Module 2

Alternative Approaches to Valuation and Investment

WACC and Debt
(WACC-Owe!)

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Recap

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

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

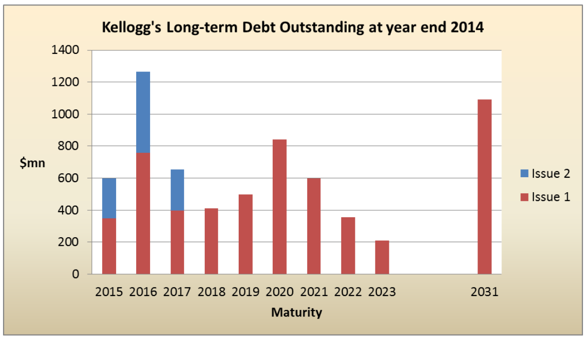
Which sources of debt go into WACC?

Excerpt from Kellogg's Financial Statements:

Liabilities ($USD millions)	2014	
Current liabilities		
Current maturities of long-term debt	607	Include
Notes payable	828	Include
Accounts payable	1,528	Exclude: Already accounted for in project cash flows
Other current liabilities	1,401	
Total current liabilities	4,364	
Non-current liabilities		
Long-term debt	5,935	Include
Deferred income taxes	726	Exclude: Already accounted for in project cash flows
Pension liability	777	Exclude: Already accounted for in project cash flows
Other liabilities	500	
Total Non-current Liabilities	7,938	
Total liabilities	12,302	

Valuation of Debt

In note 6 of its 2014 annual report, Kellogg's lists many different sources of long-term debt – with varying maturities and interest obligations.



We need to estimate the **current market value** and the **yield to maturity** for each source of debt

Valuation of Debt: Long-term fixed rate bonds

A fixed coupon-paying bond is a long-term debt-security that promises a series of **fixed coupon** payments over the life of the bond – plus repayment of the **face value** of the bond at maturity.

Coupon payments are determined by multiplying the bond's coupon rate (**c**) by the bond's face value

$$\$C = c \times \$Face\ Value$$

The value of a bond at any time is simply the present value of the cash flows promised by the bond – where the appropriate discount rate is known as the **yield to maturity (ytm)**.

$$Price = \frac{\$C}{(1+ytm)^1} + \frac{\$C}{(1+ytm)^2} + \frac{\$C}{(1+ytm)^3} + \ldots + \frac{\$C}{(1+ytm)^n} + \frac{\$Face\ Value}{(1+ytm)^n}$$

Valuation of Debt: Long-term bonds

Most times – when bonds are first issued – the coupon rate is set equal to the required yield to maturity – such that the Present Value of the bond is equal to its Face Value.

Over time though, yields to maturity change, and so does the relationship between Present Value and Face Value.

Assuming a coupon has just been paid:

$$c < ytm \therefore PV < FV$$

$$c = ytm \therefore PV = FV$$

$$c > ytm \therefore PV > FV$$

Valuation of Debt: Example

In 2001, Kellogg's issued \$1.1bn of 30-year bonds with a coupon rate of 7.45% p.a. (payable semi-annually) in order to fund its acquisition of Keebler Foods.

Assume a face value of \$1m for each bond; the value of the bond at issuance is:

$$Price = \frac{\$37250}{(1.03725)^1} + \frac{\$37250}{(1.03725)^2} + .. + \frac{\$37250}{(1.03725)^{60}} + \frac{\$1000000}{(1.03725)^{60}}$$

$$Price = \$1,000,000$$

An aside: to convert a sub-period rate (*j*) where there are *m* sub-periods per period into a rate per period (*i*) we use the following formula:

$$1 + i = (1 + j)^m$$

$$(1 + i) = (1.03725)^2 = 1.075888$$

$$i = 7.5888\% \text{ per annum}$$

Valuation of Debt: Example

Fast forward to 2015, there are now 32 coupon payments remaining, and the market required rate of return has also probably changed.

$$Price = \frac{\$37250}{(1 + ytm)^1} + .. + \frac{\$37250}{(1 + ytm)^{32}} + \frac{\$1000000}{(1 + ytm)^{32}}$$

$$Price = ?$$

The rate that we want to insert here is the (half yearly) coupon rate that Kellogg's **would** have to promise today – in order to issue 16 year bonds at face value.

What determines market yields?

The relationship between interest rates and term to maturity is known as the **term structure of interest rates.**

One of the most widely accepted reasons for why short term rates are different to longer term rates is that longer term rates build in expectations of changing short term rates.

e.g. 1 year rate = 4% per annum, 2 year rate = 5% p.a.

Two strategies:

1. Invest $100 for one year and then reinvest at the prevailing one year rate in one-year's time
2. Invest for 2 years.

$$\$100(1.04)(1+E(i_{1,2})) = \$100(1.05)^2$$

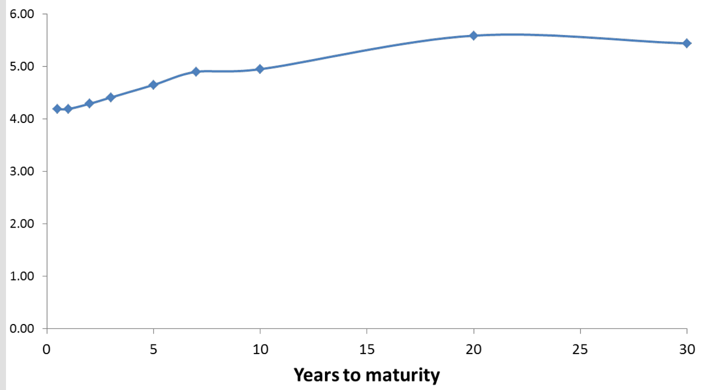
$$(1.04)(1+E(i_{1,2})) = (1.05)^2$$

$$(1+E(i_{1,2})) = \frac{(1.05)^2}{(1.04)}$$

$$E(i_{1,2}) = 6.0096\%$$

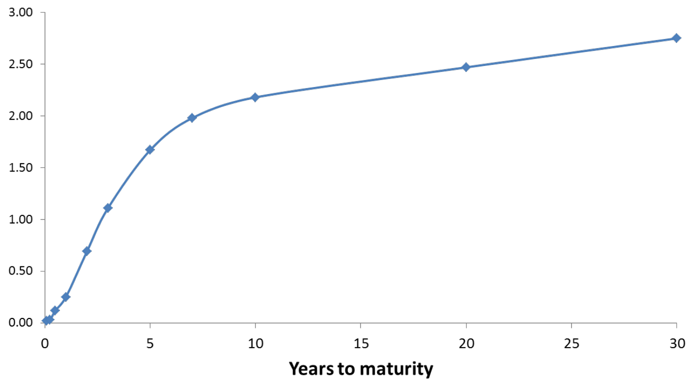
Term structure of interest rates

US Treasury Rates – January 2001



Term structure of interest rates

US Treasury Rates – January 2015



Debt valuation: Other issues

- Zero-coupon bonds involve no intermediate cash flows, so we value just as the PV of future Face Value received.
- Floating rate bonds offer coupons that change with benchmark rates – e.g. LIBOR + 100 bps. Provided the **spread** reflects adequate compensation for the risk associated with the bond – this bond will **reset** to Face Value each period.
- Bank overdraft should be included – with the appropriate interest rate as charged by the bank

Weighted average cost of debt

Once we **value** each source of debt, and identify its **cost** – we estimate the weighted average cost of debt capital. For example:

Source of debt	**Market value (1)**	**Proportion (2)**	**Cost of debt (3)**	**(2 x 3)**
Bonds maturing in 2031	$1.2 bn	(1.2/20) = 0.06	5.5%	0.33
Bonds maturing in 2020	$10.8 bn	(10.8/20) = 0.54	4.5%	2.43
Short-term notes	$8 bn	(8/20) = 0.40	2.5%	1.00
Total	$20 bn			3.76% p.a.

D in WACC

k_d in WACC

Summary

- We highlighted the key elements to be included in the estimation of k_d and D stressing the need to use market values and yields to maturity for each source of debt.
- Touched upon the fundamental principles of bond valuation differentiating between:
  - Coupon rates and yields
  - Face value and present value.
- Demonstrated how to estimate the weighted average cost of debt – a key input into WACC.

Source list

Slide 3:
Liabilities & Balance Sheet, © The University of Melbourne. Prepared by Indika Lovell & Thomas Szoka. Sourced from data contained within Item 8. Financial Statements and Supplementary Date – Consolidated Balance Sheet, p 39 Kellogg Company Annual Report 2014, 25 February 2015 (http://investor.kelloggs.com/files/doc_financials/annual_reports/K_2014-Annual-Report_v001_q725z5.pdf).

Slide 4:
Kellogg's Long-term Debt Outstanding at year end 2014 graph. Prepared by Paul Kofman from data sourced from Kellogg Company Annual Report 2014, 25 February 2015 (http://investor.kelloggs.com/files/doc_financials/annual_reports/K_2014-Annual-Report_v001_q725z5.pdf) © The University of Melbourne.

Slides 10 and 11:
Prepared by Sean Pinder from data sourced from Federal Reserve (http://www.federalreserve.gov/datadownload/Download.aspx?rel=H15&series=90056749d54649fa9e06aaa5515501e8&filetype=spreadsheetml&label=include&layout=seriescolumn&from=01/01/2000&to=05/31/2015). © The University of Melbourne.

Slide 13:
Table prepared by Sean Pinder. © The University of Melbourne.