Beta: Exploring Fundamentals

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Beta > 2	Bulgari: 2.45
Beta between 1 and 2	Qwest Communications: 1.85 Microsoft: 1.25 GE: 1.15
Beta <1	Exxon Mobil: 0.70 Altria (Philip Morris): 0.60
Beta <0	Harmony Gold Mining: -0.15

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 nondiscretionary 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

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- 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

Average: 96-13	Damodaro	8.16%		10.20%	10.20/8.16 =1.25
Average: 87-13		11.79%		11.91%	11.91/11.79 =1.01
2013	\$45,041	6.54%	\$9,450	6.62%	Operating Leverage
2012	\$42,278	3.39%	\$8,863	13.91%	
2011	\$40,893	7.44%	\$7,781	15.69%	
2010	\$38,063	5.29%	\$6,726	18.06%	
2009	\$36,149	-4.48%	\$5,697	-23.06%	
2008	\$37,843	6.57%	\$7,404	8.42%	
2007	\$35,510	5.22%	\$6,829	27.53%	c.no effect
2006	\$33,747	5.64%	\$5,355	30.39%	o No offect
2005	\$31,944	3.88%	\$4,107	1.46%	b.Lower
2004	\$30,752	13.64%	\$4,048	49.21%	
2003	\$27,061	6.84%	\$2,713	13.80%	a Higher
2002	\$25,329	0.62%	\$2,384	-15.82%	companies
2001	\$25,172	-0.97%	\$2,832	12.16%	
2000	\$25,418	8.46%	\$2,525	-29.47%	or a lower l
1999	\$23,435	2.00%	\$3,580	-6.84%	(11.23), w
1998	\$22.976	2.24%	\$3.843	-2.59%	(125) w
1997	\$22,473	19.93%	\$3.945	30.46%	Given Disn
1996	\$18,739	54 71%	\$3,024	33 69%	Q. D.
1995	\$12,112	20.46%	\$2.262	25 39%	-
1995	\$10.055	17.89%	\$1,500	15 64%	Average ac
1992	\$8 529	13.66%	\$1,207	21.21%	Average ac
1991	\$7.504	21 38%	\$1,124 \$1.287	-17.04%	-
1990	\$3,644	5 7907	\$1,506	10.25%	-
1989	\$4,594	33.62%	\$1,177	38.80%	-
1988	\$3,438	19.30%	\$848 \$1.177	12.17%	-
1987	\$2,877	10.5007	\$/56	12 170/	-
1007	¢2.077	Sales	675	EBIT	-
I Cal	Thet Sales	70 Change III	EDIT	70 Change III	

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

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- 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

- **D** 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

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Disney: The AcquirerEquity Beta1.15Debt = \$3,186 millionMarket value of equity = \$31,100 millionDebt + Equity = Firm value = \$31,100+ \$3186 = \$34,286 millionD/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

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- 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	Rovenues	Operating Income	D&A	FRITDA	S, G & A	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

Unlevered Beta

(1 - Cash/ Firm Value)

						Company	Median Cash/	Business
		Sample	Median	Median	Median	Unlevered	Firm	Unleverea
Business	Comparable firms	size	Beta	D/E	Tax rate	Beta	Value	Beta
	US firms in broadcasting							
Media Networks	business	26	1.43	71.09%	40.00%	1.0024	2.80%	1.0313
	Global firms in amusement park							
Parks & Resorts	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

		Market	+ Total Debt including			= Enterprise	Cash/Firm	Pre-tax cost	Marginal tax	Gross D/E	Revenue	T: / (0)	
Company Name	Levered Beta		Leases	=Firm Value	-Cash	Value	Value	of debt	rate	ratio	(Sales)	EV/Sales	
	1.12	\$758.8	\$96.9	3057.7	Ş145.0	\$094.1	17.14%	8.46%	40.00%	13.39%	02.0	11.20	
Mass Hysteria Entertainment Company, Inc. (OTCPK:MHYS)	1.19	Ş0.2	Ş1.1	Ş1.4	\$-	Ş1.4	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: Studio Entertainment

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	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

			Value of	Proportion of	Unlevered		
Business	Revenues	EV/Sales	Business	Disney	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 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	ldentifiable assets (2013)	Proportion of debt	Value of business	Allocated debt	Estimated equity	D/E ratio
Media Networks	\$28,627	38.04%	\$66 <i>,</i> 580	\$6,072	\$60,508	10.03%
Parks & Resorts	\$22,056	29.31%	\$45 <i>,</i> 683	\$4 <i>,</i> 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 <i>,</i> 580	10.03%	1.0975	9.07%
Parks & Resorts	0.7024	\$45 <i>,</i> 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

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- 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?