

# CB Solutions (with Notes)

FNCE 100

MacKINLAY

## Weighted Average Cost of Capital Example

Suppose a company is considering an expansion requiring an investment of \$10 million. The expansion project is expected to operate for five years.

The project specifics are:

- annual expected net cash flow is (before interest and taxes) is \$3.0 million
- tax bracket for company is 35%
- the initial investment is for assets that fall into 3-year depreciation class (depreciation for the four years is 33.33%, 44.45%, 14.81%, and 7.41%)
- additional up-front costs are anticipated to be \$115,385 (expressed on a before tax basis).

Current financial structure details for the company are:

- debt to value ratio of 0.75
- cost of debt of 8%
- cost of equity of 19.8%

$$\left. \begin{array}{l} D = 0.75 \\ E = 0.25 \end{array} \right\} V = 1 \quad \begin{array}{l} r_D = 0.08 \\ r_E = 0.198 \end{array}$$

Required:

Should the project be accepted?

Investment  $\Rightarrow C_0 = -10$

$$r_{WACC} = \frac{D}{V_L} (1 - \tau_c) r_D + \frac{E}{V_L} r_E$$

$$= \frac{0.75}{1} (1 - 0.35) (0.08) + \frac{0.25}{1} (0.198) = \underline{0.0885}$$

Discount Flows at  $r_{WACC}$

Flows	revenue	revenue after tax	dep'm expense	dep'm tax sh	net cf after tax	PV of net cf a/t use $r_{WACC}$
1	3	1.95	3.333	1.17	3.12	2.86
2	3	1.95	4.445	1.56	3.51	2.96
3	3	1.95	1.481	0.52	2.47	1.91
4	3	1.95	0.741	0.26	2.21	1.57
5	3	1.95	0.	0.00	1.95	1.28
						<u>TOTAL 10.59</u>

Salvage Value 0  
Book Value 0  
No Cash Flow

Up front costs after tax = .08

$$NPV = -10 + 10.59 - 0.08 = \underline{+0.51}$$

Since  $NPV > 0$  accept.

### Adjusted Present Value Example

Suppose a company is considering a project in a new line of business requiring an investment of \$10 million. The project is expected to have a five year life.

The project specifics are:

- annual expected net cash flow is (before interest and taxes) is \$3.0 million
- tax bracket for company is 35%
- investment is for assets that fall into 3-year depreciation class (depreciation for the four years is 33.33%, 44.45%, 14.81%, and 7.41%)

Available financing is:

- a five year loan of \$7.5 million at a annual rate of 8%
- loan is tied to project and must be repaid in annual installments of \$1.5 million plus interest
- issuing costs for the loan are 1.54% of value (expressed on a before tax basis).

A survey of companies in the same line of business as this new project found:

- average debt to value ratio of 0.75
- average cost of debt of 8%
- average cost of equity of 19.8%

// NOTE → RISK IS MATCHED

Required:

Should the project be accepted?

What role do financing effects play?

Solution:

Base-case NPV = -155,000

PV of financing side effects = PV debt tax shield - issue costs a/t  
 = 529,000 - 75,000  
 = 454,000

APV = Base-case NPV + PV of financing side effects  
 = -155,000 + 454,000  
 = 299,000.

Decision is to accept the project. The financing side effects lead to the project having a positive NPV.

See next page for calculations

APV Example (continued)

*NPV if all equity financed.*

Base-case NPV calculation:

$r_o = 12\%$

year	NCF	NCF/at	dep'n	dep t.s.	NCF/at dep t.s.	p.v. @ $r_o=12\%$
1	3.000	1.950	3.333	1.167	3.117	2.783
2	3.000	1.950	4.445	1.556	3.506	2.795
3	3.000	1.950	1.481	0.518	2.468	1.757
4	3.000	1.950	0.741	0.259	2.209	1.404
5	3.000	1.950	0.000	0.000	1.950	1.106

9.845

Base-case NPV -0.155

P.V. for financing side effects:

Loan			Loan P			Int/ts	
year	C/F	Interest	Int/at	+ Int/at	p.v. @ $r_d=8\%$	Int/ts	p.v. @ $r_d=8\%$
0	7.500			7.500	7.500		
1	-1.500	-0.600	-0.390	-1.890	-1.750	0.210	0.194
2	-1.500	-0.480	-0.312	-1.812	-1.553	0.168	0.144
3	-1.500	-0.360	-0.234	-1.734	-1.377	0.126	0.100
4	-1.500	-0.240	-0.156	-1.656	-1.217	0.084	0.062
5	-1.500	-0.120	-0.078	-1.578	-1.074	0.042	0.029
					0.529		0.529

*Complete debt flows*

*Shortcut since PV comes from interest tax shield*

*Discount flows related to debt at  $r_o$*

debt interest rate  
0.08

Loan fee a/t -0.075

Adjusted Present Value 0.299

$$r_o = \frac{D(1-\tau_c)}{V_L - \tau_c D} r_D + \frac{E}{V_L - \tau_c D} r_E$$

*What r would be if all equity financed.*

$$= \frac{.75(1-.35)}{1-.35(.75)} (.08) + \frac{.25}{1-.35(.75)} (.198) = 0.12$$

*Use for base-case NPV.*

### Flow to Equity Example

Suppose a company is considering an equity investment in a project requiring a total investment of \$10 million. The project is expected to have a five year life.

The project specifics are:

- annual expected net cash flow is (before interest and taxes) is \$3.0 million
- tax bracket for company is 35%
- investment is for assets that fall into 3-year depreciation class (depreciation for the four years is 33.33%, 44.45%, 14.81%, and 7.41%)

Available debt financing is:

- a five year loan of \$7.5 million at a annual rate of 8%
- loan is tied to project and must be repaid in annual installments of \$1.5 million plus interest
- issuing costs for the loan are 1.54% of value (expressed on a before tax basis).

The beta given the risk of this equity investment is 2.26. (The risk free rate is 4% and the market risk premium is 7%.)

Required:

Should the project be accepted?

*Focus on equity*  
 - interest + principal repayment are expenses, (interest is tax deductible)  
 - use levered flows.

$$\begin{array}{l} \text{Equity} \\ \text{Amount} \\ \text{needed} \end{array} = \begin{array}{l} \text{total} \\ \text{inv.} \\ \downarrow \\ 10 \end{array} - \begin{array}{l} \text{loan} \\ \downarrow \\ 7.5 \end{array} = \underline{\underline{2.5}}$$

$$\begin{aligned} r_E &= r_f + \beta_E (r_m - r_f) \\ &= .04 + 2.26 (.07) = \underline{\underline{0.198}} \end{aligned}$$

FLOW TO EQUITY EXAMPLE

$r_E = 19.8\%$

1+2-3-4

	Inv	-10	Debt	7.5	Equity	2.5				
year	rev	1	2	3	4	5	6	7	8	9
		rev a/t	dep'n	dep ts	prin repay	interest	int/at	net cf/at	pv	
1	3	1.95	3.333	1.16655	1.5	0.6	0.39	1.22655	1.023831	
2	3	1.95	4.445	1.55575	1.5	0.48	0.312	1.69375	1.180146	
3	3	1.95	1.481	0.51835	1.5	0.36	0.234	0.73435	0.427103	
4	3	1.95	0.741	0.25935	1.5	0.24	0.156	0.55335	0.268641	
5	3	1.95	0	0	1.5	0.12	0.078	0.372	0.150751	
			Issue Cost	0.075				TOTAL	3.050472	

$$NPV = -2.5 + 3.05 - .08$$

$$= +0.47$$
 Since  $NPV > 0$  accept

$\swarrow$  debt issue costs after tax