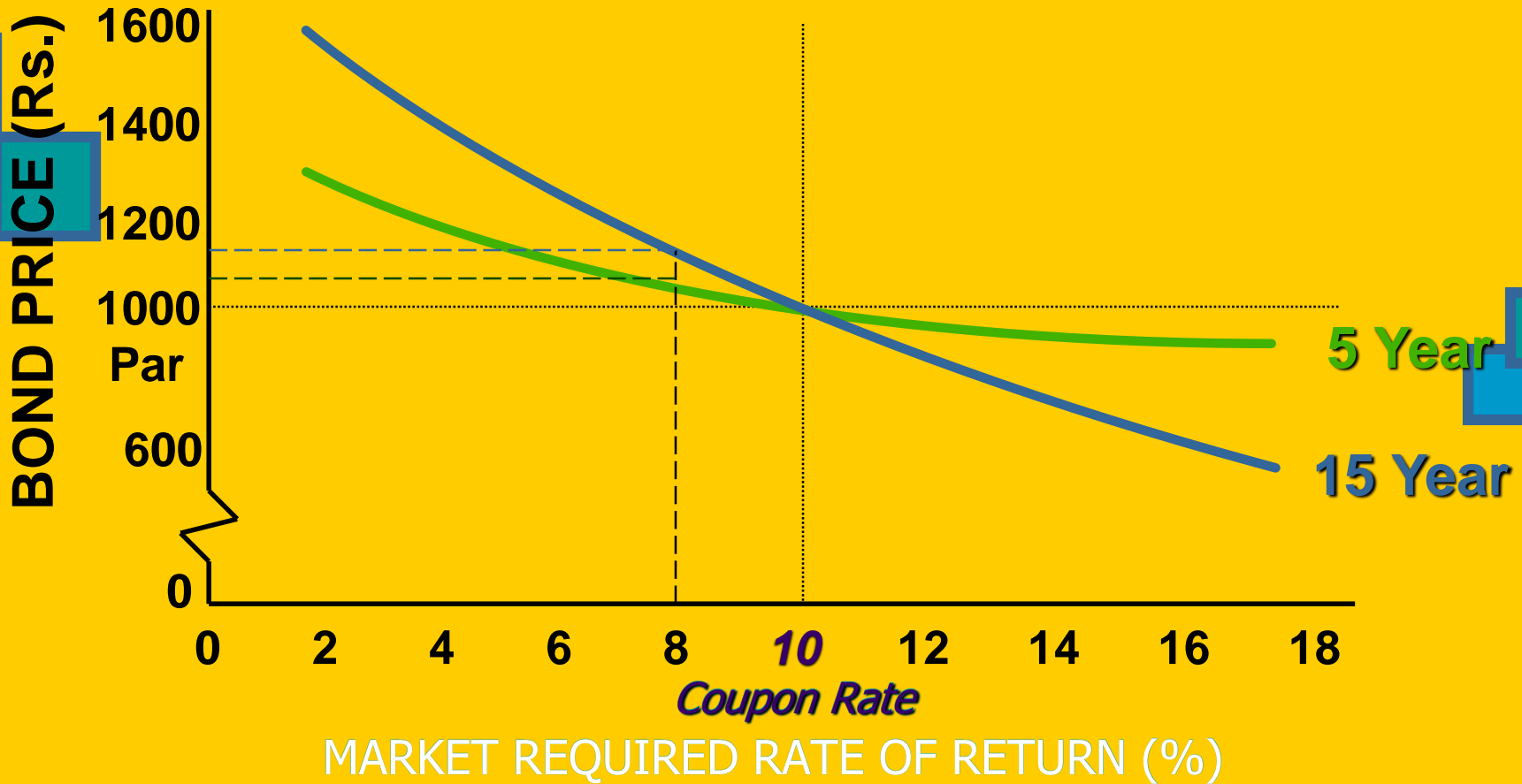


# The Role of Bond Maturity

The longer the bond maturity, the greater the change in bond price for a given change in the market required rate of return.

Assume that the required rate of return on both the 5- and 15-year, 10% coupon-paying bonds *fall* from 10% to 8%. What happens to the changes in bond prices?

# Bond Price-Yield Relationship





# The Role of Bond Maturity

The required rate of return on both the 5- and 15-year, 10% coupon-paying bonds has *fallen* from 10% to 8%.

The 5-year bond price has *risen* from Rs.1,000 to Rs.1,080 for the 5-year bond (+8.0%).

The 15-year bond price has *risen* from Rs.1,000 to Rs.1,171 (+17.1%). *Twice as fast!*

# The Role of the Coupon Rate

For a given change in the market required rate of return, the price of a bond will change by proportionally more, the lower the coupon rate.