Lancaster University
Management School

AcF302: Corporate Finance

Week 13 Workshop

Mohamed Ghaly
m.ghaly@lancaster.ac.uk

TRIPLE-ACCREDITED, WORLD-RANKED

Question 1:

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

(1) With a constant interest coverage policy, we need to know the debt capacity in order to calculate the interest tax shield.

False

Interest Expense / FCF = constant

$$\text{Interest Paid in Year } t = k \times FCF_t$$

$$PV(\text{Interest Tax Shield}) = PV(\tau_c k \times FCF) = \tau_c k \times PV(FCF)$$
$$= \tau_c k \times V^U$$

(2) If the financing of the project involves an equity issue, and if management believes that the equity will sell at a price that is lower than its true value, this mispricing is a cost of the project for the existing shareholders.

True

Existing shareholders bear the cost of this undervaluation. If the equity issuance is made specifically to finance the project, then it should be deducted from the incremental value that this project creates for the company.

(3) With the APV method the benefit of the interest tax shield is included in the discount rate.

False

With the WACC method, the benefit of the ITS is included in the discount rate. However, with the APV method, the ITS is valued separately and added to the unlevered value of the project.

(4) In the flow to equity valuation method, the cash flows to equity holders are discounted using the unlevered cost of capital.

False

In the flow to equity valuation method, the cash flows to equity holders are discounted using the cost of equity.

(5) With a constant interest coverage policy, the value of the interest tax shield is proportional to the project's unlevered value.

True

FCF / Interest Expense = constant

Interest Paid in Year $t = k \times FCF_t$

$$PV(\text{Interest Tax Shield}) = PV(\tau_c k \times FCF) = \tau_c k \times PV(FCF)$$
$$= \tau_c k \times V^U$$

Question 2:

West Delta is considering the acquisition of another firm in its industry. The acquisition is expected to increase West Delta'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. West Delta has negotiated a purchase price of $110 million. West Delta's cost of equity is 12.3%, its cost of debt is 8.5%, and its tax rate is 40%. The acquisition will be financed with $95.24 million in new debt initially. The acquisition has similar risk to the rest of West Delta. After the transaction, West Delta will adjust its capital structure to maintain its current debt-equity ratio of 2.

a) Calculate the value of this acquisition deal using the APV method.

b) What is the free cash flow to equity in years 0 and 1?

a) Calculate the value of this acquisition deal using the APV method.

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

$$Vu = \frac{FCF}{r_u - g} = \frac{\$5\ million}{r_u - 4\%}$$

$$r_U = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D$$

$$r_U = \left(\frac{1}{3}\right) \times .123 + \left(\frac{2}{3}\right) \times .085 = 9.77\%$$

$$Vu = \frac{FCF}{r_u - g} = \frac{\$5\ million}{9.77\% - 4\%} = \$86.65\ million$$

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

$$PV(ITS) = \frac{ITS}{r_u - g} = \frac{ITS}{9.77\% - 4\%}$$

$$ITS_1 = r_D \times D_0 \times \tau_C = 8.5\% \times \$95.24\,million \times 40\% = \$3.24\,million$$

$$PV(ITS) = \frac{\$3.24}{9.77\% - 4\%} = \$56.15\,million$$

$V_L = V_U$ + PV (interest tax shield) = 86.65 + 56.15 = \$142.8 million

NPV = \$142.8 - \$110 = \$32.8 million

b) What is the free cash flow to equity in years 0 and 1?

Because the acquisition is being financed with \$95.24 million in new debt, the remaining \$14.76 million of the acquisition cost must come from equity:

$$\boxed{FCFE_0 = -110 + 95.24 = -\$14.76 \text{ million}}$$

$$FCFE = FCF - (1 - \tau_c) \times (\text{Interest Payments}) + (\text{Net Borrowing})$$

In one year, the **interest** on the debt will be 8.5% × 95.24 = **\$8.1 million**

Because West Delta maintains a constant debt-equity ratio, the debt associated with the acquisition is also expected to grow at a 4% rate:

95.24 × 1.04 = \$99.05 million.

Therefore, West Delta will **borrow an additional** \$99.05 - \$95.24= **\$3.81 million at t=1**.

$$\boxed{FCFE_1 = 5.0 - (1 - 0.40) \times 8.1 + 3.81 = \$3.95 \text{ million}}$$

Question 3

Continental 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	-$200	$100	$80	$60

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

Continental Industries Market Value Balance Sheet ($ Millions) and Cost of Capital

Assets		**Liabilities**		**Cost of Capital**	
Cash	0	Debt	400	Debt	7%
Other Assets	1000	Equity	600	Equity	12%
				Corporate tax rate	35%

The risk of this new project is similar to the average risk of Continental's projects. To fund this new project, Continental borrows $120 with the principal to be repaid in three equal installments at the end of years 1, 2 and 3. The company does not plan to undertake any further borrowing in relation to this project.

Calculate the NPV of Continental's new project.

Continental has a fixed (predetermined) debt schedule, therefore the APV method is easiest to use in this case.

$V_L = V_U$ + PV (interest tax shield)

$$Vu = \frac{FCF_1}{(1+r_u)^1} + \frac{FCF_2}{(1+r_u)^2} + \frac{FCF_3}{(1+r_u)^3}$$

$$r_U = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D$$

$$r_u = \left(\frac{600}{600+400}\right) \times .12 + \left(\frac{400}{600+400}\right) \times .07 = 10.0\%$$

$$Vu = \frac{100}{(1.10)^1} + \frac{80}{(1.10)^2} + \frac{60}{(1.10)^3} = \$202.10$$

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

$$PV\text{ (interest tax shield)} = \frac{D_0 r_D \tau_c}{(1 + r_D)^1} + \frac{D_1 r_D \tau_c}{(1 + r_D)^2} + \frac{D_2 r_D \tau_c}{(1 + r_D)^3}$$

$$PV\text{ (interest tax shield)} = \frac{120(.07)(.35)}{(1.07)^1} + \frac{80(.07)(.35)}{(1.07)^2} + \frac{40(.07)(.35)}{(1.07)^3} = \mathbf{\$5.2596}$$

$V_L = V_U + PV$ (interest tax shield) = \$202.10 + \$5.26 = \$207.36

So, ***NPV*** = \$207.36 - \$200 = **\$7.36**

Question 4:

Your firm is considering a $120 million investment to launch a new product line. The project is expected to generate a free cash flow of $20 million per year forever, and its unlevered cost of capital is 8%. To fund the investment, your firm will take on $72 million in permanent debt. The marginal corporate tax rate is 35%.

a) What is the NPV of the investment?

b) Now, suppose your firm will pay a 4% underwriting fee when issuing the debt. It will raise the remaining $48 million by issuing equity. In addition to the 7% underwriting fee for the equity issue, you believe that your firm's current share price of $39 is $4 per share less than its true value. What is the NPV of the investment?

a) What is the NPV of the investment?

With permanent debt the APV method is simplest.

$$Vu = \frac{FCF}{r_u} = \frac{\$20\, million}{8\%} = \$250\, million$$

PV(ITS) = Tc × D = 35% × 72 = $25.2 million.

NPV = Vu + PV(ITS) – Initial cost = 250 + 25.2 - 120 = **$155.2 million.**

b) Now, suppose your firm will pay a 4% underwriting fee when issuing the debt. It will raise the remaining $48 million by issuing equity. In addition to the 7% underwriting fee for the equity issue, you believe that your firm's current share price of $39 is $4 per share less than its true value. What is the NPV of the investment?

Financing costs = 4% × $72 million + 7% × $48 million = $6.24 million.

Underpricing cost = underpricing cost per share x number of shares sold

Number of shares sold is equal to the value of shares sold which is $48 million divided by the price per share which is $39 (= 1.23 million shares).

Underpricing cost = $4 × 1.23 million shares = $4.92 million

NPV = $155.2 – $6.24 – $4.92 = **$144.04 million**

Question 5:

Eastern Oil is considering an investment in a new project with an unlevered cost of capital of 11%. The company's marginal corporate tax rate is 35% and its debt cost of capital is 6%. The project has free cash flows of $25 million per year which are expected to decline by 3% per year.

a) If Eastern adjusts its debt continuously to maintain a constant debt-equity ratio of 50%, then what is the present value of this new project?

b) Suppose instead that Eastern adjusts its debt once per year to maintain a constant debt-equity ratio of 50%, what is the present value of the new project in this case?

a) Continuous Adjustment:

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

$$r_{WACC} = r_u - d \times \tau_C \times r_D$$

Note the choice of formula for calculating the WACC. Because we already have information on r_u, d, T_c, and r_D then using this formula allows for a quicker calculation of WACC. With the regular WACC formula, we don't have information on r_E and we would have had to calculate it first using

$$r_E = r_u + \frac{D}{E}(r_u - r_D)$$

r_{wacc} = 11% - (1/3) (35%) (6%) = 10.3%

Because D/E = 50% = 1/2
Then d = D/V = 1/3

The cash flows from this project follow a growing perpetuity, therefore

$$V_L = \frac{CF}{wacc - g} = \frac{\$25 \text{ million}}{.103 - (-.03)} = \mathbf{\$187.96 \text{ million}}$$

Note that in this question the cash flow is declining instead of growing

b) Annual Adjustment:

Because the adjustment happens annually instead of continuously then we need to account for that through multiplying the WACC by (1+Ru)/(1+Rd).

$$r_{WACC} = r_u - d \times \tau_C \times r_D \left(\frac{1+r_u}{1+r_d}\right)$$

r_{WACC} = 11% - (1/3) (35%) (6%) (1.11/1.06) = 10.267%

$$V_L = \frac{CF}{wacc - g} = \frac{\$25 \text{ million}}{.10267 - (-.03)} = \mathbf{\$188.44\ million}$$

Question 6:

Your firm is considering building a $593 million plant to manufacture virtual reality headsets. You expect operating profits (EBITDA) of $136 million per year for the next 10 years. The plant will be fully depreciated on a straight-line basis over 10 years. After 10 years, the plant will be sold for $297 million. The project requires $50 million in working capital at the start, which will be recovered in year 10 when the project shuts down. The corporate tax rate is 35%. All cash flows occur at the end of the year.

a) Suppose the project will be all equity financed. If the risk-free rate is 4.3%, the expected return of the market is 11.1%, and the asset beta for the consumer electronics industry is 1.68, what is the NPV of the project?

b) Suppose instead that the firm will finance $474 million of the cost of the plant using 10-year, 9.3% coupon bonds sold at par. This debt is predetermined, and the company does not have a target leverage ratio. What is the NPV of the project in this case?

a)

Year	0	1 to 9	10
EBITDA ($ millions)		136	136
- Depreciation		(59.3)	(59.3)
EBIT		76.7	76.7
-Taxes (35%)		(26.8)	(26.8)
= Unlevered Net Income		49.9	49.9
+ Depreciation		59.3	59.3
- Capital Expenditures	(593)		
+ Liquidation value			193.05
+ ΔNet working capital	(50)		50
Free Cash Flow	(643)	109.2	352.3

Depreciation = $593 / 10 = $59.3.

After-tax CF from plant sale = $297 x (1 – 0.35) = $193.05

Required rate of return (using CAPM):

$$r_U = 4.3\% + 1.68(11.1\% - 4.3\%) = 15.724\%$$

Therefore,

$$NPV = -\$643 + \frac{\$109.2}{0.15724}\left(1 - \frac{1}{1.15724^{9}}\right) + \frac{\$352.3}{1.15724^{10}}$$

$$NPV = -\$643 + \$507.72 + \$81.76 = \mathbf{-\$53.52}$$

b) Suppose instead that the firm will finance $474 million of the cost of the plant using 10-year, 9.3% coupon bonds sold at par. This debt is predetermined, and the company does not have a target leverage ratio. What is the NPV of the project in this case?

Because the debt level is predetermined, we can use the APV approach.

Because the bonds initially trade at par, the interest payments are the 9.3% coupon payments of the bond. Assuming annual coupons:

$$PV(Interest\ Tax\ Shield) = \$474 \times 0.093 \times 0.35 \times \frac{1}{0.093}\left(1 - \frac{1}{1.093^{10}}\right) = \$97.72$$

$V_L = V_U$ + PV (Interest Tax Shield) = \$589.48 + \$97.72 = \$687.2

NPV = \$687.2 - \$643 = **\$44.2**

\$507.72+\$81.76
(from previous slide)