

ADAM

**DEPARTMENT OF MANAGEMENT
UNIVERSITY OF TORONTO MISSISSAUGA**

**MGT339H5S LEC0101 - Business Finance II
Summer 2013**

Instructor: ADAM KADAR

QUIZ I – July 23, 2013

Duration: 35 minutes

Aid Allowed: Non-programmable calculator

Instructions:

- a) Answer all questions and write the answers in the spaces provided below.
- b) Please show your work, where applicable.

LAST NAME: _____ FIRST NAME: _____

STUDENT NUMBER: _____

SOLUTIONS

Question	Mark
Q1 [20]	
Q2 [20]	
Total [out of 40]:	

QUESTION 1:

For this question: assume the CAPM holds and there are no corporate taxes or other market imperfections.

(a) You observe that the shares of RMX have a beta of 0.5 and an expected return of 8% while the shares of BBY have a beta of 1.5 and an expected return of 14%; calculate the risk-free rate and the expected market return. [5 marks]

① RMX: $8\% = r_f + 0.5[r_M - r_f]$

② BBY: $14\% = r_f + 1.5[r_M - r_f]$

solve for r_f : $r_f = 14\% - 1.5[r_M - r_f]$ ③

③ → ① $8\% = 14\% - 1.5[r_M - r_f] + 0.5[r_M - r_f]$

$8\% = 14\% - [r_M - r_f]$

$[r_M - r_f] = 6\%$ ④

④ → ③

$r_f = 14\% - 1.5[6\%]$

$r_f = 5\%$ → ④

$r_M - 5\% = 6\%$

$r_M = 11\%$

(b) Another firm, FAL, has 200,000 shares outstanding that are currently trading at \$5/share and have a beta of 2. The company also has debt, which consists of 10,000 bonds with two years till maturity. Each of these \$100 par value bonds will pay \$10 in one year, and \$110 in two years. The yield-to-maturity of these bonds is 10%. Assuming that there are no taxes, calculate FAL's weighted average cost of capital (WACC). [5 marks]

GIVEN

Shares Out. 200,000 } $MV_E = \$1,000,000$

$P_0 = \$5$

$B = 2$

Bonds: 10,000

$T = 2 \text{ yrs}$

Par = \$100

$YTM = 10\% \rightarrow K_D = 10\%$

$P_0 = \frac{10}{(1.1)} + \frac{110}{(1.1)^2} = 100 \therefore MV_D = 10,000 \times 100$

$MV_D = \$1,000,000$

$\frac{D}{E} = 1$ and $\frac{D}{D+E} = 0.5$ and $\frac{E}{D+E} = 0.5$

From Part (a): $r_f = 5\%$,
 $r_M - r_f = 6\%$

based on CAPM:

$K_E = r_f + B_i[r_M - r_f]$

$K_E = 5\% + 2[6\%]$

$K_E = 17\%$

$WACC = \frac{D}{D+E} K_D + \frac{E}{D+E} K_E$

$WACC = 0.5(10\%) + 0.5(17\%)$

$WACC = 13.5\%$

(c) What would FAL's weighted average cost of capital (WACC) be if the firm were all-equity financed? What would FAL's cost of equity be in this case? [5 marks]

- From Lecture #4 - slide #19
- In absence of taxes (among other things) capital structure is irrelevant
- WACC stays constant b/c as cheap debt is added, $K_E \uparrow$
- The effect on WACC of adding lower cost D is exactly offset by $\uparrow K_E$

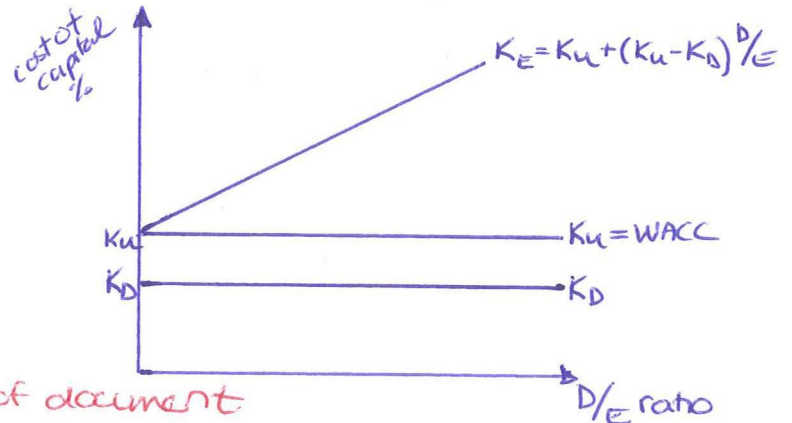
Proof: MM Prop. II

$$K_E = K_U + (K_U - K_D) \frac{D}{E}$$

$$17\% = K_U + (K_U - 10\%) 1$$

$$27\% = 2K_U$$

$$K_U = 13.5\% = \text{WACC}$$



* Alternative solution @ end of document

(d) For this part, we assume that FAL's capital structure is the same as in part (b). The firm is considering an extension of one of its current projects, which is in the firm's core business of mining. The extension requires a \$1 million investment. It generates a cash-flow of \$300,000 per year for 10 years, starting at the end of this year. Once the investment is made, the only costs linked to the project consist of a \$100,000 pollution fee paid by the firm annually. This fee will be paid every year in perpetuity, starting at the end of this year. Should FAL adopt this project? [5 marks]

$$CF_0 = -\$1,000,000$$

$$+ CF_{1-10} = \$300,000$$

$$- \text{Fees of: } \$100,000 \text{ in perpetuity}$$

since project is extension of current business use WACC to discount all CFs (13.5%)

$$NPV = 300,000 A_{0.135}^{10} - \frac{100,000}{0.135} - 1,000,000$$

where $A_{0.135}^{10} = \text{PV Annuity w/ 10 year term @ 13.5\% (ordinary)}$

$$NPV = 300,000 \cdot (5.31952) - 740,741 - 1,000,000$$

Annuity Factor

$$\boxed{NPV = -144,886} \therefore \boxed{\text{REJECT}}$$

QUESTION 2:

ABC expects to have a constant EBIT equal to \$100,000 in perpetuity. It is financed by debt and equity. The debt is risk-free and perpetual and has a market value of \$200,000 (i.e. $MV_D / D = \$200,000$), and its interest rate is 10% per year. If the company were all-equity financed, its cost of capital would be 20%. = K_u
There are 100,000 shares outstanding. The corporate tax rate is 40%.

(a) Calculate the value of an all-equity firm with the same assets and EBIT as ABC. [4 marks]

$$V_u = \frac{EBIT(1-T_c)}{K_u} = \frac{100,000(1-40\%)}{0.2}$$

$$\boxed{V_u = 300,000}$$

(b) Calculate V_L of ABC? [4 marks]

$$V_L = V_u + T_c D = D + E$$

$$V_L = 300,000 + 0.4 [200,000]$$

$$\boxed{V_L = 380,000}$$

(c) What is the market value of ABC's equity? [3 marks]

$$V_L = D + E$$

$$\therefore E = V_L - D$$

$$E = 380,000 - 200,000$$

$$\boxed{E = 180,000}$$

(d) What is the required rate of return on ABC's equity? [4 marks]

$$K_E = K_U + (K_U - K_D)(1 - T_c) D/E$$

$$K_E = 20\% + (20\% - 10\%)(1 - 40\%) \frac{200}{180}$$

$$\boxed{K_E = 26.66\%}$$

= ACFE

(e) Discount the annual cash flow to equity holders $\{[EBIT - K_D D] * (1 - T_c)\}$ using the rate you found in part (d), and verify that you find the same value of equity as in part (c). [5 marks]

$$ACFE = \frac{[EBIT - K_D D](1 - T_c)}{K_E} = \frac{[100,000 - 10\%(200,000)] * 0.6}{0.2666666...}$$

$$\boxed{180,000} = \text{Part (c)}$$

Alternative solution to Q7 (c)

since $K_D = 10\% > r_f = 5\%$ ∴ not riskless
∴ $B_D \neq \emptyset$

From CAPM

$$K_D = r_f + B_D [r_M - r_f]$$

$$10\% = 5\% + B_D [6\%]$$

$$\boxed{B_D = 5/6}$$

$$B_A = \frac{D}{D+E} B_D + \frac{E}{D+E} B_E$$

$$B_A = 0.5 (5/6) + 0.5 (2)$$

$$\boxed{B_A = \frac{17}{12} = 1.4166}$$

$$\therefore K_U = r_f + B_A [r_M - r_f]$$

$$K_U = 5\% + 1.4166 (6\%)$$

$$\boxed{K_U = 13.5\%} = \text{WACC}$$

FORMULA SHEET

Annuities:

$$PV_0 = \frac{PMT}{k} \left[1 - \frac{1}{(1+k)^n} \right]$$

Perpetuity:

$$PV = \frac{PMT}{k}$$

CAPM: $K_i = R_f + \beta_i \times (R_M - R_f)$

Beta(K_i) = $\text{Cov}(K_i, R_M) / (\sigma_M)^2$ $\beta_P = \rho_{(K_i, R_M)} \times (\sigma_{K_i} / \sigma_M)$

For development of the Modigliani-Miller propositions:

We assume perfect capital markets in the following analysis:

- Perfect competition
- Equal access to information
- No transaction costs
- No taxes (later we drop this assumption)

We also assume that the individual can borrow at the same rate as the firm.

MM Prop I – no taxes: $V_L = V_U$

MM Prop I with taxes: $V_L = V_U + PV(\text{Interest Tax Shields}) = V_U + DT_c$, if the debt is fixed and permanent.

MM Prop. II - no taxes: $K_E = K_U + (D/E)(K_U - K_D)$

MM Prop. II with taxes: $K_E = K_U + (D/E)(K_U - K_D)(1 - T_c)$

The weighted average cost of capital (assuming debt and common shares):

$$WACC = K_{wacc} = \{D / (D+E)\}(1 - T_c) K_D + \{E / (D+E)\}K_E$$

Valuation formula: Levered: $V_L = \text{EBIT}(1-T_c) / K_{WACC}$

Valuation formula: Unlevered: $V_U = \text{EBIT}(1-T_c) / K_U$

Tradeoff theory of capital structure:

$$V_L = V_U + PV(\text{Interest Tax Shields}) - PV(\text{costs of financial distress})$$

In an MM no tax world, where the beta of debt is 0, $\beta_e = \beta_a(1+D/E)$ where β_e is the beta of leveraged equity and β_a is the asset beta, which is also the beta of the unleveraged equity.

With reference to issuing costs, we typically calculate NP – the Net Proceeds from issuing debt or equity, after subtracting the after tax issuing costs. We use NP to calculate the return the firm must earn in order to provide the lenders or shareholders what they require. Since NP will be less than the par value or face value, the cost to the firm will be higher than the return required by the lenders or shareholders.

In an MM no tax world, suppose firm L = has 25% debt and 75% equity in its capital structure, and U is an identical firm which is all equity. An investor can earn the same return by either i) buying all of the leveraged firm using his own \$\$, or ii) buying all of the unleveraged firm but by borrowing 25% of the money and using 75% of his own \$\$.