From Cost of Equity to Cost of Capital

- The cost of capital is a composite cost to the firm of raising financing to fund its projects.
- In addition to equity, firms can raise capital from debt

What is debt?

- General Rule: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.
- As a consequence, debt should include
  - Any interest-bearing liability, whether short term or long term.
  - Any lease obligation, whether operating or capital.

Estimating the Cost of Debt

- If the firm has bonds outstanding, and the bonds are traded, the yield to maturity on a long-term, straight (no special features) bond can be used as the interest rate.
- If the firm is rated, use the rating and a typical default spread on bonds with that rating to estimate the cost of debt.
- If the firm is not rated,
  - and it has recently borrowed long term from a bank, use the interest rate on the borrowing or
  - estimate a synthetic rating for the company, and use the synthetic rating to arrive at a default spread and a cost of debt
- The cost of debt has to be estimated in the same currency as the cost of equity and the cash flows in the valuation.

The easy route: Outsourcing the measurement of default risk

- For those firms that have bond ratings from global ratings agencies, I used those ratings:

Company	S&P Rating	Risk-Free Rate	Default Spread	Cost of Debt
Disney	A	2.75% (US $)	1.00%	3.75%
Deutsche Bank	A	1.75% (Euros)	1.00%	2.75%
Vale	A-	2.75% (US $)	1.30%	4.05%

- If you want to estimate Vale's cost of debt in $R terms, we can again use the differential inflation approach we used for the cost of equity:

$$\text{Cost of debt}_{R\$} = (1+\text{Cost of debt}_{US\ \$})\frac{(1+\text{Expected Inflation}_{R\$})}{(1+\text{Expected Inflation}_{US\ \$})}-1$$

$$=(1.0405)\ \frac{(1.09)}{(1.02)}-1=11.19\%\%$$

A more general route: Estimating Synthetic Ratings

- The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, we can use just the interest coverage ratio:

  Interest Coverage Ratio = EBIT / Interest Expenses

- For the non-financial service companies, we obtain the following:

Company	Operating income	Interest Expense	Interest coverage ratio
Disney	$10.023	$444	22.57
Vale	$15,667	$1,342	11.67
Tata Motors	Rs 166,605	Rs 36,972	4.51
Baidu	CY 11,193	CY 472	23.72
Bookscape	$2,536	$492	5.16

Interest Coverage Ratios, Ratings and Default Spreads- November 2013

Large cap (>$5 billion)	*Small cap or risky (<$5 billion)*	*Rating is (S&P/ Moody's)*	*Spread (11/13)*
>8.50	>12,5	Aaa/AAA	0.40%
6.5-8.5	9.5-12.5	Aa2/AA	0.70%
5.5-6.5	7.5-9.5	A1/A+	0.85%
4.25-5.5	6-7.5	A2/A	1.00%
3-4.25	4.5-6	A3/A-	1.30%
2.5-3	4-4.5	Baa2/BBB	2.00%
2.25-2.5	3.5-4	Ba1/BB+	3.00%
2-2.25	3-3.5	Ba2/BB	4.00%
1.75-2.25	2.5-3	B1/B+	5.50%
1.5-1.75	2-2.5	B2/B	6.50%
1.25-1.5	1.5-2	B3/B-	7.25%
0.8-1.25	1.25-1.5	Caa/CCC	8.75%
0.65-0.8	0.8-1.25	Ca2/CC	9.50%
0.2-0.65	0.5-0.8	C2/C	10.50%
<0.2	<0.5	D2/D	12.00%

Disney: Large cap, developed	22.57	→	AAA
Vale: Large cap, emerging	11.67	→	AA
Tata Motors: Large cap, Emerging	4.51	→	A-
Baidu: Small cap, Emerging	23.72	→	AAA
Bookscape: Small cap, private	5.16	→	A-

Synthetic versus Actual Ratings: Rated Firms

- Disney's synthetic rating is AAA, whereas its actual rating is A. The difference can be attributed to any of the following:
  - Synthetic ratings reflect only the interest coverage ratio whereas actual ratings incorporate all of the other ratios and qualitative factors
  - Synthetic ratings do not allow for sector-wide biases in ratings
  - Synthetic rating was based on 2013 operating income whereas actual rating reflects normalized earnings
- Vale's synthetic rating is AA, but the actual rating for dollar debt is A-. The biggest factor behind the difference is the presence of country risk, since Vale is probably being rated lower for being a Brazil-based corporation.
- Deutsche Bank had an A rating. We will not try to estimate a synthetic rating for the bank. Defining interest expenses on debt for a bank is difficult…

Estimating Cost of Debt

- For Bookscape, we will use the synthetic rating (A-) to estimate the cost of debt:
  - Default Spread based upon A- rating = 1.30%
  - Pre-tax cost of debt = Riskfree Rate + Default Spread = 2.75% + 1.30% = 4.05%
  - After-tax cost of debt = Pre-tax cost of debt (1- tax rate) = 4.05% (1-.40) = 2.43%
- For the three publicly traded firms that are rated in our sample, we will use the actual bond ratings to estimate the costs of debt.

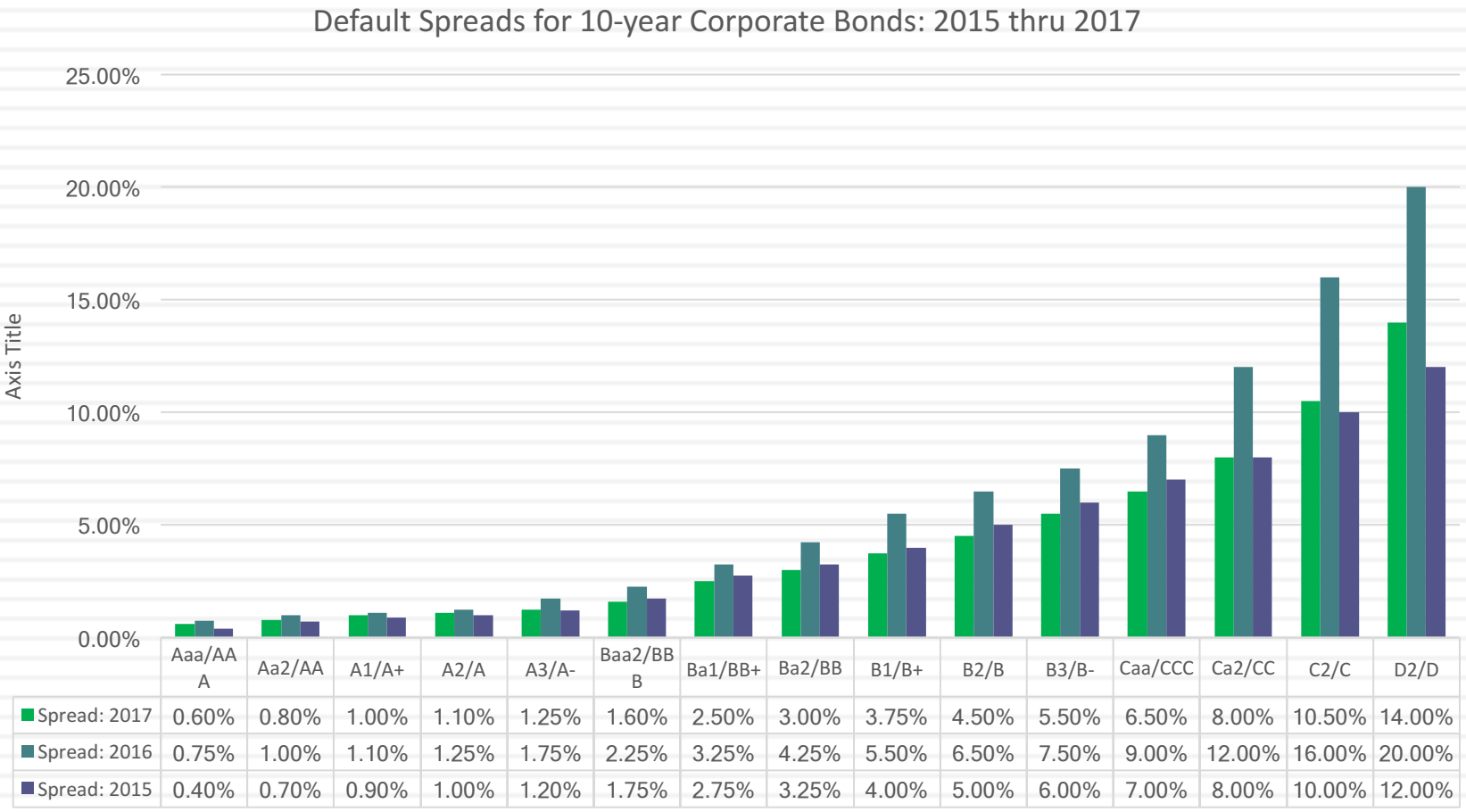
Company	S&P Rating	Risk-Free Rate	Default Spread	Cost of Debt	Tax Rate	After-Tax Cost of Debt
Disney	A	2.75% (US $)	1.00%	3.75%	36.1%	2.40%
Deutsche Bank	A	1.75% (Euros)	1.00%	2.75%	29.48%	1.94%
Vale	A-	2.75% (US $)	1.30%	4.05%	34%	2.67%

- For Tata Motors, we have a rating of AA- from CRISIL, an Indian bond-rating firm, that measures only company risk. Using that rating:

$$\text{Cost of debt}_{TMT} = \text{Risk free rate}_{Rupees} + \text{Default spread}_{India} + \text{Default spread}_{TMT}$$
$$= 6.57\% + 2.25\% + 0.70\% = 9.62\%$$

After-tax cost of debt = 9.62% (1-.3245) = 6.50%

Default Spreads – January 2017



	Aaa/AAA	Aa2/AA	A1/A+	A2/A	A3/A-	Baa2/BBB	Ba1/BB+	Ba2/BB	B1/B+	B2/B	B3/B-	Caa/CCC	Ca2/CC	C2/C	D2/D
Spread: 2017	0.60%	0.80%	1.00%	1.10%	1.25%	1.60%	2.50%	3.00%	3.75%	4.50%	5.50%	6.50%	8.00%	10.50%	14.00%
Spread: 2016	0.75%	1.00%	1.10%	1.25%	1.75%	2.25%	3.25%	4.25%	5.50%	6.50%	7.50%	9.00%	12.00%	16.00%	20.00%
Spread: 2015	0.40%	0.70%	0.90%	1.00%	1.20%	1.75%	2.75%	3.25%	4.00%	5.00%	6.00%	7.00%	8.00%	10.00%	12.00%

Application Test: Estimating a Cost of Debt

- Based upon your firm's current earnings before interest and taxes, its interest expenses, estimate
  - An interest coverage ratio for your firm
  - A synthetic rating for your firm (use the tables from prior pages)
  - A pre-tax cost of debt for your firm
  - An after-tax cost of debt for your firm

Costs of Hybrids

- Preferred stock shares some of the characteristics of debt - the preferred dividend is pre-specified at the time of the issue and is paid out before common dividend -- and some of the characteristics of equity - the payments of preferred dividend are not tax deductible. If preferred stock is viewed as perpetual, the cost of preferred stock can be written as follows:
  - kps = Preferred Dividend per share/ Market Price per preferred share
- Convertible debt is part debt (the bond part) and part equity (the conversion option). It is best to break it up into its component parts and eliminate it from the mix altogether.

Weights for Cost of Capital Calculation

- The weights used in the cost of capital computation should be market values.
- There are three specious arguments used against market value
  - Book value is more reliable than market value because it is not as volatile: While it is true that book value does not change as much as market value, this is more a reflection of weakness than strength
  - Using book value rather than market value is a more conservative approach to estimating debt ratios: For most companies, using book values will yield a lower cost of capital than using market value weights.
  - Since accounting returns are computed based upon book value, consistency requires the use of book value in computing cost of capital: While it may seem consistent to use book values for both accounting return and cost of capital calculations, it does not make economic sense.

Disney: From book value to market value for interest bearing debt…

- In Disney's 2013 financial statements, the debt due over time was footnoted.

Time due	Amount due	Weight	Weight *Maturity
0.5	$1,452	11.96%	0.06
2	$1,300	10.71%	0.21
3	$1,500	12.36%	0.37
4	$2,650	21.83%	0.87
6	$500	4.12%	0.25
8	$1,362	11.22%	0.9
9	$1,400	11.53%	1.04
19	$500	4.12%	0.78
26	$25	0.21%	0.05
28	$950	7.83%	2.19
29	$500	4.12%	1.19
	$12,139		7.92

The debt in this table does not add up to the book value of debt, because Disney does not break down the maturity of all of its debt.

- Disney's total debt due, in book value terms, on the balance sheet is $14,288 million and the total interest expense for the year was $349 million. Using 3.75% as the pre-tax cost of debt:
- Estimated MV of Disney Debt = $$349\left[\frac{(1-\frac{1}{(1.0375)^{7.92}}}{.0375}\right]+\frac{14,288}{(1.0375)^{7.92}}=\$13,028 \text{ million}$$

Operating Leases at Disney

- The "debt value" of operating leases is the present value of the lease payments, at a rate that reflects their risk, usually the pre-tax cost of debt.
- The pre-tax cost of debt at Disney is 3.75%.

Year	Commitment	Present Value @3.75%
1	$507.00	$488.67
2	$422.00	$392.05
3	$342.00	$306.24
4	$272.00	$234.76
5	$217.00	$180.52
6-10	$356.80	$1,330.69
Debt value of leases		$2,932.93

Disney reported $1,784 million in commitments after year 5. Given that their average commitment over the first 5 years, we assumed 5 years @ $356.8 million each.

- Debt outstanding at Disney = $13,028 + $ 2,933= $15,961 million

Application Test: Estimating Market Value

- Estimate the
  - Market value of equity at your firm and Book Value of equity
  - Market value of debt and book value of debt (If you cannot find the average maturity of your debt, use 3 years): Remember to capitalize the value of operating leases and add them on to both the book value and the market value of debt.
- Estimate the
  - Weights for equity and debt based upon market value
  - Weights for equity and debt based upon book value

Current Cost of Capital: Disney

- Equity
  - Cost of Equity = Riskfree rate + Beta * Risk Premium
    = 2.75% + 1.0013 (5.76%) = 8.52%
  - Market Value of Equity = $121,878 million
  - Equity/(Debt+Equity) = 88.42%
- Debt
  - After-tax Cost of debt =(Riskfree rate + Default Spread) (1-t)
    = (2.75%+1%) (1-.361) = 2.40%
  - Market Value of Debt = $13,028+ $2933 = $ 15,961 million
  - Debt/(Debt +Equity) = 11.58%
- Cost of Capital = 8.52%(.8842)+ 2.40%(.1158) = 7.81%

121,878/ (121,878+15,961)

Divisional Costs of Capital: Disney and Vale

Disney

	Cost of equity	Cost of debt	Marginal tax rate	After-tax cost of debt	Debt ratio	Cost of capital
Media Networks	9.07%	3.75%	36.10%	2.40%	9.12%	8.46%
Parks & Resorts	7.09%	3.75%	36.10%	2.40%	10.24%	6.61%
Studio Entertainment	9.92%	3.75%	36.10%	2.40%	17.16%	8.63%
Consumer Products	9.55%	3.75%	36.10%	2.40%	53.94%	5.69%
Interactive	11.65%	3.75%	36.10%	2.40%	29.11%	8.96%
Disney Operations	8.52%	3.75%	36.10%	2.40%	11.58%	7.81%

Vale

Business	*Cost of equity*	*After-tax cost of debt*	*Debt ratio*	*Cost of capital (in US$)*	*Cost of capital (in $R)*
Metals & Mining	11.35%	2.67%	35.48%	8.27%	15.70%
Iron Ore	11.13%	2.67%	35.48%	8.13%	15.55%
Fertilizers	12.70%	2.67%	35.48%	9.14%	16.63%
Logistics	10.29%	2.67%	35.48%	7.59%	14.97%
Vale Operations	11.23%	2.67%	35.48%	8.20%	15.62%

Costs of Capital: Tata Motors, Baidu and Bookscape

- To estimate the costs of capital for Tata Motors in Indian rupees:

  Cost of capital= 14.49% (1-.2928) + 6.50% (.2928) = 12.15%

- For Baidu, we follow the same path to estimate a cost of equity in Chinese RMB:

  Cost of capital = 12.91% (1-.0523) + 3.45% (.0523) = 12.42%

- For Bookscape, the cost of capital is different depending on whether you look at market or total beta:

	Cost of equity	Pre-tax Cost of debt	After-tax cost of debt	D/(D+E)	Cost of capital
Market Beta	7.46%	4.05%	2.43%	17.63%	6.57%
Total Beta	11.98%	4.05%	2.43%	17.63%	10.30%

Application Test: Estimating Cost of Capital

- Using the bottom-up unlevered beta that you computed for your firm, and the values of debt and equity you have estimated for your firm, estimate a bottom-up levered beta and cost of equity for your firm.

- Based upon the costs of equity and debt that you have estimated, and the weights for each, estimate the cost of capital for your firm.

- How different would your cost of capital have been, if you used book value weights?

Choosing a Hurdle Rate

- Either the cost of equity or the cost of capital can be used as a hurdle rate, depending upon whether the returns measured are to equity investors or to all claimholders on the firm (capital)
- If returns are measured to equity investors, the appropriate hurdle rate is the cost of equity.
- If returns are measured to capital (or the firm), the appropriate hurdle rate is the cost of capital.

Back to First Principles