Ch. 7 Bonds and Their Valuation

Topics
- Bond Prices
- Bond Yields
- Risk for Bondholders

Bonds

- Bond: A debt security that obligates the borrower or issuer to make specified payments (periodic interest payments and return of principal) to the lender or investor.
- The bond promises to pay periodic interest or **coupon** to the bondholder at the contract rate of interest, called the **coupon rate**, plus return the **face value** principal amount borrowed at **maturity**.


Corporate Bonds

- Bond issues are the dominant source of new financing for U.S. Corporations. Corporate bond issues represent half of the total bond market.
- Some corporate bonds are backed by specific collateral.
  - Mortgage bond: backed by real property pledged as a collateral.
  - Collateral bonds: backed by financial assets.
  - Debenture bonds: not backed by specific collateral, but, in the event of a default, they have general claim on the otherwise unpledged assets of the issuer.
  - Subordinated debenture bonds: not backed by collateral, and have general claim after debenture bondholders have been paid.

Key Terminologies

- Par value: Face amount of the bond, which is paid at maturity (generally, assume $1,000).
- Coupon interest rate: Stated interest rate (generally fixed) paid by the issuer. Multiply by par value to get dollar payment of interest.
- Maturity date: Years until the bond must be repaid.
- Issue date: When the bond was issued.
- Yield to maturity: Rate of return earned on a bond held until maturity (also called the "promised yield").
- Sinking fund: Provision to pay off a loan over its life rather than all at maturity.
  - Similar to amortization on a term loan.
  - Reduces risk to investor, shortens average maturity.

The Value of Financial Assets
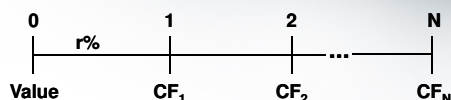
$$Value = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + ... + \frac{CF_N}{(1+r)^N}$$

Bond Pricing

- The price of a bond is the sum of the present values of the interest payment annuity plus the present value of the single cash flow or face value, usually $1000, at maturity.

$$PV = \frac{cpn}{(1+r)^1} + \frac{cpn}{(1+r)^2} + ... + \frac{(cpn+par)}{(1+r)^t}$$

- "The coupon rate is NOT the discount rate used in the bond price calculations."

Bond Pricing

- Bond prices are quoted in the financial press as a percentage of their face value. Government bonds are quoted in 32nds after the decimal; corporate bonds are quoted in eighths or now are in decimals.
- Coupon rate, Discount rate and Bond price:
  Coupon rate = Discount rate ➔ Bond price ? Face value
  Coupon rate > Discount rate ➔ Bond price ? Face value
  Coupon rate < Discount rate ➔ Bond price ? Face value

Bond Pricing

Example

What is the price of a 6.125% annual coupon bond, with a $1,000 face value, which matures in 4 years? Assume a required return of 6.6%.
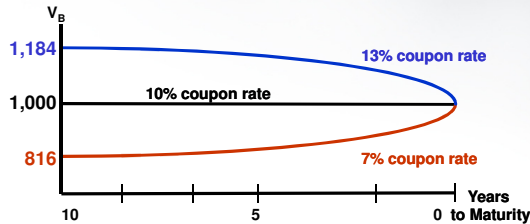

Bond Pricing

Example (continued)

What is the price of the bond if the required rate of return is 15%?

- Discount rate and Bond price:
  Discount rate ⇑ ➔ Bond price ?
  Discount rate ⇓ ➔ Bond price ?

Changes in Bond Value over Time

- What would happen to the value of three 10-year bonds with 13%, 10% and 7% coupon rates, respectively, if their required rate of returns remained at 10%:

V_B

1,184 — 13% coupon rate

1,000 — 10% coupon rate

816 — 7% coupon rate

Years to Maturity: 10   5   0

Bond Pricing

- Bond coupons are usually paid semiannually. To calculate the price of the bond on a semiannual basis, **halve** the coupon annuity payment and **double** the maturity of the bond.
- Since the time periods are now half years, the discount rate should be also changed from the annual rate to the **half year rate**.

Bond Pricing

Example (continued)

What is the price of the bond if the required rate of return is 6.6% AND the coupons are paid semi-annually?

Bond Yields

- Current Yield: Annual coupon payments divided by bond price.
  - The current yield is a rough approximation of the expected return on the bond.
  - The current yield assumes that one will hold the bond forever or that the bond is a perpetuity.
- Yield to Maturity: The YTM is the interest rate for which the PV of the bond cash flows (coupons and face value) equals the bond price.
  - A better estimate of the expected return on the bond.
  - The YTM is the approximate market rate of return and assumes that one will hold the bond until maturity.

Bond Yields

- Yield To Maturity: Interest rate for which the present value of the bond's payments equal the price.
- Calculating Yield to Maturity (YTM=r)
  If you are given the price of a bond (PV) and the coupon rate, the yield to maturity can be found by solving for r.

$$PV = \frac{cpn}{(1+r)^1} + \frac{cpn}{(1+r)^2} + ... + \frac{(cpn+par)}{(1+r)^t}$$

Bond Yields

Example
What is the YTM of a 6.125% annual coupon bond, with a $1,000 face value, which matures in 4 years? The market price of the bond is $983.76.

- Calculating YTM by hand can be very tedious. It is highly recommended that you learn to use the "IRR" or "YTM" or "i" functions on a financial calculator.

Risk for Bondholders

1. Default Risk
2. Interest Rate Risk
3. Call Risk

Default Risk

- The market yield to maturity on bonds, other than U.S. Treasury bonds, includes a default or credit risk premium, or added yield to cover the market's expected default loss on risky bonds.
- Credit (Default) Risk Premium: is the difference between the yield on a risky bond and a U.S. Treasury bond of similar maturity.
  - The higher the expected loss in yield from the risky bond, the higher the credit risk premium.
  - Bond rating firms, like Moody's and Standard and Poor's, rate the default risk of risky bonds.

Evaluating Default Risk: Bond Ratings

	Investment Grade	Junk Bonds
Moody's	Aaa Aa A Baa	Ba B Caa C
S & P	AAA AA A BBB	BB B CCC C

- Bond ratings are designed to reflect the probability of a bond issue going into default.
- Better ratings are generally associated with
  1. better financial leverage,
  2. larger firm size,
  3. larger and steadier profits,
  4. large cash flows, and
  5. lack of subordination to other debt series.

Interest Rate Risk

- Bond prices (PV) vary inversely with changes in market interest rates.
    - Discount rate ⇧ ➡ Bond price ⇩
    - Discount rate ⇩ ➡ Bond price ⇧
- The longer (shorter) the maturity of the bond, the greater (less) the change in the bond price for every change in bond discount rates.

Yield Curve

- Term Structure of Interest Rates: A listing of bond maturity dates and the interest rates that correspond with each date.
- Yield Curve: Graph of the term structure.
    - The yield curve is a plot of an issuer's, such as the U.S. Government, bond yields (YTM) by time to maturity.
    - Expectations of future interest rates has a significant impact upon the shape of the yield curve, while time risks, such as interest rate risk, may also explain the shape of the yield curve.

Call Risk

- When a company has an option to pay of the bonds early, they are said to hold a call option or the bonds are callable.
    - Callable bonds will likely be called by a company when interest rates decline.
    - Investors demand a higher yield on callable bond, for the investor is faces reinvestment risk (reinvested at a lower rate) on high coupon callable bonds.
    - The yield to nearest call date is a practical estimated yield on a callable bond (Yield to Call).

Yield to Call

Example

A 10-year, 10% semiannual coupon bond selling for $1,135.90 can be called in 4 years for $1,050, what is its yield to call (YTC)?