Question Book for Lecture Note 6

Valuing Bonds and Common Stocks

Problems

EASY PROBLEMS 1–6

(5–1) Bond Valuation with Annual Payments

Jackson Corporation's bonds have 12 years remaining to maturity. Interest is paid annually, the bonds have a $1,000 par value, and the coupon interest rate is 8%. The bonds have a yield to maturity of 9%. What is the current market price of these bonds?

(5–2) Yield to Maturity for Annual Payments

Wilson Wonders's bonds have 12 years remaining to maturity. Interest is paid annually, the bonds have a $1,000 par value, and the coupon interest rate is 10%. The bonds sell at a price of $850. What is their yield to maturity?

(5–3) Current Yield for Annual Payments

Heath Foods's bonds have 7 years remaining to maturity. The bonds have a face value of $1,000 and a yield to maturity of 8%. They pay interest annually and have a 9% coupon rate. What is their current yield?

(5–4) Determinant of Interest Rates

The real risk-free rate of interest is 4%. Inflation is expected to be 2% this year and 4% during the next 2 years. Assume that the maturity risk premium is zero. What is the yield on 2-year Treasury securities? What is the yield on 3-year Treasury securities?

(5–5) Default Risk Premium

A Treasury bond that matures in 10 years has a yield of 6%. A 10-year corporate bond has a yield of 9%. Assume that the liquidity premium on the corporate bond is 0.5%. What is the default risk premium on the corporate bond?

(5–6) Maturity Risk Premium

The real risk-free rate is 3%, and inflation is expected to be 3% for the next 2 years. A 2-year Treasury security yields 6.3%. What is the maturity risk premium for the 2-year security?

INTERMEDIATE PROBLEMS 7–20

(5–7) Bond Valuation with Semiannual Payments

Renfro Rentals has issued bonds that have a 10% coupon rate, payable semiannually. The bonds mature in 8 years, have a face value of $1,000, and a yield to maturity of 8.5%. What is the price of the bonds?

(5–8) Yield to Maturity and Call with Semiannual Payments

Thatcher Corporation's bonds will mature in 10 years. The bonds have a face value of $1,000 and an 8% coupon rate, paid semiannually. The price of the bonds is $1,100. The bonds are callable in 5 years at a call price of $1,050. What is their yield to maturity? What is their yield to call?

(5–9) Bond Valuation and Interest Rate Risk

The Garraty Company has two bond issues outstanding. Both bonds pay $100 annual interest plus $1,000 at maturity. Bond L has a maturity of 15 years, and Bond S has a maturity of 1 year.

a. What will be the value of each of these bonds when the going rate of interest is (1) 5%, (2) 8%, and (3) 12%? Assume that there is only one more interest payment to be made on Bond S.
b. Why does the longer-term (15-year) bond fluctuate more when interest rates change than does the shorter-term bond (1 year)?

(5–10) Yield to Maturity and Required Returns

The Brownstone Corporation's bonds have 5 years remaining to maturity. Interest is paid annually, the bonds have a $1,000 par value, and the coupon interest rate is 9%.

a. What is the yield to maturity at a current market price of (1) $829 or (2) $1,104?
b. Would you pay $829 for one of these bonds if you thought that the appropriate rate of interest was 12%—that is, if r_d = 12%? Explain your answer.

(5–11) Yield to Call and Realized Rates of Return

Seven years ago, Goodwynn & Wolf Incorporated sold a 20-year bond issue with a 14% annual coupon rate and a 9% call premium. Today, G&W called the bonds. The bonds originally were sold at their face value of $1,000. Compute the realized rate of return for investors who purchased the bonds when they were issued and who surrender them today in exchange for the call price.

(5–12) Bond Yields and Rates of Return

A 10-year, 12% semiannual coupon bond with a par value of $1,000 may be called in 4 years at a call price of $1,060. The bond sells for $1,100. (Assume that the bond has just been issued.)

a. What is the bond's yield to maturity?
b. What is the bond's current yield?
c. What is the bond's capital gain or loss yield?
d. What is the bond's yield to call?

(5–13) Yield to Maturity and Current Yield

You just purchased a bond that matures in 5 years. The bond has a face value of $1,000 and has an 8% annual coupon. The bond has a current yield of 8.21%. What is the bond's yield to maturity?

(5–14) Current Yield with Semiannual Payments

A bond that matures in 7 years sells for $1,020. The bond has a face value of $1,000 and a yield to maturity of 10.5883%. The bond pays coupons semiannually. What is the bond's current yield?

(5–15) Yield to Call, Yield to Maturity, and Market Rates

Absalom Motors's 14% coupon rate, semiannual payment, $1,000 par value bonds that mature in 30 years are callable 5 years from now at a price of $1,050. The bonds sell at a price of $1,353.54, and the yield curve is flat. Assuming that interest rates in the economy are expected to remain at their current level, what is the best estimate of the nominal interest rate on new bonds?

(5–16) Interest Rate Sensitivity

A bond trader purchased each of the following bonds at a yield to maturity of 8%. Immediately after she purchased the bonds, interest rates fell to 7%. What is the percentage change in the price of each bond after the decline in interest rates? Fill in the following table:

	Price @ 8%	Price @ 7%	Percentage Change
10-year, 10% annual coupon			
10-year zero			
5-year zero			
30-year zero			
$100 perpetuity			

(5–17) Bond Value as Maturity Approaches

An investor has two bonds in his portfolio. Each bond matures in 4 years, has a face value of $1,000, and has a yield to maturity equal to 9.6%. One bond, Bond C, pays an annual coupon of 10%; the other bond, Bond Z, is a zero coupon bond. Assuming that the yield to maturity of each bond remains at 9.6% over the next 4 years, what will be the price of each of the bonds at the following time periods? Fill in the following table:

t	Price of Bond C	Price of Bond Z
0	_____	_____
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____

(5–18) Determinants of Interest Rates

The real risk-free rate is 2%. Inflation is expected to be 3% this year, 4% next year, and then 3.5% thereafter. The maturity risk premium is estimated to be 0.0005 × (t – 1), where t = number of years to maturity. What is the nominal interest rate on a 7-year Treasury security?

(5–19) Maturity Risk Premiums

Assume that the real risk-free rate, r*, is 3% and that inflation is expected to be 8% in Year 1, 5% in Year 2, and 4% thereafter. Assume also that all Treasury securities are highly liquid and free of default risk. If 2-year and 5-year Treasury notes both yield 10%, what is the difference in the maturity risk premiums (MRPs) on the two notes; that is, what is MRP_5 minus MRP_2?

(5–20) Inflation Risk Premiums

Because of a recession, the inflation rate expected for the coming year is only 3%. However, the inflation rate in Year 2 and thereafter is expected to be constant at some level above 3%. Assume that the real risk-free rate is r* = 2% for all maturities and that there are no maturity premiums. If 3-year Treasury notes yield 2 percentage points more than 1-year notes, what inflation rate is expected after Year 1?

CHALLENGING PROBLEMS 21–23

(5–21) Bond Valuation and Changes in Maturity and Required Returns

Suppose Hillard Manufacturing sold an issue of bonds with a 10-year maturity, a $1,000 par value, a 10% coupon rate, and semiannual interest payments.

a. Two years after the bonds were issued, the going rate of interest on bonds such as these fell to 6%. At what price would the bonds sell?
b. Suppose that, 2 years after the initial offering, the going interest rate had risen to 12%. At what price would the bonds sell?
c. Suppose, as in part a, that interest rates fell to 6% 2 years after the issue date. Suppose further that the interest rate remained at 6% for the next 8 years. What would happen to the price of the bonds over time?

(5–22) Yield to Maturity and Yield to Call

Arnot International's bonds have a current market price of $1,200. The bonds have an 11% annual coupon payment, a $1,000 face value, and 10 years left until maturity. The bonds may be called in 5 years at 109% of face value (call price = $1,090).

a. What is the yield to maturity?
b. What is the yield to call if they are called in 5 years?
c. Which yield might investors expect to earn on these bonds, and why?
d. The bond's indenture indicates that the call provision gives the firm the right to call them at the end of each year beginning in Year 5. In Year 5, they may be called at 109% of face value, but in each of the next 4 years the call percentage will decline by 1 percentage point. Thus, in Year 6 they may be called at 108% of face value, in Year 7 they may be called at 107% of face value, and so on. If the yield curve is horizontal and interest rates remain at their current level, when is the latest that investors might expect the firm to call the bonds?

(5–23)
Determinants of Interest Rates

Suppose you and most other investors expect the inflation rate to be 7% next year, to fall to 5% during the following year, and then to remain at a rate of 3% thereafter. Assume that the real risk-free rate, r*, will remain at 2% and that maturity risk premiums on Treasury securities rise from zero on very short-term securities (those that mature in a few days) to a level of 0.2 percentage points for 1-year securities. Furthermore, maturity risk premiums increase 0.2 percentage points for each year to maturity, up to a limit of 1.0 percentage point on 5-year or longer-term T-notes and T-bonds.

a. Calculate the interest rate on 1-, 2-, 3-, 4-, 5-, 10-, and 20-year Treasury securities, and plot the yield curve.
b. Now suppose ExxonMobil's bonds, rated AAA, have the same maturities as the Treasury bonds. As an approximation, plot an ExxonMobil yield curve on the same graph with the Treasury bond yield curve. (*Hint:* Think about the default risk premium on ExxonMobil's long-term versus its short-term bonds.)
c. Now plot the approximate yield curve of Long Island Lighting Company, a risky nuclear utility.

Problems

EASY PROBLEMS 1–5

(7–1) DPS Calculation

Thress Industries just paid a dividend of $1.50 a share (i.e., D_0 = $1.50). The dividend is expected to grow 5% a year for the next 3 years and then 10% a year thereafter. What is the expected dividend per share for each of the next 5 years?

(7–2) Constant Growth Valuation

Boehm Incorporated is expected to pay a $1.50 per share dividend at the end of this year (i.e., D_1 = $1.50). The dividend is expected to grow at a constant rate of 7% a year. The required rate of return on the stock, r_s, is 15%. What is the value per share of Boehm's stock?

(7–3) Constant Growth Valuation

Woidtke Manufacturing's stock currently sells for $20 a share. The stock just paid a dividend of $1.00 a share (i.e., D_0 = $1.00), and the dividend is expected to grow forever at a constant rate of 10% a year. What stock price is expected 1 year from now? What is the required rate of return on Woidtke's stock?

(7–4) Preferred Stock Valuation

Nick's Enchiladas Incorporated has preferred stock outstanding that pays a dividend of $5 at the end of each year. The preferred sells for $50 a share. What is the stock's required rate of return?

(7–5) Nonconstant Growth Valuation

A company currently pays a dividend of $2 per share ($D_0$ = $2). It is estimated that the company's dividend will grow at a rate of 20% per year for the next 2 years, then at a constant rate of 7% thereafter. The company's stock has a beta of 1.2, the risk-free rate is 7.5%, and the market risk premium is 4%. What is your estimate of the stock's current price?

INTERMEDIATE PROBLEMS 6–16

(7–6) Constant Growth Rate, g

A stock is trading at $80 per share. The stock is expected to have a year-end dividend of $4 per share ($D_1$ = $4), and it is expected to grow at some constant rate g throughout time. The stock's required rate of return is 14%. If markets are efficient, what is your forecast of g?

(7–7) Constant Growth Valuation

You are considering an investment in Crisp Cookware's common stock. The stock is expected to pay a dividend of $2 a share at the end of this year (D_1 = $2.00); its beta is 0.9; the risk-free rate is 5.6%; and the market risk premium is 6%. The dividend is expected to grow at some constant rate g, and the stock currently sells for $25 a share. Assuming the market is in equilibrium, what does the market believe will be the stock's price at the end of 3 years (i.e., what is $\hat{P}_3$)?

(7–8) Preferred Stock Rate of Return

What is the nominal rate of return on a preferred stock with a $100 par value, a stated dividend of 8% of par, and a current market price of (a) $60, (b) $80, (c) $100, and (d) $140?

(7–9) Declining Growth Stock Valuation

Brushy Mountain Mining Company's ore reserves are being depleted, so its sales are falling. Also, its pit is getting deeper each year, so its costs are rising. As a result, the company's earnings and dividends are declining at the constant rate of 4% per year. If D_0 = $5 and r_s = 15%, what is the value of Brushy Mountain's stock?

(7–10) Rates of Return and Equilibrium

The beta coefficient for Stock C is b_C = 0.4 and that for Stock D is b_D = –0.5. (Stock D's beta is negative, indicating that its rate of return rises whenever returns on most other stocks fall. There are very few negative-beta stocks, although collection agency and gold mining stocks are sometimes cited as examples.)

a. If the risk-free rate is 9% and the expected rate of return on an average stock is 13%, what are the required rates of return on Stocks C and D?
b. For Stock C, suppose the current price, P_0, is \$25; the next expected dividend, D_1, is \$1.50; and the stock's expected constant growth rate is 4%. Is the stock in equilibrium? Explain, and describe what would happen if the stock were not in equilibrium.

(7–11) Nonconstant Growth Stock Valuation

Assume that the average firm in your company's industry is expected to grow at a constant rate of 6% and that its dividend yield is 7%. Your company is about as risky as the average firm in the industry, but it has just successfully completed some R&D work that leads you to expect that its earnings and dividends will grow at a rate of 50% [$D_1 = D_0(1 + g) = D_0(1.50)$] this year and 25% the following year, after which growth should return to the 6% industry average. If the last dividend paid (D_0) was \$1, what is the value per share of your firm's stock?

(7–12) Nonconstant Growth Stock Valuation

Simpkins Corporation is expanding rapidly, and it does not pay any dividends because it currently needs to retain all of its earnings. However, investors expect Simpkins to begin paying dividends, with the first dividend of \$1.00 coming 3 years from today. The dividend should grow rapidly—at a rate of 50% per year—during Years 4 and 5. After Year 5, the company should grow at a constant rate of 8% per year. If the required return on the stock is 15%, what is the value of the stock today?

(7–13) Preferred Stock Valuation

Several years ago, Rolen Riders issued preferred stock with a stated annual dividend of 10% of its \$100 par value. Preferred stock of this type currently yields 8%. Assume dividends are paid annually.

a. What is the value of Rolen's preferred stock?
b. Suppose interest rate levels have risen to the point where the preferred stock now yields 12%. What would be the new value of Rolen's preferred stock?

(7–14) Return on Common Stock

You buy a share of The Ludwig Corporation stock for \$21.40. You expect it to pay dividends of \$1.07, \$1.1449, and \$1.2250 in Years 1, 2, and 3, respectively, and you expect to sell it at a price of \$26.22 at the end of 3 years.

a. Calculate the growth rate in dividends.
b. Calculate the expected dividend yield.
c. Assuming that the calculated growth rate is expected to continue, you can add the dividend yield to the expected growth rate to obtain the expected total rate of return. What is this stock's expected total rate of return?

(7–15) Constant Growth Stock Valuation

Investors require a 15% rate of return on Brooks Sisters's stock ($r_s = 15\%$).

a. What would the value of Brooks's stock be if the previous dividend was $D_0 = \$2$ and if investors expect dividends to grow at a constant annual rate of (1) –5%, (2) 0%, (3) 5%, and (4) 10%?
b. Using data from part a, what is the Gordon (constant growth) model's value for Brooks Sisters's stock if the required rate of return is 15% and the expected growth rate is (1) 15% or (2) 20%? Are these reasonable results? Explain.
c. Is it reasonable to expect that a constant growth stock would have $g > r_s$?

(7–16) Equilibrium Stock Price

The risk-free rate of return, r_{RF}, is 11%; the required rate of return on the market, r_M, is 14%; and Schuler Company's stock has a beta coefficient of 1.5.

a. If the dividend expected during the coming year, D_1, is \$2.25, and if g is a constant 5%, then at what price should Schuler's stock sell?
b. Now suppose that the Federal Reserve Board increases the money supply, causing a fall in the risk-free rate to 9% and in r_M to 12%. How would this affect the price of the stock?
c. In addition to the change in part b, suppose investors' risk aversion declines; this fact, combined with the decline in r_{RF}, causes r_M to fall to 11%. At what price would Schuler's stock now sell?
d. Suppose Schuler has a change in management. The new group institutes policies that increase the expected constant growth rate to 6%. Also, the new management stabilizes sales and profits and thus causes the beta coefficient to decline from 1.5 to 1.3. Assume that r_{RF} and r_M are equal to the values in part c. After all these changes, what is Schuler's new equilibrium price? (*Note:* D_1 goes to \$2.27.)

CHALLENGING PROBLEMS 17–19

(7–17) Constant Growth Stock Valuation

Suppose a firm's common stock paid a dividend of \$2 *yesterday*. You expect the dividend to grow at the rate of 5% per year for the next 3 years; if you buy the stock, you plan to hold it for 3 years and then sell it.

a. Find the expected dividend for each of the next 3 years; in other words, calculate D_1, D_2, and D_3. Note that D_0 = \$2.
b. Given that the appropriate discount rate is 12% and that the first of these dividend payments will occur 1 year from now, find the present value of the dividend stream; that is, calculate the PV of D_1, D_2, and D_3, and then sum these PVs.
c. You expect the price of the stock 3 years from now to be \$34.73 (i.e., you expect $\hat{P}_3$= \$34.73). Discounted at a 12% rate, what is the present value of this expected future stock price? In other words, calculate the PV of \$34.73.
d. If you plan to buy the stock, hold it for 3 years, and then sell it for \$34.73, what is the most you should pay for it?
e. Use Equation 7-2 to calculate the present value of this stock. Assume that g = 5% and is constant.
f. Is the value of this stock dependent on how long you plan to hold it? In other words, if your planned holding period were 2 years or 5 years rather than 3 years, would this affect the value of the stock today, $\hat{P}_0$? Explain your answer.

(7–18) Nonconstant Growth Stock Valuation

Reizenstein Technologies (RT) has just developed a solar panel capable of generating 200% more electricity than any solar panel currently on the market. As a result, RT is expected to experience a 15% annual growth rate for the next 5 years. By the end of 5 years, other firms will have developed comparable technology, and RT's growth rate will slow to 5% per year indefinitely. Stockholders require a return of 12% on RT's stock. The most recent annual dividend (D_0), which was paid yesterday, was \$1.75 per share.

a. Calculate RT's expected dividends for t = 1, t = 2, t = 3, t = 4, and t = 5.
b. Calculate the intrinsic value of the stock today, $\hat{P}_0$. Proceed by finding the present value of the dividends expected at t = 1, t = 2, t = 3, t = 4, and t = 5 plus the present value of the stock price that should exist at t = 5, $\hat{P}_5$. The $\hat{P}_5$ stock price can be found by using the constant growth equation. Note that to find $\hat{P}_5$ you use the dividend expected at t = 6, which is 5% greater than the t = 5 dividend.

c. Calculate the expected dividend yield ($D_1/\hat{P}_0$), the capital gains yield expected during the first year, and the expected total return (dividend yield plus capital gains yield) during the first year. (Assume that $\hat{P}_0 = P_0$, and recognize that the capital gains yield is equal to the total return minus the dividend yield.) Also calculate these same three yields for t = 5 (e.g., $D_6/\hat{P}_5$).
d. If your calculated intrinsic value differed substantially from the current market price, and if your views are consistent with those of most investors (the marginal investor), what would happen in the marketplace? What would happen if your views were *not* consistent with those of the marginal investor and you turned out to be correct?

(7–19)
Supernormal Growth Stock Valuation

Taussig Technologies Corporation (TTC) has been growing at a rate of 20% per year in recent years. This same supernormal growth rate is expected to last for another 2 years ($g_1 = g_2 = 20\%$).

a. If $D_0 = \$1.60$, $r_s = 10\%$, and $g_L = 6\%$, then what is TTC's stock worth today? What is its expected dividend yield and its capital gains yield at this time?
b. Now assume that TTC's period of supernormal growth is to last another 5 years rather than 2 years ($g_1 = g_2 = g_3 = g_4 = g_5 = 20\%$). How would this affect its price, dividend yield, and capital gains yield? Answer in words only.
c. What will TTC's dividend yield and capital gains yield be once its period of supernormal growth ends? (*Hint:* These values will be the same regardless of whether you examine the case of 2 or 5 years of supernormal growth, and the calculations are very easy.)
d. Of what interest to investors is the relationship over time between dividend yield and capital gains yield?