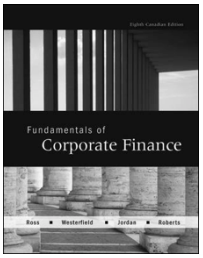
Finance for Management and Organizational Studies

MOS 2310

Chapter 7

Interest Rates and Bond Valuation



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Interest Rates and Bond Valuation

- Bonds and Bond Valuation
- More on Bond Features
- Bond Ratings
- Some Different Types of Bonds
- Bond Markets
- Inflation and Interest Rates
- Determinants of Bond Yields

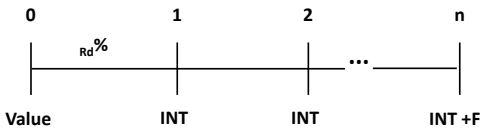
Valuation Fundamentals

Key inputs to the valuation process include cash flows, timing, and the required return. The value of any asset is equal to the present value of all future cash flows it is expected to provide over its useful life.

What is a Bond Worth?

- Bonds trade in the financial markets based on their discounted present value
- Thus, for bonds their actual market price and yield to maturity (YTM) are a direct function of the expected cash flow, the time value of money, and the returns demanded by investors

Bond Valuation



$$V_B = \frac{INT}{(1+r_d)^1} + \frac{INT}{(1+r_d)^2} + \ldots + \frac{(INT+F)}{(1+r_d)^n}$$

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The Bond-Pricing Equation

$$\text{Bond Value} = C\left[\frac{1-\frac{1}{(1+r)^t}}{r}\right] + \frac{F}{(1+r)^t}$$

Bond Value = Present Value of the coupons + Present Value of the Face amount

Bond Value = PV annuity + PV of lump sum

Bond Value = $90 (PVIFA R%, t) + $1,000 (PVIF R%, t)

Yield to Maturity (YTM)

- Market interest rate that equates a bond's Present Value (PV) of interest payments and principal payment with its price
- The rate of return anticipated on a bond if held until the end of its lifetime (maturity)
- YTM is considered a long-term bond yield expressed as an annual rate
- Takes into account the bond's current market price, par value, coupon interest rate and time to maturity (factors in the time value of money)

Coupon Rate versus Discount Rate

- The **coupon rate** is the annual interest payment divided by the face value of the bond
- The **interest rate** (or **discount rate**) is the rate at which the cash flows from the bond are discounted to determine its present value

Note: The coupon rate and the discount rate are NOT necessarily the same rate!

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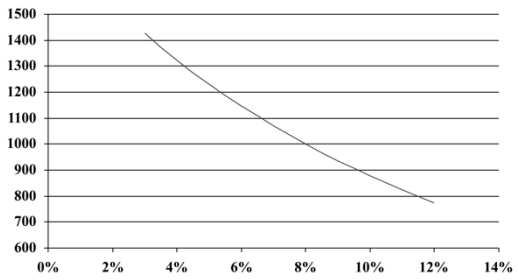
Graphical Relationship Between Price and Yield-to-Maturity



How Bond Prices Vary with Interest Rates

An increase in interest rates will cause the prices of outstanding bonds to fall, while a decrease in rates will cause bond prices to rise

P ↑ Bond interest rate ↓
P ↓ Bond interest rate ↑

Inverse relationship of bond prices to interest rates

Semiannual Coupon Payments and Bond Values

- The procedure to value bonds paying semiannual interest involved compounding interest more frequently than annually:
  - Convert annual Coupon interest to semiannual by dividing by 2
  - Convert number of years to maturity to number of 6-month periods to maturity by multiplying *t* by 2
  - Convert required stated return from annual to semiannual by dividing R_d by 2.

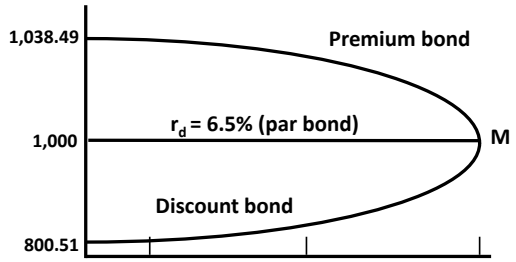
How Bond Prices Vary with Interest Rates

Bond $1,000 face value; matures in 3 years

Coupon Rate	Interest Rate	Price of Bond	Sell
6.5%	5.1%	$1,038.49	Premium
6.5%	6.5%	$1,000.00	Par
6.5%	15.0%	$ 800.51	Discount

Notice that the price of a bond decreases with increasing interest rate

Changes in Bond Values ($) Over Time



Bond Price Reporting

	Coupon	Maturity Date	Bid $	Yield %
RoyBnk	3.18	Mar 16/15	103.75	1.96

Annual Coupon: 0.0318 x 1,000 = $31.80

Maturity Date: will mature on March 16, 2015

Bid $: Last available bid price (buyer is willing to pay); quoted as a percentage of face value. 103.75% of 1,000 or $1,037.50; trading at a premium

Yield %: going market yield (return an investor will realize)

Quoted Price

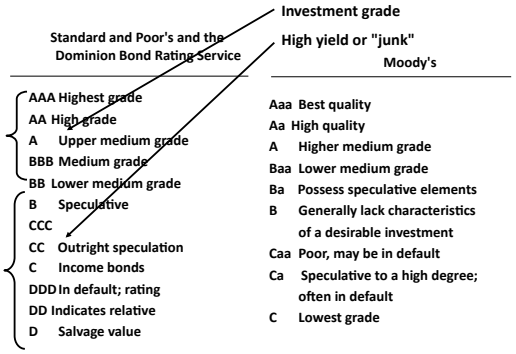
- If you buy a bond between coupon payment dates, the price you pay is usually more than than the price you are quoted
- Quoted prices "net of accrued interest"
- This quoted price is called the **clean price**
- 96 or $960
- 105 or $1,050
- The price you pay that includes the accrued interest is the **dirty price** (full or invoice price)

Accrued Interest

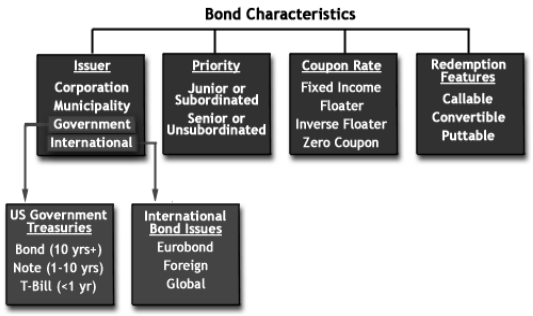
- Is the coupon payment for the period times the fraction of the period that has passed since the last coupon payment
- Multiplying the fraction of time that has passed since the last coupon payment by the next coupon amount
- e.g., Buy a bond for 97 with a 7 percent annual coupon, paid semiannually and the next coupon is due in 3 months

- Dirty Price: 97% of 1,000 = 970
- Next Coupon $35
- Accrued interest 3/6 x $35 = $17.50
- Clean price: $970 - $17.50 = $952.50s

Bond Ratings



Bond Characteristics



Interest Rates and Required Returns

- The cost of borrowing funds is the Interest Rate
- The cost of funds obtained by selling an ownership interest is the Required Return
- The Real Rate of Interest assumes no inflation and complete market certainty
- The Nominal Rate of Interest is the actual rate charged by the suppliers of funds
- Effective Annual Rate (EAR) the annual rate of interest actually paid or earned

Term Structure of Interest Rates

- The Term Structure of Interest Rates (TSIR) relates the interest rate to the time to maturity
- The Yield Curve is a graphic depiction of the term structure of interest rates, and is either:
  - An Inverted Yield Curve (downward sloping);
  - A Normal Yield Curve (upward sloping); or
  - A Flat Yield Curve.
- The shape of the yield curve affects the maturity choice in the firm's financing decisions

Theories of Term Structure

1. Expectation Hypothesis suggests that the yield curve reflects investor expectations about future interest rates and inflation
2. Liquidity Preference Theory assumes investors perceive less risk in short-term securities, and borrowers are willing to pay premium on long-term securities
3. Market Segmentation Theory suggests that the market for loans is segmented on the basis of maturity

Government of Canada Yield Curve

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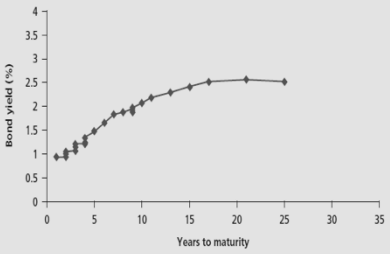
FIGURE 7.6

Government of Canada yield curve

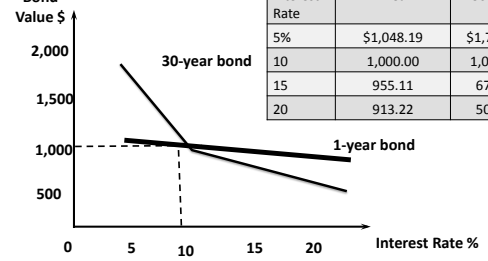


Source: *Financial Post*, January 05, 2012. Used with permission.

Interest Rate Risk and Time to Maturity

$1,000 Bond 10% Coupon

	Time to Maturity	
Interest Rate	1 Year	30 Years
5%	$1,048.19	$1,772.72
10	1,000.00	1,000.00
15	955.11	671.01
20	913.22	501.64



Interest Rate Risk

- Arises from fluctuating rates (market yields)
- How much risk depends on how sensitive its price is to interest rate changes
- This sensitivity depends on two things:
  1. All other things being equal, the longer time to maturity, the greater the interest rate risk
  2. All other things being equal, the lower the coupon rate, the greater the interest rate risk

Reinvestment Risk

- Assume that the interest has declined
- Now suppose bonds will be called or come due, and investors wish to purchase/replace
- Thus, the risk of an income decline due to a drop in interest rates is called reinvestment risk
- If you hold onto your bonds (not due) you will NOT face reinvestment risk

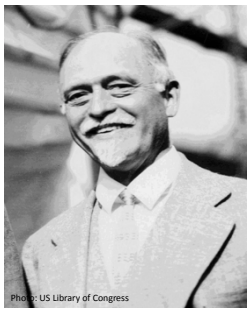
The Fisher Effect

- The real interest rate equals the nominal rate minus the expected inflation rate
- Real rates fall as inflation increases, unless nominal rates increase at the same rate as inflation
- $1 + R = (1 + r)(1 + h)$

R = nominal rate

r = real rate

h = inflation rate



Irving Fisher (1867 – 1947)