Solutions, KW, 15/12/11

MACQUARIE UNIVERSITY
SYDNEY ~ AUSTRALIA

FIRST SUPPLEMENTARY FINAL EXAMINATIONS 2011

Unit: ACCG253: Financial Management

Time Allowed: 2 hours plus 10 minutes reading time.

Total Number of Questions: **6** Short Answer Questions plus **10** full response questions.

Instructions:

1. **PART A (18 marks):** There are **6** short answer questions. Attempt all questions. Show all workings. Write answers in the spaces provided. *Illegible handwriting risks loss of marks*.

2. **PART B (102 marks):** There are **10** questions. Attempt all questions. Show all workings. Write answers in the spaces provided. *Illegible handwriting risks loss of marks*.

Materials Permitted:

- No dictionaries are permitted.
- A non-programmable calculator (no text retrieval capacity) is permitted.
- Financial calculators may be used.
- Mobile telephones must be turned off and left at the front of the room.

Question:	A	1	2	3	4	5	6	7	8	9	10	Total
Out of:	18	7	6	7	12	18	16	8	10	8	10	120
Mark:												

6-50

PART A (18 Marks)

There are **SIX** (**6**) short answer choice questions. Each question in Part A is worth **3** marks.

Question 1: A stock has a beta of 2 and a total standard deviation of 160%. The market's standard deviation is 30%. What is the stock's idiosyncratic standard deviation?

$$\sigma_{i,tot}^2 = B_i^2 \sigma_m^2 + \sigma_{i,\varepsilon}^2$$

$$1.6^2 = 2^2 \times 0.3^2 + \sigma_{i,\varepsilon}^2$$

$$\sigma_{i,\varepsilon}^2 = 1.6^2 - 2^2 \times 0.3^2 = 2.2$$

$$\sigma_{i,\varepsilon} = \sqrt{2.2} = 1.4832 = 148.32\%$$

Question 2: A company issues a large amount of **equity** to raise money for new projects of similar risk to the company's existing projects. Assume a classical tax system. Circle what will happen to the firm's **after tax WACC**:

(Increase,) Decrease, Stay the same

WACC after tax ↑ due to less tax shields since the proportion of debt is lower.

Question 3: A company issues a large amount of **debt** to raise money for new projects of similar risk to the company's existing projects. Assume a classical tax system. Circle what will happen to the firm's **pre tax WACC**:

Increase, ~~Decrease,~~ (Stay the same)

WACC before tax is unchanged due to Miller & Modigliani's irrelevance of capital structure theory, when taxes are ignored.

Question 4: Name two different assets or portfolios of assets that have zero idiosyncratic risk.

The market portfolio since it is fully diversified.

The risk-free security (treasury bonds) since it has no risk at all.

Question 5: Stocks A and B have a correlation of returns of zero. Is diversification possible? If so, which risks are reduced, idiosyncratic risk or systematic risk?

Diversification is possible with any two assets so long as their correlation is not one.

Idiosyncratic risk is reduced by diversification, systematic risk is unaffected.

Question 6: A company has 200 million shares outstanding. The market price of one share is currently $2. The company's debentures are publicly traded and their market price is equal to 93% of its face value. The debentures have a total face value of $50,000,000 and the current yield to maturity of corporate debentures is 12% per annum. The risk-free rate is 8.50% and the market return is 13.7%. Market analysts estimated that the company's stock has a beta of 0.90. The corporate tax rate is 30%. What is the company's after-tax weighted average cost of capital (WACC) under the classical tax system?

$$V = D + E$$

$$V = 50m \times 0.93 + 200m \times 2$$

$$= 46.5m + 400m$$

$$= \$446.5m$$

$$\mu_E = r_f + \beta_E(\mu_m - r_f)$$

$$= 0.085 + 0.9(0.137 - 0.085)$$

$$= 0.1318$$

$$WACC = r_E \cdot \frac{E}{V} + r_D(1 - t_c) \cdot \frac{D}{V}$$

$$= 0.1318 \times \frac{400}{446.5} + 0.12 \times \frac{46.5}{446.5} \times (1 - 0.3)$$

$$= 0.1268$$

$$= 12.68\%$$

PART B (102 Marks)

Answer each of the following questions in the space provided below the questions. Mark allocations are noted next to each question.

Question 1:
Three years ago you bought an apartment for $**315,000**.

You currently live in the apartment.

You just paid for a professional real estate valuer to appraise your apartment and she valued it at **$450,000**.

You've been offered **$520,000** to sell the property. The investor who made the offer is very reliable and has the money ready to pay you right away.

A person wanting to rent the apartment has offered you **$2,700** per month.

Assume that the rent is paid in advance (at the start of the month), that the rent will be constant every month, that it will be paid forever, and that there will be no vacancy or costs of renting. The discount rate is 1% per month given as an effective rate.

Question 1a (3 marks): What is the NPV of renting the apartments? You may ignore taxes.

opp. cost; payment at t=0; perpetuity of payments

$$NPV_{\text{apartments renting}} = -520k + 2.7k + \frac{2.7k}{0.01}$$

$$= -520k + 272.7k$$

$$= -247.3k$$

Question 1b (2 marks): In the previous question, what implicit assumption did you make about the capital growth rate (price growth) of the apartment?

We assumed that the rent would be constant forever so there is no growth. This growth rate of zero is also the capital (or price) growth rate, therefore we assumed zero capital growth.

Question 1b (2 marks):

Calculate the payback period of renting the apartments. Give your answer in years.

Cashflow at $t=0$, $C_0 = -520k + 2.7k = -517.3k$

Cashflows at every month after are 2.7k, 5

so payback period is: $t = \frac{517.3k}{2.7k} = 191.59 \text{ months}$

$= 15.97 \text{ yrs.}$

Question 2 (6 marks): In the context of capital budgeting, the cost of goods sold (COGS) is subtracted from pre-tax net income, using the following formula:

$$NI = (Rev - COGS - FC - Depr - IntExp)(1 - t_C)$$

COGS includes the cost of raw materials.

When calculating Cash Flow From Assets (CFFA), the increase in Net Working Capital ($\uparrow NWC$) is subtracted, using the following formula:

$$CFFA = NI + Depr - CapEx - \uparrow NWC + IntExp$$

The increase in NWC is calculated as follows:

$$\uparrow NWC = (CA_{now} - CL_{now}) - (CA_{before} - CL_{before})$$

When 'raw materials' are purchased, their cost will increase NWC since raw materials are a current asset (CA), usually as part of inventory. When raw materials are used in production, the inventory account will be reduced which will lead to a decrease in NWC.

Your friend argues that because the cost of the raw materials is included in both COGS and $\uparrow NWC$, the cost of raw materials is double-counted. and should not be included in both COGS and $\uparrow NWC$.

Do you agree with your friend? Explain your answer clearly and succinctly in 2 sentences.

Raw materials are not double-counted because they add to NWC when bought, subtract from NWC when sold, which nets to zero, but then subtracts from cashflow when sold since they are included in COGS. The net effect on CFFA is a single cost, but ~~there~~ we include all 3 to account for timing differences.

Question 3: A $15 stock just paid its annual dividend of $1, which is expected to increase by 3% every year forever. The correlation of the stock's returns with the market portfolio is 0.5, the market's standard deviation is 30% and the stock's standard deviation is 40%. The risk free rate is 5% and the market return is 8%.

Question 3a (2 marks): What is the cost of equity using the Dividend Discount Model?

$$P = \frac{\text{Div}_1}{r_E - g}$$

$$15 = \frac{1(1+0.03)}{r_E - 0.03}, \quad r_E = \frac{1(1+0.03)}{15} + 0.03$$

$$= 0.0986$$

Question 3b (3 marks): What is the cost of equity using the CAPM (or SML)?
Hint: Remember to use the formulas in the back of the exam.

$$B_i = \frac{\sigma_{i,m}}{\sigma_m^2} = \frac{\rho_{i,m} \cdot \sigma_i \cdot \sigma_m}{\sigma_m^2} = \frac{0.5 \times 0.4 \times 0.3}{0.3^2}$$

$$= \frac{0.5 \times 0.4}{0.3}$$

$$B_i = 0.66 = 2/3$$

$$r_E = r_f + B_E(r_m - r_f)$$

$$= 0.05 + \frac{2}{3}(0.08 - 0.05)$$

$$= 0.07$$

Question 3c (2 marks): The correlation of the stock with the market was the historical correlation, calculated from past returns. If you think that the future correlation will be higher, what would be the effect on the cost of equity calculated in the previous question? Circle whether the cost of equity should be:

unaffected, (higher,) or lower?

if $\rho_{i,m} \uparrow$, $B_i \uparrow$, $r_E \uparrow$.

Question 4a (9 marks): Using the dividend discount model, give **three** reasons why the **capital growth rate** of the stock may fall. Explain your answer. (Hint: specify 3 things and whether they must increase or decrease for the capital growth rate to fall).

$$P_0 = \frac{div_1}{r_E - g}$$, rearranging:

$$g = r_E - \frac{div_1}{P_0}$$

A decrease (↓) in g, the growth rate in the dividend which is also the capital growth rate of the stock, could be caused by:

- ↓ r_E, the required total return of equity
- ↓ div_1, the dividend at t=1 which grows by 'g' forever.
- ↑ P_0, the initial (t=0) price of the stock.

Question 4b (3 marks): Do you believe that the Dividend Discount Model is a good equity valuation tool? Explain.

Yes it is, assuming:

- dividend grows smoothly & forever at a rate of g per period.
- the systematic risk of the firm stays the same so r_E doesn't vary.
- g is less than r_E.

In reality, some of these assumptions are likely to be broken but the model still gives a good estimate.

Question 5: Your friend is betting on the poker machines (also called slot machines or pokies) at the casino. For every $1 put into a poker machine, on average $0.85 is paid back. Answer the following:

Question 5a (3 marks): What is the NPV of betting on the poker machines? Circle whether it is:

Positive, Zero, or Negative.

Question 5b: Risk can be measured as the variance or standard deviation of returns above and below the expected return. According to the CAPM there are two types of risk: systematic and idiosyncratic.

Poker machines have risk since the amount of money that the machine gives back varies.

Question 5bi (5 marks): Does your friend take on idiosyncratic risk when he bets on the poker machines? Can your friend diversify this risk?

Yes, he takes on idios. risk. He can diversify this risk by betting small amounts at a time. Maybe betting on different machines also helps.

Question 5bii (5 marks): Does your friend take on systematic risk when he bets on the poker machines? Can your friend diversify this risk?

No, he takes on zero systematic risk because there is no correlation between returns on the pokies & returns on the market portfolio. The beta will be zero, $\beta_i = \frac{\sigma_{i,m}}{\sigma_m^2} = \frac{0}{\sigma_m^2} = 0$

Syst. risk can not be diversified.

Question 5c (5 marks): You try to convince your friend that betting on the poker machines is a bad idea and that he should bet on stocks instead since they tend to **increase in value**. But your friend says that stocks are also risky and that they have **zero NPV**. Assume that markets are efficient, (therefore stocks are fairly priced) and that there are no transaction costs.

Is it true that stocks have zero NPV and that their prices tend to rise? Explain your answer clearly and succinctly.

Yes it is true for both. NPV is zero for stocks since we assume they are fairly priced.

But just because NPV is zero, doesn't mean prices can't rise. Price rises are capital returns, & the total return on a stock is the capital & dividend returns summed. If NPV = 0, total return should be equal to required return, which should be determined by the CAPM & beta.

Question 6: A firm is considering a project which is of similar risk to the rest of the firm's business. Assume a classical tax system (no franking credits).

The firm has the following details, and all rates are effective annual rates:

- A target debt-to-equity ratio of 80%.
- A beta on equity of 2.5.
- Existing debt which yields 11%.
- A corporate tax rate of 30%.
- Also, the risk free rate is 5% and the market rate of return is 10%.

Question 6a (3 marks): Calculate the **cost of equity.**

$\frac{D}{E} = \frac{0.8}{1}$, assume $D = 0.8$, $E = 1$, $V = D + E = 1.8$.

$r_E = B_E r_f + B_E (r_m - r_f)$

$= 0.05 + 2.5(0.1 - 0.05) = 0.175$

Question 6b (3 marks): Calculate the **pre-tax WACC** (sometimes called the opportunity cost of capital, or the required return on assets, r_A).

$r_A = \frac{D}{V} \cdot r_D + \frac{E}{V} \cdot r_E$

$= \frac{0.8}{1.8} \times 0.11 + \frac{1}{1.8} \times 0.175 = 0.1461$

Question 6c (3 marks): Calculate the **after-tax WACC.**

$WACC_{\text{after tax}} = \frac{D}{V} \cdot r_D(1 - t_c) + \frac{E}{V} \cdot r_E$

$= \frac{0.8}{1.8} \times 0.11 \times (1 - 0.3) + \frac{1}{1.8} \times 0.175 = 0.1314$

Question 6d (4 marks): This firm has a high debt-to-equity ratio. Outline 2 costs that this is likely to be causing for the firm.

- financial distress in the form of (1) losing employees who are afraid of losing their job when the firm goes bust, so they quit. (2) losing customers who know the warranty won't last (3) losing suppliers who won't sell on credit ~~(4) paying higher~~

Question 6e (3 marks): The company has calculated the CFFA for each year in the project's life, assuming that the project is all-equity financed. That is, there are no debt payments included in the CFFA. Considering this, which discount rate should the company use to discount its CFFA? Circle one of the following:

Risk-free rate, Cost of debt, Cost of equity, Pre-tax WACC, (After-tax WACC) since this will account for tax shields which should be included in the firm's value.

Question 7: The market portfolio (M) and a stock (A) have the following returns:

Year	r_M (mkt)	r_A (stock)
2007	0.2	0.4
2008	0.04	-0.2
2009	-0.1	-0.3
2010	0.18	0.5

Question 7a (1 marks)**:** What is the average return of each?

$\bar{r}_m = 0.08$

$\bar{r}_A = 0.1$

Question 7b (3 marks)**:** What is the standard deviation of returns for each?

$\sigma_m = 0.139523$, $\sigma_m^2 = 0.019467$

$\sigma_A = 0.408248$, $\sigma_A^2 = 0.166\dot{6}$

Question 7c (4 marks)**:** What is the Beta of stock A using the CAPM?

$$\beta_A = \frac{cov(r_A, r_m)}{var(r_m)}$$

$cov(r_A, r_m) = 0.05\dot{3}$ ← this takes some calc. using $cov(r_A, r_m) = \frac{\sum (r_{A,t} - \bar{r}_A)(r_{m,t} - \bar{r}_m)}{n-1}$

$$\beta_A = \frac{0.05\dot{3}}{0.019467}$$

$= 2.739726$

Question 8

Question 8a (2 marks): A firm has identified a new project that will last for 1 year and is estimated to have a significantly positive NPV. The project is announced at mid-day to shareholders and the share prices rises from $2 before the announcement to $2.20 after the announcement. Over that time, the ASX200 (the market portfolio) was unchanged. The firm has 5 million shares outstanding. What was the NPV of the project? Assume that markets are efficient. The increase in the mkt cap (E) of ~~the~~ equity must be the NPV of the project.

~~$P_{old} = \$2$~~ $E = P_{share} \times n_{shares}$, $E_{increase} = (2.2 - 2) \times 5m$ = $1m

Question 8b: Due to the value created by the new project, the firm decides to pay out more cash to equity holders.

Note that the project has a short life. Assume that the firm has no other positive NPV projects on the horizon, and shareholders know this. You may ignore taxes.

Question 8bi (2 marks): Out of the following options, what would be more suitable? Conducting a **share repurchase**, a **share dividend**, or are they equivalent? (Note: a share dividend is not the same as a cash dividend). Explain succinctly in two sentences or less.

A share repurchase is better since it will distribute the cash to participating shareholders. A share dividend will not distribute cash, it is useless.

Question 8bii (3 marks): Out of the following options, what would be more suitable? Paying a **special cash dividend**, **increasing the regular cash dividend**, or are they equivalent? Explain succinctly in two sentences or less.

Paying a one-off special cash dividend is better since the project is a one-off. Regular dividends should not be paid since the firm has no more positive NPV projects to sustain the higher regular dividend.

Question 8biii (3 marks): Out of the following options, what would be more suitable? Conducting a **share repurchase**, paying a **cash dividend**, or are they equivalent? Explain succinctly in two sentences or less.

Miller & Modigliani irrelevance of payout policy.

A share repurchase & a special cash dividend are equivalent, ignoring taxes. ~~Dec~~ Increasing the regular cash dividend, as said before, is not a good idea.

Question 9: An investor has $5 million to invest in shares A, B and C. She wants to buy exactly $1 million worth of stock C, but doesn't care how much of stocks A and B are bought. She desires an expected annual return of 8%. All of the stocks are fairly priced.

Share A has an expected annual return of 5%.

Share B has an expected annual return of 8%.

Share C has an expected annual return of 10%.

Question 9a (4 marks): How much **money** should she invest in shares A and share B respectively?

$r_p = x_A \cdot r_A + x_B \cdot r_B + x_C \cdot r_C$

$0.08 = x_A \times 0.05 + x_B \times 0.08 + \frac{1m}{5m} \times 0.1$

Also, sum of weights must equal one.

$x_A + x_B + \frac{1m}{5m} = 1$, $x_A = \frac{4}{5} - x_B$. Substituting:

$x_B = 0.6 = \frac{2}{3}$, $x_A = 0.1\dot{3}$, $x_C = \frac{1}{5}$

Question 9b (2 marks): If the risk free rate is 5% and the market return is 10% pa, what will be the beta of the portfolio?

~~$\beta_p = x_A \cdot \beta_A + x_B \cdot \beta_B + x_C \cdot \beta_C$, $r_p = 0.08$~~

$r_p = r_f + \beta_p (r_m - r_f)$ ← not the only method

$0.08 = 0.05 + \beta_p (0.1 - 0.05)$, $\beta_p = 0.6$

Question 9c (1 marks): Circle the correct answer. Compared to the market portfolio, the portfolio of stocks A, B and C will have a **systematic** variance that is:

Higher than, (lower than,) the same as the market's.

↙ since $\beta_p < \beta_m$, $0.6 < 1$

Question 9d (1 marks): Circle the correct answer: Compared to the market portfolio, the portfolio of stocks A, B and C will have an **idiosyncratic** variance that is:

(Higher than,) lower than, the same as the market's.

$\sigma_{p,\varepsilon}$ is likely to be greater than zero, but $\sigma_{M,\varepsilon}$ will equal zero since the mkt is fully diversified.

Question 10 (10 marks):

Project Data	
Project life	2 yrs
Initial investment in equipment	\$8m
Depreciation of equipment per year	\$4m
Unit sales per year	3m
Sale price per unit	\$10
Variable cost per unit	\$6
Fixed costs per year, paid at the end of each year	\$2m
Tax rate	0.3

Note 1: Due to the project, current assets will grow by \$1m initially (at t = 0), and then grow by \$0.5m one year later (at t = 1), and then they will fall by \$0.5m the year after (at t=2). Current liabilities will not be affected by the project. At the end of the project, the current assets accumulated due to the project can be sold for **60%** of the price for which they were bought. Keep in mind that this loss will be tax-deductible.

Find the three Cash Flow From Assets (CFFA) at times t=0, 1, 2. You DO NOT need to find NPV.

$$NI = (Q(P-VC) - FC - Depr - IntExp)(1-t_c)$$
$$= (3m(10-6) - 2m - 4m - 0)(1-0.3)$$
$$= 4.2m$$

$$CFFA = NI + Depr - CapEx - \uparrow NWC + IntExp$$

$$CFFA_0 = 0 + 0 - 8m - 1m + 0 = -9m$$

$$CFFA_1 = 4.2m + 4m - 0 - 0.5m + 0 = 7.7m$$

$$CFFA_2 = 4.2m + 4m - 0 - [0.5m - 1m \times 0.6(1-0.3)] + 0$$
$$= 9.12m$$

Spare Scribble Sheet

Formulas

$$PV(single\ cash\ flow) = V_0 = \frac{C_t}{(1 + r_{eff})^t}$$

$$PV(annuity) = V_0 = \frac{C_1}{r_{eff}}\left(1 - \frac{1}{(1 + r_{eff})^T}\right)$$

$$PV(perpetuity) = V_0 = \frac{C_1}{r_{eff} - g_{eff}}$$

$$r_{eff,annual} = (1 + r_{eff,monthly})^{12} - 1$$

$$r_{eff,monthly} = \frac{r_{APR,comp\ monthly}}{12}$$

$$Price_{bill} = V_0 = \frac{F_t}{\left(1 + r_{simple} \times \frac{t}{365}\right)}$$

$$Price_{bond} = PV(annuity\ of\ coupons) + PV(principal)$$

$$= \frac{C_1}{r_{eff}}\left(1 - \frac{1}{(1 + r_{eff})^T}\right) + \frac{Face}{(1 + r_{eff})^T}$$

$$CapEx = NFA_{now} - NFA_{before} + Depreciation$$

$$\uparrow NWC = (CA_{now} - CL_{now}) - (CA_{before} - CL_{before})$$

$$CFFA = NI + Depr - CapEx - \uparrow NWC + IntExp$$

$$CFFA = \quad CF\ to\ equity\ holders \quad + CF\ to\ creditors$$

$$r_{0-1} = \frac{p_1 - p_0}{p_0} = \frac{p_1}{p_0} - 1$$

$$\bar{r} = \frac{\sum_{i=1}^{n}(r_i)}{n} = \frac{r_1 + r_2 + \cdots + r_n}{n}$$

$$var(r) = \sigma^2 = \frac{\sum_{i=1}^{n}[(r_i - \bar{r})^2]}{n - 1}$$

$$cov(r_1, r_2) = \sigma_{1,2} = \frac{\sum_{i=1}^{n}[(r_{1,i} - \bar{r}_1)(r_{2,i} - \bar{r}_2)]}{n - 1}$$

$$correl(r_1, r_2) = \rho_{1,2} = \frac{cov(r_1, r_2)}{sd(r_1).sd(r_2)} = \frac{\sigma_{1,2}}{\sigma_1.\sigma_2}$$

$$\bar{r} = \sum_{i=1}^{n} (p_i . r_i) = p_1 . r_1 + p_2 . r_2 + \cdots + p_n . r_n$$

$$var(r) = \sigma^2 = \sum_{i=1}^{n} [p_i (r_i - \bar{r})^2]$$

$$cov(r_1, r_2) = \sigma_{1,2} = \sum_{i=1}^{n} [p_i (r_{1,i} - \bar{r_1})(r_{2,i} - \bar{r_2})]$$

$$r_P = x_1 . r_1 + x_2 . r_2 + \cdots + x_n . r_n = \sum_{i=1}^{n} (x_i . r_i)$$

$$x_1 + x_2 + \cdots + x_n = 1$$

$${\sigma_P}^2 = x_1^2 . \sigma_1^2 + x_2^2 . \sigma_2^2 + 2 . x_1 . x_2 . \sigma_{1,2}$$

$$\sigma_{1,2} = \rho_{1,2} . \sigma_1 . \sigma_2$$

$$\mu_i = r_f + \beta_i (\mu_M - r_f)$$

$$\beta_i = \frac{\sigma_{i,M}}{{\sigma_M}^2} = \frac{cov(r_i, r_M)}{var(r_M)}$$

$${\sigma_{i,total}}^2 = {\beta_i}^2 . {\sigma_M}^2 + {\sigma_{i,\varepsilon}}^2$$

$$\beta_P = x_1 \beta_1 + x_2 \beta_2 + \cdots + x_n \beta_n$$

$$r_{WACC\ after\ tax} = \frac{D}{V} . r_D (1 - t_c) + \frac{E}{V} . r_E$$

$$r_{WACC\ before\ tax} = r_A = \frac{D}{V} . r_D + \frac{E}{V} . r_E$$

$$V = D + E$$