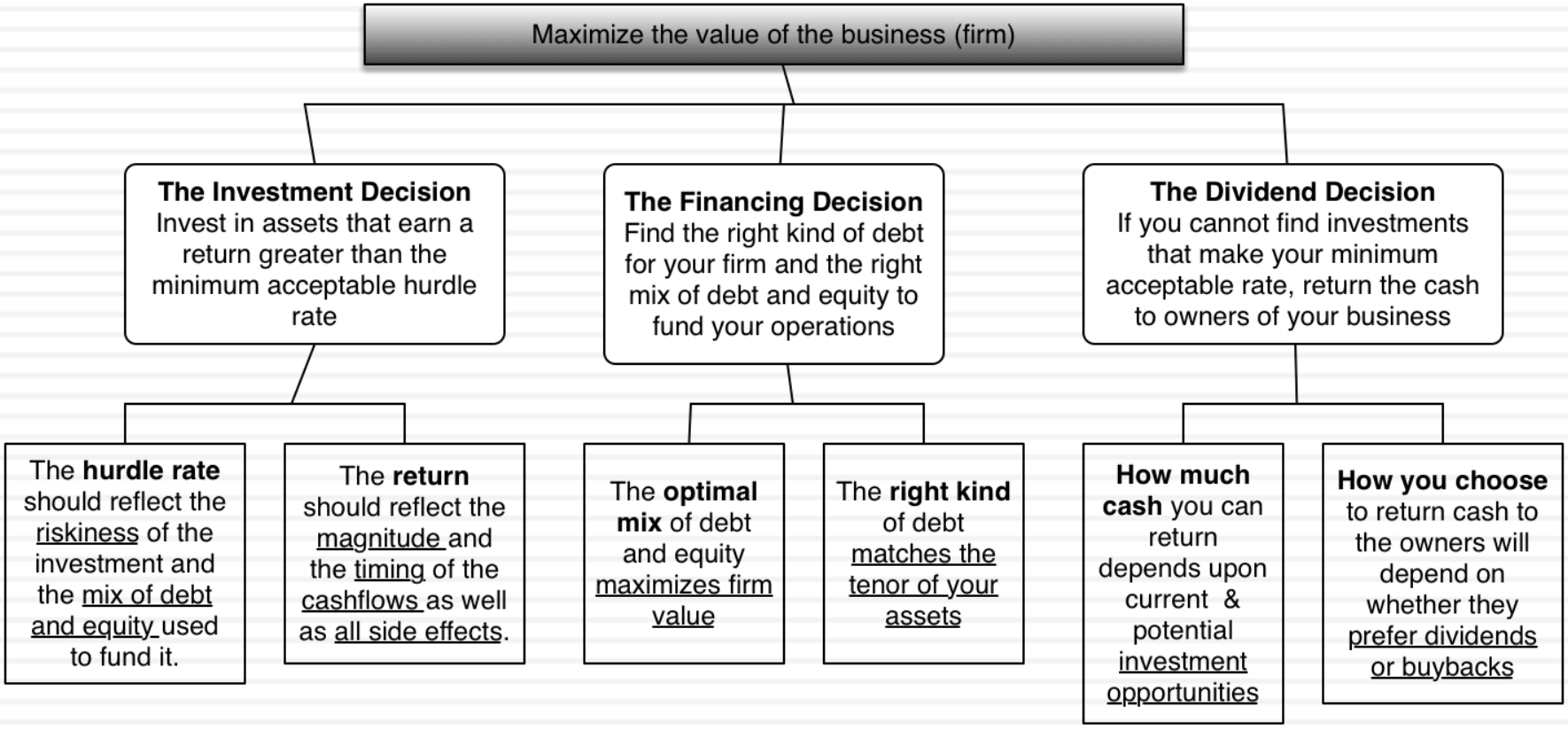
VALUATION

Cynic: A person who knows the price of everything but the value of nothing..
Oscar Wilde

First Principles



Three approaches to valuation

- Intrinsic valuation: The value of an asset is a function of its fundamentals – cash flows, growth and risk. In general, discounted cash flow models are used to estimate intrinsic value.
- Relative valuation: The value of an asset is estimated based upon what investors are paying for similar assets. In general, this takes the form of value or price multiples and comparing firms within the same business.
- Contingent claim valuation: When the cash flows on an asset are contingent on an external event, the value can be estimated using option pricing models.

One tool for estimating intrinsic value: Discounted Cash Flow Valuation

Value of growth
The future cash flows will reflect expectations of how quickly earnings will grow in the future (as a positive) and how much the company will have to reinvest to generate that growth (as a negative). The net effect will determine the value of growth.
Expected Cash Flow in year t = E(CF) = Expected Earnings in year t - Reinvestment needed for growth

Cash flows from existing assets
The base earnings will reflect the earnings power of the existing assets of the firm, net of taxes and any reinvestment needed to sustain the base earnings.

$$\text{Value of asset} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} \ldots\ldots + \frac{E(CF_n)}{(1+r)^n}$$

Steady state
The value of growth comes from the capacity to generate excess returns. The length of your growth period comes from the strength & sustainability of your competitive advantages.

Risk in the Cash flows
The risk in the investment is captured in the discount rate as a beta in the cost of equity and the default spread in the cost of debt.

Equity Valuation

- The value of equity is obtained by discounting expected cashflows to equity, i.e., the residual cashflows after meeting all expenses, tax obligations and interest and principal payments, at the cost of equity, i.e., the rate of return required by equity investors in the firm.

$$\text{Value of Equity} = \sum_{t=1}^{t=n} \frac{\text{CF to Equity}_t}{(1+k_e)^t}$$

where,

CF to Equity $_t$ = Expected Cashflow to Equity in period t

ke = Cost of Equity

- The dividend discount model is a specialized case of equity valuation, and the value of a stock is the present value of expected future dividends.

Firm Valuation

- The value of the firm is obtained by discounting expected cashflows to the firm, i.e., the residual cashflows after meeting all operating expenses and taxes, but prior to debt payments, at the weighted average cost of capital, which is the cost of the different components of financing used by the firm, weighted by their market value proportions.

$$\text{Value of Firm} = \sum_{t=1}^{t=n} \frac{\text{CF to Firm}_t}{(1+\text{WACC})^t}$$

where,

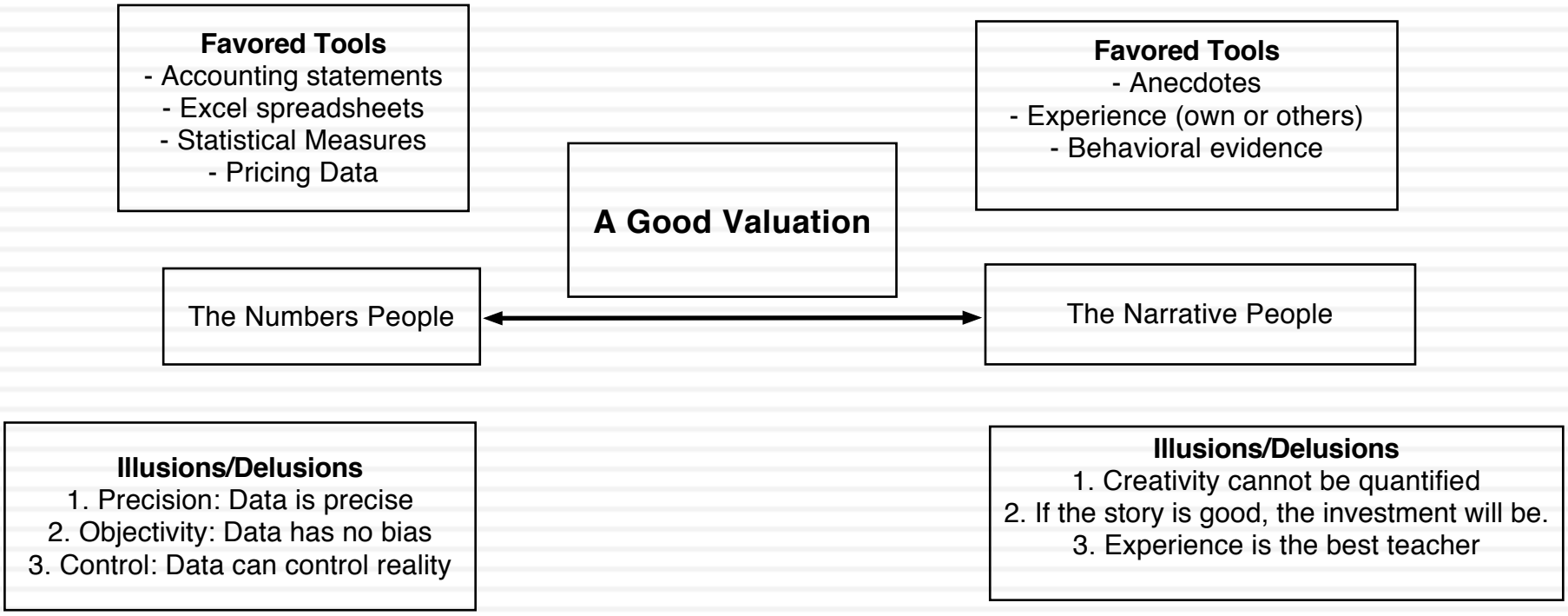
CF to Firm_t = Expected Cashflow to Firm in period t

WACC = Weighted Average Cost of Capital

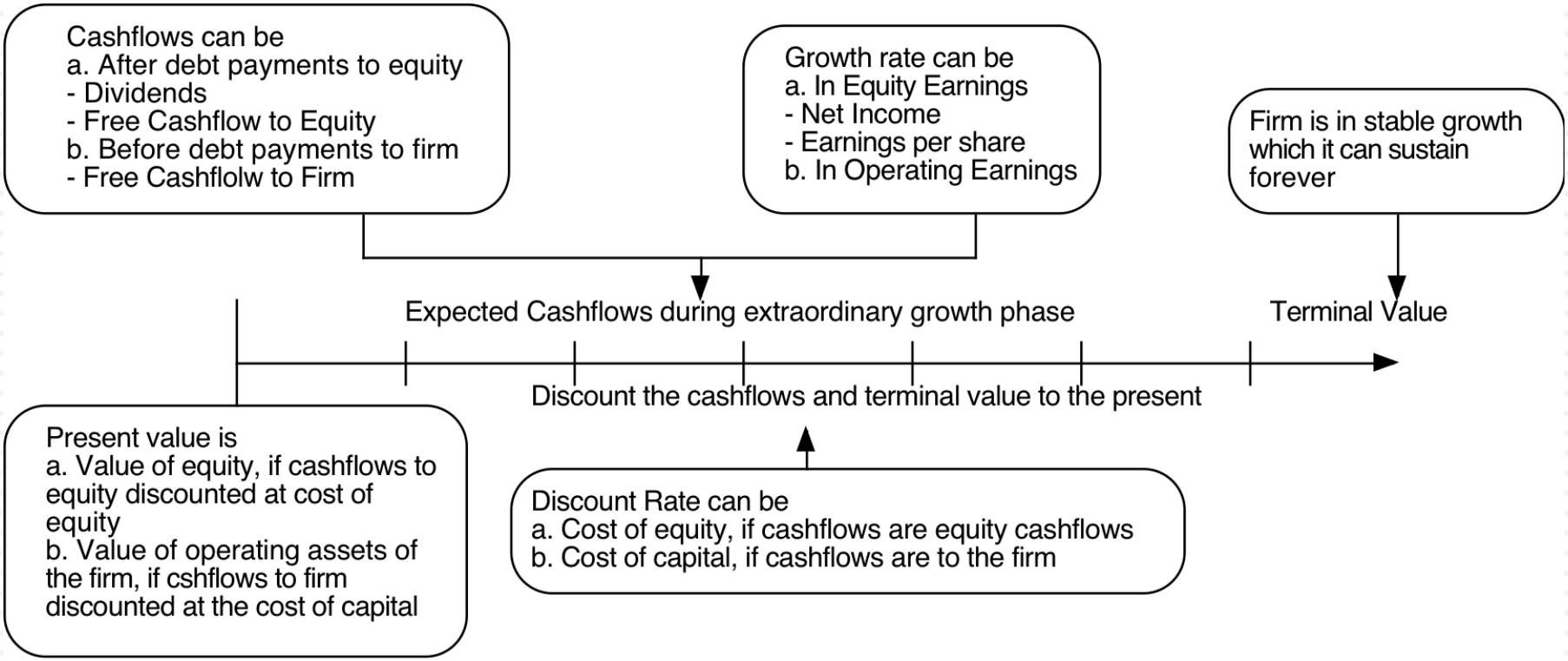
Choosing a Cash Flow to Discount

- When you cannot estimate the free cash flows to equity or the firm, the only cash flow that you can discount is dividends. For financial service firms, it is difficult to estimate free cash flows. For Deutsche Bank, we will be discounting dividends.
- If a firm's debt ratio is not expected to change over time, the free cash flows to equity can be discounted to yield the value of equity. For Tata Motors, we will discount free cash flows to equity.
- If a firm's debt ratio might change over time, free cash flows to equity become cumbersome to estimate. Here, we would discount free cash flows to the firm. For Vale and Disney, we will discount the free cash flow to the firm.

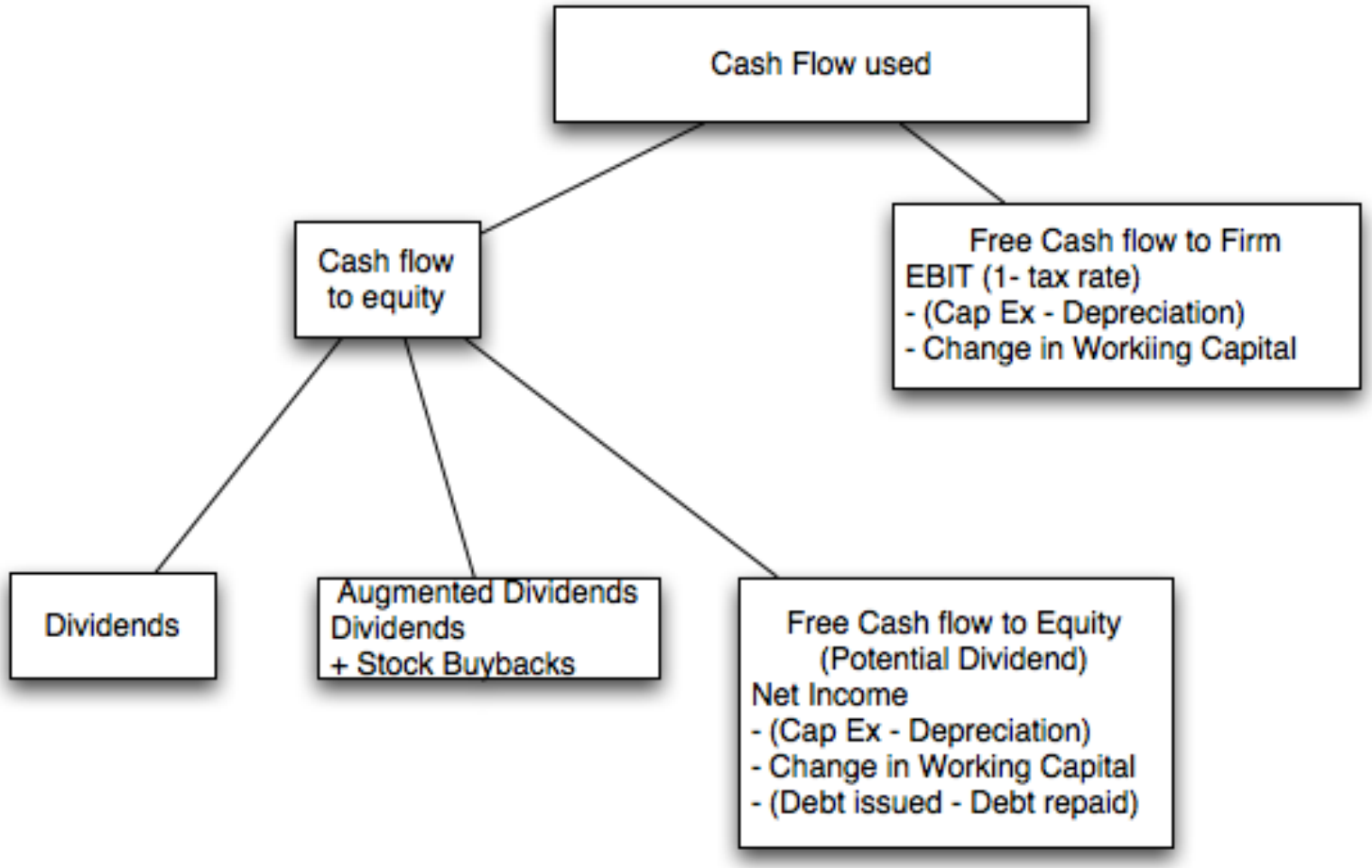
Stories + Numbers = Value



The Ingredients that determine value.



I. Estimating Cash Flows



Dividends and Modified Dividends for Deutsche Bank

- In 2007, Deutsche Bank paid out dividends of 2,146 million Euros on net income of 6,510 million Euros. In early 2008, we valued Deutsche Bank using the dividends it paid in 2007. In my 2008 valuation I am assuming the dividends are not only reasonable but sustainable.
- In October 2016, Deutsche Bank has suspended dividends, was losing money and was in serious danger. Rather than focus on the dividends (which were small), we estimated the potential dividends (by estimating the free cash flows to equity after investments in regulatory capital)

	Current	1	2	3	4	5	6	7	8	9	10
Risk Adjusted Assets	$445,570	$450,026	$454,526	$459,071	$463,662	$468,299	$472,982	$477,711	$482,488	$487,313	$492,186
Tier 1 Capital/ Risk Adjusted Assets (Ratio)	12.41%	13.74%	13.95%	14.17%	14.38%	14.60%	14.81%	15.03%	15.24%	15.46%	15.67%
Tier 1 Capital (Risk Adjusted Assets * Tier 1 Capital Ratio)	$55,282	$61,834	$63,427	$65,045	$66,690	$68,361	$70,059	$71,784	$73,537	$75,317	$77,126
Change in regulatory capital (Tier 1)		$6,552	$1,593	$1,619	$1,645	$1,671	$1,698	$1,725	$1,753	$1,780	$1,809
Book Equity	$64,609	$71,161	$72,754	$74,372	$76,017	$77,688	$79,386	$81,111	$82,864	$84,644	$86,453
Expected ROE	-13.70%	-7.18%	-2.84%	0.06%	1.99%	5.85%	6.568%	7.286%	8.004%	8.722%	9.440%
Net Income (Book Equity * ROE)	$(8,851)	$(5,111)	$(2,065)	$43	$1,512	$4,545	$5,214	$5,910	$6,632	$7,383	$8,161
- Investment in Regulatory Capital		$6,552	$1,593	$1,619	$1,645	$1,671	$1,698	$1,725	$1,753	$1,780	$1,809
FCFE		$(11,663)	$(3,658)	$(1,576)	$(133)	$2,874	$3,516	$4,185	$4,880	$5,602	$6,352

Estimating FCFE (past) : Tata Motors

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

- 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

- 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%.

$$\text{Cost of Equity}_{\text{Jan 2008}} = \text{Riskfree Rate}_{\text{Jan 2008}} + \text{Beta}^* \text{ Mature Market Risk Premium}$$

$$= 4.00\% + 1.162\,(4.5\%) = 9.23\%$$

- 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

- We will be valuing Tata Motors in rupee terms. That is a choice. Any 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):

  Levered $\text{Beta}_{\text{Company}}$= 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%.

  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%:

  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%.

  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):

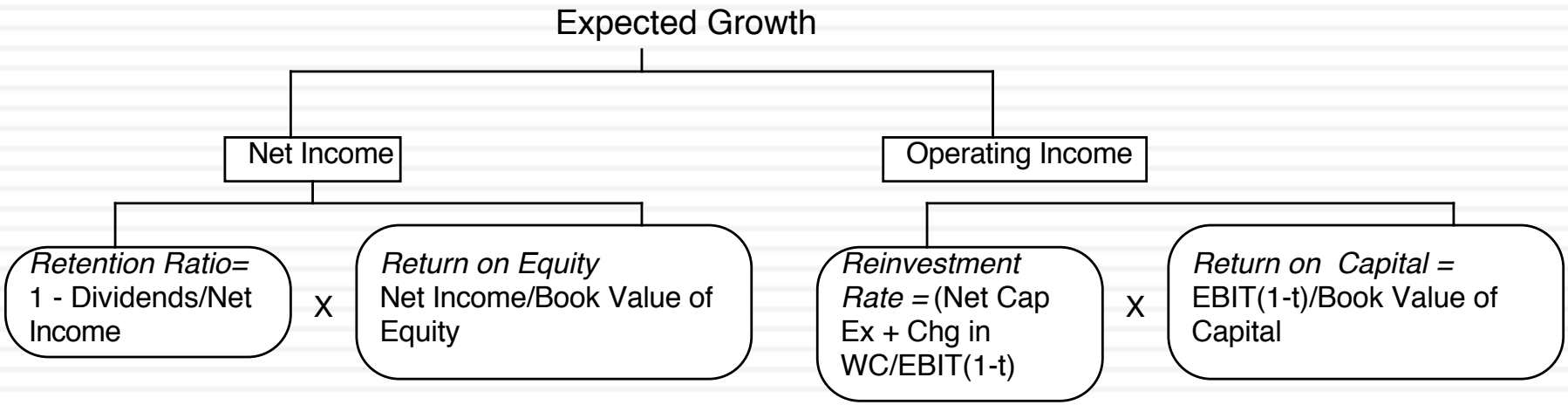
  Cost of capital =

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

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



Estimating growth in EPS: Deutsche Bank in January 2008

- 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.

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

  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:

  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:

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

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

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

Estimating growth in Net Income: Tata Motors

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

- 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

ROE = ROC + D/E (ROC - i (1-t))

where,

ROC = (EBIT (1 - tax rate)) / (Book Value of Capital)

BV of Capital = BV of Debt + BV of Equity - Cash

D/E = Debt/ Equity ratio

i = Interest rate on debt

t = Tax rate on ordinary income.

Decomposing ROE

- 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:

  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:

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

  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.

  Expected Growth Rate from Existing Fundamentals = 53.93% * 12.61% = 6.8%

When everything is in flux: Changing growth and margins

- 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

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