

Estimating FCFE (past) : Tata Motors

234

Year	Net Income	Cap Ex	Depreciation	Change in WC	Change in Debt	Equity Reinvestment	Equity Reinvestment Rate
2008-09	-25,053₹	99,708₹	25,072₹	13,441₹	25,789₹	62,288₹	-248.63%
2009-10	29,151₹	84,754₹	39,602₹	-26,009₹	5,605₹	13,538₹	46.44%
2010-11	92,736₹	81,240₹	46,510₹	50,484₹	24,951₹	60,263₹	64.98%
2011-12	135,165₹	138,756₹	56,209₹	22,801₹	30,846₹	74,502₹	55.12%
2012-13	98,926₹	187,570₹	75,648₹	680₹	32,970₹	79,632₹	80.50%
Aggregate	330,925₹	592,028₹	243,041₹	61,397₹	120,160₹	290,224₹	87.70%

Estimating FCFF: Disney

- In the fiscal year ended September 2013, Disney reported the following:
 - ▣ Operating income (adjusted for leases) = \$10,032 million
 - ▣ Effective tax rate = 31.02%
 - ▣ Capital Expenditures (including acquisitions) = \$5,239 million
 - ▣ Depreciation & Amortization = \$2,192 million
 - ▣ Change in non-cash working capital = \$103 million
- The free cash flow to the firm can be computed as follows:

After-tax Operating Income	=	10,032 (1 -.3102)	=	\$6,920
- Net Cap Expenditures	=	\$5,239 - \$2,192	=	\$3,629
- Change in Working Capital	=		=	\$103
= Free Cashflow to Firm (FCFF)	=		=	\$3,188
- The reinvestment and reinvestment rate are as follows:
 - ▣ Reinvestment = \$3,629 + \$103 = \$3,732 million
 - ▣ Reinvestment Rate = \$3,732/ \$6,920 = 53.93%

II. Discount Rates

236

- Critical ingredient in discounted cashflow valuation. Errors in estimating the discount rate or mismatching cashflows and discount rates can lead to serious errors in valuation.
- At an intuitive level, the discount rate used should be consistent with both the riskiness and the type of cashflow being discounted.
- The cost of equity is the rate at which we discount cash flows to equity (dividends or free cash flows to equity). The cost of capital is the rate at which we discount free cash flows to the firm.

Cost of Equity: Deutsche Bank

2008 versus 2016

237

- In early 2008, we estimated a beta of 1.162 for Deutsche Bank, which used in conjunction with the Euro risk-free rate of 4% (in January 2008) and an equity risk premium of 4.50%, yielded a cost of equity of 9.23%.

$$\begin{aligned}\text{Cost of Equity}_{\text{Jan 2008}} &= \text{Riskfree Rate}_{\text{Jan 2008}} + \text{Beta} * \text{Mature Market Risk Premium} \\ &= 4.00\% + 1.162 (4.5\%) = 9.23\%\end{aligned}$$

- In October 2016, the Euro riskfree rate had dropped to 0.10% and the Deutsche's cost of equity had risen to 10.2%, putting it in the 75th percentile of banks in terms of cost of equity.

Cost of Equity: Tata Motors

238

- We will be valuing Tata Motors in rupee terms. That is a choice. A company can be valued in any currency.
- Earlier, we estimated a levered beta for equity of 1.1007 for Tata Motor's operating assets. Since we will be discounting FCFE with the income from cash included in the cash, we recomputed a beta for Tata Motors as a company (with cash):

$$\text{Levered Beta}_{\text{Company}} = 1.1007 (1428/1630) + 0 (202/1630) = 0.964$$

- With a nominal rupee risk-free rate of 6.57 percent and an equity risk premium of 7.19% for Tata Motors, we arrive at a cost of equity of 13.50%.

$$\text{Cost of Equity} = 6.57\% + 0.964 (7.19\%) = 13.50\%$$

Current Cost of Capital: Disney

- The beta for Disney's stock in November 2013 was 1.0013. The T. bond rate at that time was 2.75%. Using an estimated equity risk premium of 5.76%, we estimated the cost of equity for Disney to be 8.52%:

$$\text{Cost of Equity} = 2.75\% + 1.0013(5.76\%) = 8.52\%$$

- Disney's bond rating in May 2009 was A, and based on this rating, the estimated pretax cost of debt for Disney is 3.75%. Using a marginal tax rate of 36.1, the after-tax cost of debt for Disney is 2.40%.

$$\text{After-Tax Cost of Debt} = 3.75\% (1 - 0.361) = 2.40\%$$

- The cost of capital was calculated using these costs and the weights based on market values of equity (121,878) and debt (15,961):

Cost of capital =

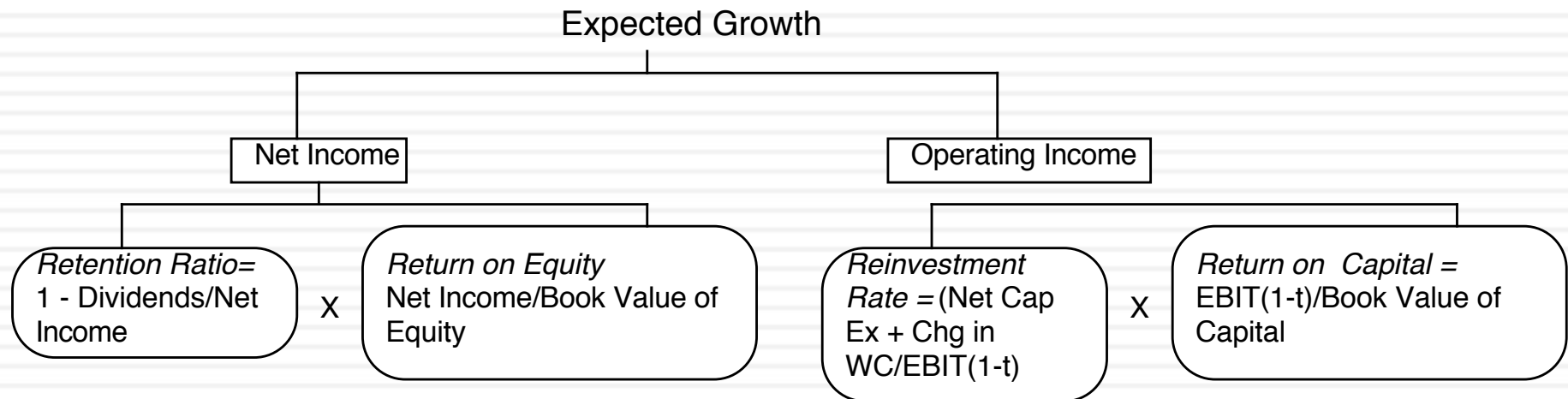
$$8.52\% \frac{121,878}{(15,961+121,878)} + 2.40\% \frac{15,961}{(15,961+121,878)} = 7.81\%$$

But costs of equity and capital can and should change over time...

Year	Beta	Cost of Equity	After-tax Cost of Debt	Debt Ratio	Cost of capital
1	1.0013	8.52%	2.40%	11.50%	7.81%
2	1.0013	8.52%	2.40%	11.50%	7.81%
3	1.0013	8.52%	2.40%	11.50%	7.81%
4	1.0013	8.52%	2.40%	11.50%	7.81%
5	1.0013	8.52%	2.40%	11.50%	7.81%
6	1.0010	8.52%	2.40%	13.20%	7.71%
7	1.0008	8.51%	2.40%	14.90%	7.60%
8	1.0005	8.51%	2.40%	16.60%	7.50%
9	1.0003	8.51%	2.40%	18.30%	7.39%
10	1.0000	8.51%	2.40%	20.00%	7.29%

III. Expected Growth

241



Estimating growth in EPS: Deutsche Bank in January 2008

242

- In 2007, Deutsche Bank reported net income of 6.51 billion Euros on a book value of equity of 33.475 billion Euros at the start of the year (end of 2006), and paid out 2.146 billion Euros as dividends.

$$\text{Return on Equity} = \frac{\text{Net Income}_{2007}}{\text{Book Value of Equity}_{2006}} = \frac{6,510}{33,475} = 19.45\%$$

$$\text{Retention Ratio} = 1 - \frac{\text{Dividends}}{\text{Net Income}} = 1 - \frac{2,146}{6,510} = 67.03\%$$

- If Deutsche Bank maintains the return on equity (ROE) and retention ratio that it delivered in 2007 for the long run:

$$\text{Expected Growth Rate}_{\text{Existing Fundamentals}} = 0.6703 * 0.1945 = 13.04\%$$

- If we replace the net income in 2007 with average net income of \$3,954 million, from 2003 to 2007:

$$\text{Normalized Return on Equity} = \frac{\text{Average Net Income}_{2003-07}}{\text{Book Value of Equity}_{2006}} = \frac{3,954}{33,475} = 11.81\%$$

$$\text{Normalized Retention Ratio} = 1 - \frac{\text{Dividends}}{\text{Net Income}} = 1 - \frac{2,146}{3,954} = 45.72\%$$

$$\text{Expected Growth Rate}_{\text{Normalized Fundamentals}} = 0.4572 * 0.1181 = 5.40\%$$

Estimating growth in Net Income: Tata Motors

243

Year	Net Income	Cap Ex	Depreciation	Change in WC	Change in Debt	Equity Reinvestment	Equity Reinvestment Rate
2008-09	-25,053₹	99,708₹	25,072₹	13,441₹	25,789₹	62,288₹	-248.63%
2009-10	29,151₹	84,754₹	39,602₹	-26,009₹	5,605₹	13,538₹	46.44%
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Aggregate	330,925₹	592,028₹	243,041₹	61,397₹	120,160₹	290,224₹	87.70%

Year	Net Income	BV of Equity at start of the year	ROE
2008-09	-25,053₹	91,658₹	-27.33%
2009-10	29,151₹	63,437₹	45.95%
2010-11	92,736₹	84,200₹	110.14%
2011-12	135,165₹	194,181₹	69.61%
2012-13	98,926₹	330,056₹	29.97%
Aggregate	330,925₹	763,532₹	43.34%

	2013 value	Average values: 2008-2013
Reinvestment rate	80.50%	87.70%
ROE	29.97%	43.34%
Expected growth	24.13%	38.01%

ROE and Leverage

244

- A high ROE, other things remaining equal, should yield a higher expected growth rate in equity earnings.
- The ROE for a firm is a function of both the quality of its investments and how much debt it uses in funding these investments. In particular

$$\text{ROE} = \text{ROC} + \text{D/E} (\text{ROC} - i (1-t))$$

where,

$$\text{ROC} = (\text{EBIT} (1 - \text{tax rate})) / (\text{Book Value of Capital})$$

$$\text{BV of Capital} = \text{BV of Debt} + \text{BV of Equity} - \text{Cash}$$

$$\text{D/E} = \text{Debt/ Equity ratio}$$

$$i = \text{Interest rate on debt}$$

$$t = \text{Tax rate on ordinary income.}$$

Decomposing ROE

245

- Assume that you are analyzing a company with a 15% return on capital, an after-tax cost of debt of 5% and a book debt to equity ratio of 100%. Estimate the ROE for this company.

- Now assume that another company in the same sector has the same ROE as the company that you have just analyzed but no debt. Will these two firms have the same growth rates in earnings per share if they have the same dividend payout ratio?

- Will they have the same equity value?

Estimating Growth in EBIT: Disney

- We started with the reinvestment rate that we computed from the 2013 financial statements:

$$\text{Reinvestment rate} = \frac{(3,629 + 103)}{10,032 (1-.3102)} = 53.93\%$$

We computed the reinvestment rate in prior years to ensure that the 2013 values were not unusual or outliers.

- We compute the return on capital, using operating income in 2013 and capital invested at the start of the year:

$$\text{Return on Capital}_{2013} = \frac{\text{EBIT} (1-t)}{(\text{BV of Equity} + \text{BV of Debt} - \text{Cash})} = \frac{10,032 (1-.361)}{(41,958 + 16,328 - 3,387)} = 12.61\%$$

Disney's return on capital has improved gradually over the last decade and has levelled off in the last two years.

- If Disney maintains its 2013 reinvestment rate and return on capital for the next five years, its growth rate will be 6.80 percent.

$$\text{Expected Growth Rate from Existing Fundamentals} = 53.93\% * 12.61\% = 6.8\%$$

When everything is in flux: Changing growth and margins

247

- The elegant connection between reinvestment and growth in operating income breaks down, when you have a company in transition, where margins are changing over time.
- If that is the case, you have to estimate cash flows in three steps:
 - ▣ Forecast revenue growth and revenues in future years, taking into account market potential and competition.
 - ▣ Forecast a “target” margin in the future and a pathway from current margins to the target.
 - ▣ Estimate reinvestment from revenues, using a sales to capital ratio (measuring the dollars of revenues you get from each dollar of investment).

Here is an example: Baidu's Expected FCFF

248

Year	Revenue growth	Revenues	Operating Margin	EBIT	Tax rate	EBIT (1-t)	Chg in Revenues	Sales/Capital	Reinvestment	FCFF
Base year		\$28,756	48.72%	\$14,009	16.31%	\$11,724		2.64		
1	25.00%	\$35,945	47.35%	\$17,019	16.31%	\$14,243	\$7,189	2.64	\$2,722	\$11,521
2	25.00%	\$44,931	45.97%	\$20,657	16.31%	\$17,288	\$8,986	2.64	\$3,403	\$13,885
3	25.00%	\$56,164	44.60%	\$25,051	16.31%	\$20,965	\$11,233	2.64	\$4,253	\$16,712
4	25.00%	\$70,205	43.23%	\$30,350	16.31%	\$25,400	\$14,041	2.64	\$5,316	\$20,084
5	25.00%	\$87,756	41.86%	\$36,734	16.31%	\$30,743	\$17,551	2.64	\$6,646	\$24,097
6	20.70%	\$105,922	40.49%	\$42,885	18.05%	\$35,145	\$18,166	2.64	\$6,878	\$28,267
7	16.40%	\$123,293	39.12%	\$48,227	19.79%	\$38,685	\$17,371	2.64	\$6,577	\$32,107
8	12.10%	\$138,212	37.74%	\$52,166	21.52%	\$40,938	\$14,918	2.64	\$5,649	\$35,289
9	7.80%	\$148,992	36.37%	\$54,191	23.26%	\$41,585	\$10,781	2.64	\$4,082	\$37,503
10	3.50%	\$154,207	35.00%	\$53,972	25.00%	\$40,479	\$5,215	2.64	\$1,974	\$38,505

IV. Getting Closure in Valuation

249

- Since we cannot estimate cash flows forever, we estimate cash flows for a “growth period” and then estimate a terminal value, to capture the value at the end of the period:

$$\text{Value} = \sum_{t=1}^{t=N} \frac{CF_t}{(1+r)^t} + \frac{\text{Terminal Value}}{(1+r)^N}$$

- When a firm’s cash flows grow at a “constant” rate forever, the present value of those cash flows can be written as:

Value = Expected Cash Flow Next Period / (r - g)

where,

r = Discount rate (Cost of Equity or Cost of Capital)

g = Expected growth rate forever.

- This “constant” growth rate is called a stable growth rate and cannot be higher than the growth rate of the economy in which the firm operates.

Getting to stable growth...

250

- A key assumption in all discounted cash flow models is the period of high growth, and the pattern of growth during that period. In general, we can make one of three assumptions:
 - ▣ there is no high growth, in which case the firm is already in stable growth
 - ▣ there will be high growth for a period, at the end of which the growth rate will drop to the stable growth rate (2-stage)
 - ▣ there will be high growth for a period, at the end of which the growth rate will decline gradually to a stable growth rate (3-stage)
- The assumption of how long high growth will continue will depend upon several factors including:
 - ▣ the size of the firm (larger firm -> shorter high growth periods)
 - ▣ current growth rate (if high -> longer high growth period)
 - ▣ barriers to entry and differential advantages (if high -> longer growth period)

Choosing a Growth Period: Examples

251

	<i>Disney</i>	<i>Vale</i>	<i>Tata Motors</i>	<i>Baidu</i>
Firm size/market size	Firm is one of the largest players in the entertainment and theme park business, but the businesses are being redefined and are expanding.	The company is one of the largest mining companies in the world, and the overall market is constrained by limits on resource availability.	Firm has a large market share of Indian (domestic) market, but it is small by global standards. Growth is coming from Jaguar division in emerging markets.	Company is in a growing sector (online search) in a growing market (China).
Current excess returns	Firm is earning more than its cost of capital.	Returns on capital are largely a function of commodity prices. Have generally exceeded the cost of capital.	Firm has a return on capital that is higher than the cost of capital.	Firm earns significant excess returns.
Competitive advantages	Has some of the most recognized brand names in the world. Its movie business now houses Marvel superheros, Pixar animated characters & Star Wars.	Cost advantages because of access to low-cost iron ore reserves in Brazil.	Has wide distribution/service network in India but competitive advantages are fading there. Competitive advantages in India are fading but Landrover/Jaguar has strong brand name value, giving Tata pricing power and growth potential.	Early entry into & knowledge of the Chinese market, coupled with government-imposed barriers to entry on outsiders.
Length of high-growth period	Ten years, entirely because of its strong competitive advantages/	None, though with normalized earnings and moderate excess returns.	Five years, with much of the growth coming from outside India.	Ten years, with strong excess returns.

Valuing Vale in November 2013 (in US dollars)

Let's start with some history & estimate what a normalized year will look like

Year	Operating Income (\$)	Effective tax rate	BV of Debt	BV of Equity	Cash	Invested capital	Return on capital
2009	\$6,057	27.79%	\$18,168	\$42,556	\$12,639	\$48,085	9.10%
2010	\$23,033	18.67%	\$23,613	\$59,766	\$11,040	\$72,339	25.90%
2011	\$30,206	18.54%	\$27,668	\$70,076	\$9,913	\$87,831	28.01%
2012	\$13,346	18.96%	\$23,116	\$78,721	\$3,538	\$98,299	11.00%
2013 (TTM)	\$15,487	20.65%	\$30,196	\$75,974	\$5,818	\$100,352	12.25%
Normalized	\$17,626	20.92%					17.25%

Estimate the costs of equity & capital for Vale

Business	Sample size	Unlevered beta of business	Revenues	Peer Group EV/Sales	Value of Business	Proportion of Vale
Metals & Min	48	0.86	\$9,013	1.97	\$17,739	16.65%
Iron Ore	78	0.83	\$32,717	2.48	\$81,188	76.20%
Fertilizers	693	0.99	\$3,777	1.52	\$5,741	5.39%
Logistics	223	0.75	\$1,644	1.14	\$1,874	1.76%
Vale Operations		0.8440	\$47,151		\$106,543	100.00%

Market D/E = 54.99%

Marginal tax rate = 34.00% (Brazil)

Levered Beta = $0.844 (1 + (1 - 0.34)(.5499)) = 1.15$

Cost of equity = $2.75\% + 1.15 (7.38\%) = 10.87\%$

	% of revenues	ERP
US & Canada	4.90%	5.50%
Brazil	16.90%	8.50%
Rest of Latin America	1.70%	10.09%
China	37.00%	6.94%
Japan	10.30%	6.70%
Rest of Asia	8.50%	8.61%
Europe	17.20%	6.72%
Rest of World	3.50%	10.06%
Vale ERP	100.00%	7.38%

Vale's rating: A-

Default spread based on rating = 1.30%

Cost of debt (pre-tax) = $2.75\% + 1.30\% = 4.05\%$

Cost of capital = $11.23\% (.6452) + 4.05\% (1 - .34) (.3548) = 8.20\%$

Assume that the company is in stable growth, growing 2% a year in perpetuity

$$\text{Reinvestment Rate} = \frac{g}{ROC} = \frac{2\%}{17.25\%} = 11.59\%$$

$$\text{Value of Operating Assets} = \frac{17,626 (1 - .2092)(1 - .1159)}{(.082 - .02)} = \$202,832$$

Value of operating assets	= \$202,832
+ Cash & Marketable Securities	= \$ 7,133
- Debt	= \$ 42,879
Value of equity	= \$167,086
Value per share	= \$ 32.44
Stock price (11/2013)	= \$ 13.57

Estimating Stable Period Inputs after a high growth period: Disney

- Respect the cap: The growth rate forever is assumed to be 2.5%. This is set lower than the riskfree rate (2.75%).
- Stable period excess returns: The return on capital for Disney will drop from its high growth period level of 12.61% to a stable growth return of 10%. This is still higher than the cost of capital of 7.29% but the competitive advantages that Disney has are unlikely to dissipate completely by the end of the 10th year.
- Reinvest to grow: Based on the expected growth rate in perpetuity (2.5%) and expected return on capital forever after year 10 of 10%, we compute a stable period reinvestment rate of 25%:
 - $\text{Reinvestment Rate} = \text{Growth Rate} / \text{Return on Capital} = 2.5\% / 10\% = 25\%$
- Adjust risk and cost of capital: The beta for the stock will drop to one, reflecting Disney's status as a mature company.
 - $\text{Cost of Equity} = \text{Riskfree Rate} + \text{Beta} * \text{Risk Premium} = 2.75\% + 5.76\% = 8.51\%$
 - The debt ratio for Disney will rise to 20%. Since we assume that the cost of debt remains unchanged at 3.75%, this will result in a cost of capital of 7.29%
 - $\text{Cost of capital} = 8.51\% (.80) + 3.75\% (1-.361) (.20) = 7.29\%$

V. From firm value to equity value per share

254

Approach used	To get to equity value per share
Discount dividends per share at the cost of equity	Present value is value of equity per share
Discount aggregate FCFE at the cost of equity	Present value is value of aggregate equity. Subtract the value of equity options given to managers and divide by number of shares.
Discount aggregate FCFF at the cost of capital	$\begin{aligned} \text{PV} &= \text{Value of operating assets} \\ &+ \text{Cash \& Near Cash investments} \\ &+ \text{Value of minority cross holdings} \\ &- \text{Debt outstanding} \\ &= \text{Value of equity} \\ &- \text{Value of equity options} \\ &= \text{Value of equity in common stock} \\ &/ \text{Number of shares} \end{aligned}$