

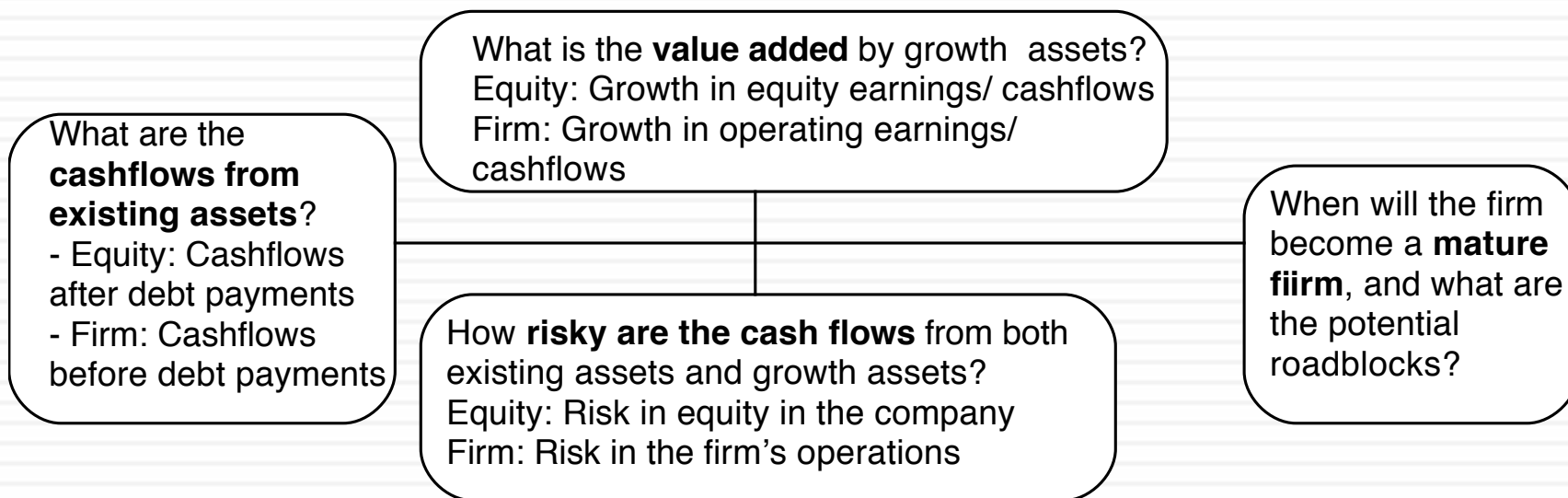


THE DARK SIDE OF VALUATION:  
A JEDI GUIDE TO VALUING DIFFICULT-  
TO-VALUE COMPANIES

Anyone can value a money-making stable company..

# The fundamental determinants of value...

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# The Dark Side of Valuation...

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- Valuing stable, money making companies with consistent and clear accounting statements, a long and stable history and lots of comparable firms is easy to do.
- The true test of your valuation skills is when you have to value “difficult” companies. In particular, the challenges are greatest when valuing:
  - Young companies, early in the life cycle, in young businesses
  - Companies that don’t fit the accounting mold
  - Companies that face substantial truncation risk (default or nationalization risk)

# Difficult to value companies...

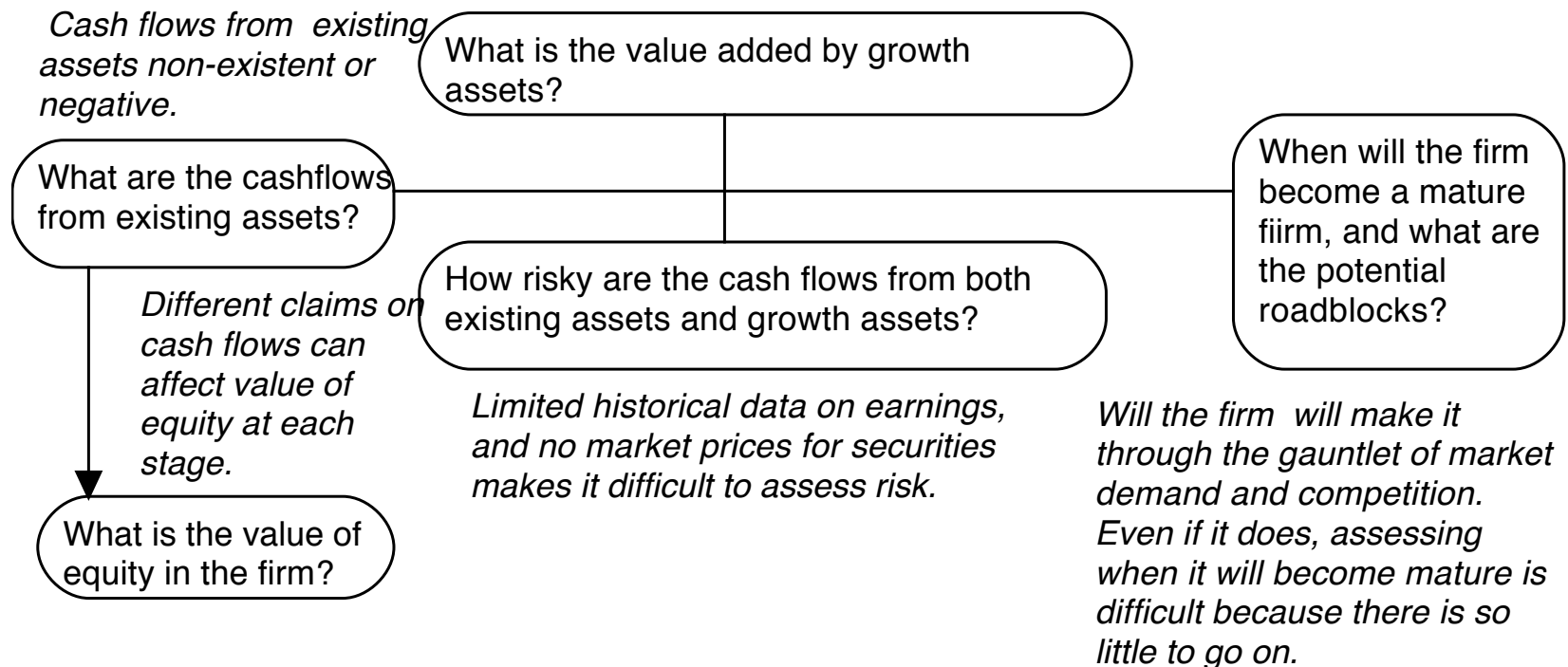
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- Across the life cycle:
  - Young, growth firms: Limited history, small revenues in conjunction with big operating losses and a propensity for failure make these companies tough to value.
  - Mature companies in transition: When mature companies change or are forced to change, history may have to be abandoned and parameters have to be reestimated.
  - Declining and Distressed firms: A long but irrelevant history, declining markets, high debt loads and the likelihood of distress make them troublesome.
- Across markets
  - Emerging market companies are often difficult to value because of the way they are structured, their exposure to country risk and poor corporate governance.
- Across sectors
  - Financial service firms: Opacity of financial statements and difficulties in estimating basic inputs leave us trusting managers to tell us what's going on.
  - Commodity and cyclical firms: Dependence of the underlying commodity prices or overall economic growth make these valuations susceptible to macro factors.
  - Firms with intangible assets: Accounting principles are left to the wayside on these firms.

# I. The challenge with young companies...

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*Making judgments on revenues/ profits difficult because you cannot draw on history. If you have no product/ service, it is difficult to gauge market potential or profitability. The company;s entire value lies in future growth but you have little to base your estimate on.*



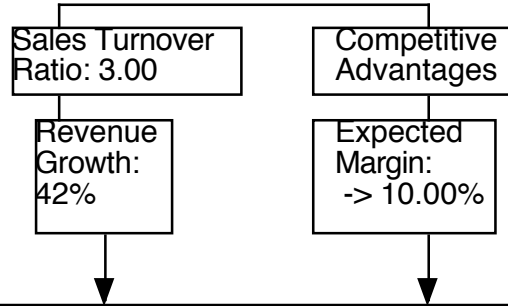
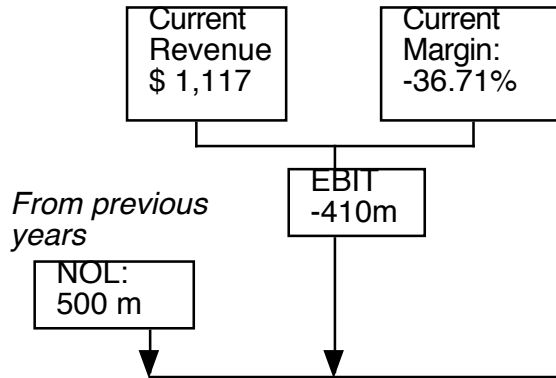
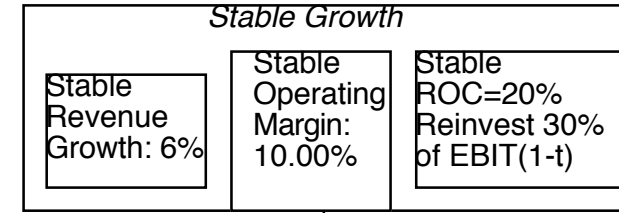
# Upping the ante.. Young companies in young businesses...

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- When valuing a business, we generally draw on three sources of information
  - ▣ The firm's current financial statement
    - How much did the firm sell?
    - How much did it earn?
  - ▣ The firm's financial history, usually summarized in its financial statements.
    - How fast have the firm's revenues and earnings grown over time?
    - What can we learn about cost structure and profitability from these trends?
    - Susceptibility to macro-economic factors (recessions and cyclical firms)
  - ▣ The industry and comparable firm data
    - What happens to firms as they mature? (Margins.. Revenue growth... Reinvestment needs... Risk)
- It is when valuing these companies that you find yourself tempted by the dark side, where
  - ▣ "Paradigm shifts" happen...
  - ▣ New metrics are invented ...
  - ▣ The story dominates and the numbers lag...

# 9a. Amazon in January 2000

*Sales to capital ratio and expected margin are retail industry average numbers*



Terminal Value =  $1881 / (.0961 - .06) = 52,148$

Value of Op Assets	\$ 14,910
+ Cash	\$ 26
= Value of Firm	\$14,936
- Value of Debt	\$ 349
= Value of Equity	\$14,587
- Equity Options	\$ 2,892
Value per share	\$ 34.32

Revenues	\$2,793	5,585	9,774	14,661	19,059	23,862	28,729	33,211	36,798	39,006
EBIT	-\$373	-\$94	\$407	\$1,038	\$1,628	\$2,212	\$2,768	\$3,261	\$3,646	\$3,883
EBIT (1-t)	-\$373	-\$94	\$407	\$871	\$1,058	\$1,438	\$1,799	\$2,119	\$2,370	\$2,524
- Reinvestment	\$559	\$931	\$1,396	\$1,629	\$1,466	\$1,601	\$1,623	\$1,494	\$1,196	\$736
FCFF	-\$931	-\$1,024	-\$989	-\$758	-\$408	-\$163	\$177	\$625	\$1,174	\$1,788

Term. Year

\$41,346
10.00%
35.00%
\$2,688
\$ 807
\$1,881

*All existing options valued as options, using current stock price of \$84.*

	1	2	3	4	5	6	7	8	9	10
Cost of Equity	12.90%	12.90%	12.90%	12.90%	12.90%	12.42%	12.30%	12.10%	11.70%	10.50%
Cost of Debt	8.00%	8.00%	8.00%	8.00%	8.00%	7.80%	7.75%	7.67%	7.50%	7.00%
AT cost of debt	8.00%	8.00%	8.00%	6.71%	5.20%	5.07%	5.04%	4.98%	4.88%	4.55%
Cost of Capital	12.84%	12.84%	12.84%	12.83%	12.81%	12.13%	11.96%	11.69%	11.15%	9.61%

Forever

Amazon was trading at \$84 in January 2000.

**Cost of Equity 12.90%**

*Used average interest coverage ratio over next 5 years to get BBB rating.*

**Cost of Debt 6.5%+1.5%=8.0%**  
Tax rate = 0% -> 35%

**Weights Debt= 1.2% -> 15%**

*Pushed debt ratio to retail industry average of 15%.*

*Dot.com retailers for first 5 years  
Conventional retailers after year 5*

**Riskfree Rate:**  
T. Bond rate = 6.5%

+ **Beta 1.60 -> 1.00**

X **Risk Premium 4%**

Internet/Retail

Operating Leverage

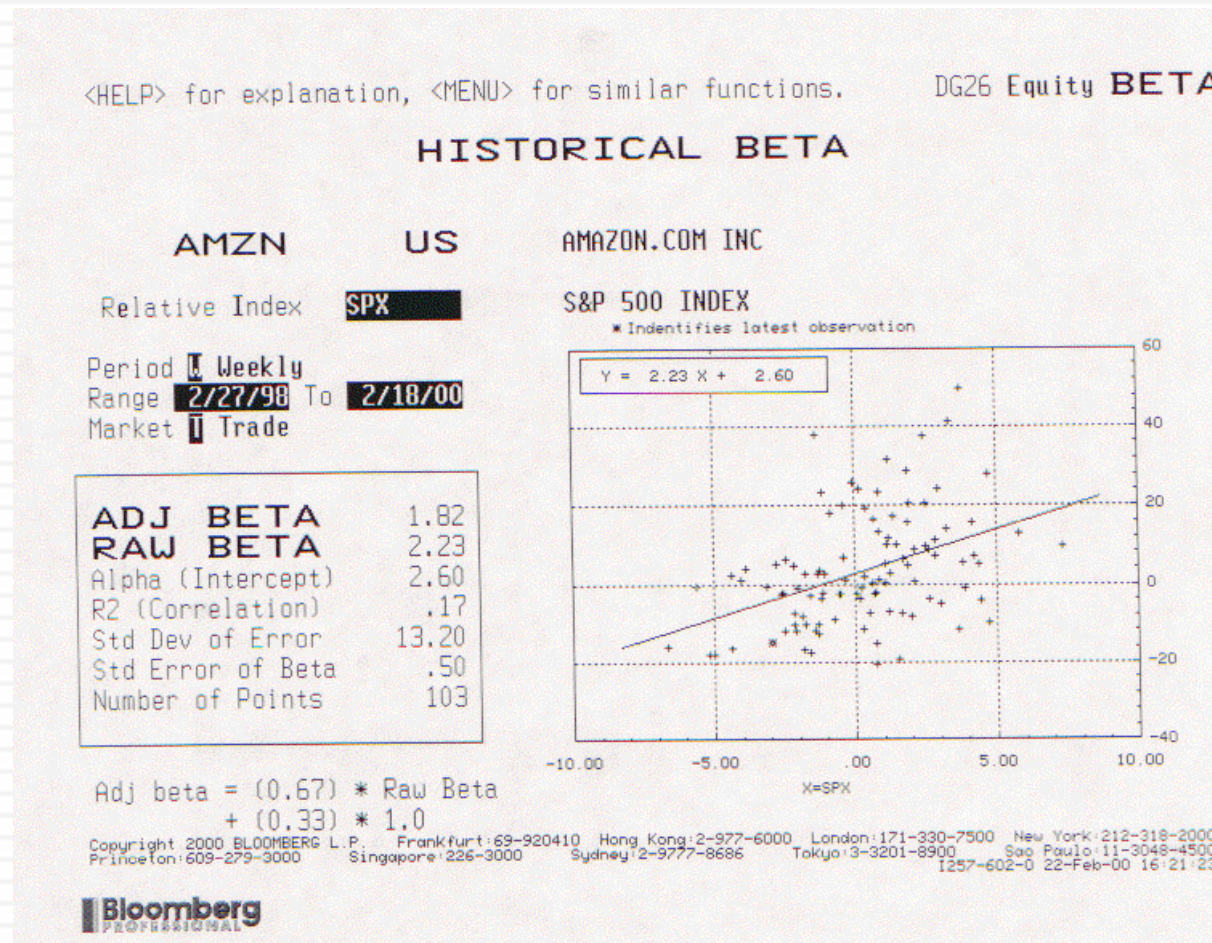
Current D/E: 1.21%

Base Equity Premium

Country Risk Premium

# Lesson 1: Don't trust regression betas....

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## Lesson 2: Work backwards and keep it simple...

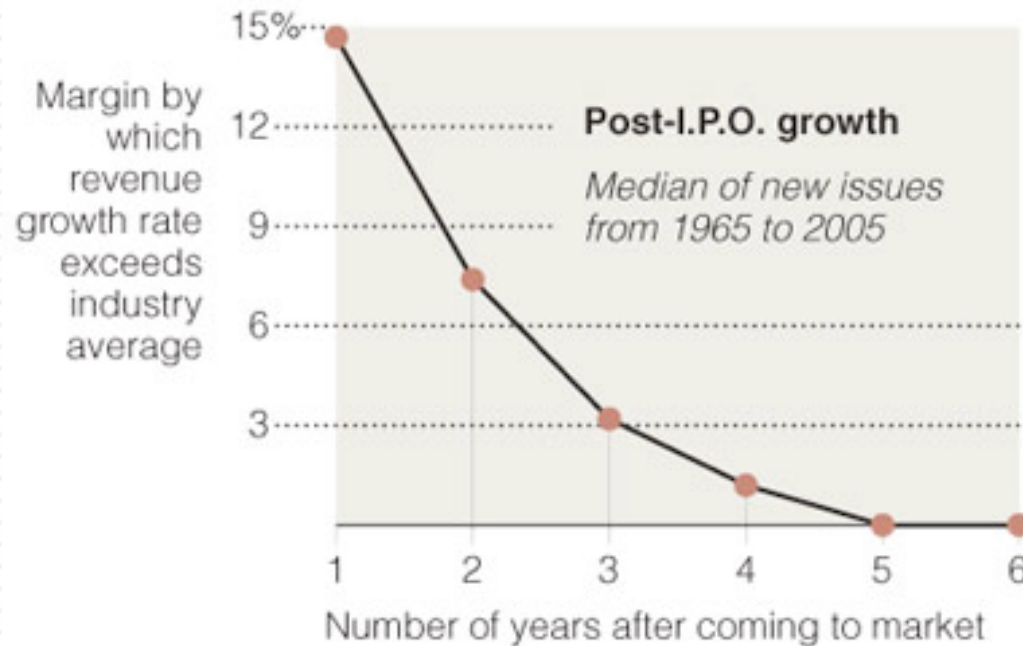
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Year	Revenues	Operating Margin	EBIT
Tr12m	\$1,117	-36.71%	-\$410
1	\$2,793	-13.35%	-\$373
2	\$5,585	-1.68%	-\$94
3	\$9,774	4.16%	\$407
4	\$14,661	7.08%	\$1,038
5	\$19,059	8.54%	\$1,628
6	\$23,862	9.27%	\$2,212
7	\$28,729	9.64%	\$2,768
8	\$33,211	9.82%	\$3,261
9	\$36,798	9.91%	\$3,646
10	\$39,006	9.95%	\$3,883
TY(11)	\$41,346	10.00%	\$4,135

# Lesson 3: Scaling up is hard to do...

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Typically, the revenue growth rate of a newly public company outpaces its industry average for only about five years.



Source: Andrew Metrick

The New York Times

## Lesson 4: Don't forget to pay for growth... and check your reinvestment...

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Year	Rev growth	Chg in Rev	Reinv	S/Cap	ROC
1	150.00%	\$1,676	\$559	3.00	-76.62%
2	100.00%	\$2,793	\$931	3.00	-8.96%
3	75.00%	\$4,189	\$1,396	3.00	20.59%
4	50.00%	\$4,887	\$1,629	3.00	25.82%
5	30.00%	\$4,398	\$1,466	3.00	21.16%
6	25.20%	\$4,803	\$1,601	3.00	22.23%
7	20.40%	\$4,868	\$1,623	3.00	22.30%
8	15.60%	\$4,482	\$1,494	3.00	21.87%
9	10.80%	\$3,587	\$1,196	3.00	21.19%
10	6.00%	\$2,208	\$736	3.00	20.39%

# Lesson 5: And don't worry about dilution... It is already factored in

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- With young growth companies, it is almost a given that the number of shares outstanding will increase over time for two reasons:
  - ▣ To grow, the company will have to issue new shares either to raise cash to take projects or to offer to target company stockholders in acquisitions
  - ▣ Many young, growth companies also offer options to managers as compensation and these options will get exercised, if the company is successful.
- In DCF valuation, both effects are already incorporated into the value per share, even though we use the current number of shares in estimating value per share
  - ▣ The need for new equity issues is captured in negative cash flows in the earlier years. The present value of these negative cash flows will drag down the current value of equity and this is the effect of future dilution.
  - ▣ The options are valued and netted out against the current value. Using an option pricing model allows you to incorporate the expected likelihood that they will be exercised and the price at which they will be exercised.

# Lesson 6: There are always scenarios where the market price can be justified...

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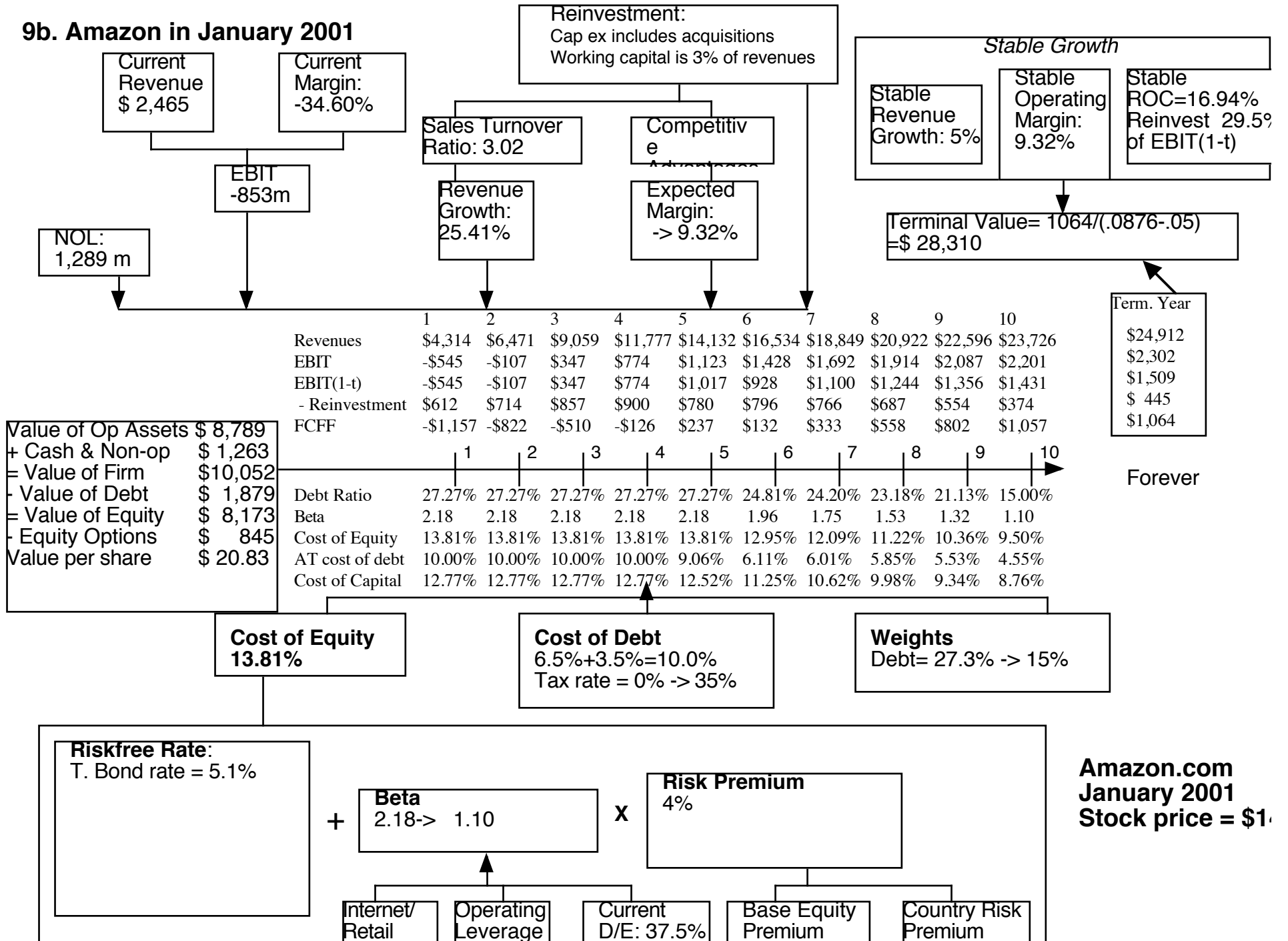
	6%	8%	10%	12%	14%
30%	\$ (1.94)	\$ 2.95	\$ 7.84	\$ 12.71	\$ 17.57
35%	\$ 1.41	\$ 8.37	\$ 15.33	\$ 22.27	\$ 29.21
40%	\$ 6.10	\$ 15.93	\$ 25.74	\$ 35.54	\$ 45.34
45%	\$ 12.59	\$ 26.34	\$ 40.05	\$ 53.77	\$ 67.48
50%	\$ 21.47	\$ 40.50	\$ 59.52	\$ 78.53	\$ 97.54
55%	\$ 33.47	\$ 59.60	\$ 85.72	\$ 111.84	\$ 137.95
60%	\$ 49.53	\$ 85.10	\$ 120.66	\$ 156.22	\$ 191.77

## Lesson 7: You will be wrong 100% of the time... and it really is not (always) your fault...

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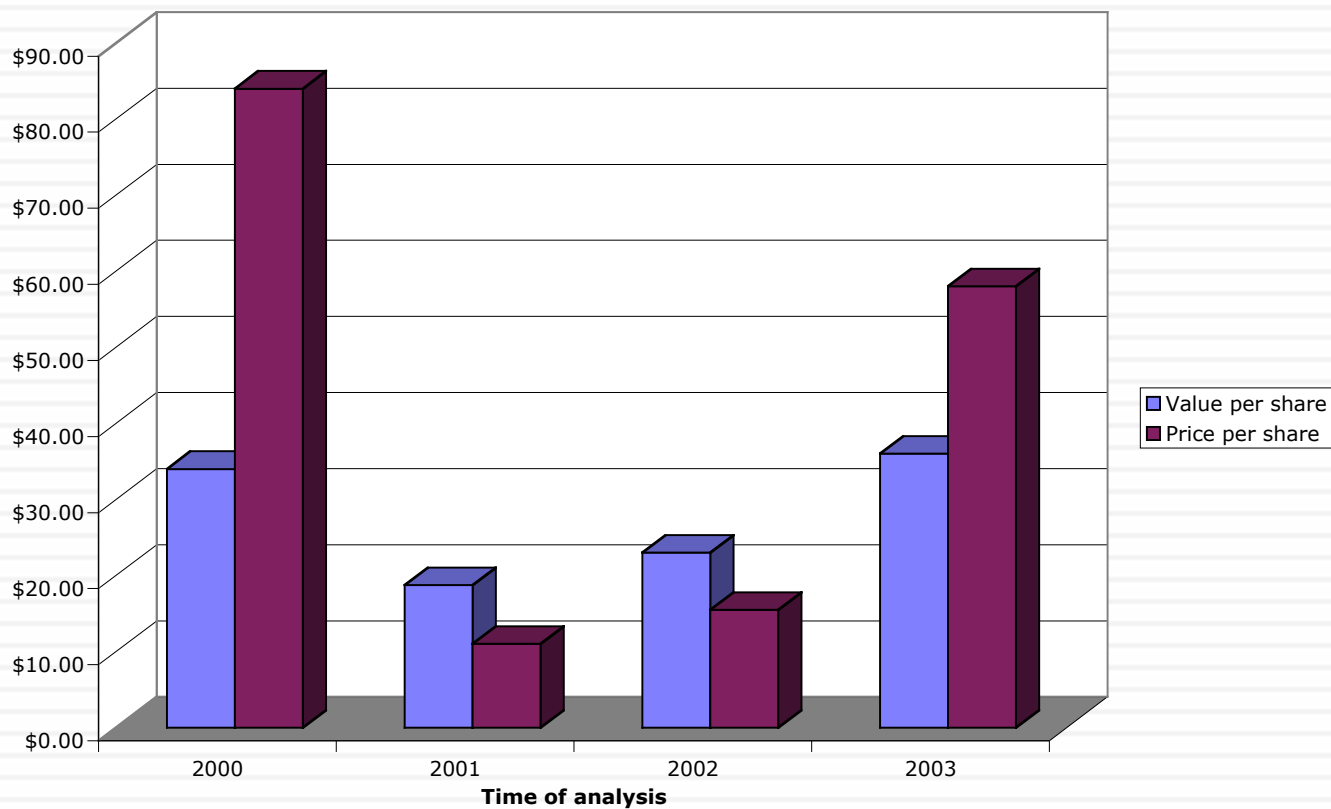
- No matter how careful you are in getting your inputs and how well structured your model is, your estimate of value will change both as new information comes out about the company, the business and the economy.
- As information comes out, you will have to adjust and adapt your model to reflect the information. Rather than be defensive about the resulting changes in value, recognize that this is the essence of risk.
- A test: If your valuations are unbiased, you should find yourself increasing estimated values as often as you are decreasing values. In other words, there should be equal doses of good and bad news affecting valuations (at least over time).

### 9b. Amazon in January 2001



# And the market is often “more wrong”....

Amazon: Value and Price





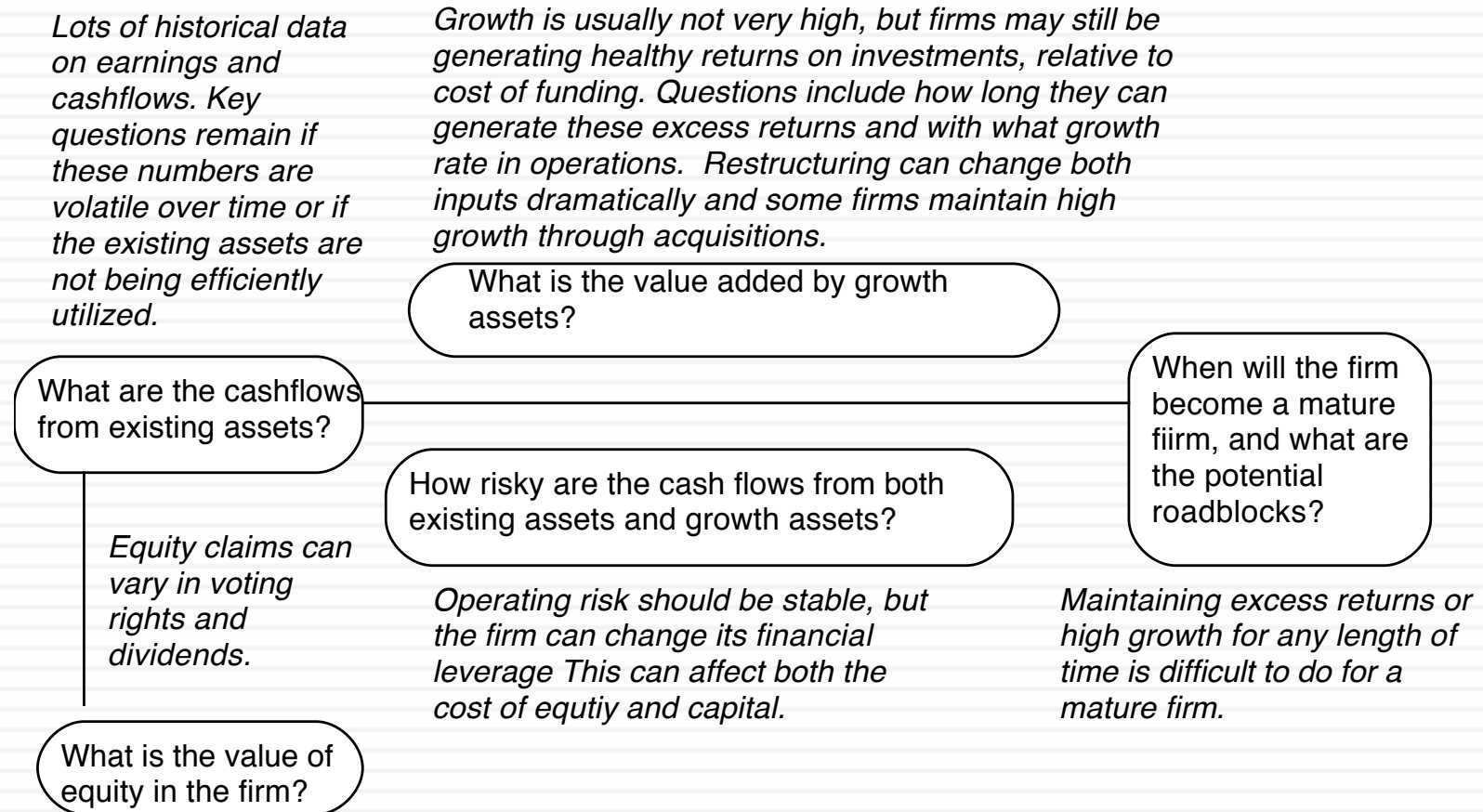
## II. Mature Companies in transition..

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- Mature companies are generally the easiest group to value. They have long, established histories that can be mined for inputs. They have investment policies that are set and capital structures that are stable, thus making valuation more grounded in past data.
- However, this stability in the numbers can mask real problems at the company. The company may be set in a process, where it invests more or less than it should and does not have the right financing mix. In effect, the policies are consistent, stable and bad.
- If you expect these companies to change or as is more often the case to have change thrust upon them,

# The perils of valuing mature companies...

Figure 7.1: Estimation Issues - Mature Companies



### Hormel Foods: The Value of Control Changing

Hormel Foods sells packaged meat and other food products and has been in existence as a publicly traded company for almost 80 years. In 2008, the firm reported after-tax operating income of \$315 million, reflecting a compounded growth of 5% over the previous 5 years.

#### The Status Quo

Run by existing management, with conservative reinvestment policies (reinvestment rate = 14.34% and debt ratio = 10.4%.

Anemic growth rate and short growth period, due to reinvestment policy

Low debt ratio affects cost of capital

Year	Operating income after taxes	Expected growth rate	ROC	Reinvestment Rate	Reinvestment	FCFF	Cost of capital	Present Value
Trailing 12 months	\$315							
1	\$324	2.75%	14.34%	19.14%	\$62	\$262	6.79%	\$245
2	\$333	2.75%	14.34%	19.14%	\$64	\$269	6.79%	\$236
3	\$342	2.75%	14.34%	19.14%	\$65	\$276	6.79%	\$227
Beyond	\$350	2.35%	7.23%	32.52%	\$114	\$4,840	7.23%	\$3,974
Value of operating assets								\$4,682
(Add) Cash								\$155
(Subtract) Debt								\$491
(Subtract) Management Options								\$53
Value of equity in common stock								\$4,293
Value per share								\$31.91

#### New and better management

More aggressive reinvestment which increases the reinvestment rate (to 40%) and length of growth (to 5 years), and higher debt ratio (20%).

#### Operating Restructuring ①

Expected growth rate = ROC \* Reinvestment Rate  
 Expected growth rate (status quo) = 14.34% \* 19.14% = 2.75%  
 Expected growth rate (optimal) = 14.00% \* 40% = 5.60%  
 ROC drops, reinvestment rises and growth goes up.

#### Financial restructuring ②

Cost of capital = Cost of equity (1-Debt ratio) + Cost of debt (Debt ratio)  
 Status quo = 7.33% (1-.104) + 3.60% (1-.40) (.104) = 6.79%  
 Optimal = 7.75% (1-.20) + 3.60% (1-.40) (.20) = 6.63%  
 Cost of equity rises but cost of capital drops.

Year	Operating income after taxes	Expected growth rate	ROC	Reinvestment Rate	Reinvestment	FCFF	Cost of capital	Present Value
Trailing 12 months	\$315							
1	\$333	5.60%	14.00%	40.00%	\$133	\$200	6.63%	\$187
2	\$351	5.60%	14.00%	40.00%	\$141	\$211	6.63%	\$185
3	\$371	5.60%	14.00%	40.00%	\$148	\$223	6.63%	\$184
4	\$392	5.60%	14.00%	40.00%	\$260	\$235	6.63%	\$182
5	\$414	5.60%	14.00%	40.00%	\$223	\$248	6.63%	\$180
Beyond	\$423	2.35%	6.74%	34.87%	\$148	\$6,282	6.74%	\$4,557
Value of operating assets								\$5,475
(Add) Cash								\$155
(Subtract) Debt								\$491
(Subtract) Management Options								\$53
Value of equity in common stock								\$5,085
Value per share								\$37.80

Probability of management change = 10%  
 Expected value = \$31.91 (.90) + \$37.80 (.10) = \$32.50  
 ③  
 ④

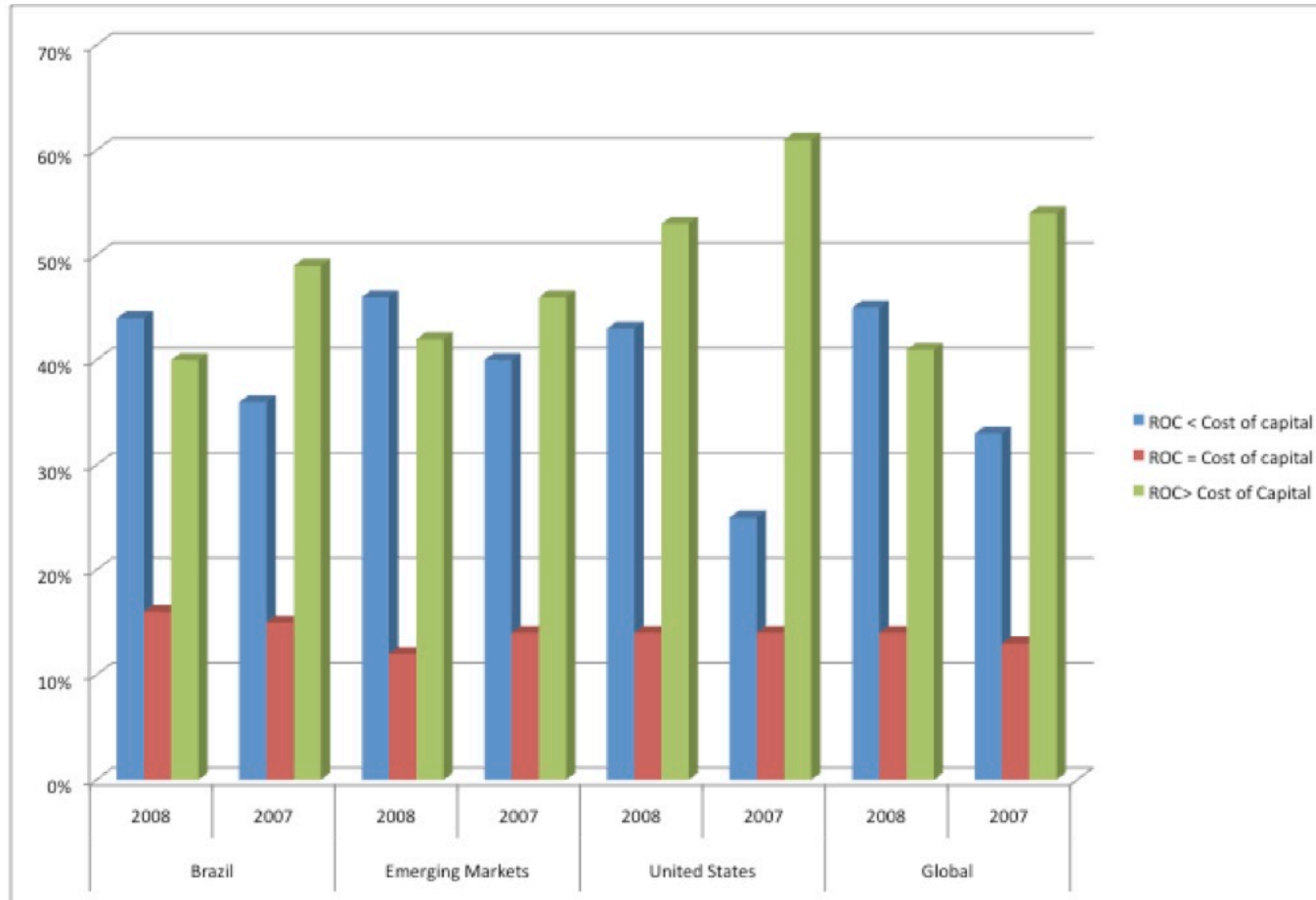
# Lesson 1: Cost cutting and increased efficiency are easier accomplished on paper than in practice... and require commitment

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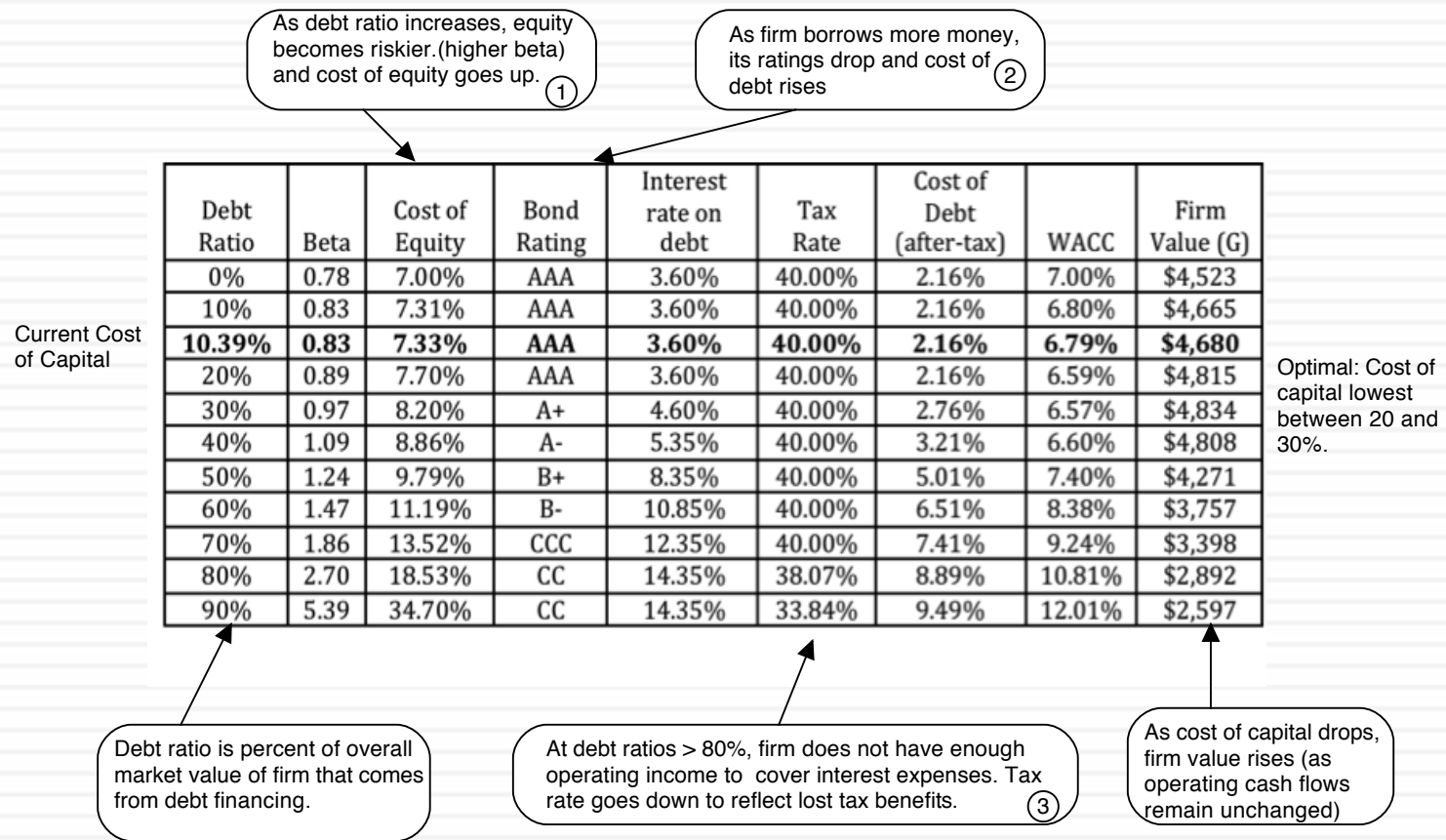
# Lesson 2: Increasing growth is not always a value creating option.. And it may destroy value at times..

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# Lesson 3: Financial leverage is a double-edged sword..

Exhibit 7.1: Optimal Financing Mix: Hormel Foods in January 2009



# III. Dealing with decline and distress...

*Historical data often reflects flat or declining revenues and falling margins. Investments often earn less than the cost of capital.*

*Growth can be negative, as firm sheds assets and shrinks. As less profitable assets are shed, the firm's remaining assets may improve in quality.*

What is the value added by growth assets?

What are the cashflows from existing assets?

*Underfunded pension obligations and litigation claims can lower value of equity. Liquidation preferences can affect value of equity*

What is the value of equity in the firm?

How risky are the cash flows from both existing assets and growth assets?

*Depending upon the risk of the assets being divested and the use of the proceeds from the divestiture (to pay dividends or retire debt), the risk in both the firm and its equity can change.*

When will the firm become a mature firm, and what are the potential roadblocks?

*There is a real chance, especially with high financial leverage, that the firm will not make it. If it is expected to survive as a going concern, it will be as a much smaller entity.*

## a. Dealing with Decline

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- In decline, firms often see declining revenues and lower margins, translating in negative expected growth over time.
- If these firms are run by good managers, they will not fight decline. Instead, they will adapt to it and shut down or sell investments that do not generate the cost of capital. This can translate into negative net capital expenditures (depreciation exceeds cap ex), declining working capital and an overall negative reinvestment rate. The best case scenario is that the firm can shed its bad assets, make itself a much smaller and healthier firm and then settle into long-term stable growth.
- As an investor, your worst case scenario is that these firms are run by managers in denial who continue to expand the firm by making bad investments (that generate lower returns than the cost of capital). These firms may be able to grow revenues and operating income but will destroy value along the way.



# 11. Sears Holdings: Status Quo

**Current Cashflow to Firm**  
 EBIT(1-t) : 1,183  
 - Nt CpX -18  
 - Chg WC -67  
 = FCFF 1,268  
 Reinvestment Rate = -75/1183  
 = -7.19%  
 Return on capital = 4.99%

Reinvestment Rate  
 -30.00%

**Expected Growth in EBIT (1-t)**  
 $-.30 * .05 = -0.015$   
 -1.5%

Return on Capital  
 5%

Stable Growth  
 $g = 2\%$ ; Beta = 1.00;  
 Country Premium = 0%  
 Cost of capital = 7.13%  
 ROC = 7.13%; Tax rate = 38%  
 Reinvestment Rate = 28.05%

Terminal Value<sub>4</sub> =  $868 / (.0713 - .02) = 16,921$

Op. Assets 17,634  
 + Cash: 1,622  
 - Debt 7,726  
 = Equity 11,528  
 - Options 5  
 Value/Share \$87.29

	1	2	3	4
EBIT (1-t)	\$1,165	\$1,147	\$1,130	\$1,113
- Reinvestment	(\$349)	(\$344)	(\$339)	(\$334)
FCFF	\$1,514	\$1,492	\$1,469	\$1,447

Term Yr  
 \$1,206  
 \$ 339  
 \$ 868

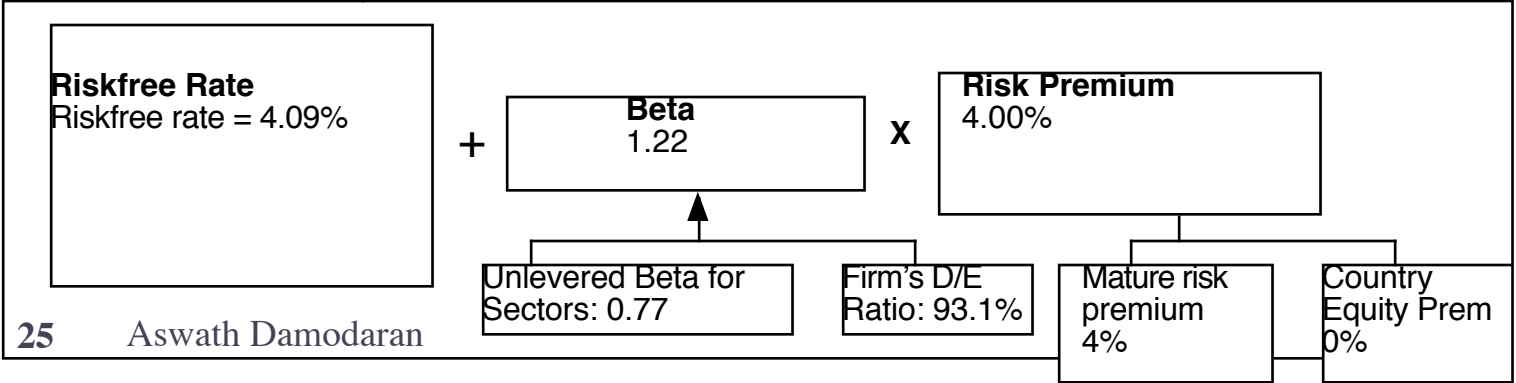
Discount at Cost of Capital (WACC) = 9.58% (.566) + 4.80% (0.434) = 7.50%

**Cost of Equity**  
 9.58%

**Cost of Debt**  
 $(4.09\% + 3.65\%)(1 - .38)$   
 = 4.80%

**Weights**  
 E = 56.6% D = 43.4%

On July 23, 2008,  
 Sears was trading at  
 \$76.25 a share.



## b. Dealing with the “downside” of Distress

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- A DCF valuation values a firm as a going concern. If there is a significant likelihood of the firm failing before it reaches stable growth and if the assets will then be sold for a value less than the present value of the expected cashflows (a distress sale value), DCF valuations will overstate the value of the firm.
- Value of Equity= DCF value of equity (1 - Probability of distress) + Distress sale value of equity (Probability of distress)
- There are three ways in which we can estimate the probability of distress:
  - Use the bond rating to estimate the cumulative probability of distress over 10 years
  - Estimate the probability of distress with a probit
  - Estimate the probability of distress by looking at market value of bonds..
- The distress sale value of equity is usually best estimated as a percent of book value (and this value will be lower if the economy is doing badly and there are other firms in the same business also in distress).

Current Revenue  
\$ 4,390

Current Margin:  
4.76%

EBIT  
\$ 209m

Reinvestment:  
Capital expenditures include cost of new casinos and working capital

Extended reinvestment break, due to investment in past

Industry average

Expected Margin:  
-> 17%

Stable Growth

Stable Revenue Growth: 3%

Stable Operating Margin: 17%

Stable ROC=10%  
Reinvest 30% of EBIT(1-t)

Terminal Value =  $758 \cdot (0.0743 - 0.03)$   
= \$ 17,129

Value of Op Assets \$ 9,793  
+ Cash & Non-op \$ 3,040  
= Value of Firm \$ 12,833  
- Value of Debt \$ 7,565  
= Value of Equity \$ 5,268

Value per share \$ 8.12

Revenues	\$4,434	\$4,523	\$5,427	\$6,513	\$7,815	\$8,206	\$8,616	\$9,047	\$9,499	\$9,974	
Oper margin	5.81%	6.86%	7.90%	8.95%	10%	11.40%	12.80%	14.20%	15.60%	17%	
EBIT	\$258	\$310	\$429	\$583	\$782	\$935	\$1,103	\$1,285	\$1,482	\$1,696	
Tax rate	26.0%	26.0%	26.0%	26.0%	26.0%	28.4%	30.8%	33.2%	35.6%	38.00%	
EBIT * (1 - t)	\$191	\$229	\$317	\$431	\$578	\$670	\$763	\$858	\$954	\$1,051	
- Reinvestment	-\$19	-\$11	\$0	\$22	\$58	\$67	\$153	\$215	\$286	\$350	
FCFF	\$210	\$241	\$317	\$410	\$520	\$603	\$611	\$644	\$668	\$701	
		1	2	3	4	5	6	7	8	9	10
Beta	3.14	3.14	3.14	3.14	3.14	2.75	2.36	1.97	1.59	1.20	
Cost of equity	21.82%	21.82%	21.82%	21.82%	21.82%	19.50%	17.17%	14.85%	12.52%	10.20%	
Cost of debt	9%	9%	9%	9%	9%	8.70%	8.40%	8.10%	7.80%	7.50%	
Debt ratio	73.50%	73.50%	73.50%	73.50%	73.50%	68.80%	64.10%	59.40%	54.70%	50.00%	
Cost of capital	9.88%	9.88%	9.88%	9.88%	9.88%	9.79%	9.50%	9.01%	8.32%	7.43%	

Term. Year  
\$10,273  
17%  
\$ 1,746  
38%  
\$1,083  
\$ 325  
\$758

Forever

Cost of Equity  
21.82%

Cost of Debt  
3%+6%= 9%  
9% (1-.38)=5.58%

Weights  
Debt= 73.5% ->50%

Riskfree Rate:  
T. Bond rate = 3%

+ Beta  
3.14-> 1.20

X Risk Premium  
6%

Casino  
1.15

Current  
D/E: 277%

Base Equity  
Premium

Country Risk  
Premium

Las Vegas Sands  
February 2009  
Trading @ \$4.25

# Adjusting the value of LVS for distress..

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- In February 2009, LVS was rated B+ by S&P. Historically, 28.25% of B+ rated bonds default within 10 years. LVS has a 6.375% bond, maturing in February 2015 (7 years), trading at \$529. If we discount the expected cash flows on the bond at the riskfree rate, we can back out the probability of distress from the bond price:

$$529 = \sum_{t=1}^{t=7} \frac{63.75(1 - \Pi_{\text{Distress}})^t}{(1.03)^t} + \frac{1000(1 - \Pi_{\text{Distress}})^7}{(1.03)^7}$$

- Solving for the probability of bankruptcy, we get:
- $\pi_{\text{Distress}}$  = Annual probability of default = 13.54%
- Cumulative probability of surviving 10 years =  $(1 - .1354)^{10} = 23.34\%$
- Cumulative probability of distress over 10 years =  $1 - .2334 = .7666$  or 76.66%
- If LVS is becomes distressed:
  - Expected distress sale proceeds = \$2,769 million < Face value of debt
  - Expected equity value/share = \$0.00
- Expected value per share =  $\$8.12 (1 - .7666) + \$0.00 (.7666) = \$1.92$

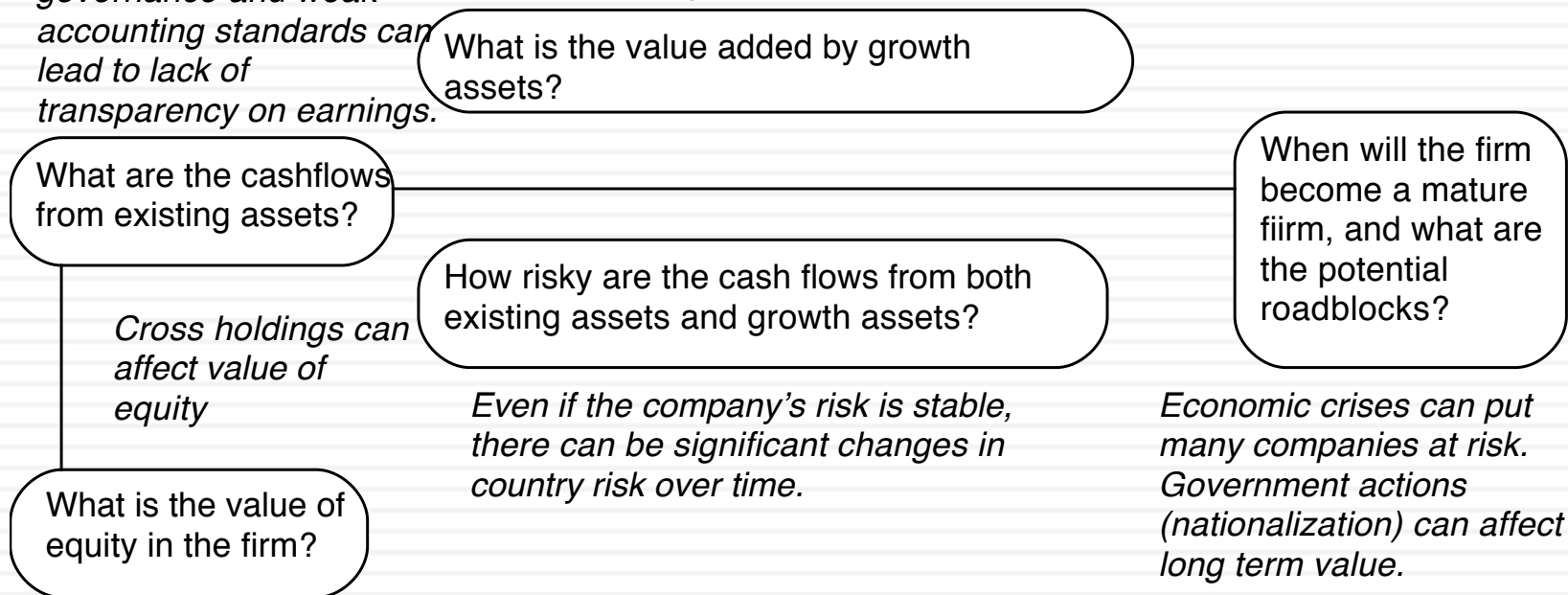
# IV. Emerging Market Companies

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## Estimation Issues - Emerging Market Companies

*Big shifts in economic environment (inflation, interest rates) can affect operating earnings history. Poor corporate governance and weak accounting standards can lead to lack of transparency on earnings.*

*Growth rates for a company will be affected heavily by growth rate and political developments in the country in which it operates.*



# Lesson 1: Country risk has to be incorporated... but with a scalpel, not a bludgeon

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- Emerging market companies are undoubtedly exposed to additional country risk because they are incorporated in countries that are more exposed to political and economic risk.
- Not all emerging market companies are equally exposed to country risk and many developed markets have emerging market risk exposure because of their operations.
- You can use either the “weighted country risk premium”, with the weights reflecting the countries you get your revenues from or the lambda approach (which may incorporate more than revenues) to capture country risk exposure.

# ERP : Jan 2014

Andorra	6.80%	1.80%	Liechtenstein	5.00%	0.00%
Austria	5.00%	0.00%	Luxembourg	5.00%	0.00%
Belgium	5.90%	0.90%	Malta	6.80%	1.80%
Cyprus	20.00%	15.00%	Netherlands	5.00%	0.00%
Denmark	5.00%	0.00%	Norway	5.00%	0.00%
Finland	5.00%	0.00%	Portugal	10.40%	5.40%
France	5.60%	0.60%	Spain	8.30%	3.30%
Germany	5.00%	0.00%	Sweden	5.00%	0.00%
Greece	20.00%	15.00%	Switzerland	5.00%	0.00%
Iceland	8.30%	3.30%	Turkey	8.30%	3.30%
Ireland	8.75%	3.75%	United Kingdom	5.60%	0.60%
Italy	7.85%	2.85%	<b>Western Europe</b>	<b>6.29%</b>	<b>1.29%</b>

Canada	5.00%	0.00%
United States of America	5.00%	0.00%
<b>North America</b>	<b>5.00%</b>	<b>0.00%</b>

Argentina	14.75%	9.75%
Belize	18.50%	13.50%
Bolivia	10.40%	5.40%
Brazil	7.85%	2.85%
Chile	5.90%	0.90%
Colombia	8.30%	3.30%
Costa Rica	8.30%	3.30%
Ecuador	16.25%	11.25%
El Salvador	10.40%	5.40%
Guatemala	8.75%	3.75%
Honduras	13.25%	8.25%
Mexico	7.40%	2.40%
Nicaragua	14.75%	9.75%
Panama	7.85%	2.85%
Paraguay	10.40%	5.40%
Peru	7.85%	2.85%
Suriname	10.40%	5.40%
Uruguay	8.30%	3.30%
Venezuela	16.25%	11.25%
<b>Latin America</b>	<b>8.62%</b>	<b>3.62%</b>

Angola	10.40%	5.40%
Benin	13.25%	8.25%
Botswana	6.28%	1.28%
Burkina Faso	13.25%	8.25%
Cameroon	13.25%	8.25%
Cape Verde	13.25%	8.25%
DR Congo	14.75%	9.75%
Egypt	16.25%	11.25%
Gabon	10.40%	5.40%
Ghana	11.75%	6.75%
Kenya	11.75%	6.75%
Morocco	8.75%	3.75%
Mozambique	11.75%	6.75%
Namibia	8.30%	3.30%
Nigeria	10.40%	5.40%
Rep Congo	10.40%	5.40%
Rwanda	13.25%	8.25%
Senegal	11.75%	6.75%
South Africa	7.40%	2.40%
Tunisia	10.40%	5.40%
Uganda	11.75%	6.75%
Zambia	11.75%	6.75%
<b>Africa</b>	<b>10.04%</b>	<b>5.04%</b>

Albania	11.75%	6.75%
Armenia	9.50%	4.50%
Azerbaijan	8.30%	3.30%
Belarus	14.75%	9.75%
Bosnia and Herzegovina	14.75%	9.75%
Bulgaria	7.85%	2.85%
Croatia	8.75%	3.75%
Czech Republic	6.05%	1.05%
Estonia	6.05%	1.05%
Georgia	10.40%	5.40%
Hungary	8.75%	3.75%
Kazakhstan	7.85%	2.85%
Latvia	7.85%	2.85%
Lithuania	7.40%	2.40%
Macedonia	10.40%	5.40%
Moldova	14.75%	9.75%
Montenegro	10.40%	5.40%
Poland	6.28%	1.28%
Romania	8.30%	3.30%
Russia	7.40%	2.40%
Serbia	11.75%	6.75%
Slovakia	6.28%	1.28%
Slovenia	8.75%	3.75%
Ukraine	16.25%	11.25%
<b>E. Europe &amp; Russia</b>	<b>7.96%</b>	<b>2.96%</b>

Abu Dhabi	5.75%	0.75%
Bahrain	7.85%	2.85%
Israel	6.05%	1.05%
Jordan	11.75%	6.75%
Kuwait	5.75%	0.75%
Lebanon	11.75%	6.75%
Oman	6.05%	1.05%
Qatar	5.75%	0.75%
Saudi Arabia	5.90%	0.90%
United Arab Emirates	5.75%	0.75%
<b>Middle East</b>	<b>6.14%</b>	<b>1.14%</b>

Bangladesh	10.40%	5.40%
Cambodia	13.25%	8.25%
China	5.90%	0.90%
Fiji	11.75%	6.75%
Hong Kong	5.60%	0.60%
India	8.30%	3.30%
Indonesia	8.30%	3.30%
Japan	5.90%	0.90%
Korea	5.90%	0.90%
Macao	5.90%	0.90%
Malaysia	6.80%	1.80%
Mauritius	7.40%	2.40%
Mongolia	11.75%	6.75%
Pakistan	16.25%	11.25%
Papua New Guinea	11.75%	6.75%
Philippines	8.30%	3.30%
Singapore	5.00%	0.00%
Sri Lanka	11.75%	6.75%
Taiwan	5.90%	0.90%
Thailand	7.40%	2.40%
Vietnam	13.25%	8.25%
<b>Asia</b>	<b>6.51%</b>	<b>1.51%</b>

Australia	5.00%	0.00%
Cook Islands	11.75%	6.75%
New Zealand	5.00%	0.00%
<b>Australia &amp; New Zealand</b>	<b>5.00%</b>	<b>0.00%</b>

Black #: Total ERP  
 Red #: Country risk premium  
 AVG: GDP weighted average

## Indofoods - April 2014

**Current Cashflow to Firm**  
 EBIT(1-t) = 6,222(1-.263) = 4,587  
 - (Cap Ex - Deprecn) 4,997  
 - Chg Working capital 63  
 = FCFF -473  
 Reinvestment Rate = 7,967/4587  
 =175.04%  
 Return on capital = 21.15%

Reinvestment Rate  
78.03%

Return on Capital  
22.20%

**Expected Growth**  
 $.222 \times .7803 = .1725$  or 17.25%

**Stable Growth**  
 g = 6%; Beta = 1.00;  
 Debt % = 30.3%; k(debt) = 7.5%  
 Cost of capital = 12.2%  
 Tax rate = 25%; ROC = 15%;  
 Reinvestment Rate = 6/15 = 40%

Op. Assets 71,223  
 + Cash: 18,367  
 - Debt 27,492  
 - Minority Int 14,725  
 = Equity 47,373  
 - Options 0  
**Value/Share 5,395 IDR**

First 5 years

Year	1	2	3	4	5	6	7	8	9	10
EBIT (1-t)	5388	6328	7432	8729	10252	11809	13338	14763	16008	16997
- Reinvestment	4204	4938	5799	6811	7999	8317	8378	8151	7621	6799
FCFF	1184	1390	1633	1918	2252	3493	4959	6612	8387	10198

Growth declines gradually to 2.75%

Terminal Value<sub>10</sub> = 10,810 / (.122 - .06) = 174,434

Term Yr  
 18,017  
 7,207  
 10,810

Cost of Capital (WACC) = 14.20% (0.697) + 9.56% (0.303) = 12.79%

Cost of capital declines gradually to 12.2%

**Cost of Equity**  
14.20

**Cost of Debt**  
 (6.24% + 4.3% + 2.2%) (1 - .25)  
 = 9.56%  
 Based on actual A rating

**Weights**  
 E = 69.7% D = 30.3%

*In April 2014, Indofoods was trading at 7200 IDR/share*

**Riskfree Rate:**  
Riskfree rate = 6.24%

+

**Beta**  
0.97

X

**ERP for operations**  
8.21%

=

Unlevered Beta for Sectors: 0.7323

D/E = 43.49%

+

Riskfree rate = 6.24%

X

Beta 0.97

+

Riskfree rate = 6.24%

=

	Indonesia	Other countries	Indofood
ERP for operations	8.30%	Varied	8.21%
Weight	92.70%	7.30%	100.00%



## Lesson 2: Currency should not matter

33

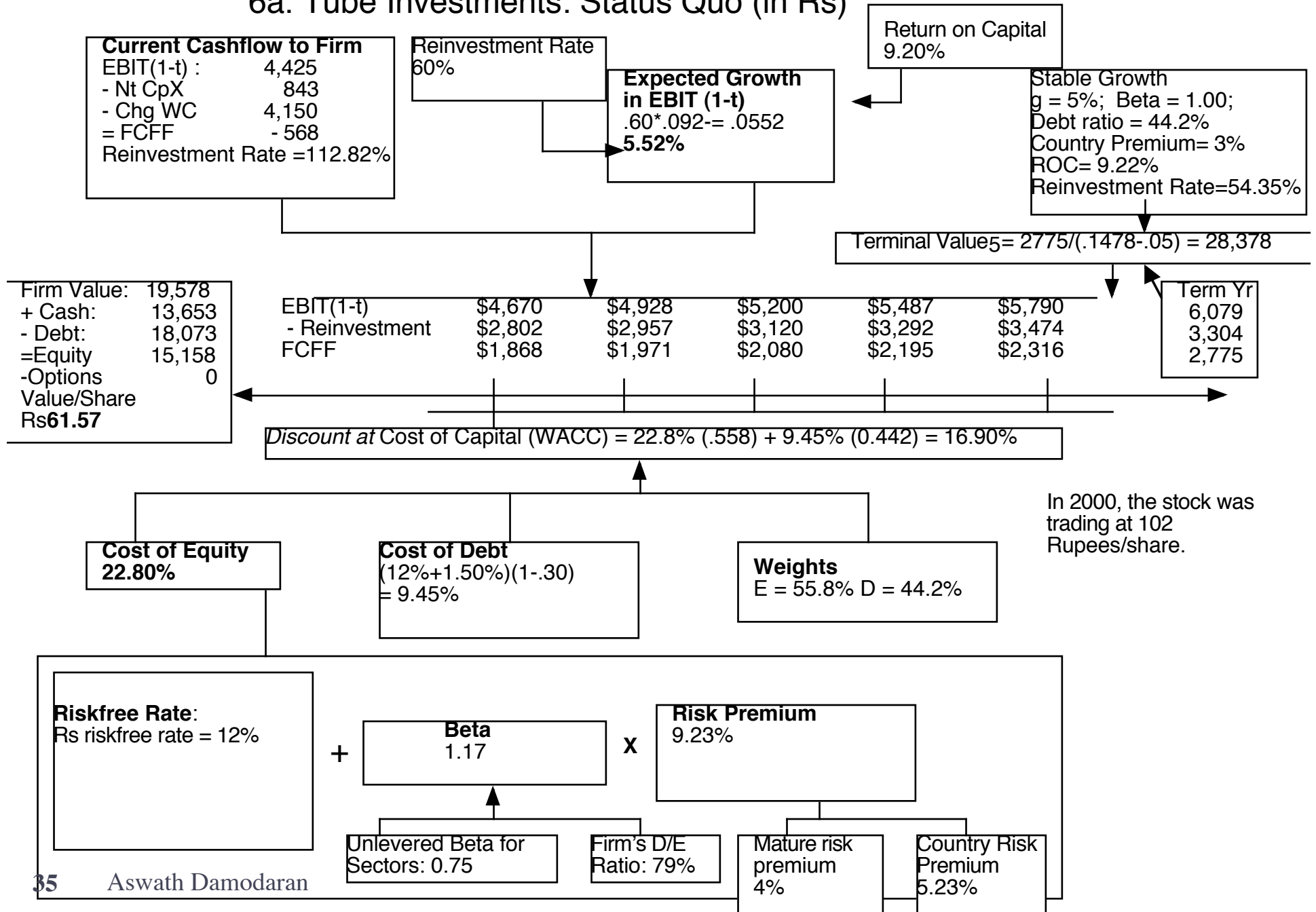
- You can value any company in any currency. Thus, you can value a Brazilian company in nominal reais, US dollars or Swiss Francs.
- For your valuation to stay invariant and consistent, your cash flows and discount rates have to be in the same currency. Thus, if you are using a high inflation currency, both your growth rates and discount rates will be much higher.
- For your cash flows to be consistent, you have to use expected exchange rates that reflect purchasing power parity (the higher inflation currency has to depreciate by the inflation differential each year).

## Lesson 3: The “corporate governance” drag

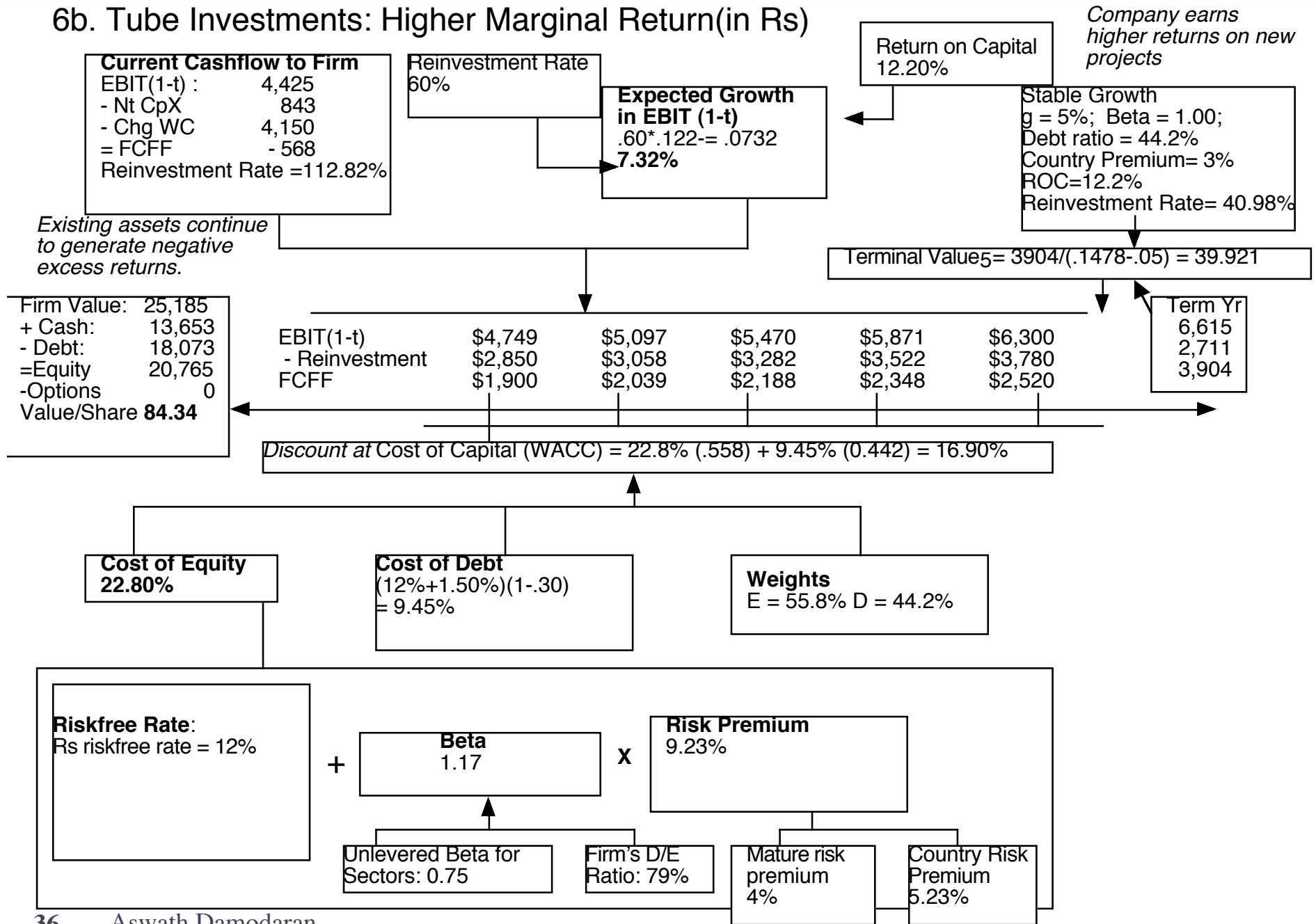
34

- Stockholders in Asian, Latin American and many European companies have little or no power over the managers of the firm. In many cases, insiders own voting shares and control the firm and the potential for conflict of interests is huge.
- This weak corporate governance is often a reason for given for using higher discount rates or discounting the estimated value for these companies.
- Would you discount the value that you estimate for an emerging market company to allow for this absence of stockholder power?
  - a. Yes
  - b. No.

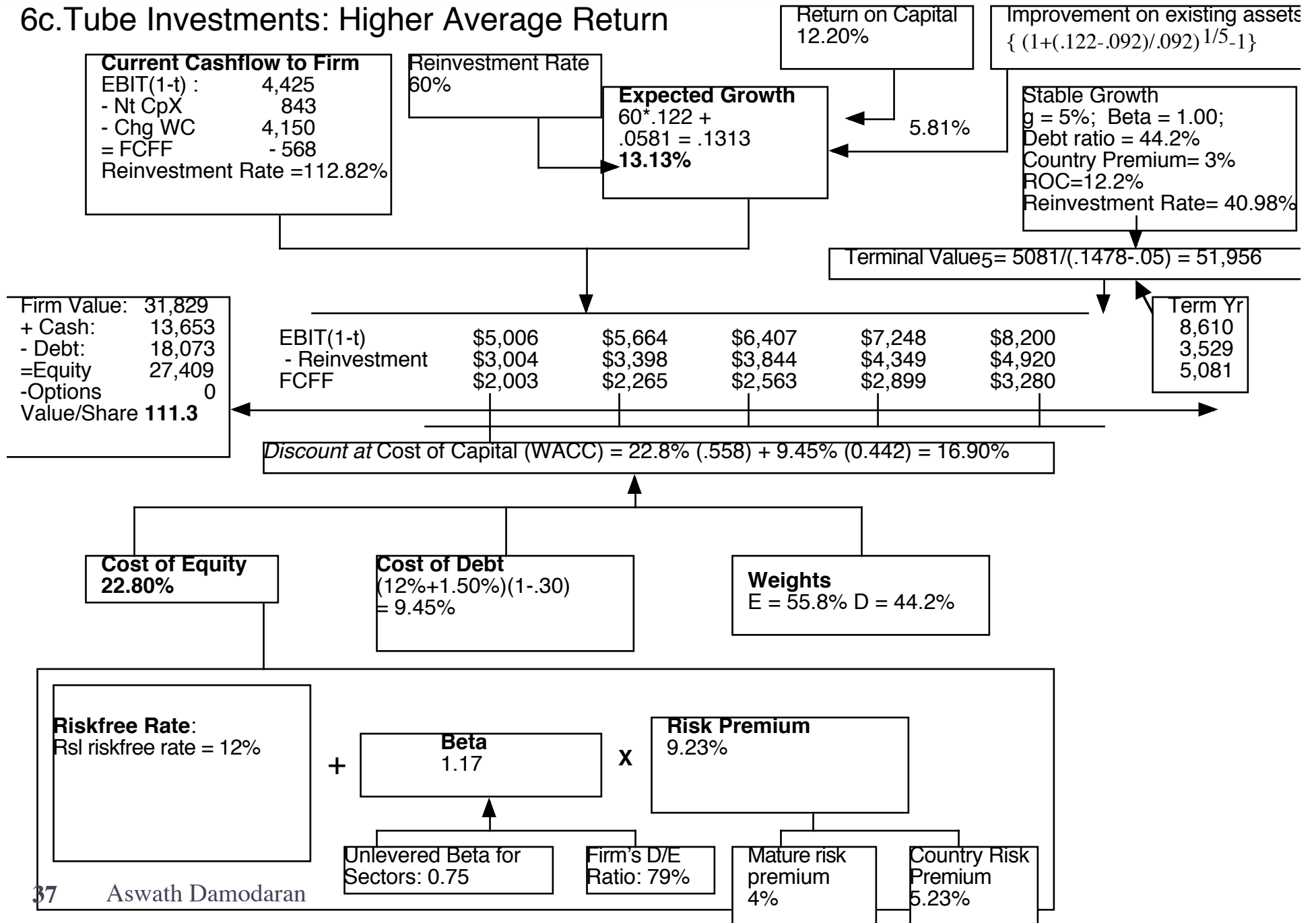
## 6a. Tube Investments: Status Quo (in Rs)



## 6b. Tube Investments: Higher Marginal Return(in Rs)



## 6c. Tube Investments: Higher Average Return



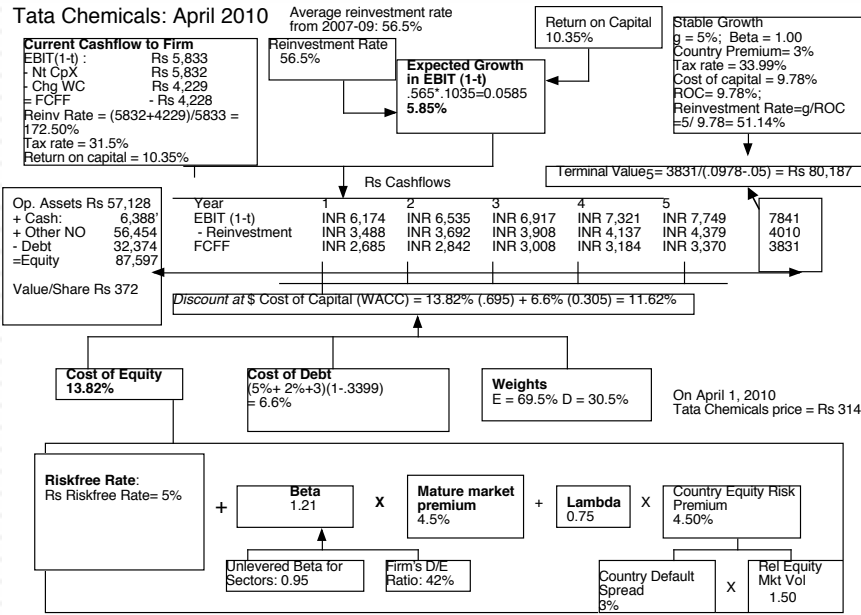
## Lesson 4: Watch out for cross holdings...

38

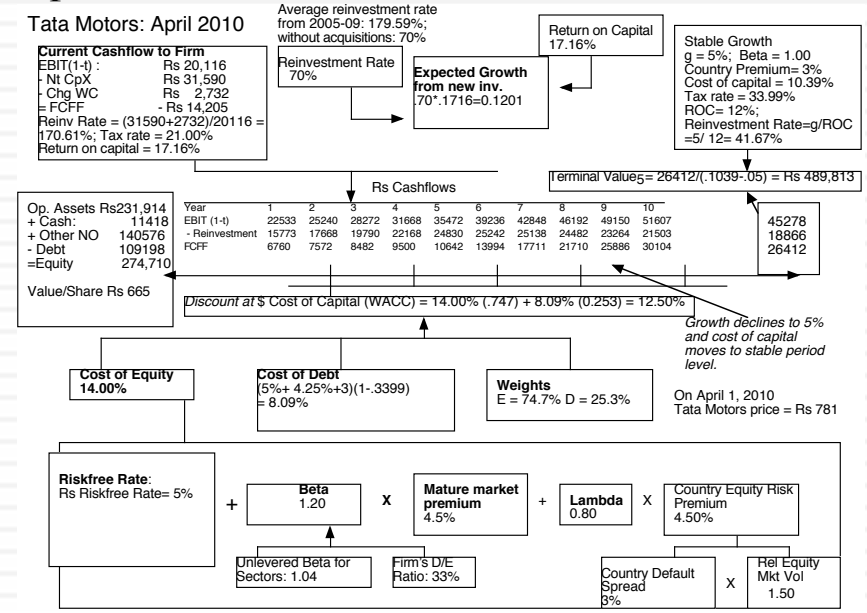
- Emerging market companies are more prone to having cross holdings than companies in developed markets. This is partially the result of history (since many of the larger public companies used to be family owned businesses until a few decades ago) and partly because those who run these companies value control (and use cross holdings to preserve this control).
- In many emerging market companies, the real process of valuation begins when you have finished your DCF valuation, since the cross holdings (which can be numerous) have to be valued, often with minimal information.

# 8. The Tata Group – April 2010

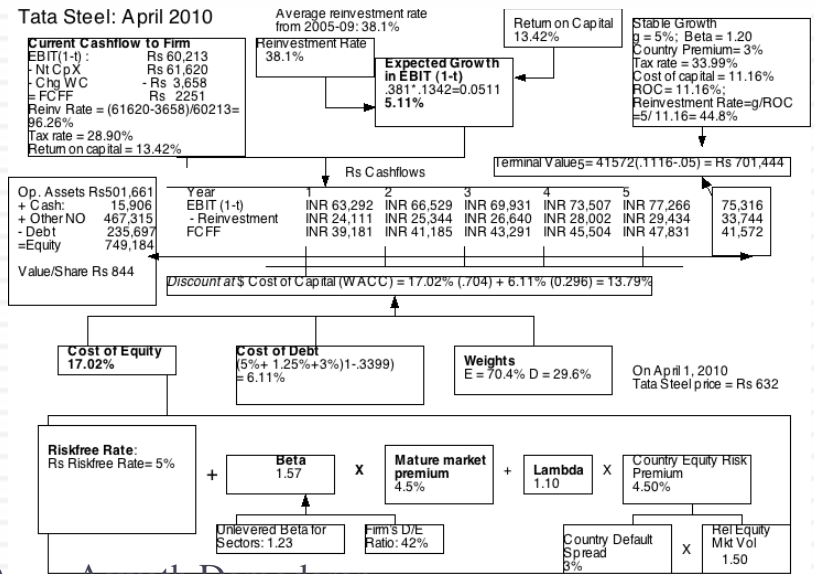
## Tata Chemicals: April 2010



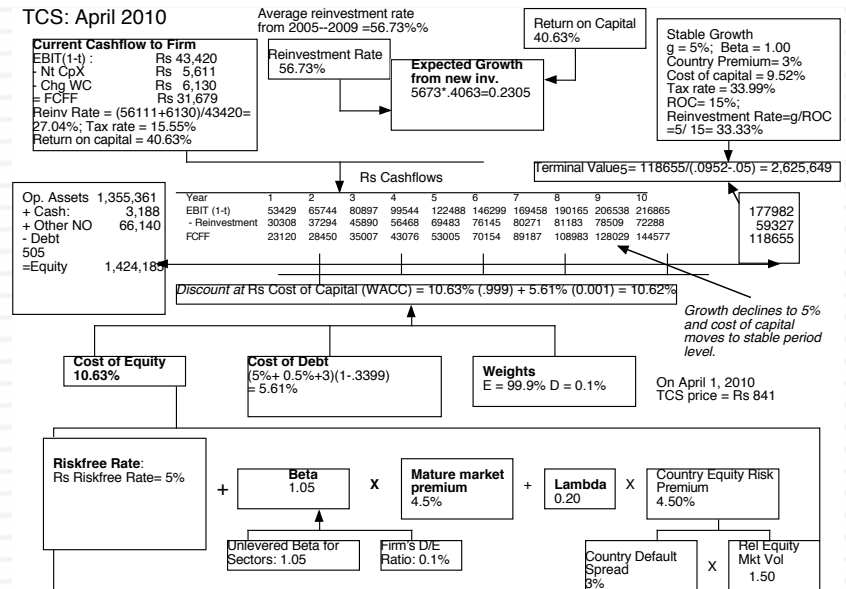
## Tata Motors: April 2010



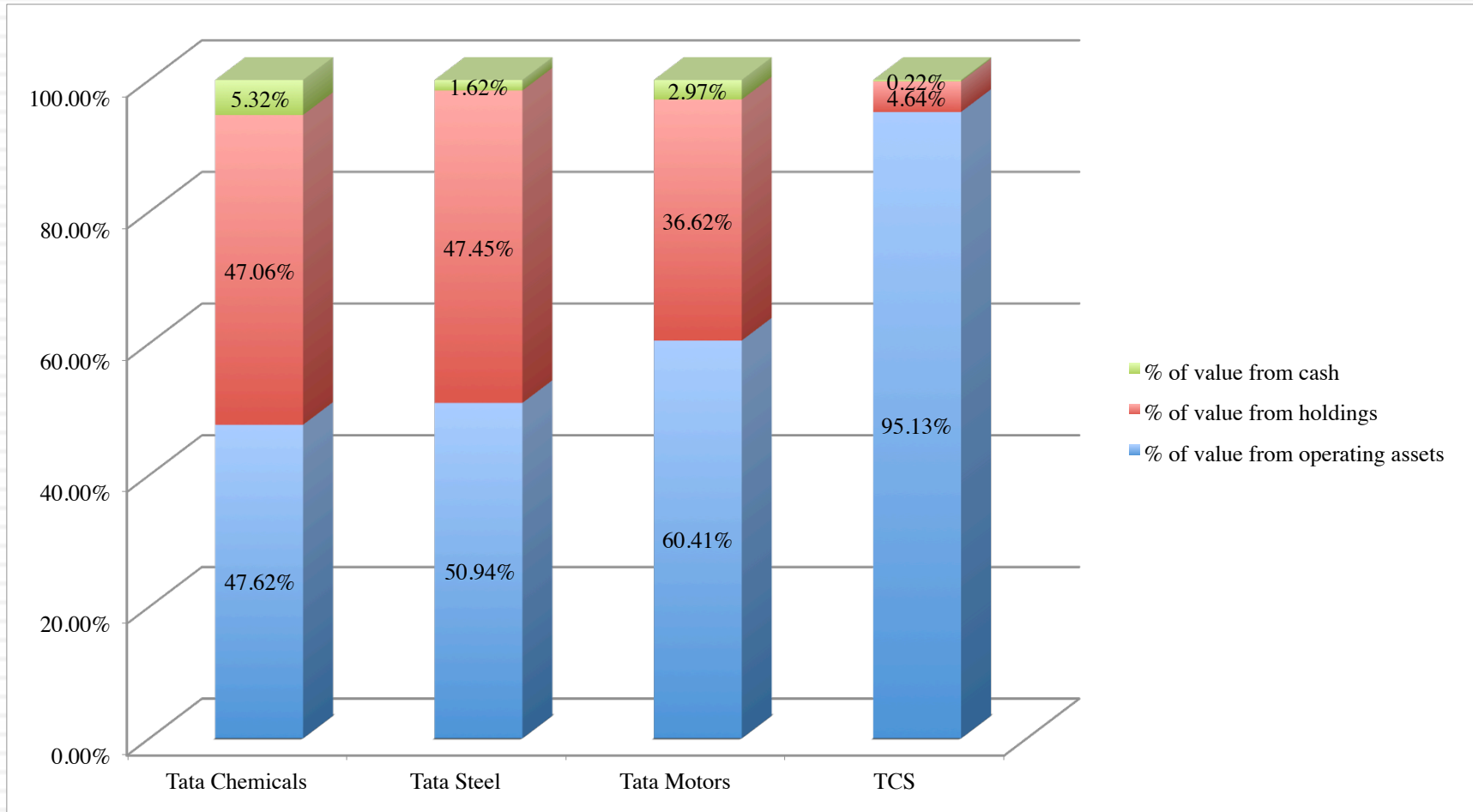
## Tata Steel: April 2010



## TCS: April 2010



# Tata Companies: Value Breakdown





## Lesson 5: Truncation risk can come in many forms...

41

- Natural disasters: Small companies in some economies are much exposed to natural disasters (hurricanes, earthquakes), without the means to hedge against that risk (with insurance or derivative products).
- Terrorism risk: Companies in some countries that are unstable or in the grips of civil war are exposed to damage or destruction.
- Nationalization risk: While less common than it used to be, there are countries where businesses may be nationalized, with owners receiving less than fair value as compensation.

# Dealing with truncation risk..

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- Assume that you are valuing Gazprom, the Russian oil company and have estimated a value of US \$180 billion for the operating assets. The firm has \$30 billion in debt outstanding. What is the value of equity in the firm?
- Now assume that the firm has 15 billion shares outstanding. Estimate the value of equity per share.
- The Russian government owns 42% of the outstanding shares. Would that change your estimate of value of equity per share?

# V. Valuing Financial Service Companies

*Existing assets are usually financial assets or loans, often marked to market. Earnings do not provide much information on underlying risk.*

*Defining capital expenditures and working capital is a challenge. Growth can be strongly influenced by regulatory limits and constraints. Both the amount of new investments and the returns on these investments can change with regulatory changes.*

What are the cashflows from existing assets?

What is the value added by growth assets?

When will the firm become a mature firm, and what are the potential roadblocks?

*Preferred stock is a significant source of capital.*

How risky are the cash flows from both existing assets and growth assets?

What is the value of equity in the firm?

*For financial service firms, debt is raw material rather than a source of capital. It is not only tough to define but if defined broadly can result in high financial leverage, magnifying the impact of small operating risk changes on equity risk.*

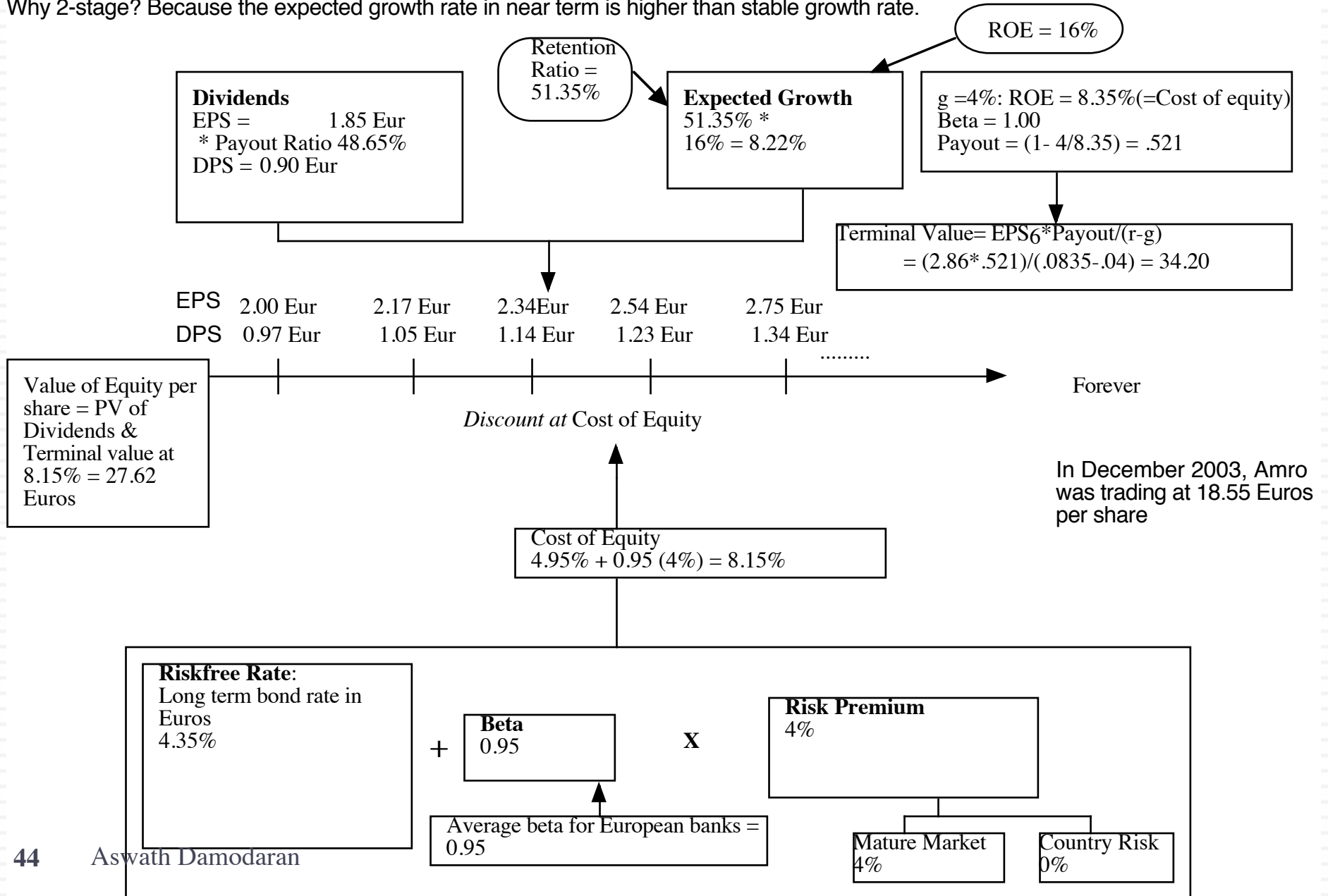
*In addition to all the normal constraints, financial service firms also have to worry about maintaining capital ratios that are acceptable to regulators. If they do not, they can be taken over and shut down.*

## 2a. ABN AMRO - December 2003

### Rationale for model

Why dividends? Because FCFE cannot be estimated

Why 2-stage? Because the expected growth rate in near term is higher than stable growth rate.



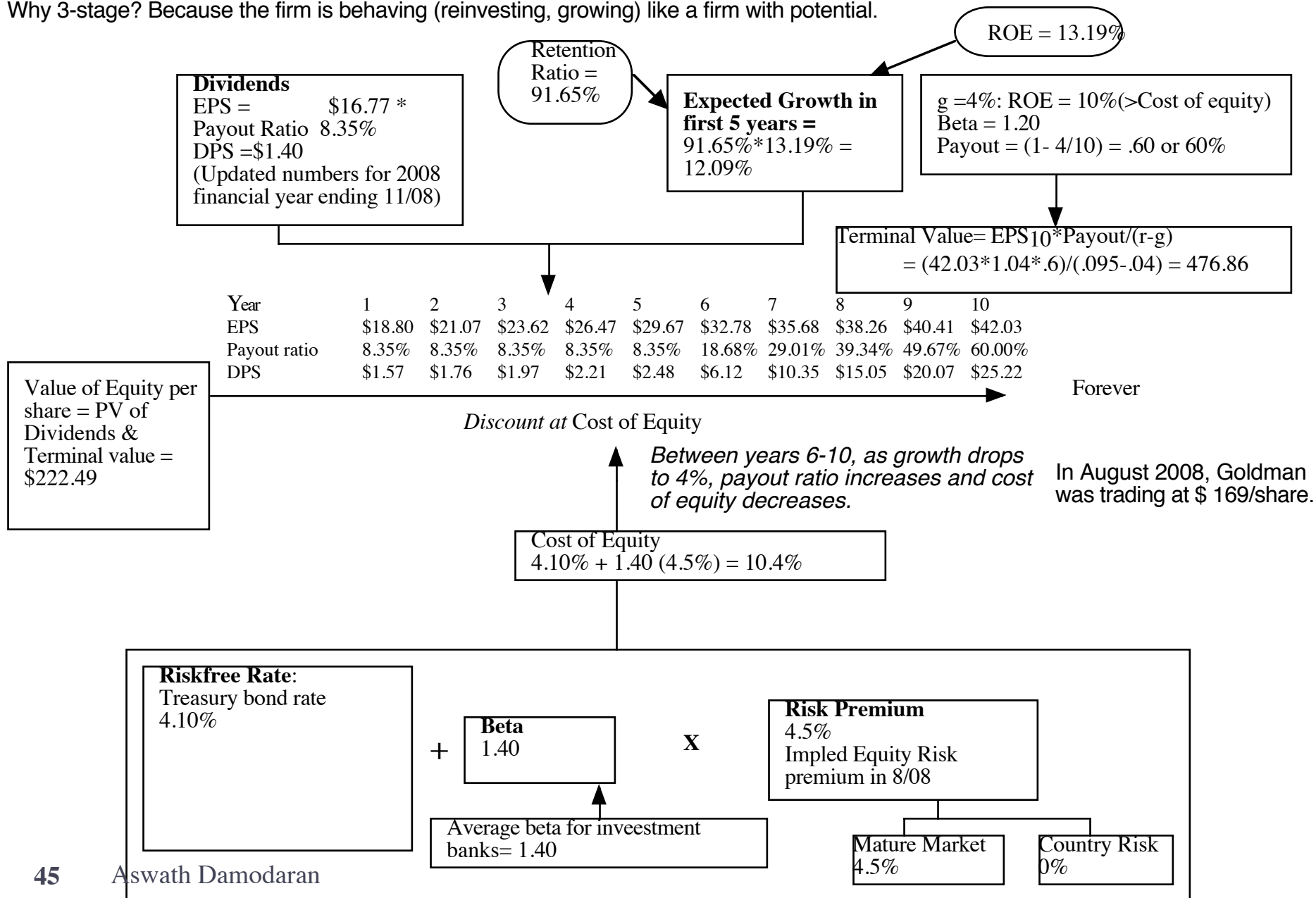
## 2b. Goldman Sachs: August 2008

### Rationale for model

Why dividends? Because FCFE cannot be estimated

Why 3-stage? Because the firm is behaving (reinvesting, growing) like a firm with potential.

Left return on equity at 2008 levels. well below 16% in 2007 and 20% in 2004-2006.



# Lesson 1: Financial service companies are opaque...

46

- With financial service firms, we enter into a Faustian bargain. They tell us very little about the quality of their assets (loans, for a bank, for instance are not broken down by default risk status) but we accept that in return for assets being marked to market (by accountants who presumably have access to the information that we don't have).
- In addition, estimating cash flows for a financial service firm is difficult to do. So, we trust financial service firms to pay out their cash flows as dividends. Hence, the use of the dividend discount model.
- During times of crises or when you don't trust banks to pay out what they can afford to in dividends, using the dividend discount model may not give you a "reliable" value.

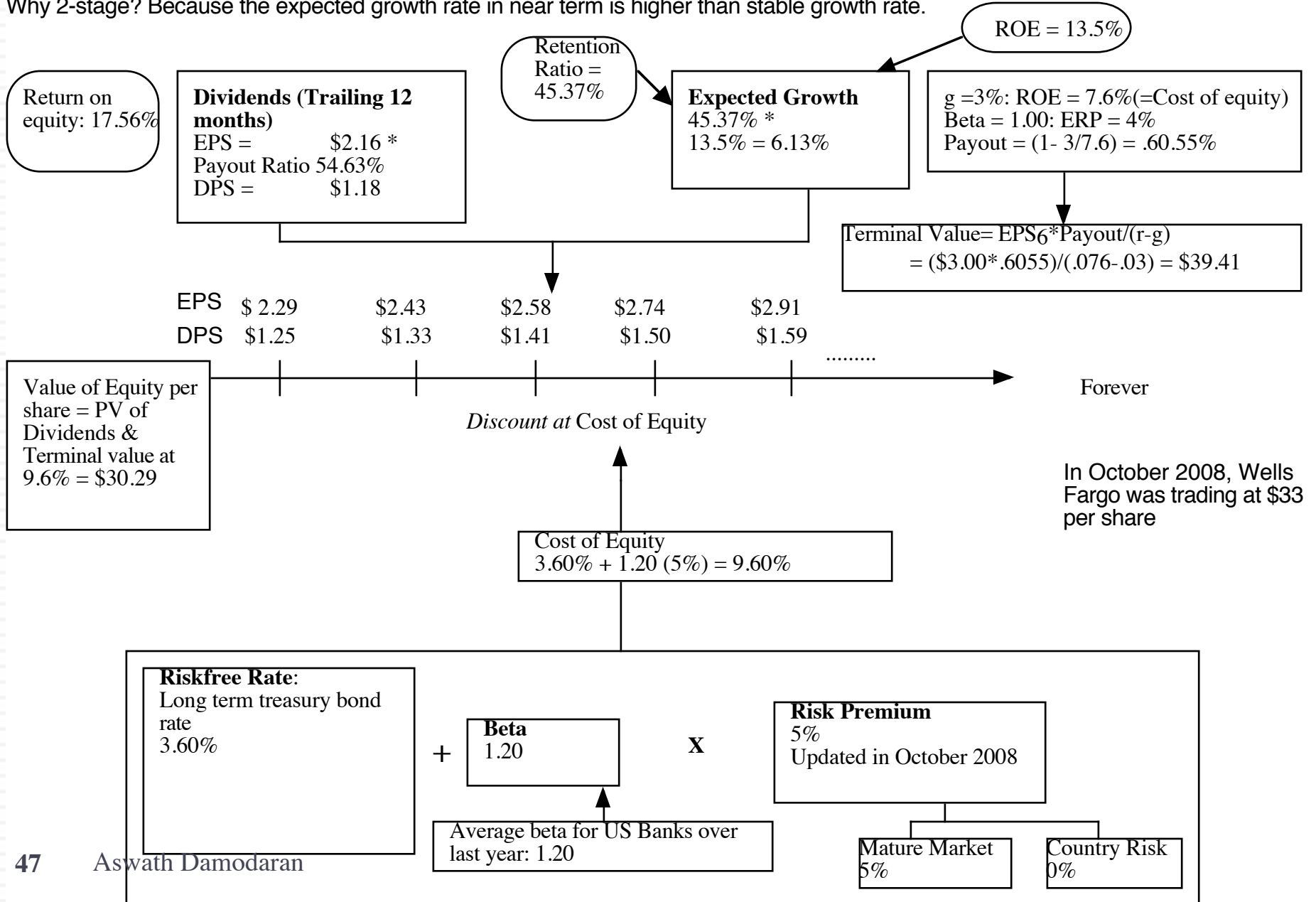
## 2c. Wells Fargo: Valuation on October 7, 2008

Assuming that Wells will have to increase its capital base by about 30% to reflect tighter regulatory concerns. ( $.1756/1.3 = .135$ )

### Rationale for model

Why dividends? Because FCFE cannot be estimated

Why 2-stage? Because the expected growth rate in near term is higher than stable growth rate.



# Lesson 2: For financial service companies, book value matters...

48

- The book value of assets and equity is mostly irrelevant when valuing non-financial service companies. After all, the book value of equity is a historical figure and can be nonsensical. (The book value of equity can be negative and is so for more than a 1000 publicly traded US companies)
- With financial service firms, book value of equity is relevant for two reasons:
  - Since financial service firms mark to market, the book value is more likely to reflect what the firms own right now (rather than a historical value)
  - The regulatory capital ratios are based on book equity. Thus, a bank with negative or even low book equity will be shut down by the regulators.
- From a valuation perspective, it therefore makes sense to pay heed to book value. In fact, you can argue that reinvestment for a bank is the amount that it needs to add to book equity to sustain its growth ambitions and safety requirements:
  - $FCFE = \text{Net Income} - \text{Reinvestment in regulatory capital (book equity)}$



# FCFE for a bank...

49

- To estimate the FCFE for a bank, we redefine reinvestment as investment in regulatory capital. Since any dividends paid deplete equity capital and retained earnings increase that capital, the FCFE is:

$$FCFE_{\text{Bank}} = \text{Net Income} - \text{Increase in Regulatory Capital (Book Equity)}$$

## *Deutsche Bank: FCFE*

	Current	1	2	3	4	5	Steady state
Asset Base	312,882 €	325,398 €	338,414 €	351,950 €	366,028 €	380,669 €	392,089 €
Capital ratio	10.20%	10.16%	10.12%	10.08%	10.04%	10.00%	10.00%
Regulatory Capital	31,914 €	33,060 €	34,247 €	35,477 €	36,749 €	38,067 €	39,244 €
Change in regulatory capital		1,146 €	1,187 €	1,229 €	1,273 €	1,318 €	1,177 €
ROE	9.40%	9.56%	9.72%	9.88%	10.04%	10.20%	10.20%
Net Income	3,000 €	3,161 €	3,329 €	3,505 €	3,690 €	3,883 €	4,003 €
- Investment in Regulatory Capital		1,146 €	1,187 €	1,229 €	1,273 €	1,318 €	1,177 €
FCFE		2,014 €	2,142 €	2,276 €	2,417 €	2,565 €	2,826 €

## 2d. Deutsche Bank: March 2009

### Last 2 years

	2007	2008
Net Income	3,954 m	-3,855m
Dividends	2,146 m	285 m
Risk adjusted assets =	312,882m	
Book Equity =	31,914 m	
Regulatory Capital =		

Normalized  
Net Income  
for base year  
3,000 m  
Normalized  
ROE = 9.4%

Expected  
growth in  
asset base  
4%

Target capital  
ratio 10%  
  
Target ROE  
10.2%

Stable Growth  
g = 3%; Beta = 1.00  
Cost of equity = 10.20%  
Return on equity = 10.20%;  
Reinvestment Rate =  $g/ROE$   
=  $3/10.20\% = 29.41\%$

### Cashflows

	1	2	3	4	5
Asset Base	325,398 €	338,414 €	351,950 €	366,028 €	380,669 €
Capital ratio	10.16%	10.12%	10.08%	10.04%	10.00%
Regulatory Capital	33,060 €	34,247 €	35,477 €	36,749 €	38,067 €
Change in capital	1,146 €	1,187 €	1,229 €	1,273 €	1,318 €
ROE	9.56%	9.72%	9.88%	10.04%	10.20%
Net Income	3,161 €	3,329 €	3,505 €	3,690 €	3,883 €
-Reinvestment	1,146 €	1,187 €	1,229 €	1,273 €	1,318 €
FCFE	2,014 €	2,142 €	2,276 €	2,417 €	2,565 €

Terminal Value<sub>5</sub> =  $2,823 / (.102 - .03) = 39,209$  m

3,999  
1,176  
2,823

PV of CF = 31,383 m  
/ # shares 581.85  
Value/Share 53.94 €

Discount at Cost of equity =  $3.60\% + 1.162 * 6\% + -0.60\% = 11.172\%$

In March 2009  
Deutsche Bank price = 48  
Euros/share (down from 89  
Euros in early 2008)

Riskfree Rate:  
Euro Riskfree Rate =  
3.6%

+

Beta  
1.162

X

Mature market  
premium  
6%

+

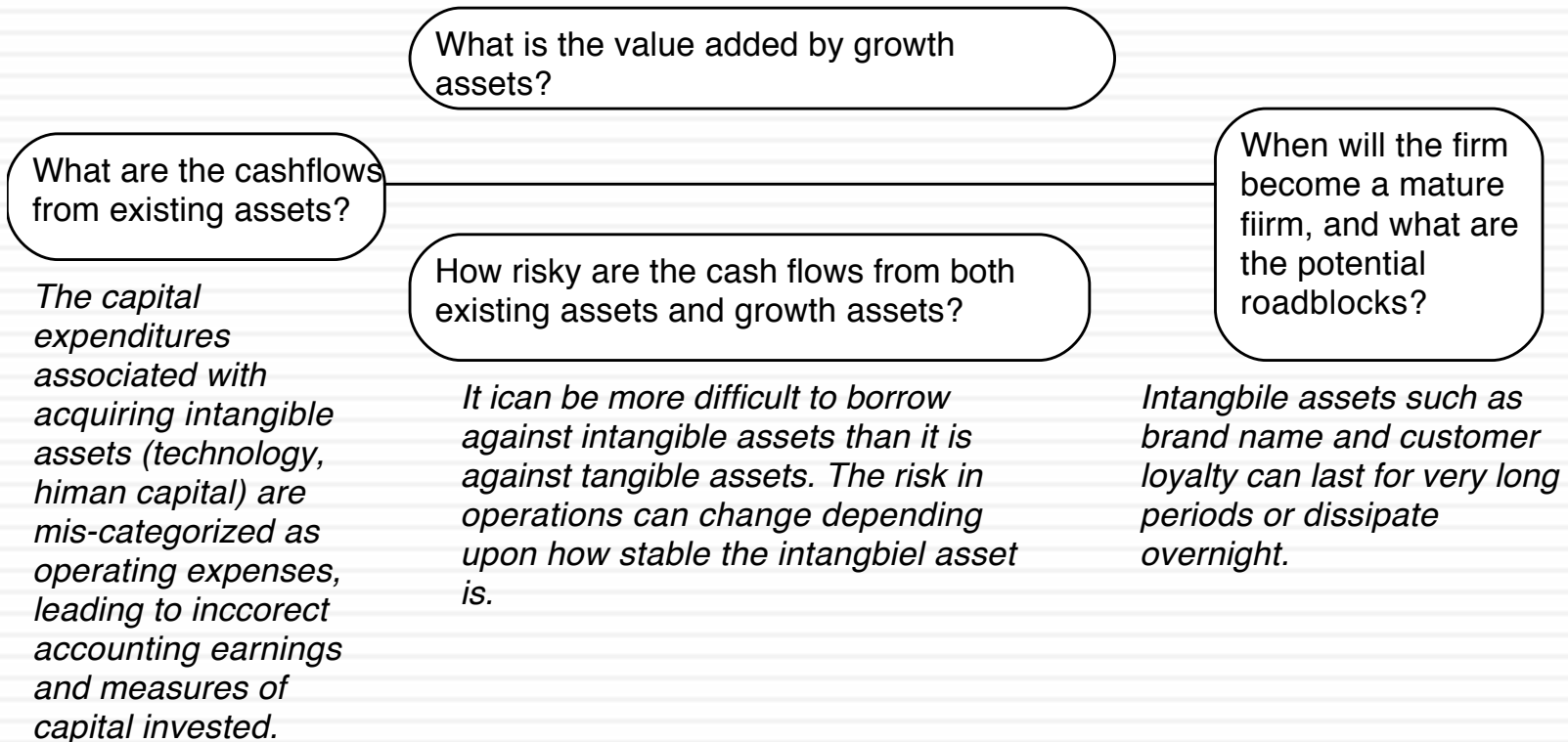
Region	Lambda	CRP
Western Europe	0.68	0.00%
United States	0.42	0.00%
Latin America	0.01	4.50%
Africa & Middle East	0.01	7.00%
Asia	0.11	3.50%
Eastern Europe	0.04	3.00%
Deutsche Bank		0.60%

Beta for commercial &  
investment banking

# VI. Valuing Companies with “intangible” assets

51

*If capital expenditures are miscategorized as operating expenses, it becomes very difficult to assess how much a firm is reinvesting for future growth and how well its investments are doing.*



# Lesson 1: Accounting rules are cluttered with inconsistencies...

52

- If we start with accounting first principles, capital expenditures are expenditures designed to create benefits over many periods. They should not be used to reduce operating income in the period that they are made, but should be depreciated/amortized over their life. They should show up as assets on the balance sheet.
- Accounting is consistent in its treatment of cap ex with manufacturing firms, but is inconsistent with firms that do not fit the mold.
  - With pharmaceutical and technology firms, R&D is the ultimate cap ex but is treated as an operating expense.
  - With consulting firms and other firms dependent on human capital, recruiting and training expenses are your long term investments that are treated as operating expenses.
  - With brand name consumer product companies, a portion of the advertising expense is to build up brand name and is the real capital expenditure. It is treated as an operating expense.

*Exhibit 11.1: Converting R&D expenses to R&D assets - Amgen*

**Step 1: Determining an amortizable life for R & D expenses.** ①

How long will it take, on an expected basis, for research to pay off at Amgen? Given the length of the approval process for new drugs by the Food and Drugs Administration, we will assume that this amortizable life is 10 years.

**Step 2: Capitalize historical R&D expense**

Year	R&D Expense	Unamortized portion	Amortization this year
Current	3030.00	1.00	3030.00
-1	3266.00	0.90	2939.40
-2	3366.00	0.80	2692.80
-3	2314.00	0.70	1619.80
-4	2028.00	0.60	1216.80
-5	1655.00	0.50	827.50
-6	1117.00	0.40	446.80
-7	864.00	0.30	259.20
-8	845.00	0.20	169.00
-9	823.00	0.10	82.30
-10	663.00	0.00	0.00
		\$13283.60	\$1,694.10

④

Current year's R&D expense = Cap ex = \$3,030 million  
 R&D amortization = Depreciation = \$ 1,694 million  
 Unamortized R&D = Capital invested (R&D) = \$13,284 million

**Step 3: Restate earnings, book value and return numbers**

	Unadjusted	Adjusted for R&D	Comments
Net Income	\$4,196	$4,196 + 3030 - 1694 = \$ 5,532$	Add current year's R&D and subtract R&D amortization
Book value of equity	\$17,869	$17,869 + 13,284 = \$ 31,153$	Add unamortized R&D from prior years
Return on Equity	$\frac{4196}{17869} = 23.48\%$	$\frac{5532}{31153} = 17.75\%$	Return on equity drops when book equity is augmented by R&D, even though net income rises.
Pre-tax Operating Income	\$5,594	$5,594 + 3030 - 1694 = \$ 6,930$	Add current year's R&D and subtract R&D amortization
Book value of invested capital	\$21,985	$\$21,985 + \$13,284 = \$35,269$	Add unamortized R&D from prior years
Pre-tax Return on Capital	$\frac{5594}{21985} = 25.44\%$	$\frac{6930}{35269} = 19.65\%$	Return on capital drops when capital is augmented by R&D, even though operating income rises.

⑤

# 10. Amgen: Status Quo

Cap Ex = Acc net Cap Ex(255) + Acquisitions (3975) + R&D (2216)

### Current Cashflow to Firm

EBIT(1-t) =  $.7336(1-.28) = 6058$   
 - Nt CpX = 6443  
 - Chg WC 37  
 = FCFF - 423  
 Reinvestment Rate =  $6480/6058 = 106.98\%$   
 Return on capital = 16.71%

Reinvestment Rate 60%

Expected Growth in EBIT (1-t)  
 $.60 \times .16 = .096$   
 9.6%

Return on Capital 16%

### Stable Growth

$g = 4\%$ ; Beta = 1.10;  
 Debt Ratio = 20%; Tax rate = 35%  
 Cost of capital = 8.08%  
 ROC = 10.00%;  
 Reinvestment Rate =  $4/10 = 40\%$

Terminal Value<sub>10</sub> =  $7300 / (.0808 - .04) = 179,099$

First 5 years

Growth decreases gradually to 4%

Op. Assets 94214  
 + Cash: 1283  
 - Debt 8272  
 = Equity 87226  
 - Options 479  
 Value/Share \$ 74.33

Year	1	2	3	4	5	6	7	8	9	10	Term Yr
EBIT	\$9,221	\$10,106	\$11,076	\$12,140	\$13,305	\$14,433	\$15,496	\$16,463	\$17,306	\$17,998	18718
EBIT (1-t)	\$6,639	\$7,276	\$7,975	\$8,741	\$9,580	\$10,392	\$11,157	\$11,853	\$12,460	\$12,958	12167
- Reinvestment	\$3,983	\$4,366	\$4,785	\$5,244	\$5,748	\$5,820	\$5,802	\$5,690	\$5,482	\$5,183	4867
= FCFF	\$2,656	\$2,911	\$3,190	\$3,496	\$3,832	\$4,573	\$5,355	\$6,164	\$6,978	\$7,775	7300

Cost of Capital (WACC) =  $11.7\% (0.90) + 3.66\% (0.10) = 10.90\%$

Debt ratio increases to 20%  
 Beta decreases to 1.10

On May 1, 2007, Amgen was trading at \$ 55/share

Cost of Equity 11.70%

Cost of Debt  $(4.78\% + .85\%)(1-.35) = 3.66\%$

Weights E = 90% D = 10%

Riskfree Rate: Riskfree rate = 4.78%

+

Beta 1.73

x

Risk Premium 4%

Unlevered Beta for Sectors: 1.59

D/E = 11.06%

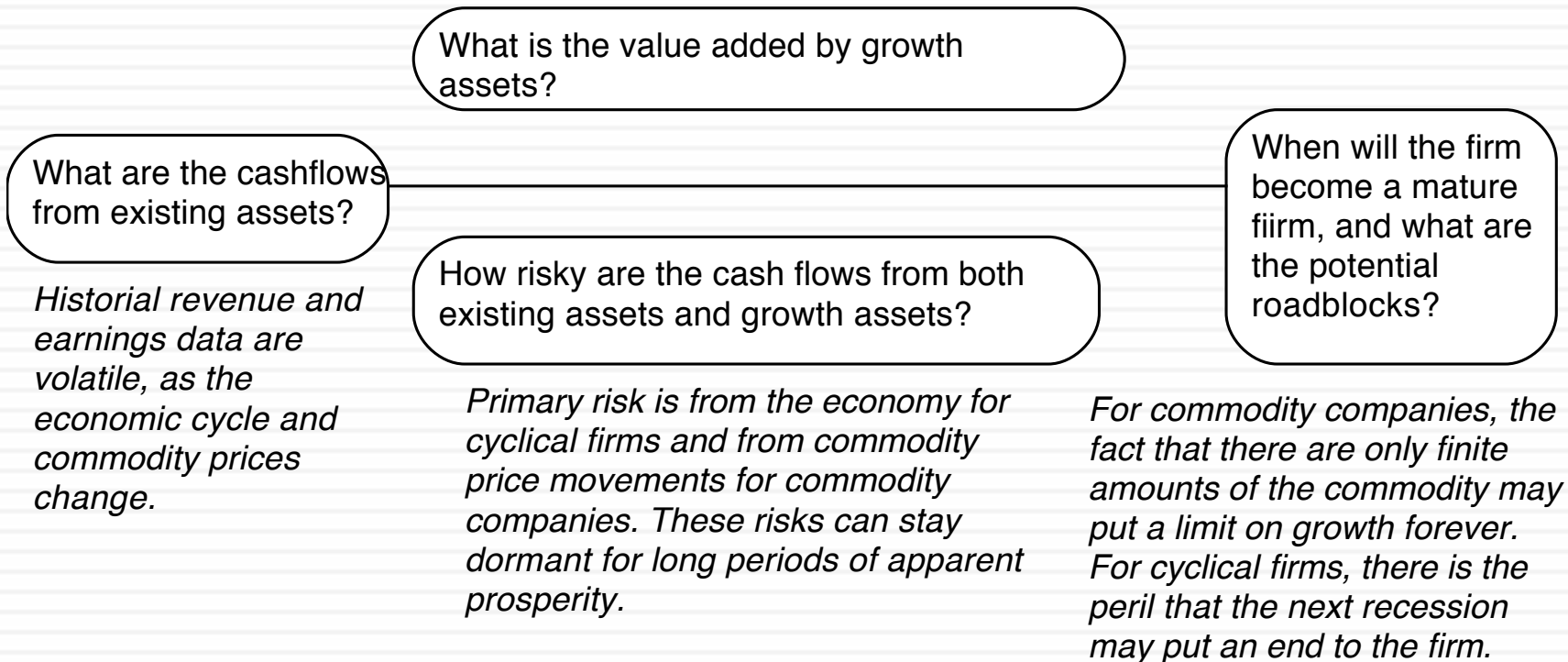
## Lesson 2: And fixing those inconsistencies can alter your view of a company and affect its value

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	No R&D adjustment	R&D adjustment
EBIT	\$5,071	\$7,336
Invested Capital	\$25,277	\$33,173
ROIC	14.58%	18.26%
Reinvestment Rate	115.68%	106.98%
Value of firm	\$58,617	\$95,497
Value of equity	\$50,346	\$87,226
Value/share	\$42.73	\$74.33

# VII. Valuing cyclical and commodity companies

*Company growth often comes from movements in the economic cycle, for cyclical firms, or commodity prices, for commodity companies.*





## Valuing a Cyclical Company - Toyota in Early 2009

Year	Revenues	Operating Income	EBITDA	Operating Margin
FY1 1992	¥10,163,380	¥218,511	¥218,511	2.15%
FY1 1993	¥10,210,750	¥181,897	¥181,897	1.78%
FY1 1994	¥9,362,732	¥136,226	¥136,226	1.45%
FY1 1995	¥8,120,975	¥255,719	¥255,719	3.15%
FY1 1996	¥10,718,740	¥348,069	¥348,069	3.25%
FY1 1997	¥12,243,830	¥665,110	¥665,110	5.43%
FY1 1998	¥11,678,400	¥779,800	¥1,382,950	6.68%
FY1 1999	¥12,749,010	¥774,947	¥1,415,997	6.08%
FY1 2000	¥12,879,560	¥775,982	¥1,430,982	6.02%
FY1 2001	¥13,424,420	¥870,131	¥1,542,631	6.48%
FY1 2002	¥15,106,300	¥1,123,475	¥1,822,975	7.44%
FY1 2003	¥16,054,290	¥1,363,680	¥2,101,780	8.49%
FY1 2004	¥17,294,760	¥1,666,894	¥2,454,994	9.64%
FY1 2005	¥18,551,530	¥1,672,187	¥2,447,987	9.01%
FY1 2006	¥21,036,910	¥1,878,342	¥2,769,742	8.93%
FY1 2007	¥23,948,090	¥2,238,683	¥3,185,683	9.35%
FY1 2008	¥26,289,240	¥2,270,375	¥3,312,775	8.64%
FY 2009 (Estim)	¥22,661,325	¥267,904	¥1,310,304	1.18%
		¥1,306,867		7.33%

In early 2009, Toyota Motors had the highest market share in the sector. However, the global economic recession in 2008-09 had pulled earnings down.

### Normalized Return on capital and Reinvestment ②

Once earnings bounce back to normal, we assume that Toyota will be able to earn a return on capital equal to its cost of capital (5.09%). This is a sector, where earning excess returns has proved to be difficult even for the best of firms. To sustain a 1.5% growth rate, the reinvestment rate has to be:  
 Reinvestment rate =  $1.5\% / 5.09\%$   
 = 29.46%

### Normalized Earnings ①

As a cyclical company, Toyota's earnings have been volatile and 2009 earnings reflect the troubled global economy. We will assume that when economic growth returns, the operating margin for Toyota will revert back to the historical average.

Normalized Operating Income = Revenues in 2009 \* Average Operating Margin (98--09)  
 =  $22661 * .0733 = 1660.7$  billion yen

Operating Assets	19,640
+ Cash	2,288
+ Non-operating assets	6,845
- Debt	11,862
- Minority Interests	583
Value of Equity	
/ No of shares	/3,448
Value per share	¥4735

$$\text{Value of operating assets} = \frac{1660.7 (1.015) (1 - .407) (1 - .2946)}{(.0509 - .015)} = 19,640 \text{ billion}$$

### Normalized Cost of capital ③

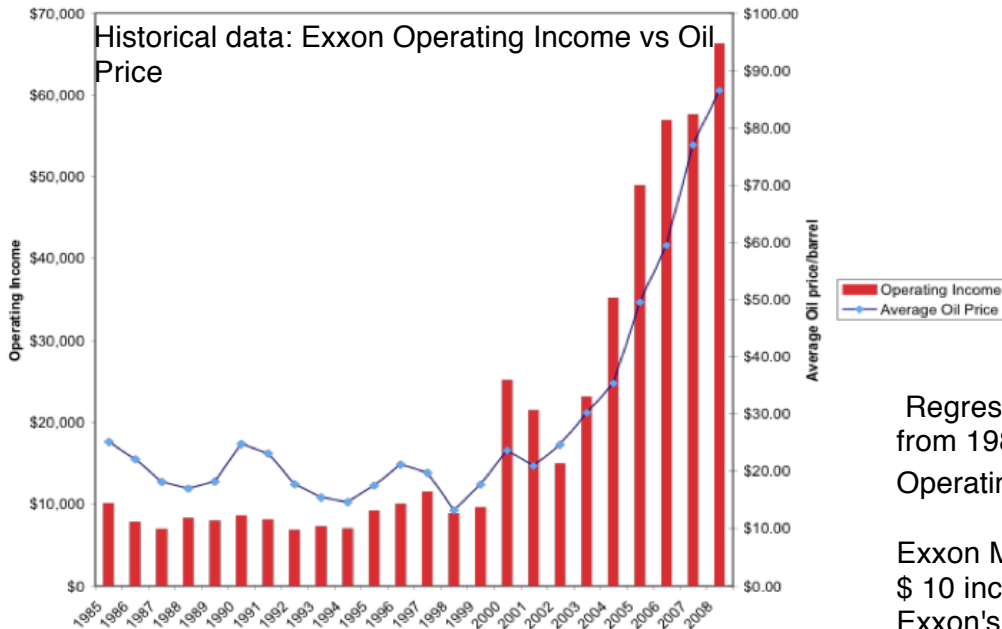
The cost of capital is computed using the average beta of automobile companies (1.10), and Toyota's cost of debt (3.25%) and debt ratio (52.9% debt ratio). We use the Japanese marginal tax rate of 40.7% for computing both the after-tax cost of debt and the after-tax operating income

Cost of capital =  $8.65\% (.471) + 3.25\% (1 - .407) (.529) = 5.09\%$

### Stable Growth ④

Once earnings are normalized, we assume that Toyota, as the largest market-share company, will be able to maintain only stable growth (1.5% in Yen terms)

## Valuing a commodity company - Exxon in Early 2009



Regressing Exxon's operating income against the oil price per barrel from 1985-2008:

$$\text{Operating Income} = -6,395 + 911.32 (\text{Average Oil Price}) \quad R^2 = 90.2\%$$

(2.95)      (14.59)

Exxon Mobil's operating income increases about \$9.11 billion for every \$ 10 increase in the price per barrel of oil and 90% of the variation in Exxon's earnings over time comes from movements in oil prices.

### Estimate normalized income based on current oil price ①

At the time of the valuation, the oil price was \$ 45 a barrel. Exxon's operating income based on this price is

$$\text{Normalized Operating Income} = -6,395 + 911.32 (\$45) = \$34,614$$

### Estimate return on capital and reinvestment rate based on normalized income ②

This operating income translates into a return on capital of approximately 21% and a reinvestment rate of 9.52%, based upon a 2% growth rate.

$$\text{Reinvestment Rate} = g / \text{ROC} = 2 / 21\% = 9.52\%$$

$$\text{Value of operating assets} = \frac{34,614(1 - .38)(1 - .0952)}{(.0818 - .02)} = \$320,472 \text{ million}$$

### Exxon's cost of capital ④

Exxon has been a predominantly equity funded company, and is expected to remain so, with a debt ratio of only 2.85%. Its cost of equity is 8.35% (based on a beta of 0.90) and its pre-tax cost of debt is 3.75% (given AAA rating). The marginal tax rate is 38%.

$$\text{Cost of capital} = 8.35\% (0.9715) + 3.75\% (1 - .38) (.0285) = 8.18\%$$

### Expected growth in operating income ③

Since Exxon Mobile is the largest oil company in the world, we will assume an expected growth of only 2% in perpetuity.

# Lesson 1: With “macro” companies, it is easy to get lost in “macro” assumptions...

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- With cyclical and commodity companies, it is undeniable that the value you arrive at will be affected by your views on the economy or the price of the commodity.
- Consequently, you will feel the urge to take a stand on these macro variables and build them into your valuation. Doing so, though, will create valuations that are jointly impacted by your views on macro variables and your views on the company, and it is difficult to separate the two.
- The best (though not easiest) thing to do is to separate your macro views from your micro views. Use current market based numbers for your valuation, but then provide a separate assessment of what you think about those market numbers.

## Lesson 2: Use probabilistic tools to assess value as a function of macro variables...

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- If there is a key macro variable affecting the value of your company that you are uncertain about (and who is not), why not quantify the uncertainty in a distribution (rather than a single price) and use that distribution in your valuation.
- That is exactly what you do in a Monte Carlo simulation, where you allow one or more variables to be distributions and compute a distribution of values for the company.
- With a simulation, you get not only everything you would get in a standard valuation (an estimated value for your company) but you will get additional output (on the variation in that value and the likelihood that your firm is under or over valued)

# Exxon Mobil Valuation: Simulation

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