

## Luento 3.

# Puhtaan siirtymän hankkeiden rahoitus

Aalto University

**Markku Kaustia**

*Hannes Gebhard Professor of Finance and Insurance,  
Department of Finance, Aalto University*

Projektityö

## Valmistele valitsemasi puhtaan siirtymän hankkeen (osittainen) rahoitushakemus

Kohteeksi soveltuu meneillään oleva, potentiaalinen, tai kuviteltavissa oleva mutta realistinen hanke. Työn täytyy pitää sisällään seuraavat elementit:

- Hankkeen kuvaus, hyödyt, ja riskit
- Kassavirtojen ennustaminen
- Rahoitusrakenne ja –instrumentit
- Pääoman kustannus
- Investoinnin kannattavuuden analyysi
- Yhteenveto, kannattaako hanke käynnistää ja miksi



**Kassavirtalaskelma  
ja pääoman  
kustannus** Aalto University

## Cost of capital as an opportunity cost

Your vacation example: (1) out-of-pocket cost, (2) opportunity cost, (3) public externality cost

Opportunity cost of capital is the return that the capital would earn elsewhere

- **Classic def.:** with similar risk
- **Sustainable finance def.:** with an acceptable combination of return, risk, and externalities

An appropriate discount rate reflects the opportunity cost of capital

## Key elements of cost of capital

How much debt, how much equity? (i.e., capital structure)

Any tax advantage of debt?

Required returns on equity and debt

Project-specific risk considerations

**Concepts to cover:** Firm value, cash flow calculations, leverage effect

## Enterprise value method of equity valuation

- The total value of firm (EV, enterprise value) = the value of firm's assets = the present value of unlevered cash flow (UCF)
- (Analysts' main method of equity valuation)
- We use this logic for investment project analysis

*Market value -based balance sheet*

Assets	Liabilities
Value of firms' operating assets (EV)	Value of Equity (E)
Cash holdings	Value of debt (D)

Enterprise value (EV)

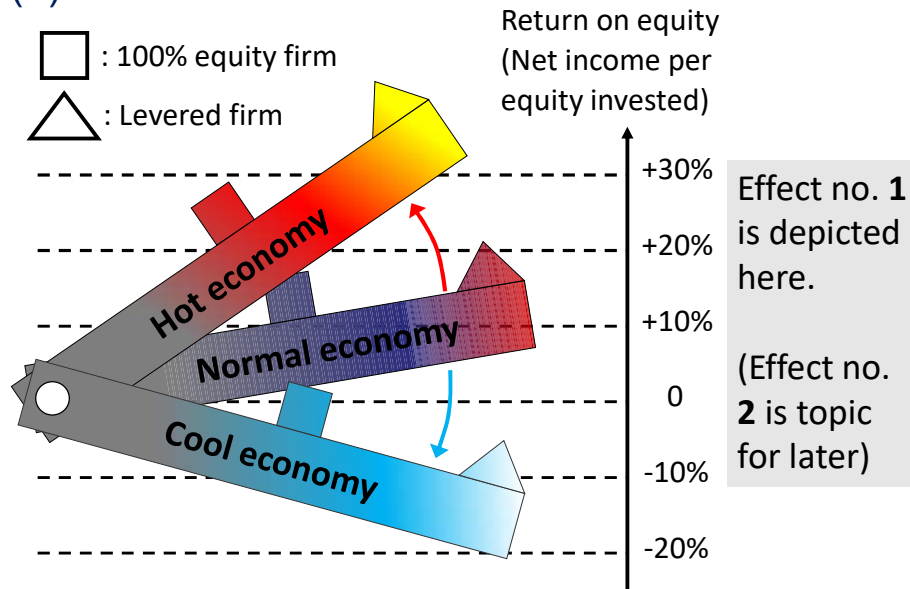
= Value of firm's operating assets

= PV of the cash flow generated by assets

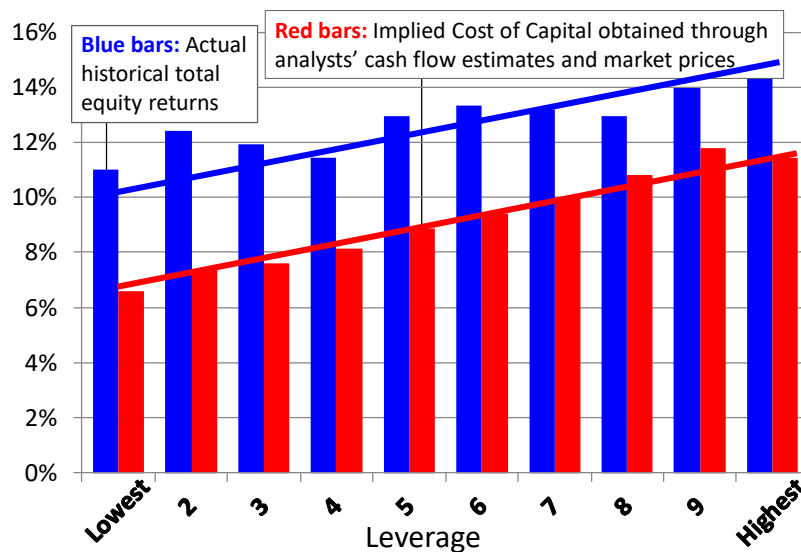
Solving for E:

$$E = EV - \underbrace{(\text{Debt} - \text{Cash and cash equivalents})}_{= \text{Net debt}}$$

Leverage (= debt) makes (1) equity riskier, but (2) reduces taxes



Leverage makes equity riskier; To compensate, investors expect more return



Source: Hou, Kewei, van Dijk, Mathijs A., and Zhang, Yinglei, (2010)



## Unlevered Cash Flow (UCF)

### Unlevered cash flow (UCF)

Cash flow that could be (financially sustainably) paid out as dividends, assuming the firm had no debt

But dividends are the cash flow to stockholders?

- True. You can think of UCF as the ‘potential dividend’
- Actual dividend paid can be higher or lower in the short-term, doesn’t matter for valuation

## Why this fictional UCF, instead of just normal actual cash flow?

1. Hard to deduct the (opportunity) cost of capital in calculating cash flow
2. Because of accounting rules, debt financing offers a tax shield (equity does not)

Both issues are easier to “handle” by using an appropriate discount rate (*WACC*, topic for later)

- I.e., use a cash flow that is ‘wrong’ in a specific way, to make the end result right

## Steps of enterprise value (EV) method

1. Compute and forecast UCF
2. Discount by Weighted Average Cost of Capital (*WACC*)
3. Subtract net debt to get equity value

## EV valuation example, Catskills Inc.

**Given:** UCF of \$1 million next year, growing at 5%;  
Assume WACC is 11.45%

The value of assets (V) is

$$V = \frac{UCF_1}{WACC - g} = \frac{\$1M}{6.45\%} = \$15.5M$$

There's \$5m in debt, so E = \$15.5M - \$5M = \$10.5M

That was easy. The harder part is obtaining UCF and WACC. Next, UCF...

## Computing UCF

UCF =

+ UOCF    **[1. Unlevered operating cash flow]**

– CAPEX    **[2. Capital expenditures]**

– ΔNWC    **[3. Change in net working capital]**

= EBIT x (1 - Tax rate) + Depreciation – CAPEX – ΔNWC

Recall: This “as if” there was no debt

## 1. Unlevered operating cash flow (UOCF)

EBIT = Earnings before interest and taxes

$$\text{UOCF} = \text{EBIT} \times (1 - \text{Tax Rate}) + \text{Depreciation}$$

↑  
In accounting this  
comes after deducting  
depreciation

↑  
Add back depreciation because  
it's not a cash flow, despite  
being deducted in accounting

(but the tax savings from  
depreciation *is* a cash flow,  
so that can stay)

## 2. Capital expenditures (CAPEX)

E.g., purchase of equipment, building a facility

Positive CAPEX (buying something) is a cash outflow,  
negative CAPEX (selling something) is a cash inflow

Can be inferred from net fixed assets (NFA\*) as CAPEX  
= Change in net fixed assets + Depreciation

\* Can also be called *property  
plant and equipment*, or PPE

### 3. Change in net working capital ( $\Delta$ NWC)

Net working capital = Current Assets – Current Liabilities

$\Delta$ NWC = Current NWC – Past NWC

An increase in NWC is a cash outflow, decrease is a cash inflow

- E.g., takes time for customers to pay, but you need cash to meet costs
- E.g., you may need to accumulate inventory

#### UCF example

	2010	2011
Sales	754.2	900.1
Cost of goods sold	400.1	550.8
Other expences	25.6	40.1
Depreciation	150.6	161.6
Interest	15.4	13.2
Cash	100.2	81.4
Accounts rec.	36.2	41.4
Inventory	75.9	82.6
Net fixed assets	599.3	615.2
S-term notes payable	31.2	28.4
Accounts payable	54.1	59.9
Long-term debt	100.1	98.4
Dividends	9.1	8.9

The table shows past (2010) and forecasted (2011) income statement and balance sheet items for QVC co.

What is the forecasted UCF for 2011?

The corporate tax rate is 35%

Amounts in millions

## UCF example

	2010	2011		
			<b>EBIT</b>	
Sales	754.2	900.1	= 900.1	[Sales]
Cost of goods sold	400.1	550.8	- 550.8	[COGS]
Other expences	25.6	40.1	- 40.1	[Other exp.]
Depreciation	150.6	161.6	- 161,6	[Depr.]
Interest	15.4	13.2		
Cash	100.2	81.4	<b>= 147,6</b>	
Accounts rec.	36.2	41.4		
Inventory	75.9	82.6		
Net fixed assets	599.3	615.2		
S-term notes payable	31.2	28.4		
Accounts payable	54.1	59.9		
Long-term debt	100.1	98.4		
Dividends	9.1	8.9		

## UCF example

	2010	2011		
			<b>Unlevered operating cash flow (UOCF)</b>	
Sales	754.2	900.1	= 147.6	[EBIT]
Cost of goods sold	400.1	550.8	- 0.35 x 147.6	[Taxes on EBIT]
Other expences	25.6	40.1		
Depreciation	150.6	161.6	+ 161.6	[Depr.]
Interest	15.4	13.2		
Cash	100.2	81.4	<b>= 257.54</b>	
Accounts rec.	36.2	41.4		
Inventory	75.9	82.6		
Net fixed assets	599.3	615.2		
S-term notes payable	31.2	28.4		
Accounts payable	54.1	59.9		
Long-term debt	100.1	98.4		
Dividends	9.1	8.9		

## UCF example

	2010	2011	
Sales	754.2	900.1	<b>CAPEX</b> = 615.2 - 599.3 [ $\Delta$ NFA] + 161.6 [Depr] <b>= 177.5</b>
Cost of goods sold	400.1	550.8	
Other expences	25.6	40.1	
Depreciation	150.6	161.6	
Interest	15.4	13.2	
Cash	100.2	81.4	
Accounts rec.	36.2	41.4	
Inventory	75.9	82.6	
Net fixed assets	599.3	615.2	
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## UCF example

	2010	2011	
Sales	754.2	900.1	<b><math>\Delta</math> NWC</b> = $NWC_{11} - NWC_{10}$ $NWC = CA - CL$ = $\begin{matrix} \boxed{\text{AR} \\ + \text{inventory} \\ + \text{cash}} \end{matrix} - \begin{matrix} \boxed{\text{AP} \\ + \text{short} \\ \text{term} \\ \text{notes} \\ \text{payable}} \end{matrix}$ For 2011, CA - CL: 205.4 - 88.3 = 117.1 For 2010, CA - CL: 212.3 - 85.3 = 127 $\Delta$ NWC = 117.1 - 127 = <b>- 9.6</b>
Cost of goods sold	400.1	550.8	
Other expences	25.6	40.1	
Depreciation	150.6	161.6	
Interest	15.4	13.2	
Cash	100.2	81.4	
Accounts rec.	36.2	41.4	
Inventory	75.9	82.6	
Net fixed assets	599.3	615.2	
S-term notes payable	31.2	28.4	
Accounts payable	54.1	59.9	
Long-term debt	100.1	98.4	
Dividends	9.1	8.9	

CA: Current Assets, CL: Current Liabilities; AP: Accounts Payable, AE: Accounts Receivable

## UCF example

	2010	2011		
Sales	754.2	900.1		
Cost of goods sold	400.1	550.8	257.4	[UOCF]
Other expenses	25.6	40.1	- 177.5	[CAPEX]
Depreciation	150.6	161.6	- (-9.9)	[Δ NWC]
Interest	15.4	13.2		
Cash	100.2	81.4	<b>= 89.94M</b>	
Accounts rec.	36.2	41.4		
Inventory	75.9	82.6		
Net fixed assets	599.3	615.2		
S-term notes payable	31.2	28.4		
Accounts payable	54.1	59.9		
Long-term debt	100.1	98.4		
Dividends	9.1	8.9		

## Weighted Average Cost of Capital (WACC)

- Needed for a levered firm/project, i.e., one that employs debt (= usually the case)
- Average of equity and debt expected return, accounting for tax shields
- Analysts value firms using WACC for unlevered cash flows the firm generates



## Example: WACC

Los Ninos del Mar is a boutique wine producer

Cost of capital is 12.4% for equity and 6% for debt;  
current *capital structure* is the following

Market-value balance sheet, mil.			
Assets	1,250	500	Debt
	1,250	750	Equity
		1,250	

What is the weighted average cost of capital, WACC?  
For now, assume there are no taxes.

Capital structure weights for Los Ninos del Mar



$$\frac{D}{V} = \frac{D}{D+E} = \frac{500}{500+750} = 0.4, \quad \frac{E}{V} = \frac{750}{1,250} = 0.6$$

Think of the firm's assets as  
investment portfolio  $E + D$

Portfolio return is a weighted  
average of component returns

$$r = \frac{D}{V} \times r_D + \frac{E}{V} \times r_E$$

$$= 0.4 \times 6\% + 0.6 \times 12.4\% = 9.84\%$$

Total value of assets (V)	Value of Equity (E)
	Value of debt (D)

## WACC (no longer ignoring taxes)

Weighted average of after-tax costs of debt and equity

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

Use this as the discount rate for unlevered cash flow (UCF) from

- Individual investment projects to get their PV
- The whole firm to get enterprise value (EV)

## Debt provides a tax shield

Tax shield of debt per year is	100% equity	Levered firm	
$D \times r_D \times T_C$	1,000	1,000	[EBIT]
where $T_C$ is the corporate income tax rate	1,000	-200	[Interest expense]
	800	800	[Pretax profit]
	-350	-280	[Corp. income tax, 35%]
	650	520	[Net income]
Cash flow to			
Bond holders	0	200	
Equity holders	650	520	
Total cash flow to providers of capital	650	720	70 [Difference = tax shield of debt]

Is after-tax cost of debt really  $r_D \times (1 - T_C)$ ? Yes.

Suppose the amount of debt was \$4,000 in the previous example

Interest expense was \$200, so the rate of interest is  $200 / 4,000 = 5\%$

But the after-tax effect on net income was only  $\$200 \times (1 - 0.35) = \$130$

So cost of debt was  $\$130 / \$4,000 = 3.25\%$ , i.e.,

$$r_D \times (1 - T_C) = 5\% \times 0.65 = 3.25\%$$