

# MIT SLOAN SCHOOL OF MANAGEMENT

J. Wang  
E52-456

15.407  
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## Problem Set 3: Common Stock

Due: October 10, 2003

1. (BKM) Which of the following assumptions are(is) necessary to the constant-growth dividend discount model? Briefly explain.
  - (a) Dividends grow at a constant rate
  - (b) The dividend growth rate continues indefinitely
  - (c) The required rate of return is higher than the dividend growth rate.
  
2. Explain the following:
  - (a) When will the DDM model not be able to assign a positive/finite value to a company? Explain why that may or may not be a problem when valuing a company.
  - (b) Typically, what types of company will have a high P/E ratio, and what types will have a high Book-to-Market ratio? Does that mean that companies of high P/E or B-M ratio are overvalued or undervalued?
  
3. (BM) In March 1995, International Paper's stock sold for about \$73. Security analysts were forecasting a long-term earnings growth rate of 8.5%. The company was paying dividends of \$1.68 per share.

Consider the following two parts separately.

  - (a) Assume dividends are expected to grow along with earnings at  $g = 8.5\%$  per year in perpetuity. What rate of return  $r$  were investors expecting?
  - (b) International Paper was expected to earn about 12% on book equity and to pay out about 50% of earnings as dividends. What do these forecasts imply for  $g$ ? For  $r$ ? Use the perpetual-growth DCF formula.
  
4. (BKM) The FI Corporation's dividends per share are expected to grow indefinitely by 5% per year.
  - (a) If this year's year-end dividend is \$8 and the market capitalization rate is 10% per year, what must be the current stock price according to the DDM?
  - (b) If the expected earnings per share are \$12, what is the implied value of the ROE on future investment opportunities?
  - (c) How much is the market paying per share for growth opportunities (i.e., for an ROE on future investments that exceeds the market capitalization rate)?

5. (BKM) The Digital Electronic Quotation System (DEQS) Corporation pays no cash dividends currently and is not expected to for the next five years. Its latest EPS was \$10, all of which was reinvested in the company. The firm's expected ROE for the next five years is 20% per year, and during this time it is expected to continue to reinvest all of its earnings. Starting six years from now the firm's ROE on new investments is expected to fall to 15%, and the company is expected to start paying out 40% of its earnings in cash dividends, which it will continue to do forever after. DEQS's market capitalization rate is 15% per year.

- (a) What is the value of DEQS according to the DDM model?
- (b) Assuming its current market price is equal to the answer in (a), what do you expect to happen to its price over the next year? The year after?
- (c) What effect would it have on your estimate of DEQS's value if you expected DEQS to pay out only 20% of earnings starting in year 6?

6. Company RF is a matured company. Its asset is worth \$100 with no debt. RF has plenty of cash but exhausted its internal investment opportunities. RF currently produce (riskless) cashflow of \$5 at the end of each year and pays all of it as dividend.

Company RF is contemplating buying up company RK which is a high-tech company that is short of cash. Since it has no cashflow right now, company RK is unable to issue bonds or equity. If company RK gets no funding, it will produce a expected cashflow of \$5 per year, starting 3 years from now and all paid as dividend. If it gets a funding of \$20 today, it can invest aggressively and it will produce additional cashflows starting 5 years from now. The first cashflow will be \$5, and then grow at 10% forever. Company RK will need to re-invest 20% of the proceed from the new project to support growth and pays the rest as dividend. The cost of equity of RK is 15%.

- (a) What is the cost of equity of RF?
- (b) What is the total value of RF and RK if they remain separate? (i.e. RK does not get funding from any source)
- (c) What is the total value if RF combines with RK and provides funding to RK?
- (d) Suppose RF merges with RK to form a new company, and has declared that it will undertake the new project. What is the weighted-average cost of capital(WACC) for the new combined entity? i.e. find the appropriate cost of equity that, when you discount all the expected dividends of the merged company, you find the market value of the company.