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%

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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.

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

- [ ] Inflation Differential: 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:

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

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

- [ ] Riskfree Rate: 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.

Company	Largest holder	# of institutional investors in top ten holdings
Disney	Laurene Jobs (7.3%)	8
Deutsche Bank	Blackrock (4.69%)	10
Vale Preferred	Aberdeen (7.40%)	8
Tata Motors	Tata Sons (26.07%)	7
Baidu (A)	Capital Group (12.46%)	10

□ 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

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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**

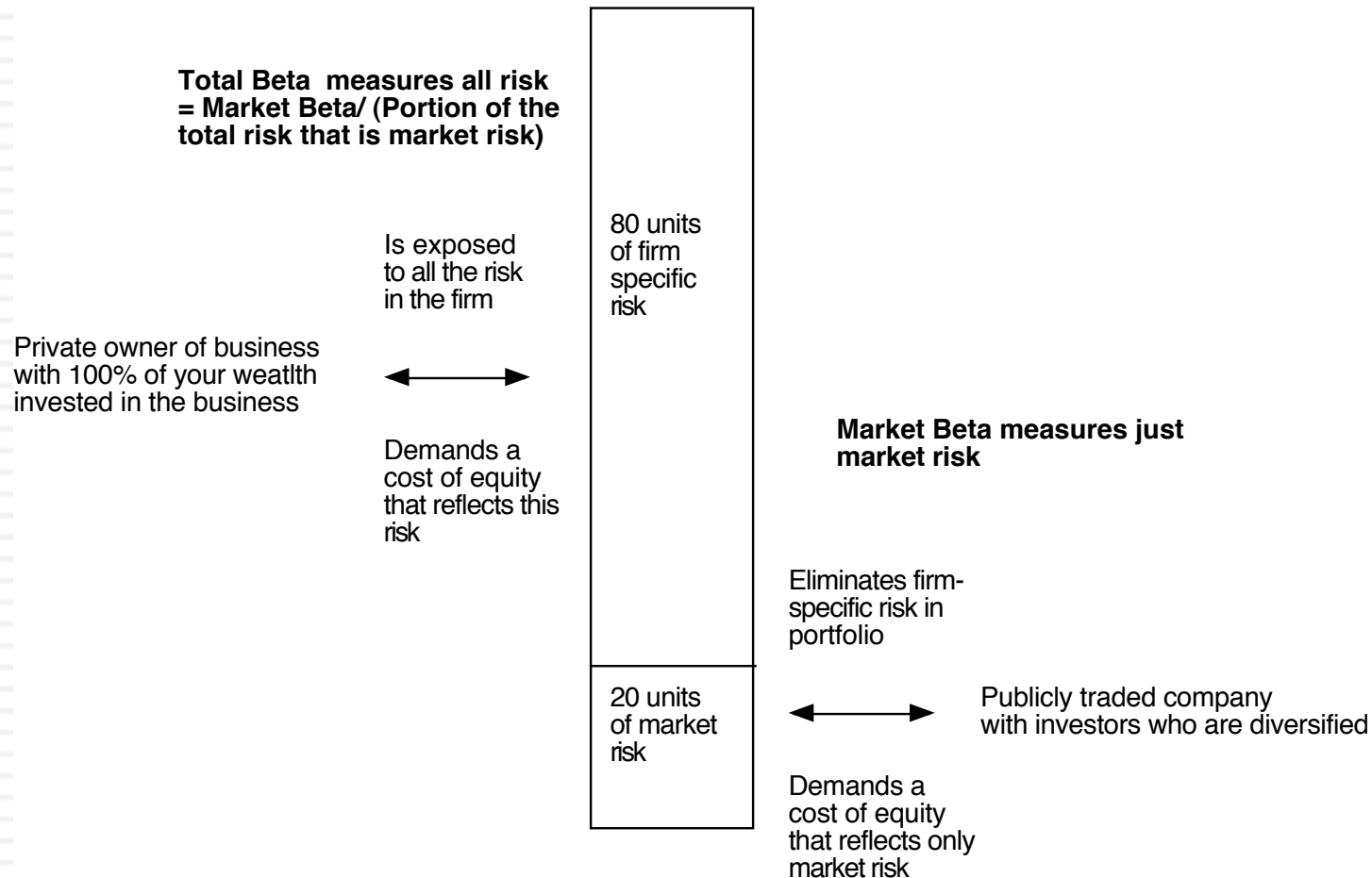Unlevered beta for book company = 0.8130/ (1+ (1-.4) (.2141)) = 0.7205
Unlevered beta for book business = 0.7205/(1-.05) = 0.7584

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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?

Private Owner versus Publicly Traded Company Perceptions of Risk in an Investment

Total Beta measures all risk = Market Beta/ (Portion of the total risk that is market risk)

Is exposed to all the risk in the firm

Private owner of business with 100% of your weatlth invested in the business

Demands a cost of equity that reflects this risk

80 units of firm specific risk

Market Beta measures just market risk

Eliminates firm-specific risk in portfolio

20 units of market risk

Publicly traded company with investors who are diversified

Demands a cost of equity that reflects only market risk

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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%

❏ Note that the market beta and the correlation come from publicly traded companies in this space.

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Application Test: Estimating a Bottom-up Beta

☐ 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.

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