

# Estimating Bottom Up Betas & Costs of Equity: Vale

<i>Business</i>	<i>Sample</i>	<i>Sample size</i>	<i>Unlevered beta of business</i>	<i>Revenues</i>	<i>Peer Group EV/Sales</i>	<i>Value of Business</i>	<i>Proportion of Vale</i>
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%
<i>Vale Operations</i>			<i>0.8440</i>	<i>\$47,151</i>		<i>\$106,543</i>	<i>100.00%</i>

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:

$$\begin{aligned} \text{Cost of Equity}_{\text{Nominal R\$}} &= (1 + \text{Cost of Equity}_{\text{US \$}}) \frac{(1 + \text{Expected Inflation}_{\text{R\$}})}{(1 + \text{Expected Inflation}_{\text{US \$}})} - 1 \\ &= (1.1123) \frac{(1.09)}{(1.02)} - 1 = 18.87\% \end{aligned}$$

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

$$\text{Cost of Equity in \$R} = 10.18\% + 1.15 (7.38\%) = 18.67\%$$

# 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.

<i>Business</i>	<i>Sample used</i>	<i>Sample size</i>	<i>Median Levered Beta</i>	<i>Deutsche Net Revenues in 2012</i>	<i>Proportion</i>
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%:

<i>Business</i>	<i>Beta</i>	<i>Cost of Equity</i>
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

184

- 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

<i>Company Name</i>	<i>Industry</i>	<i>Market Capitalization</i>	<i>Levered Beta</i>	<i>Marginal tax rate</i>	<i>Gross D/E ratio</i>	<i>Cash/Firm Value</i>	<i>R<sup>2</sup></i>
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
<b>Average</b>			<b>1.1796</b>	<b>40.00%</b>	<b>368.76%</b>	<b>10.27%</b>	<b>0.2442</b>
<b>Median</b>			<b>0.8130</b>	<b>40.00%</b>	<b>21.41%</b>	<b>5.00%</b>	<b>0.2600</b>

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.  
$$\text{Levered beta for Bookscape} = 0.7584[1 + (1 - 0.40)(0.2141)] = 0.8558$$
- Using a riskfree rate of 2.75% (US treasury bond rate) and an equity risk premium of 5.5%:  
$$\text{Cost of Equity} = 2.75\% + 0.8558(5.5\%) = 7.46\%$$

# 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%

# Application Test: Estimating a Bottom-up Beta

189

- Based upon the business or businesses that your firm is in right now, and its current financial leverage, estimate the bottom-up unlevered beta for your firm.
- Data Source: You can get a listing of unlevered betas by industry on my web site by going to updated data.

# From Cost of Equity to Cost of Capital

190

- 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?

191

- 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

192

- 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:

$$\begin{aligned}\text{Cost of debt}_{\text{R\$}} &= (1 + \text{Cost of debt}_{\text{US\$}}) \frac{(1 + \text{Expected Inflation}_{\text{R\$}})}{(1 + \text{Expected Inflation}_{\text{US\$}})} - 1 \\ &= (1.0405) \frac{(1.09)}{(1.02)} - 1 = 11.19\%\end{aligned}$$