Module 2

Alternative Approaches to Valuation and Investment

Foundations of the WACC (Finance is so WACC!)

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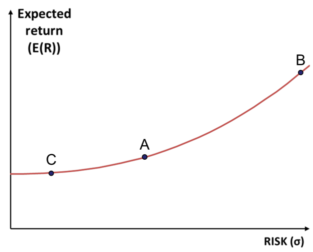
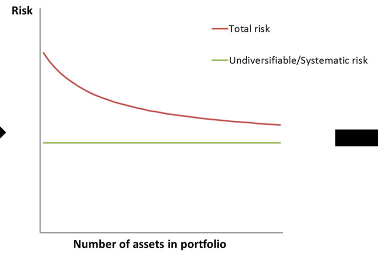
A brief recap…

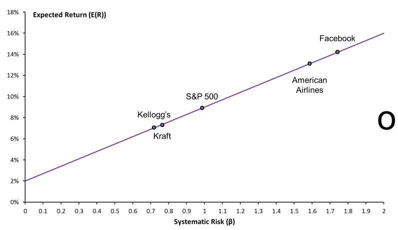


→ σ →



→ β

→



→ $$E(R_i) = R_f + \beta_i\left[E(R_M) - R_f\right]$$

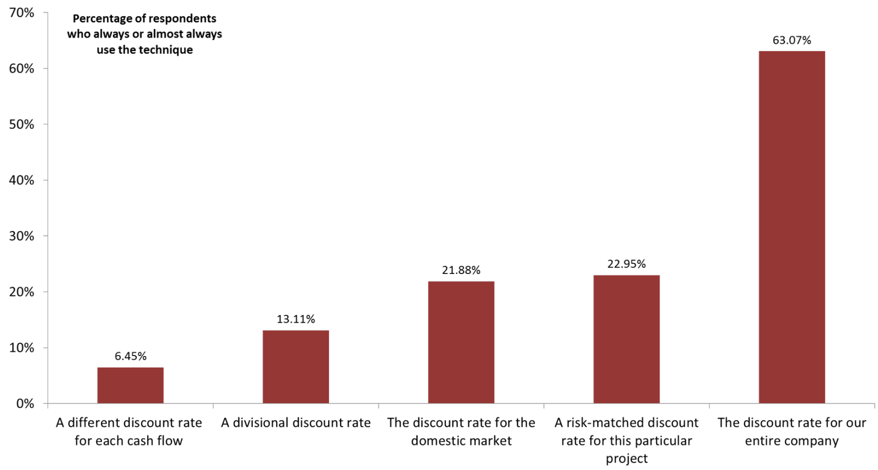
or

→ $$E(R_i) - R_f = \beta_i^{Mkt}\left[E(R_M) - R_f\right] + \beta_i^{SMB}\left[E(R_{SMB})\right] + \beta_i^{HML}\left[E(R_{HML})\right]$$

..but then..

A brief recap…

How frequently would your company use the following discount rates when evaluating a new project…?



Weighted Average Cost of Capital

$$WACC = k_d(1-t_c)\left(\frac{D}{V}\right) + k_e\left(\frac{E}{V}\right)$$

Where:

- k_d = Cost of debt capital
- t_c = Corporate tax rate
- k_e = Cost of equity capital
- D = Market value of debt
- E = Market value of equity
- V = Market value of assets
  = D+E

Demonstrating the intuition behind WACC

Let's assume the following for ABC Ltd:

k_d	5% per annum
k_e	12% per annum
t_c	35%
D	$1,000,000
E	$1,000,000

Let's also assume that:

- Shareholders receive all of their returns via dividends – that is: 100% payout
- Debt levels will be constant
- The firm is a going concern – with a cash flow stream that will be constant in perpetuity.

$$PV_{Perpetuity} = \frac{C}{(1+r)} + \frac{C}{(1+r)^2} + .. + \frac{C}{(1+r)^\infty} = \frac{C}{r}$$

Demonstrating the intuition behind WACC

Cash flows required by contributors of capital

Debtholders:

Interest Cost = $k_d \times D$ = 5% × $1m = $50,000

But that cash flow is tax-deductible – that is – it reduces the corporate tax paid by the company.

Tax-deduction = $50,000 × 35% = $17,500

After-tax interest cost = $50,000 − $17,500
= $32,500

After-tax interest cost = $k_d \times (1-t_c) \times D$

Demonstrating the intuition behind WACC

Cash flows required by contributors of capital

Equity holders:

Dividends = $\mathbf{k_e \times E}$ = 12% × \$1m = \$120,000

Recall that the value of a perpetuity is calculated as:

$$PV_{Perpetuity} = \frac{C}{(1+r)} + \frac{C}{(1+r)^2} + .. + \frac{C}{(1+r)^\infty} = \frac{C}{r}$$

The value of the firm's **assets** therefore can be estimated as:

$$Value = \frac{C}{r} = \frac{Annual\ Cash\ Flow}{Firm - wide\ Cost\ of\ Capital}$$

Demonstrating the intuition behind WACC

We know that the value of the firm's assets is simply the value of debt plus the value of equity:

V = D + E

Therefore:

$$D + E = \frac{Annual\ Cash\ Flow}{Firm - wide\ Cost\ of\ Capital}$$

$$Firm - wide\ Cost\ of\ Capital = \frac{Annual\ Cash\ Flow}{D + E}$$

Demonstrating the intuition behind WACC

Substitute what we know about the annual cash flow required by debtholders and shareholders:

$$Cost\ of\ Capital = \frac{k_d(1-t_c)D + k_e E}{D+E}$$

$$Cost\ of\ Capital = \frac{k_d(1-t_c)D}{D+E} + \frac{k_e E}{D+E}$$

$$Cost\ of\ Capital = k_d(1-t_c)\frac{D}{D+E} + k_e\frac{E}{D+E}$$

$$Cost\ of\ Capital = k_d(1-t_c)\frac{D}{V} + k_e\frac{E}{V} = WACC$$

Demonstrating the intuition behind WACC

So in our example:

$$Cost\ of\ Capital = \frac{Annual\ Cash\ Flow}{D+E}$$

$$Cost\ of\ Capital = \frac{\$32,500 + \$120,000}{\$1m + \$1m}$$

$$Cost\ of\ Capital = \frac{\$152,500}{\$2m} = 7.625\%\ per\ annum$$

Demonstrating the intuition behind WACC

…or alternatively...

$$WACC = k_d(1-t_c)\frac{D}{V} + k_e\frac{E}{V}$$

$$WACC = \left(0.05 \times (1-0.35) \times \frac{1}{2}\right) + \left(0.12 \times \frac{1}{2}\right)$$

$$WACC = 0.01625 + 0.06 = 0.07625 = 7.625\%\ per\ annum$$

WACC – some points

$$WACC = k_d(1-t_c)\left(\frac{D}{V}\right) + k_e\left(\frac{E}{V}\right)$$

1. Always use current costs of capital – that is – if you were to raise the funds today to fund the company – what would it cost you?
2. Always use **current market values** of debt and equity not **book values.**

WACC – who cares?

- Companies are often fiercely protective of letting others know the value of their WACC.
- One of the key reason's for this is that it can give competitors an advantage when bidding for assets.

$$NPV = -I_o + \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} \ldots + \frac{C_n}{(1+r)^n}$$

$$NPV = -Price\ bid + \frac{C_1}{(1+WACC)^1} + \frac{C_2}{(1+WACC)^2} \ldots + \frac{C_n}{(1+WACC)^n}$$

$$0 = -Price\ bid_{MAX} + \frac{C_1}{(1+WACC)^1} + \frac{C_2}{(1+WACC)^2} \ldots + \frac{C_n}{(1+WACC)^n}$$

$$Price\ bid_{MAX} = \frac{C_1}{(1+WACC)^1} + \frac{C_2}{(1+WACC)^2} \ldots + \frac{C_n}{(1+WACC)^n}$$

Summary

- We defined Weighted Average Cost of Capital as:

$$WACC = k_d(1-t_c)\left(\frac{D}{V}\right) + k_e\left(\frac{E}{V}\right)$$

- We demonstrated the foundations of the equation – which also highlighted its key features:
  1. The use of market values for all elements of debt and equity
  2. The use of current required rates of return
- Highlighted why firm's guard their WACC carefully.

…Let's demonstrate the technique with a comprehensive example…

Source list

Slide 2:
Expected return/Risk and Risk/Number of assets in portfolio graphs created by Sean Pinder. © The University of Melbourne.

Expected return/systematic risk graph created by Sean Pinder using data downloaded from Yahoo Finance in June 2015 at https://au.finance.yahoo.com. © The University of Melbourne.

Slide 3:
Graph created by Sean Pinder using data sourced from Coleman, L., Maheswaran, K., & Pinder, S. (2010), 'Narratives in managers' corporate finance decisions', *Accounting & Finance*, vol. 50, no. 3, pp. 605-633.

Slide 4:
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Source list

Slide 5:
Example adapted from chapter 14 of *Business Finance* 12th edition, 2015, Peirson, Brown, Easton, Howard and Pinder, McGraw-Hill Education, Sydney.

Slide 12:
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