Chapter 8

Interest Rates and Bond Valuation

Key Concepts and Skills

- Know the important bond features and bond types
- Understand bond values and why they fluctuate
- Understand bond ratings and what they mean
- Understand the term structure of interest rates and the determinants of bond yields

Chapter Outline

8.1 Bonds and Bond Valuation
8.2 Government and Corporate Bonds
8.3 Bond Markets
8.4 Inflation and Interest Rates
8.5 Determinants of Bond Yields

8.1 Bonds and Bond Valuation

- A bond is a legally binding agreement between a borrower and a lender that specifies the:
  - Par (face) value
  - Coupon rate
  - Coupon payment
  - Maturity Date
- The yield to maturity is the required market interest rate on the bond.

Bond Valuation

- Primary Principle:
  - Value of financial securities = PV of expected future cash flows
- Bond value is, therefore, determined by the present value of the coupon payments and par value.
- Interest rates are inversely related to present (i.e., bond) values.

Bond Example: Calculator

Find the present value (as of January 1, 2009), of a 6 3/8% coupon bond with semi-annual payments, and a maturity date of December 2013 if the YTM is 5%.

\[
P\text{MT} = \frac{1,000 \times 0.06375}{2} = 31.875
\]

\[
P\text{V} = 1,000
\]
Bond Concepts

- Bond prices and market interest rates move in opposite directions.
- When coupon rate = YTM, price = par value
- When coupon rate > YTM, price > par value (premium bond)
- When coupon rate < YTM, price < par value (discount bond)

Interest Rate Risk

- Price Risk
  - Change in price due to changes in interest rates
  - Long-term bonds have more price risk than short-term bonds. Low coupon rate bonds have more price risk than high coupon rate bonds.
- Reinvestment Rate Risk
  - Uncertainty concerning rates at which cash flows can be reinvested
  - Short-term bonds have more reinvestment rate risk than long-term bonds.
  - High coupon bonds have more reinvestment rate risk than low coupon rate bonds.

Computing Yield to Maturity

- Yield to maturity is the rate implied by the current bond price.
- With a financial calculator, enter N, PV, PMT, and FV, remembering the sign convention (PMT and FV need to have the same sign, PV the opposite sign).

YTM with Semiannual Coupons

- Suppose a bond with a 10% coupon rate and semiannual coupons has a face value of $1,000, 20 years to maturity, and is selling for $1,197.93.
  - N = 40; PV = -1,197.93; PMT = 50; FV = 1,000; CPT I/Y = 4% (Is this the YTM?)
  - YTM = 4%*2 = 8%

Current Yield vs. Yield to Maturity

- Current Yield = annual coupon / price
- Yield to maturity = current yield + capital gains yield
- Example: 10% coupon bond, with semiannual coupons, face value of 1,000, 20 years to maturity, $1,197.93 price
  - Current yield = .10 / 1197.93 = .0825 = 8.35%
  - Price in 1 year, if YTM unchanged = 1,193.68
  - Capital gain yield = (1193.68 - 1197.93) / 1197.93 = -.0035 = -35%
  - YTM = 8.35 - .35 = 8%, which is the same YTM computed earlier

Bond Pricing Theorems

- Bonds of similar risk (and maturity) will be priced to yield about the same return, regardless of the coupon rate.
- If you know the price of one bond, you can estimate its YTM and use that to find the price of the second bond.
- This is a useful concept that can be transferred to valuing assets other than bonds.
Zero Coupon Bonds

- Make no periodic interest payments (coupon rate = 0%)
- The entire yield to maturity comes from the difference between the purchase price and the par value
- Cannot sell for more than par value
- Sometimes called zeroes, deep discount bonds, or original issue discount bonds (OIDs)
- Treasury Bills and principal-only Treasury strips are good examples of zeroes

8.2 Government and Corporate Bonds

- Treasury Securities
  - Federal government debt
  - T-bills – pure discount bonds with original maturity less than one year
  - T-notes – coupon debt with original maturity between one and ten years
  - T-bonds – coupon debt with original maturity greater than ten years
- Municipal Securities
  - Debt of state and local governments
  - Varying degrees of default risk, rated similar to corporate debt
  - Interest received is tax-exempt at the federal level

After-tax Yields

- A taxable bond has a yield of 8%, and a municipal bond has a yield of 6%.
- If you are in a 40% tax bracket, which bond do you prefer?
  - 8%(1 - .4) = 4.8%
  - The after-tax return on the corporate bond is 4.8%, compared to a 6% return on the municipal
- At what tax rate would you be indifferent between the two bonds?
  - 8%(1 − T) = 6%, implying T = 25%

Corporate Bonds

- Greater default risk relative to government bonds
- The promised yield (YTM) may be higher than the expected return due to this added default risk

Bond Ratings – Investment Quality

- High Grade - Moody's Aaa and S&P AAA – capacity to pay is extremely strong, Moody's Aa and S&P AA – capacity to pay is very strong
- Medium Grade - Moody's A and S&P A – capacity to pay is strong, but more susceptible to changes in circumstances, Moody's Baa and S&P BBB – capacity to pay is adequate, adverse conditions will have more impact on the firm's ability to pay

Bond Ratings - Speculative

- Low Grade - Moody's Ba and B, S&P BB and B, Considered speculative with respect to capacity to pay.
- Very Low Grade - Moody's C, S&P C & D, Highly uncertain repayment and, in many cases, already in default, with principal and interest in arrears.
8.4 Inflation and Interest Rates

- Real rate of interest – change in purchasing power
- Nominal rate of interest – quoted rate of interest, change in purchasing power and inflation
- The ex ante nominal rate of interest includes our desired real rate of return plus an adjustment for expected inflation.

Real versus Nominal Rates

\[(1 + R) = (1 + r)(1 + h), \text{ where} \]
- \( R \) = nominal rate
- \( r \) = real rate
- \( h \) = expected inflation rate

Approximation
- \( R = r + h \)

The Fisher Effect: Example

- If we require a 10% real return and we expect inflation to be 8%, what is the nominal rate?
- \( R = (1.1)(1.08) - 1 = .188 = 18.8\% \)
- Approximation: \( R = 10\% + 8\% = 18\% \)
- If the real return and expected inflation are relatively high, there is a significant difference between the actual Fisher Effect and the approximation.

8.5 Determinants of Bond Yields

- Term structure is the relationship between time to maturity and yields, all else equal.
- It is important to recognize that we pull out the effect of default risk, different coupons, etc.
- Yield curve – graphical representation of the term structure
  - Normal – upward-sloping, long-term yields are higher than short-term yields
  - Inverted – downward-sloping, long-term yields are lower than short-term yields

Factors Affecting Required Return

- Default risk premium – remember bond ratings
- Taxability premium – remember municipal versus taxable
- Liquidity premium – bonds that have more frequent trading will generally have lower required returns (remember bid-ask spreads)
- Anything else that affects the risk of the cash flows to the bondholders will affect the required returns.
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