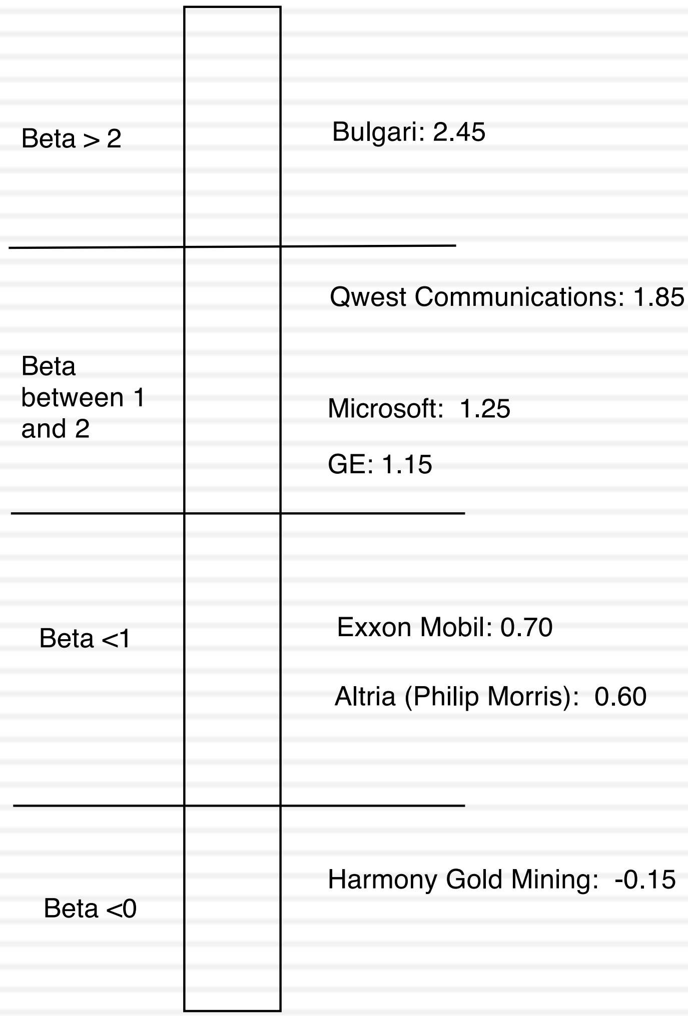
Beta: Exploring Fundamentals



Determinant 1: Product Type

- Industry Effects: The beta value for a firm depends upon the sensitivity of the demand for its products and services and of its costs to macroeconomic factors that affect the overall market.
  - Cyclical companies have higher betas than non-cyclical firms
  - Firms which sell more discretionary products will have higher betas than firms that sell less discretionary products

A Simple Test

- Phone service is close to being non-discretionary in the United States and Western Europe. However, in much of Asia and Latin America, there are large segments of the population for which phone service is a luxury.
- Given our discussion of discretionary and non-discretionary products, which of the following conclusions would you be willing to draw:
  - Emerging market telecom companies should have higher betas than developed market telecom companies.
  - Developed market telecom companies should have higher betas than emerging market telecom companies
  - The two groups of companies should have similar betas

Determinant 2: Operating Leverage Effects

- Operating leverage refers to the proportion of the total costs of the firm that are fixed.
- Other things remaining equal, higher operating leverage results in greater earnings variability which in turn results in higher betas.

Measures of Operating Leverage

- Fixed Costs Measure = Fixed Costs / Variable Costs
  - This measures the relationship between fixed and variable costs. The higher the proportion, the higher the operating leverage.
- EBIT Variability Measure = % Change in EBIT / % Change in Revenues
  - This measures how quickly the earnings before interest and taxes changes as revenue changes. The higher this number, the greater the operating leverage.

Disney's Operating Leverage: 1987- 2013

Year	Net Sales	% Change in Sales	EBIT	% Change in EBIT	
1987	$2,877		$756		
1988	$3,438	19.50%	$848	12.17%	
1989	$4,594	33.62%	$1,177	38.80%	
1990	$5,844	27.21%	$1,368	16.23%	
1991	$6,182	5.78%	$1,124	-17.84%	
1992	$7,504	21.38%	$1,287	14.50%	
1993	$8,529	13.66%	$1,560	21.21%	
1994	$10,055	17.89%	$1,804	15.64%	
1995	$12,112	20.46%	$2,262	25.39%	
1996	$18,739	54.71%	$3,024	33.69%	
1997	$22,473	19.93%	$3,945	30.46%	
1998	$22,976	2.24%	$3,843	-2.59%	
1999	$23,435	2.00%	$3,580	-6.84%	
2000	$25,418	8.46%	$2,525	-29.47%	
2001	$25,172	-0.97%	$2,832	12.16%	
2002	$25,329	0.62%	$2,384	-15.82%	
2003	$27,061	6.84%	$2,713	13.80%	
2004	$30,752	13.64%	$4,048	49.21%	
2005	$31,944	3.88%	$4,107	1.46%	
2006	$33,747	5.64%	$5,355	30.39%	
2007	$35,510	5.22%	$6,829	27.53%	
2008	$37,843	6.57%	$7,404	8.42%	
2009	$36,149	-4.48%	$5,697	-23.06%	
2010	$38,063	5.29%	$6,726	18.06%	
2011	$40,893	7.44%	$7,781	15.69%	
2012	$42,278	3.39%	$8,863	13.91%	
2013	$45,041	6.54%	$9,450	6.62%	**Operating Leverage**
Average: 87-13		**11.79%**		**11.91%**	**11.91/11.79 =1.01**
Average: 96-13		**8.16%**		**10.20%**	**10.20/8.16 =1.25**

Average across entertainment companies = 1.35

Given Disney's operating leverage measures (1.01 or 1.25), would you expect Disney to have a higher or a lower beta than other entertainment companies?

a. Higher

b. Lower

c. No effect

Determinant 3: Financial Leverage

- As firms borrow, they create fixed costs (interest payments) that make their earnings to equity investors more volatile. This increased earnings volatility which increases the equity beta.
- The beta of equity alone can be written as a function of the unlevered beta and the debt-equity ratio

$$\beta_L = \beta_u \, (1+ ((1-t)D/E))$$

  where
  - β_L = Levered or Equity Beta   D/E = Market value Debt to equity ratio
  - β_u = Unlevered or Asset Beta   t = Marginal tax rate
- Earlier, we estimated the beta for Disney from a regression. Was that beta a levered or unlevered beta?

a. Levered

b. Unlevered

Effects of leverage on betas: Disney

- The regression beta for Disney is 1.25. This beta is a levered beta (because it is based on stock prices, which reflect leverage) and the leverage implicit in the beta estimate is the average market debt equity ratio during the period of the regression (2008 to 2013)
- The average debt equity ratio during this period was 19.44%.
- The unlevered beta for Disney can then be estimated (using a marginal tax rate of 36.1%)

  = Current Beta / (1 + (1 - tax rate) (Average Debt/Equity))

  = 1.25 / (1 + (1 - 0.361)(0.1944))= 1.1119

Disney : Beta and Financial Leverage

Debt to Capital	*Debt/Equity Ratio*	*Beta*	*Effect of Leverage*
0.00%	0.00%	1.11	0.00
10.00%	11.11%	1.1908	0.08
20.00%	25.00%	1.29	0.18
30.00%	42.86%	1.42	0.30
40.00%	66.67%	1.59	0.47
50.00%	100.00%	1.82	0.71
60.00%	150.00%	2.18	1.07
70.00%	233.33%	2.77	1.66
80.00%	400.00%	3.95	2.84
90.00%	900.00%	7.51	6.39

Betas are weighted Averages

- The beta of a portfolio is always the market-value weighted average of the betas of the individual investments in that portfolio.
- Thus,
  - the beta of a mutual fund is the weighted average of the betas of the stocks and other investment in that portfolio
  - the beta of a firm after a merger is the market-value weighted average of the betas of the companies involved in the merger.

The Disney/Cap Cities Merger (1996): Pre-Merger

Disney: The Acquirer

Equity Beta
1.15

Debt = $3,186 million
Market value of equity = $31,100 million
Debt + Equity = Firm value = $31,100 + $3186 = $34,286 million
D/E Ratio = 3186/31100 = 0.10

+

Capital Cities: The Target

Equity Beta
0.95

Debt = $ 615 million
Market value of equity = $18, 500 million
Debt + Equity = Firm value = $18,500 + $615 = $19,115 million
D/E Ratio = 615/18500 = 0.03

Disney Cap Cities Beta Estimation: Step 1

- Calculate the unlevered betas for both firms
  - Disney's unlevered beta = 1.15/(1+0.64*0.10) = 1.08
  - Cap Cities unlevered beta = 0.95/(1+0.64*0.03) = 0.93
- Calculate the unlevered beta for the combined firm
  - Unlevered Beta for combined firm

  = 1.08 (34286/53401) + 0.93 (19115/53401)

  = 1.026
  - The weights used are the firm values (and not just the equity values) of the two firms, since these are unlevered betas and thus reflects the risks of the entire businesses and not just the equity]

Disney Cap Cities Beta Estimation: Step 2

- If Disney had used all equity to buy Cap Cities equity, while assuming Cap Cities debt, the consolidated numbers would have looked as follows:
  - Debt = \$ 3,186+ \$615 = \$ 3,801 million
  - Equity = \$ 31,100 + \$18,500 = \$ 49,600 m (Disney issues \$18.5 billion in equity)
  - D/E Ratio = 3,801/49600 = 7.66%
  - New Beta = 1.026 (1 + 0.64 (.0766)) = 1.08
- Since Disney borrowed \$ 10 billion to buy Cap Cities/ABC, funded the rest with new equity and assumed Cap Cities debt:
  - The market value of Cap Cities equity is \$18.5 billion. If \$ 10 billion comes from debt, the balance (\$8.5 billion) has to come from new equity.
  - Debt = \$ 3,186 + \$615 million + \$ 10,000 = \$ 13,801 million
  - Equity = \$ 31,100 + \$8,500 = \$39,600 million
  - D/E Ratio = 13,801/39600 = 34.82%
  - New Beta = 1.026 (1 + 0.64 (.3482)) = 1.25

Firm Betas versus divisional Betas

- Firm Betas as weighted averages: The beta of a firm is the weighted average of the betas of its individual projects.
- Firm Betas and Business betas: At a broader level of aggregation, the beta of a firm is the weighted average of the betas of its individual division.

Bottom-up versus Top-down Beta

- The top-down beta for a firm comes from a regression
- The bottom up beta can be estimated by doing the following:
  - Find out the businesses that a firm operates in
  - Find the unlevered betas of other firms in these businesses
  - Take a weighted (by sales or operating income) average of these unlevered betas
  - Lever up using the firm's debt/equity ratio
- The bottom up beta is a better estimate than the top down beta for the following reasons
  - The standard error of the beta estimate will be much lower
  - The betas can reflect the current (and even expected future) mix of businesses that the firm is in rather than the historical mix

Disney's businesses: The financial breakdown (from 2013 annual report)

Business	*Revenues*	*Operating Income*	*D&A*	*EBITDA*	*S, G & A Costs*	*Cap Ex*	*Identifiable Assets*
Media Networks	$20,356	$6,818	$251	$7,069	$2,768	$263	$28,627
Parks & Resorts	$14,087	$2,220	$1,370	$3,590	$1,960	$2,110	$22,056
Studio Entertainment	$5,979	$661	$161	$822	$2,145	$78	$14,750
Consumer Products	$3,555	$1,112	$146	$1,258	$731	$45	$7,506
Interactive	$1,064	-$87	$44	-$43	$449	$13	$2,311