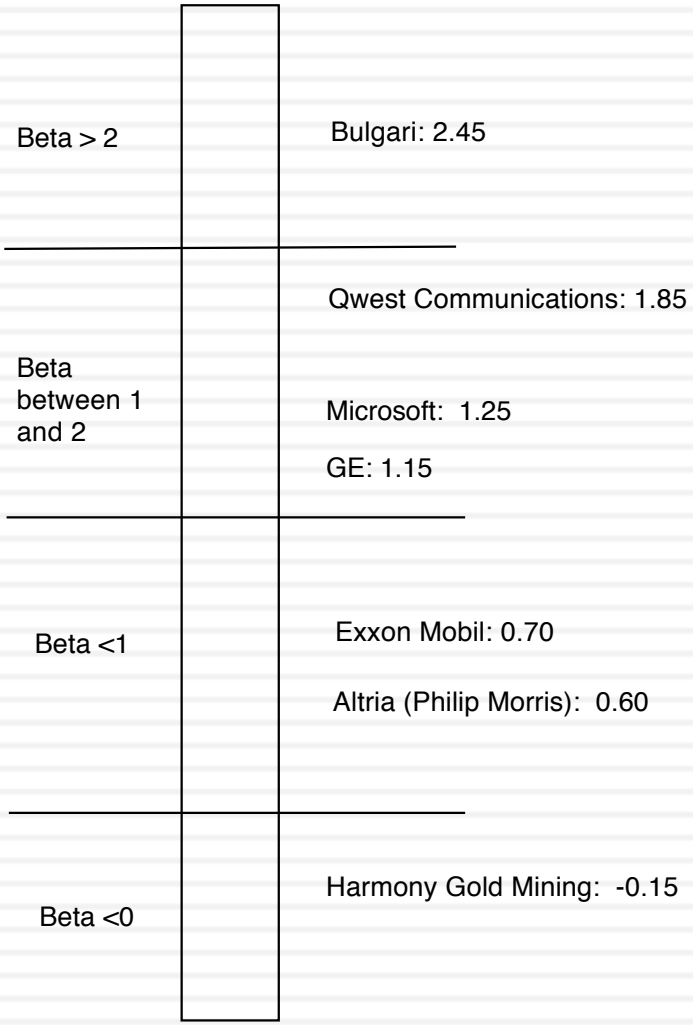
Beta: Exploring Fundamentals



Determinant 1: Product/ Service Type

- Betas measure a company's exposure to macroeconomic risks. Consequently, you would expect the beta to be a function of the sensitivity of the demand for its products and services to macroeconomic factors.
  - To the extent that cyclical companies are more likely to move with the macroeconomy, they are likely to have higher betas.
  - Firms which sell more discretionary products will have higher betas than firms that sell less discretionary product

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.
- When a company has higher fixed costs, small changes in revenues will translate into larger changes in earnings, and by extension, into more variable earnings.
  - Other things remaining equal, sectors with higher operating leverage should have higher betas than sectors with less operating leverage.
  - Within sectors, companies with more flexible cost structures (where costs adjust more quickly to revenues) should have lower betas than companies with more rigid cost structures.

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.
  - The problem with this measure is that companies do not break costs down into fixed and variable.
- 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.
  - There is noise in this number on a year-to-year basis.

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%
Average: 87-13		**11.79%**		**11.91%**
Average: 96-13		**8.16%**		**10.20%**

The average for this statistic across entertainment companies is 1.15.

Operating Leverage
11.91/11.79 =1.01
10.20/8.16 =1.25

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

$$\beta_{Levered} = \beta_{unlevered} (1+ ((1-t)D/E))$$

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%)

    Disney's Unlevered Beta

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

    = 1.25 / (1 + (1 - 0.361)(0.1944))= 1.11

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.
  - Since betas measure exposure to macro risk, if the projects are all in the same line of business, they may all share the same unlevered beta.
  - If the projects vary in their macroeconomic risk exposure, the project betas will also vary.
- Firm Betas and Business betas: At a broader level of aggregation, the beta of a multi-business firm is the weighted average of the betas of the different businesses that they operate in.

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

Unlevered Betas for businesses

$$\text{Unlevered Beta} = \frac{\text{Unlevered Beta}}{(1 - \text{Cash/ Firm Value})}$$

Business	*Comparable firms*	*Sample size*	*Median Beta*	*Median D/E*	*Median Tax rate*	*Company Unlevered Beta*	*Median Cash/ Firm Value*	*Business Unlevered Beta*
Media Networks	US firms in broadcasting business	26	1.43	71.09%	40.00%	1.0024	2.80%	1.0313
Parks & Resorts	Global firms in amusement park business	20	0.87	46.76%	35.67%	0.6677	4.95%	0.7024
Studio Entertainment	US movie firms	10	1.24	27.06%	40.00%	1.0668	2.96%	1.0993
Consumer Products	Global firms in toys/games production & retail	44	0.74	29.53%	25.00%	0.6034	10.64%	0.6752
Interactive	Global computer gaming firms	33	1.03	3.26%	34.55%	1.0085	17.25%	1.2187

A closer look at the process… Studio Entertainment Betas

Company Name	Levered Beta	Market Capitalization	+ Total Debt including Leases	=Firm Value	-Cash	= Enterprise Value	Cash/Firm Value	Pre-tax cost of debt	Marginal tax rate	Gross D/E ratio	Revenue (Sales)	EV/Sales
SFX Entertainment Inc. (NasdaqGS:SFXE)	1.12	$738.8	$98.9	$837.7	$143.6	$694.1	17.14%	8.46%	40.00%	13.39%	62.0	11.20
Mass Hysteria Entertainment Company, Inc. (OTCPK:MHYS)	1.19	$0.2	$1.1	$1.4	$-	$1.4	0.00%	10.00%	40.00%	477.94%	0	12.45
Medient Studios, Inc. (OTCPK:MDNT)	0.93	$3.2	$3.2	$6.4	$0.1	$6.3	0.81%	4.84%	40.00%	99.07%	5.22	1.21
POW! Entertainment, Inc. (OTCPK:POWN)	0.94	$4.0	$0.3	$4.3	$0.4	$3.9	9.85%	4.00%	40.00%	8.65%	2.03	1.92
MGM Holdings Inc. (OTCPK:MGMB)	1.29	$3,631.7	$142.2	$3,773.9	$140.7	$3,633.2	3.73%	10.00%	40.00%	3.91%	1,892.6	1.92
Lions Gate Entertainment Corp. (NYSE:LGF)	1.20	$4,719.6	$1,283.2	$6,002.8	$67.2	$5,935.6	1.12%	6.34%	40.00%	27.19%	2,597.8	2.28
DreamWorks Animation SKG Inc. (NasdaqGS:DWA)	1.32	$2,730.0	$348.3	$3,078.3	$156.4	$2,921.9	5.08%	3.00%	40.00%	12.76%	767.3	3.81
Twenty-First Century Fox, Inc. (NasdaqGS:FOXA)	1.28	$77,743.5	$20,943.0	$98,686.5	$6,681.0	$92,005.5	6.77%	6.15%	40.00%	26.94%	28,733.0	3.20
Independent Film Development Corporation (OTCPK:IFLM)	1.61	$1.3	$1.0	$2.3	$-	$2.2	2.20%	10.00%	40.00%	72.35%	1	3.37
Odyssey Pictures Corp. (OTCPK:OPIX)	2.60	$0.3	$1.6	$1.9	$0.0	$1.9	0.10%	3.00%	40.00%	551.12%	0.669	2.90
Average	**1.35**						**4.68%**	**6.58%**	**40.00%**	**129.33%**		**4.43**
Aggregate	**1.35**		**$22,822.82**	**$112,395.45**	**$7,189.43**	**$105,206.02**	**6.40%**	**6.58%**	**40.00%**	**25.48%**	**34,061.4**	**3.09**
Median	**1.24**						**2.96%**	**6.24%**	**40.00%**	**27.06%**		**3.05**

Backing into a pure play beta: The Median Movie Company

	Value	*Beta*		*Value*	*Beta*
Movie Business	97.04	1.0993	Debt	21.3	0
Cash Business	2.96	0	Equity	78.7	1.24
Movie Company	100	1.0668			

1. Start with the median regression beta (equity beta) of 1.24
2. Unlever the beta, using the median gross D/E ratio of 27.06%
   Gross D/E ratio = 21.30/78.70 = 27.06%
   Unlevered beta = 1.24/ (1+ (1-.4) (.2706)) = 1.0668
3. Take out the cash effect, using the median cash/value of 2.96%
   (.0296) (0) + (1-.0296) (Beta of movie business) = 1.0668
   Beta of movie business = 1.0668/(1-.0296) = 1.0993

Alternatively, you could have used the net debt to equity ratio

Net D/E ratio = (21.30-2.96)/78.70 = 23.30%
Unlevered beta for movies = 1.24/ (1+(1-.4)(.233)) = 1.0879

Disney's Unlevered Beta: Operations & Entire Company

Disney Operations: Unlevered Beta

Business	*Revenues*	*EV/Sales*	*Value of Business*	*Proportion of Disney*	*Unlevered beta*	*Value*	*Proportion*
Media Networks	$20,356	3.27	$66,580	49.27%	1.03	$66,579.81	49.27%
Parks & Resorts	$14,087	3.24	$45,683	33.81%	0.70	$45,682.80	33.81%
Studio Entertainment	$5,979	3.05	$18,234	13.49%	1.10	$18,234.27	13.49%
Consumer Products	$3,555	0.83	$2,952	2.18%	0.68	$2,951.50	2.18%
Interactive	$1,064	1.58	$1,684	1.25%	1.22	$1,683.72	1.25%
Disney Operations	$45,041		$135,132	100.00%	0.9239	$135,132.11	

Disney – The Company: Unlevered Beta

Disney has $3.93 billion in cash, invested in close to riskless assets (with a beta of zero). You can compute an unlevered beta for Disney as a company (inclusive of cash):

$$\beta_{\text{Disney}} = \beta_{\text{Operating Assets}} \frac{\text{Value}_{\text{Operating Assets}}}{(\text{Value}_{\text{Operating Assets}} + \text{Value}_{\text{Cash}})} + \beta_{\text{Cash}} \frac{\text{Value}_{\text{Cash}}}{(\text{Value}_{\text{Operating Assets}} + \text{Value}_{\text{Cash}})}$$

$$= 0.9239\left(\frac{135,132}{(135,132+3,931)}\right) + 0.00\left(\frac{3,931}{(135,132+3,931)}\right) = 0.8978$$

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?