

# Estimating growth in EPS: Deutsche Bank in January 2008

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- 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

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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%
<b>Aggregate</b>	<b>330,925₹</b>	<b>592,028₹</b>	<b>243,041₹</b>	<b>61,397₹</b>	<b>120,160₹</b>	<b>290,224₹</b>	<b>87.70%</b>

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%
<b>Aggregate</b>	<b>330,925₹</b>	<b>763,532₹</b>	<b>43.34%</b>

	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

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- 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,

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

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

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

$i$  = Interest rate on debt

$t$  = Tax rate on ordinary income.

# Decomposing ROE

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- 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

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- 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

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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

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- 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:

$$\text{Value} = \text{Expected Cash Flow Next Period} / (r - g)$$

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...

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- 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

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	<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%
<b>Normalized</b>	<b>\$17,626</b>	<b>20.92%</b>					<b>17.25%</b>

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%
<b>Vale Operations</b>		<b>0.8440</b>	<b>\$47,151</b>		<b>\$106,543</b>	<b>100.00%</b>

Market D/E = 54.99%

Marginal tax rate = 34.00% (Brazil)

Levered Beta = 0.844 (1+(1-.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%
<b>Vale ERP</b>	<b>100.00%</b>	<b>7.38%</b>

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

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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}  &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}  $

# Valuing Deutsche Bank in early 2008

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- To value Deutsche Bank, we started with the normalized income over the previous five years (3,954 million Euros) and the dividends in 2008 (2,146 million Euros). We assumed that the payout ratio and ROE, based on these numbers will continue for the next 5 years:
  - ▣ Payout ratio =  $2,146/3954 = 54.28\%$
  - ▣ Expected growth rate =  $(1-.5428) * .1181 = 0.054$  or 5.4%
  - ▣ Cost of equity = 9.23%

<i>Year</i>	<i>Net Income</i>	<i>Payout Ratio</i>	<i>Dividends</i>	<i>PV @ 9.23%</i>
2008	4,167 €	54.28%	2,262 €	2,071 €
2009	4,392 €	54.28%	2,384 €	1,998 €
2010	4,629 €	54.28%	2,513 €	1,928 €
2011	4,879 €	54.28%	2,648 €	1,861 €
2012	5,143 €	54.28%	2,791 €	1,795 €
				9,653 €

# Deutsche Bank in stable growth

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- At the end of year 5, the firm is in stable growth. We assume that the cost of equity drops to 8.5% (as the beta moves to 1) and that the return on equity also drops to 8.5 (to equal the cost of equity).

$$\text{Stable Period Payout Ratio} = 1 - g/\text{ROE} = 1 - 0.03/0.085 = 0.6471 \text{ or } 64.71\%$$

$$\begin{aligned} \text{Expected Dividends in Year 6} &= \text{Expected Net Income}_5 * (1+g_{\text{Stable}}) * \text{Stable Payout Ratio} \\ &= \text{€}5,143 (1.03) * 0.6471 = \text{€}3,427 \text{ million} \end{aligned}$$

$$\text{Terminal Value} = \frac{\text{Expected Dividends}_6}{(\text{Cost of Equity}-g)} = \frac{3,247}{(.085-.03)} = 62,318 \text{ million Euros}$$

$$\text{PV of Terminal Value} = \frac{\text{Terminal Value}_n}{(1+\text{Cost of Equity}_{\text{High growth}})^n} = \frac{62,318}{(1.0923)^5} = 40,079 \text{ mil Euros}$$

- Value of equity = €9,653+ €40,079 = €49,732 million Euros
- Value of equity per share =  $\frac{\text{Value of Equity}}{\# \text{ Shares}} = \frac{49,732}{474.2} = 104.88 \text{ Euros/share}$

Stock was trading at 89 Euros per share at the time of the analysis.

# Valuing Deutsche Bank in 2013

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	Current	1	2	3	4	5	Steady state
Risk Adjusted Assets (grows 3% a year for next 5 years)	439,851 €	453,047 €	466,638 €	480,637 €	495,056 €	509,908 €	517,556 €
Tier 1 Capital ratio (increases from 15.13% to 18.00% over next 5 years)	15.13%	15.71%	16.28%	16.85%	17.43%	18.00%	18.00%
Tier 1 Capital (Risk Adjusted Assets * Tier 1 Capital Ratio)	66,561 €	71,156 €	75,967 €	81,002 €	86,271 €	91,783 €	93,160 €
Change in regulatory capital (Tier 1)		4,595 €	4,811 €	5,035 €	5,269 €	5,512 €	1,377 €
Book Equity	76,829 €	81,424 €	86,235 €	91,270 €	96,539 €	102,051 €	103,605 €
ROE (expected to improve from -1.08% to 8.00% in year 5)	-1.08%	0.74%	2.55%	4.37%	6.18%	8.00%	8.00%
Net Income (Book Equity * ROE)	-716 €	602 €	2,203 €	3,988 €	5,971 €	8,164 €	8,287 €
- Investment in Regulatory Capital		4,595 €	4,811 €	5,035 €	5,269 €	5,512 €	1,554 €
FCFE		-3,993 €	-2,608 €	-1,047 €	702 €	2,652 €	6,733 €
Terminal value of equity						103,582.19 €	
Present value		-3,669.80 €	-2,202.88 €	-812.94 €	500.72 €	69,671.28 €	
Cost of equity	8.80%	8.80%	8.80%	8.80%	8.80%	8.80%	8.00%
Value of equity today =	63,486.39 €						
Number of shares outstanding =	1019.50						
<b>Value per share =</b>	<b>62.27 €</b>						
<b>Stock price in November 2013 =</b>	<b>35.46 €</b>						



# Valuing Tata Motors with a FCFE model in November 2013: The high growth period

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- We use the expected growth rate of 24.13%, estimated based upon the 2013 values for ROE (29.97%) and equity reinvestment rate (80.5%):
  - Expected growth rate =  $29.97\% * 80.5\% = 24.13\%$
- The cost of equity for Tata Motors is 13.50%:
 

$\text{Cost of equity} = 6.57\% + 0.964 (7.19\%) = 13.50\%$
- The expected FCFE for the high growth period

	Current	1	2	3	4	5
Expected growth rate		24.13%	24.13%	24.13%	24.13%	24.13%
Net Income	98,926₹	122,794₹	152,420₹	189,194₹	234,841₹	291,500₹
Equity Reinvestment Rate	80.50%	80.50%	80.50%	80.50%	80.50%	80.50%
Equity Reinvestment	79,632₹	98,845₹	122,693₹	152,295₹	189,039₹	234,648₹
FCFE	19,294₹	23,949₹	29,727₹	36,899₹	45,802₹	56,852₹
PV of FCFE@13.5%		21,100₹	23,075₹	25,235₹	27,597₹	30,180₹

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Sum of PV of FCFE = 127,187₹

# Stable growth and value....

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- After year five, we will assume that the beta will increase to 1 and that the equity risk premium will decline to 6.98% percent (as the company becomes more global). The resulting cost of equity is 13.55 percent.  
Cost of Equity in Stable Growth =  $6.57\% + 1(6.98\%) = 13.55\%$
- We will assume that the growth in net income will drop to 6% and that the return on equity will drop to 13.55% (which is also the cost of equity).  
Equity Reinvestment Rate  $_{\text{Stable Growth}} = 6\%/13.55\% = 44.28\%$   
FCFE in Year 6 =  $\text{₹}291,500(1.06)(1 - 0.4428) = \text{₹} 136,822\text{million}$   
Terminal Value of Equity =  $\text{₹}136,822/(0.1355 - 0.06) = \text{₹} 2,280,372 \text{ million}$
- To value equity in the firm today  
Value of equity = PV of FCFE during high growth + PV of terminal value  
=  $\text{₹}127,187 + 2,280,372/1.1355^5 = \text{₹}742,008 \text{ million}$ 
  - ▣ Dividing by 2694.08 million shares yields a value of equity per share of  $\text{₹}275.42$ , about 40% lower than the stock price of  $\text{₹}427.85$  per share.

## Baidu: My valuation (November 2013)

Last 12 months    Last year

Revenues	¥28,756	¥22,306
Operating income or EBIT	¥14,009	¥11,051
Operating Margin	48.72%	49.54%
Revenue Growth	28.92%	
Sales/Capital Ratio	2.64	

Revenue growth of 25% a year for 5 years, tapering down to 3.5% in year 10

Pre-tax operating margin decreases to 35% over time

Sales to capital ratio maintained at 2.64 (current level)

**Stable Growth**  
 $g = 3.5\%$   
 Cost of capital = 10%  
 ROC = 15%;  
 Reinvestment Rate =  $3.5\%/15\% = 23.33\%$   
 Terminal Value<sub>10</sub> =  $32,120 / (.10 - 0.035) = ¥494,159$

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

Term yr	
EBIT (1-t)	41,896
- Reinv	9,776
FCFF	32,120

Operating assets ¥291,618  
 + Cash 43,300  
 - Debt 20,895  
 Value of equity 314,023  
 / No of shares 2088.87  
 Value/share ¥150.33

Cost of capital = 12.91% (.9477) + 3.45% (.0523) = 12.42%

Cost of capital decreases to 10% from years 6-10

**Cost of Equity**  
12.91%

**Cost of Debt**  
 $(3.5\% + 0.8\% + 0.3\%)(1 - .25) = 3.45\%$

**Weights**  
 $E = 94.77\%$   $D = 5.23\%$

In November 2013, the stock was trading at ¥160.06 per share.

