University Southampton
Solutions

Question 1

a. An analyst uses a temporary supernormal growth model to value a common stock. The company paid a $2 dividend last year. The analyst expects dividends to grow at 15% each year for the next three years and then to resume a normal rate of 7% per year indefinitely. The analyst estimates that investors require a 12% return on the stock. What is the value of this common stock?

Calculate the dividends during the supernormal growth period using g_S = 15%

$D_1 = D_0(1+g_S) = \$2.00\ (1.15\%) = \$2.30$

$D_2 = D_0(1+g_S)^2 = \$2.00\ (1.15\%)^2 = \$2.645$

$D_3 = D_0(1+g_S)^3 = \$2.00\ (1.15\%)^3 = \$3.042$

D_3 is the first dividend that will grow at a constant rate. Use this dividend to calculate the value of the stock at t=2 using the infinite period DDM.

$$P_2 = \frac{D_3}{(K_e - g)} = \frac{3.042}{0.12 - 0.07} = 60.84$$

Calculate the present value of the cash flows discounted at K_e of 12%

PV of $D_1 = \$2.30 / (1.12) = \$2.054$

PV of $D_2 = \$2.645 / (1.12)^2 = \$2.109$

PV of $P_2 = \$60.84 / (1.12)^2 = \$48.50$

V_S = **$52.664**

[40 marks]

b. Critically discuss the three assumptions that lie behind the Modigliani–Miller theory in a world without taxes. Are these assumptions reasonable in the real world?

Assumptions of the Modigliani-Miller theory in a world without taxes:

1) Individuals can borrow at the same interest rate at which the firm borrows. Since investors can purchase securities on margin, an individual's effective interest rate is probably no higher than that for a firm. Therefore, this assumption is reasonable when applying MM's theory to the real world. If a firm were able to borrow at a rate lower than individuals, the firm's value would increase through corporate leverage. As MM Proposition I states, this is not the case in a world with no taxes.

2) There are no taxes. In the real world, firms do pay taxes. In the presence of corporate taxes, the value of a firm is positively related to its debt level. Since interest payments are deductible, increasing debt reduces taxes and raises the value of the firm.

[30 marks]

c. Explain why share price drop on the ex-rights day.

The price drop will occur on the ex-rights date, even though the ex-rights date is neither the expiration date nor the date on which the rights are first exercisable. If you purchase the equity before the ex-rights date, you will receive the rights. If you purchase the equity on or after the ex-rights date, you will not receive the rights. Since rights have value, the shareholder receiving the rights must pay for them. The share price drop on the ex-rights day is similar to the share price drop on an ex-dividend day.

[30 marks]

Question 2

a. Use the following information to answer the questions

The company has a target capital structure of 40% debt and 60% equity

Bonds with face value of $1,000 pay a 10% coupon (semi-annual), mature in 20 years, and sell for $849.54 with yield to maturity of 12%.

The company stock beta is 1.2

Risk-free rate is 10%, and market risk premium is 5%

The company is a constant-growth firm that just paid a dividend of $2, sells for $27 per share, and has a growth rate of 8%

The company's marginal tax rate is 40%

a. What is the company's after-tax cost of debt?

$$k_d(1-t) = 12(1-0.4) = 7.2\%$$

[10 marks]

b. What is the company's cost of equity using the capital asset pricing model (CAPM)?

Using the CAPM formula, $k_{CE} = R_F + \beta(E_{RM} - R_F) = 10\% + 1.2 \times 5\%$=16%

[10 marks]

c. What is the company's cost of equity using the dividend discount model?

$$D_1 = D_0(1+g) = 2 \times (1.08) = 2.16$$

$$k_{CE} = (D_1/P_0) + g = (2.16/27) + 0.08$$=16%

[10 marks]

d. What is the company's weighted average cost of capital (using the cost of equity from CAPM)?

$$WACC = (w_d)(k_d)(1-t) + (w_{ce})(k_{ce}) = (0.4)(7.2) + (0.6)(16) = 12.48\%$$

[10 marks]

Total [40 marks]

b. What do you understand by the term "value maximization"? Who maximizes this value and why? Explain.

Corporate goals and wealth (value) maximization

- Maximization of shareholders' wealth is the dominant goal of management in the Anglo-American world.

- In the rest of the world, this perspective still holds true (although to a lesser extent in some countries).
- In Anglo-American markets, this goal is realistic; in many other countries it is not.

Shareholder Wealth Maximization

- In a Shareholder Wealth Maximization model (SWM), a firm should strive to *maximize the return to shareholders*, as measured by the *sum of capital gains and dividends*, for a given level of risk.
- Alternatively, the firm should minimize the level of risk to shareholders for a given rate of return.

[20 marks]

c. Discuss why NPV is considered as a superior method of evaluating the cash flows from a project.

NPV is superior to the other methods of analysis because it has no serious flaws.

- Takes account of time value of money.
- Uses cash flow, not accounting profit.
- Takes account of all relevant cash flows over life of project.
- Can take account of conventional and non-conventional cash flows, as well as changes in discount rate during project.

[20 marks]

d. Explain the capital asset pricing model (CAPM), including its underlying assumptions and the resulting conclusions

The CAPM is an equilibrium asset pricing model that assumes that market risk, measured by beta, is the only risk priced by investors. The Security Market Line is the graph of the CAPM:

$$E(R_i) = R_F + \beta_i[E(R_M - R_F)]$$

The intercept of the SML is the risk-free rate, R_F, and the slope is the market risk premium, $E(R_M) - R_F$

[20 marks]

Question 3

a. . Biosys Ltd has developed a patented procedure that is able to reverse genetic mutations in mice. Initial human trials have been successful and the company expects this procedure to be prohibitively expensive for its competitors to develop or mimic. Once the procedure is fully implemented the company expects to generate net after-tax cash flows of $12,000,000 next year with the cash flows expected to grow at a constant rate of 8% per annum in perpetuity. The initial investment required for the development and further testing of the procedure is $90,000,000. The company uses a discount rate of 20% to evaluate its projects.

i. Compute the project's net present value. What decision would the firm make?

NPV = $10,000,000.

[10 marks]

ii. Compute the project's internal rate of return. What decision would the firm make now?

IRR = 21.3%.

[10 marks]

iii. Are there any conflicts in your decisions in parts (a) and (b) above? If so, explain why these conflicts may exist.
The two methods give the same decision.

[10 marks]
Total [30 marks]

b. Define the concept of capital market efficiency. What is meant by the weak, semi-strong and strong forms of market efficiency? How does the concept of market efficiency differ from the concept of capital market *inefficiency*?

A market is **informationally efficient** if prices instantaneously and unbiased reflect all available, relevant information.

Weak form of market efficiency: Information on past prices is fully reflected in current prices. Past prices cannot help investors earn returns in excess of what other investors are earning on similar risk securities

Semi-strong form of market efficiency: All publicly available information is fully and instantaneously reflected in current market prices.
Examples: Announcements of earnings and dividends, share buybacks, stock splits, mergers, takeovers, etc
Implication of Semi-strong form of market efficiency: Past and currently available information is fully reflected in current market prices. Investors cannot use any publicly available information to *"beat the market".* Note: A market cannot be semi-strong form efficient if it is weak form inefficient

Strong form of market efficiency: All information, public and private, is fully reflected in prices. The market does not neglect any relevant information
Implication: Since all information is impounded in prices fully and instantaneously it will be useless in predicting future prices (and returns)

Implications of market inefficiency
Implications of strong form inefficiency: Company insiders with inside information may exploit their private information to earn "excess" or "abnormal" returns/profits.
Note 1: A market can be semi-strong form efficient but not necessarily strong form efficient
Note 2: Stock exchanges typically actively monitor and prevent insider trading

In an efficient market investors do not ***over-react*** or ***under react*** to "news".
Example: Bad news hits the market which implies that the price of a stock should fall by $1.50 from $5.00. Some market participants "panic" and offer to sell their shares at $3.00. In an unbiased market the stock should trade at $3.50 after the news announcement.

[30 marks]

c. At Litchfield Chemical Corp. (LCC), a director of the company said that the use of dividend discount models by investors is "proof" that the higher the dividend, the higher the stock price.

i. Using a constant-growth dividend discount model as a basis of reference, evaluate the director's statement.

This director is confused. In the context of the constant growth model:
[i.e., $P_0 = D_1/(k - g)$], it is true that price is higher when dividends are higher *holding everything else including dividend growth constant*. But everything else will not be constant. If the firm increases the dividend payout rate, the growth rate *g* will fall **(given that the company will have to forego retained earnings for increased dividends)**, and stock price will not necessarily rise. In fact, if ROE > *k*, price will fall.

[20 marks]

ii. Explain how an increase in dividend payout would affect each of the following (holding all other factors constant):

1. Sustainable growth rate.

An increase in dividend payout will reduce the sustainable growth rate as less funds are reinvested in the firm. The sustainable growth rate (i.e., ROE×plowback) will fall as plowback ratio falls.

[10 marks]

2. Growth in book value.

The increased dividend payout rate will reduce the growth rate of book value for the same reason -- **less funds are reinvested in the firm**.

[10 marks]