~~Advanced~~ Valuation

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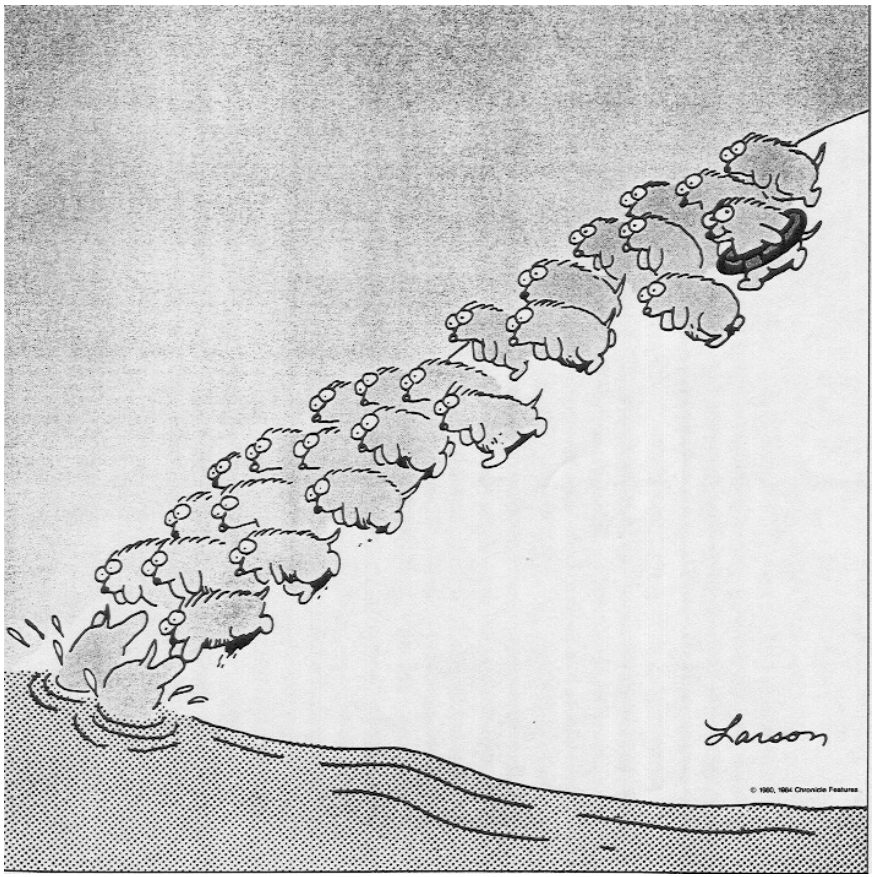
Some Initial Thoughts

" One hundred thousand lemmings cannot be wrong"

Graffiti



Misconceptions about Valuation

- Myth 1: A valuation is an objective search for "true" value
  - Truth 1.1: All valuations are biased. The only questions are how much and in which direction.
  - Truth 1.2: The direction and magnitude of the bias in your valuation is directly proportional to who pays you and how much you are paid.
- Myth 2.: A good valuation provides a precise estimate of value
  - Truth 2.1: There are no precise valuations
  - Truth 2.2: The payoff to valuation is greatest when valuation is least precise.
- Myth 3: . The more quantitative a model, the better the valuation
  - Truth 3.1: One's understanding of a valuation model is inversely proportional to the number of inputs required for the model.
  - Truth 3.2: Simpler valuation models do much better than complex ones.

Approaches to Valuation

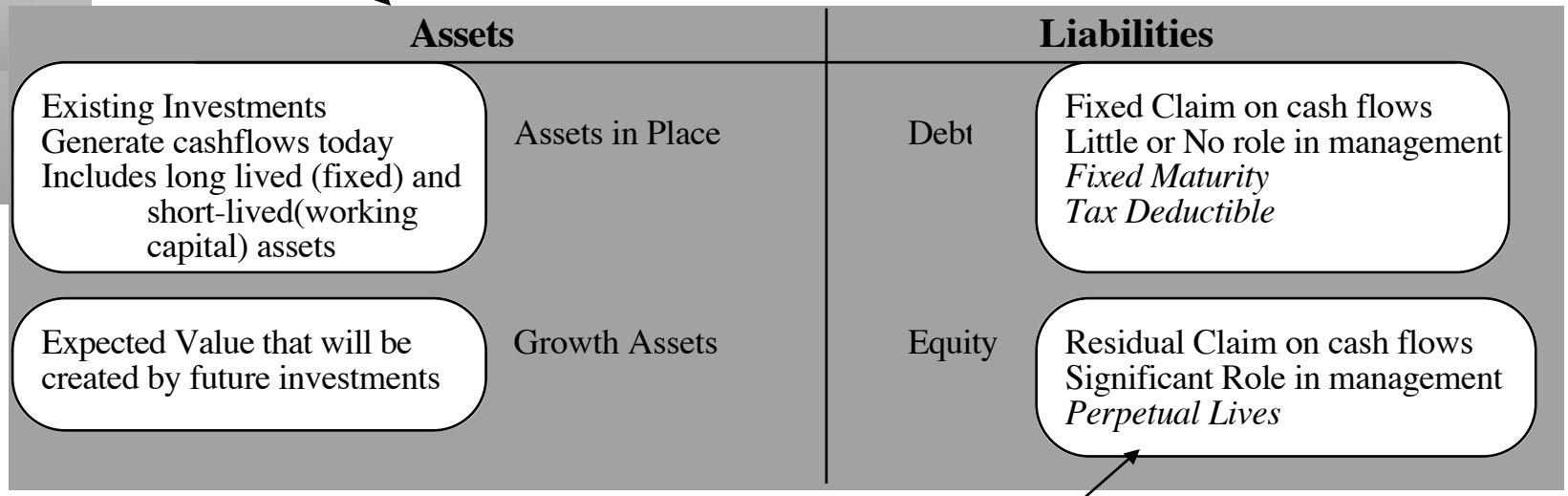
- **Discounted cashflow valuation**, relates the value of an asset to the present value of expected future cashflows on that asset.
- **Relative valuation**, estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable like earnings, cashflows, book value or sales.
- **Contingent claim valuation**, uses option pricing models to measure the value of assets that share option characteristics.

Discounted Cash Flow Valuation

- **What is it**: In discounted cash flow valuation, the value of an asset is the present value of the expected cash flows on the asset.
- **Philosophical Basis**: Every asset has an intrinsic value that can be estimated, based upon its characteristics in terms of cash flows, growth and risk.
- **Information Needed**: To use discounted cash flow valuation, you need
  - to estimate the life of the asset
  - to estimate the cash flows during the life of the asset
  - to estimate the discount rate to apply to these cash flows to get present value
- **Market Inefficiency**: Markets are assumed to make mistakes in pricing assets across time, and are assumed to correct themselves over time, as new information comes out about assets.

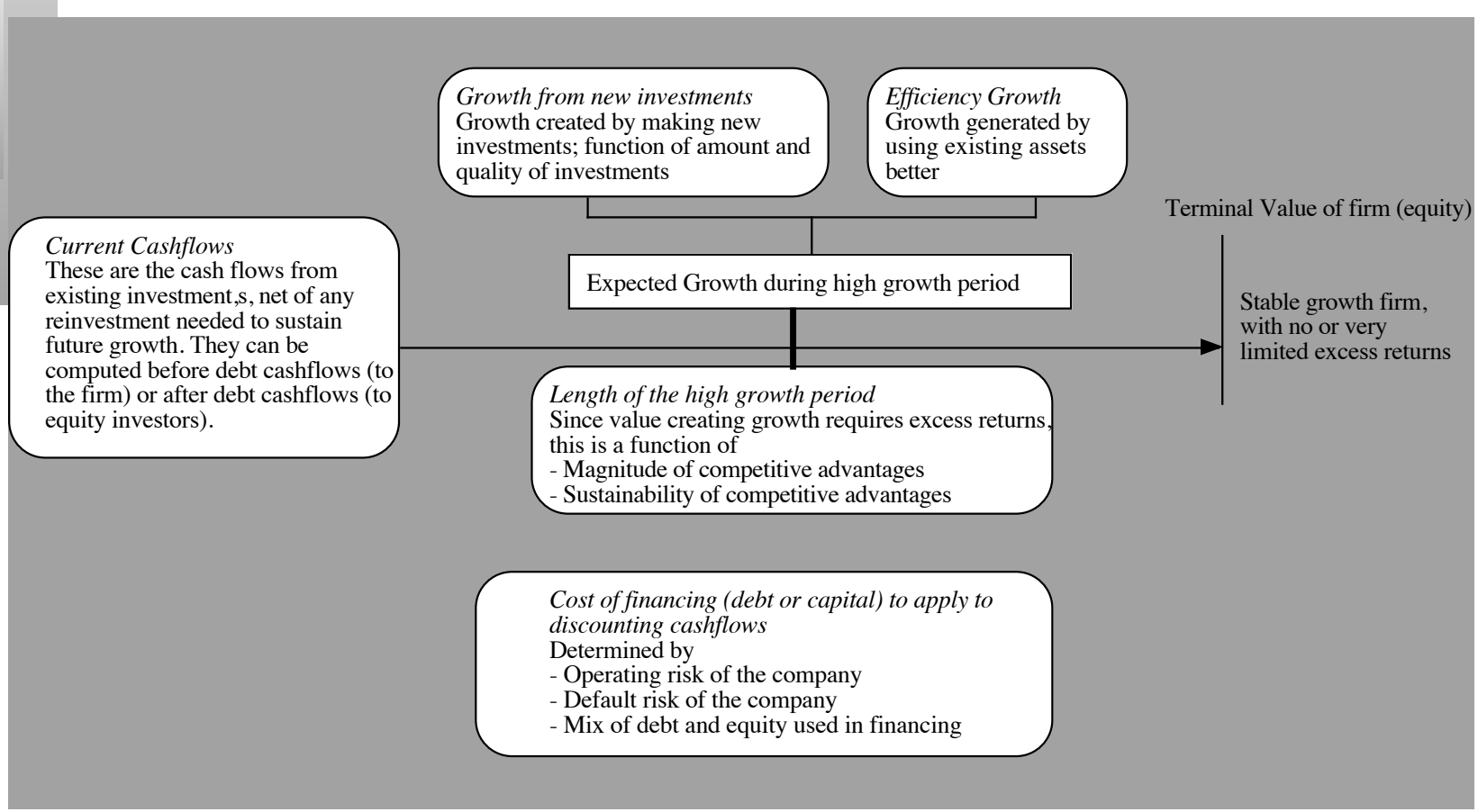
DCF Choices: Equity Valuation versus Firm Valuation

Firm Valuation: Value the entire business

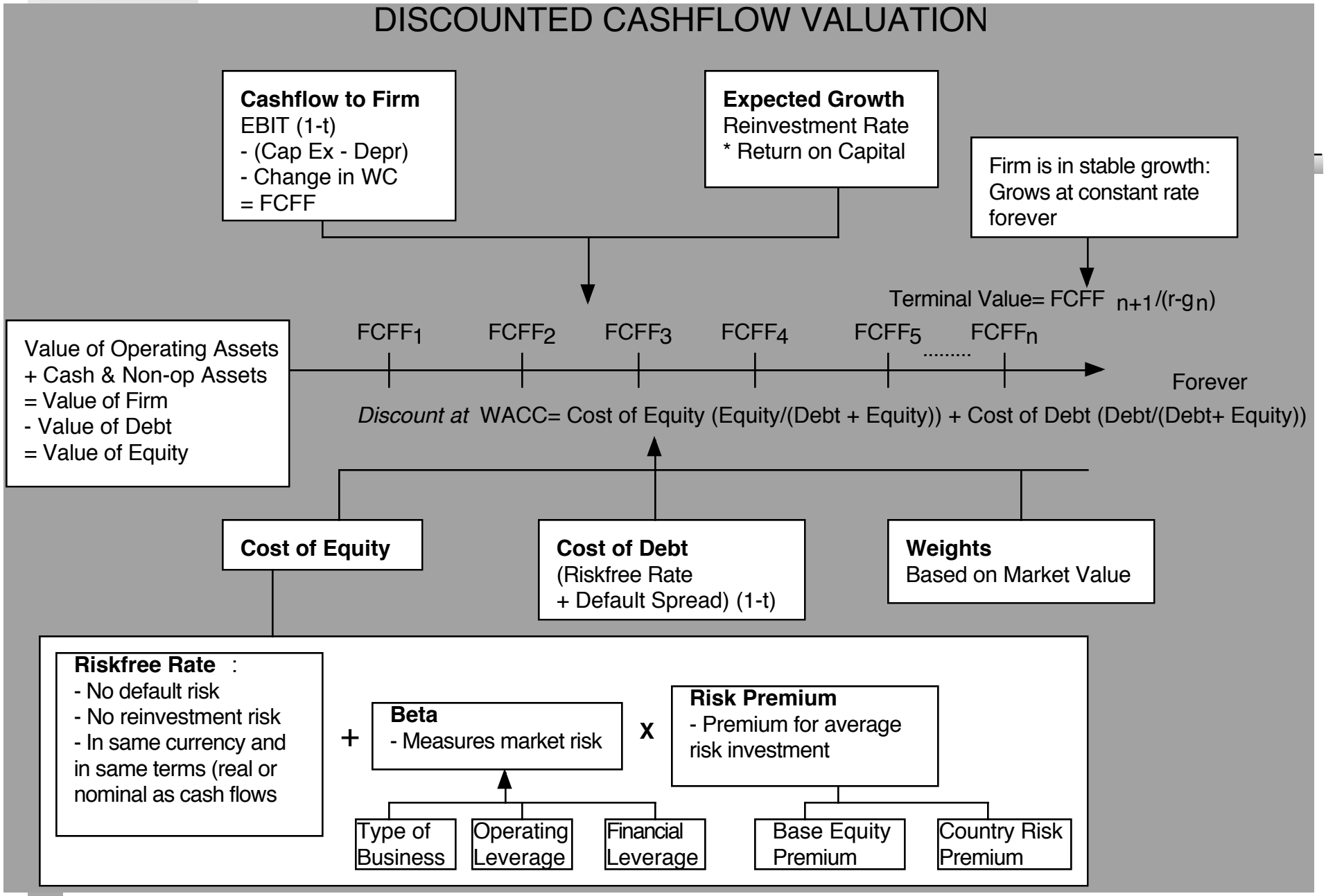


Equity valuation: Value just the equity claim in the business

The Drivers of Value…



DISCOUNTED CASHFLOW VALUATION



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%

Return on Capital 16%

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

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$_{10}$ = 7300/(.0808-.04) = 179,099

First 5 years

Growth decreases gradually to 4%

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

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

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%

+

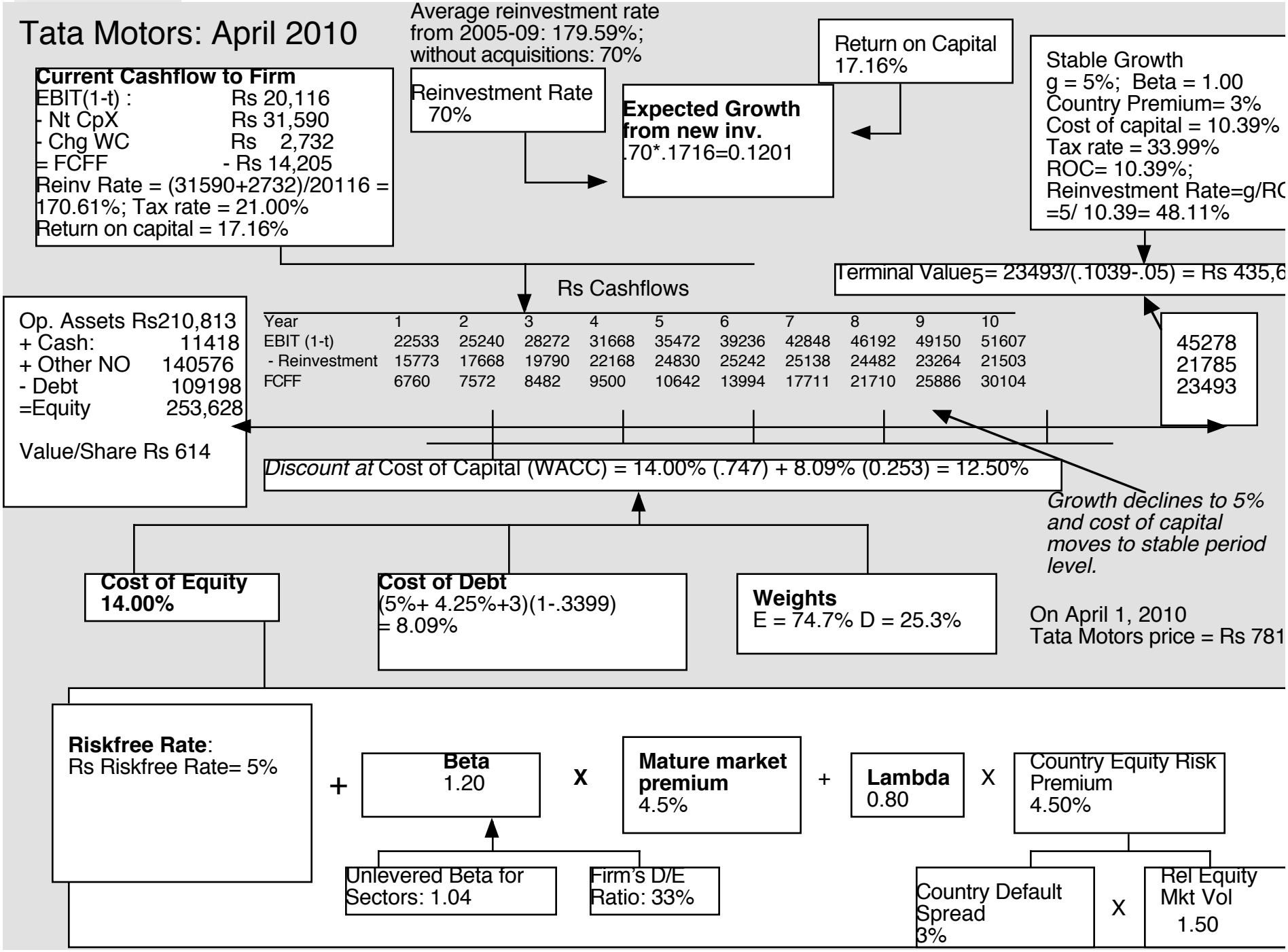
Beta
1.73

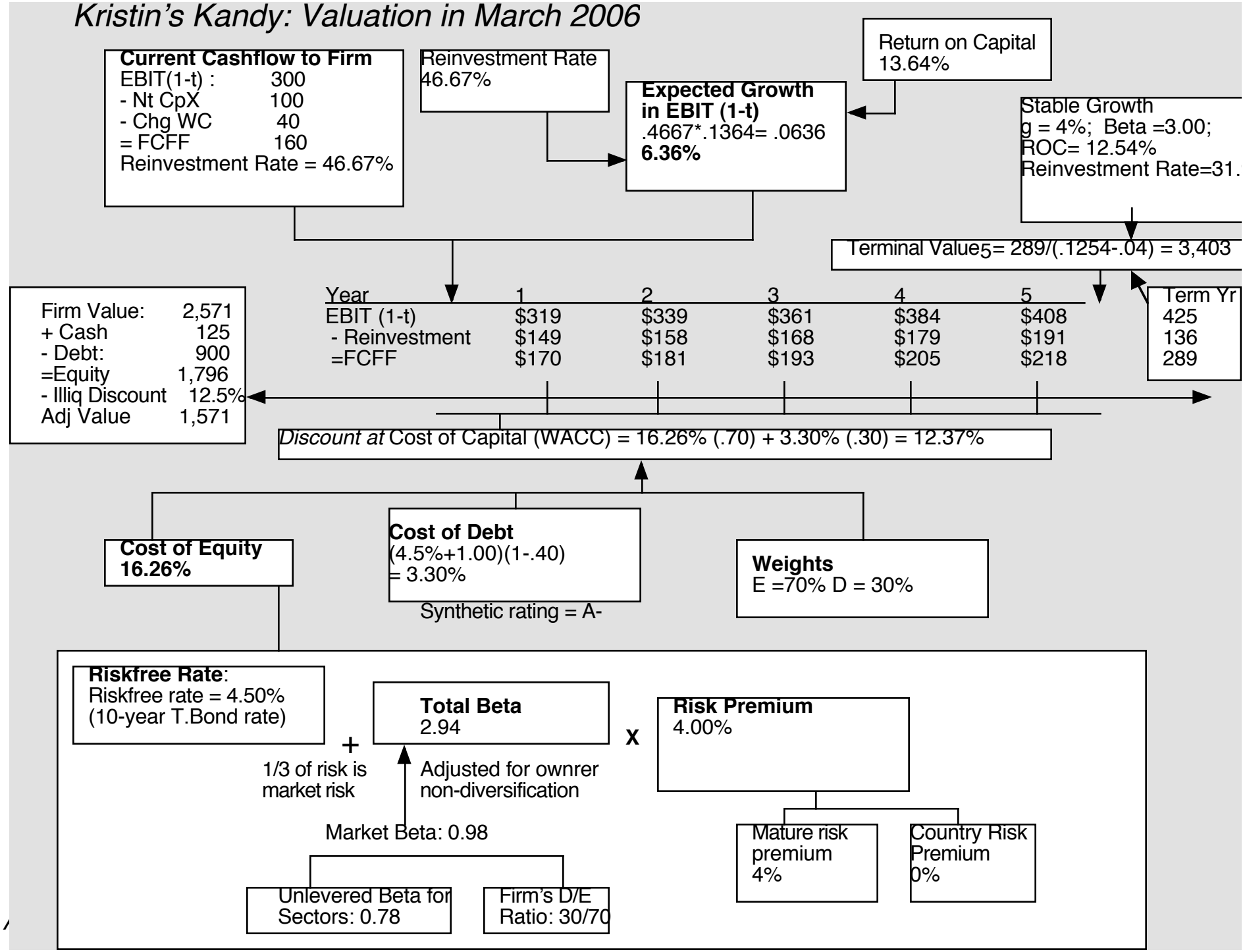
Unlevered Beta for Sectors: 1.59

D/E=11.06%

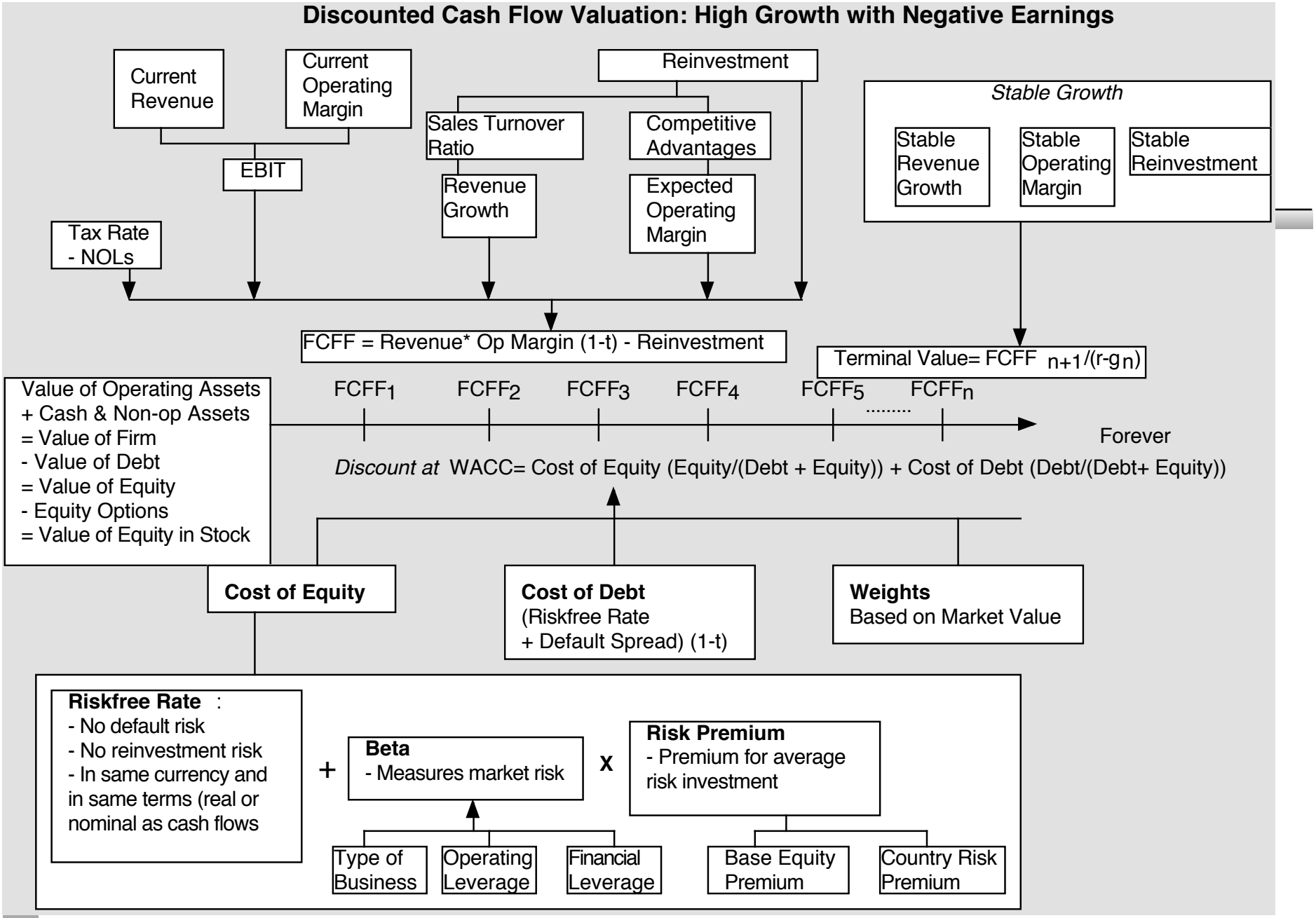
x

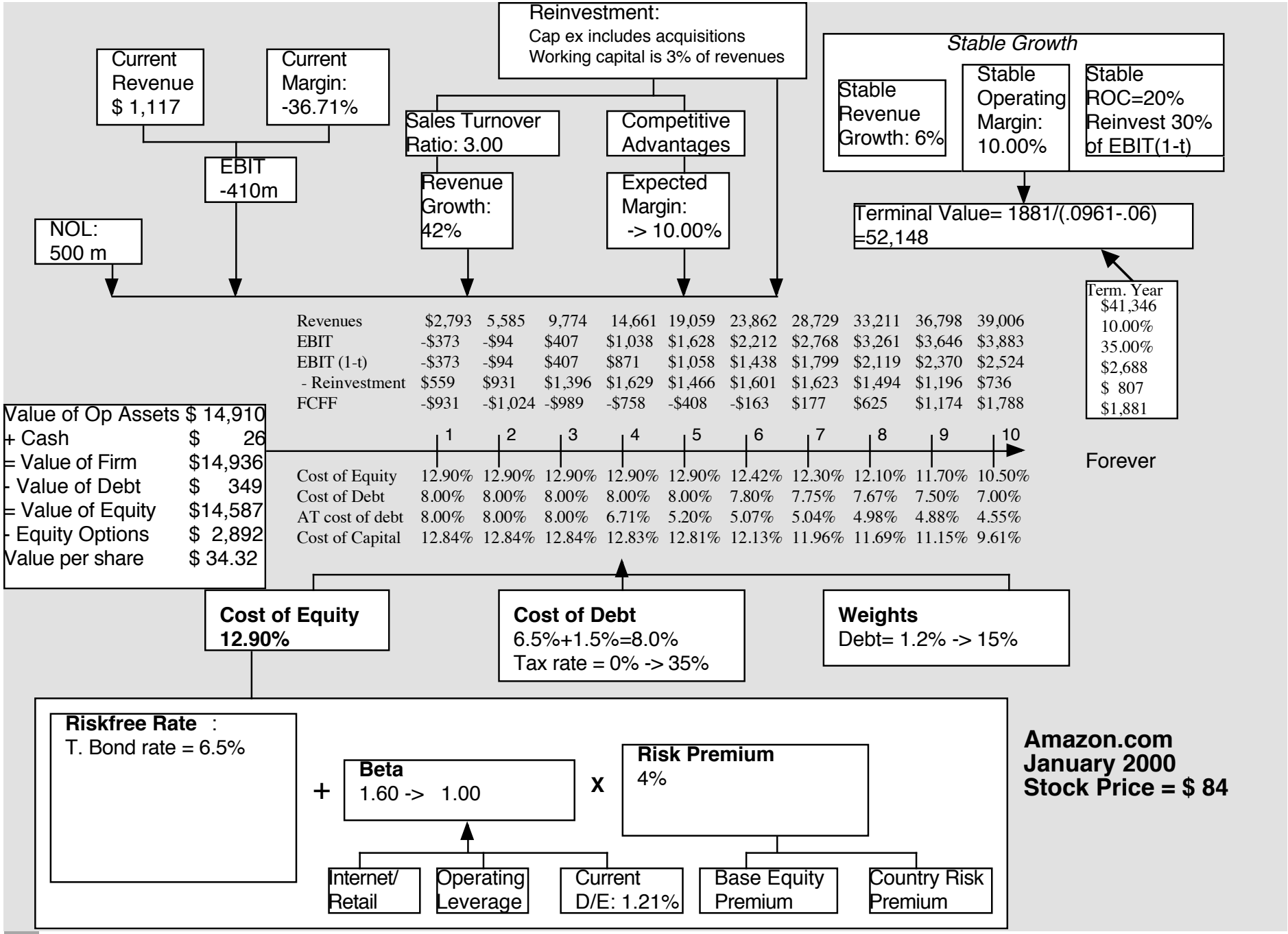
Risk Premium
4%


Tata Motors: April 2010
Average reinvestment rate from 2005-09: 179.59%; without acquisitions: 70%
Current Cashflow to Firm
EBIT(1-t) : Rs 20,116
- Nt CpX Rs 31,590
- Chg WC Rs 2,732
= FCFF - Rs 14,205
Reinv Rate = (31590+2732)/20116 = 170.61%; Tax rate = 21.00%
Return on capital = 17.16%
Reinvestment Rate 70%
Return on Capital 17.16%
Expected Growth from new inv. .70*.1716=0.1201
Stable Growth g = 5%; Beta = 1.00
Country Premium= 3%
Cost of capital = 10.39%
Tax rate = 33.99%
ROC= 10.39%;
Reinvestment Rate=g/RO
=5/ 10.39= 48.11%
Terminal Value5= 23493/(.1039-.05) = Rs 435,6
Rs Cashflows
Year 1 2 3 4 5 6 7 8 9 10
EBIT (1-t) 22533 25240 28272 31668 35472 39236 42848 46192 49150 51607
- Reinvestment 15773 17668 19790 22168 24830 25242 25138 24482 23264 21503
FCFF 6760 7572 8482 9500 10642 13994 17711 21710 25886 30104
45278
21785
23493
Op. Assets Rs210,813
+ Cash: 11418
+ Other NO 140576
- Debt 109198
=Equity 253,628
Value/Share Rs 614
Discount at Cost of Capital (WACC) = 14.00% (.747) + 8.09% (0.253) = 12.50%
Growth declines to 5% and cost of capital moves to stable period level.
Cost of Equity 14.00%
Cost of Debt (5%+ 4.25%+3)(1-.3399) = 8.09%
Weights E = 74.7% D = 25.3%
On April 1, 2010 Tata Motors price = Rs 781
Riskfree Rate: Rs Riskfree Rate= 5%
+
Beta 1.20
X
Mature market premium 4.5%
+
Lambda 0.80
X
Country Equity Risk Premium 4.50%
Unlevered Beta for Sectors: 1.04
Firm's D/E Ratio: 33%
Country Default Spread 3%
X
Rel Equity Mkt Vol 1.50

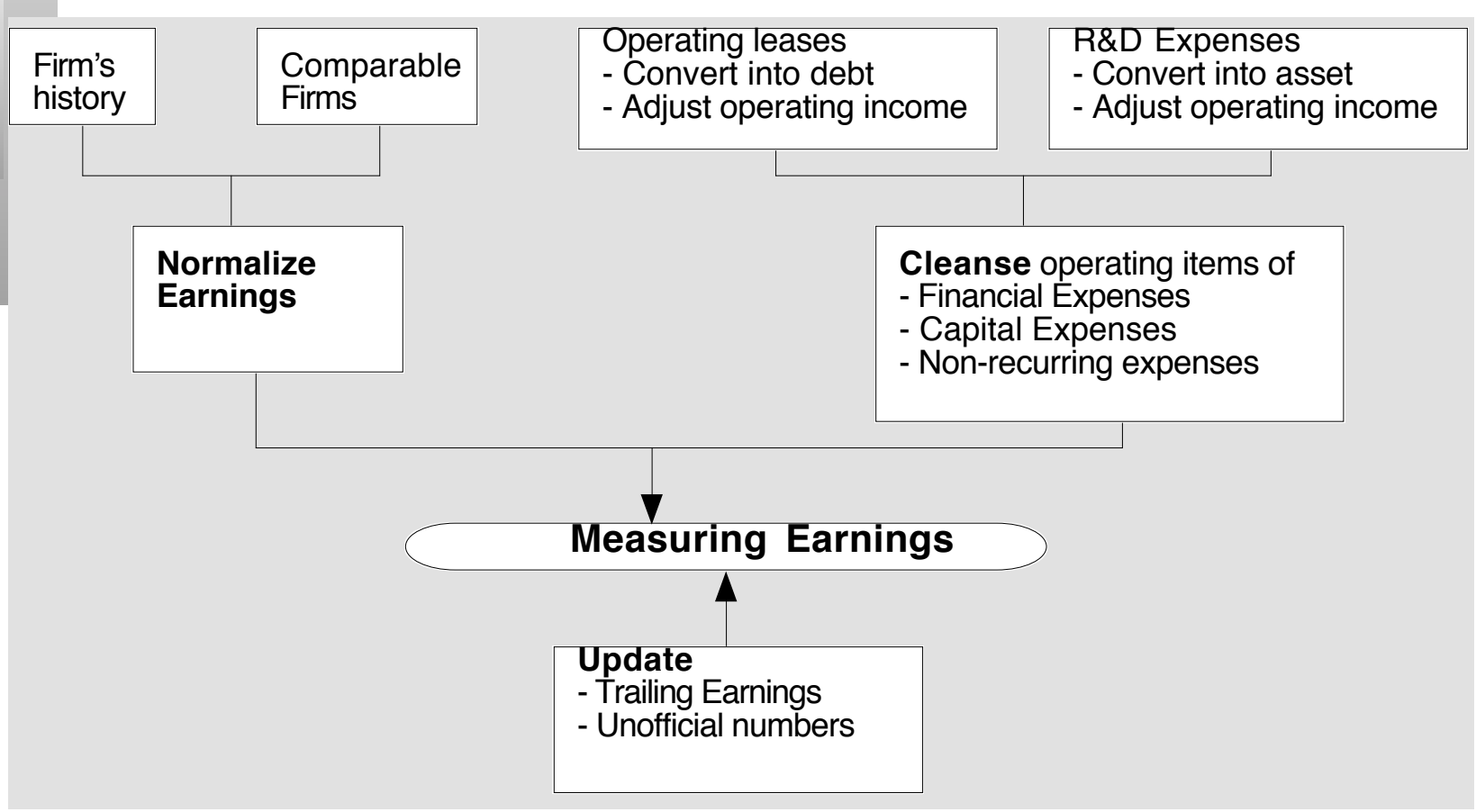

Kristin's Kandy: Valuation in March 2006
Current Cashflow to Firm
EBIT(1-t) : 300
- Nt CpX 100
- Chg WC 40
= FCFF 160
Reinvestment Rate = 46.67%
Reinvestment Rate
46.67%
Return on Capital
13.64%
Expected Growth in EBIT (1-t)
.4667*.1364= .0636
6.36%
Stable Growth
g = 4%; Beta =3.00;
ROC= 12.54%
Reinvestment Rate=31.
Terminal Value5= 289/(.1254-.04) = 3,403
Year 1 2 3 4 5
EBIT (1-t) $319 $339 $361 $384 $408
- Reinvestment $149 $158 $168 $179 $191
=FCFF $170 $181 $193 $205 $218
Term Yr
425
136
289
Firm Value: 2,571
+ Cash 125
- Debt: 900
=Equity 1,796
- Illiq Discount 12.5%
Adj Value 1,571
Discount at Cost of Capital (WACC) = 16.26% (.70) + 3.30% (.30) = 12.37%
Cost of Equity
16.26%
Cost of Debt
(4.5%+1.00)(1-.40)
= 3.30%
Synthetic rating = A-
Weights
E =70% D = 30%
Riskfree Rate:
Riskfree rate = 4.50%
(10-year T.Bond rate)
+
Total Beta
2.94
1/3 of risk is market risk
Adjusted for ownrer non-diversification
x
Risk Premium
4.00%
Market Beta: 0.98
Unlevered Beta for Sectors: 0.78
Firm's D/E Ratio: 30/70
Mature risk premium 4%
Country Risk Premium 0%

Discounted Cash Flow Valuation: High Growth with Negative Earnings




Reinvestment:
Cap ex includes acquisitions
Working capital is 3% of revenues
Current Revenue $ 1,117
Current Margin: -36.71%
EBIT -410m
NOL: 500 m
Sales Turnover Ratio: 3.00
Revenue Growth: 42%
Competitive Advantages
Expected Margin: -> 10.00%
Stable Growth
Stable Revenue Growth: 6%
Stable Operating Margin: 10.00%
Stable ROC=20% Reinvest 30% of EBIT(1-t)
Terminal Value= 1881/(.0961-.06) =52,148
Term. Year
$41,346
10.00%
35.00%
$2,688
$ 807
$1,881
Forever
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
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%
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
Cost of Equity 12.90%
Cost of Debt 6.5%+1.5%=8.0% Tax rate = 0% -> 35%
Weights Debt= 1.2% -> 15%
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
Amazon.com
January 2000
Stock Price = $ 84

I. Measure earnings right..



Operating Leases at Amgen in 2007

- Amgen has lease commitments and its cost of debt (based on it's A rating) is 5.63%.

Year	Commitment	Present Value
1	$96.00	$90.88
2	$95.00	$85.14
3	$102.00	$86.54
4	$98.00	$78.72
5	$87.00	$66.16
6-12	$107.43	$462.10 ($752 million prorated)
Debt Value of leases =		$869.55

- Debt outstanding at Amgen = $7,402 + $ 870 = $8,272 million
- Adjusted Operating Income = Stated OI + Lease exp this year - Depreciation
  = 5,071 m + 69 m - 870/12 = $5,068 million (12 year life for assets)
- Approximate Operating income= $5,071 m + 870 m (.0563) = $ 5,120 million

Capitalizing R&D Expenses: Amgen

- R & D was assumed to have a 10-year life.

Year	R&D Expense	Unamortized portion		Amortization this year
Current	3366.00	1.00	3366.00	
-1	2314.00	0.90	2082.60	$231.40
-2	2028.00	0.80	1622.40	$202.80
-3	1655.00	0.70	1158.50	$165.50
-4	1117.00	0.60	670.20	$111.70
-5	865.00	0.50	432.50	$86.50
-6	845.00	0.40	338.00	$84.50
-7	823.00	0.30	246.90	$82.30
-8	663.00	0.20	132.60	$66.30
-9	631.00	0.10	63.10	$63.10
-10	558.00	0.00	0.00	$55.80
Value of Research Asset =			$10,112.80	$1,149.90

Adjusted Operating Income = $5,120 + 3,366 - 1,150 = $7,336 million

II. Get the big picture (not the accounting one) when it comes to cap ex and working capital

- Capital expenditures should include
  - Research and development expenses, once they have been re-categorized as capital expenses.
  - Acquisitions of other firms, whether paid for with cash or stock.
- Working capital should be defined not as the difference between current assets and current liabilities but as the difference between non-cash current assets and non-debt current liabilities.
- On both items, start with what the company did in the most recent year but do look at the company's history and at industry averages.

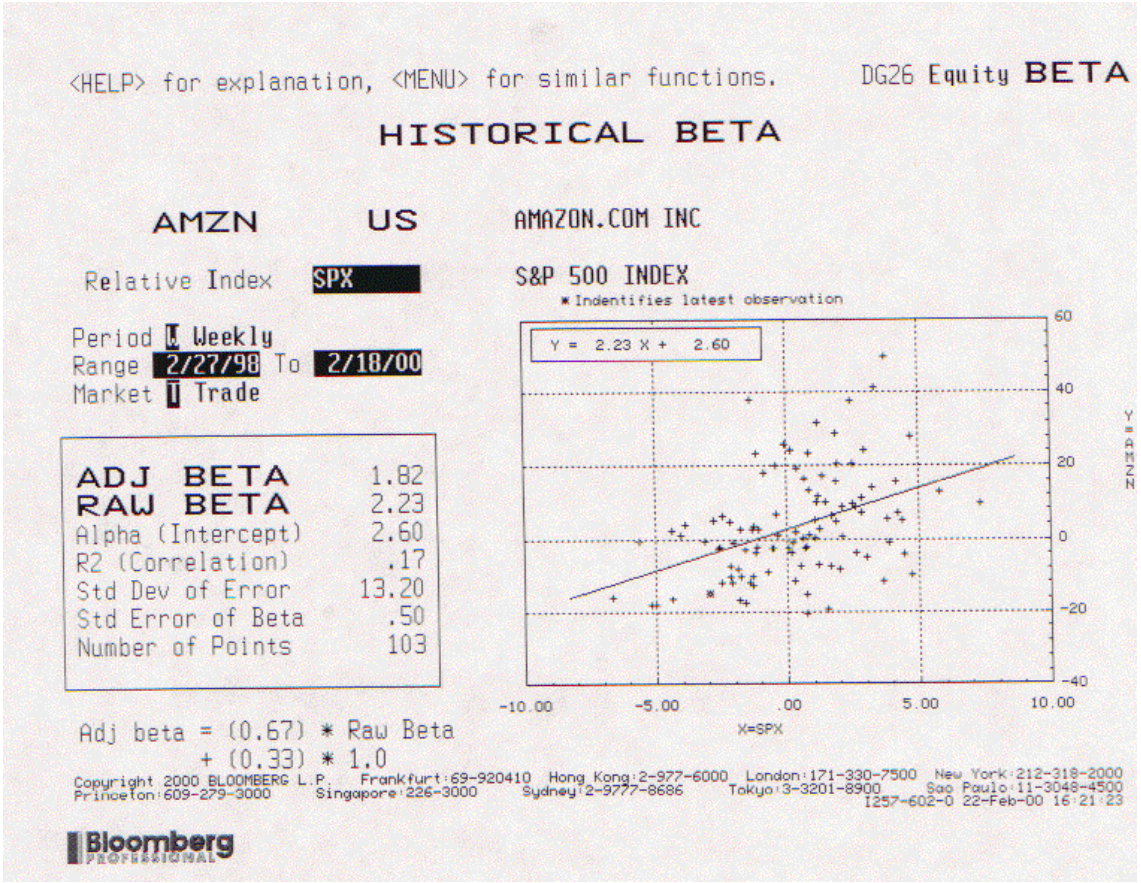
Amgen's Net Capital Expenditures

- If we define capital expenditures broadly to include R&D and acquisitions:

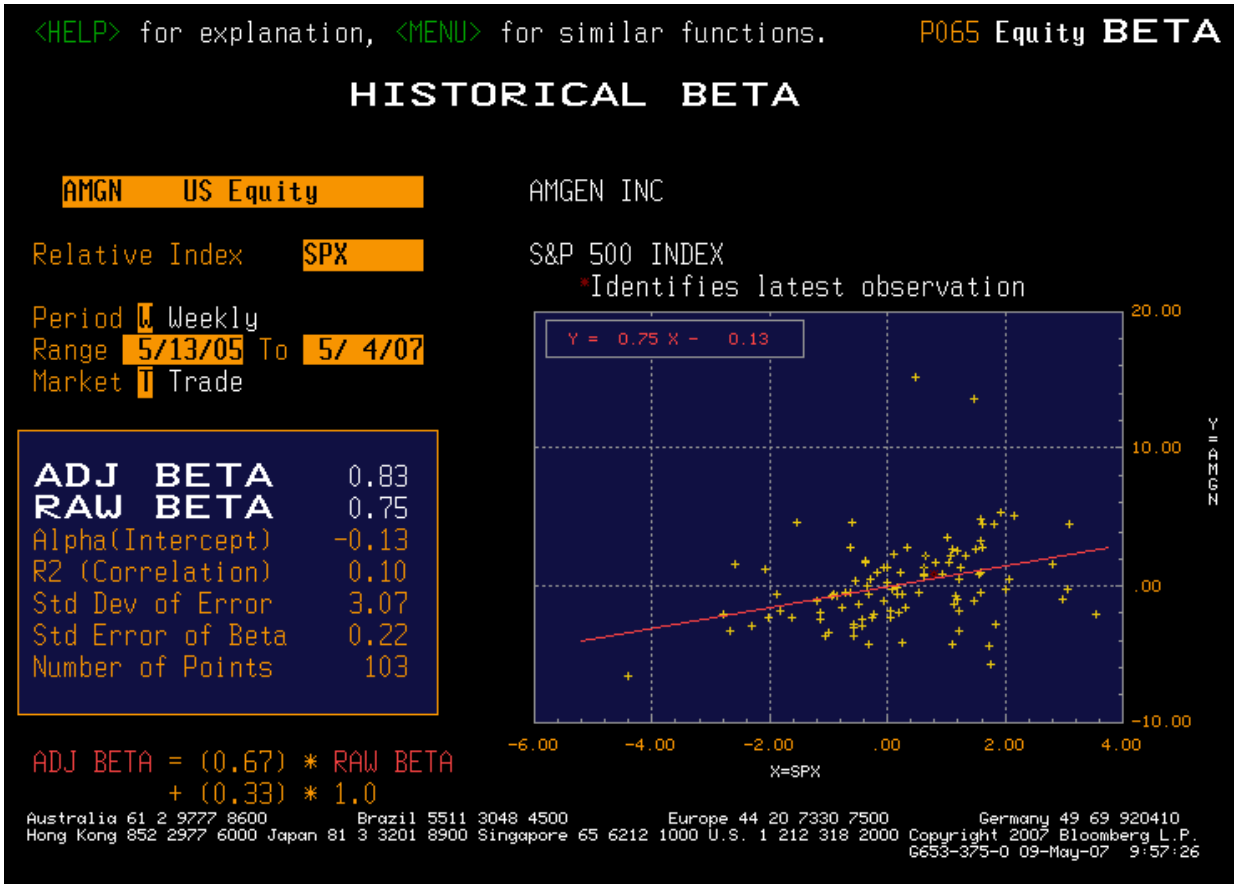
Accounting Capital Expenditures =	$1,218 million
- Accounting Depreciation =	$ 963 million
Accounting Net Cap Ex =	$ 255 million
Net R&D Cap Ex = (3366-1150) =	$2,216 million
Acquisitions in 2006 =	$3,975 million
Total Net Capital Expenditures =	$ 6,443 million

- Acquisitions have been a volatile item. Amgen was quiet on the acquisition front in 2004 and 2005 and had a significant acquisition in 2003.

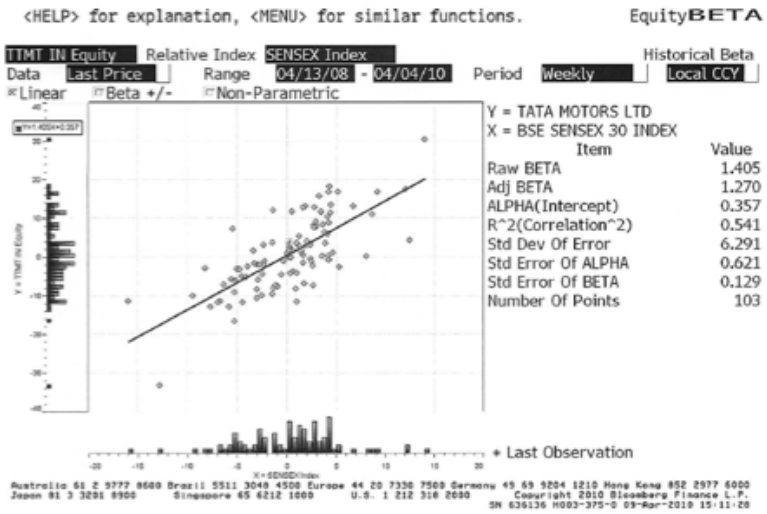
III. Betas do not come from regressions…

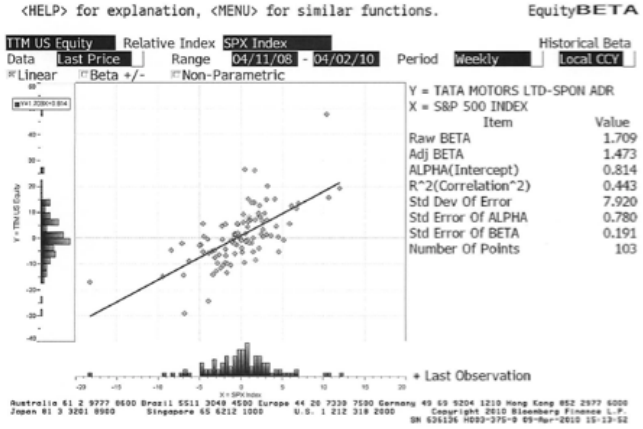


Carry much noise…

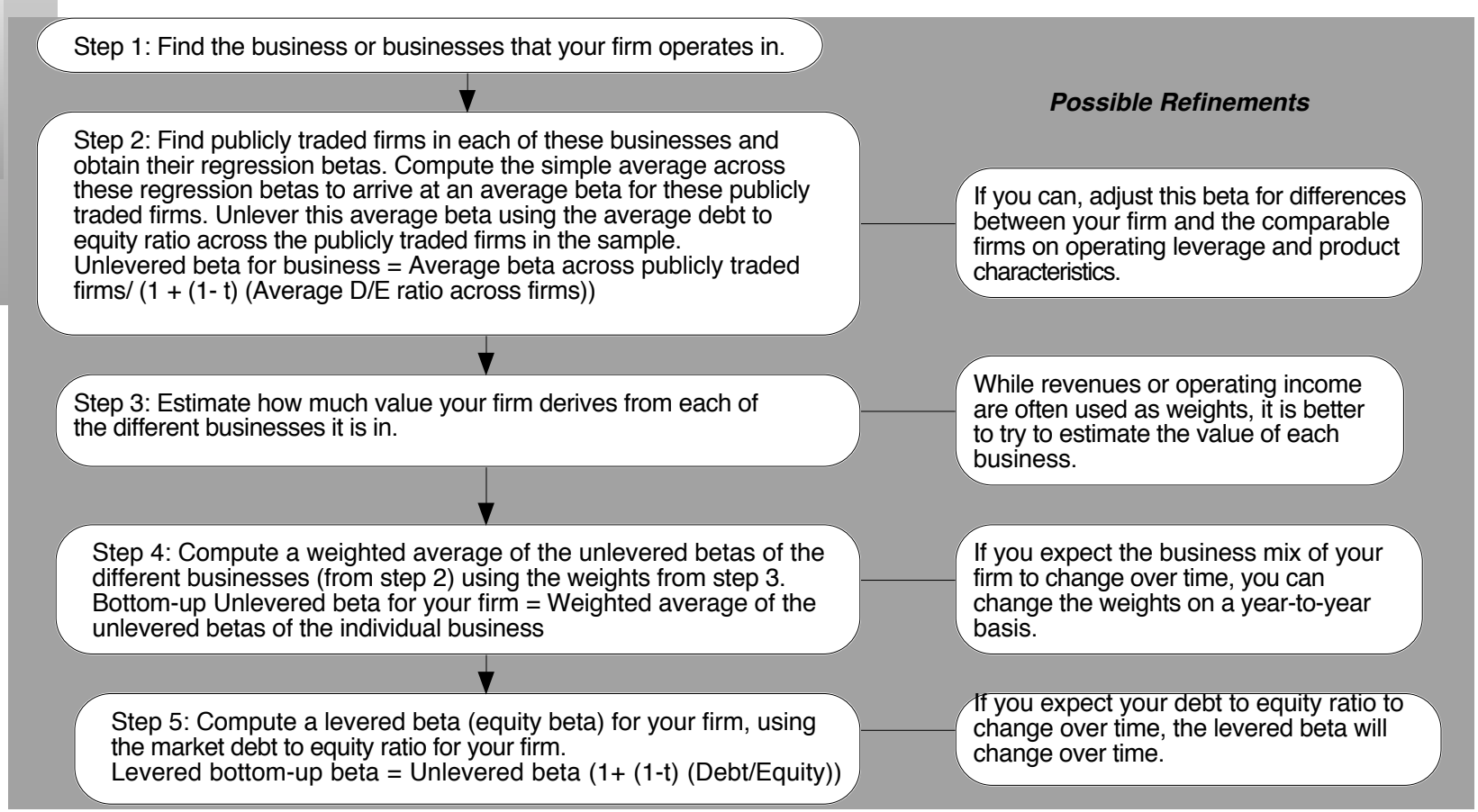


Look better for some companies, but looks can be deceptive…





Bottom-up Betas



Two examples…

- **Amgen**
  - The unlevered beta for pharmaceutical firms is 1.59. Using Amgen's debt to equity ratio of 11%, the bottom up beta for Amgen is
  - Bottom-up Beta = 1.59 (1+ (1-.35)(.11)) = 1.73
- **Tata Motors**
  - The unlevered beta for automobile firms is 0.98. Using Tata Motor's debt to equity ratio of 33.87%, the bottom up beta for Tata Motors is
  - Bottom-up Beta = 0.98 (1+ (1-.3399)(.3387)) = 1.20
- A Question to ponder: Tata Motors recently made two big investments.
  - Tata Nano: Promoted as the cheapest car in the world, Tata Motors hopes that volume (especially in Asia) will make up for tight margins.
  - Jaguar/Land Rover: Tata acquired both firms, catering to luxury markets.

  What effect will these investments have on Tata Motor's beta?

IV. And the past is not always a good indicator of the future

- It is standard practice to use historical premiums as forward looking premiums. :

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2010	7.62%	6.03%	5.67%	4.31%
	2.25%	2.38%		
1961-2010	5.83%	4.13%	4.44%	3.09%
	2.42%	2.69%		
2001-2010	1.37%	-2.26%	-0.79%	-4.11%
	6.73%	9.00%		

- An alternative is to back out the premium from market prices:

In 2010, the actual cash returned to stockholders was 53.96. That was up about 30% from 2009 levels.

Analysts expect earnings to grow 13% in 2011, 8% in 2012, 6% in 2013 and 4% therafter, resulting in a compounded annual growth rate of 6.95% over the next 5 years. We will assume that dividends & buybacks will tgrow 6.95% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 3.29%, the same rate as the entire economy (= riskfree rate).

57.72 61.73 66.02 70.60 75.51

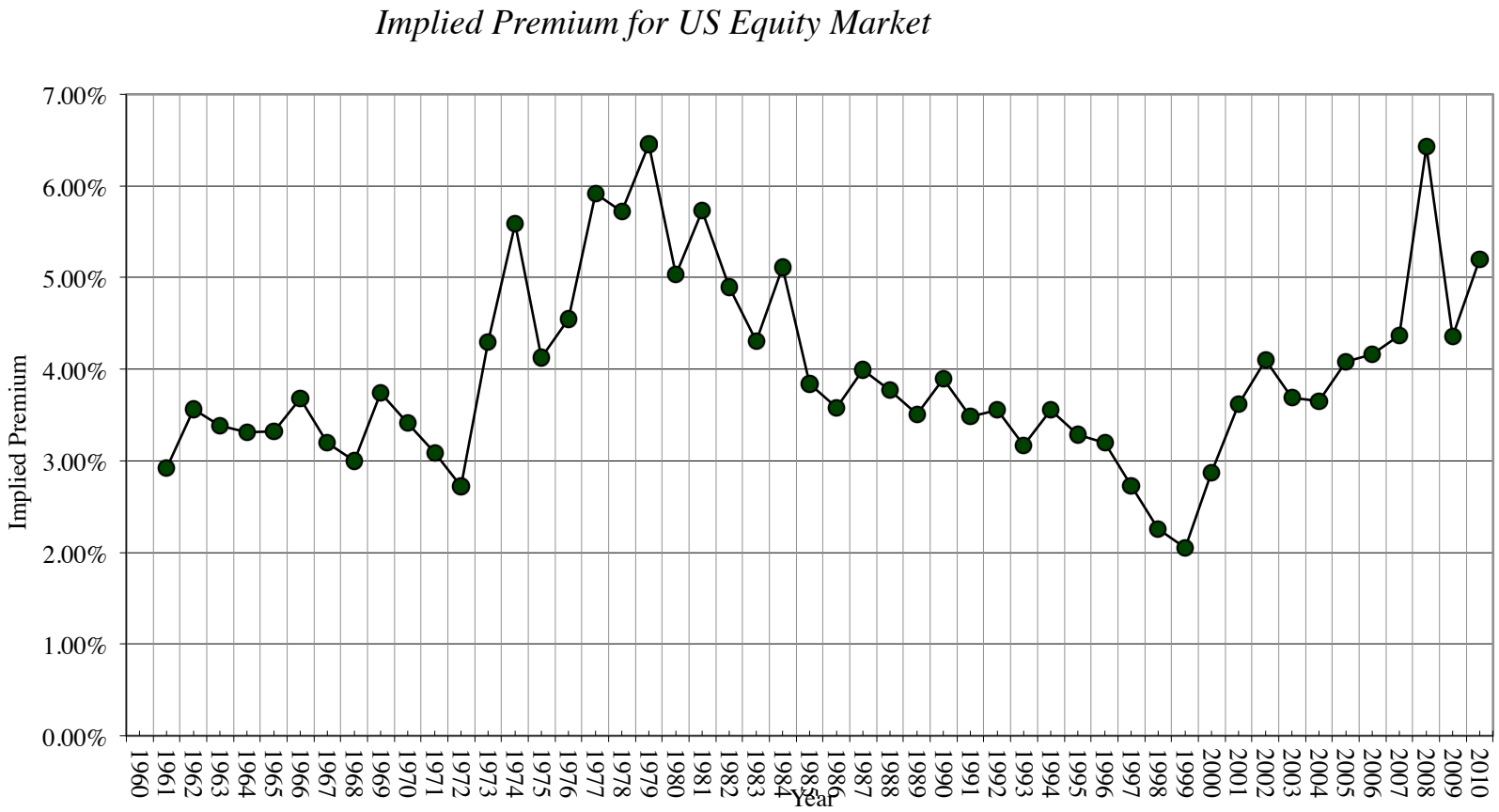
$$1257.64=\frac{57.72}{(1+r)}+\frac{61.73}{(1+r)^2}+\frac{66.02}{(1+r)^3}+\frac{70.60}{(1+r)^4}+\frac{75.51}{(1+r)^5}+\frac{75.51(1.0329)}{(r-.0329)(1+r)^5}$$

January 1, 2011
S&P 500 is at 1257.64
Adjusted Dividends & Buybacks for 2010 = 53.96

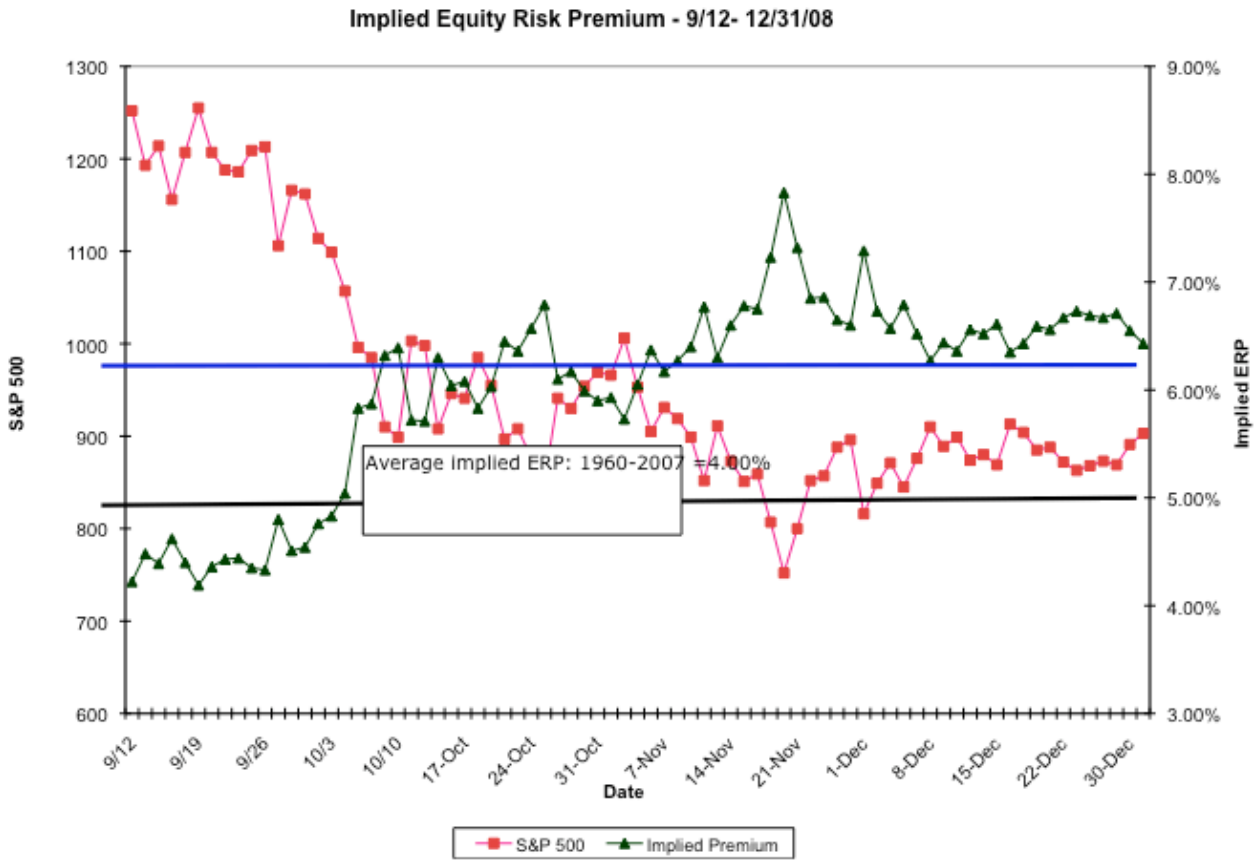
Expected Return on Stocks (1/1/11) = 8.49%
T.Bond rate on 1/1/11 = 3.29%
Equity Risk Premium = 8.03% - 3.29% = 5.20%

Data Sources:
Dividends and Buybacks last year: S&P
Expected growth rate: News stories, Yahoo! Finance, Zacks

Implied Premiums in the US



The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009



Implied Premium for India using the Sensex: April 2010

- Level of the Index = 17559
- FCFE on the Index = 3.5% (Estimated FCFE for companies in index as % of market value of equity)
- Other parameters
  - Riskfree Rate = 5% (Rupee)
  - Expected Growth (in Rupee)
    - Next 5 years = 20% (Used expected growth rate in Earnings)
    - After year 5 = 5%
- Solving for the expected return:
  - Expected return on Equity = 11.72%
  - Implied Equity premium for India =11.72% - 5% = 6.72%

V. There is a downside to globalization…

- Emerging markets offer growth opportunities but they are also riskier. If we want to count the growth, we have to also consider the risk.
- Two ways of estimating the country risk premium:
  - *Default spread on Country Bond*: In this approach, the country equity risk premium is set equal to the default spread of the bond issued by the country.
    - Equity Risk Premium for mature market = 4.5%
    - Equity Risk Premium for India = 4.5% + 3% = 7.5%
  - *Adjusted for equity risk*: The country equity risk premium is based upon the volatility of the equity market relative to the government bond rate.

    Country risk premium= Default Spread* $\sigma_{\text{Country Equity}} / \sigma_{\text{Country Bond}}$
    - Standard Deviation in Sensex = 30%
    - Standard Deviation in Indian government bond= 20%
    - Default spread on Indian Bond= 3%
    - Total equity risk premium for India = 4.5% + 3% (30/20) = 9%

Country Risk Premiums January 2011

Canada	5.00%
Malaysia	6.73%
United States	5.00%

Argentina	14.00%
Belize	14.00%
Bolivia	11.00%
Brazil	8.00%
Chile	6.05%
Colombia	8.00%
Costa Rica	8.00%
Ecuador	20.00%
El Salvador	20.00%
Guatemala	8.60%
Honduras	12.50%
Mexico	7.25%
Nicaragua	14.00%
Panama	8.00%
Paraguay	11.00%
Peru	8.00%
Uruguary	8.60%
Venezuela	11.00%

Austria [1]	5.00%
Belgium [1]	5.38%
Cyprus [1]	6.05%
Denmark	5.00%
Finland [1]	5.00%
France [1]	5.00%
Georgia	9.88%
Germany [1]	5.00%
Greece [1]	8.60%
Iceland	8.00%
Ireland [1]	7.25%
Italy [1]	5.75%
Malta [1]	6.28%
Netherlands [1]	5.00%
Norway	5.00%
Portugal [1]	6.28%
Spain [1]	5.38%
Sweden	5.00%
Switzerland	5.00%
United Kingdom	5.00%

Albania	11.00%
Armenia	9.13%
Azerbaijan	8.60%
Belarus	11.00%
Bosnia and Herzegovina	12.50%
Bulgaria	8.00%
Croatia	8.00%
Czech Republic	6.28%
Estonia	6.28%
Hungary	8.00%
Kazakhstan	7.63%
Latvia	8.00%
Lithuania	7.25%
Moldova	14.00%
Montenegro	9.88%
Poland	6.50%
Romania	8.00%
Russia	7.25%
Slovakia	6.28%
Slovenia [1]	5.75%
Ukraine	12.50%

Bangladesh	9.88%
Cambodia	12.50%
China	6.05%
Fiji Islands	11.00%
Hong Kong	5.38%
India	8.60%
Indonesia	9.13%
Japan	5.75%
Korea	6.28%
Macao	6.05%
Mongolia	11.00%
Pakistan	14.00%
Papua New Guinea	11.00%
Philippines	9.88%
Singapore	5.00%
Sri Lanka	11.00%
Taiwan	6.05%
Thailand	7.25%
Turkey	9.13%

Angola	11.00%
Botswana	6.50%
Egypt	8.60%
Mauritius	7.63%
Morocco	8.60%
South Africa	6.73%
Tunisia	7.63%

Bahrain	6.73%
Israel	6.28%
Jordan	8.00%
Kuwait	5.75%
Lebanon	11.00%
Oman	6.28%
Qatar	5.75%
Saudi Arabia	6.05%
United Arab Emirates	5.75%

Australia	5.00%
New Zealand	5.00%

VI. And it is not just emerging market companies that are exposed to this risk..

- If we treat country risk as a separate risk factor and allow firms to have different exposures to country risk (perhaps based upon the proportion of their revenues come from non-domestic sales)

  $$E(\text{Return}) = \text{Riskfree Rate} + \beta\,(\text{US premium}) + \lambda\,(\text{Country ERP})$$

- The easiest and most accessible data is on revenues. Most companies break their revenues down by region. One simplistic solution would be to do the following:

  λ = % of revenues domestically$_{firm}$ / % of revenues domestically$_{avg\ firm}$

  Consider two firms – Tata Motors and Tata Consulting Services. In 2008-09, Tata Motors got about 91.37% of its revenues in India and TCS got 7.62%. The average Indian firm gets about 80% of its revenues in India:

  $\lambda_{\text{Tata Motors}} = 91\%/80\% = 1.14$

  $\lambda_{TCS} = 7.62\%/80\% = 0.09$

- There are two implications
  - A company's risk exposure is determined by where it does business and not by where it is located
  - Firms might be able to actively manage their country risk exposures

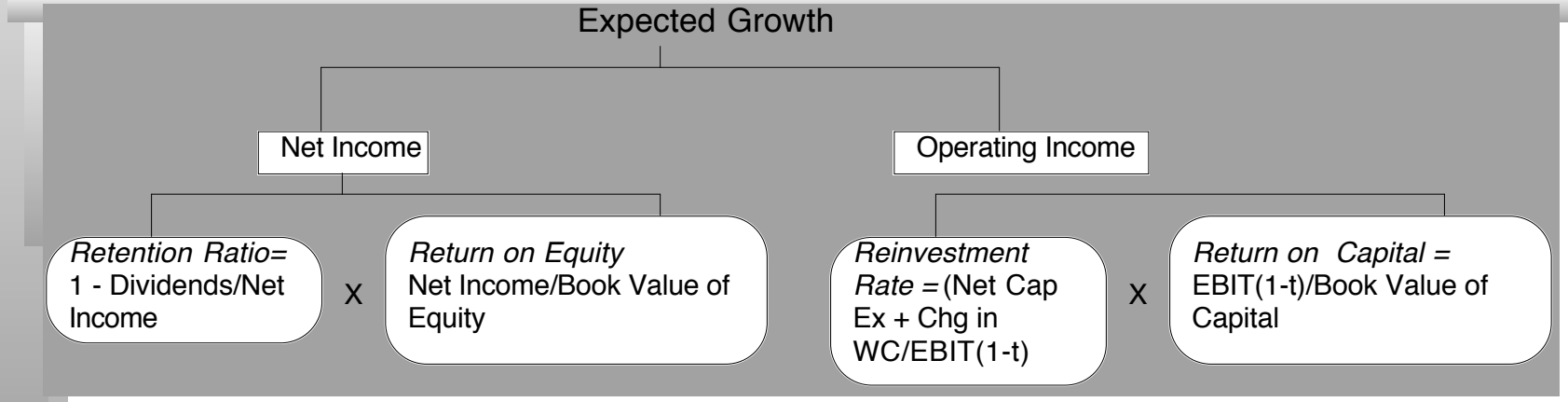
Estimating lambdas: Tata Motors versus TCS

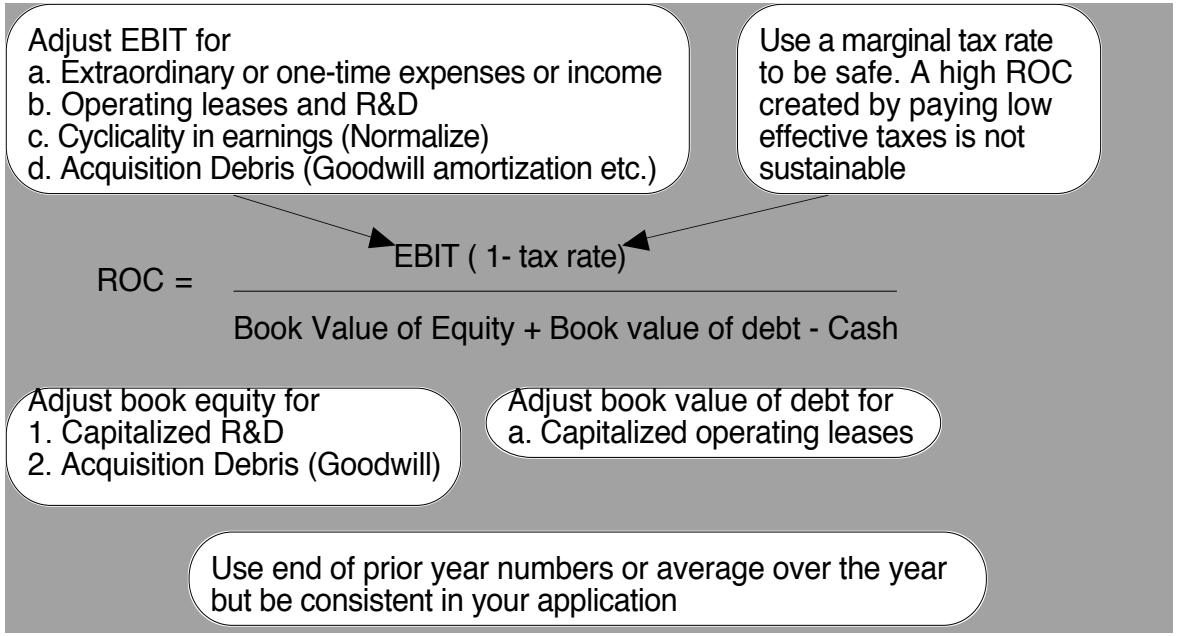
	Tata Motors	*TCS*
% of production/ operations in India	High	High
% of revenues in India	91.37% (in 2009) Estimated 70% (in 2010)	7.62%
Lambda	0.80	0.20
Flexibility in moving operations	Low. Significant physical assets.	High. Human capital is mobile.

VII. Discount rates can (and often should) change over time…

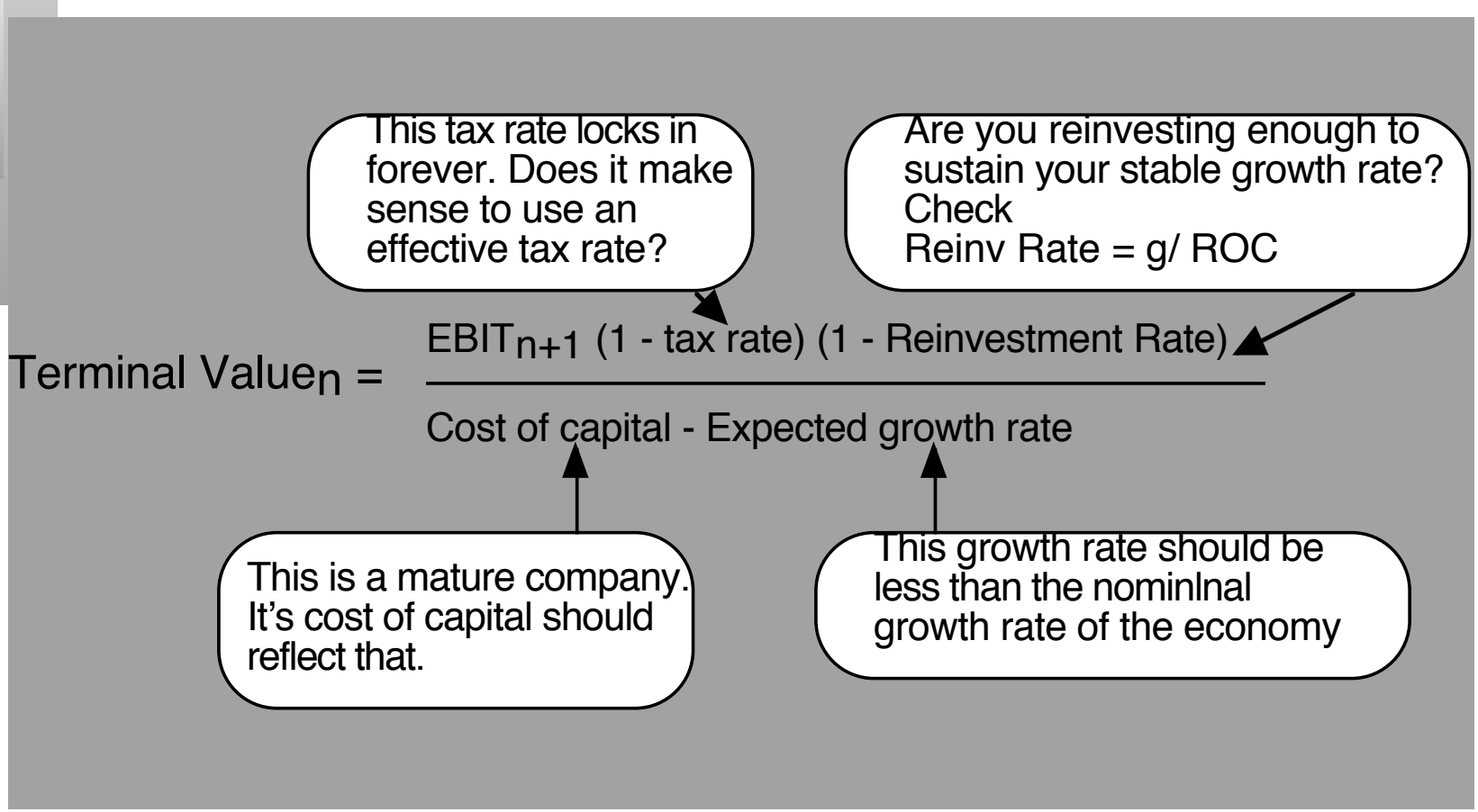
- The inputs into the cost of capital - the cost of equity (beta), the cost of debt (default risk) and the debt ratio - can change over time. For younger firms, they should change over time.
- At the minimum, they should change when you get to your terminal year to inputs that better reflect a mature firm.

VIII. Growth has to be earned (not endowed or estimated)





IX. All good things come to an end..And the terminal value is not an ATM…



Terminal Value and Growth

	Amgen	Tata Motors	Kristin Kandy	Amazon
0%	$150,652	INR 435,686	$3,387	$27,973
1%	$154,749	INR 435,686	$3,387	$29,662
2%	$160,194	INR 435,686	$3,387	$31,794
3%	$167,784	INR 435,686	$3,387	$34,573
4%	$179,099	INR 435,686	$3,387	$38,342
ROIC	10.00%	10.39%	12.54%	20.00%
Cost of capital	8.08%	10.39%	12.54%	9.61%

X. The loose ends matter…

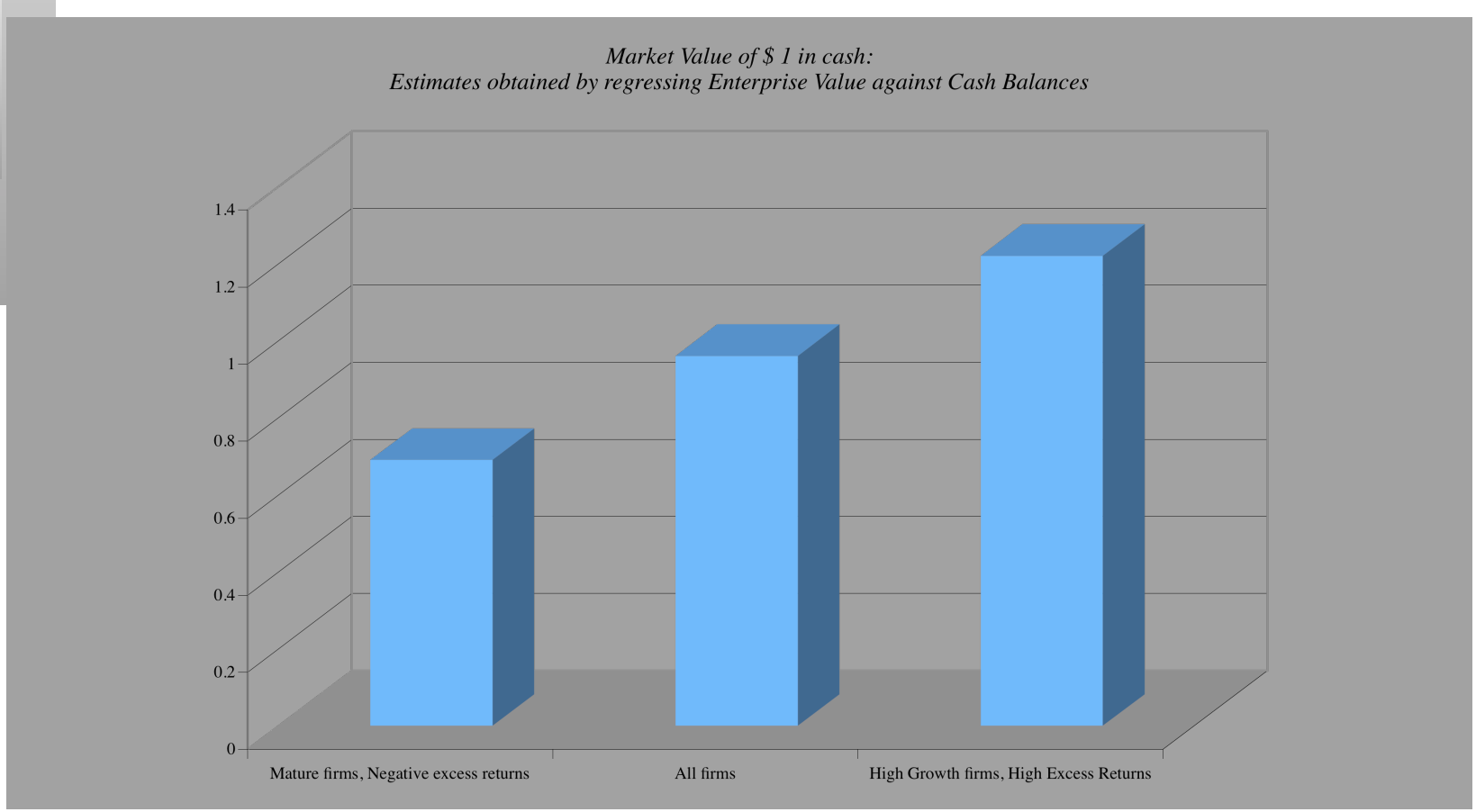
Value of Operating Assets	Since this is a discounted cashflow valuation, should there be a real option premium?
+ Cash and Marketable Securities	Operating versus Non-opeating cash Should cash be discounted for earning a low return?
+ Value of Cross Holdings	How do you value cross holdings in other companies? What if the cross holdings are in private businesses?
+ Value of Other Assets	What about other valuable assets? How do you consider under utlilized assets?
Value of Firm	Should you discount this value for opacity or complexity? How about a premium for synergy? What about a premium for intangibles (brand name)?
- Value of Debt	What should be counted in debt? Should you subtract book or market value of debt? What about other obligations (pension fund and health care? What about contingent liabilities? What about minority interests?
= Value of Equity	Should there be a premium/discount for control? Should there be a discount for distress
- Value of Equity Options	What equity options should be valued here (vested versus non-vested)? How do you value equity options?
= Value of Common Stock	Should you divide by primary or diluted shares?
/ Number of shares	
= Value per share	Should there be a discount for illiquidity/ marketability? Should there be a discount for minority interests?

1. The Value of Cash
An Exercise in Cash Valuation

	Company A	*Company B*	*Company C*
Enterprise Value	$ 1 billion	$ 1 billion	$ 1 billion
Cash	$ 100 mil	$ 100 mil	$ 100 mil
Return on Capital	10%	5%	22%
Cost of Capital	10%	10%	12%
Trades in	US	US	Argentina

In which of these companies is cash most likely to trade at face value, at a discount and at a premium?

Cash: Discount or Premium?



2. Dealing with Holdings in Other firms

- Holdings in other firms can be categorized into
  - Minority passive holdings, in which case only the dividend from the holdings is shown in the balance sheet
  - Minority active holdings, in which case the share of equity income is shown in the income statements
  - Majority active holdings, in which case the financial statements are consolidated.
- We tend to be sloppy in practice in dealing with cross holdings. After valuing the operating assets of a firm, using consolidated statements, it is common to add on the balance sheet value of minority holdings (which are in book value terms) and subtract out the minority interests (again in book value terms), representing the portion of the consolidated company that does not belong to the parent company.

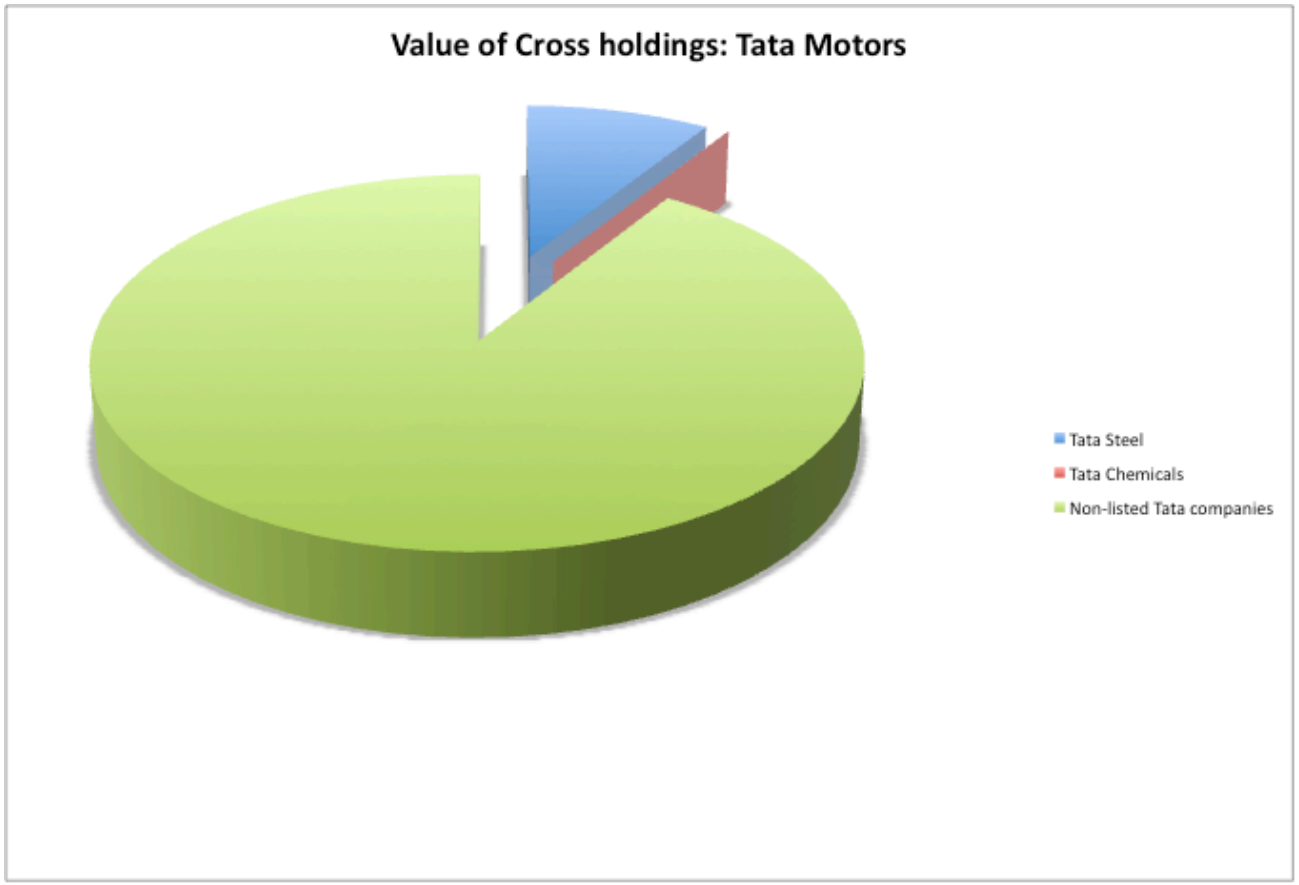
How to value holdings in other firms.. In a perfect world..

- In a perfect world, we would strip the parent company from its subsidiaries and value each one separately. The value of the combined firm will be
  - Value of parent company + Proportion of value of each subsidiary
- To do this right, you will need to be provided detailed information on each subsidiary to estimated cash flows and discount rates.

Two compromise solutions…

- The market value solution: When the subsidiaries are publicly traded, you could use their traded market capitalizations to estimate the values of the cross holdings. You do risk carrying into your valuation any mistakes that the market may be making in valuation.
- The relative value solution: When there are too many cross holdings to value separately or when there is insufficient information provided on cross holdings, you can convert the book values of holdings that you have on the balance sheet (for both minority holdings and minority interests in majority holdings) by using the average price to book value ratio of the sector in which the subsidiaries operate.

Tata Motor's Cross Holdings



3. Other Assets that have not been counted yet..

- **Unutilized assets**: If you have assets or property that are not being utilized (vacant land, for example), you have not valued it yet. You can assess a market value for these assets and add them on to the value of the firm.
- **Overfunded pension plans**: If you have a defined benefit plan and your assets exceed your expected liabilities, you could consider the over funding with two caveats:
  - Collective bargaining agreements may prevent you from laying claim to these excess assets.
  - There are tax consequences. Often, withdrawals from pension plans get taxed at much higher rates.

  Do not double count an asset. If you count the income from an asset in your cashflows, you cannot count the market value of the asset in your value.

4. A Discount for Complexity: An Experiment

	Company A	*Company B*
Operating Income	$ 1 billion	$ 1 billion
Tax rate	40%	40%
ROIC	10%	10%
Expected Growth	5%	5%
Cost of capital	8%	8%
Business Mix	Single Business	Multiple Businesses
Holdings	Simple	Complex
Accounting	Transparent	Opaque

- *Which firm would you value more highly?*

Measuring Complexity: Volume of Data in Financial Statements

Company	*Number of pages in last 10Q*	*Number of pages in last 10K*
General Electric	65	410
Microsoft	63	218
Wal-mart	38	244
Exxon Mobil	86	332
Pfizer	171	460
Citigroup	252	1026
Intel	69	215
AIG	164	720
Johnson & Johnson	63	218
IBM	85	353

Measuring Complexity: A Complexity Score

Item	Factors	Follow-up Question	Answer	Weighting factor	Gerdau Score	GE Score
Operating Income	1. Multiple Businesses	Number of businesses (with more than 10% of revenues) =	1	2.00	2	30
	2. One-time income and expenses	Percent of operating income =	10%	10.00	1	0.8
	3. Income from unspecified sources	Percent of operating income =	0%	10.00	0	1.2
	4. Items in income statement that are volatile	Percent of operating income =	15%	5.00	0.75	1
Tax Rate	1. Income from multiple locales	Percent of revenues from non-domestic locales =	70%	3.00	2.1	1.8
	2. Different tax and reporting books	Yes or No	No	Yes=3	0	3
	3. Headquarters in tax havens	Yes or No	No	Yes=3	0	0
	4. Volatile effective tax rate	Yes or No	Yes	Yes=2	2	0
Capital Expenditures	1. Volatile capital expenditures	Yes or No	Yes	Yes=2	2	2
	2. Frequent and large acquisitions	Yes or No	Yes	Yes=4	4	4
	3. Stock payment for acquisitions and investments	Yes or No	No	Yes=4	0	4
Working capital	1. Unspecified current assets and current liabilities	Yes or No	No	Yes=3	0	0
	2. Volatile working capital items	Yes or No	Yes	Yes=2	2	2
Expected Growth rate	1. Off-balance sheet assets and liabilities (operating leases and R&D)	Yes or No	No	Yes=3	0	3
	2. Substantial stock buybacks	Yes or No	No	Yes=3	0	3
	3. Changing return on capital over time	Is your return on capital volatile?	Yes	Yes=5	5	5
	4. Unsustainably high return	Is your firm's ROC much higher than industry average?	No	Yes=5	0	0
Cost of capital	1. Multiple businesses	Number of businesses (more than 10% of revenues) =	1	1.00	1	20
	2. Operations in emerging markets	Percent of revenues=	50%	5.00	2.5	2.5
	3. Is the debt market traded?	Yes or No	No	No=2	2	0
	4. Does the company have a rating?	Yes or No	Yes	No=2	0	0
	5. Does the company have off-balance sheet debt?	Yes or No	No	Yes=5	0	5
No-operating assets	Minority holdings as percent of book assets	Minority holdings as percent of book assets	0%	20.00	0	0.8
Firm to Equity value	Consolidation of subsidiaries	Minority interest as percent of book value of equity	63%	20.00	12.6	1.2
Per share value	Shares with different voting rights	Does the firm have shares with different voting rights?	Yes	Yes = 10	10	0
	Equity options outstanding	Options outstanding as percent of shares	0%	10.00	0	0.25
		Complexity Score =			48.95	90.55

Dealing with Complexity

In Discounted Cashflow Valuation

- The Aggressive Analyst: Trust the firm to tell the truth and value the firm based upon the firm's statements about their value.
- The Conservative Analyst: Don't value what you cannot see.
- The Compromise: Adjust the value for complexity
  - Adjust cash flows for complexity
  - Adjust the discount rate for complexity
  - Adjust the expected growth rate/ length of growth period
  - Value the firm and then discount value for complexity

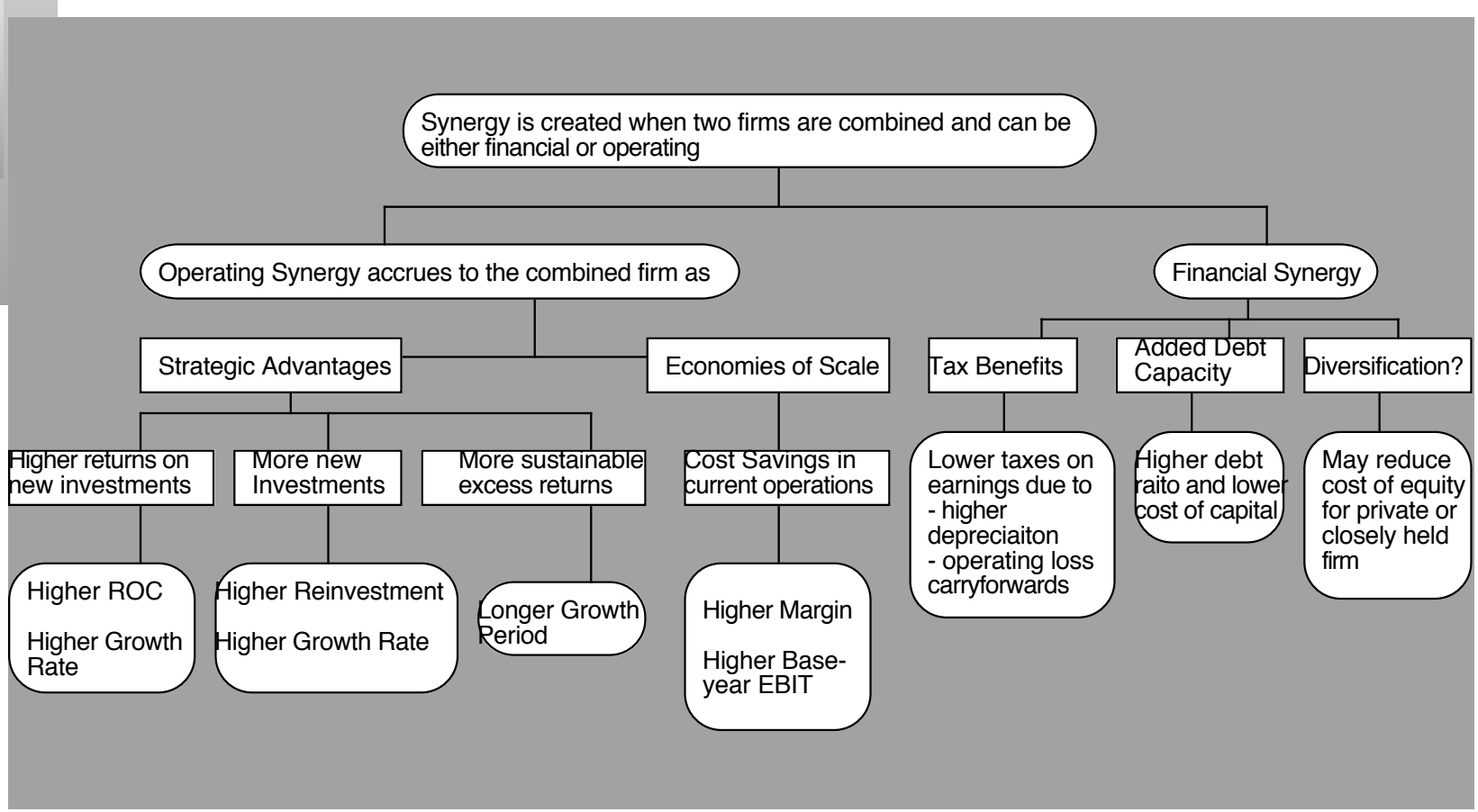
In relative valuation

In a relative valuation, you may be able to assess the price that the market is charging for complexity:

With the hundred largest market cap firms, for instance:

PBV = 0.65 + 15.31 ROE – 0.55 Beta + 3.04 Expected growth rate – 0.003 # Pages in 10K

5. The Value of Synergy



Valuing Synergy

(1) the firms involved in the merger are **valued independently**, by discounting expected cash flows to each firm at the weighted average cost of capital for that firm.

(2) the **value of the combined firm, with no synergy**, is obtained by adding the values obtained for each firm in the first step.

(3) The **effects of synergy are built into expected growth rates and cashflows**, and the combined firm is re-valued with synergy.

Value of Synergy = Value of the combined firm, with synergy - Value of the combined firm, without synergy

Valuing Synergy: P&G + Gillette

	P&G	Gillette	Piglet: No Synergy	Piglet: Synergy	
Free Cashflow to Equity	$5,864.74	$1,547.50	$7,412.24	$7,569.73	Annual operating expenses reduced by $250 million
Growth rate for first 5 years	12%	10%	11.58%	12.50%	Slighly higher growth rate
Growth rate after five years	4%	4%	4.00%	4.00%	
Beta	0.90	0.80	0.88	0.88	
Cost of Equity	7.90%	7.50%	7.81%	7.81%	Value of synergy
Value of Equity	$221,292	$59,878	$281,170	$298,355	**$17,185**

6. Brand name, great management, superb product …Are we short changing the intangibles?

- There is often a temptation to add on premiums for intangibles. Among them are
  - Brand name
  - Great management
  - Loyal workforce
  - Technological prowess
- There are two potential dangers:
  - For some assets, the value may already be in your value and adding a premium will be double counting.
  - For other assets, the value may be ignored but incorporating it will not be easy.

Valuing Brand Name

	Coca Cola	With Cott Margins
Current Revenues =	$21,962.00	$21,962.00
Length of high-growth period	10	10
Reinvestment Rate =	50%	50%
Operating Margin (after-tax)	15.57%	5.28%
Sales/Capital (Turnover ratio)	1.34	1.34
Return on capital (after-tax)	20.84%	7.06%
Growth rate during period (g) =	10.42%	3.53%
Cost of Capital during period =	7.65%	7.65%
Stable Growth Period		
Growth rate in steady state =	4.00%	4.00%
Return on capital =	7.65%	7.65%
Reinvestment Rate =	52.28%	52.28%
Cost of Capital =	7.65%	7.65%
Value of Firm =	**$79,611.25**	**$15,371.24**

7. Be circumspect about defining debt for cost of capital purposes…

- **General Rule**: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.
- Defined as such, debt should include
  - All interest bearing liabilities, short term as well as long term
  - All leases, operating as well as capital
- Debt should not include
  - Accounts payable or supplier credit

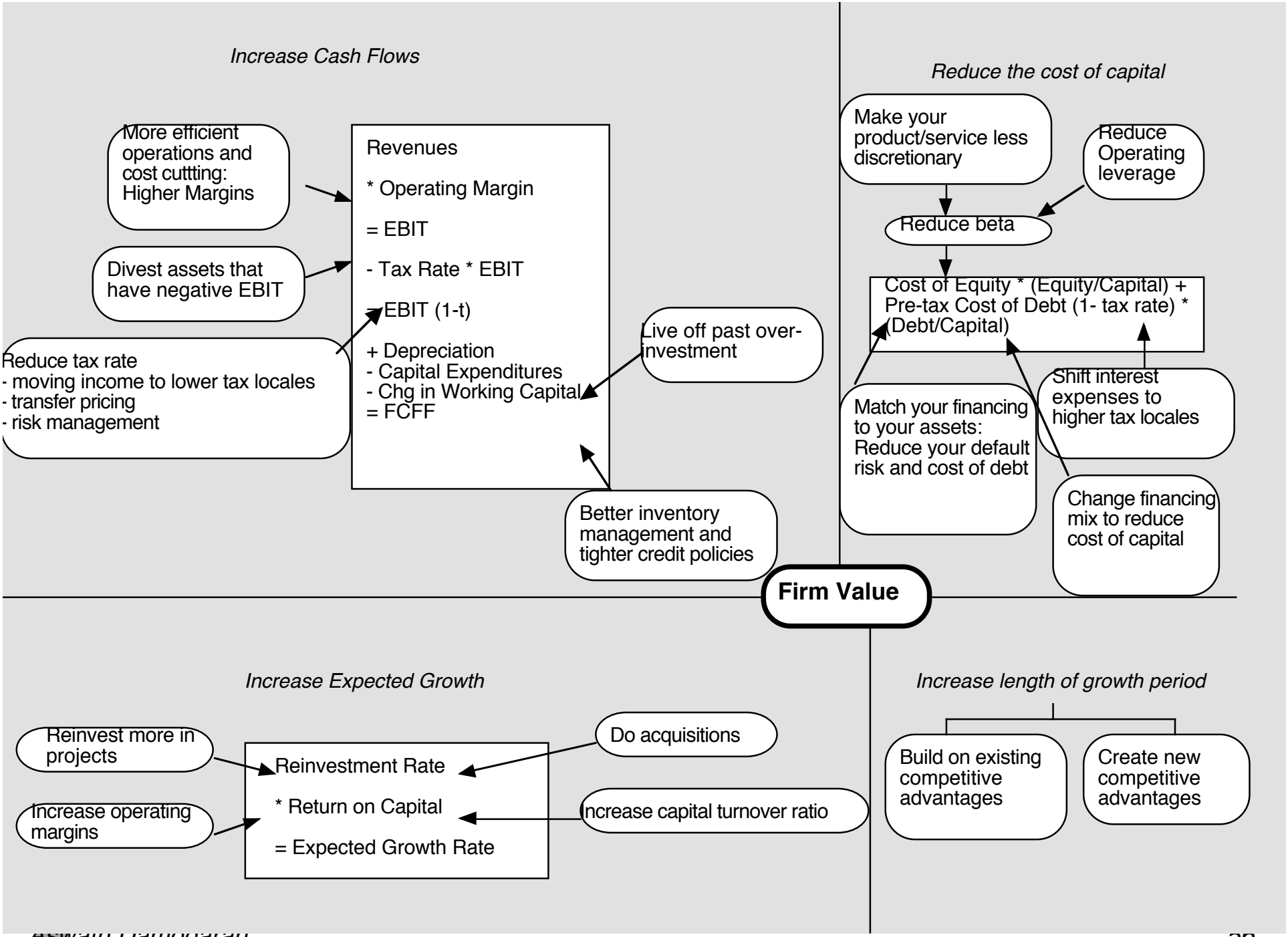
But should consider other potential liabilities when getting to equity value…

- If you have under funded pension fund or health care plans, you should consider the under funding at this stage in getting to the value of equity.
  - If you do so, you should not double count by also including a cash flow line item reflecting cash you would need to set aside to meet the unfunded obligation.
  - You should not be counting these items as debt in your cost of capital calculations….
- If you have contingent liabilities - for example, a potential liability from a lawsuit that has not been decided - you should consider the expected value of these contingent liabilities
  - Value of contingent liability = Probability that the liability will occur * Expected value of liability

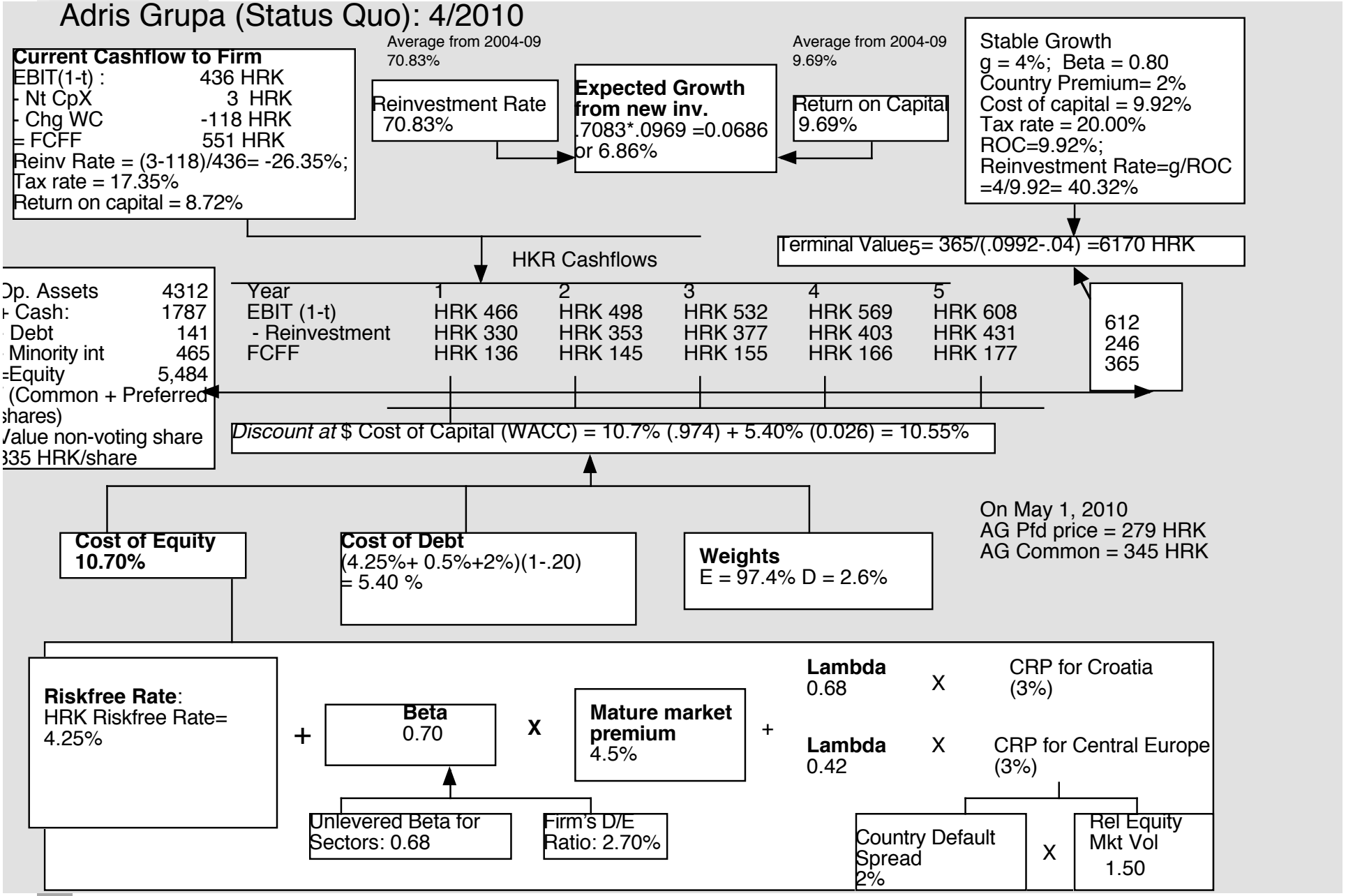
8. The Value of Control

- The value of the control premium that will be paid to acquire a block of equity will depend upon two factors -
  - **Probability that control of firm will change**: This refers to the probability that incumbent management will be replaced. this can be either through acquisition or through existing stockholders exercising their muscle.
  - **Value of Gaining Control of the Company:** The value of gaining control of a company arises from two sources - the increase in value that can be wrought by changes in the way the company is managed and run, and the side benefits and perquisites of being in control

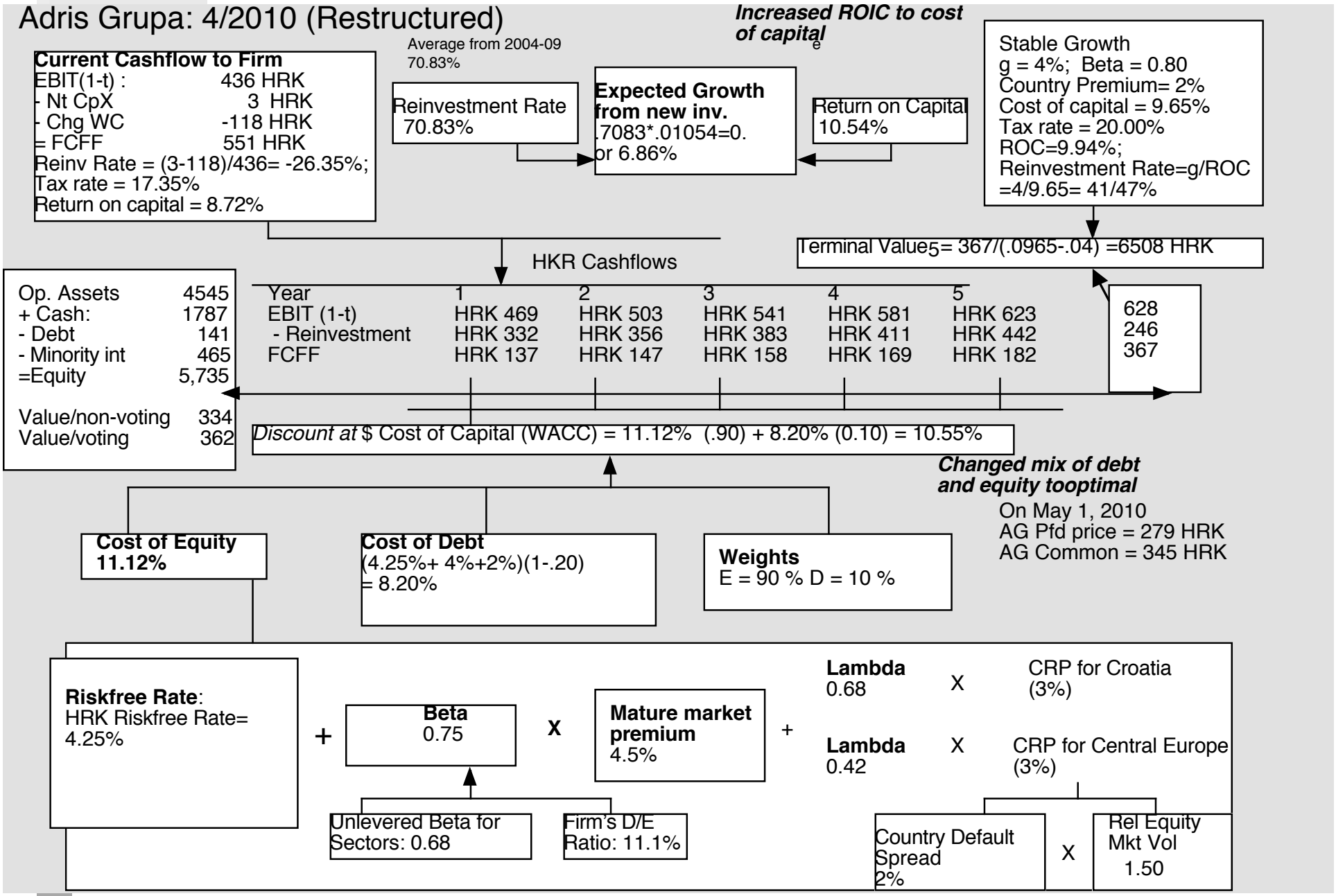
  Value of Gaining Control = Present Value (Value of Company with change in control - Value of company without change in control) + Side Benefits of Control


Increase Cash Flows
More efficient operations and cost cuttting: Higher Margins
Divest assets that have negative EBIT
Reduce tax rate
- moving income to lower tax locales
- transfer pricing
- risk management
Revenues
* Operating Margin
= EBIT
- Tax Rate * EBIT
= EBIT (1-t)
+ Depreciation
- Capital Expenditures
- Chg in Working Capital
= FCFF
Live off past over-investment
Better inventory management and tighter credit policies
Reduce the cost of capital
Make your product/service less discretionary
Reduce Operating leverage
Reduce beta
Cost of Equity * (Equity/Capital) + Pre-tax Cost of Debt (1- tax rate) * (Debt/Capital)
Match your financing to your assets: Reduce your default risk and cost of debt
Shift interest expenses to higher tax locales
Change financing mix to reduce cost of capital
Firm Value
Increase Expected Growth
Reinvest more in projects
Increase operating margins
Reinvestment Rate
* Return on Capital
= Expected Growth Rate
Do acquisitions
Increase capital turnover ratio
Increase length of growth period
Build on existing competitive advantages
Create new competitive advantages

Adris Grupa (Status Quo): 4/2010



Adris Grupa: 4/2010 (Restructured)



Value of Control and the Value of Voting Rights

- The value of control at Adris Grupa can be computed as the difference between the status quo value (5469) and the optimal value (5735).
- The value of a voting share derives entirely from the capacity you have to change the way the firm is run. In this case, we have two values for Adris Grupa's Equity.

Status Quo Value of Equity = 5,469 million HKR

All shareholders, common and preferred, get an equal share of the status quo value.

Value for a non-voting share = 5469/(9.616+6.748) = 334 HKR/share

Optimal value of Equity = 5,735 million HKR

Value of control at Adris Grupa = 5,735 – 5469 = 266 million HKR

Only voting shares get a share of this value of control

Value per voting share =334 HKR + 266/9.616 = 362 HKR

9. Distress and the Going Concern Assumption

- Traditional valuation techniques are built on the assumption of a going concern, i.e., a firm that has continuing operations and there is no significant threat to these operations.
  - In discounted cashflow valuation, this going concern assumption finds its place most prominently in the terminal value calculation, which usually is based upon an infinite life and ever-growing cashflows.
  - In relative valuation, this going concern assumption often shows up implicitly because a firm is valued based upon how other firms - most of which are healthy - are priced by the market today.
- When there is a significant likelihood that a firm will not survive the immediate future (next few years), traditional valuation models may yield an over-optimistic estimate of value.

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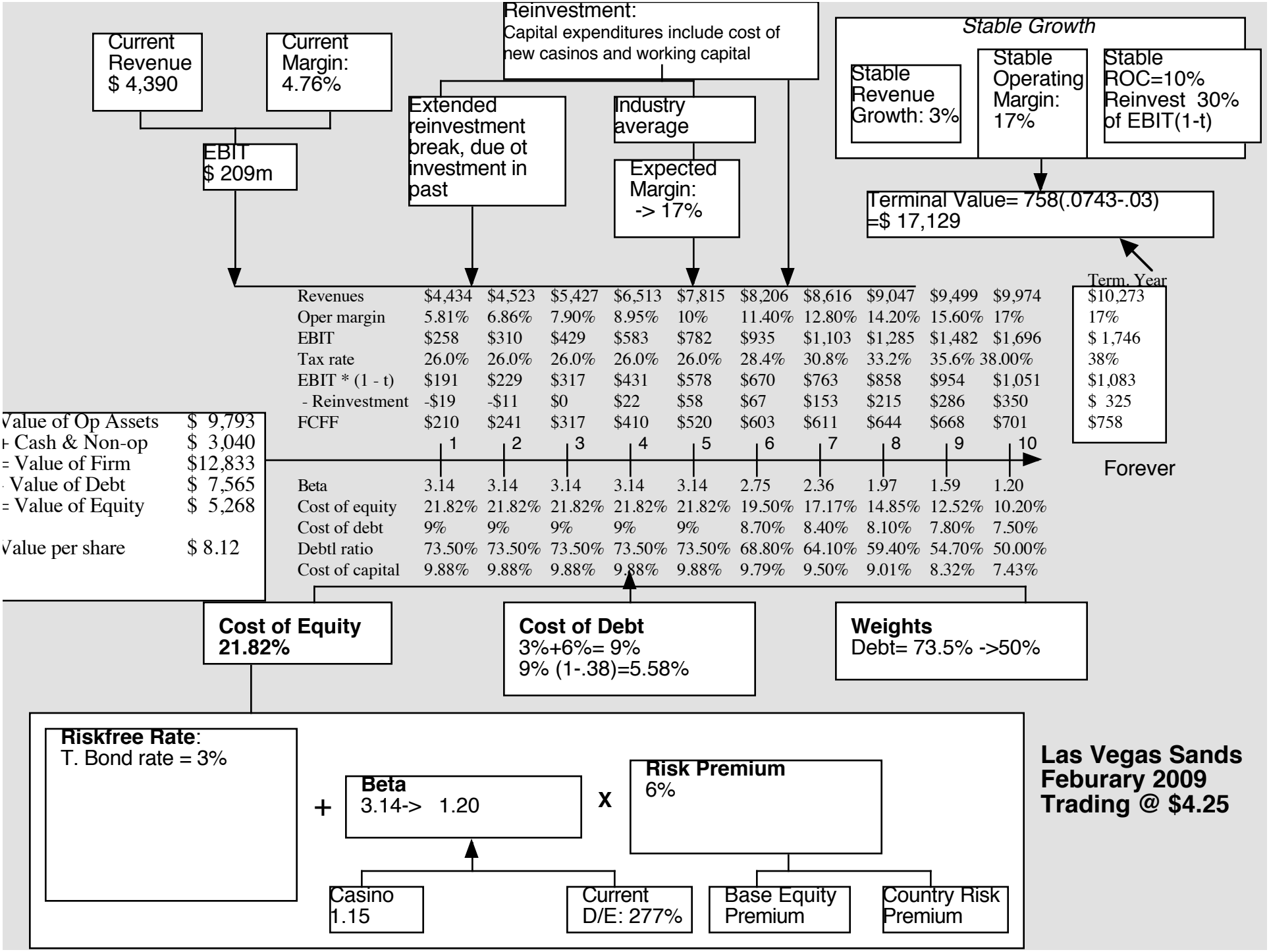

Current Revenue $ 4,390
Current Margin: 4.76%
EBIT $ 209m
Reinvestment: Capital expenditures include cost of new casinos and working capital
Extended reinvestment break, due ot investment in past
Industry average
Expected Margin: -> 17%
Stable Growth
Stable Revenue Growth: 3%
Stable Operating Margin: 17%
Stable ROC=10% Reinvest 30% of EBIT(1-t)
Terminal Value= 758(.0743-.03) =$ 17,129
Term. Year
Revenues $4,434 $4,523 $5,427 $6,513 $7,815 $8,206 $8,616 $9,047 $9,499 $9,974 $10,273
Oper margin 5.81% 6.86% 7.90% 8.95% 10% 11.40% 12.80% 14.20% 15.60% 17% 17%
EBIT $258 $310 $429 $583 $782 $935 $1,103 $1,285 $1,482 $1,696 $ 1,746
Tax rate 26.0% 26.0% 26.0% 26.0% 26.0% 28.4% 30.8% 33.2% 35.6% 38.00% 38%
EBIT * (1 - t) $191 $229 $317 $431 $578 $670 $763 $858 $954 $1,051 $1,083
- Reinvestment -$19 -$11 $0 $22 $58 $67 $153 $215 $286 $350 $ 325
FCFF $210 $241 $317 $410 $520 $603 $611 $644 $668 $701 $758
1 2 3 4 5 6 7 8 9 10 Forever
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
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%
Debtl 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%
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 Feburary 2009 Trading @ $4.25

The Distress Factor

- 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:

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

- Solving for the probability of bankruptcy, we get:

$$\pi_{Distress} = \text{Annual probability of default} = 13.54\%$$

  - 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

10. Analyzing the Effect of Illiquidity on Value

- Investments which are less liquid should trade for less than otherwise similar investments which are more liquid.
- The size of the illiquidity discount should vary across firms and also across time. The conventional practice of relying upon studies of restricted stocks or IPOs will fail sooner rather than later.
  - Restricted stock studies are based upon small samples of troubled firms
  - The discounts observed in IPO studies are too large for these to be arms length transactions. They just do not make sense.

Illiquidity Discounts from Bid-Ask Spreads

- Using data from the end of 2000, for instance, we regressed the bid-ask spread against annual revenues, a dummy variable for positive earnings (DERN: 0 if negative and 1 if positive), cash as a percent of firm value and trading volume.

Spread = 0.145 – 0.0022 ln (Annual Revenues) -0.015 (DERN) – 0.016 (Cash/Firm Value) – 0.11 ($ Monthly trading volume/ Firm Value)

- We could substitute in the revenues of Kristin Kandy ($5 million), the fact that it has positive earnings and the cash as a percent of revenues held by the firm (8%):

Spread = 0.145 – 0.0022 ln (Annual Revenues) -0.015 (DERN) – 0.016 (Cash/Firm Value) – 0.11 ($ Monthly trading volume/ Firm Value)

= 0.145 – 0.0022 ln (5) -0.015 (1) – 0.016 (.08) – 0.11 (0) = .12.52%

- Based on this approach, we would estimate an illiquidity discount of 12.52% for Kristin Kandy.

Relative Valuation

Aswath Damodaran

Relative valuation is pervasive…

- Most asset valuations are relative.
- Most equity valuations on Wall Street are relative valuations.
  - Almost 85% of equity research reports are based upon a multiple and comparables.
  - More than 50% of all acquisition valuations are based upon multiples
  - Rules of thumb based on multiples are not only common but are often the basis for final valuation judgments.
- While there are more discounted cashflow valuations in consulting and corporate finance, they are often relative valuations masquerading as discounted cash flow valuations.
  - The objective in many discounted cashflow valuations is to back into a number that has been obtained by using a multiple.
  - The terminal value in a significant number of discounted cashflow valuations is estimated using a multiple.

The Reasons for the allure…

"If you think I'm crazy, you should see the guy who lives across the hall"

Jerry Seinfeld talking about Kramer in a Seinfeld episode

" A little inaccuracy sometimes saves tons of explanation"

H.H. Munro

" If you are going to screw up, make sure that you have lots of company"

Ex-portfolio manager

The Four Steps to Deconstructing Multiples

- Define the multiple
  - In use, the same multiple can be defined in different ways by different users. When comparing and using multiples, estimated by someone else, it is critical that we understand how the multiples have been estimated
- Describe the multiple
  - Too many people who use a multiple have no idea what its cross sectional distribution is. If you do not know what the cross sectional distribution of a multiple is, it is difficult to look at a number and pass judgment on whether it is too high or low.
- Analyze the multiple
  - It is critical that we understand the fundamentals that drive each multiple, and the nature of the relationship between the multiple and each variable.
- Apply the multiple
  - Defining the comparable universe and controlling for differences is far more difficult in practice than it is in theory.

Definitional Tests

- Is the multiple consistently defined?
  - **Proposition 1: Both the value (the numerator) and the standardizing variable (the denominator) should be to the same claimholders in the firm. In other words, the value of equity should be divided by equity earnings or equity book value, and firm value should be divided by firm earnings or book value.**
- Is the multiple uniformly estimated?
  - The variables used in defining the multiple should be estimated uniformly across assets in the "comparable firm" list.
  - If earnings-based multiples are used, the accounting rules to measure earnings should be applied consistently across assets. The same rule applies with book-value based multiples.

Example 1: Price Earnings Ratio: Definition

PE = Market Price per Share / Earnings per Share

- There are a number of variants on the basic PE ratio in use. They are based upon how the price and the earnings are defined.
- Price: is usually the current price
  is sometimes the average price for the year
- EPS: earnings per share in most recent financial year
  earnings per share in trailing 12 months (Trailing PE)
  forecasted earnings per share next year (Forward PE)
  forecasted earnings per share in future year

Example 2: Enterprise Value /EBITDA Multiple

- The enterprise value to EBITDA multiple is obtained by netting cash out against debt to arrive at enterprise value and dividing by EBITDA.

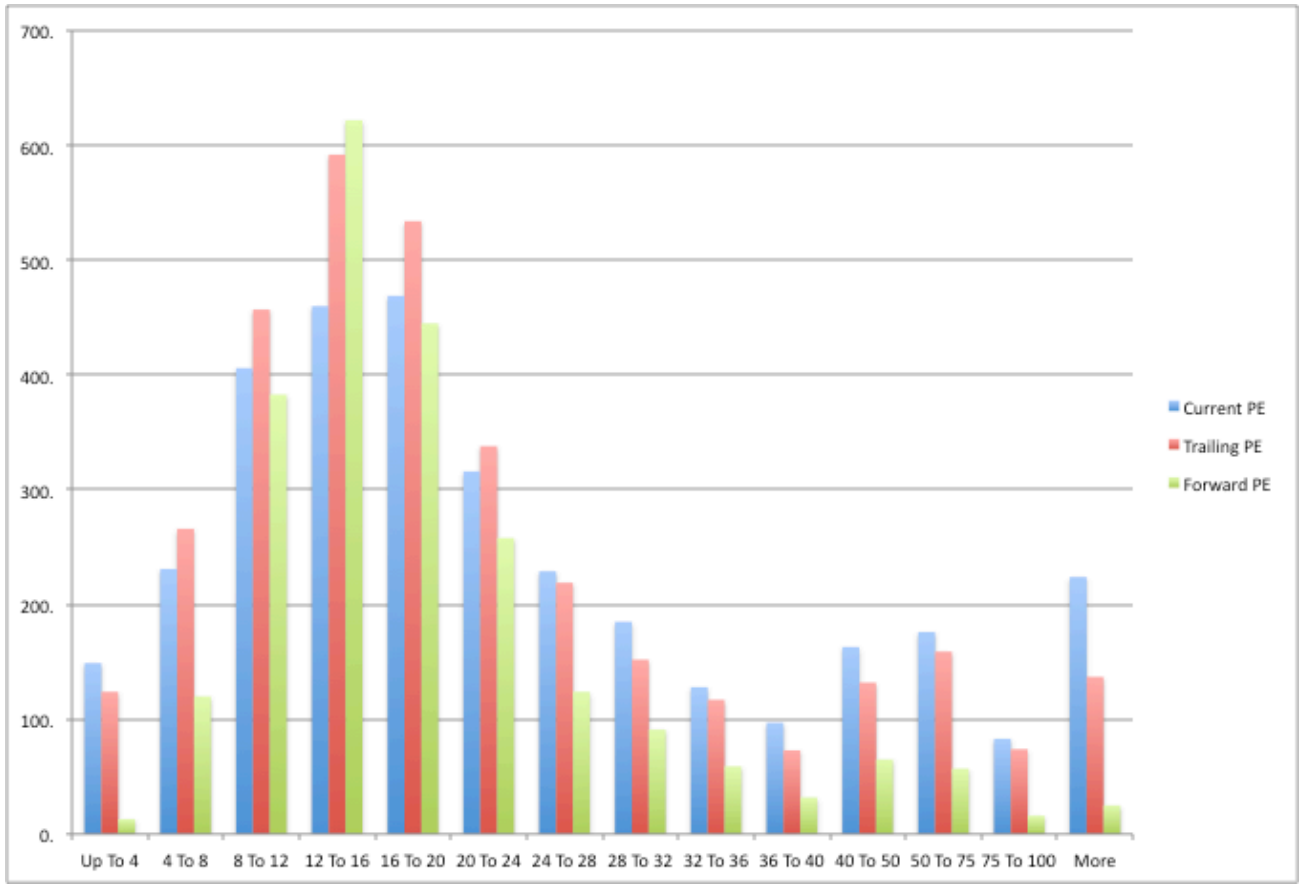
$$\frac{\text{Enterprise Value}}{\text{EBITDA}} = \frac{\text{Market Value of Equity} + \text{Market Value of Debt} - \text{Cash}}{\text{Earnings before Interest, Taxes and Depreciation}}$$

- Why do we net out cash from firm value?
- What happens if a firm has cross holdings which are categorized as:
  - Minority interests?
  - Majority active interests?

Descriptive Tests

- What is the average and standard deviation for this multiple, across the universe (market)?
- What is the median for this multiple?
  - The median for this multiple is often a more reliable comparison point.
- How large are the outliers to the distribution, and how do we deal with the outliers?
  - Throwing out the outliers may seem like an obvious solution, but if the outliers all lie on one side of the distribution (they usually are large positive numbers), this can lead to a biased estimate.
- Are there cases where the multiple cannot be estimated? Will ignoring these cases lead to a biased estimate of the multiple?
- How has this multiple changed over time?

Looking at the distribution of PE ratios… US stocks in January 2011

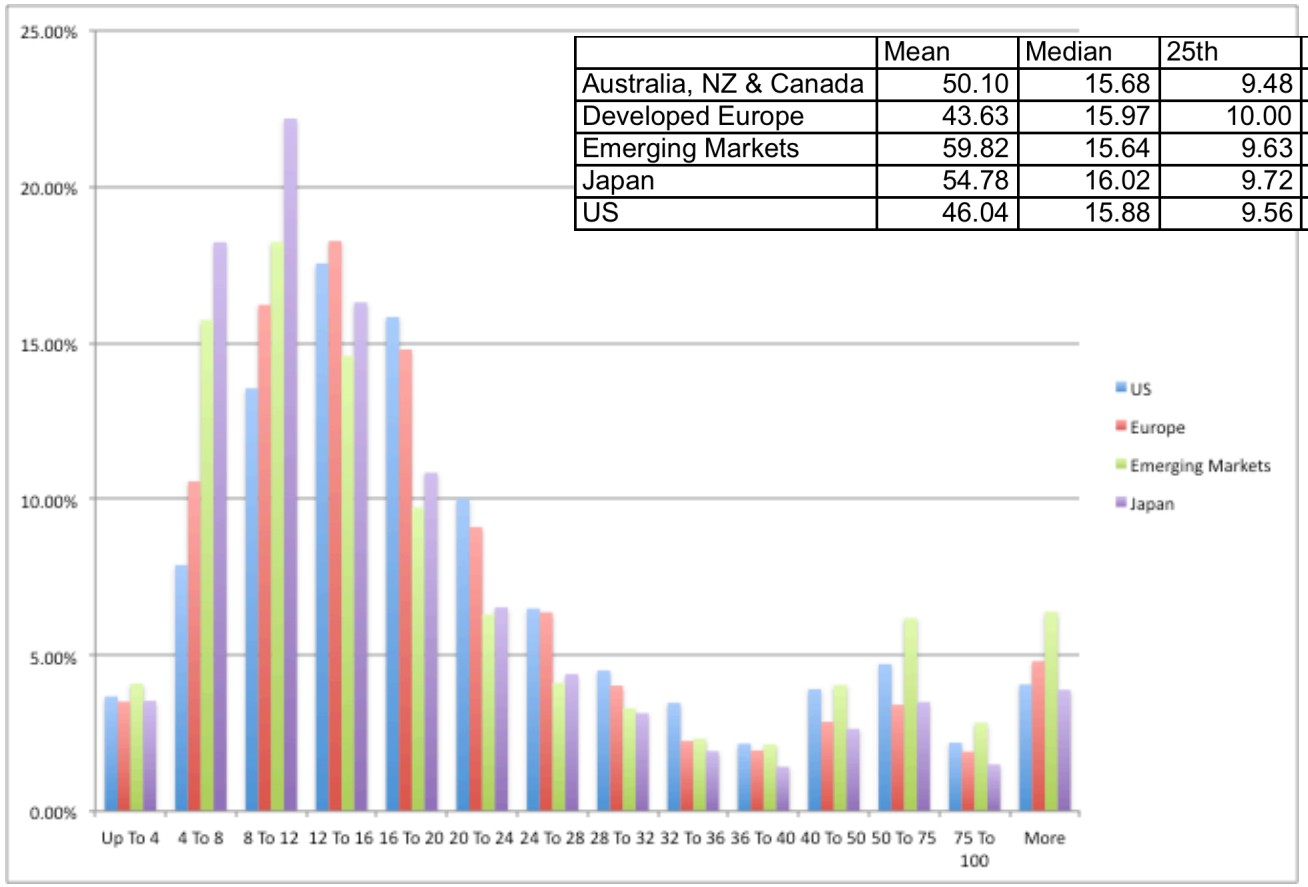


PE: Deciphering the Distribution

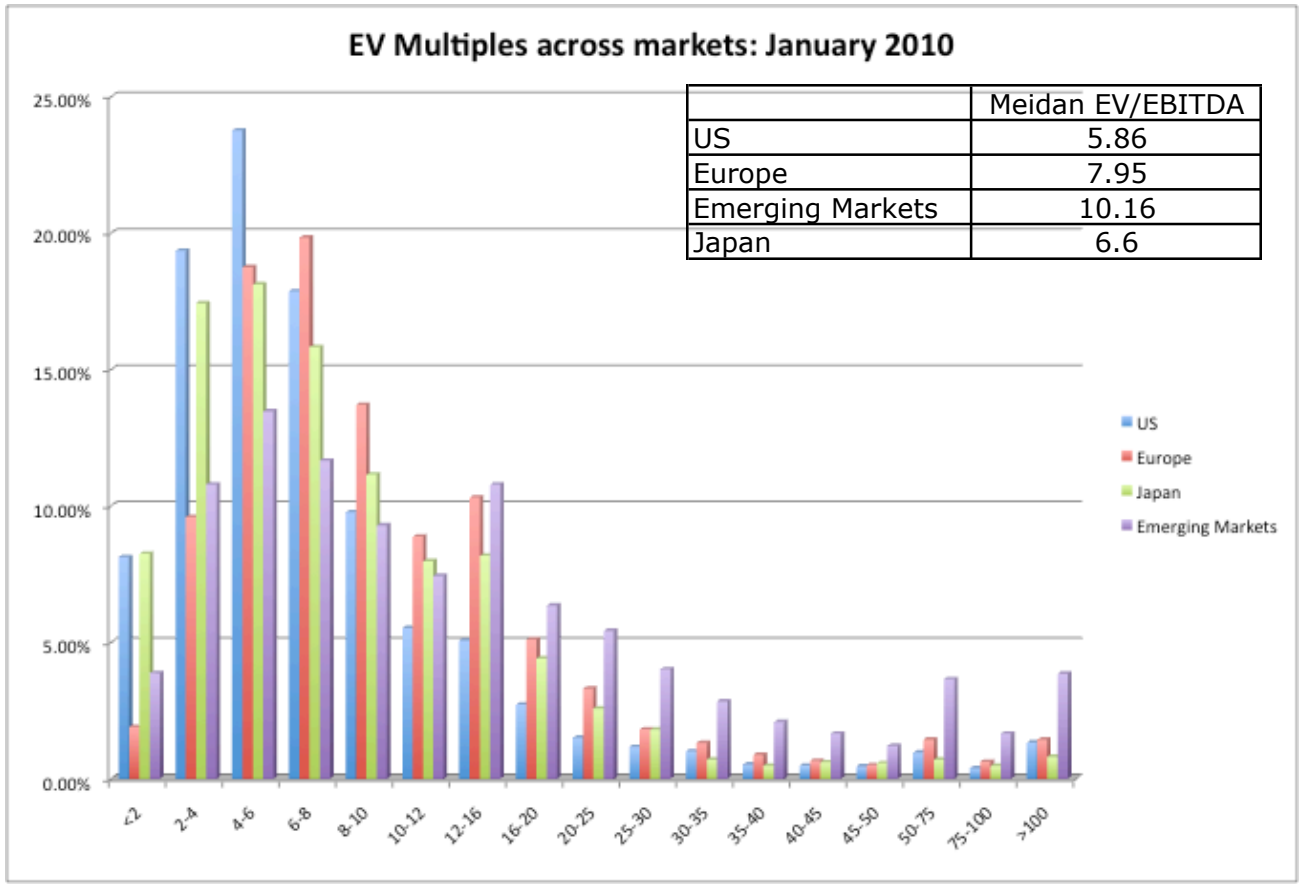
	Current PE	Trailing PE	Forward PE
Average	49.82	38.19	21.4
Median	19.5	17.79	16.16
25h percentile	12.38	11.99	12.44
75th percentile	33.44	28.02	22.13
Minimum	0.01	0.	1.82
Maximum	11,270.	6,680.7	717.
Number	3316	3374	2310
Sample Size	5928	5928	5928

Characteristic 3: Across Markets
PE Ratios: US, Europe, Japan and Emerging Markets – January 2011

	Mean	Median	25th	75th
Australia, NZ & Canada	50.10	15.68	9.48	27.82
Developed Europe	43.63	15.97	10.00	28.20
Emerging Markets	59.82	15.64	9.63	27.93
Japan	54.78	16.02	9.72	29.12
US	46.04	15.88	9.56	30.19



And 6 times EBITDA may not be cheap…



	Meidan EV/EBITDA
US	5.86
Europe	7.95
Emerging Markets	10.16
Japan	6.6

Analytical Tests

- What are the fundamentals that determine and drive these multiples?
  - Proposition 2: Embedded in every multiple are all of the variables that drive every discounted cash flow valuation - growth, risk and cash flow patterns.
  - In fact, using a simple discounted cash flow model and basic algebra should yield the fundamentals that drive a multiple
- How do changes in these fundamentals change the multiple?
  - The relationship between a fundamental (like growth) and a multiple (such as PE) is seldom linear. For example, if firm A has twice the growth rate of firm B, it will generally not trade at twice its PE ratio
  - **Proposition 3: It is impossible to properly compare firms on a multiple, if we do not know the nature of the relationship between fundamentals and the multiple.**

PE Ratio: Understanding the Fundamentals

- To understand the fundamentals, start with a basic equity discounted cash flow model.
- With the dividend discount model,

$$P_0 = \frac{DPS_1}{r - g_n}$$

- Dividing both sides by the current earnings per share,

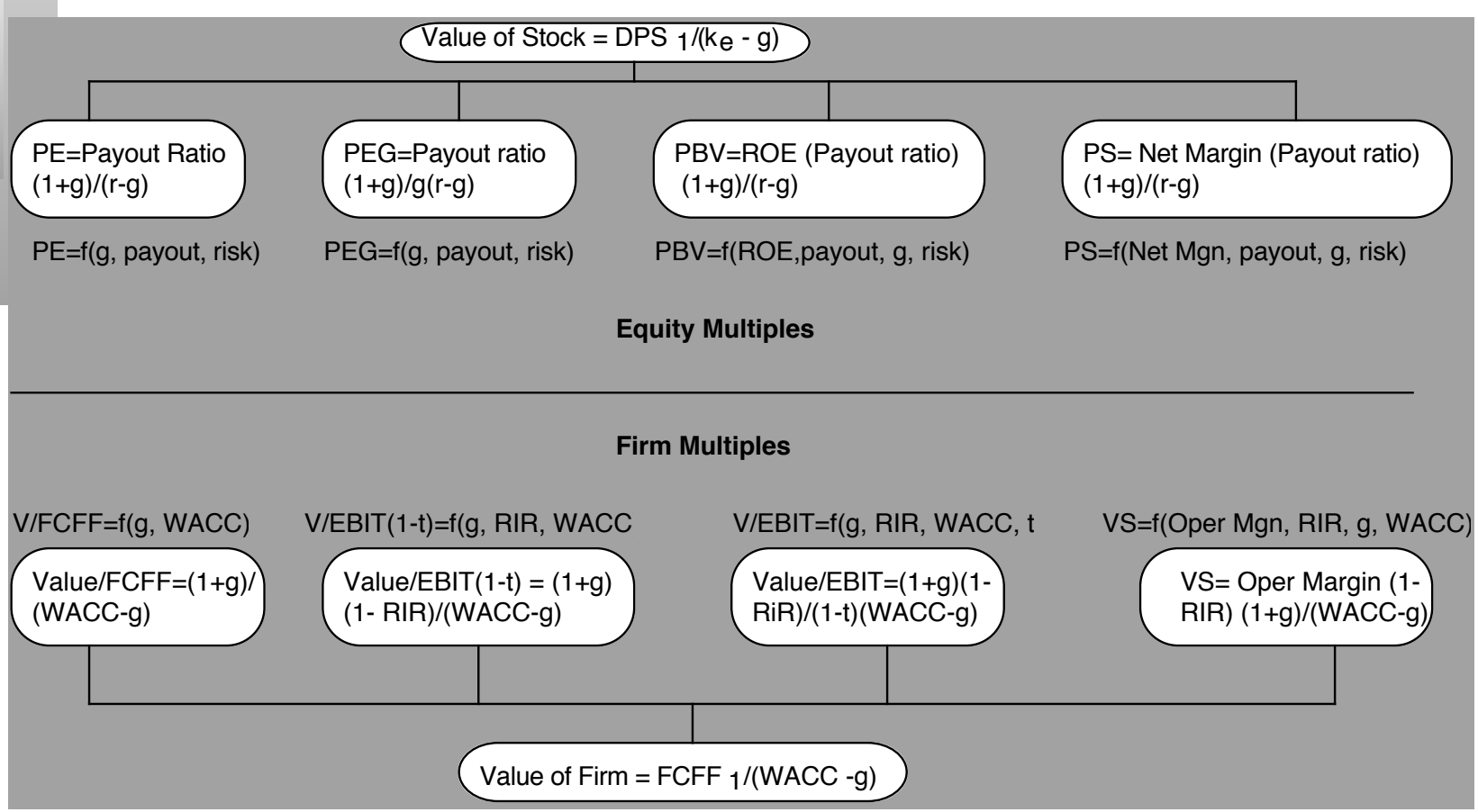
$$\frac{P_0}{EPS_0} = PE = \frac{\text{Payout Ratio} * (1 + g_n)}{r - g_n}$$

- If this had been a FCFE Model,

$$P_0 = \frac{FCFE_1}{r - g_n}$$

$$\frac{P_0}{EPS_0} = PE = \frac{(FCFE/Earnings) * (1 + g_n)}{r - g_n}$$

The Determinants of Multiples…



Application Tests

- Given the firm that we are valuing, what is a "comparable" firm?
  - While traditional analysis is built on the premise that firms in the same sector are comparable firms, valuation theory would suggest that a comparable firm is one which is similar to the one being analyzed in terms of fundamentals.
  - **Proposition 4: There is no reason why a firm cannot be compared with another firm in a very different business, if the two firms have the same risk, growth and cash flow characteristics.**
- Given the comparable firms, how do we adjust for differences across firms on the fundamentals?
  - **Proposition 5: It is impossible to find an exactly identical firm to the one you are valuing.**

An Example: Comparing PE Ratios across a Sector: PE

Company Name	PE	Growth
PT Indosat ADR	7.8	0.06
Telebras ADR	8.9	0.075
Telecom Corporation of New Zealand ADR	11.2	0.11
Telecom Argentina Stet - France Telecom SA ADR B	12.5	0.08
Hellenic Telecommunication Organization SA ADR	12.8	0.12
Telecomunicaciones de Chile ADR	16.6	0.08
Swisscom AG ADR	18.3	0.11
Asia Satellite Telecom Holdings ADR	19.6	0.16
Portugal Telecom SA ADR	20.8	0.13
Telefonos de Mexico ADR L	21.1	0.14
Matav RT ADR	21.5	0.22
Telstra ADR	21.7	0.12
Gilat Communications	22.7	0.31
Deutsche Telekom AG ADR	24.6	0.11
British Telecommunications PLC ADR	25.7	0.07
Tele Danmark AS ADR	27	0.09
Telekomunikasi Indonesia ADR	28.4	0.32
Cable & Wireless PLC ADR	29.8	0.14
APT Satellite Holdings ADR	31	0.33
Telefonica SA ADR	32.5	0.18
Royal KPN NV ADR	35.7	0.13
Telecom Italia SPA ADR	42.2	0.14
Nippon Telegraph & Telephone ADR	44.3	0.2
France Telecom SA ADR	45.2	0.19
Korea Telecom ADR	71.3	0.44

PE, Growth and Risk

Dependent variable is: PE

R squared = 66.2% R squared (adjusted) = 63.1%

Variable	Coefficient	SE	t-ratio	prob
Constant	13.1151	3.471	3.78	0.0010
Growth rate	121.223	19.27	6.29	≤ 0.0001
Emerging Market	-13.8531	3.606	-3.84	0.0009

Emerging Market is a dummy: 1 if emerging market
0 if not

Is Telebras under valued?

- Predicted PE = 13.12 + 121.22 (.075) - 13.85 (1) = 8.35
- At an actual price to earnings ratio of 8.9, Telebras is slightly overvalued.

Amgen's Relative Value

Company Name	*Market Cao*	*PE Ratio*	*Expected Growth*	*Beta*	*ROE*
King Pharmac.	$5,064	12.64	-0.50%	1.10	20.29%
Pfizer Inc.	$190,923	12.74	2.00%	0.85	21.07%
GlaxoSmithKline ADR	$158,986	15.63	5.00%	0.85	55.29%
Amgen	$66,847	15.99	15.00%	0.85	22.05%
Wyeth	$74,271	17.35	9.00%	1.00	29.22%
Novartis AG ADR	$133,805	18.58	7.50%	0.70	17.52%
Lilly (Eli)	$66,440	19.21	7.00%	0.85	31.49%
Merck & Co.	$110,731	20.09	7.00%	0.85	31.40%
Hospira Inc.	$6,416	20.72	8.00%	0.70	22.75%
Cephalon Inc.	$5,183	21.17	14.00%	1.15	18.69%
Forest Labs.	$16,381	24.56	10.00%	0.80	24.72%
Teva Pharmac. (ADR)	$29,272	27.30	14.50%	0.75	17.75%
Gilead Sciences	$37,365	32.17	17.50%	0.90	63.97%
Schering-Plough	$46,814	34.63	29.50%	0.95	20.89%
Novo Nordisk ADR	$33,333	35.87	14.50%	0.85	21.22%
Bristol-Myers Squibb	$58,636	36.99	7.00%	1.00	13.65%
Genentech Inc.	$83,856	39.69	27.50%	0.80	22.29%
Allergan Inc.	$18,595	41.15	15.00%	0.85	14.38%
Biogen Idec Inc.	$15,254	70.13	33.50%	1.10	3.04%
Celgene Corp.	$23,683	343.23	59.00%	1.30	3.49%
MedImmune Inc.	$13,560	797.62	58.00%	1.00	1.23%

The Drivers of PE Ratios…

- Regressing PE ratios against growth, we get
  - PE = 14.86 + 0.85 (Expected growth rate) R^2 = 49%
  - Plugging in Amgen's expected growth rate of 15%, we get
  - PE = 14.86 + 0.85 (15) = 27.61
- At 16 times earnings, Amgen seems to be significantly undervalued by almost 40% relative to the rest of the pharmaceutical sector.

Comparisons to the entire market: Why not?

- In contrast to the 'comparable firm' approach, the information in the entire cross-section of firms can be used to predict PE ratios.
- The simplest way of summarizing this information is with a multiple regression, with the PE ratio as the dependent variable, and proxies for risk, growth and payout forming the independent variables.

PE Ratio: Standard Regression for US stocks - January 2011

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.447[a]	.200	.198	1228.28770

a. Predictors: (Constant), Regression Beta, Expected Growth in EPS: next 5 years, Payout Ratio

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.372	1.090		5.846	.000
	Expected Growth in EPS: next 5 years	83.558	4.937	.414	16.925	.000
	Payout Ratio	5.826	1.357	.107	4.294	.000
	Regression Beta	5.062	.619	.190	8.182	.000

a. Dependent Variable: Current PE
b. Weighted Least Squares Regression - Weighted by Market Cap

Amgen valued relative to the market

- Plugging in Amgen's numbers into the January 2007 market regression:
  - Expected growth rate = 15%
  - Beta = 0.85
  - Payout ratio = 0%
  - Predicted PE = 10.645 + 1.176 (15) - 2.621 (0.85) = 26.06
- Again, at 16 times earnings, Amgen seems to be significantly undervalued, relative to how the market is pricing all other stocks.

Fundamentals hold in every market: PE regressions across markets…

Region	Regression – January 2011	R squared
Europe	PE = 11.55 + 53.32 Expected Growth + 6.00 Payout -1.35 Beta	29.8%
Japan	PE = 16.60 + 17.24 Expected Growth + 14.68 Beta	19.6%
Emerging Markets	PE = 19.47+ 17.10 Expected Growth + 2.45 Payout	7.8%

Choosing Between the Multiples

- As presented in this section, there are dozens of multiples that can be potentially used to value an individual firm.
- In addition, relative valuation can be relative to a sector (or comparable firms) or to the entire market (using the regressions, for instance)
- Since there can be only one final estimate of value, there are three choices at this stage:
  - Use a simple average of the valuations obtained using a number of different multiples
  - Use a weighted average of the valuations obtained using a nmber of different multiples
  - Choose one of the multiples and base your valuation on that multiple

Picking one Multiple

- This is usually the best way to approach this issue. While a range of values can be obtained from a number of multiples, the "best estimate" value is obtained using one multiple.
- The multiple that is used can be chosen in one of two ways:
  - Use the multiple that best fits your objective. Thus, if you want the company to be undervalued, you pick the multiple that yields the highest value.
  - Use the multiple that has the highest R-squared in the sector when regressed against fundamentals. Thus, if you have tried PE, PBV, PS, etc. and run regressions of these multiples against fundamentals, use the multiple that works best at explaining differences across firms in that sector.
  - Use the multiple that seems to make the most sense for that sector, given how value is measured and created.

Conventional usage…

Sector	Multiple Used	Rationale
Cyclical Manufacturing	PE, Relative PE	Often with normalized earnings
Growth firms	PEG ratio	Big differences in growth rates
Young growth firms w/ losses	Revenue Multiples	What choice do you have?
Infrastructure	EV/EBITDA	Early losses, big DA
REIT	P/CFE (where CFE = Net income + Depreciation)	Big depreciation charges on real estate
Financial Services	Price/ Book equity	Marked to market?
Retailing	Revenue multiples	Margins equalize sooner or later

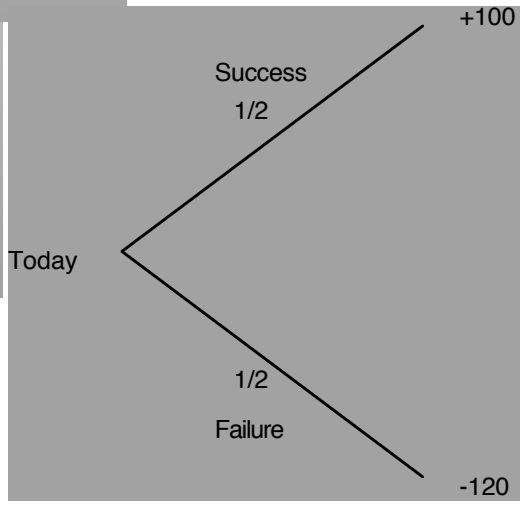
Real Options: Fact and Fantasy

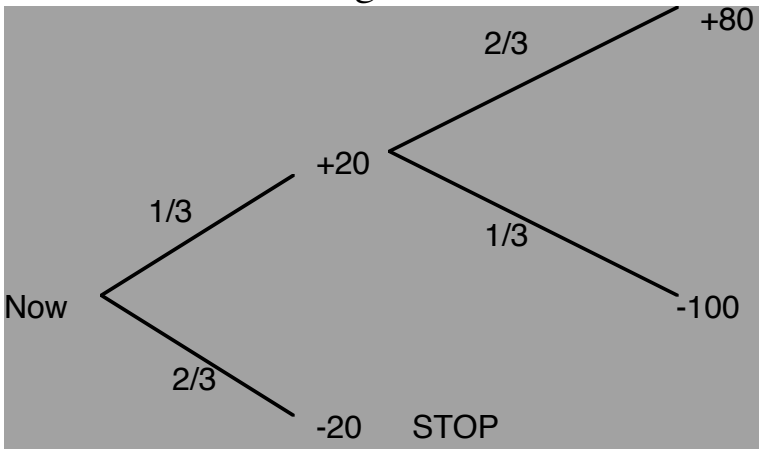
Aswath Damodaran

The Basis for Real Options

- In the last few years, there are some who have argued that discounted cashflow valuations under valued some companies and that a real option premium should be tacked on to DCF valuations. To understanding its moorings, compare the two trees below:

A bad investment…….. Becomes a good one..





1. Learn at relatively low cost
2. Make better decisions based on learning

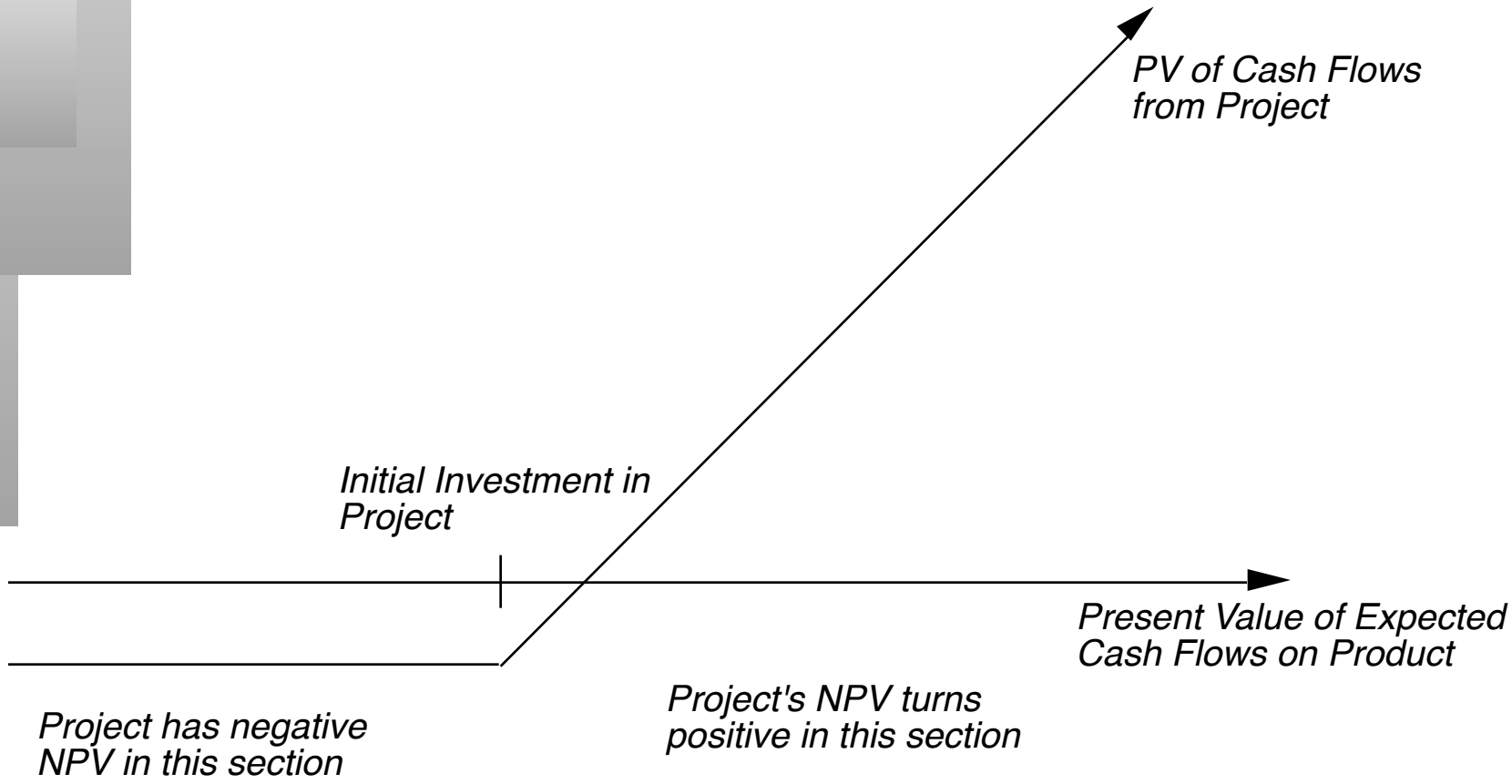
Three Basic Questions

- When is there a real option embedded in a decision or an asset?
- When does that real option have significant economic value?
- Can that value be estimated using an option pricing model?

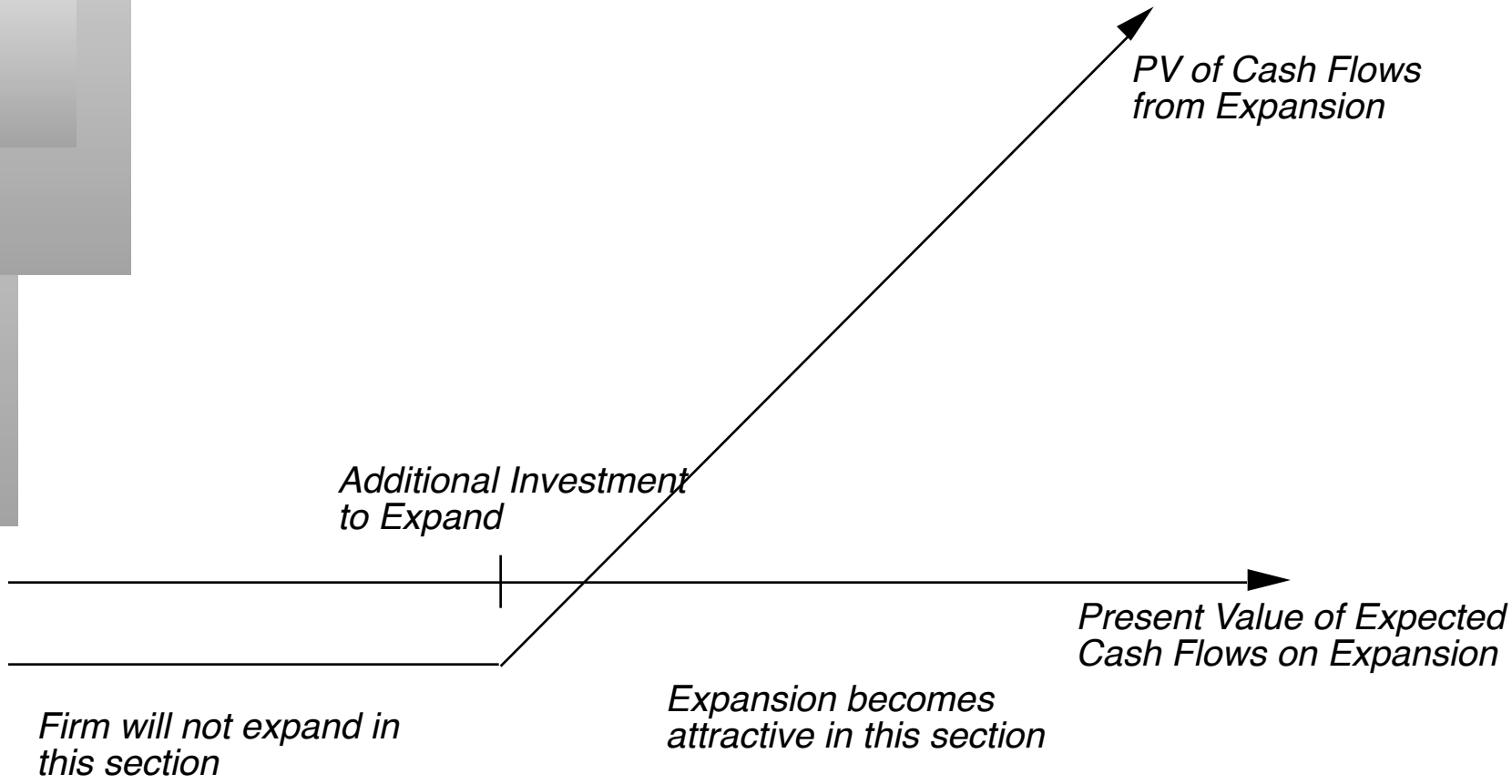
When is there an option embedded in an action?

- An option provides the holder with the **right** to buy or sell a specified quantity of an underlying asset at a fixed price (called a strike price or an exercise price) at or before the expiration date of the option.
- There has to be a clearly defined underlying asset whose value changes over time in unpredictable ways.
- The payoffs on this asset (real option) have to be contingent on an specified event occurring within a finite period.

Example 1: Product Patent as an Option



Example 2: Expansion of existing project as an option



When does the option have significant economic value?

- For an option to have significant economic value, there has to be a restriction on competition in the event of the contingency. In a perfectly competitive product market, no contingency, no matter how positive, will generate positive net present value.
- At the limit, real options are most valuable when you have exclusivity - you and only you can take advantage of the contingency. They become less valuable as the barriers to competition become less steep.

Exclusivity: Putting Real Options to the Test

- Product Options: Patent on a drug
  - Patents restrict competitors from developing similar products
  - Patents do not restrict competitors from developing other products to treat the same disease.
- Growth Options: Expansion into a new product or market
  - Barriers may range from strong (exclusive licenses granted by the government - as in telecom businesses) to weaker (brand name, knowledge of the market) to weakest (first mover).

Determinants of option value

- Variables Relating to Underlying Asset
  - Value of Underlying Asset; as this value increases, the right to buy at a fixed price (calls) will become more valuable and the right to sell at a fixed price (puts) will become less valuable.
  - Variance in that value; as the variance increases, both calls and puts will become more valuable because all options have limited downside and depend upon price volatility for upside.
  - Expected dividends on the asset, which are likely to reduce the price appreciation component of the asset, reducing the value of calls and increasing the value of puts.
- Variables Relating to Option
  - Strike Price of Options; the right to buy (sell) at a fixed price becomes more (less) valuable at a lower price.
  - Life of the Option; both calls and puts benefit from a longer life.
- Level of Interest Rates; as rates increase, the right to buy (sell) at a fixed price in the future becomes more (less) valuable.

The Building Blocks for Option Pricing Models: Arbitrage and Replication

- The objective in creating a replicating portfolio is to use a combination of riskfree borrowing/lending and the underlying asset to create the same cashflows as the option being valued.
  - Call = Borrowing + Buying Δ of the Underlying Stock
  - Put = Selling Short Δ on Underlying Asset + Lending
  - The number of shares bought or sold is called the **option delta**.
- The principles of arbitrage then apply, and the value of the option has to be equal to the value of the replicating portfolio.

When can you use option pricing models to value real options?

- The notion of a replicating portfolio that drives option pricing models makes them most suited for valuing real options where
  - The underlying asset is traded - this yield not only observable prices and volatility as inputs to option pricing models but allows for the possibility of creating replicating portfolios
  - An active marketplace exists for the option itself.
  - The cost of exercising the option is known with some degree of certainty.
- When option pricing models are used to value real assets, we have to accept the fact that
  - The value estimates that emerge will be far more imprecise.
  - The value can deviate much more dramatically from market price because of the difficulty of arbitrage.

Valuing a Product Patent as an option: Avonex

- Biogen, a bio-technology firm, has a patent on Avonex, a drug to treat multiple sclerosis, for the next 17 years, and it plans to produce and sell the drug by itself. The key inputs on the drug are as follows:

  PV of Cash Flows from Introducing the Drug Now = S = $ 3.422 billion

  PV of Cost of Developing Drug for Commercial Use = K = $ 2.875 billion

  Patent Life = t = 17 years Riskless Rate = r = 6.7% (17-year T.Bond rate)

  Variance in Expected Present Values = σ^2 = 0.224 (Industry average firm variance for bio-tech firms)

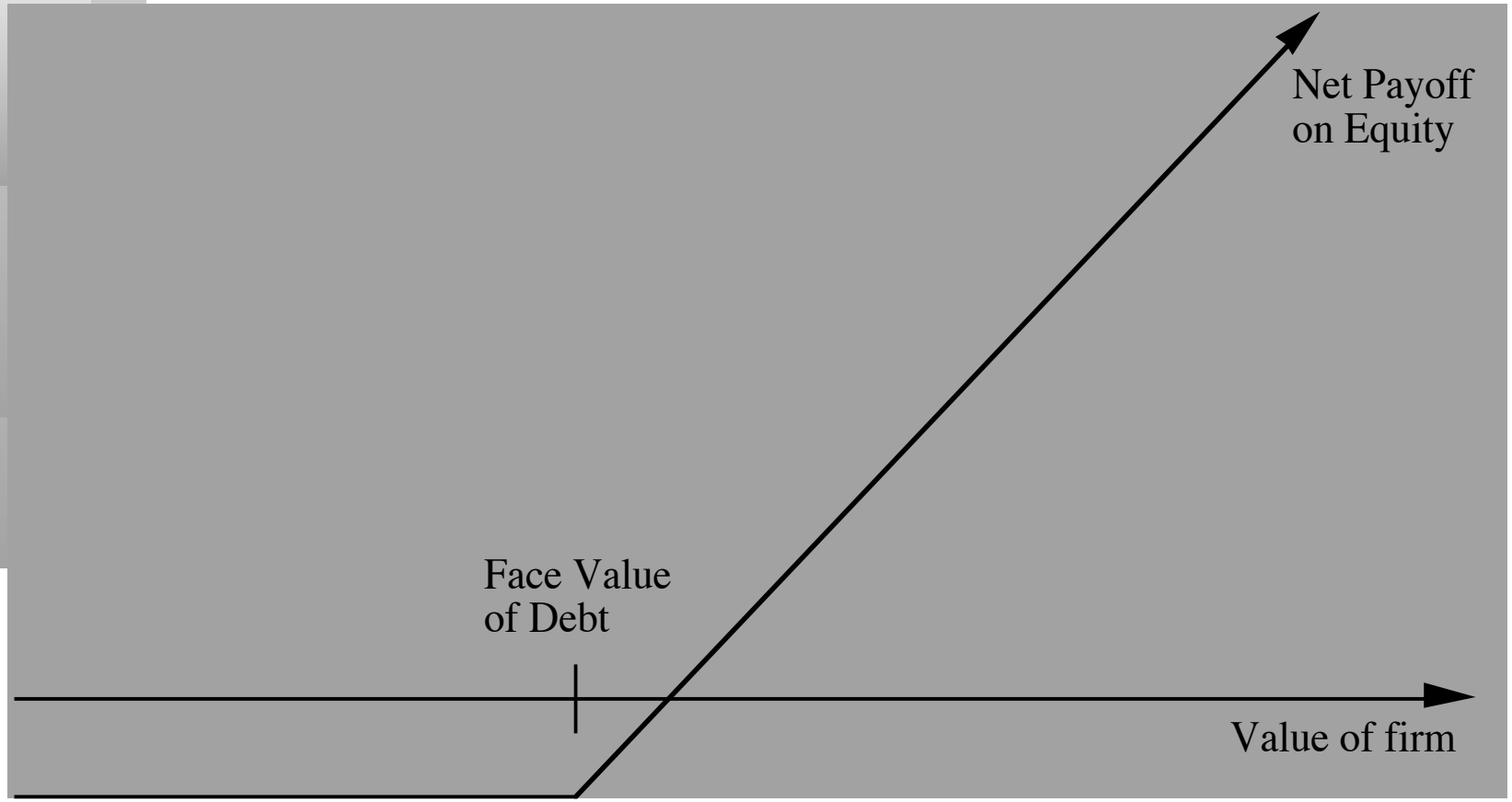
  Expected Cost of Delay = y = 1/17 = 5.89%

  d1 = 1.1362 N(d1) = 0.8720

  d2 = -0.8512 N(d2) = 0.2076

Call Value= 3,422 $\exp^{(-0.0589)(17)}$ (0.8720) - 2,875 ($\exp^{(-0.067)(17)}$ (0.2076)= $ 907 million

One final example: Equity as a Liquidation Option



Application to valuation: A simple example

- Assume that you have a firm whose assets are currently valued at $100 million and that the standard deviation in this asset value is 40%.
- Further, assume that the face value of debt is $80 million (It is zero coupon debt with 10 years left to maturity).
- If the ten-year treasury bond rate is 10%,
  - how much is the equity worth?
  - What should the interest rate on debt be?

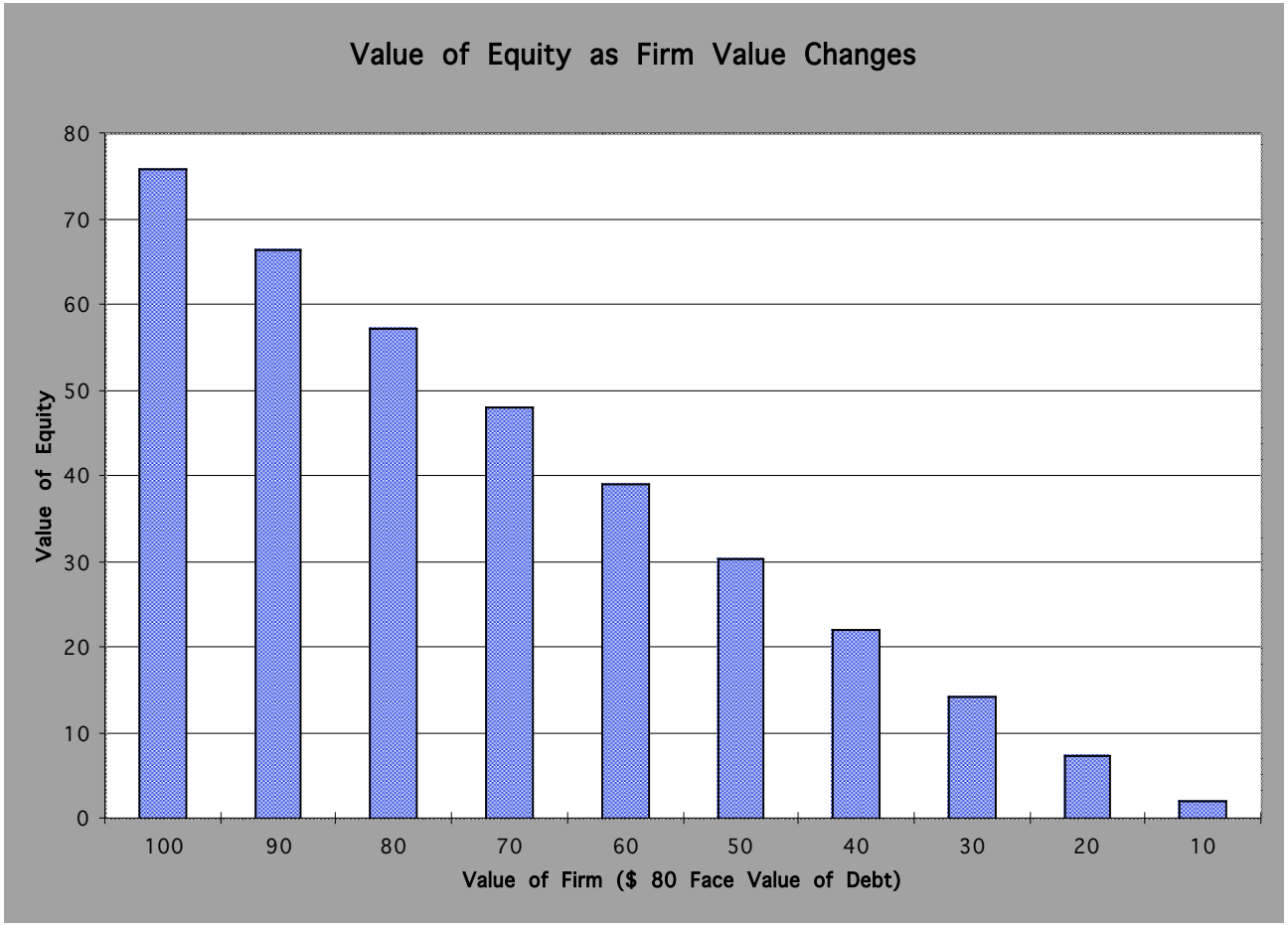
Valuing Equity as a Call Option

- Inputs to option pricing model
  - Value of the underlying asset = S = Value of the firm = $ 100 million
  - Exercise price = K = Face Value of outstanding debt = $ 80 million
  - Life of the option = t = Life of zero-coupon debt = 10 years
  - Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.16
  - Riskless rate = r = Treasury bond rate corresponding to option life = 10%
- Based upon these inputs, the Black-Scholes model provides the following value for the call:
  - d1 = 1.5994 N(d1) = 0.9451
  - d2 = 0.3345 N(d2) = 0.6310
- Value of the call = $100 (0.9451) - 80 \exp^{(-0.10)(10)} (0.6310) = \$75.94$ million
- Value of the outstanding debt = $100 - $75.94 = $24.06 million
- Interest rate on debt = $(\$ 80 / \$24.06)^{1/10} - 1 = 12.77\%$

The Effect of Catastrophic Drops in Value

- Assume now that a catastrophe wipes out half the value of this firm (the value drops to $ 50 million), while the face value of the debt remains at $ 80 million. Consider the new inputs into the equity valuation:
  - Value of the underlying asset = S = Value of the firm = $ 50 million
  - Exercise price = K = Face Value of outstanding debt = $ 80 million
  - Life of the option = t = Life of zero-coupon debt = 10 years
  - Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.16
  - Riskless rate = r = Treasury bond rate corresponding to option life = 10%
- Based upon these inputs, the Black-Scholes model provides the following value for the call:
  - d1 = 1.0515 N(d1) = 0.8534
  - d2 = -0.2135 N(d2) = 0.4155
  - Value of the call (Equity)= 50 (0.8534) - 80 $\exp^{(-0.10)(10)}$ (0.4155) = $30.44 million
  - Value of the debt= $50 - $30.44 = $19.56 million

Equity value persists ..



Back to Lemmings...