

1. True or false? Briefly explain.

(a) _____ Your firm has the opportunity to invest \$20 million in a project with positive net present value. Even though this investment adds to the value of the firm, under some circumstances the firm might reject it.

(b) _____ For most firms, a small or moderate amount of borrowing will have essentially no effect on the probability of bankruptcy. Therefore, a small amount of borrowing will have no effect on the risk of equity.

1. True or false, cont.

(c) _____ The average return on stocks in the U.S. (the market portfolio) over the past 30 years has been 12% annually. You find two mutual funds that have average returns of 13% and 16% over the same time period. This evidence contradicts the efficient market hypothesis.

(d) _____ Your firm is growing quickly and has decided to invest \$10 million next year in an expansion of the business. Although the firm has both debt and equity in its capital structure, you decide to finance the expansion by issuing \$10 million in new debt. The yield on your debt is 8% annually. This represents the project's cost of capital.

2. You are a financial analyst at Boston Edison, a utility which operates a mix of electric and gas assets. The firm is considering an \$100 million investment (immediate cashflow) in additional electric assets. The project will be entirely debt financed and will generate after-tax cashflows of \$10 million per year, beginning at the end of the first year (assume all cashflows occur at the end of the year). Additional information about Boston Edison and some competitors is provided below:

Firm	D / V	β_E	β_D
Boston Edison	0.50	0.95	0.20
Electric utilities	0.60	0.80	0.10
Gas companies	0.40	1.10	0.20

The riskfree interest rate is 5% and the expected rate of return on the market is 12%. *You can ignore taxes in this problem and assume the CAPM is true.*

- (a) What are the expected rates of return on Boston Edison's debt and equity?

- (b) What is Boston Edison's weighted average cost of capital before the project is taken? If the project is taken, what would happen to the WACC?

2. (cont.)

(c) What is the appropriate discount rate to use for the project?

(d) What is the net present value of the project?

(e) In general terms (you do not need to derive a specific numerical solution), how would the tax effects of financing affect your answers to parts (c) and (d)? Explain.

3. You work for Hotelux, a chain of global luxury hotels. Hotelux has a target capital structure of 40% debt and 60% equity. Currently, the firm's cost of debt financing is 8% and the firm's cost of equity financing is 16%. The tax rate is 40%.

Hotelux is thinking about acquiring Club Carib, a smaller firm which owns several luxury resort villages in the Caribbean. In a good year, Club Carib produces after-tax operating cashflows of \$40 million. However, every year there is a 25% probability that a major hurricane will hit one of Club Carib's resorts, which reduces the firm's cashflows that year to \$0. Club Carib is currently all-equity financed and has a cost of capital equal to 13.7%

- a. What is the current market value of Club Carib? How does the hurricane risk of Club Carib affect the discount rate that well-diversified investors would use to value the firm?

- b. What is the after-tax WACC of Hotelux?

- c. Suppose that the market risk of Hotelux's assets and Carib Club's assets are the same. However, the two firms' have different WACCs. How can these two observations both be true?

3. (cont.)

d. Suppose that an acquisition by Hotelux wouldn't affect Club Carib's expected cashflows. How much would Hotelux be willing to pay for Club Carib?

e. Is Club Carib worth more to Hotelux than it is worth as a stand alone firm? If no, explain why. If yes, explain where the gains from the merger come from.

f. Suppose that Hotelux announces a tender offer for Club Carib (an offer to purchase Club Carib's shares). If the market is semi-strong form efficient, how do you expect Club Carib's stock price to behave before, during, and after the announcement?

4. You are considering an investment in two stocks, A and B. To help make an informed decision, you have collected 10 years of monthly return data (120 months) about each of the stocks, the S&P 500 index, and the return on short-term Tbills.

a. In very general terms, how would you estimate the ‘betas’ of stocks A and B?

b. Suppose that you estimate $\beta_A = 0.80$ and $\beta_B = 1.40$. Provide an economic interpretation of these betas.

For parts (c) – (e), you also estimate the following values, which you believe are a reliable guide for the future (the betas from part b continue to be apply). All values are expressed in annual terms. The correlation between stocks A and B is 0.40.

	Exp. return	Std. deviation	Variance
A	10.6%	28%	$784\%^2$
B	16.0%	25%	$625\%^2$
Market	12.0%	15%	$225\%^2$
Tbill	5.0%	--	--

c. From the perspective of a well-diversified investor, is stock A or stock B riskier?

4. (cont.)

d. Is the return data consistent with the CAPM?

e. You decide to invest half your wealth in stock A and half in stock B. What is the variance of your portfolio?

Formula sheet

$$\text{NPV} = \text{CF}_0 + \frac{\text{CF}_1}{(1+r)} + \frac{\text{CF}_2}{(1+r)^2} + \frac{\text{CF}_3}{(1+r)^3} + \frac{\text{CF}_4}{(1+r)^4} + \dots$$

$$\text{PV of an annuity} = C \times \left[\frac{1}{r} - \frac{1}{r(1+r)^T} \right]$$

$$\text{PV of a perpetuity} = \frac{C}{r}$$

$$\text{PV of a growing perpetuity} = \frac{C}{r-g}$$

$$\text{Stock price} = \frac{\text{Div}_1}{(1+r)} + \frac{\text{Div}_2}{(1+r)^2} + \frac{\text{Div}_3}{(1+r)^3} + \frac{\text{Div}_4}{(1+r)^4} + \dots$$

$$\text{Stock price} = \frac{\text{Div}}{r} = \frac{\text{EPS}}{r}$$

$$\text{Stock price} = \frac{\text{Div}_1}{r-g}$$

$$\text{Stock price} = \frac{\text{EPS}}{r} + \text{NPVGO}$$

$$\text{P/E} = \frac{1}{r} \times \left[\frac{\text{price}}{\text{price} - \text{NPVGO}} \right]$$

Plowback ratio = Reinvestment / Earnings

$$g = \text{ROE} \times \text{plowback ratio}$$

$$E[\text{R}_p] = w_1 E[\text{R}_1] + w_2 E[\text{R}_2]$$

$$\begin{aligned} \text{var}(\text{R}_p) &= w_1^2 \cdot \text{var}(\text{R}_1) + w_2^2 \cdot \text{var}(\text{R}_2) + 2 w_1 w_2 \text{cov}(\text{R}_1, \text{R}_2) \\ &= w_1^2 \cdot \text{var}(\text{R}_1) + w_2^2 \cdot \text{var}(\text{R}_2) + 2 w_1 w_2 \text{corr}(\text{R}_1, \text{R}_2) \text{stdev}(\text{R}_1) \text{stdev}(\text{R}_2) \end{aligned}$$

$$E[\text{R}_p] = \sum_i w_i E[\text{R}_i]$$

$$\begin{aligned} \text{var}(\text{R}_p) &= \sum_i w_i^2 \text{var}(\text{R}_i) + \sum \sum_{i \neq j} w_i w_j \text{cov}(\text{R}_i, \text{R}_j) \\ &= \sum_i w_i^2 \text{var}(\text{R}_i) + \sum \sum_{i \neq j} w_i w_j \rho_{x,y} \text{stdev}_x \text{stdev}_y \end{aligned}$$

$$\text{Sharpe ratio} = \frac{E[R_p] - r_f}{\sigma_p}$$

$$r_i = r_f + \beta_i (E[R_M] - r_f)$$

No taxes:

$$r_A = (D/V) r_D + (E/V) r_E$$

$$\beta_A = (D/V) \beta_D + (E/V) \beta_E$$

$$r_E = r_A + (D/E) (r_A - r_D)$$

$$\beta_E = \beta_A + (D/E) (\beta_A - \beta_D)$$

Taxes:

$$\text{PV}(\text{interest tax shields}) = \tau D$$

$$\text{after-tax WACC} = (D/V) (1 - \tau) r_D + (E/V) r_E$$

$$r_E = r_A + (D/E) (1 - \tau) (r_A - r_D)$$

$$V_L = V_U + \text{PV}(\text{interest tax shields})$$