The levered beta: Disney and its divisions

- To estimate the debt ratios for division, we allocate Disney's total debt ($15,961 million) to its divisions based on identifiable assets.

Business	*Identifiable assets (2013)*	*Proportion of debt*	*Value of business*	*Allocated debt*	*Estimated equity*	*D/E ratio*
Media Networks	$28,627	38.04%	$66,580	$6,072	$60,508	10.03%
Parks & Resorts	$22,056	29.31%	$45,683	$4,678	$41,005	11.41%
Studio Entertainment	$14,750	19.60%	$18,234	$3,129	$15,106	20.71%
Consumer Products	$7,506	9.97%	$2,952	$1,592	$1,359	117.11%
Interactive	$2,311	3.07%	$1,684	$490	$1,194	41.07%
Disney	$75,250	100.00%		$15,961	$121,878	13.10%

- We use the allocated debt to compute D/E ratios and levered betas.

Business	*Unlevered beta*	*Value of business*	*D/E ratio*	*Levered beta*	*Cost of Equity*
Media Networks	1.0313	$66,580	10.03%	1.0975	9.07%
Parks & Resorts	0.7024	$45,683	11.41%	0.7537	7.09%
Studio Entertainment	1.0993	$18,234	20.71%	1.2448	9.92%
Consumer Products	0.6752	$2,952	117.11%	1.1805	9.55%
Interactive	1.2187	$1,684	41.07%	1.5385	11.61%
Disney Operations	0.9239	$135,132	13.10%	1.0012	8.52%

Discussion Issue

- Assume now that you are the CFO of Disney. The head of the movie business has come to you with a new big budget movie that he would like you to fund. He claims that his analysis of the movie indicates that it will generate a return on equity of 9.5%. Would you fund it?
  - Yes. It is higher than the cost of equity for Disney as a company
  - No. It is lower than the cost of equity for the movie business.
  - What are the broader implications of your choice?

Estimating Bottom Up Betas & Costs of Equity: Vale

Business	*Sample*	*Sample size*	*Unlevered beta of business*	*Revenues*	*Peer Group EV/Sales*	*Value of Business*	*Proportion of Vale*
Metals & Mining	Global firms in metals & mining, Market cap>$1 billion	48	0.86	$9,013	1.97	$17,739	16.65%
Iron Ore	Global firms in iron ore	78	0.83	$32,717	2.48	$81,188	76.20%
Fertilizers	Global specialty chemical firms	693	0.99	$3,777	1.52	$5,741	5.39%
Logistics	Global transportation firms	223	0.75	$1,644	1.14	$1,874	1.76%
Vale Operations			*0.8440*	*$47,151*		*$106,543*	*100.00%*

Business	Unlevered beta	D/E ratio	Levered beta	Risk free rate	ERP	Cost of Equity
Metals & Mining	0.86	54.99%	1.1657	2.75%	7.38%	11.35%
Iron Ore	0.83	54.99%	1.1358	2.75%	7.38%	11.13%
Fertilizers	0.99	54.99%	1.3493	2.75%	7.38%	12.70%
Logistics	0.75	54.99%	1.0222	2.75%	7.38%	10.29%
Vale Operations	0.84	54.99%	1.1503	2.75%	7.38%	11.23%

Vale: Cost of Equity Calculation – in nominal $R

- To convert a discount rate in one currency to another, all you need are expected inflation rates in the two currencies.

$$(1 + \$\text{ Cost of Equity}) \frac{(1 + \text{Inflation Rate}_{\text{Brazil}})}{(1 + \text{Inflation Rate}_{\text{US}})} - 1$$

- From US $ to R$: If we use 2% as the inflation rate in US dollars and 9% as the inflation ratio in Brazil, we can convert Vale's US dollar cost of equity of 11.23% to a $R cost of equity:

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

$$= (1.1123) \frac{(1.09)}{(1.02)} - 1 = 18.87\%$$

- Alternatively, you can compute a cost of equity, starting with the $R riskfree rate of 10.18%.

Cost of Equity in $R = = 10.18% + 1.15 (7.38%) = 18.67%

Bottom up betas & Costs of Equity: Tata Motors & Baidu

- Tata Motors: We estimated an unlevered beta of 0.8601 across 76 publicly traded automotive companies (globally) and estimated a levered beta based on Tata Motor's D/E ratio of 41.41% and a marginal tax rate of 32.45% for India:

  Levered Beta for Tata Motors = 0.8601 (1 + (1-.3245) (.4141)) = 1.1007

  Cost of equity for Tata Motors (Rs) = 6.57% + 1.1007 (7.19%) = 14.49%

- Baidu: To estimate its beta, we looked at 42 global companies that derive all or most of their revenues from online advertising and estimated an unlevered beta of 1.30 for the business. Incorporating Baidu's current market debt to equity ratio of 5.23% and the marginal tax rate for China of 25%, we estimate Baidu's current levered beta to be 1.3560.

  Levered Beta for Baidu = 1.30 (1 + (1-.25) (.0523)) = 1.356

  Cost of Equity for Baidu (Renmimbi) = 3.50% + 1.356 (6.94%) = 12.91%

Bottom up Betas and Costs of Equity: Deutsche Bank

- We break Deutsche Bank down into two businesses – commercial and investment banking.

Business	*Sample used*	*Sample size*	*Median Levered Beta*	*Deutsche Net Revenues in 2012*	*Proportion*
Banking	European diversified banks	84	1.0665	19,019 mil €	54.86%
Investment Banking	Global investment banks	58	1.2550	15,648 mil €	45.14%
Deutsche Bank			1.1516	34,667 mil €	

- We do not unlever or relever betas, because estimating debt and equity for banks is an exercise in futility. Using a riskfree rate of 1.75% (Euro risk free rate) and Deutsche's ERP of 6.12%:

Business	*Beta*	*Cost of Equity*
Commercial banking	1.0665	1.75%+1.0665 (6.12%) = 8.28%
Investment Banking	1.2550	1.75%+1.2550 (6.12%) = 9.44%
Deutsche Bank	1.1516	1.75%+1.1516 (6.12%) = 8.80%

Estimating Betas for Non-Traded Assets

- The conventional approaches of estimating betas from regressions do not work for assets that are not traded. There are no stock prices or historical returns that can be used to compute regression betas.
- There are two ways in which betas can be estimated for non-traded assets
  - Using comparable firms
  - Using accounting earnings

Using comparable firms to estimate beta for Bookscape

Company Name	*Industry*	*Market Capitalization*	*Levered Beta*	*Marginal tax rate*	*Gross D/E ratio*	*Cash/Firm Value*	R^2
Red Giant Entertainment	Publishing	$2.13	0.69	40.00%	0.00%	0.05%	0.1300
CTM Media Holdings	Publishing	$25.20	1.04	40.00%	17.83%	33.68%	0.1800
Books-A-Million	Book Stores	$38.60	1.42	40.00%	556.55%	4.14%	0.1900
Dex Media	Publishing	$90.50	4.92	40.00%	3190.39%	7.86%	0.2200
Martha Stewart Living	Publishing	$187.70	1.11	40.00%	19.89%	15.86%	0.3500
Barnes & Noble	Book Stores	$939.30	0.11	40.00%	164.54%	3.22%	0.2600
Scholastic Corporation	Publishing	$953.80	1.08	40.00%	21.41%	1.36%	0.2750
John Wiley	Publishing	$2,931.40	0.81	40.00%	29.58%	5.00%	0.3150
Washington Post	Publishing	$4,833.20	0.68	40.00%	21.04%	16.04%	0.2680
News Corporation	Publishing	$10,280.40	0.49	40.00%	8.73%	24.05%	0.2300
Thomson Reuters	Publishing	$31,653.80	0.62	40.00%	26.38%	1.68%	0.2680
Average			**1.1796**	**40.00%**	**368.76%**	**10.27%**	**0.2442**
Median			**0.8130**	**40.00%**	**21.41%**	**5.00%**	**0.2600**

Unlevered beta for book company = 0.8130/ (1+ (1-.4) (.2141)) = 0.7205

Unlevered beta for book business = 0.7205/(1-.05) = 0.7584

Estimating Bookscape Levered Beta and Cost of Equity

- Because the debt/equity ratios used in computing levered betas are market debt equity ratios, and the only debt equity ratio we can compute for Bookscape is a book value debt equity ratio, we have assumed that Bookscape is close to the book industry median market debt to equity ratio of 21.41 percent.
- Using a marginal tax rate of 40 percent for Bookscape, we get a levered beta of 0.8558.

  Levered beta for Bookscape = 0.7584[1 + (1 – 0.40) (0.2141)] = 0.8558
- Using a riskfree rate of 2.75% (US treasury bond rate) and an equity risk premium of 5.5%:

  Cost of Equity = 2.75%+ 0.8558 (5.5%) = 7.46%

Is Beta an Adequate Measure of Risk for a Private Firm?

- Beta measures the risk added on to a diversified portfolio. The owners of most private firms are not diversified. Therefore, using beta to arrive at a cost of equity for a private firm will
  a. Under estimate the cost of equity for the private firm
  b. Over estimate the cost of equity for the private firm
  c. Could under or over estimate the cost of equity for the private firm

Total Risk versus Market Risk

- Adjust the beta to reflect total risk rather than market risk. This adjustment is a relatively simple one, since the R squared of the regression measures the proportion of the risk that is market risk.
  - Total Beta = Market Beta / Correlation of the sector with the market
- In the Bookscape example, where the market beta is 0.8558 and the median R-squared of the comparable publicly traded firms is 26.00%; the correlation with the market is 50.99%.

$$\frac{\text{Market Beta}}{\sqrt{\text{R squared}}} = \frac{0.8558}{.5099} = 1.6783$$

  - Total Cost of Equity = 2.75 + 1.6783 (5.5%) = 11.98%