Lancaster University
Management School

AcF302: Corporate Finance

Week 12 Workshop

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Question 1:

For each of the following statements, explain whether the statement is true or false:

(1) When a firm has a constant debt-to-equity ratio, the firm's cost of capital will not fluctuate when it accepts a new project similar in risk to the firm's existing projects .

True

If the new project is of similar risk to the company's existing projects and the leverage ratio of the company does not change as a result of the new project, then the risk profile of the company will not change, and shareholders and lenders should not ask for a different return to what they were originally asking for.

(2) The assumption that a firm's debt-to-equity ratio is constant means the firm's debt capacity will remain constant throughout the life of a new project.

False

A new project will change the value of the company. So, in order for the debt-to-value ratio (or debt-to-equity ratio) to remain constant, the debt capacity (debt level) has to change proportionally.

(3) A target leverage ratio means that the firm adjusts its debt proportionally to the project's value.

True

Explanation similar to Statement 2.

(4) Firms adjust their leverage to maintain a constant debt-to-equity ratio in terms of book value.

False

Firms adjust their leverage to maintain a constant debt-to-equity ratio in terms of **market** value.

(5) When we relax the assumption of a constant debt-to-equity ratio, the equity cost of capital for a project will remain constant as the debt-to-equity ratio changes.

False

A change in a company's leverage ratio changes the risk of the company. The cost of equity will change because shareholders will update the returns they ask for as a result the company becoming riskier (or less risky).

(6) When a firm maintains a target leverage ratio, its future interest tax shields should be discounted by the cost of debt to get their present value.

False

To keep a target leverage ratio, the debt capacity has to be adjusted proportional to the increase in value that the project generates. The interest tax shields will therefore fluctuate proportionally to the project cash flows and will have similar risk, so they should be discounted by the project's unlevered cost of capital (Ru).

(7) As a general rule, the WACC method is the easiest to use when a firm maintains a fixed debt-to-value ratio over the life of the investment.

True

Implementing the APV approach with a constant debt-equity ratio requires solving for the project's debt and value simultaneously. Similarly with the FTE method, we need to compute the project's debt capacity to determine interest and net borrowing.

Question 2:

Kinston Industries is considering investing in a machine that will cost $125,000 and will last for three years. The machine will generate revenues of $120,000 each year and the cost of goods sold will be 50% of sales. At the end of year three the machine will be sold for $15,000. The appropriate cost of capital is 10% and Kinston is in the 21% tax bracket. Assume that Kinston's new machine will be depreciated straight line to a salvage value of $5,000 at the end of year three.

What is the NPV of this investment?

Year	0	1	2	3
Sales (revenues in $)				
-Cost of Goods Sold				
- Depreciation				
EBIT				
-Taxes (21%)				
= Unlevered Net Income				
+ Depreciation				
- Capital Expenditures				
+ Liquidation Cash Flow				
Free Cash Flow				

Sales ($120,000 given); **COGS** (50% of sales = $60,000)

Depreciation: The machine is depreciated straight line to a book value of $5,000 at the end of year 3 (125,000 – 5,000 = 120,000 / 3 = $40,000)

Liquidation CF: Machine is sold at the end of year 3 for $15,000.
Gain=$15,000 - $5,000 = $10,000. You pay a tax on the gain of $10,000.
CF from machine sale = $15,000 – ($10,000 × .21) = $12,900

Year	0	1	2	3
Sales (revenues in $)		120,000	120,000	120,000
-Cost of Goods Sold		(60,000)	(60,000)	(60,000)
- Depreciation		(40,000)	(40,000)	(40,000)
EBIT		20,000	20,000	20,000
-Taxes (21%)		(4,200)	(4,200)	(4,200)
= Unlevered Net Income		15,800	15,800	15,800
+ Depreciation		40,000	40,000	40,000
- Capital Expenditures	-125,000			
+ Liquidation Cash Flow				12,900
Free Cash Flow	-125,000	55,800	55,800	68,700

Sales ($120,000 given); **COGS** (50% of sales = $60,000)

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$$NPV = FCF_0 + \frac{FCF_1}{1+r} + \frac{FCF_2}{(1+r)^2} + \frac{FCF_3}{(1+r)^3}$$

We have all information on the FCF from the previous table. The cost of capital is given as 10%.

$$NPV = -125{,}000 + \frac{55{,}800}{1.1} + \frac{55{,}800}{1.1^2} + \frac{68{,}700}{1.1^3}$$

$$\boxed{NPV = \$23{,}460}$$

Question 3

United Industries is considering a project that will generate the following free cash flows:

United Industries New Project Free Cash Flows

Year	0	1	2	3
Free Cash Flows	-£250	£75	£150	£100

You are also provided with the following market value balance sheet and information regarding United's cost of capital:

United Industries Market Value Balance Sheet (£ Millions) and Cost of Capital

Assets		Liabilities		Cost of Capital	
Cash	250	Debt	650	Debt	7%
Other Assets	1200	Equity	800	Equity	14%
				Corporate tax rate	35%

Assume that the risk of this new project is similar to the average risk of United's projects and that the firm wants to hold constant its debt to equity ratio.

a) Calculate United's weighted average cost of capital.

$$r_{wacc} = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D (1 - \tau c)$$

where D = Net Debt = Debt – Cash = 650 – 250 = 400

$$r_{wacc} = \frac{800}{800+400} (0.14) + \frac{400}{800+400} (0.07) (1 - 0.35) = \mathbf{0.1085 \text{ or } 10.85\%}$$

Common mistake:

Using Debt instead of Net Debt in the calculation

b) Calculate the NPV for United's new project.

$$NPV = FCF_0 + \frac{FCF_1}{1 + r_{wacc}} + \frac{FCF_2}{(1 + r_{wacc})^2} + \frac{FCF_3}{(1 + r_{wacc})^3}$$

$$NPV = -250 + \frac{75}{1.1085} + \frac{150}{1.1085^2} + \frac{100}{1.1085^3} = \mathbf{£\,13.14}$$

c) What is the debt capacity for United's new project in year 0?

$$D_0 = d \times V_0^L$$

Remember: ***d*** is the debt-to-value ratio of the whole company, which is 400/1200 = 1/3

$$V_0^L = \frac{75}{(1.1085)^1} + \frac{150}{(1.1085)^2} + \frac{100}{(1.1085)^3} = £263.14$$

$$D_0 = {}^1/_3 \times 263.14 = \mathbf{£\,87.71}$$

Common mistakes:

- **Using NPV instead of V^L in the calculation**
- **Using D/E for d instead of D/V**

d) What is the value of new equity that United has to issue to finance the project?

New equity $_{t=0}$ = Project cost – Debt capacity $_{t=0}$

Project cost = £250

New equity $_{t=0}$ = 250 – 87.71 = **£162.29**

e) Do you expect the value of United's existing equity to change?

Remember V_0^L = 263.14 and E/V = 2/3

Therefore, the total increase in the value of Equity on the balance sheet is 2/3 x 263.14 = £175.43

New equity $_{t=0}$ = £162.29 (from part d)

Therefore, existing equity will go up in value by:

175.43 – 162.29 = **£13.14**

Question 4:

Superjet is considering the acquisition of another firm in its industry. The acquisition is expected to increase Superjet's free cash flow by $5 million the first year, and this contribution is expected to grow at a rate of 4% per year from then on. Superjet has negotiated a purchase price of $110 million. Superjet's weighted average cost of capital (WACC) is 7.5%. After the transaction, Superjet will adjust its capital structure to maintain its current debt-to-equity ratio of 2.

a) If the acquisition has similar risk to the rest of Superjet, what is the value of this deal?

b) How much debt must Superjet use to finance the acquisition and still maintain its debt-to-value ratio?

c) What percentage of the acquisition's cost will be financed through equity?

a) If the acquisition has similar risk to the rest of Superjet, what is the value of this deal?

The acquisition can be viewed as a growing perpetuity:

$$V_L = \frac{FCF}{r_{WACC} - g}$$

$$V^L = \frac{\$5 \text{ million}}{7.5\% - 4\%} = \$142,857,143$$

NPV of the acquisition = 142,857,143 – 110,000,000 = **$32,857,143**

b) How much debt must Superjet use to finance the acquisition and still maintain its debt-to-value ratio?

$$D_t = d \times V_t^L$$

The MV of the assets acquired in the acquisition (V_L) is \$142,857,143

d is the debt-to-value ratio but we only have info about the debt-to-equity ratio

A debt-to-equity ratio of 2 is equivalent to a debt-to-value ratio of 2/3

D_0 = 2/3 x \$142,857,143 = \$95,238,095

c) What percentage of the acquisition's cost will be financed through equity?

Cost of acquisition is $110,000,000

D_0 = $95,238,095

Equity financing = $110,000,000 - $95,238,095 = $14,761,905

Equity financing % = $14,761,905 / $110,000,000 = **13.42%**

Question 5:

Based on the information in the two tables below, use the APV method to estimate the value of Bluehole Industries in 2005. Assume that the market risk premium is 6%, the risk-free rate is 5%, Bluehole's unlevered beta is 1.2, its debt cost of capital is 6.8%, and its continuation value in 2010 is $243,377,000. The corporate tax rate is 35%.

Forecasted cash flows:

	Year	2005	2006	2007	2008	2009	2010
Free Cash Flow ($000s)							
1	**Net Income**		4,595	5,065	6,107	7,936	8,547
2	Plus: After-Tax Interest Expense		4,420	4,420	4,420	4,420	4,420
3	**Unlevered Net Income**		9,015	9,485	10,527	12,356	12,967
4	Plus: Depreciation		5,450	5,405	5,365	5,328	6,795
5	Less: Increases in NWC		(3,218)	(3,423)	(3,790)	(4,297)	(4,751)
6	Less: Capital Expenditures		(5,000)	(5,000)	(5,000)	(5,000)	(20,000)
7	**Free Cash Flow of Firm**		6,246	6,467	7,102	8,387	(4,989)
8	Plus: Net Borrowing		-	-	-	-	15,000
9	Less: After-Tax Interest Expense		(4,420)	(4,420)	(4,420)	(4,420)	(4,420)
10	**Free Cash Flow to Equity**		1,826	2,047	2,682	3,967	5,591

Fixed debt schedule:

			2005	2006	2007	2008	2009	2010
Debt & Interest Table ($000s)								
1	Outstanding Debt		100,000	100,000	100,000	100,000	100,000	115,000

$$V^L = APV = V^U + PV(\text{Interest Tax Shield})$$

$$Vu = \frac{FCF_{2006}}{(1+r_u)^1} + \frac{FCF_{2007}}{(1+r_u)^2} + \frac{FCF_{2008}}{(1+r_u)^3} + \frac{FCF_{2009}}{(1+r_u)^4} + \frac{FCF_{2010} + CV_{2010}}{(1+r_u)^5}$$

We have all information on the FCF from the first table. We also have information on the continuation value.

We can use the CAPM to estimate the unlevered cost of capital (Ru).

$$r_u = r_f + \beta_u \left(E\left[R_{mkt}\right] - r_f \right) = 5\% + 1.2\left(6\%\right) = 12.2\%$$

$$Vu = \frac{6{,}246}{(1+0.122)^1} + \frac{6{,}467}{(1+0.122)^2} + \frac{7{,}102}{(1+0.122)^3} + \frac{8{,}387}{(1+0.122)^4} + \frac{-4{,}989 + 243{,}377}{(1+0.122)^5}$$

$$Vu = \$155{,}091$$

$$V^L = APV = V^U + PV(\text{Interest Tax Shield})$$

$$PV(ITS) = \frac{ITS_{2006}}{(1+r_d)^1} + \frac{ITS_{2007}}{(1+r_d)^2} + \frac{ITS_{2008}}{(1+r_d)^3} + \frac{ITS_{2009}}{(1+r_d)^4} + \frac{ITS_{2010}}{(1+r_d)^5}$$

$$ITS_t = D_{t-1} \times r_D \times \tau_C$$

We have information about the debt level in each period from the second table. Rd is given as 6.8%. Tc is given as 35%.

Therefore, we can easily calculate the ITS every period. For example:

$$ITS_{2006} = D_{2005} \times r_D \times \tau_C = 100{,}000 \times 6.8\% \times 35\% = \$2{,}380$$

$$PV(ITS) = \frac{2{,}380}{(1+0.068)^1} + \frac{2{,}380}{(1+0.068)^2} + \frac{2{,}380}{(1+0.068)^3} + \frac{2{,}380}{(1+0.068)^4} + \frac{2{,}380}{(1+0.068)^5}$$

$$PV(ITS) = \$9{,}811$$

$$V_L = Vu + PV(ITS) = \$164{,}902$$

Question 6:

Mercure Industries has 10 million shares outstanding and a current share price of $40 per share. It also has long-term debt outstanding. This debt is risk free, is four years away from maturity, has annual coupons with a coupon rate of 10%, and has a $100 million face value. The first of the remaining coupon payments will be due in exactly one year. The risk-free interest rate is 6%. Mercure has EBIT of $88 million, which is expected to remain constant each year forever. New capital expenditures are expected to equal depreciation and equal $13 million per year, while no changes to net working capital are expected in the future. The corporate tax rate is 25%, and Mercure is expected to keep its debt-to-equity ratio constant in the future.

a) Based on the above information, calculate Mercure's WACC.

b) What is Mercure's equity cost of capital?

$$r_{wacc} = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D (1 - \tau_C)$$

We don't know Mercure's equity cost of capital, so we cannot calculate WACC directly. However, we can compute it indirectly by estimating the discount rate that is consistent with Mercure's market value and FCF.

$$V_L = \frac{FCF}{r_{WACC}}$$

$V_L = E + D$

E = 10 million shares x $40 per share = $400 million

$$\mathrm{D} = 10 \times \frac{1}{0.06}\left(1 - \frac{1}{1.06^4}\right) + \frac{100}{1.06^4} = \$113.86 \text{ million.}$$

V_L = 400 + 113.86 = $513.86 million

FCF = EBIT × (1 – T_c) + Depreciation – Capex – ΔNWC

FCF = 88 × (1 – 0.25) + 13 – 13 – 0 = $66 million

$$V_L = \frac{FCF}{r_{WACC}}$$

$$513.86 = \frac{66}{r_{WACC}}$$

r_{WACC} = **12.84%**

b) What is Mercure's equity cost of capital?

$$\text{Using } r_{wacc} = \frac{E}{E+D} r_E + \frac{D}{D+E} r_D (1-\tau_c),$$

$$12.84\% = \frac{400}{513.86} r_E + \frac{113.86}{513.86} 6\%(1-0.25)$$

solving for r_E:

$$r_E = \frac{513.86}{400}\left[12.84\% - \frac{113.86}{513.86} 6\%(1-0.25)\right] = 15.21\%.$$