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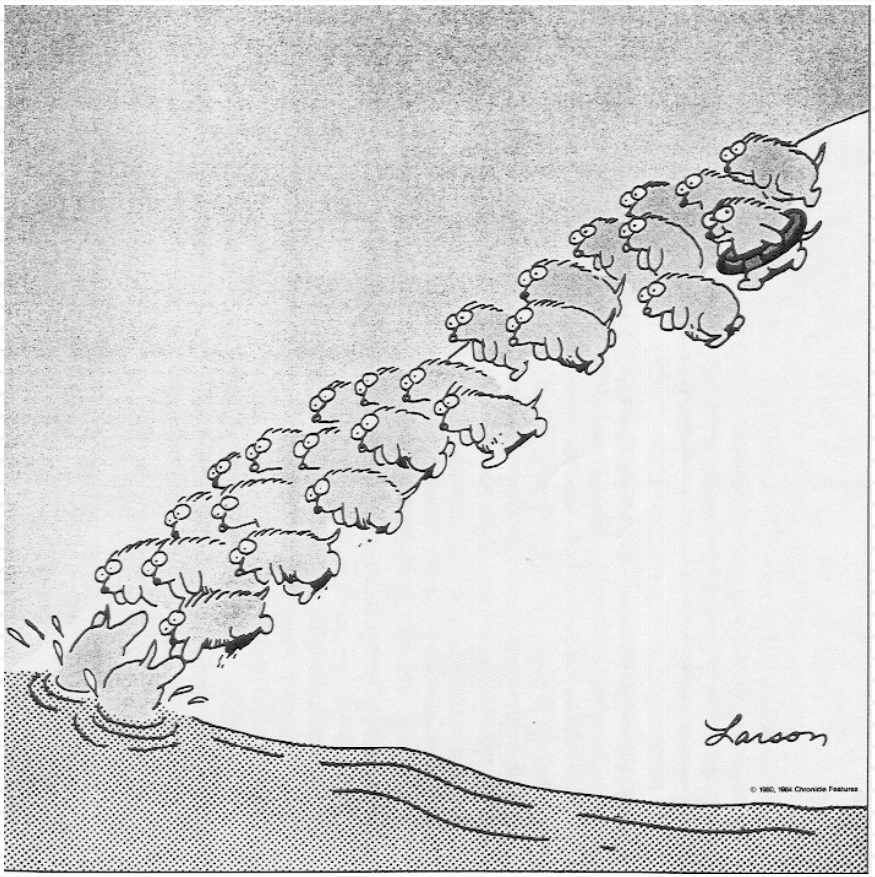
ADVANCED VALUATION

Aswath Damodaran

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

- **Intrinsic 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.

Intrinsic Value: Four Basic Propositions

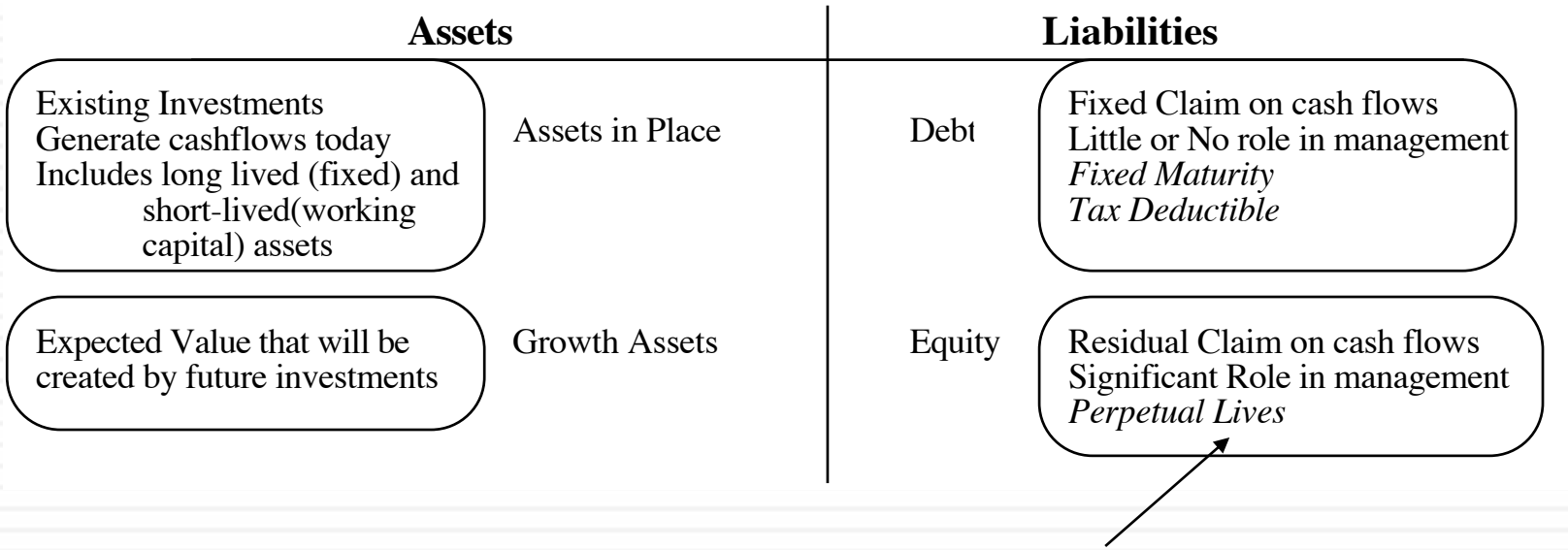
The value of an asset is the present value of the expected cash flows on that asset, over its expected life:

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

1. *The IT Proposition*: If "it" does not affect the cash flows or alter risk (thus changing discount rates), "it" cannot affect value.
2. *The DUH Proposition*: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.
3. *The DON'T FREAK OUT Proposition*: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.
4. *The VALUE IS NOT PRICE Proposition*: The value of an asset may be very different from its price.

DCF Choices: Equity Valuation versus Firm Valuation

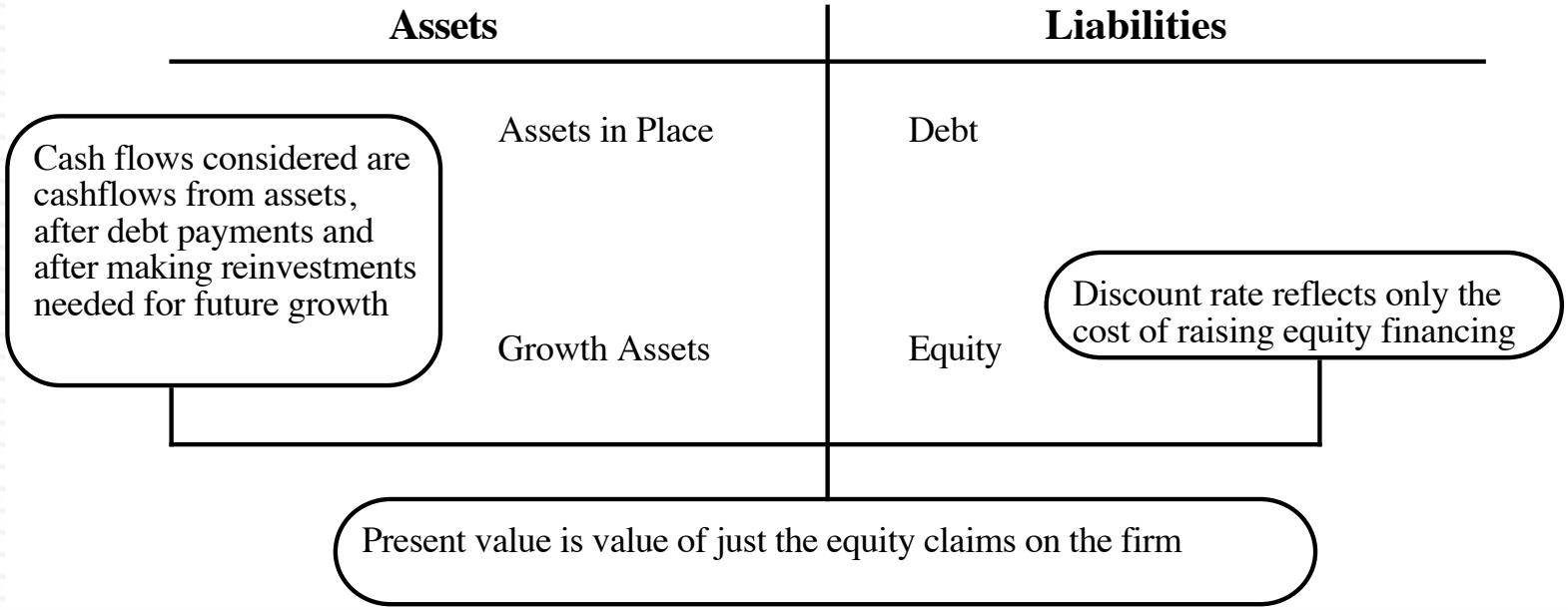
Firm Valuation: Value the entire business



Equity valuation: Value just the equity claim in the business

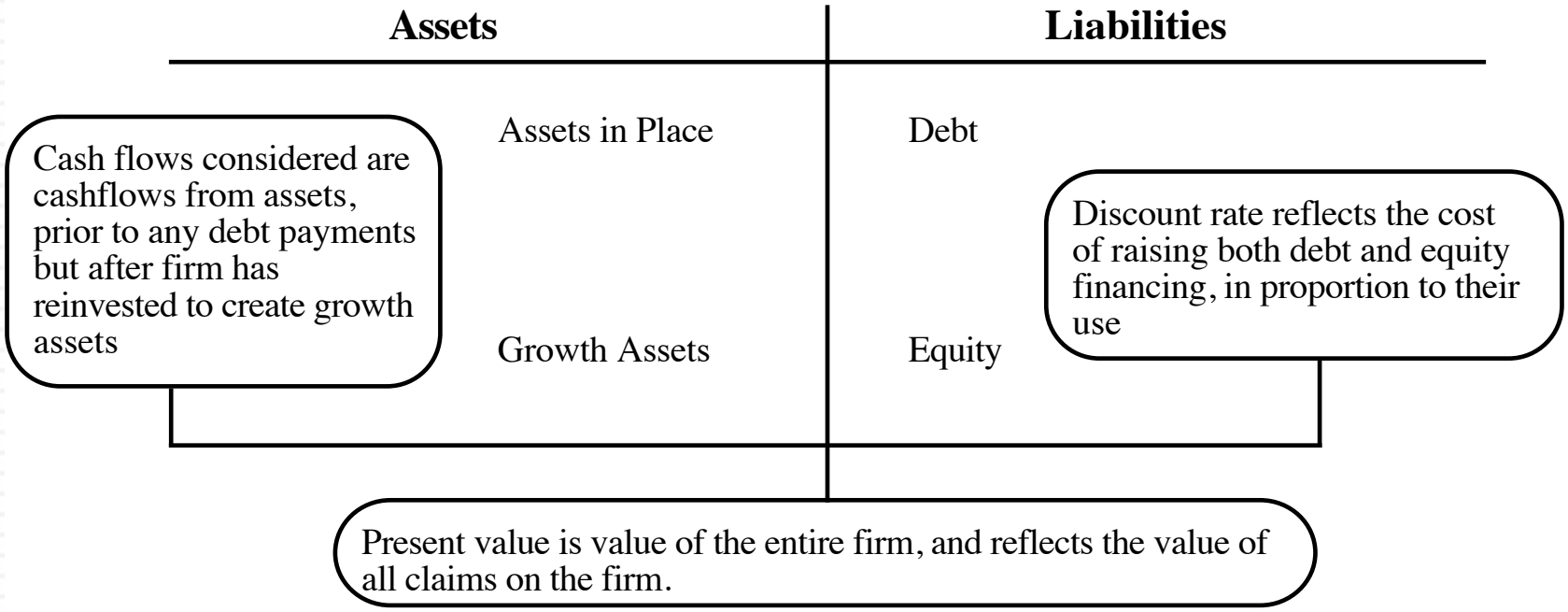
Equity Valuation

Figure 5.5: Equity Valuation

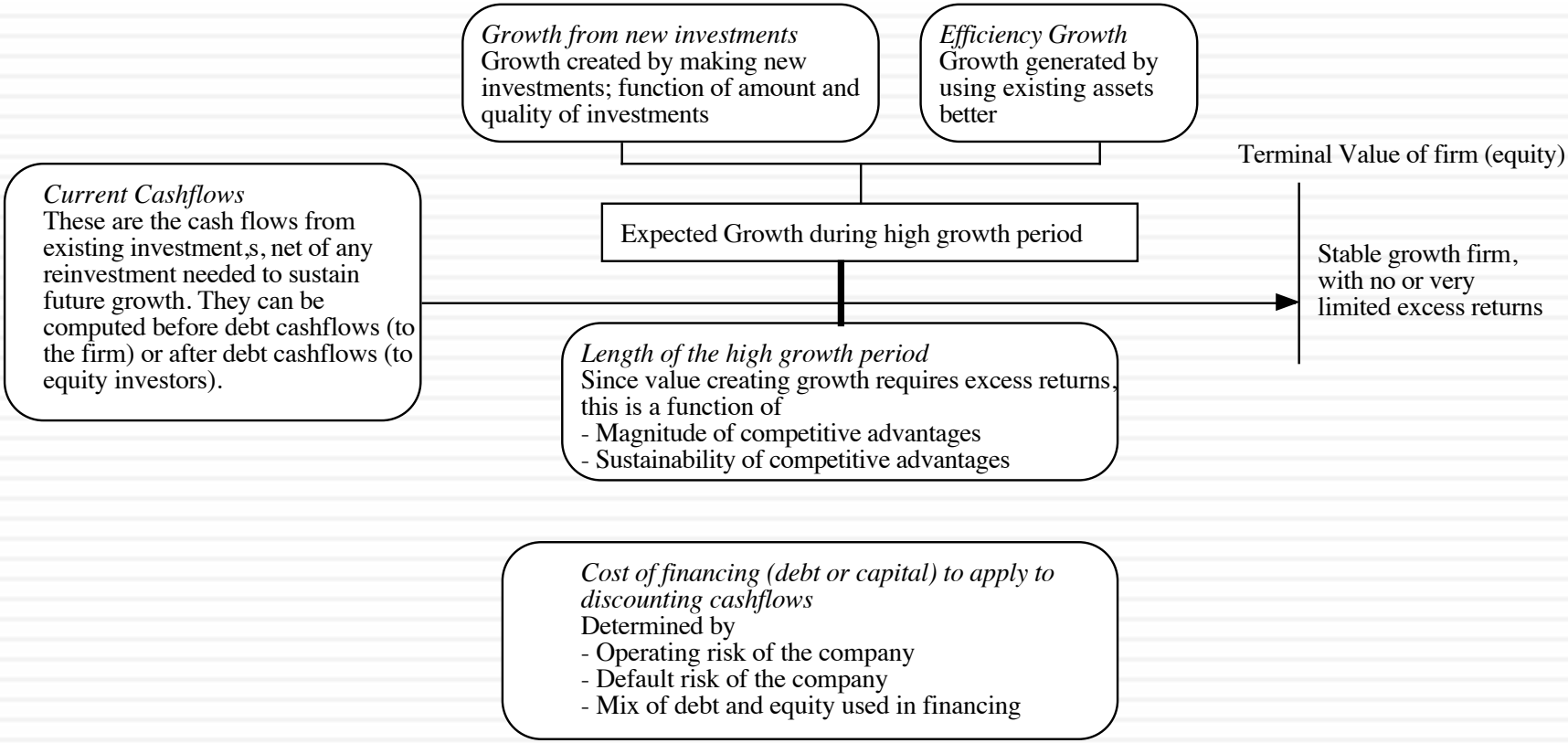


Firm Valuation

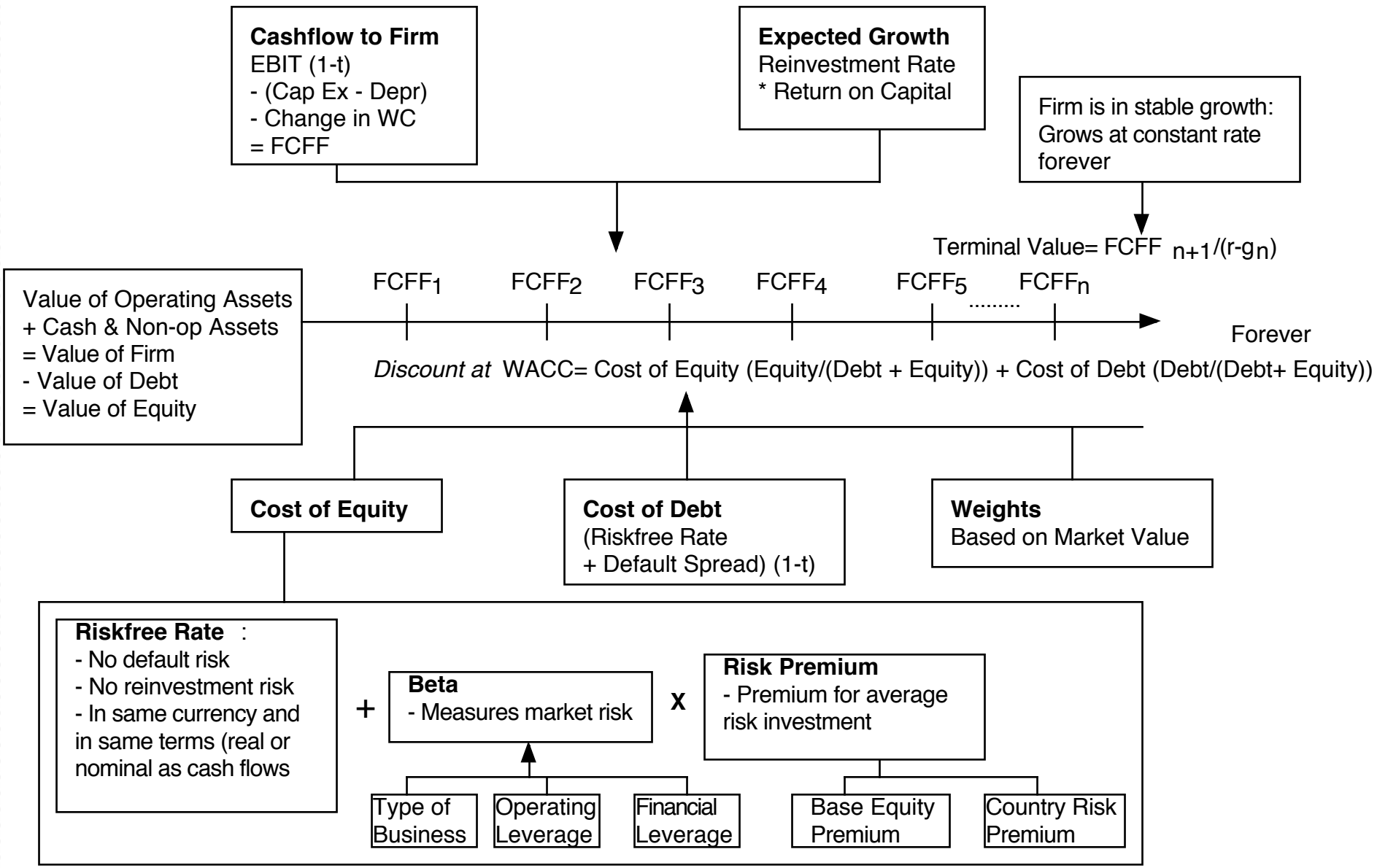
Figure 5.6: Firm Valuation



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

x

Risk Premium
4%

Unlevered Beta for Sectors: 1.59

D/E=11.06%

Tata Motors: April 2010

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%

Average reinvestment rate from 2005-09: 179.59%; without acquisitions: 70%

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/ROC =5/ 10.39= 48.11%

Terminal Value5= 23493/(.1039-.05) = Rs 435,686

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

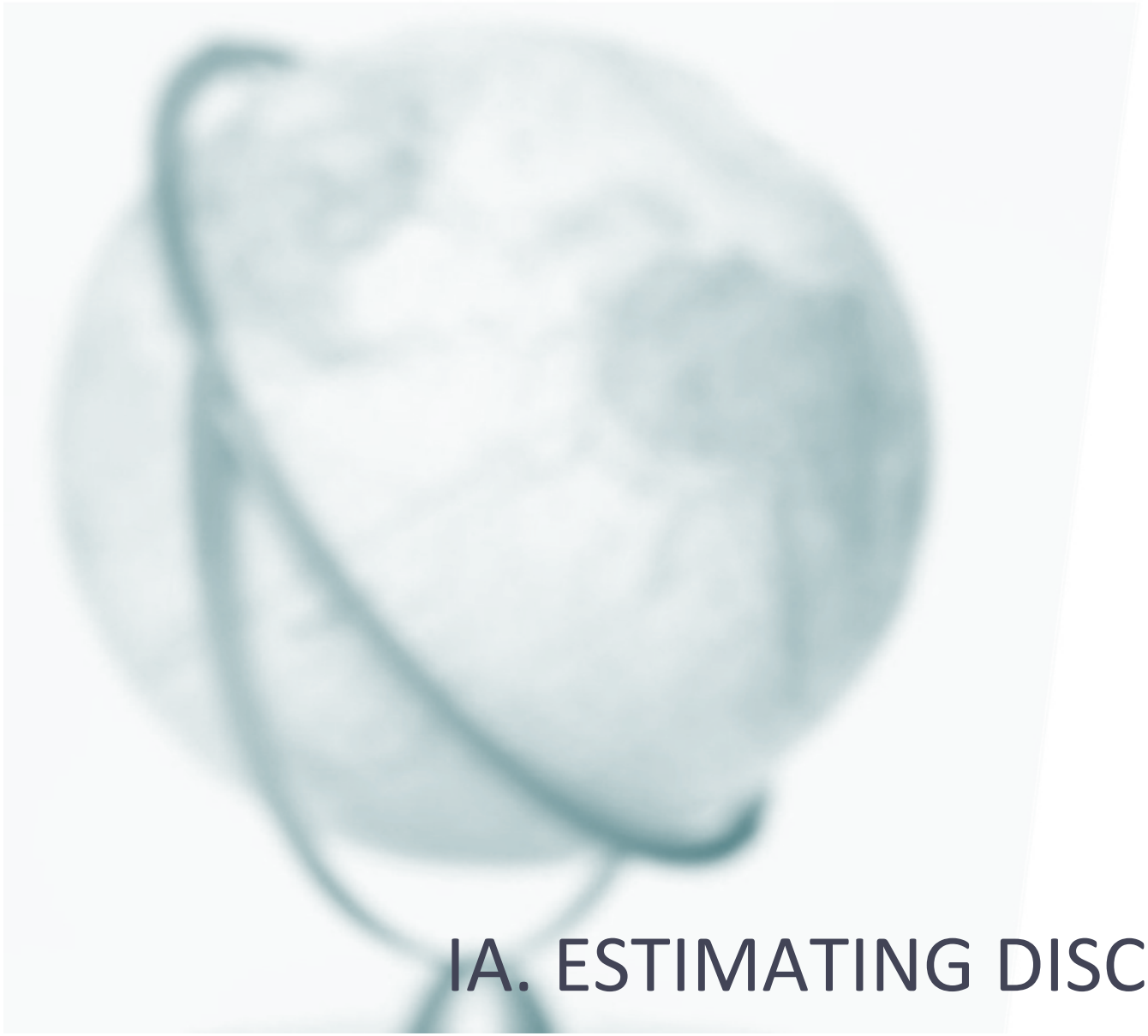
Riskfree Rate:
Rs Riskfree Rate= 5%

+ **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



IA. ESTIMATING DISCOUNT RATES

Risk in the DCF Model

Expectation of cash flows across all scenarios, good and bad. Incorporates all risks that affect the asset / business.

$$\frac{\text{Expected Cash Flows}}{\text{Risk Adjusted Discount Rate}}$$

Discount rate should reflect the risk perceived by the marginal investor in the company

Risk Adjusted Cost of equity	=	Risk free rate in the currency of analysis	+	Relative risk of company/equity in questiion	X	Equity Risk Premium required for average risk equity

Not all risk is created equal…

- Estimation versus Economic uncertainty
  - Estimation uncertainty reflects the possibility that you could have the "wrong model" or estimated inputs incorrectly within this model.
  - Economic uncertainty comes the fact that markets and economies can change over time and that even the best models will fail to capture these unexpected changes.
- Micro uncertainty versus Macro uncertainty
  - Micro uncertainty refers to uncertainty about the potential market for a firm's products, the competition it will face and the quality of its management team.
  - Macro uncertainty reflects the reality that your firm's fortunes can be affected by changes in the macro economic environment.
- Discrete versus continuous uncertainty
  - Discrete risk: Risks that lie dormant for periods but show up at points in time. (Examples: A drug working its way through the FDA pipeline may fail at some stage of the approval process or a company in Venezuela may be nationalized)
  - Continuous risk: Risks changes in interest rates or economic growth occur continuously and affect value as they happen.

Risk and Cost of Equity: The role of the marginal investor

- While the notion that the cost of equity should be higher for riskier investments and lower for safer investments is intuitive, what risk should be built into the cost of equity is the question.
- While risk is usually defined in terms of the variance of actual returns around an expected return, risk and return models in finance assume that the risk that should be rewarded (and thus built into the discount rate) in valuation should be the risk perceived by the marginal investor in the investment
- Most risk and return models in finance also assume that the marginal investor is well diversified, and that the only risk that he or she perceives in an investment is risk that cannot be diversified away (i.e, market or non-diversifiable risk). In effect, it is primarily economic, macro, continuous risk that should be incorporated into the cost of equity.

The Cost of Equity: Competing " Market Risk" Models

Model	Expected Return	Inputs Needed
CAPM	$E(R) = Rf + \beta (Rm - Rf)$	Riskfree Rate
		Beta relative to market portfolio
		Market Risk Premium
APM	$E(R) = Rf + \Sigma \beta j (Rj - Rf)$	Riskfree Rate; # of Factors;
		Betas relative to each factor
		Factor risk premiums
Multi factor	$E(R) = Rf + \Sigma \beta j (Rj - Rf)$	Riskfree Rate; Macro factors
		Betas relative to macro factors
		Macro economic risk premiums
Proxy	$E(R) = a + \Sigma$ bj Yj	Proxies
		Regression coefficients

The CAPM: Cost of Equity

- Consider the standard approach to estimating cost of equity:

  Cost of Equity = Riskfree Rate + Equity Beta * (Equity Risk Premium)

- In practice,
  - Government security rates are used as risk free rates
  - Historical risk premiums are used for the risk premium
  - Betas are estimated by regressing stock returns against market returns

I. A Riskfree Rate

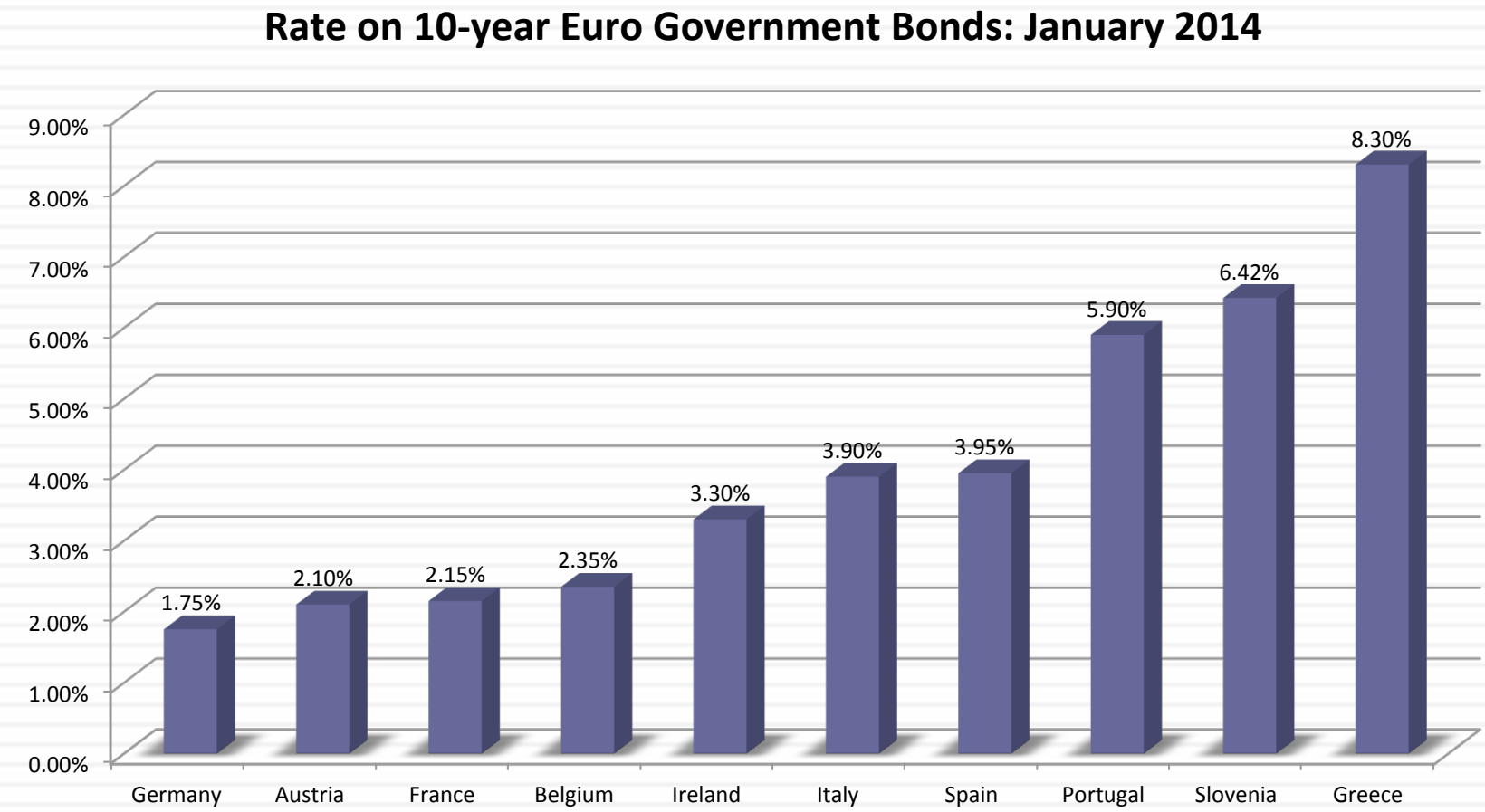
- On a riskfree asset, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.
- For an investment to be riskfree, then, it has to have
  - No default risk
  - No reinvestment risk

1. Time horizon matters: Thus, the riskfree rates in valuation will depend upon when the cash flow is expected to occur and will vary across time.
2. Not all government securities are riskfree: Some governments face default risk and the rates on bonds issued by them will not be riskfree.

Test 1: A riskfree rate in US dollars!

- In valuation, we estimate cash flows forever (or at least for very long time periods). The right risk free rate to use in valuing a company in US dollars would be
  a. A three-month Treasury bill rate (0.2%)
  b. A ten-year Treasury bond rate (3%)
  c. A thirty-year Treasury bond rate (4%)
  d. A TIPs (inflation-indexed treasury) rate (1%)
  e. None of the above

Test 2: A Riskfree Rate in Euros



Test 3: A Riskfree Rate in Indian Rupees

- The Indian government had 10-year Rupee bonds outstanding, with a yield to maturity of about 8.83% on January 1, 2014.
- In January 2014, the Indian government had a local currency sovereign rating of Baa3. The typical default spread (over a default free rate) for Baa3 rated country bonds in early 2014 was 2.2%. The riskfree rate in Indian Rupees is
  a. The yield to maturity on the 10-year bond (8.83%)
  b. The yield to maturity on the 10-year bond + Default spread (11.03%)
  c. The yield to maturity on the 10-year bond – Default spread (6.63%)
  d. None of the above

Sovereign Default Spread: Three paths to the same destination…

- Sovereign dollar or euro denominated bonds: Find sovereign bonds denominated in US dollars, issued by emerging markets. The difference between the interest rate on the bond and the US treasury bond rate should be the default spread.
- CDS spreads: Obtain the default spreads for sovereigns in the CDS market.
- Average spread: For countries which don't issue dollar denominated bonds or have a CDS spread, you have to use the average spread for other countries in the same rating class.

Local Currency Government Bond Rates – January 2014

Country	*Government bond rate*	*Country*	*Government bond rate*
Argentine Peso	12.24%	Lithuanian Litas	3.80%
Australian Dollar	4.28%	Malaysian Ringgit	4.15%
Brazilian Reais	13.21%	Mexican Peso	6.45%
British Pound	3.03%	New Zealand $	4.78%
Bulgarian Lev	3.60%	Nigerian Naira	13.26%
Canadian dollar	2.77%	Norwegian Krone	2.97%
Chilean Peso	5.22%	Pakistani Rupee	11.50%
Chinese Remimbi	4.64%	Peruvian Sul	6.76%
Colombian Peso	6.83%	Phillipine Peso	3.80%
Croatian Kuna	5.21%	Polish Zloty	4.35%
Czech Koruna	2.35%	Romanian Leu	5.43%
Danish Krone	1.99%	Russian Rouble	7.71%
Dutch Guilder	2.23%	Singapore $	2.56%
Euro	1.94%	South African Rand	7.91%
Hong Kong $	2.35%	Swedish Krona	2.52%
Hungarian Forint	5.71%	Swiss Franc	1.09%
icelandic Krona	3.47%	Taiwanese $	1.70%
Indian Rupee	8.83%	Thai Baht	3.91%
Indonesian Rupiah	8.44%	Turkish Lira	10.27%
Israeli Shekel	3.65%	US $	3.04%
Japanese Yen	0.74%	Venezuelan Bolivar	14.05%
Kenyan Shilling	12.60%	Vietnamese Dong	8.95%

Approach 1: Default spread from Government Bonds

BONDS - HIGH YIELD & EMERGING MARKET

Dec 31	Red date	Coupon	Ratings S*	Ratings M*	Ratings F*	Bid price	Bid yield	Day's chge yield	Mth's chge yield	Spread vs US
High Yield US$										
Kazkommerts Int	04/14	7.88	B	Caa1	B	100.65	5.17	0.03	-0.34	5.06
Bertin	10/16	10.25	BB	Ba3	-	111.08	5.82	0.02	-0.37	5.08
High Yield Euro										
Royal Carib Crs	01/14	5.63	BB	Ba1	-	99.90	-	-	-2.12	-
Kazkommerts Int	02/17	6.88	B	Caa1	B	100.08	6.84	-0.01	0.07	6.46
Emerging US$										
Bulgaria	01/15	8.25	BBB	Baa2	BBB-	107.40	0.98	0.02	-0.09	0.86
Peru	02/15	9.88	BBB+	Baa2	BBB+	109.51	1.02	-0.01	-0.10	0.90
Brazil	03/15	7.88	BBB	Baa2	BBB	107.14	1.68	0.03	0.26	1.57
Mexico	09/16	11.38	BBB+	Baa1	BBB+	127.57	0.97	-0.04	-0.15	0.21
Philippines	01/19	9.88	BBB-	Baa3	BBB-	131.44	3.07	0.06	0.09	1.35
Brazil	01/20	12.75	BBB	Baa2	BBB	146.90	3.93	0.02	0.73	1.50
Colombia	02/20	11.75	BBB	Baa3	BBB	143.56	3.74	-0.03	0.09	1.31
Russia	03/30	7.50	BBB	Baa1	BBB	116.40	4.19	0.06	0.08	2.47
Mexico	08/31	8.30	BBB+	Baa1	BBB+	134.20	5.29	0.08	0.01	2.30
Indonesia	02/37	6.63	BB+	Baa3	BBB-	101.25	6.52	-	-0.06	2.61
Emerging Euro										
Brazil	02/15	7.38	BBB	Baa2	BBB	106.77	1.06	0.01	-0.08	0.91
Poland	02/16	3.63	A-	A2	A-	106.22	0.60	-0.06	-0.14	0.38
Turkey	03/16	5.00	NR	Baa3	BBB-	105.75	2.23	0.19	-0.01	2.01
Mexico	02/20	5.50	BBB+	Baa1	BBB+	117.25	2.43	-0.06	-0.17	1.26

US $ denominated bonds NY close; all other London close. *S - Standard & Poor's, M - Moody's, F - Fitch.
Source: ThomsonReuters

The Mechanics

Brazil 2020 Bond: 3.93%

US 2020 T.Bond: 2.43%

Spread: 1.50%

Approach 2: CDS Spreads – January 2014

Country	*Moody's local currency*	10-year CDS	*Country*	*Moody's local currency*	10-year CDS	*Country*	*Moody's local currency*	10-year CDS
Abu Dhabi	Aa2	1.00%	Iceland	Baa3	2.19%	Poland	A2	1.28%
Argentina	B3	14.73%	India	Baa3	3.51%	Portugal	Ba3	4.03%
Australia	Aaa	0.70%	Indonesia	Baa3	3.19%	Qatar	Aa2	1.03%
Austria	Aaa	0.74%	Ireland	Ba1	1.69%	Romania	Baa3	2.61%
Bahrain	Baa1	2.97%	Israel	A1	1.53%	Russia	Baa1	2.21%
Belgium	Aa3	0.97%	Italy	Baa2	2.11%	Saudi Arabia	Aa3	1.09%
Brazil	Baa2	2.53%	Japan	Aa3	0.79%	Senegal	B1	0.90%
Bulgaria	Baa2	1.89%	Kazakhstan	Baa2	2.26%	Slovakia	A2	1.30%
Chile	Aa3	1.08%	Korea	Aa3	0.97%	Slovenia	Ba1	2.75%
China	Aa3	1.33%	Latvia	Baa2	1.69%	South Africa	Baa1	2.75%
Colombia	Baa3	1.74%	Lebanon	B1	4.38%	Spain	Baa3	1.96%
Costa Rica	Baa3	3.43%	Lithuania	Baa1	1.77%	Sweden	Aaa	0.39%
Croatia	Ba1	3.97%	Malaysia	A3	1.65%	Switzerland	Aaa	0.56%
Czech Republic	A1	1.07%	Mexico	Baa1	1.49%	Thailand	Baa1	1.86%
Denmark	Aaa	0.54%	Morocco	Ba1	2.54%	Tunisia	Ba2	4.57%
Estonia	A1	0.89%	Netherlands	Aaa	0.74%	Turkey	Baa3	2.89%
Finland	Aaa	0.48%	New Zealand	Aaa	0.80%	United Arab Emirates	Aa2	2.88%
France	Aa1	1.06%	Norway	Aaa	0.29%	United Kingdom	Aa1	0.57%
Germany	Aaa	0.56%	Panama	Baa2	1.64%	United States of America	Aaa	0.46%
Hong Kong	Aa1	0.91%	Peru	Baa2	1.88%	Venezuela	B1	10.80%
Hungary	Ba1	3.08%	Philippines	Ba1	1.81%	Vietnam	B2	3.35%

Approach 3: Typical Default Spreads: January 2014

Sovereign Rating	*Default Spread over riskfree*
Aaa	0.00%
Aa1	0.40%
Aa2	0.50%
Aa3	0.60%
A1	0.70%
A2	0.85%
A3	1.20%
Baa1	1.60%
Baa2	1.90%
Baa3	2.20%
Ba1	2.50%
Ba2	3.00%
Ba3	3.60%
B1	4.50%
B2	5.50%
B3	6.50%
Caa1	7.50%
Caa2	9.00%
Caa3	10.00%

Getting to a risk free rate in a currency: Example

- The Brazilian government bond rate in nominal reais in January 2014 was 13.21%. To get to a riskfree rate in nominal reais, we can use one of three approaches.
  - Approach 1: Government Bond spread
    - The 2020 Brazil bond, denominated in US dollars, has a spread of 1.50% over the US treasury bond rate.
    - Riskfree rate in $R = 13.21% - 1.50%% = 11.71%
  - Approach 2: The CDS Spread
    - The CDS spread for Brazil on January 1, 2014 was 2.53%.
    - Riskfree rate in $R = 13.21% - 2.53% = 10.68%
  - Approach 3: The Rating based spread
    - Brazil has a Baa2 local currency rating from Moody's. The default spread for that rating is 1.90%
    - Riskfree rate in $R = 13.21% - 1.90% = 11.31%

Test 4: A Real Riskfree Rate

- In some cases, you may want a riskfree rate in real terms (in real terms) rather than nominal terms.
- To get a real riskfree rate, you would like a security with no default risk and a guaranteed real return. Treasury indexed securities offer this combination.
- In January 2014, the yield on a 10-year indexed treasury bond was 1.00%. Which of the following statements would you subscribe to?
  a. This (1.00%) is the real riskfree rate to use, if you are valuing US companies in real terms.
  b. This (1.00%) is the real riskfree rate to use, anywhere in the world

  Explain.

No default free entity: Choices with riskfree rates….

- Estimate a range for the riskfree rate in local terms:
  - Approach 1: Subtract default spread from local government bond rate: Government bond rate in local currency terms - Default spread for Government in local currency
  - Approach 2: Use forward rates and the riskless rate in an index currency (say Euros or dollars) to estimate the riskless rate in the local currency.
- Do the analysis in real terms (rather than nominal terms) using a real riskfree rate, which can be obtained in one of two ways –
  - from an inflation-indexed government bond, if one exists
  - set equal, approximately, to the long term real growth rate of the economy in which the valuation is being done.
- Do the analysis in a currency where you can get a riskfree rate, say US dollars or Euros.

Risk free Rate: Don't have or trust the government bond rate?

1. Build up approach: The risk free rate in any currency can be written as the sum of two variables:

Risk free rate = Expected Inflation in currency + Expected real interest rate

The expected real interest rate can be computed in one of two ways: from the US TIPs rate or set equal to real growth in the economy. Thus, if the expected inflation rate in a country is expected to be 15% and the TIPs rate is 1%, the risk free rate is 16%.

2. US $ rate & Differential Inflation: Alternatively, you can scale up the US $ risk free rate by the differential inflation between the US $ and the currency in question:

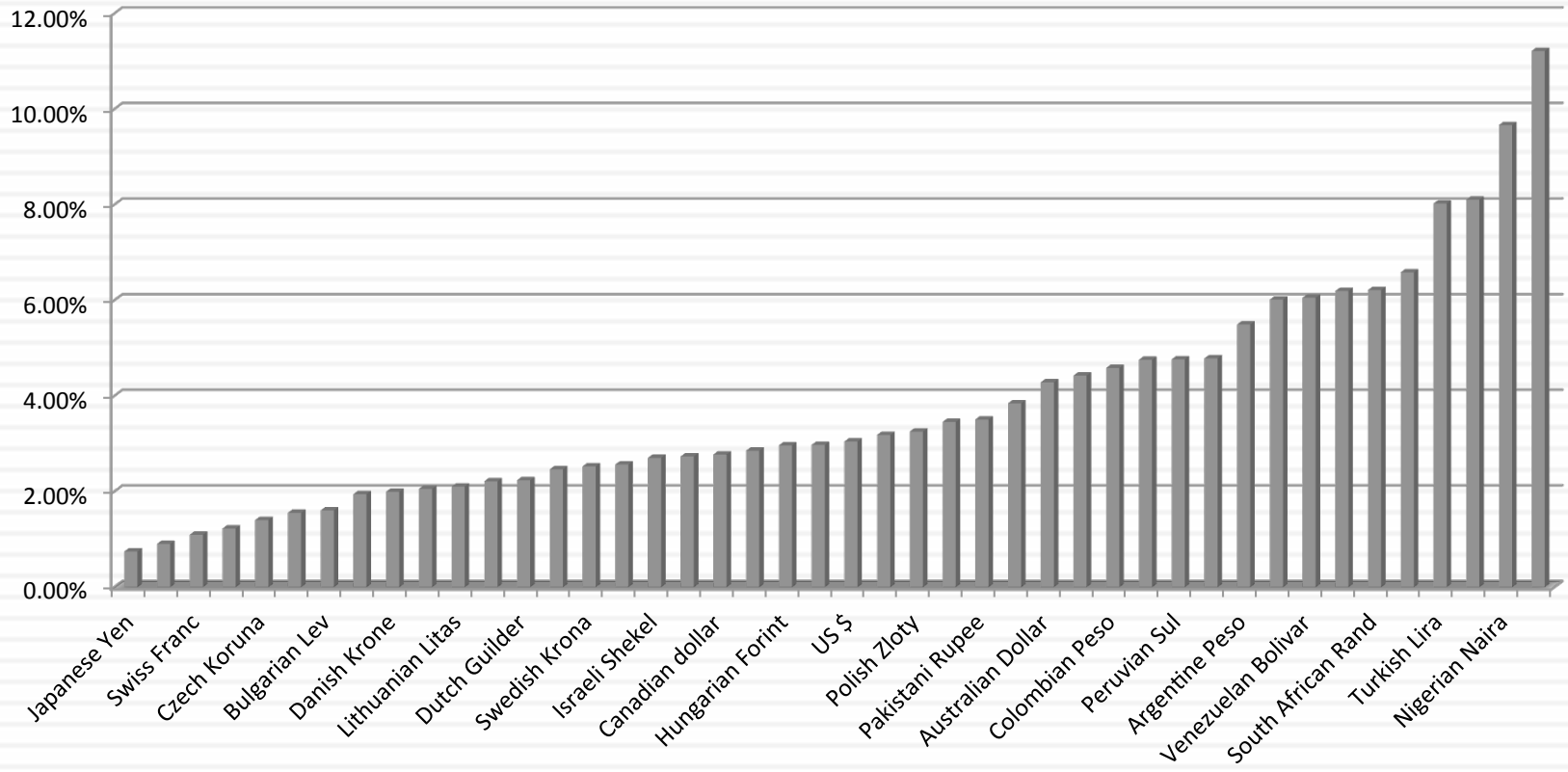
Risk free rate$_{Currency}$ = $(1 + Riskfree\ rate_{US\ \$}) \frac{(1 + Expected\ Inflation_{Foreign\ Currency})}{(1 + Expected\ Inflation_{US\ \$})} - 1$

Thus, if the US $ risk free rate is 3.04%, the inflation rate in the foreign currency is 15% and the inflation rate in US $ is 2%, the foreign currency risk free rate is as follows:

Risk free rate = $(1.0304) \frac{(1.15)}{(1.02)} - 1 = 16.17\%$

Why do risk free rates vary across currencies? January 2014 Risk free rates

Risk free rate by Currency: January 2014



One more test on riskfree rates…

- In January 2014, the 10-year treasury bond rate in the United States was 3.04%, higher than it was a year ago, but well below the historical averages. Assume that you were valuing a company in US dollars then, but were wary about the risk free rate being too low. Which of the following should you do?
  a. Replace the current 10-year bond rate with a more reasonable normalized riskfree rate (the average 10-year bond rate over the last 30 years has been about 5-6%)
  b. Use the current 10-year bond rate as your riskfree rate but make sure that your other assumptions (about growth and inflation) are consistent with the riskfree rate
  c. Something else…

II. Equity Risk Premiums
The ubiquitous historical risk premium

- The historical premium is the premium that stocks have historically earned over riskless securities.
- While the users of historical risk premiums act as if it is a fact (rather than an estimate), it is sensitive to
  - How far back you go in history…
  - Whether you use T.bill rates or T.Bond rates
  - Whether you use geometric or arithmetic averages.
- For instance, looking at the US:

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2013	7.93%	6.29%	6.02%	4.62%
Std Error	*2.19%*	*2.34%*		
1964-2013	6.18%	4.32%	4.83%	3.33%
Std Error	*2.42%*	*2.75%*		
2004-2013	7.55%	4.41%	5.80%	3.07%
Std Error	*6.02%*	*8.66%*		

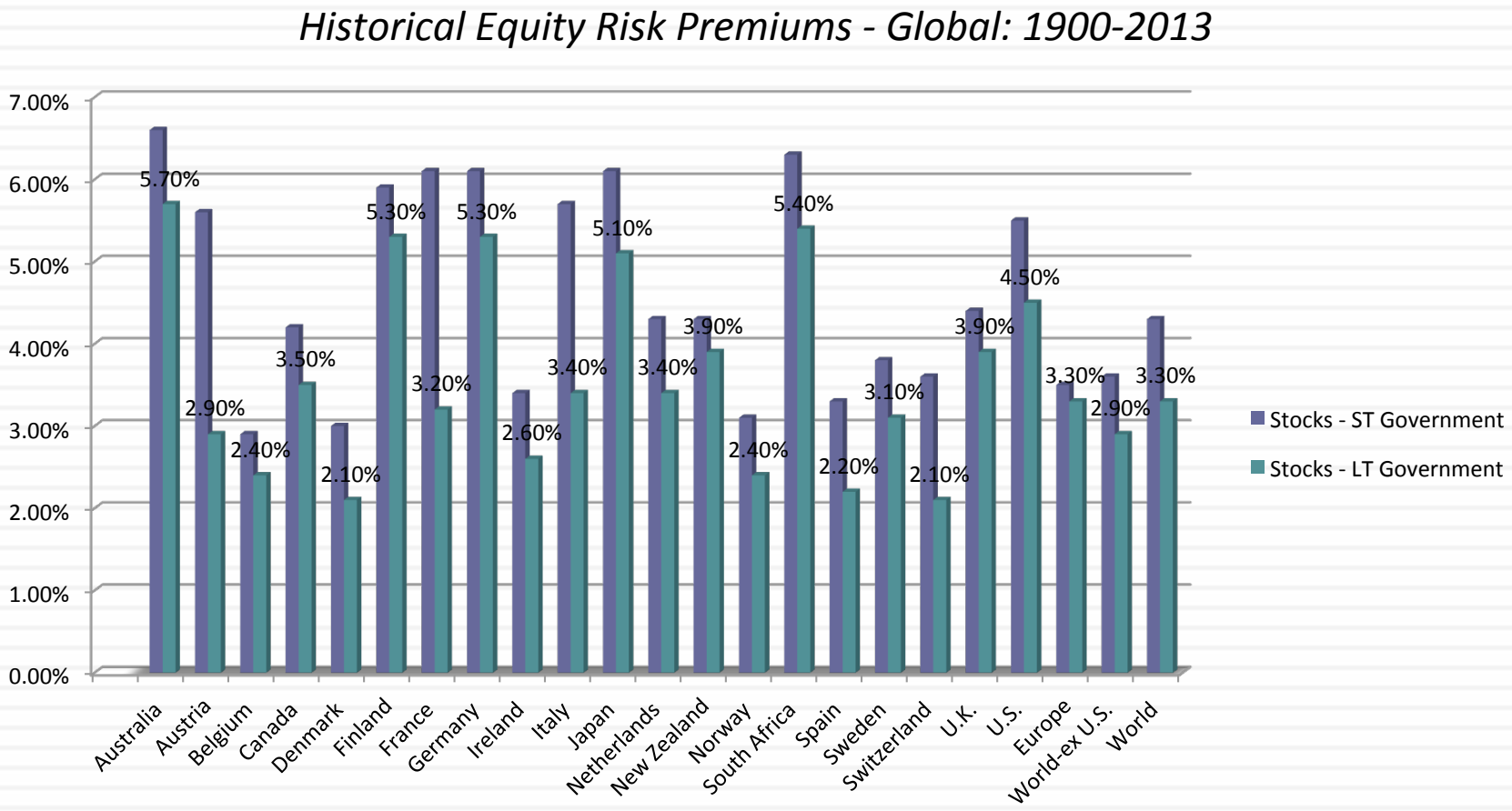
The perils of trusting the past…….

- Noisy estimates: Even with long time periods of history, the risk premium that you derive will have substantial standard error. For instance, if you go back to 1928 (about 80 years of history) and you assume a standard deviation of 20% in annual stock returns, you arrive at a standard error of greater than 2%:

  Standard Error in Premium = 20%/√80 = 2.26%

- Survivorship Bias: Using historical data from the U.S. equity markets over the twentieth century does create a sampling bias. After all, the US economy and equity markets were among the most successful of the global economies that you could have invested in early in the century.
- These problems get exacerbated in emerging markets, where there is far less historical data and survivor bias is worse.

Risk Premium for a Mature Market? Broadening the sample



The simplest way of estimating an additional country risk premium: The country default spread

- Default spread for country: In this approach, the country equity risk premium is set equal to the default spread for the country, estimated in one of three ways:
  - The default spread on a dollar denominated bond issued by the country. (In January 2014, that spread was 1.50% for the Brazilian $ bond)
  - The sovereign CDS spread for the country. In January 2015, the ten year CDS spread for Brazil was 2.53%.
  - The default spread based on the local currency rating for the country. Brazil's sovereign local currency rating is Baa2 and the default spread for a Baa2 rated sovereign was about 1.90% in January 2014.
- Add the default spread to a "mature" market premium: This default spread is added on to the mature market premium to arrive at the total equity risk premium for Brazil, assuming a mature market premium of 5.00%.
  - Country Risk Premium for Brazil = 1.90%
  - Total ERP for Brazil = 5.00% + 1.90% = 6.90%

An equity volatility based approach to estimating the country total ERP

- This approach draws on the standard deviation of two equity markets, the emerging market in question and a base market (usually the US). The total equity risk premium for the emerging market is then written as:
  - Total equity risk premium = Risk Premium$_{US}$ * $\sigma_{\text{Country Equity}}$ / $\sigma_{\text{US Equity}}$
- The country equity risk premium is based upon the volatility of the market in question relative to U.S market.
  - Assume that the equity risk premium for the US is 5.00%.
  - Assume that the standard deviation in the Bovespa (Brazilian equity) is 21% and that the standard deviation for the S&P 500 (US equity) is 18%.
  - Total Equity Risk Premium for Brazil = 5.00% (21%/18%) = 5.83%
  - Country equity risk premium for Brazil = 5.83% - 5.00% = 0.83%

A melded approach to estimating the additional country risk premium

- Country ratings measure default risk. While default risk premiums and equity risk premiums are highly correlated, one would expect equity spreads to be higher than debt spreads.
- Another is to multiply the bond default spread by the relative volatility of stock and bond prices in that market. Using this approach for Brazil in January 2014, you would get:
  - Country Equity risk premium = Default spread on country bond* $\sigma_{\text{Country Equity}} / \sigma_{\text{Country Bond}}$
    - Standard Deviation in Bovespa (Equity) = 21%
    - Standard Deviation in Brazil government bond = 14%
    - Default spread on C-Bond = 1.90%
  - Brazil Country Risk Premium = 1.90% (21%/14%) = 2.85%
  - Brazil Total ERP = Mature Market Premium + CRP = 5.00% + 2.85% = 7.85%

ERP : Jan 2014

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

Canada	5.00%	0.00%
United States of America	5.00%	0.00%
North America	**5.00%**	**0.00%**

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%
Latin America	**8.62%**	**3.62%**

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%
Africa	**10.04%**	**5.04%**

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%
E. Europe & Russia	**7.96%**	**2.96%**

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%
Middle East	**6.14%**	**1.14%**

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%
Asia	**6.51%**	**1.51%**

Australia	5.00%	0.00%
Cook Islands	11.75%	6.75%
New Zealand	5.00%	0.00%
Australia & New Zealand	**5.00%**	**0.00%**

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

From Country Equity Risk Premiums to Corporate Equity Risk premiums

- Approach 1: Assume that every company in the country is equally exposed to country risk. In this case,
  - E(Return) = Riskfree Rate + CRP + Beta (Mature ERP)
  - Implicitly, this is what you are assuming when you use the local Government's dollar borrowing rate as your riskfree rate.
- Approach 2: Assume that a company's exposure to country risk is similar to its exposure to other market risk.
  - E(Return) = Riskfree Rate + Beta (Mature ERP+ CRP)
- Approach 3: 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(Return)=Riskfree Rate+ β (Mature ERP) + λ (CRP)

Mature ERP = Mature market Equity Risk Premium

CRP = Additional country risk premium

Approaches 1 & 2: Estimating country risk premium exposure

- Location based CRP: The standard approach in valuation is to attach a country risk premium to a company based upon its country of incorporation. Thus, if you are an Indian company, you are assumed to be exposed to the Indian country risk premium. A developed market company is assumed to be unexposed to emerging market risk.
- Operation-based CRP: There is a more reasonable modified version. The country risk premium for a company can be computed as a weighted average of the country risk premiums of the countries that it does business in, with the weights based upon revenues or operating income. If a company is exposed to risk in dozens of countries, you can take a weighted average of the risk premiums by region.

Operation based CRP: Single versus Multiple Emerging Markets

- Single emerging market: Embraer, in 2004, reported that it derived 3% of its revenues in Brazil and the balance from mature markets. The mature market ERP in 2004 was 5% and Brazil's CRP was 7.89%.

	Revenues	Total ERP	CRP
US and other mature markets	97%	5.00%	0.00%
Brazil	3%	12.89%	8%
Embraer		**5.24%**	**0.24%**

- Multiple emerging markets: Ambev, the Brazilian-based beverage company, reported revenues from the following countries during 2011.

	Revenues	%	Total ERP	CRP
Argentina	19	9.31%	15.00%	9.00%
Bolivia	4	1.96%	10.88%	4.88%
Brazil	130	63.73%	8.63%	2.63%
Canada	23	11.27%	6.00%	0.00%
Chile	7	3.43%	7.05%	1.05%
Ecuador	6	2.94%	12.75%	6.75%
Paraguay	3	1.47%	12.00%	6.00%
Peru	12	5.88%	9.00%	3.00%
Ambev	**204**		**9.11%**	**3.11%**

Extending to a multinational: Regional breakdown Coca Cola's revenue breakdown and ERP in 2012

Region	*Revenues*	*Total ERP*	*CRP*
Western Europe	19%	6.67%	0.67%
Eastern Europe & Russia	5%	8.60%	2.60%
Asia	15%	7.63%	1.63%
Latin America	15%	9.42%	3.42%
Australia	4%	6.00%	0.00%
Africa	4%	9.82%	3.82%
North America	40%	6.00%	0.00%
Coca Cola	100%	7.14%	1.14%

Things to watch out for

1. Aggregation across regions. For instance, the Pacific region often includes Australia & NZ with Asia
2. Obscure aggregations including Eurasia and Oceania

45

Two problems with these approaches..

- Focus just on revenues: To the extent that revenues are the only variable that you consider, when weighting risk exposure across markets, you may be missing other exposures to country risk. For instance, an emerging market company that gets the bulk of its revenues outside the country (in a developed market) may still have all of its production facilities in the emerging market.
- Exposure not adjusted or based upon beta: To the extent that the country risk premium is multiplied by a beta, we are assuming that beta in addition to measuring exposure to all other macro economic risk also measures exposure to country risk.

Approach 3: Estimate a lambda for country risk

- Source of revenues: Other things remaining equal, a company should be more exposed to risk in a country if it generates more of its revenues from that country.
- Manufacturing facilities: Other things remaining equal, a firm that has all of its production facilities in a "risky country" should be more exposed to country risk than one which has production facilities spread over multiple countries. The problem will be accented for companies that cannot move their production facilities (mining and petroleum companies, for instance).
- Use of risk management products: Companies can use both options/ futures markets and insurance to hedge some or a significant portion of country risk.
- Government "national" interests: There are sectors that are viewed as vital to the national interests, and governments often play a key role in these companies, either officially or unofficially. These sectors are more exposed to country risk.

Estimating Company Exposure to Country Risk

- The factor "l" measures the relative exposure of a firm to country risk. One simplistic solution would be to do the following:

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

- Consider two firms – Tata Motors and Tata Consulting Services, both Indian companies. 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:
  - $\lambda_{Tata\ Motors}$= 91%/80% = 1.14
  - λ_{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 incorporated.
  - Firms might be able to actively manage their country risk exposures

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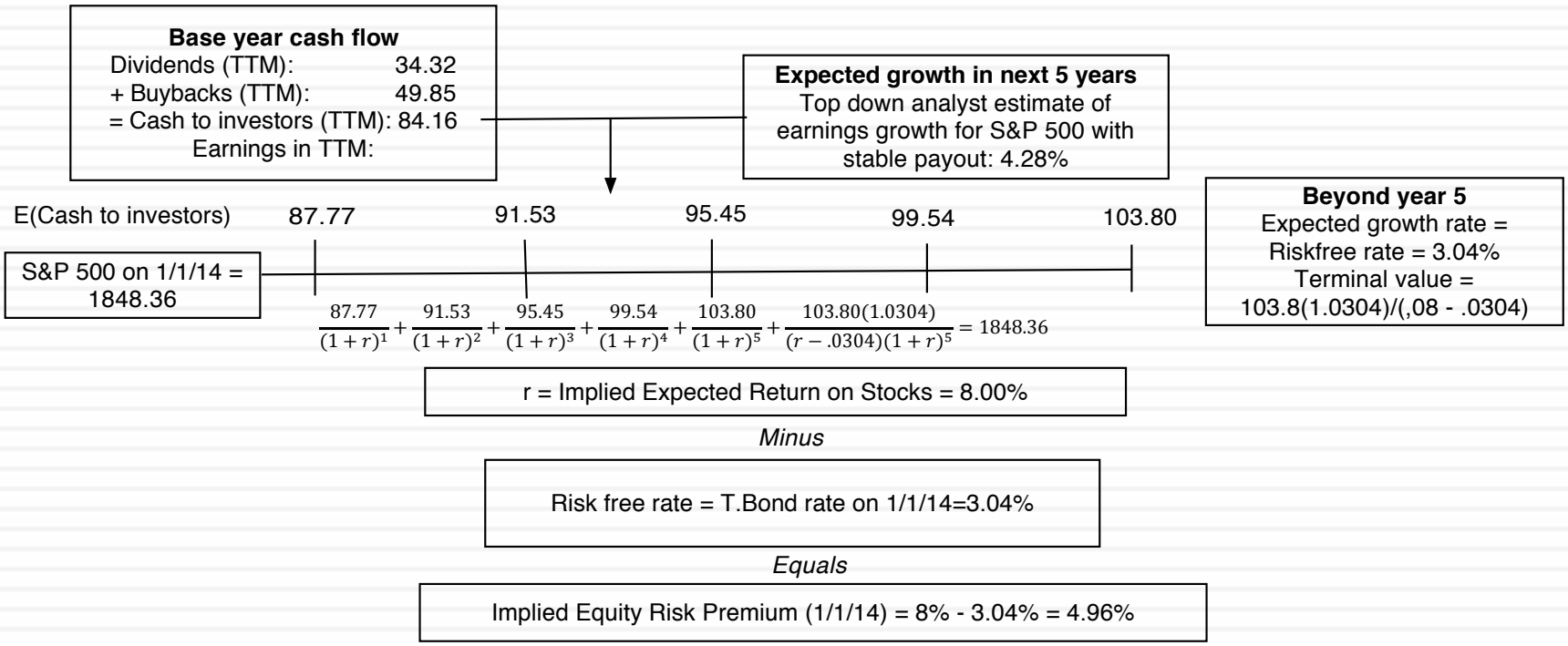
Why revenue exposure can be deceptive…

- Operations can still be exposed to country risk: Even though a company may very little of its revenues from a market, there is the very real possibility that its operations are still centered in that market, thus exposing it to country risk.
  - While Tata Consulting Services gets the bulk of its revenues from the United States and Western Europe, the bulk of its operations (back office, consulting and outsourcing) are in India.
- Acquisitions and strategic decisions to enter new markets can alter country risk exposure: A firm can change its revenue exposure dramatically with a big acquisition of a company in another market as well as by targeting new markets for growth.
  - Tata Motors acquired Jaguar/Land Rover in 2008-09. While the 2008-09 numbers don't reflect this acquisition yet, Tata Motors will get a much larger portion of its revenues from developed markets in the future.
  - TCS is actively expanding targeting Latin America for growth. While the percent of revenues from Latin American right now is very small, it may grow over time.

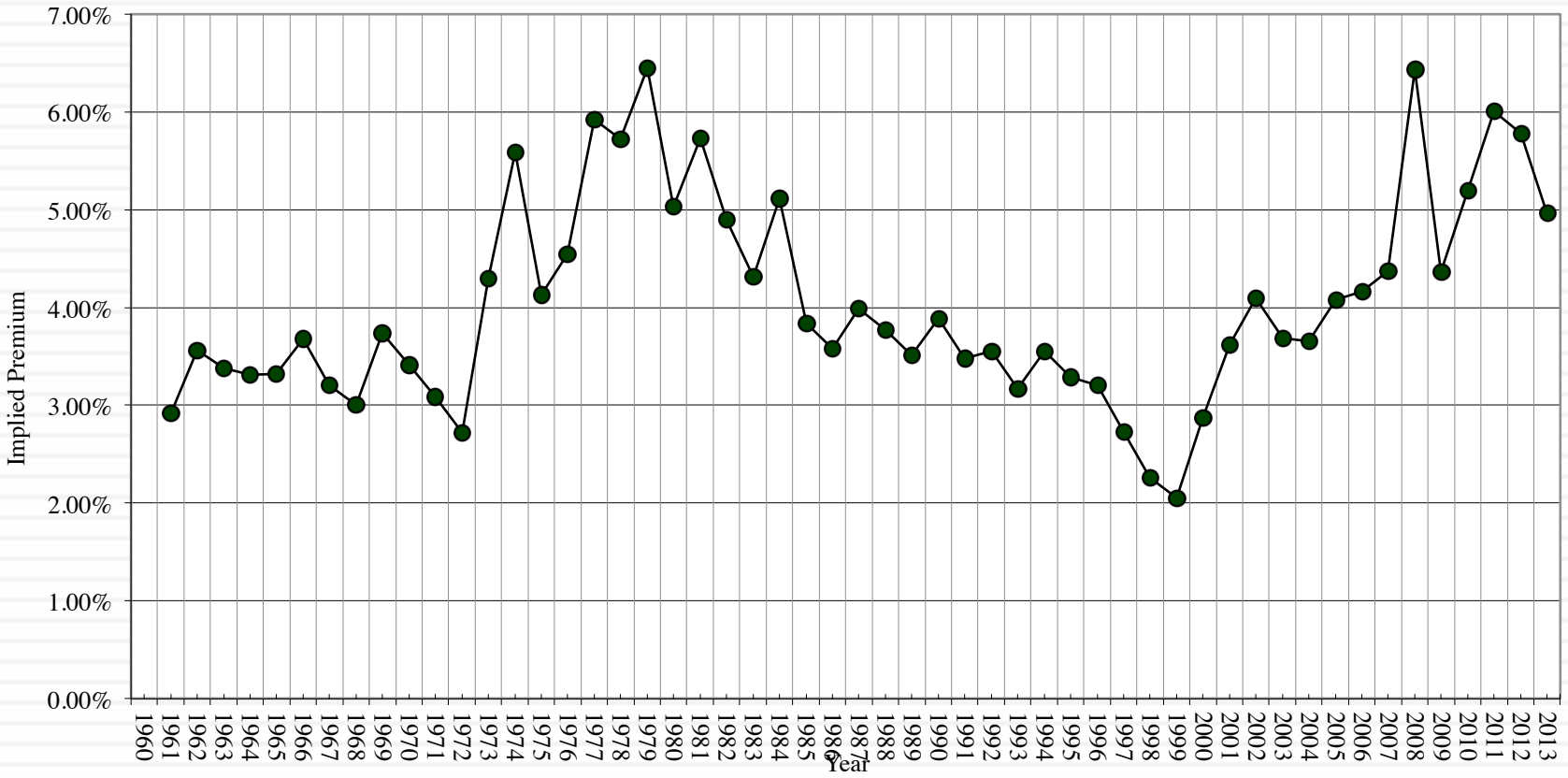
Estimating lambdas: Tata Motors versus TCS

	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.

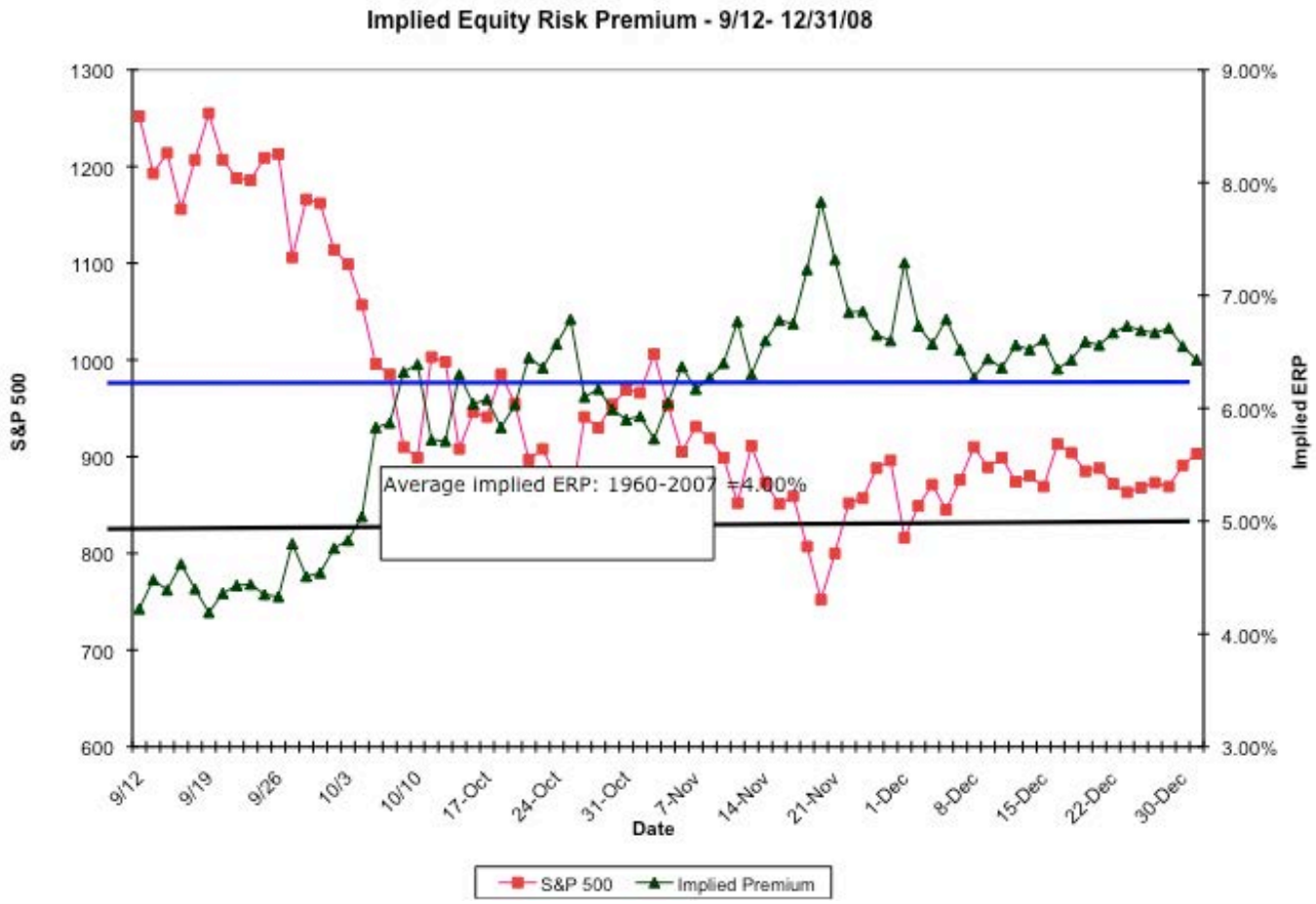
An Alternative: Watch what I pay, not what I say!



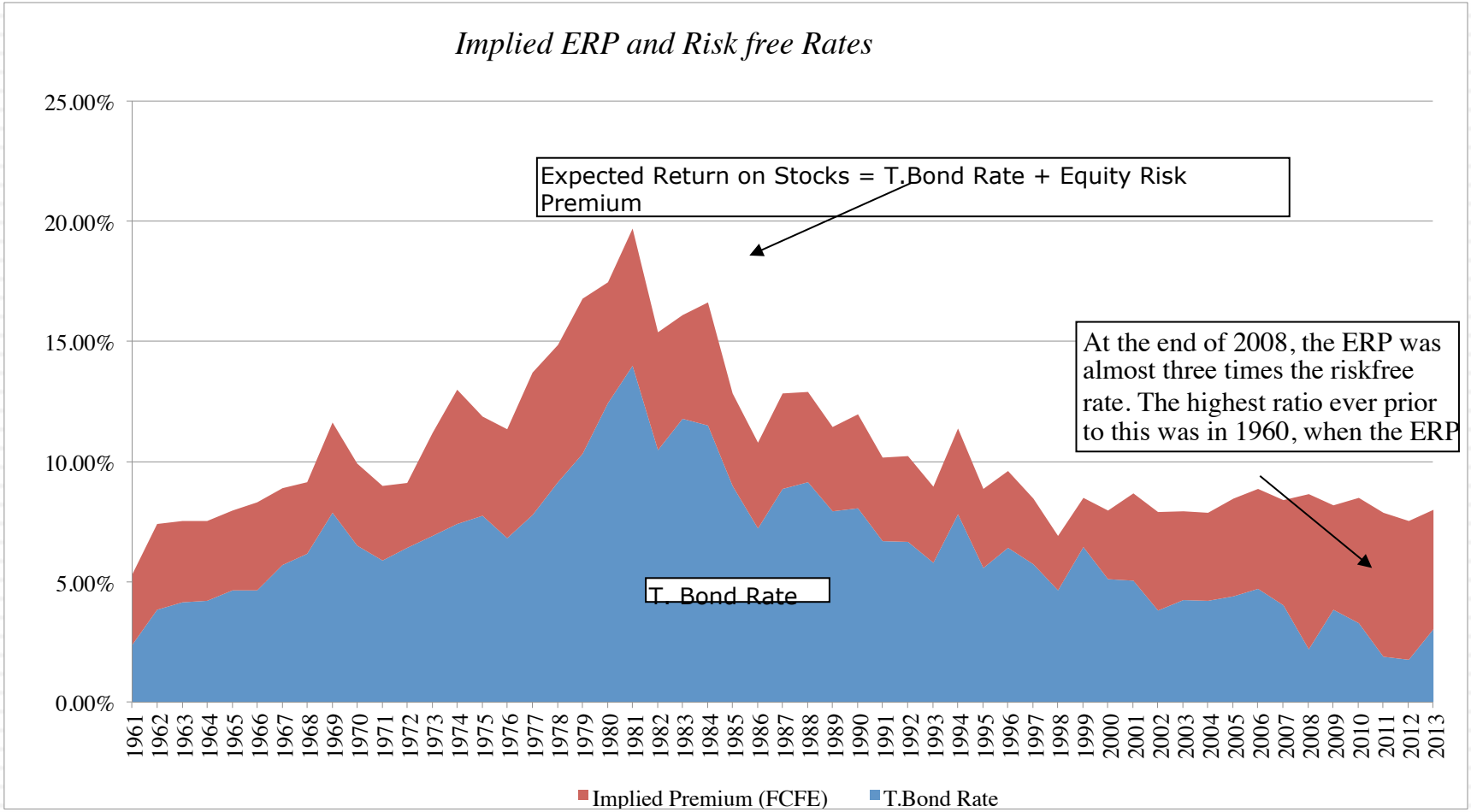
Implied Premiums in the US



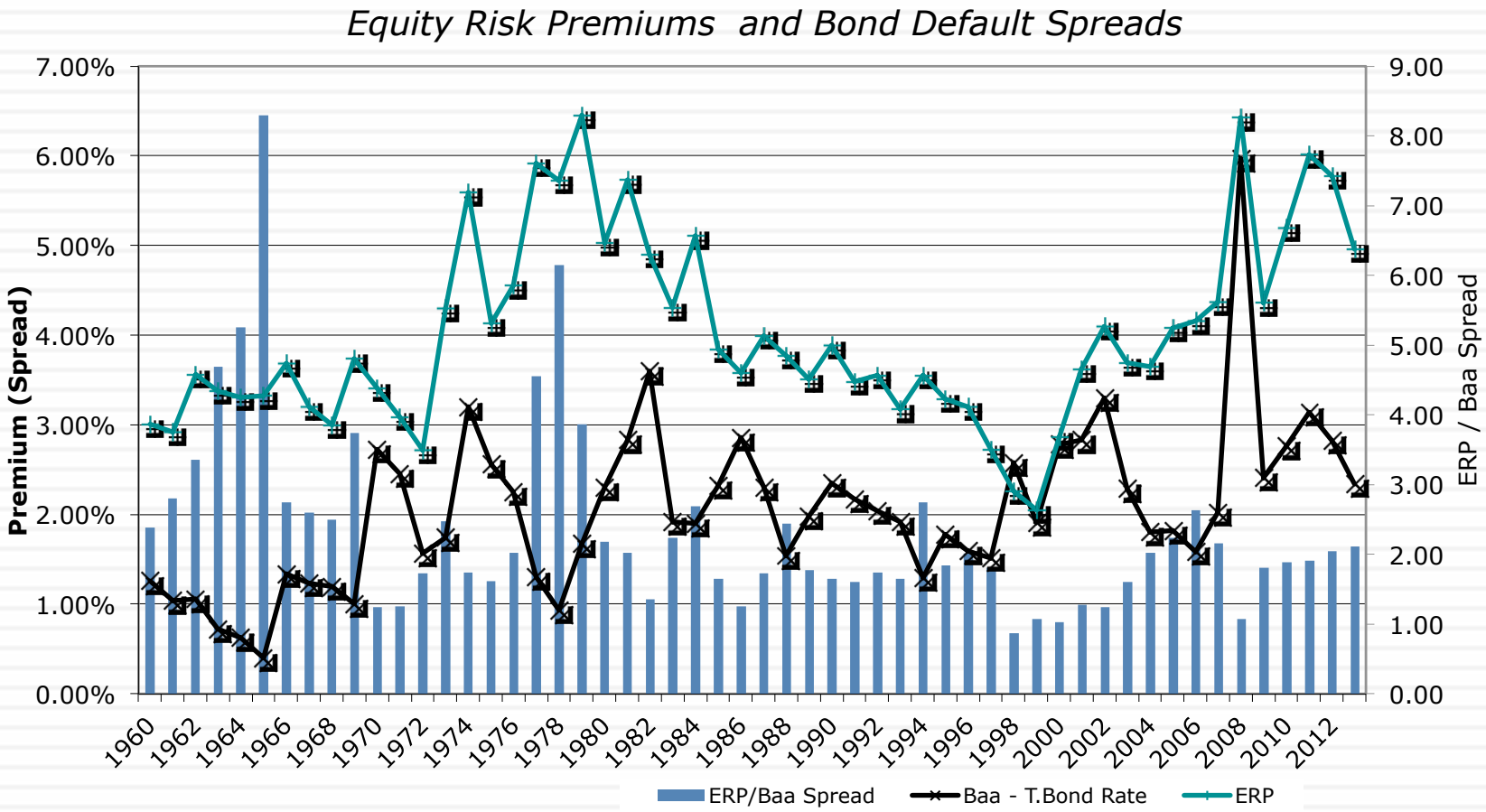
The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009



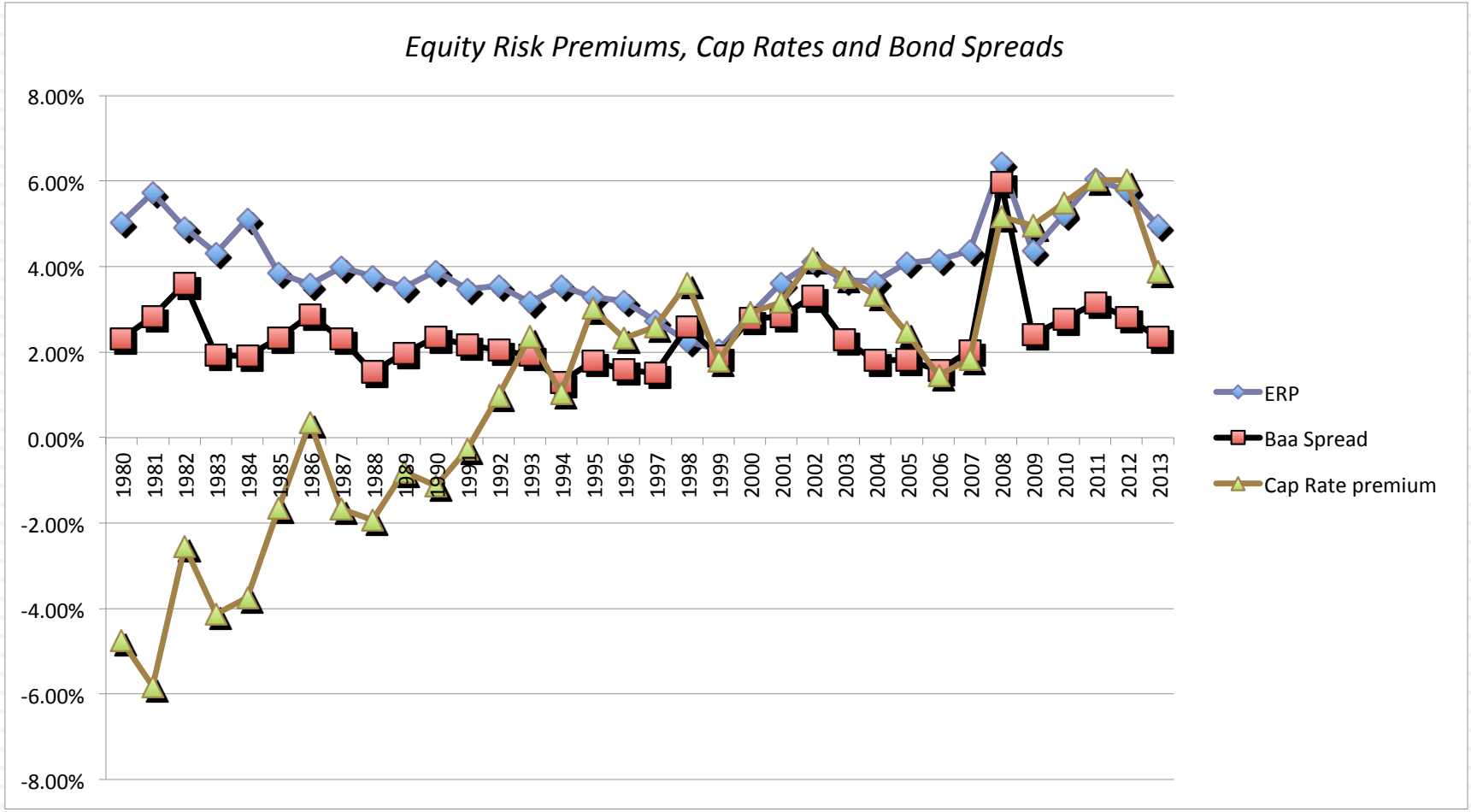
Implied Premium versus Risk Free Rate



Equity Risk Premiums and Bond Default Spreads



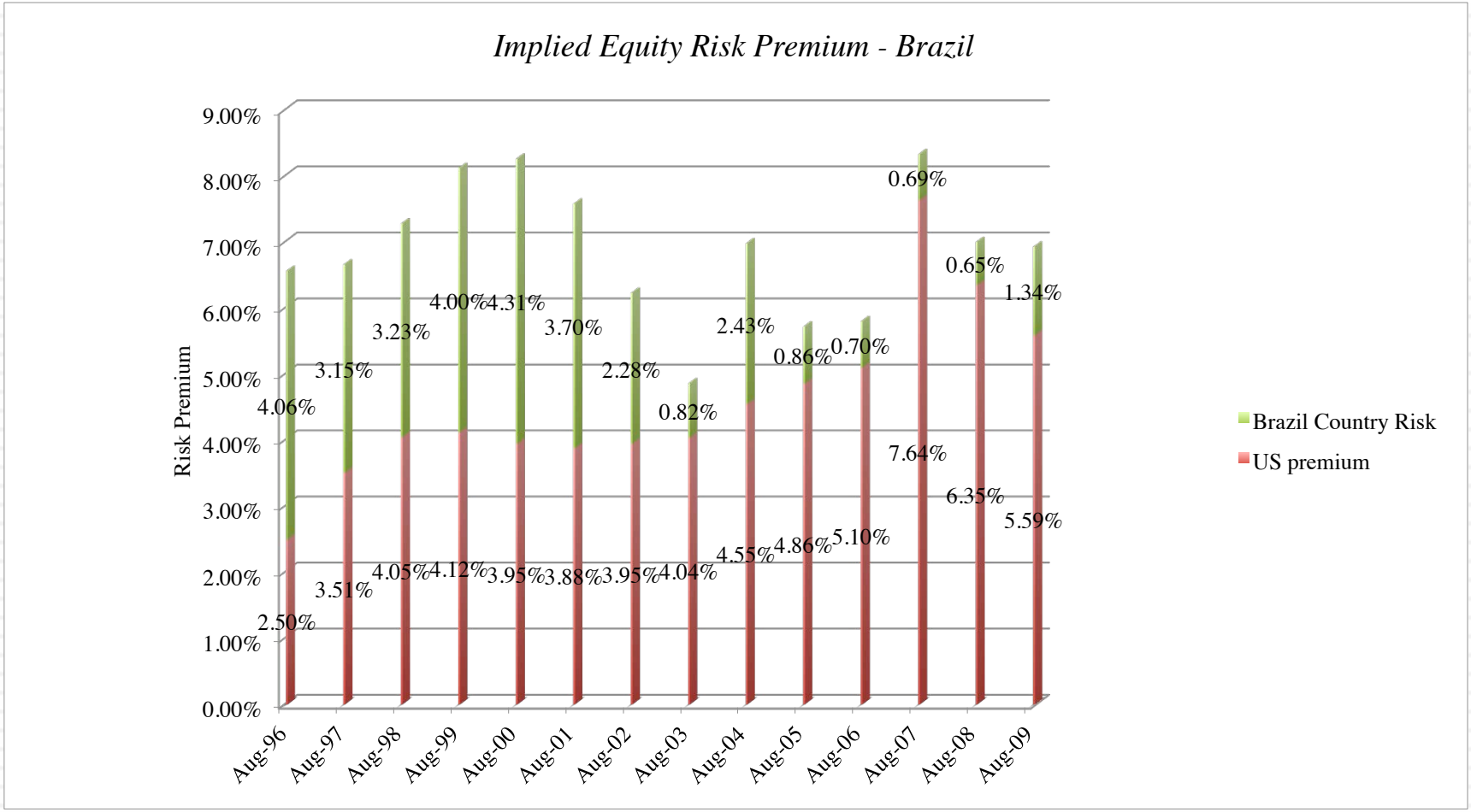
Equity Risk Premiums and Cap Rates (Real Estate)



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%

Can country risk premiums change? Brazil CRP & Total ERP from 2000 to 2013



The evolution of Emerging Market Risk

	PBV Developed	PBV Emerging	ROE Developed	ROE Emerging	US T.Bond rate	Growth rate Developed	Growth rate Emerging	Cost of equity (Developed)	Cost of equity (Emerging)	Differential ERP
2004	2.00	1.19	10.81%	11.65%	4.22%	3.72%	5.22%	7.27%	10.62%	3.36%
2005	2.09	1.27	11.12%	11.93%	4.39%	3.89%	5.39%	7.35%	10.54%	3.19%
2006	2.03	1.44	11.32%	12.18%	4.70%	4.20%	5.70%	7.71%	10.20%	2.49%
2007	1.67	1.67	10.87%	12.88%	4.02%	3.52%	5.02%	7.92%	9.73%	1.81%
2008	0.87	0.83	9.42%	11.12%	2.21%	1.71%	3.21%	10.57%	12.74%	2.17%
2009	1.20	1.34	8.48%	11.02%	3.84%	3.34%	4.84%	7.62%	9.45%	1.83%
2010	1.39	1.43	9.14%	11.22%	3.29%	2.79%	4.29%	7.36%	9.14%	1.78%
2011	1.12	1.08	9.21%	10.04%	1.88%	1.38%	2.88%	8.37%	9.51%	1.14%
2012	1.17	1.18	9.10%	9.33%	1.76%	1.26%	2.76%	7.96%	8.33%	0.37%
Jun-13	1.17	1.17	8.79%	9.37%	2.55%	2.05%	3.55%	7.81%	8.52%	0.71%

Why implied premiums matter?

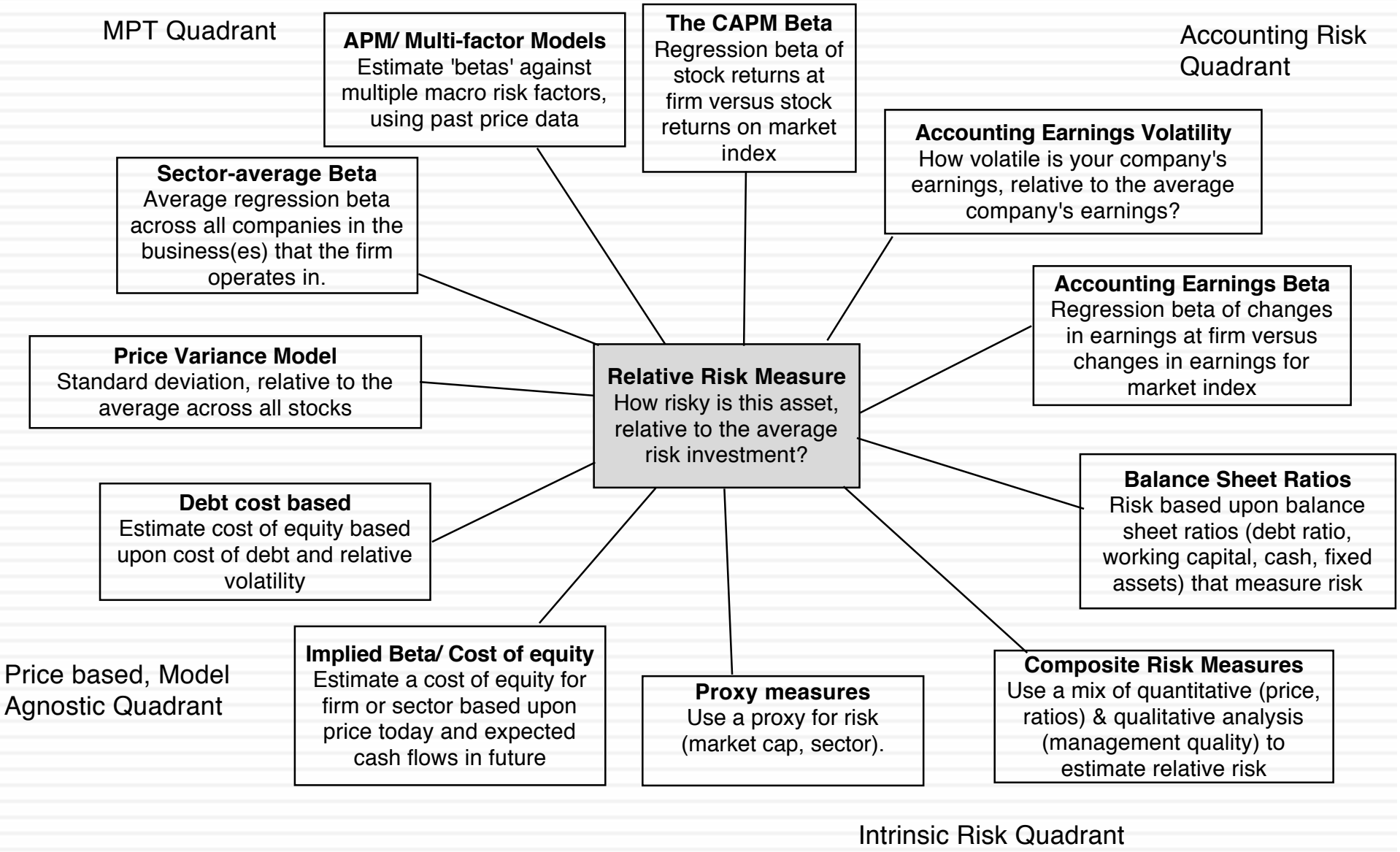
- In many investment banks, it is common practice (especially in corporate finance departments) to use historical risk premiums (and arithmetic averages at that) as risk premiums to compute cost of equity. If all analysts in the department used the arithmetic average premium (for stocks over T.Bills) for 1928-2013 of 6% to value stocks in January 2014, given the implied premium of 4.96%, what are they likely to find?

a. The values they obtain will be too low (most stocks will look overvalued)
b. The values they obtain will be too high (most stocks will look under valued)
c. There should be no systematic bias as long as they use the same premium to value all stocks.

Which equity risk premium should you use?

If you assume this	Premium to use
Premiums revert back to historical norms and your time period yields these norms	Historical risk premium
Market is correct in the aggregate or that your valuation should be market neutral	Current implied equity risk premium
Marker makes mistakes even in the aggregate but is correct over time	Average implied equity risk premium over time.

Predictor	*Correlation with implied premium next year*	*Correlation with actual risk premium- next 5 years*	*Correlation with actual risk premium – next 10 years*
Current implied premium	0.757	0.638	0.421
Average implied premium: Last 5 years	0.655	0.424	0.339
Historical Premium	-0.278	-0.267	-0.482
Default Spread based premium	0.111	0.328	0.171


MPT Quadrant
APM/ Multi-factor Models
Estimate 'betas' against multiple macro risk factors, using past price data
The CAPM Beta
Regression beta of stock returns at firm versus stock returns on market index
Accounting Risk Quadrant
Accounting Earnings Volatility
How volatile is your company's earnings, relative to the average company's earnings?
Sector-average Beta
Average regression beta across all companies in the business(es) that the firm operates in.
Accounting Earnings Beta
Regression beta of changes in earnings at firm versus changes in earnings for market index
Price Variance Model
Standard deviation, relative to the average across all stocks
Relative Risk Measure
How risky is this asset, relative to the average risk investment?
Balance Sheet Ratios
Risk based upon balance sheet ratios (debt ratio, working capital, cash, fixed assets) that measure risk
Debt cost based
Estimate cost of equity based upon cost of debt and relative volatility
Price based, Model Agnostic Quadrant
Implied Beta/ Cost of equity
Estimate a cost of equity for firm or sector based upon price today and expected cash flows in future
Proxy measures
Use a proxy for risk (market cap, sector).
Composite Risk Measures
Use a mix of quantitative (price, ratios) & qualitative analysis (management quality) to estimate relative risk
Intrinsic Risk Quadrant

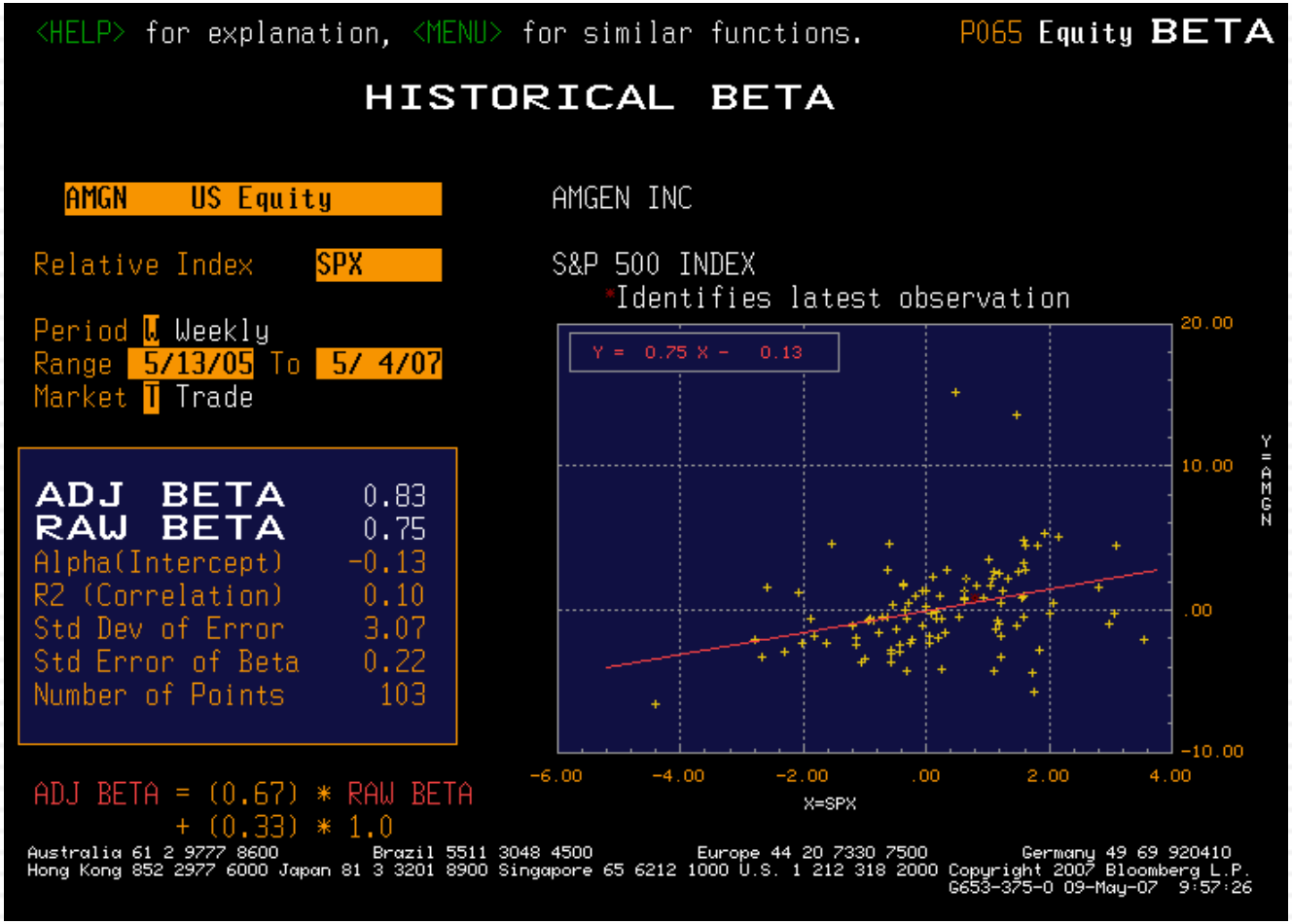
Estimating Beta

- The standard procedure for estimating betas is to regress stock returns (Rj) against market returns (Rm) -

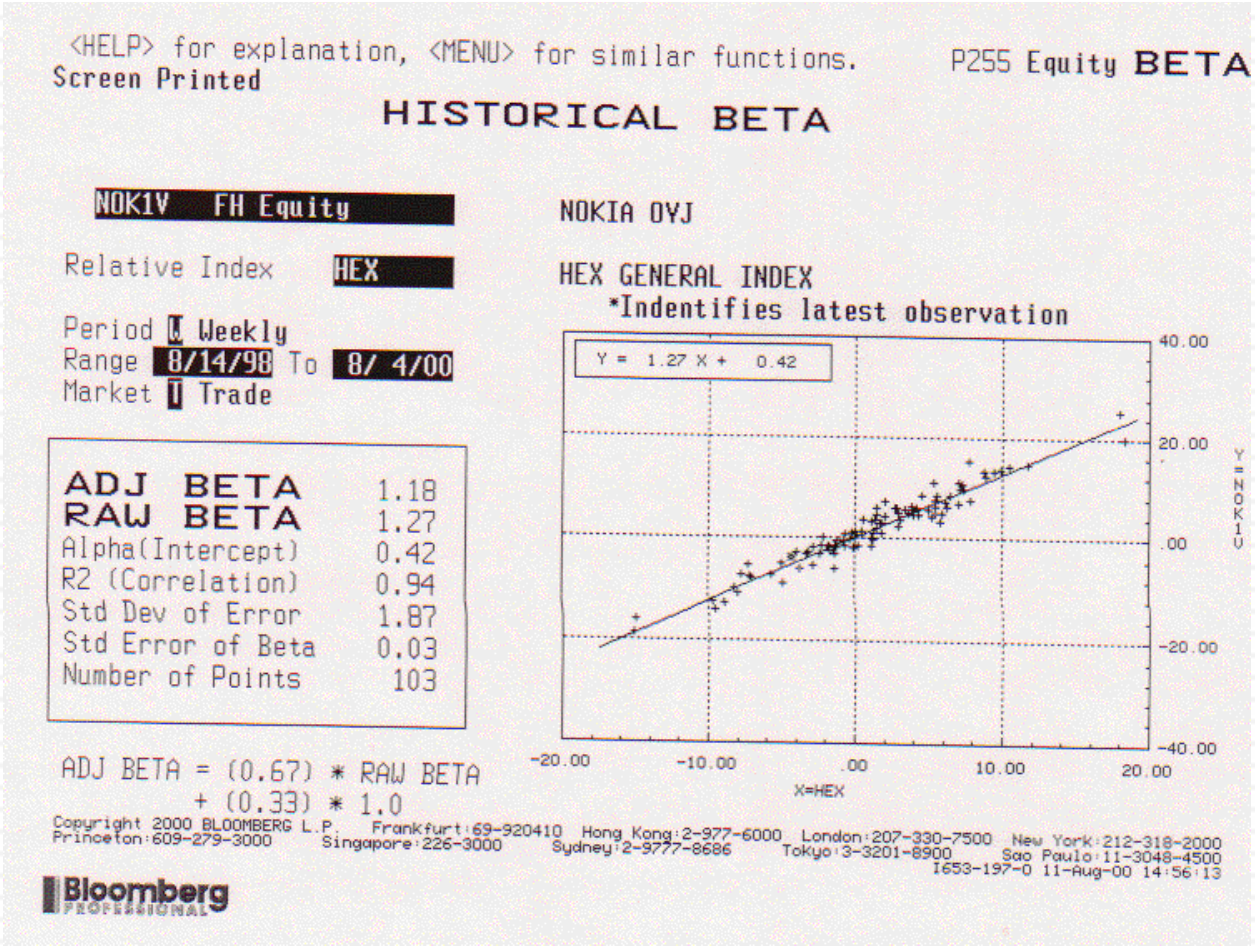
$$Rj = a + b\ Rm$$

  - where a is the intercept and b is the slope of the regression.
- The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock.
- This beta has three problems:
  - It has high standard error
  - It reflects the firm's business mix over the period of the regression, not the current mix
  - It reflects the firm's average financial leverage over the period rather than the current leverage.

Beta estimates are noisy…



Beta Estimation: The Index Effect



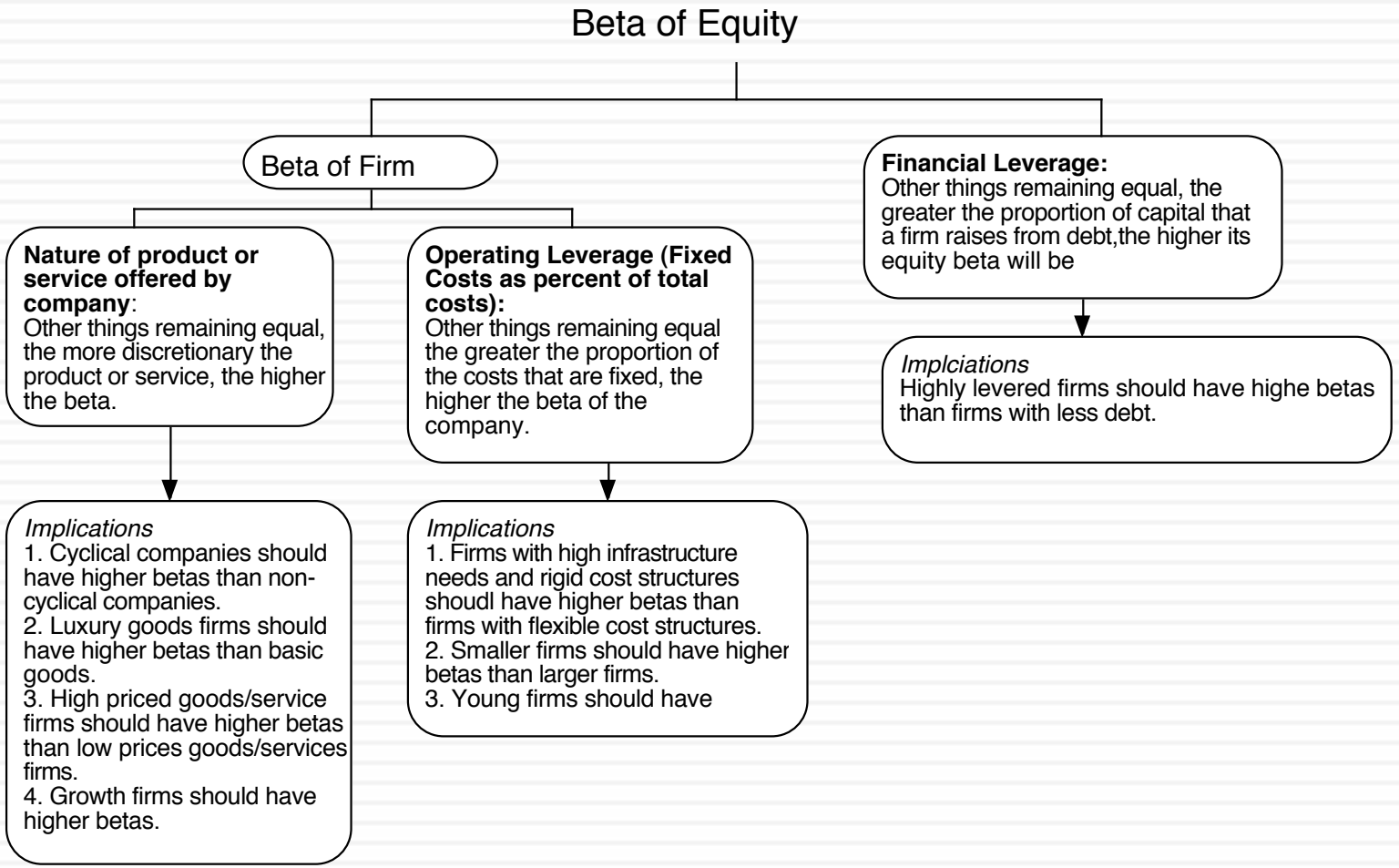
Stock-priced based solutions to the Regression Beta Problem

- Modify the regression beta by
  - changing the index used to estimate the beta
  - adjusting the regression beta estimate, by bringing in information about the fundamentals of the company
- Estimate the beta for the firm using
  - the standard deviation in stock prices instead of a regression against an index
  - Relative risk = Standard deviation in stock prices for investment/ Average standard deviation across all stocks
- Estimate the beta for the firm from the bottom up without employing the regression technique. This will require
  - understanding the business mix of the firm
  - estimating the financial leverage of the firm
- Imputed or implied beta (cost of equity) for the sector.

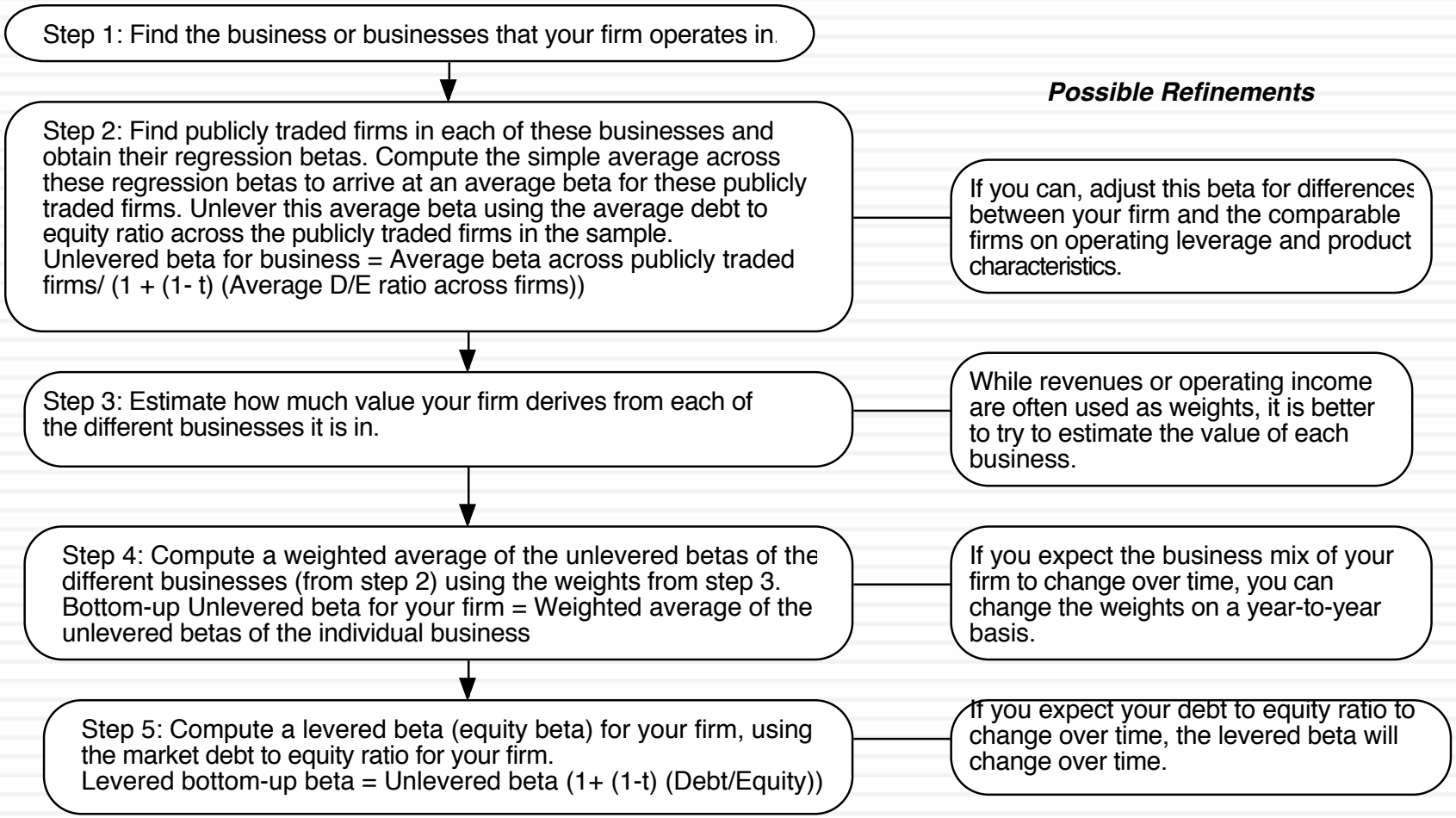
Alternative measures of relative risk for equity

- Accounting risk measures: To the extent that you don't trust market-priced based measures of risk, you could compute relative risk measures based on
  - Accounting earnings volatility: Compute an accounting beta or relative volatility
  - Balance sheet ratios: You could compute a risk score based upon accounting ratios like debt ratios or cash holdings (akin to default risk scores like the Z score)
- Proxies: In a simpler version of proxy models, you can categorize firms into risk classes based upon size, sectors or other characteristics.
- Qualitative Risk Models: In these models, risk assessments are based at least partially on qualitative factors (quality of management).
- Debt based measures: You can estimate a cost of equity, based upon an observable costs of debt for the company.
  - Cost of equity = Cost of debt * Scaling factor

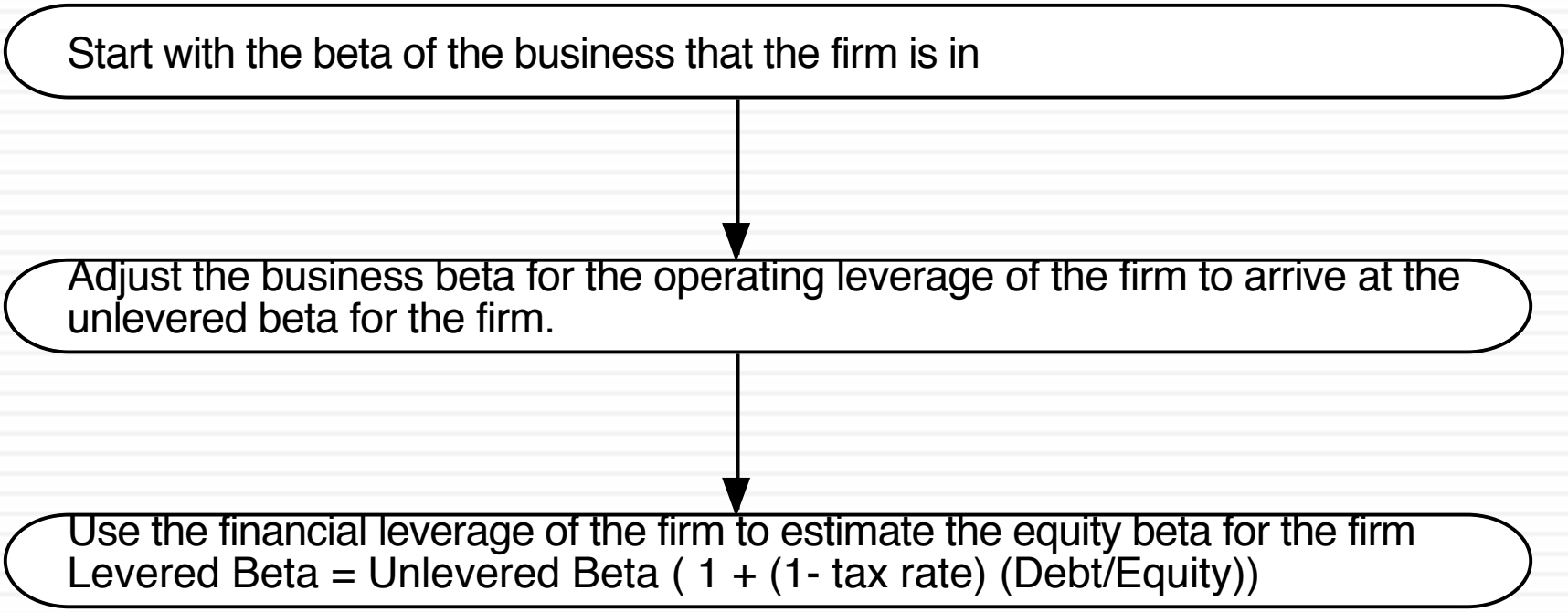
Determinants of Betas



Bottom-up Betas



In a perfect world… we would estimate the beta of a firm by doing the following



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?

Adjusting for operating leverage…

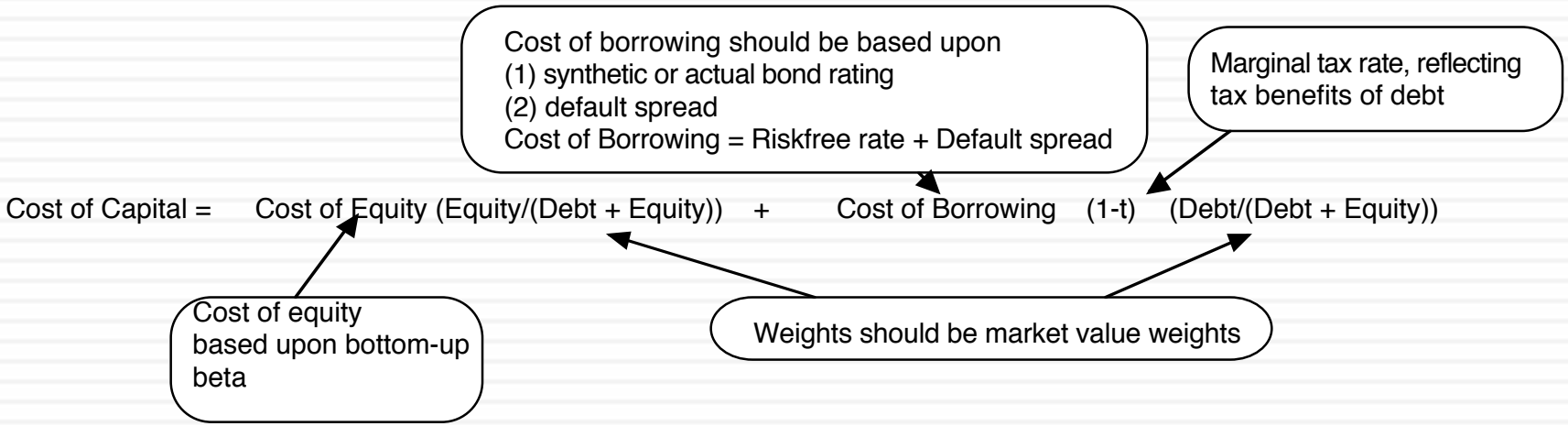
- Within any business, firms with lower fixed costs (as a percentage of total costs) should have lower unlevered betas. If you can compute fixed and variable costs for each firm in a sector, you can break down the unlevered beta into business and operating leverage components.
  - Unlevered beta = Pure business beta * (1 + (Fixed costs/ Variable costs))
- The biggest problem with doing this is informational. It is difficult to get information on fixed and variable costs for individual firms.
- In practice, we tend to assume that the operating leverage of firms within a business are similar and use the same unlevered beta for every firm.

Estimating Bottom Up Betas & Costs of Equity: Vale

Business	*Sample*	*Sample size*	*Unlevered beta of business*	*Revenues*	*Peer Group EV/Sales*	*Value of Business*	*Proportion of Vale*
Metals & Mining	Global firms in metals & mining, Market cap>$1 billion	48	0.86	$9,013	1.97	$17,739	16.65%
Iron Ore	Global firms in iron ore	78	0.83	$32,717	2.48	$81,188	76.20%
Fertilizers	Global specialty chemical firms	693	0.99	$3,777	1.52	$5,741	5.39%
Logistics	Global transportation firms	223	0.75	$1,644	1.14	$1,874	1.76%
Vale Operations			*0.8440*	*$47,151*		*$106,543*	*100.00%*

Business	Unlevered beta	D/E ratio	Levered beta	Risk free rate	ERP	Cost of Equity
Metals & Mining	0.86	54.99%	1.1657	2.75%	7.38%	11.35%
Iron Ore	0.83	54.99%	1.1358	2.75%	7.38%	11.13%
Fertilizers	0.99	54.99%	1.3493	2.75%	7.38%	12.70%
Logistics	0.75	54.99%	1.0222	2.75%	7.38%	10.29%
Vale Operations	0.84	54.99%	1.1503	2.75%	7.38%	11.23%

From Cost of Equity to Cost of Capital



What is debt?

- 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.
- As a consequence, debt should include
  - Any interest-bearing liability, whether short term or long term.
  - Any lease obligation, whether operating or capital.

Estimating the Cost of Debt

- If the firm has bonds outstanding, and the bonds are traded, the yield to maturity on a long-term, straight (no special features) bond can be used as the interest rate.
- If the firm is rated, use the rating and a typical default spread on bonds with that rating to estimate the cost of debt.
- If the firm is not rated,
  - and it has recently borrowed long term from a bank, use the interest rate on the borrowing or
  - estimate a synthetic rating for the company, and use the synthetic rating to arrive at a default spread and a cost of debt
- The cost of debt has to be estimated in the same currency as the cost of equity and the cash flows in the valuation.

Bond Ratings

- Amgen had a bond rating. In 2007, its actual rating was A+.
- For firms without a rating, you estimate a synthetic rating. In its simplest form, the rating can be estimated from the interest coverage ratio

  Interest Coverage Ratio = EBIT / Interest Expenses
- For Tata Motor's interest coverage ratio, we used the interest expenses and EBIT from 2008-09.

  Interest Coverage Ratio = 17527/ 6737 = 2.60

Interest Coverage Ratios, Ratings and Default Spreads: Small market cap companies (January '10)

If interest coverage ratio is			
greater than	≤ to	Rating is	Spread is
-100000	0.499999	D	15.00%
0.5	0.799999	C	12.00%
0.8	1.249999	CC	10.00%
1.25	1.499999	CCC	8.50%
1.5	1.999999	B-	5.50%
2	2.499999	B	5.25%
2.5	2.999999	B+	4.25%
3	3.499999	BB	4.00%
3.5	3.9999999	BB+	3.50%
4	4.499999	BBB	2.00%
4.5	5.999999	A-	1.50%
6	7.499999	A	1.25%
7.5	9.499999	A+	1.00%
9.5	12.499999	AA	0.75%
12.5	100000	AAA	0.50%

Estimating the cost of debt for a firm

- The actual rating for Amgen was A. Using the 2007 default spread of 0.85%, we estimate a cost of debt of

  Cost of debt = Riskfree rate + Default spread =4.78% + 0.85% = 5.63%

- The synthetic rating for Tata Motors is B+. Using the 2010 default spread of 4.25%, we estimate a cost of debt of 12.25% (using a RS riskfree rate of 5% and adding in the country default spread of 3%):

  Cost of debt = Riskfree rate + Country default spread + Company default spread =5.00% + 4.25%+ 3% = 12.25%

Default Spreads: The effect of the crisis of 2008.. And the aftermath

	Default spread over treasury					
Rating	1-Jan-08	12-Sep-08	12-Nov-08	1-Jan-09	1-Jan-10	1-Jan-11
Aaa/AAA	0.99%	1.40%	2.15%	2.00%	0.50%	0.55%
Aa1/AA+	1.15%	1.45%	2.30%	2.25%	0.55%	0.60%
Aa2/AA	1.25%	1.50%	2.55%	2.50%	0.65%	0.65%
Aa3/AA-	1.30%	1.65%	2.80%	2.75%	0.70%	0.75%
A1/A+	1.35%	1.85%	3.25%	3.25%	0.85%	0.85%
A2/A	1.42%	1.95%	3.50%	3.50%	0.90%	0.90%
A3/A-	1.48%	2.15%	3.75%	3.75%	1.05%	1.00%
Baa1/BBB+	1.73%	2.65%	4.50%	5.25%	1.65%	1.40%
Baa2/BBB	2.02%	2.90%	5.00%	5.75%	1.80%	1.60%
Baa3/BBB-	2.60%	3.20%	5.75%	7.25%	2.25%	2.05%
Ba1/BB+	3.20%	4.45%	7.00%	9.50%	3.50%	2.90%
Ba2/BB	3.65%	5.15%	8.00%	10.50%	3.85%	3.25%
Ba3/BB-	4.00%	5.30%	9.00%	11.00%	4.00%	3.50%
B1/B+	4.55%	5.85%	9.50%	11.50%	4.25%	3.75%
B2/B	5.65%	6.10%	10.50%	12.50%	5.25%	5.00%
B3/B-	6.45%	9.40%	13.50%	15.50%	5.50%	6.00%
Caa/CCC+	7.15%	9.80%	14.00%	16.50%	7.75%	7.75%
ERP	4.37%	4.52%	6.30%	6.43%	4.36%	5.20%

Updated Default Spreads - January 2014

Rating	1 year	5 year	10 Year	30 year
Aaa/AAA	0.05%	0.18%	0.42%	0.65%
Aa1/AA+	0.11%	0.37%	0.57%	0.82%
Aa2/AA	0.16%	0.55%	0.71%	0.98%
Aa3/AA-	0.22%	0.60%	0.75%	0.99%
A1/A+	0.26%	0.65%	0.78%	1.00%
A2/A	0.33%	0.67%	0.84%	1.12%
A3/A-	0.46%	0.84%	1.00%	1.26%
Baa1/BBB+	0.58%	1.09%	1.32%	1.67%
Baa2/BBB	0.47%	1.27%	1.52%	1.91%
Baa3/BBB-	0.95%	1.53%	1.78%	2.18%
Ba1/BB+	1.68%	2.29%	2.59%	2.97%
Ba2/BB	2.40%	3.04%	3.39%	3.77%
Ba3/BB-	3.12%	3.80%	4.20%	4.57%
B1/B+	3.84%	4.56%	5.01%	5.36%
B2/B	4.56%	5.31%	5.81%	6.16%
B3/B-	5.28%	6.06%	6.62%	6.96%
Caa/CCC+	6.00%	6.82%	7.43%	7.75%

Weights for the Cost of Capital Computation

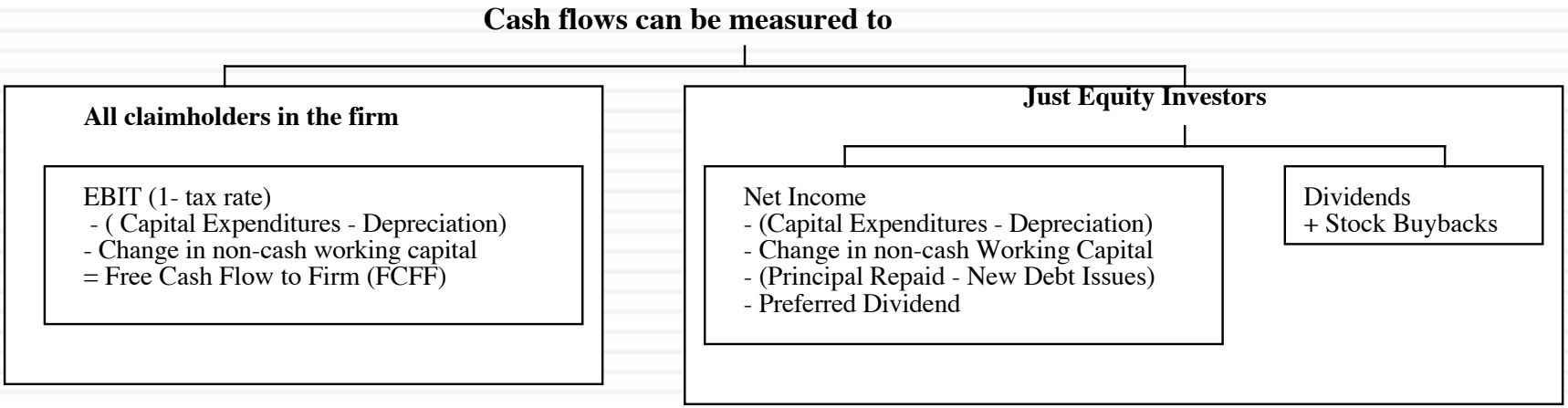
- The weights used to compute the cost of capital should be the market value weights for debt and equity.
- There is an element of circularity that is introduced into every valuation by doing this, since the values that we attach to the firm and equity at the end of the analysis are different from the values we gave them at the beginning.
- For private companies, neither the market value of equity nor the market value of debt is observable. Rather than use book value weights, you should try
  - Industry average debt ratios for publicly traded firms in the business
  - Target debt ratio (if management has such a target)
  - Estimated value of equity and debt from valuation (through an iterative process)

Company costs of capital

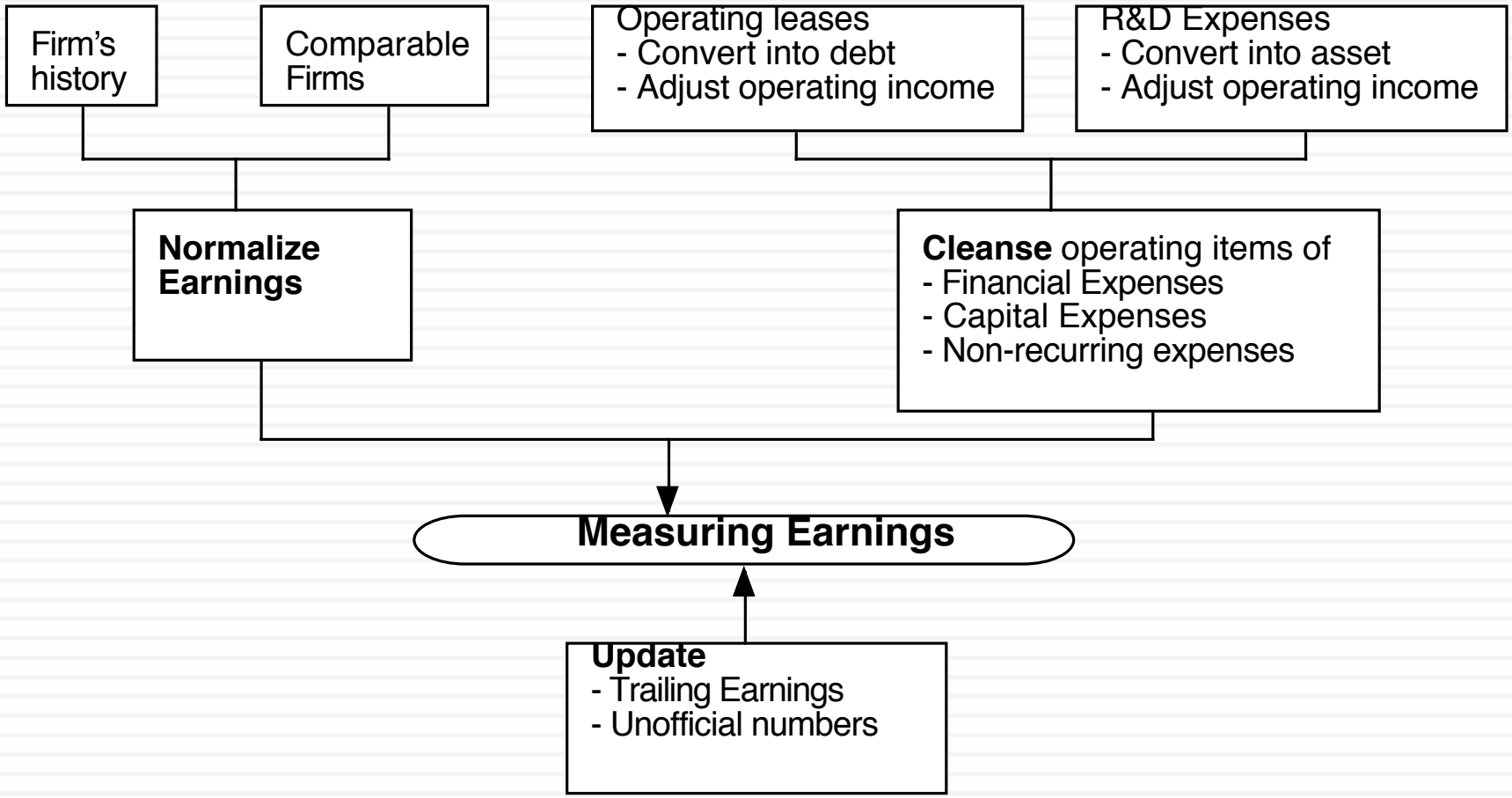
	Amgen	Tata Motors
Riskfree rate	4.78%	5%
Beta	1.73	1.2
Mature ERP	4%	4.50%
Lambda	0.00	0.80
CRP	0.00%	4.50%
Cost of equity	11.70%	14.00%
Rating	A	B+
Default spread	0.85%	4.25%
Default spread (country)	0.00%	3.00%
Cost of debt	5.63%	12.2500%
Marginal tax rate	35%	33.99%
After-tax cost of debt	3.66%	8.09%
MV of equity	$74,287	INR 322,388
MV of debt	$8,272	INR 109,198
D/ (D+E)	10.00%	25.30%
Cost of capital	10.90%	12.50%

IB. ESTIMATING CASHFLOWS AND GROWTH

Defining Cashflow



From Reported to Actual Earnings



Dealing with Operating Lease Expenses

- Operating Lease Expenses are treated as operating expenses in computing operating income. In reality, operating lease expenses should be treated as financing expenses, with the following adjustments to earnings and capital:
- Debt Value of Operating Leases = Present value of Operating Lease Commitments at the pre-tax cost of debt
- When you convert operating leases into debt, you also create an asset to counter it of exactly the same value.
- Adjusted Operating Earnings
  - Adjusted Operating Earnings = Operating Earnings + Operating Lease Expenses - Depreciation on Leased Asset

  As an approximation, this works:
  - Adjusted Operating Earnings = Operating Earnings + Pre-tax cost of Debt * PV of Operating Leases.

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 expense this year – Depreciation
  = 5,071 m + 69 m - 870/12 = $5,068 million (12 year life for assets)
- Approximate Operating income= stated OI + PV of Lease commitment * Pre-tax cost of debt

= $5,071 m + 870 m (.0563) = $ 5,120 million

Collateral Effects of Treating Operating Leases as Debt for a lease-rich company: The Gap

Conventional Accounting	*Operating Leases Treated as Debt*
Income Statement EBIT& Leases = 1,990 - Op Leases = 978 EBIT = 1,012	*Income Statement* EBIT& Leases = 1,990 - Deprecn: OL= 628 EBIT = 1,362 Interest expense will rise to reflect the conversion of operating leases as debt. Net income should not change.
Balance Sheet Off balance sheet (Not shown as debt or as an asset). Only the conventional debt of $1,970 million shows up on balance sheet	*Balance Sheet* Asset Liability OL Asset 4397 OL Debt 4397 Total debt = 4397 + 1970 = $6,367 million
Cost of capital = 8.20%(7350/9320) + 4% (1970/9320) = 7.31% Cost of equity for The Gap = 8.20% After-tax cost of debt = 4% Market value of equity = 7350	Cost of capital = 8.20%(7350/13717) + 4% (6367/13717) = 6.25%
Return on capital = 1012 (1-.35)/(3130+1970) = 12.90%	Return on capital = 1362 (1-.35)/(3130+6367) = 9.30%

R&D Expenses: Operating or Capital Expenses

- Accounting standards require us to consider R&D as an operating expense even though it is designed to generate future growth. It is more logical to treat it as capital expenditures.
- To capitalize R&D,
  - Specify an amortizable life for R&D (2 - 10 years)
  - Collect past R&D expenses for as long as the amortizable life
  - Sum up the unamortized R&D over the period. (Thus, if the amortizable life is 5 years, the research asset can be obtained by adding up 1/5th of the R&D expense from five years ago, 2/5th of the R&D expense from four years ago...:

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	$55.80
Value of Research Asset =			$10,112.80	$1,149.90

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

The Effect of Capitalizing R&D at Amgen

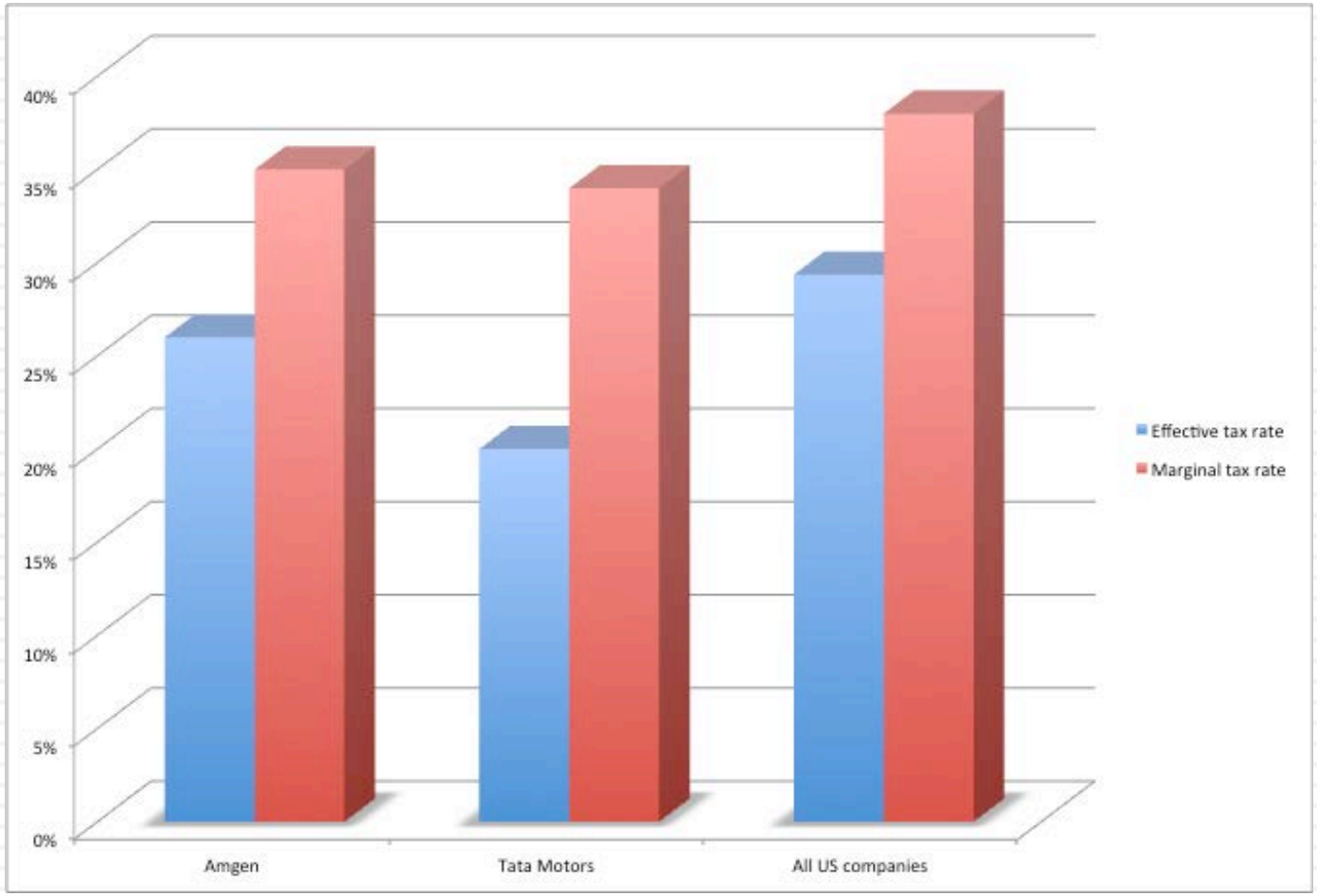
Conventional Accounting	*R&D treated as capital expenditure*
Income Statement EBIT& R&D = 8,486 - R&D = 3,366 EBIT = 5,120 EBIT (1-t) = 3,686	*Income Statement* EBIT& R&D = 8,486 - Amort: R&D = 1,150 EBIT = 7,336 (Increase 2,216 m) EBIT (1-t) = 5,282 m Ignored tax benefit = (3366-1150)(.28) = 621 Adjusted EBIT (1-t) = 5,282 +621 = 5,902 million Net Income will also increase by 2,216 million
Balance Sheet Off balance sheet asset. Book value of equity at $18,964 million is understated because biggest asset is off the books.	*Balance Sheet* Asset Liability R&D Asset 10,112 Book Equity +10,112 Book Equity = 18,964+ 10,112= 29,076 mil
Capital Expenditures Conventional net cap ex of $4,227 million	*Capital Expenditures* Net Cap ex = 4,227 + 2216 = $6,493 mil
Cash Flows EBIT (1-t) = 3686 - Net Cap Ex & WC = 4279 FCFF = -578	*Cash Flows* EBIT (1-t) = 5902 - Net Cap Ex = 6443 FCFF = - 678 m
Return on capital = 3686/22753 = 14.00%	Return on capital = 5902/36432 = 16.71%

What tax rate?

- The tax rate that you should use in computing the after-tax operating income should be

a. The effective tax rate in the financial statements (taxes paid/Taxable income)
b. The tax rate based upon taxes paid and EBIT (taxes paid/ EBIT)
c. The marginal tax rate for the country in which the company operates
d. The weighted average marginal tax rate across the countries in which the company operates
e. None of the above
f. Any of the above, as long as you compute your after-tax cost of debt using the same tax rate

Tax Rates


40%
35%
30%
25%
20%
15%
10%
5%
0%
Amgen
Tata Motors
All US companies
Effective tax rate
Marginal tax rate

Capital expenditures should include

- Research and development expenses, once they have been re-categorized as capital expenses. The adjusted net cap ex will be
  - Adjusted Net Capital Expenditures = Net Capital Expenditures + Current year's R&D expenses - Amortization of Research Asset
- Acquisitions of other firms, since these are like capital expenditures. The adjusted net cap ex will be
  - Adjusted Net Cap Ex = Net Capital Expenditures + Acquisitions of other firms - Amortization of such acquisitions
  - Two caveats:
  - 1. Most firms do not do acquisitions every year. Hence, a normalized measure of acquisitions (looking at an average over time) should be used
  - 2. The best place to find acquisitions is in the statement of cash flows, usually categorized under other investment activities

Amgen 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.

Working Capital Investments

- In accounting terms, the working capital is the difference between current assets (inventory, cash and accounts receivable) and current liabilities (accounts payables, short term debt and debt due within the next year)
- A cleaner definition of working capital from a cash flow perspective is the difference between non-cash current assets (inventory and accounts receivable) and non-debt current liabilities (accounts payable)
- Any investment in this measure of working capital ties up cash. Therefore, any increases (decreases) in working capital will reduce (increase) cash flows in that period.
- When forecasting future growth, it is important to forecast the effects of such growth on working capital needs, and building these effects into the cash flows.

FCFF estimates: Last year

	Amgen	Tata Motors
EBIT (1-t)	$6,058.00	20,116.00Rs
- Net Cap Ex	$6,443.00	31,590.00Rs
- Change in non-cash WC	$37.00	2,732.00Rs
FCFF	-$422.00	14,206.00Rs
Reinvestment Rate	106.97%	170.62%

From FCFF to FCFE: Debt cash flows….

- In the strictest sense, the only cash flow that an investor will receive from an equity investment in a publicly traded firm is the dividend paid on the stock.
- Actual dividends, however, are set by the managers of the firm and may be much lower than the potential dividends (that could have been paid out)
  - managers are conservative and try to smooth out dividends
  - managers like to hold on to cash to meet unforeseen future contingencies and investment opportunities
- The potential dividends of a firm are the cash flows left over after the firm has made any "investments" it needs to make to create future growth and net debt repayments (debt repayments - new debt issues):

  Net Income
  - (Capital Expenditures - Depreciation)
  - Changes in non-cash Working Capital
  - (Principal Repayments - New Debt Issues)
  = Free Cash flow to Equity

Growth in Earnings

- Look at the past
  - The historical growth in earnings per share is usually a good starting point for growth estimation
- Look at what others are estimating
  - Analysts estimate growth in earnings per share for many firms. It is useful to know what their estimates are.
- Look at fundamentals
  - Ultimately, all growth in earnings can be traced to two fundamentals - how much the firm is investing in new projects, and what returns these projects are making for the firm.

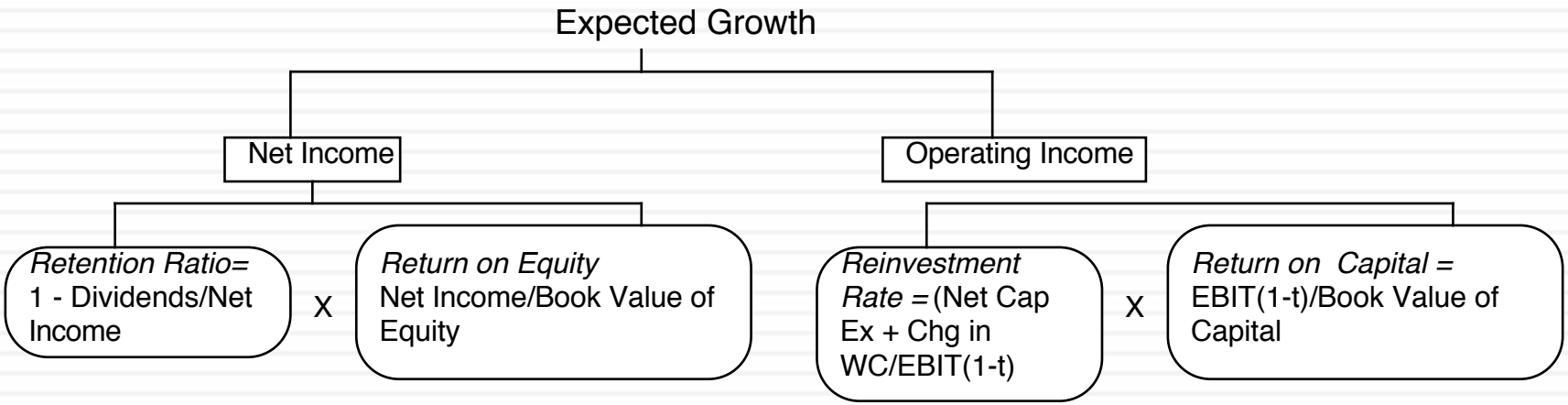
I. Historical Growth in EPS

- Historical growth rates can be estimated in a number of different ways
  - Arithmetic versus Geometric Averages
  - Simple versus Regression Models
- Historical growth rates can be sensitive to
  - the period used in the estimation
- In using historical growth rates, the following factors have to be considered
  - how to deal with negative earnings
  - the effect of changing size

II. Analyst Growth Rates

- Proposition 1: There if far less private information and far more public information in most analyst forecasts than is generally claimed.
- Proposition 2: The biggest source of private information for analysts remains the company itself which might explain
  - why there are more buy recommendations than sell recommendations (information bias and the need to preserve sources)
  - why there is such a high correlation across analysts forecasts and revisions
  - why All-America analysts become better forecasters than other analysts after they are chosen to be part of the team.
- Proposition 3: There is value to knowing what analysts are forecasting as earnings growth for a firm. There is, however, danger when they agree too much (lemmingitis) and when they agree to little (in which case the information that they have is so noisy as to be useless).

III. Fundamental or Intrinsic Growth



Measuring Return on Capital (Equity)

Adjust EBIT for
a. Extraordinary or one-time expenses or income
b. Operating leases and R&D
c. Cyclicality in earnings (Normalize)
d. Acquisition Debris (Goodwill amortization etc.)

Use a marginal tax rate to be safe. A high ROC created by paying low effective taxes is not sustainable

$$\text{ROC} = \frac{\text{EBIT (1- tax rate)}}{\text{Book Value of Equity + Book value of debt - Cash}}$$

Adjust book equity for
1. Capitalized R&D
2. Acquisition Debris (Goodwill)

Adjust book value of debt for
a. Capitalized operating leases

Use end of prior year numbers or average over the year but be consistent in your application

Fundamental Growth when return on equity (capital) is changing

- When the return on equity or capital is changing, there will be a second component to growth, positive if the return is increasing and negative if the return is decreasing. If ROCt is the return on capital in period t and ROCt+1 is the return on capital in period t+1, the expected growth rate in operating income will be:

  Expected Growth Rate $= ROC_{t+1} *$ Reinvestment rate $+(ROC_{t+1} - ROC_t) / ROC_t$

- For example, assume that you have a firm that is generating a return on capital of 8% on its existing assets and expects to increase this return to 10% next year. The efficiency growth for this firm is

  Efficiency growth = (10% -8%)/ 8% = 25%

- Thus, if this firm has a reinvestment rate of 50% and makes a 10% return on capital on its new investments as well, its total growth next year will be 30%

  Growth rate = .50 * 10% + 25% = 30%

- The key difference is that growth from new investments is sustainable whereas returns from efficiency are short term (or transitory).

IC. THE TAIL THAT WAGS THE DOG… TERMINAL VALUE

Getting Closure in Valuation

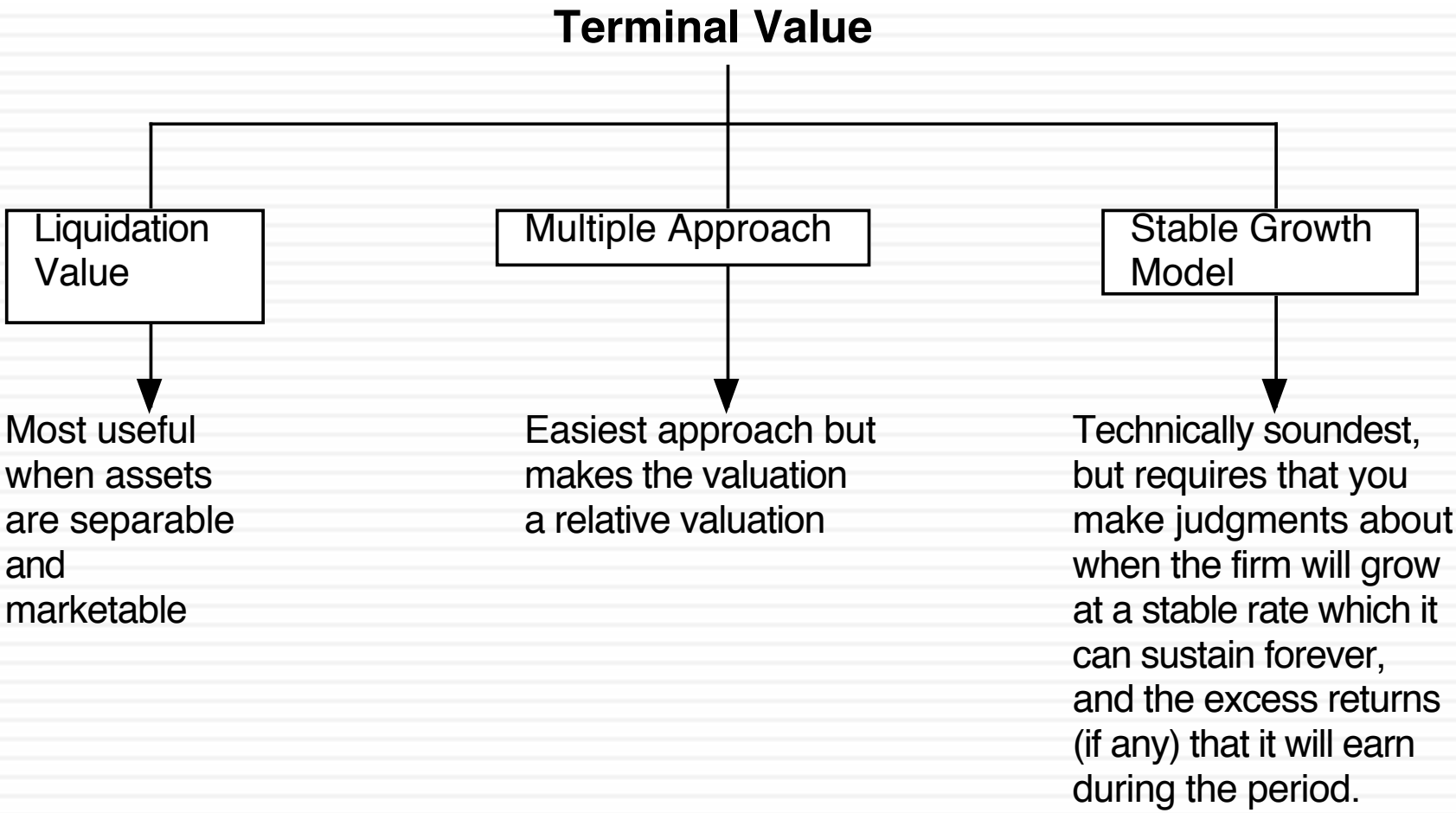
- A publicly traded firm potentially has an infinite life. The value is therefore the present value of cash flows forever.

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

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

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

Ways of Estimating Terminal Value



Stable Growth and Terminal Value

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

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

  where,

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

  g = Expected growth rate

- This "constant" growth rate is called a stable growth rate and cannot be higher than the growth rate of the economy in which the firm operates.
- While companies can maintain high growth rates for extended periods, they will all approach "stable growth" at some point in time.

Getting Terminal Value Right
1. Obey the growth cap

- The stable growth rate cannot exceed the growth rate of the economy but it can be set lower.
  - If you assume that the economy is composed of high growth and stable growth firms, the growth rate of the latter will probably be lower than the growth rate of the economy.
  - The stable growth rate can be negative. The terminal value will be lower and you are assuming that your firm will disappear over time.
  - If you use nominal cashflows and discount rates, the growth rate should be nominal in the currency in which the valuation is denominated.
- One simple proxy for the nominal growth rate of the economy is the riskfree rate.
  - Riskfree rate = Expected inflation + Expected Real Interest Rate
  - Nominal growth rate in economy = Expected Inflation + Expected Real Growth

Getting Terminal Value Right
2. Don't wait too long…

- Assume that you are valuing a young, high growth firm with great potential, just after its initial public offering. How long would you set your high growth period?
  a. < 5 years
  b. 5 years
  c. 10 years
  d. >10 years
- While analysts routinely assume very long high growth periods (with substantial excess returns during the periods), the evidence suggests that they are much too optimistic. Most growth firms have difficulty sustaining their growth for long periods, especially while earning excess returns.

And the key determinant of growth periods is the company's competitive advantage…

- Recapping a key lesson about growth, it is not growth per se that creates value but growth with excess returns. For growth firms to continue to generate value creating growth, they have to be able to keep the competition at bay.
- Proposition 1: The stronger and more sustainable the competitive advantages, the longer a growth company can sustain "value creating" growth.
- Proposition 2: Growth companies with strong and sustainable competitive advantages are rare.

Getting Terminal Value Right
3. Don't forget that growth has to be earned

- In the section on expected growth, we laid out the fundamental equation for growth:

Growth rate = Reinvestment Rate * Return on invested capital

+ Growth rate from improved efficiency

- In stable growth, you cannot count on efficiency delivering growth (why?) and you have to reinvest to deliver the growth rate that you have forecast. Consequently, your reinvestment rate in stable growth will be a function of your stable growth rate and what you believe the firm will earn as a return on capital in perpetuity:
  - Reinvestment Rate = Stable growth rate/ Stable period Return on capital
- A key issue in valuation is whether it okay to assume that firms can earn more than their cost of capital in perpetuity. There are some (McKinsey, for instance) who argue that the return on capital = cost of capital in stable growth…

And don't fall for sleight of hand…

- A typical assumption in many DCF valuations, when it comes to stable growth, is that capital expenditures offset depreciation and there are no working capital needs. Stable growth firms, we are told, just have to make maintenance cap ex (replacing existing assets) to deliver growth. If you make this assumption, what expected growth rate can you use in your terminal value computation?

- What if the stable growth rate = inflation rate? Is it okay to make this assumption then?

Getting Terminal Value Right
4. Be internally consistent..

- Risk and costs of equity and capital: Stable growth firms tend to
  - Have betas closer to one
  - Have debt ratios closer to industry averages (or mature company averages)
  - Country risk premiums (especially in emerging markets should evolve over time)
- The excess returns at stable growth firms should approach (or become) zero. ROC -> Cost of capital and ROE -> Cost of equity
- The reinvestment needs and dividend payout ratios should reflect the lower growth and excess returns:
  - Stable period payout ratio = 1 - g/ ROE
  - Stable period reinvestment rate = g/ ROC

Valuation: Stable Growth Inputs

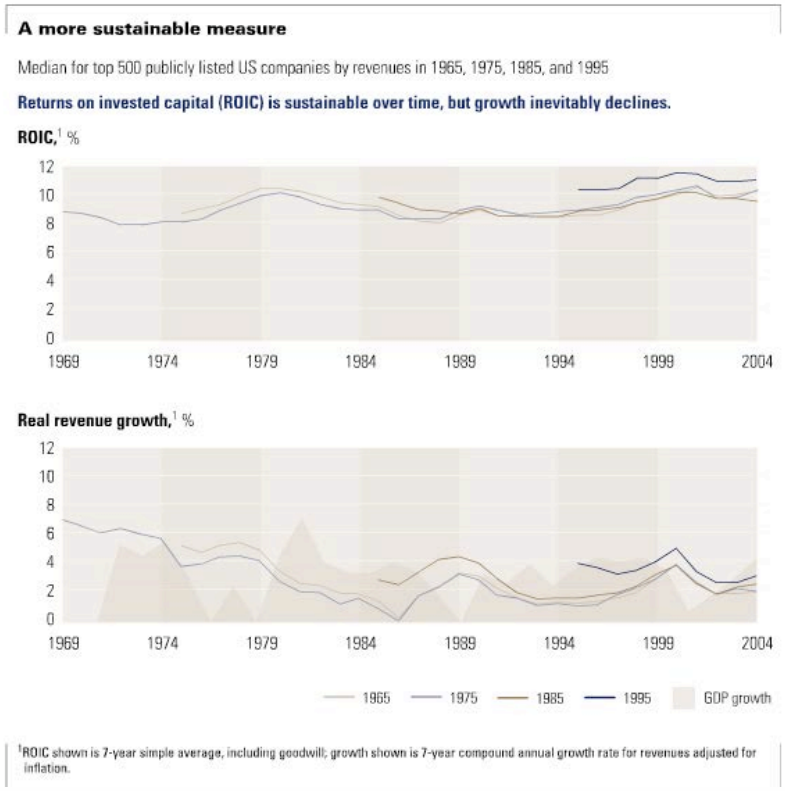
		Amgen	Tata Motors
Beta	High Growth	1.73	1.20
	Stable Growth	1.10	1.00
Lambda	High Growth	0.00	0.80
	Stable Growth	0.00	0.80
Country Risk Premium	High Growth	0.00%	4.50%
	Stable Growth	0.00%	3.00%
Cost of equity	High Growth	11.70%	14.00%
	Stable Growth	9.18%	11.90%
Debt Ratio	High Growth	10.00%	25.30%
	Stable Growth	20.00%	25.30%
Cost of debt	High Growth	5.63%	12.25%
	Stable Growth	5.63%	9.00%
Cost of capital	High Growth	10.90%	12.50%
	Stable Growth	8.08%	10.39%
Return on capital	High Growth	16.00%	17.16%
	Stable Growth	10.00%	10.39%
Reinvestment Rate	High Growth	60.00%	70.00%
	Stable Growth	40.00%	41.67%
Expected growth rate	High Growth	9.60%	12.01%
	Stable Growth	4.00%	5.00%

Terminal Value and Growth

Stable growth rate	Amgen	Tata Motors
0%	$150,652	435,686Rs
1%	$154,479	435,686Rs
2%	$160,194	435,686Rs
3%	$167,784	435,686Rs
4%	$179,099	435,686Rs
ROIC	10%	10.39%
Cost of capital	8.08%	10.39%

Excess returns forever?

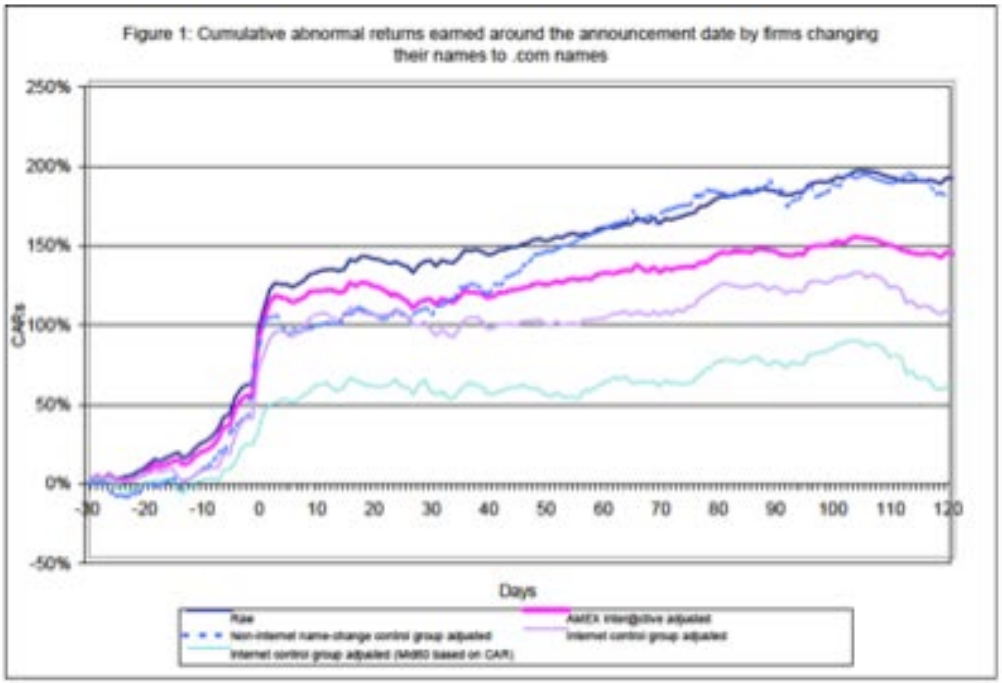
- While growth rates seem to fade quickly as firms become larger, well managed firms seem to do much better at sustaining excess returns for longer periods.



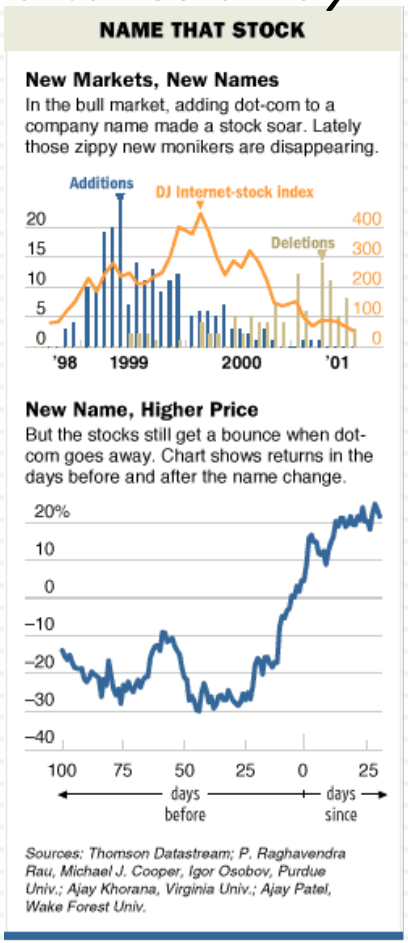
II. CORPORATE FINANCE MEETS VALUE: THE SECRET TO VALUE ENHANCEMENT

Price Enhancement versus Value Enhancement

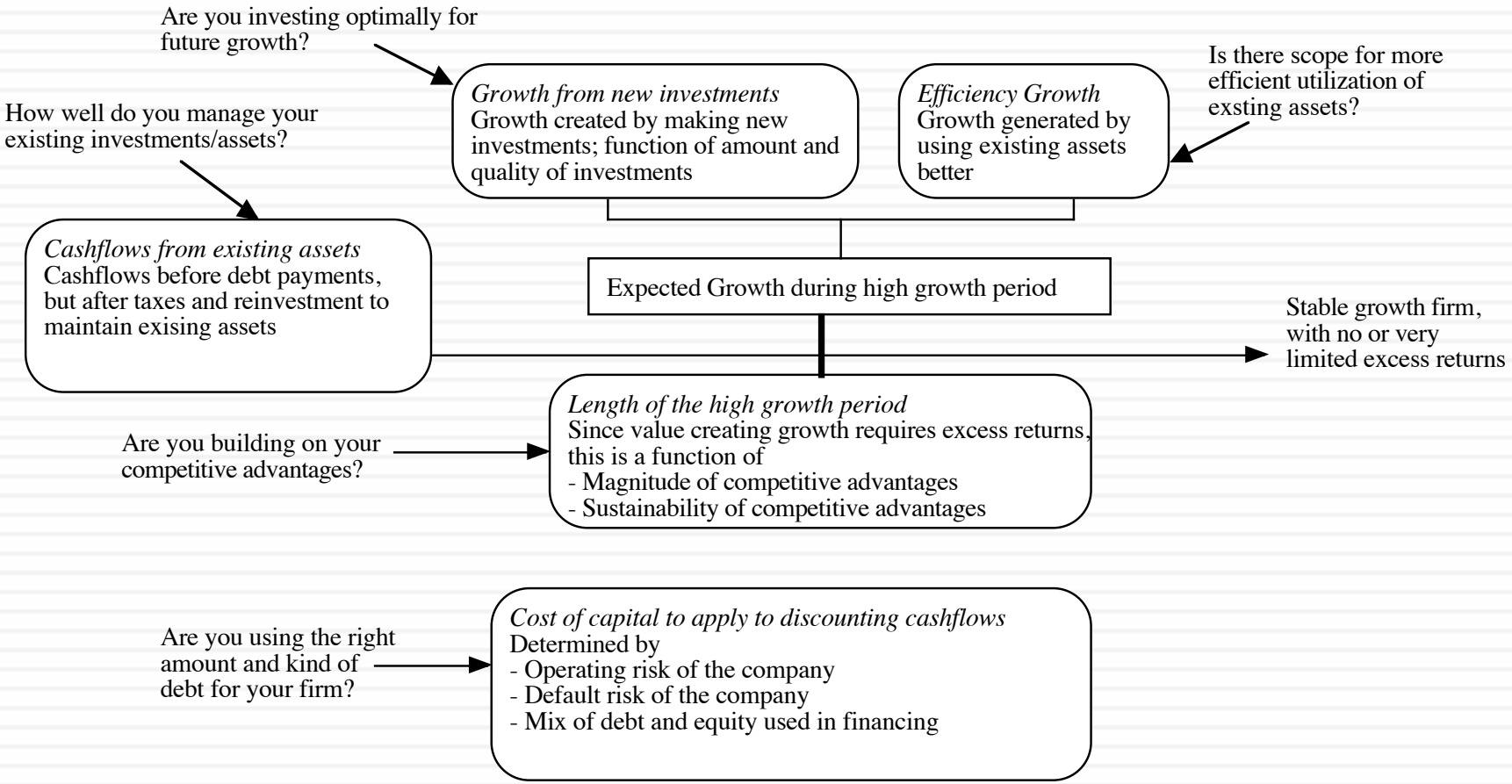
The market gives…



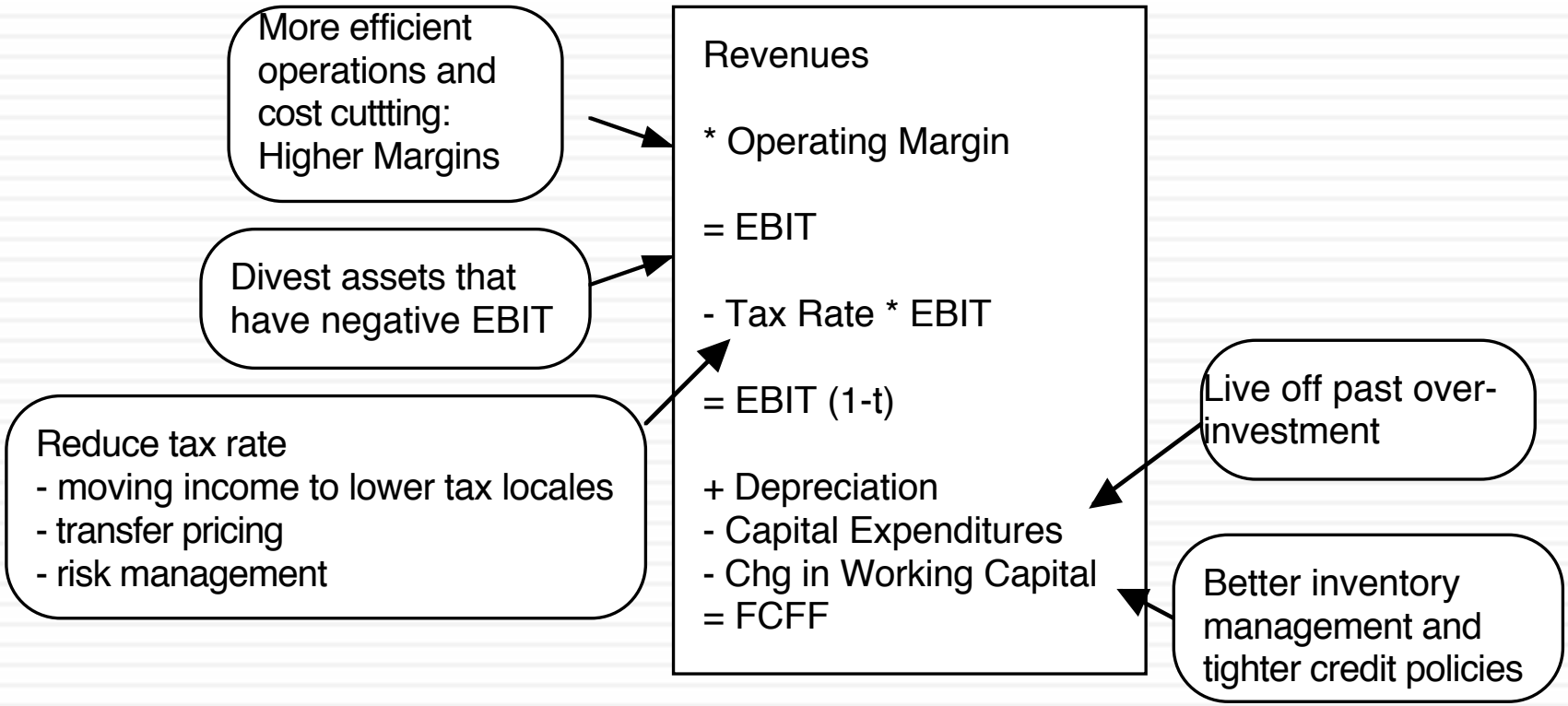
And takes away….



The Paths to Value Creation.. Back to the determinants of value..



Value Creation 1: Increase Cash Flows from Assets in Place



1.1.: Poor Investments: Should you divest?

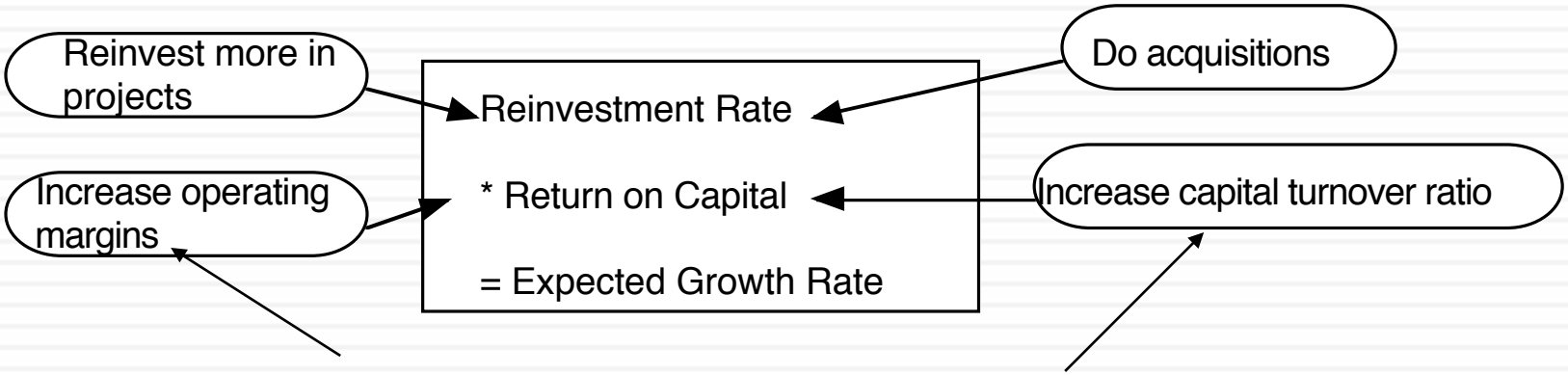
- Every firm has at least a few investments in place that are poor investments, earning less than the cost of capital or even losing money.
- In deciding whether to divest, there are three values that we need to consider:
  - Continuing Value: This is the present value of the expected cash flows from continuing the investment through the end of its life.
  - Salvage or Liquidation Value: This is the net cash flow that the firm will receive if it terminated the project today.
  - Divestiture Value: This is the price that will be paid by the highest bidder for this investment.
- If the continuing value is the greatest, there can be no value created by terminating or liquidating this investment, even if it is a bad investment.
- If the liquidation or divestiture value is greater than the continuing value, the firm value will increase by the difference between the two values:
  - If liquidation is optimal: Liquidation Value - Continuing Value
  - If divestiture is optimal: Divestiture Value - Continuing Value

1.2: Manage working capital

- If non-cash working capital is defined to be the difference between non-cash current assets (accounts receivable & inventory) and non-debt current liabilities (accounts payable & supplier credit), there are three ways in which you can reduce working capital (and increase cash flows):
  - Reduce inventory at every stage in the process (work in process, finished goods)
  - Offer less or tighter credit and/or demand a fair market interest rate when offering credit.
  - Use supplier credit or accounts payable, but only if the financing cost (explicit or implicit) is lower than the company's pre-tax cost of debt.
- Reducing working capital is not a free good. The cash flow gain from reducing inventory and tightening credit has to be weighed off against the cost of lost sales and profits.

Value Creation 2: Increase Expected Growth

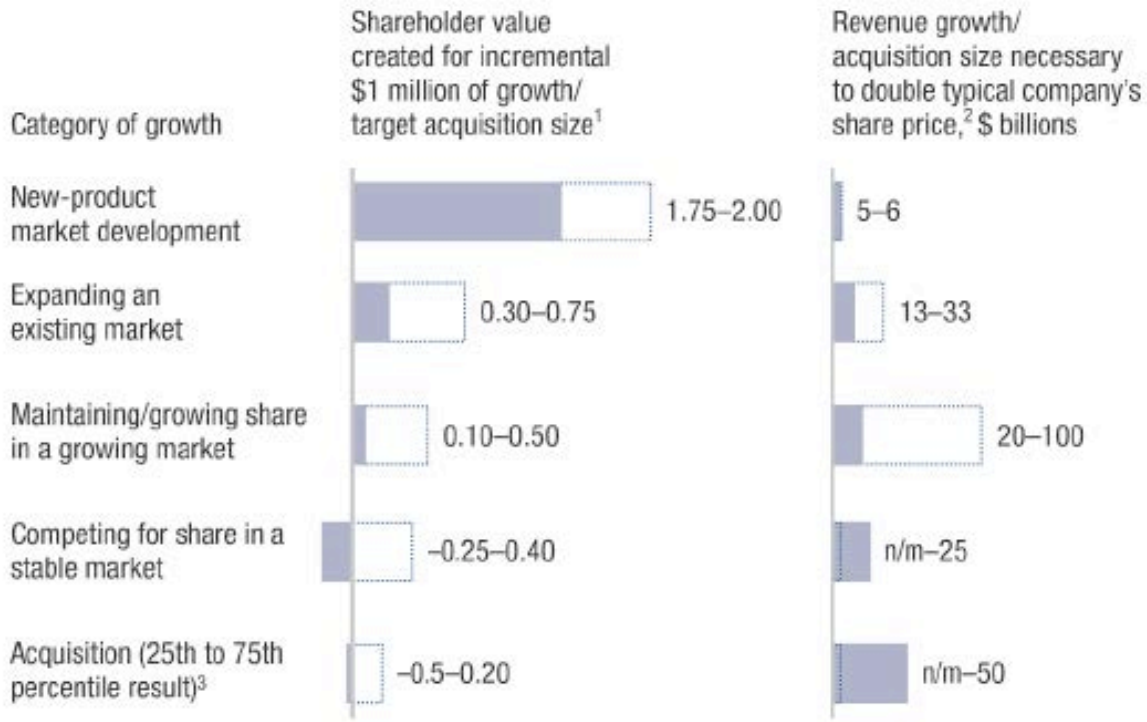
- Keeping all else constant, increasing the expected growth in earnings will increase the value of a firm.
- The expected growth in earnings of any firm is a function of two variables:
  - The amount that the firm reinvests in assets and projects
  - The quality of these investments



Price Leader versus Volume Leader Strategies
*Return on Capital = Operating Margin * Capital Turnover Ratio*

Value Creating Growth… Evaluating the Alternatives..

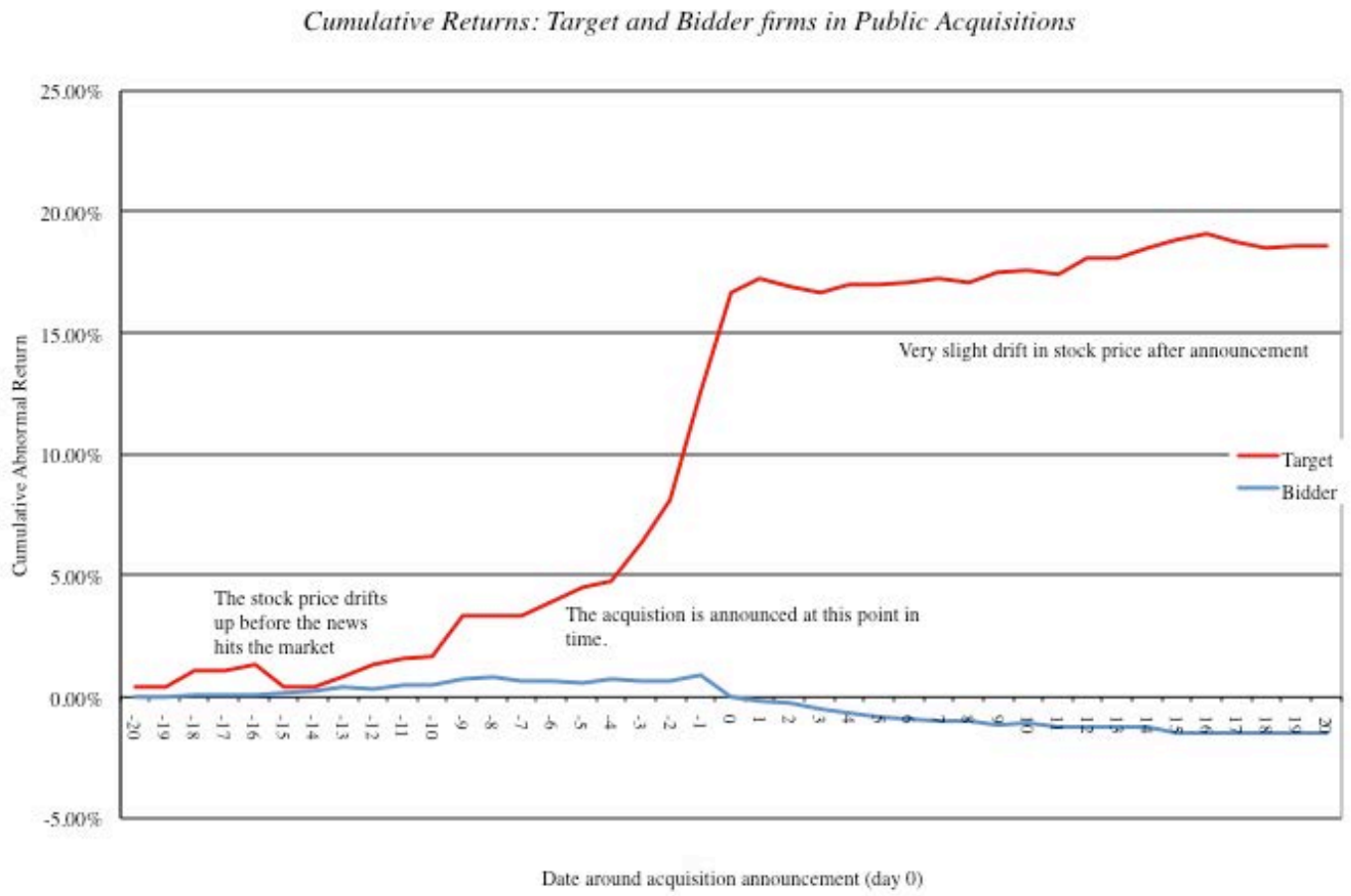
Modes of organic growth vary in value creation intensity—consumer goods industry



A postscript on creating growth: The Role of Acquisitions and Divestitures

- An acquisition is just a large-scale project. All of the rules that apply to individual investments apply to acquisitions, as well. For an acquisition to create value, it has to
  - Generate a higher return on capital, after allowing for synergy and control factors, than the cost of capital.
  - Put another way, an acquisition will create value only if the present value of the cash flows on the acquired firm, inclusive of synergy and control benefits, exceeds the cost of the acquisitons
- A divestiture is the reverse of an acquisition, with a cash inflow now (from divesting the assets) followed by cash outflows (i.e., cash flows foregone on the divested asset) in the future. If the present value of the future cash outflows is less than the cash inflow today, the divestiture will increase value.
- A fair-price acquisition or divestiture is value neutral.

Acquisitions are great for target companies but for acquiring company stockholders…



And the long-term follow up is not positive either..

- Managers often argue that the market is unable to see the long term benefits of mergers that they can see at the time of the deal. If they are right, mergers should create long term benefits to acquiring firms.
- The evidence does not support this hypothesis:
  - McKinsey and Co. has examined acquisition programs at companies on
    - Did the return on capital invested in acquisitions exceed the cost of capital?
    - Did the acquisitions help the parent companies outperform the competition?
    - Half of all programs failed one test, and a quarter failed both.
  - Synergy is elusive. KPMG in a more recent study of global acquisitions concludes that most mergers (>80%) fail - the merged companies do worse than their peer group.
  - A large number of acquisitions that are reversed within fairly short time periods. About 20% of the acquisitions made between 1982 and 1986 were divested by 1988. In studies that have tracked acquisitions for longer time periods (ten years or more) the divestiture rate of acquisitions rises to almost 50%.

A scary thought… The disease is spreading… Indian firms acquiring US targets – 1999 - 2005

Figure 2. Acquisition Announcement Effect on the Acquiring Firms' Stocks

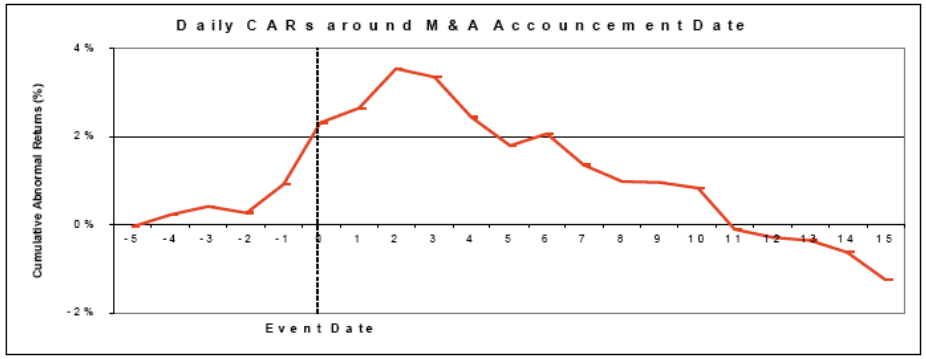
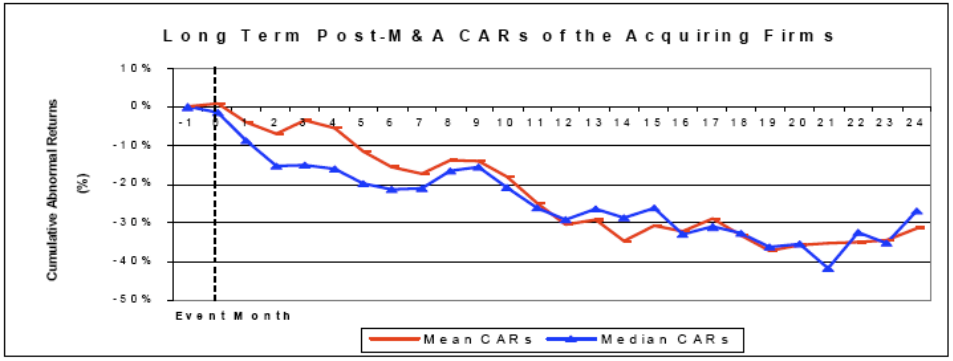


Figure 3. Long Term Stock Performance of the Acquiring Firms



Growing through acquisitions seems to be a "loser's game"

- Firms that grow through acquisitions have generally had far more trouble creating value than firms that grow through internal investments.
- In general, acquiring firms tend to
  - Pay too much for target firms
  - Over estimate the value of "synergy" and "control"
  - Have a difficult time delivering the promised benefits
- Worse still, there seems to be very little learning built into the process. The same mistakes are made over and over again, often by the same firms with the same advisors.
- Conclusion: There is something structurally wrong with the process for acquisitions which is feeding into the mistakes.

Seven reasons why acquisitions fail…

1. Risk Transference: Attributing acquiring company risk characteristics to the target firm. Just because you are a safe firm and operate in a secure market, does not mean that you can transfer these characteristics to a target firm.
2. Debt subsidies: Subsiding target firm stockholders for the strengths of the acquiring firm is providing them with a benefit they did not earn.
3. Auto-pilot Control: Adding 20% or some arbitrary number to the market price just because other people do it is a recipe for overpayment. Using silly rules such as EPS accretion just makes the problem worse.
4. Elusive Synergy: While there is much talk about synergy in mergers, it is seldom valued realistically or appropriately.
5. Its all relative: The use of transaction multiples (multiples paid by other acquirers in acquisitions) perpetuates over payment.
6. Verdict first, trial afterwards: Deciding you want to do an acquisition first and then looking for justification for the price paid does not make sense.
7. It's not my fault: Holding no one responsible for delivering results is a sure-fire way not to get results…

Lets start with a target firm

- The target firm has the following income statement:

Revenues	100
Operating Expenses	80
= Operating Income	20
Taxes	8
= After-tax OI	12

- Assume that this firm will generate this operating income forever (with no growth) and that the cost of equity for this firm is 20%. The firm has no debt outstanding. What is the value of this firm?

Test 1: Risk Transference…

- Assume that as an acquiring firm, you are in a much safer business and have a cost of equity of 10%. What is the value of the target firm to you?

Lesson 1: Don't transfer your risk characteristics to the target firm

- The cost of equity used for an investment should reflect the risk of the investment and not the risk characteristics of the investor who raised the funds.
- Risky businesses cannot become safe just because the buyer of these businesses is in a safe business.

Test 2: Cheap debt?

- Assume as an acquirer that you have access to cheap debt (at 4%) and that you plan to fund half the acquisition with debt. How much would you be willing to pay for the target firm?

Lesson 2: Render unto the target firm that which is the target firm's but no more..

- As an acquiring firm, it is entirely possible that you can borrow much more than the target firm can on its own and at a much lower rate. If you build these characteristics into the valuation of the target firm, you are essentially transferring wealth from your firm's stockholder to the target firm's stockholders.
- When valuing a target firm, use a cost of capital that reflects the debt capacity and the cost of debt that would apply to the firm.

Test 3: Control Premiums

- Assume that you are now told that it is conventional to pay a 20% premium for control in acquisitions (backed up by Mergerstat). How much would you be willing to pay for the target firm?

- Would your answer change if I told you that you can run the target firm better and that if you do, you will be able to generate a 30% pre-tax operating margin (rather than the 20% margin that is currently being earned).

- What if the target firm were perfectly run?

Lesson 3: Beware of rules of thumb…

- Valuation is cluttered with rules of thumb. After painstakingly valuing a target firm, using your best estimates, you will be often be told that
  - It is common practice to add arbitrary premiums for brand name, quality of management, control etc…
  - These premiums will be often be backed up by data, studies and services. What they will not reveal is the enormous sampling bias in the studies and the standard errors in the estimates.
  - If you have done your valuation right, those premiums should already be incorporated in your estimated value. Paying a premium will be double counting.

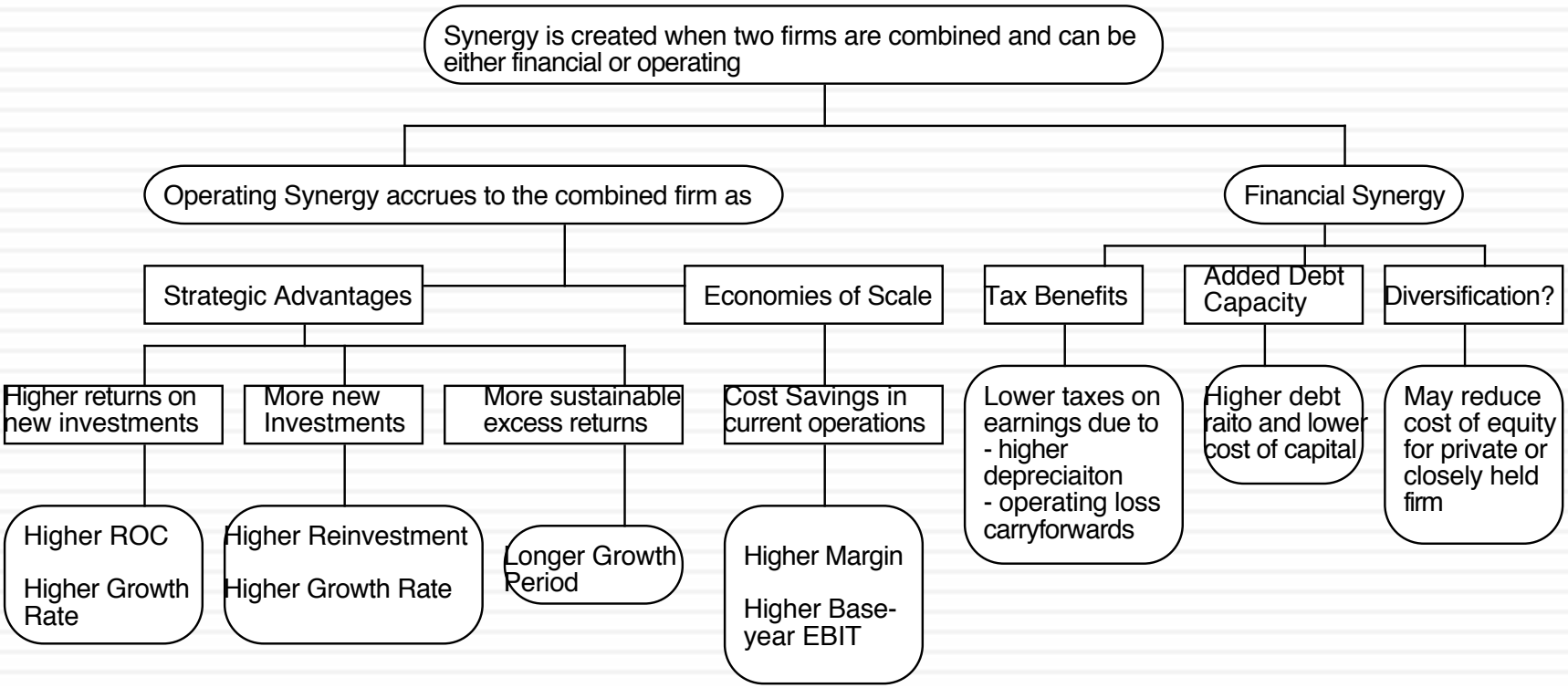
Test 4: Synergy….

- Assume that you are told that the combined firm will be less risky than the two individual firms and that it should have a lower cost of capital (and a higher value). Is this likely?

- Assume now that you are told that there are potential growth and cost savings synergies in the acquisition. Would that increase the value of the target firm?

- Should you pay this as a premium?

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

Synergy – Example
Higher growth and cost savings

	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**

Lesson 4: Don't pay for buzz words

- Through time, acquirers have always found ways of justifying paying for premiums over estimated value by using buzz words - synergy in the 1980s, strategic considerations in the 1990s and real options in this decade.
- While all of these can have value, the onus should be on those pushing for the acquisitions to show that they do and not on those pushing against them to show that they do not.

Test 5: Comparables and Exit Multiples

- Now assume that you are told that an analysis of other acquisitions reveals that acquirers have been willing to pay 5 times EBIT.. Given that your target firm has EBIT of $ 20 million, would you be willing to pay $ 100 million for the acquisition?

- What if I estimate the terminal value using an exit multiple of 5 times EBIT?

- As an additional input, your investment banker tells you that the acquisition is accretive. (Your PE ratio is 20 whereas the PE ratio of the target is only 10… Therefore, you will get a jump in earnings per share after the acquisition…)

Biased samples = Poor results

- Biased samples yield biased results. Basing what you pay on what other acquirers have paid is a recipe for disaster. After all, we know that acquirer, on average, pay too much for acquisitions. By matching their prices, we risk replicating their mistakes.
- Even when we use the pricing metrics of other firms in the sector, we may be basing the prices we pay on firms that are not truly comparable.
- When we use exit multiples, we are assuming that what the market is paying for comparable companies today is what it will continue to pay in the future.

Lesson 5: Don't be a lemming…

- All too often, acquisitions are justified by using one of the following two arguments:
  - Every one else in your sector is doing acquisitions. You have to do the same to survive.
  - The value of a target firm is based upon what others have paid on acquisitions, which may be much higher than what your estimate of value for the firm is.
- With the right set of comparable firms (selected to back up your story), you can justify almost any price.
- And EPS accretion is a meaningless measure. After all, buying an company with a PE lower than yours will lead mathematically to EPS accretion.

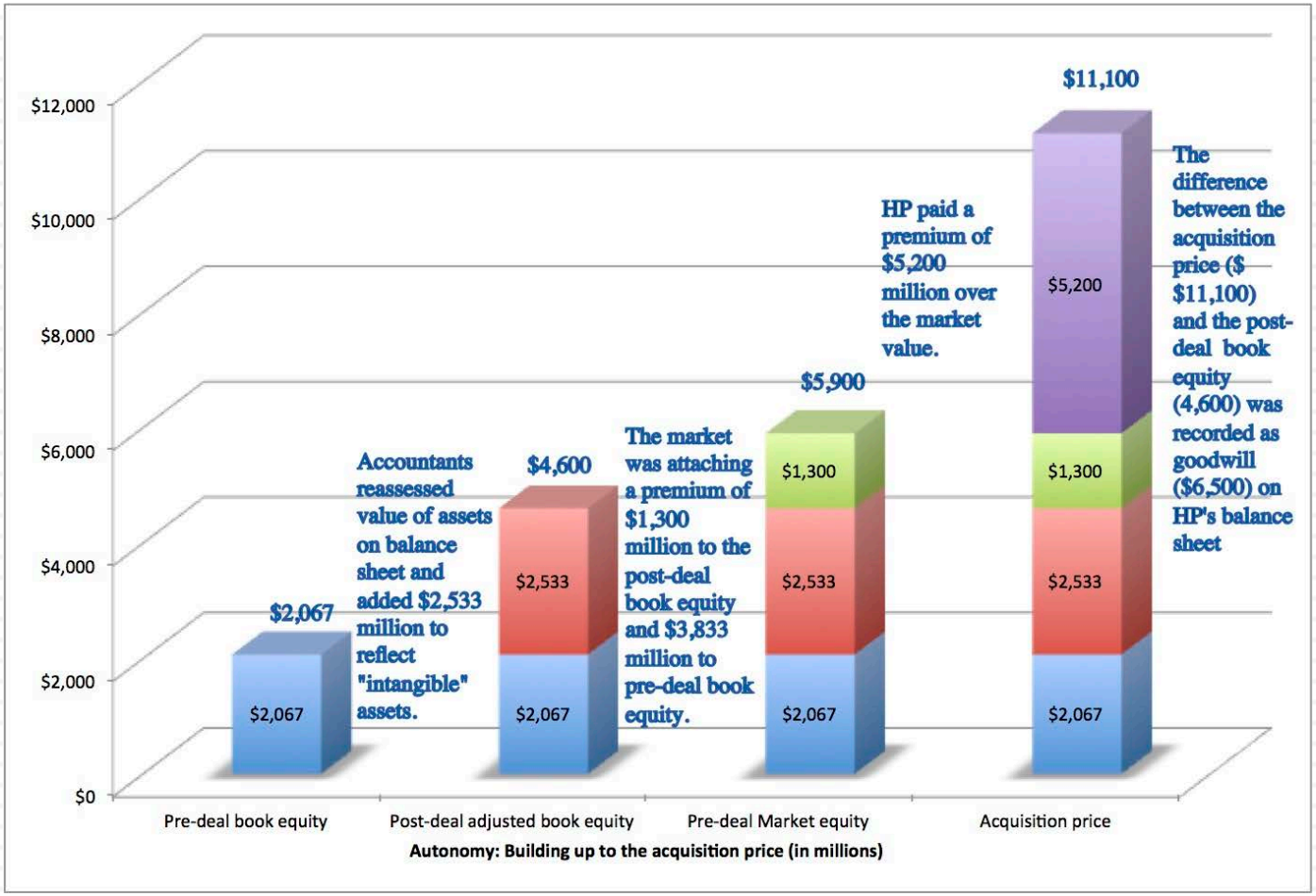
Test 6: The CEO really wants to do this…

- Now assume that you know that the CEO of the acquiring firm really, really wants to do this acquisition and that the investment bankers on both sides have produced fairness opinions that indicate that the firm is worth $ 100 million. Would you be willing to go along?

Lesson 6: Don't let egos or investment bankers get the better of common sense…

- If you define your objective in a bidding war as winning the auction at any cost, you will win. But beware the winner's curse!
- The premiums paid on acquisitions often have nothing to do with synergy, control or strategic considerations (though they may be provided as the reasons). They may just reflect the egos of the CEOs of the acquiring firms.

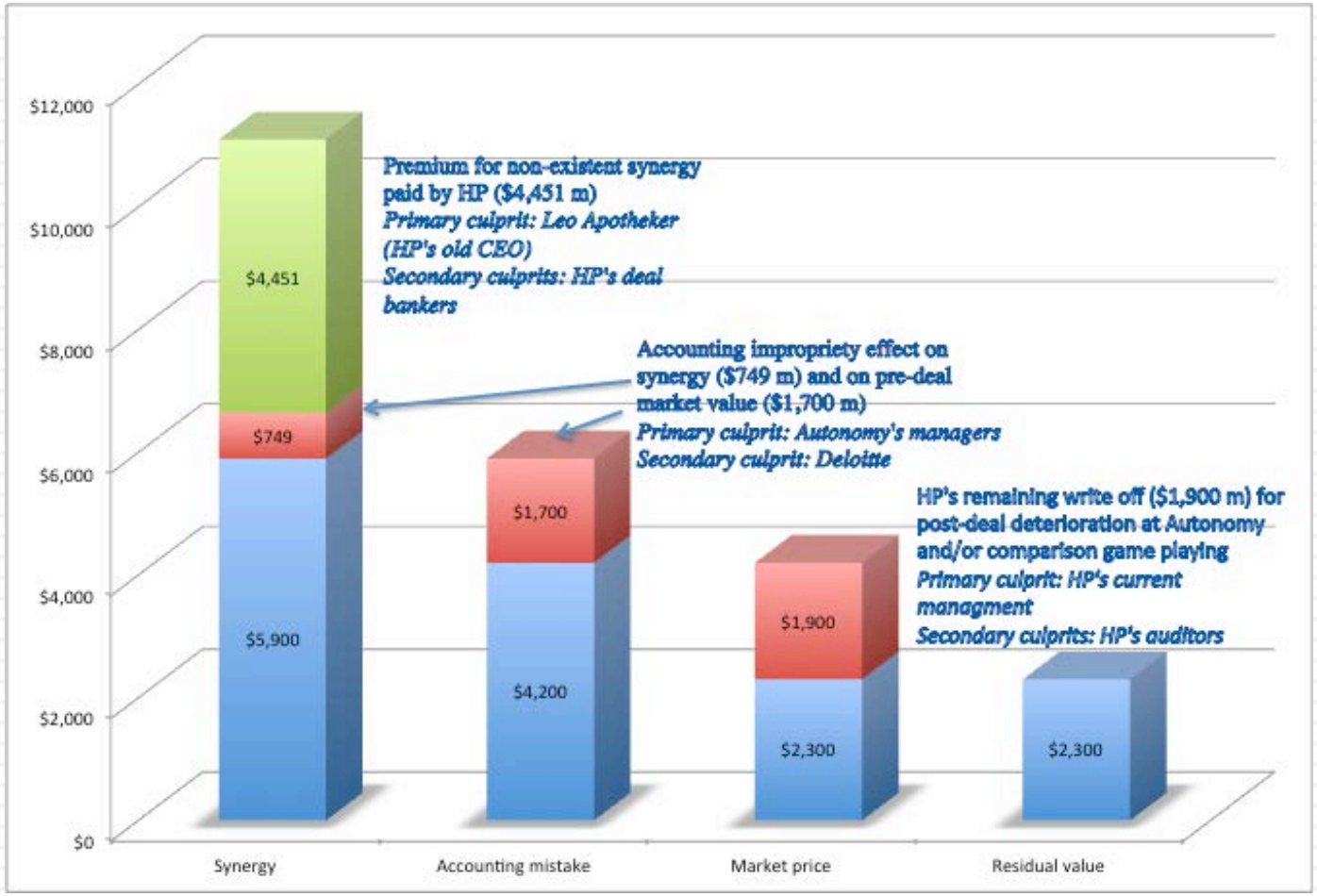
To illustrate: A bad deal is made, and justified by accountants & bankers



The CEO steps in… and digs a hole…

- Leo Apotheker was the CEO of HP at the time of the deal, brought in to replace Mark Hurd, the previous CEO who was forced to resign because of a "sex" scandal.
- In the face of almost universal feeling that HP had paid too much for Autonomy, Mr. Apotheker addressing a conference at the time of the deal: "We have a **pretty rigorous process inside H.P.** that we follow for **all our acquisitions**, which is a **D.C.F.-based model**," he said, in a reference to discounted cash flow, a standard valuation methodology. "And we try to take a **very conservative view**."
- Apotheker added, "Just to make sure everybody understands, Autonomy will be, on Day 1, **accretive to H.P**….. "**Just take it from us**. We did that analysis at **great length, in great detail**, and we feel that we paid a **very fair price** for Autonomy. And it will give a **great return to our shareholders**.

A year later… HP admits a mistake…and explains it…

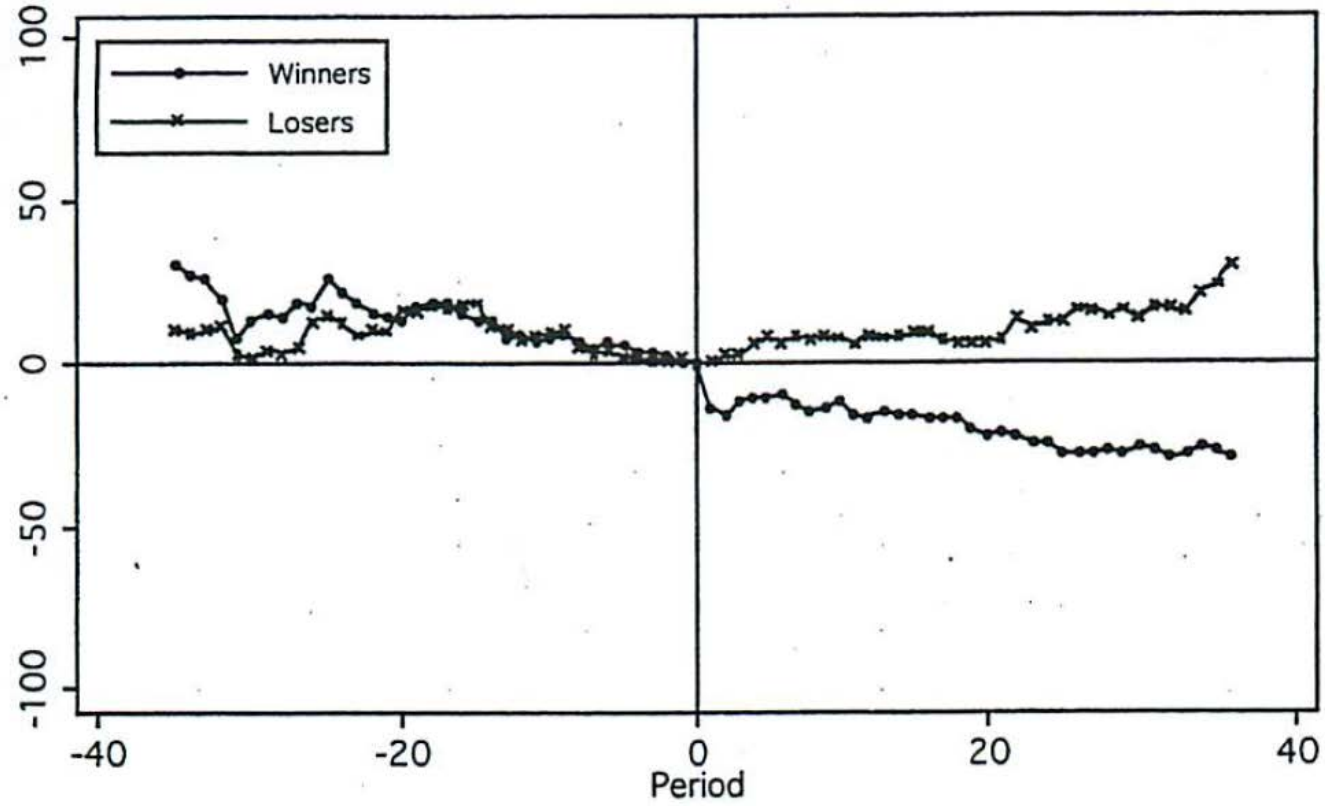


Test 7: Is it hopeless?

- The odds seem to be clearly weighted against success in acquisitions. If you were to create a strategy to grow, based upon acquisitions, which of the following offers your best chance of success?

This	Or this
Sole Bidder	Bidding War
Public target	Private target
Pay with cash	Pay with stock
Small target	Large target
Cost synergies	Growth synergies

Better to lose a bidding war than to win one…

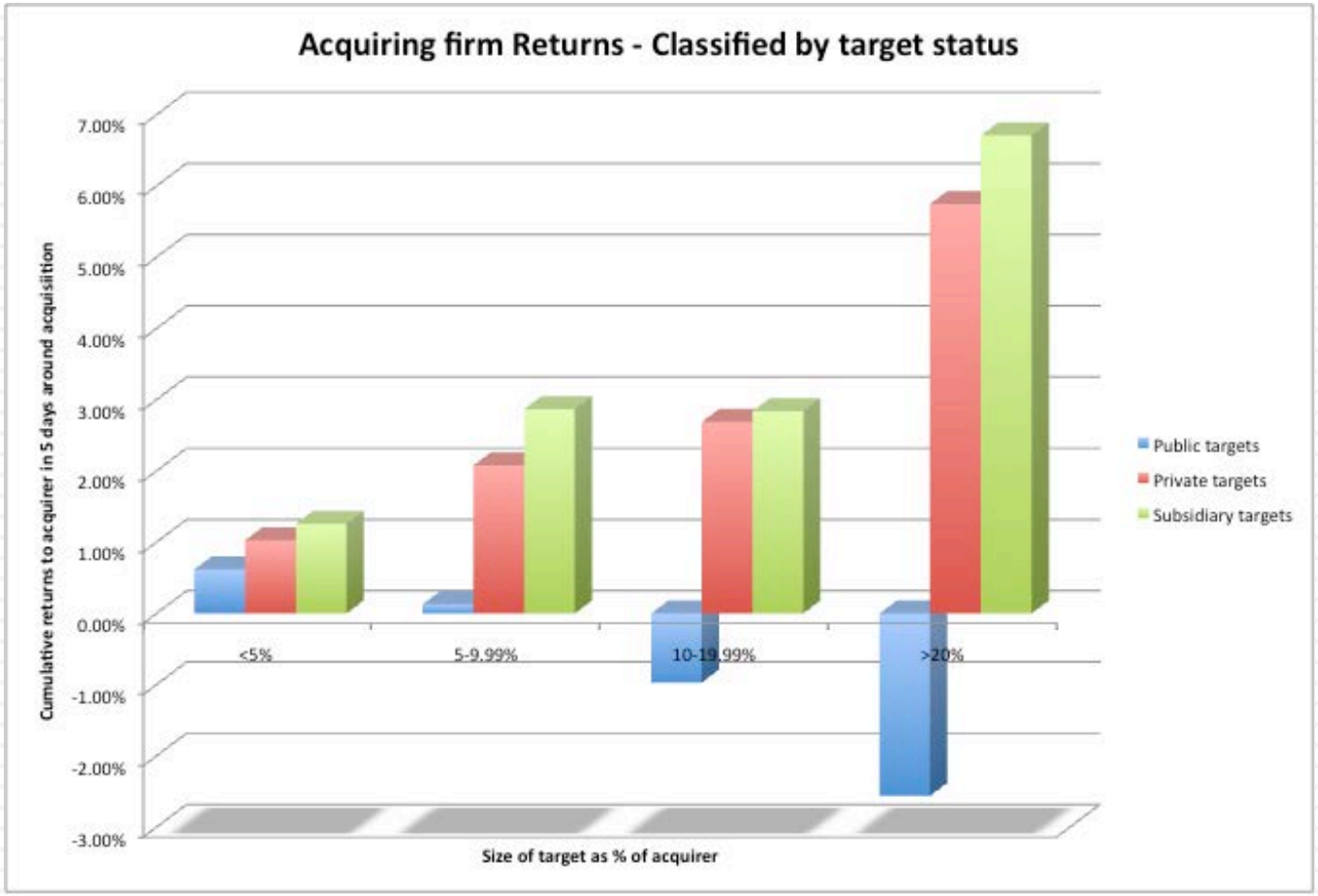


(a) Market-adjusted CARs

Returns in the 40 months before & after bidding war
Source: Malmendier, Moretti & Peters (2011)

You are better off buying small rather than large targets… with cash rather than stock

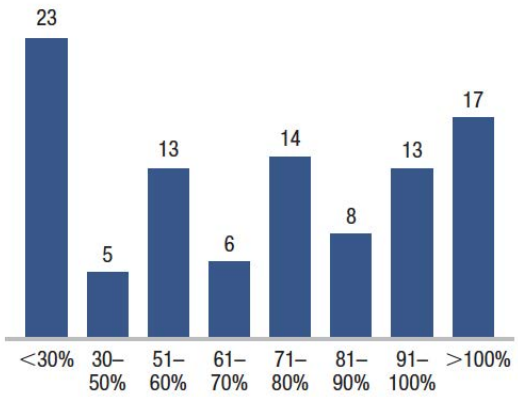
And focusing on private firms and subsidiaries, rather than public firms…



Growth vs Cost Synergies

Top-line trouble: 70 percent of mergers failed to achieve expected revenue synergies

Mergers achieving stated percentage of expected revenue synergies, percent $N = 77$



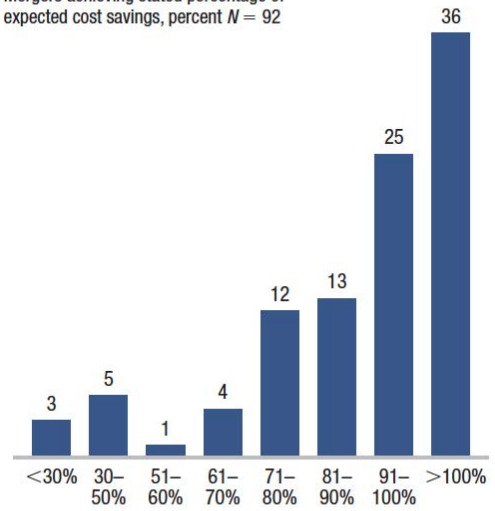
Typical sources of estimation error

- Ignoring or underestimating customer losses (typically 2% to 5%) that result from the integration
- Assuming growth or share targets out of line with overall market growth and competitive dynamics (no "outside view" calibration)

Source: McKinsey (2002) Postmerger Management Practice client survey; client case studies

Cost-synergy estimation is better, but there are patterns emerging in the errors

Mergers achieving stated percentage of expected cost savings, percent $N = 92$



Typical sources of estimation error

- Underestimating one-time costs
- Using benchmarks from noncomparable situations
- Not sanity-checking management estimates against precedent transactions
- Failing to ground estimates in bottom-up analysis (e.g., location-by-location review of overlaps

Source: McKinsey (2002) Postmerger Management Practice client survey; client case studies

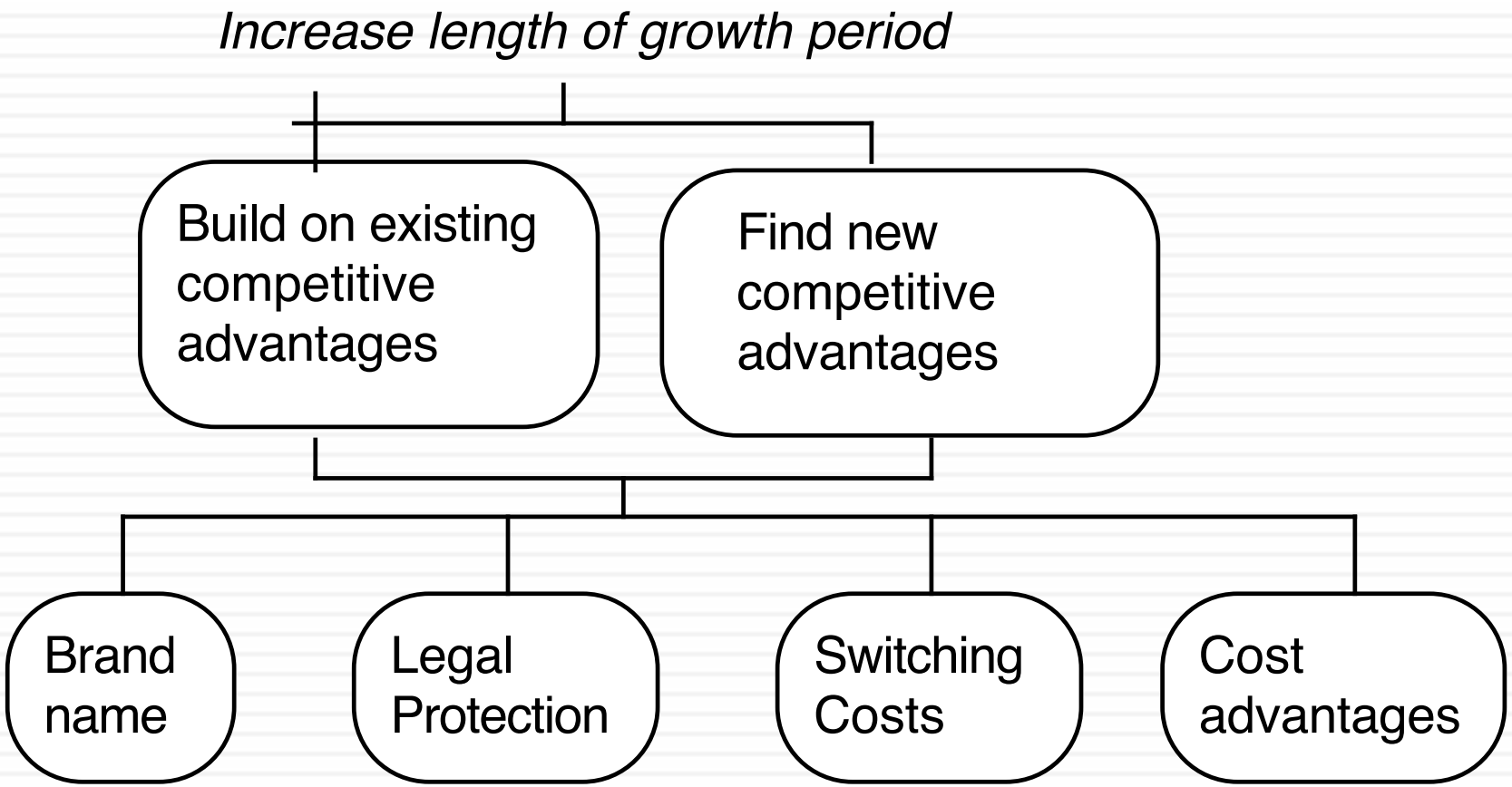
Synergy: Odds of success

- Studies that have focused on synergies have concluded that you are far more likely to deliver cost synergies than growth synergies.
- Synergies that are concrete and planned for at the time of the merger are more likely to be delivered than fuzzy synergies.
- Synergy is much more likely to show up when someone is held responsible for delivering the synergy.
- You are more likely to get a share of the synergy gains in an acquisition when you are a single bidder than if you are one of multiple bidders.

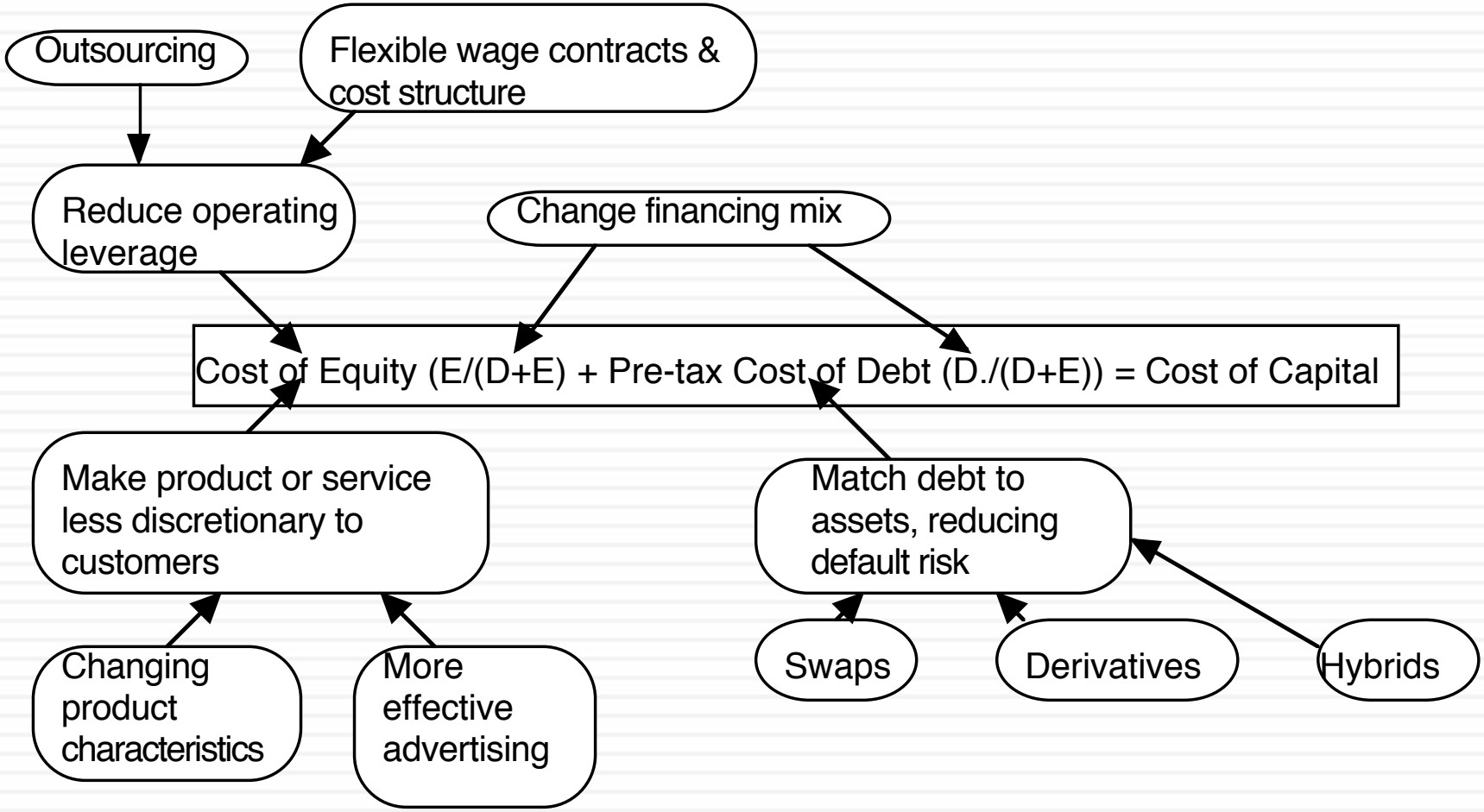
Lesson 7: For acquisitions to create value, you have to stay disciplined..

- If you have a successful acquisition strategy, stay focused on that strategy. Don't let size or hubris drive you to "expand" the strategy.
- Realistic plans for delivering synergy and control have to be put in place before the merger is completed. By realistic, we have to mean that the magnitude of the benefits have to be reachable and not pipe dreams and that the time frame should reflect the reality that it takes a while for two organizations to work as one.
- The best thing to do in a bidding war is to drop out.
- Someone (preferably the person pushing hardest for the merger) should be held to account for delivering the benefits.
- The compensation for investment bankers and others involved in the deal should be tied to how well the deal works rather than for getting the deal done.

III. Building Competitive Advantages: Increase length of the growth period



Value Creation 4: Reduce Cost of Capital



Debt: Summarizing the trade off

Advantages of Debt	*Disadvantages of debt*
1. Tax Benefit: Interest expenses on debt are tax deductible but cash flows to equity are generally not. *Implication: The higher the marginal tax rate, the greater the benefits of debt.*	**1. Expected Bankruptcy Cost**: The expected cost of going bankrupt is a product of the probability of going bankrupt and the cost of going bankrupt. The latter includes both direct and indirect costs. The probability of going bankrupt will be higher in businesses with more volatile earnings and the cost of bankruptcy will also vary across businesses. *Implication:* *1. Firms with more stable earnings should borrow more, for any given level of earnings.* *2. Firms with lower bankruptcy costs should borrow more, for any given level of earnings.*
2. Added Discipline: Borrowing money may force managers to think about the consequences of the investment decisions a little more carefully and reduce bad investments. *Implication: As the separation between managers and stockholders increases, the benefits to using debt will go up.*	**2. Agency Costs**: Actions that benefit equity investors may hurt lenders. The greater the potential for this conflict of interest, the greater the cost borne by the borrower (as higher interest rates or more covenants). *Implication: Firms where lenders can monitor/ control how their money is being used should be able to borrow more than firms where this is difficult to do.*
	3. Loss of flexibility: Using up available debt capacity today will mean that you cannot draw on it in the future. This loss of flexibility can be disastrous if funds are needed and access to capital is shut off. *Implication:* 1. *Firms that can forecast future funding needs better should be able to borrow more.* 2. *Firms with better access to capital markets should be more willing to borrow more today.*

Finding an optimal debt ratio: The Cost of Capital Approach

1. Estimate the Cost of Equity at different levels of debt:
   - Equity will become riskier -> Beta will increase -> Cost of Equity will increase.
   - Estimation will use levered beta calculation
2. Estimate the Cost of Debt at different levels of debt:
   - Default risk will go up and bond ratings will go down as debt goes up -> Cost of Debt will increase.
   - To estimating bond ratings, we will use the interest coverage ratio (EBIT/Interest expense)
3. Estimate the Cost of Capital at different levels of debt
4. Calculate the effect on Firm Value and Stock Price.

Amgen's Optimal Financing Mix

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Firm Value (G)
0%	1.61	11.23%	AAA	5.13%	35.00%	3.33%	11.23%	$77,593
10%	1.73	11.70%	AAA	5.13%	35.00%	3.33%	10.86%	$82,559
20%	1.88	12.28%	A+	5.48%	35.00%	3.56%	10.54%	$87,441
30%	2.06	13.03%	A-	5.78%	35.00%	3.76%	10.25%	$92,273
40%	2.31	14.03%	CCC	12.78%	35.00%	8.31%	11.74%	$71,646
50%	2.68	15.49%	CCC	12.78%	33.94%	8.44%	11.97%	$69,237
60%	3.51	18.82%	C	16.78%	21.54%	13.17%	15.43%	$45,452
70%	4.68	23.51%	C	16.78%	18.46%	13.68%	16.63%	$40,450
80%	7.02	32.87%	C	16.78%	16.15%	14.07%	17.83%	$36,367
90%	14.04	60.96%	C	16.78%	14.36%	14.37%	19.03%	$32,972

Amgen's current debt ratio = 10%
Amgen's optimal debt ratio = 30%

Tata Motor's Optimal Financing Mix

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Firm Value (G)
0%	0.98	12.36%	AAA	8.50%	33.99%	5.61%	12.36%	INR 440,722
10%	1.05	12.89%	A+	9.00%	33.99%	5.94%	12.20%	INR 450,734
20%	1.14	13.57%	BB+	11.50%	33.99%	7.59%	12.37%	INR 439,581
30%	1.26	14.44%	B-	13.50%	33.99%	8.91%	12.78%	INR 415,561
40%	1.42	15.65%	CC	18.00%	32.81%	12.09%	14.23%	INR 346,933
50%	1.75	18.15%	C	20.00%	21.23%	15.75%	16.95%	INR 262,949
60%	2.24	21.79%	D	23.00%	14.47%	19.67%	20.52%	INR 197,512
70%	3.00	27.52%	D	23.00%	11.66%	20.32%	22.48%	INR 172,970
80%	4.52	38.91%	D	23.00%	9.76%	20.75%	24.39%	INR 153,836
90%	9.07	73.00%	D	23.00%	8.40%	21.07%	26.26%	INR 138,352

Tata Motor's current debt ratio = 25%
Tata Motor's optimal debt ratio = 10%

III. LOOSE ENDS IN VALUATION: FROM FIRM VALUE TO VALUE OF EQUITY PER SHARE

But what comes next?

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?

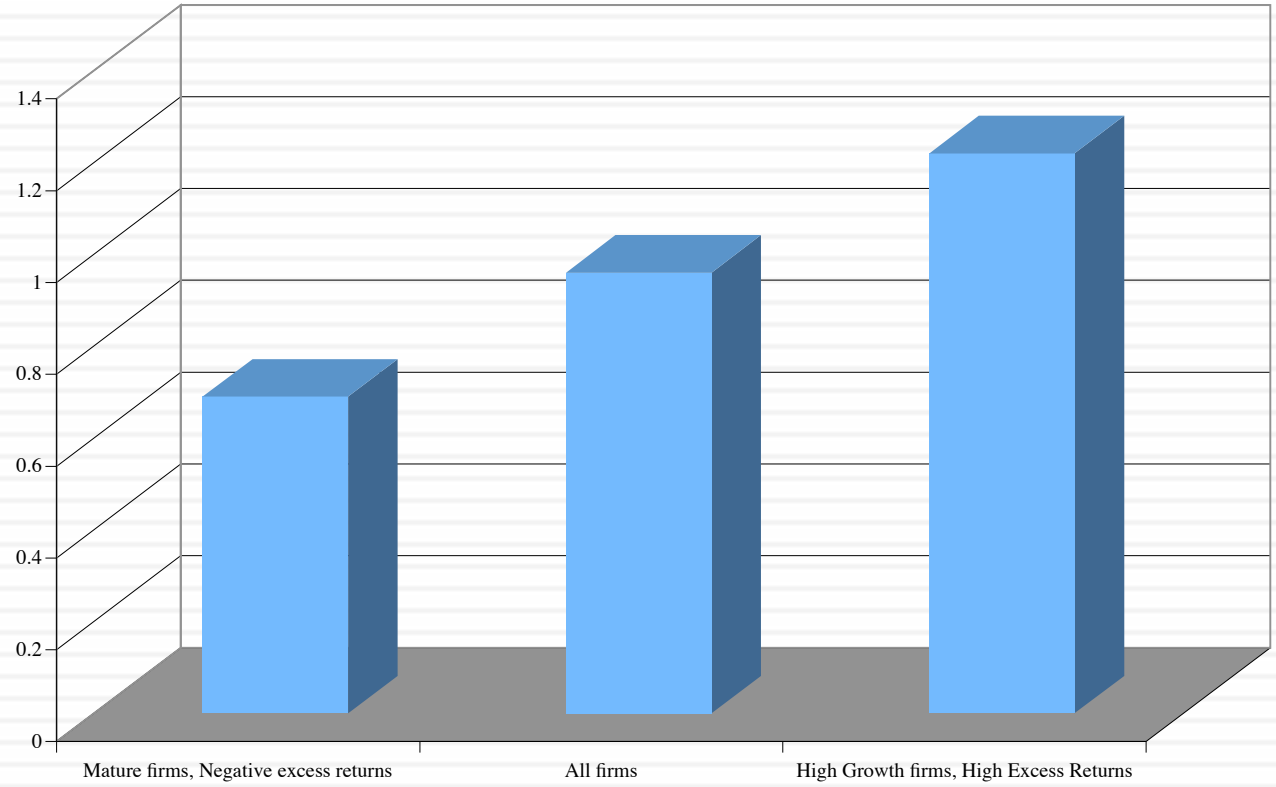
1. The Value of Cash
An Exercise in Cash Valuation

	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?

Market Value of $ 1 in cash:
Estimates obtained by regressing Enterprise Value against Cash Balances



2. Dealing with Holdings in Other firms

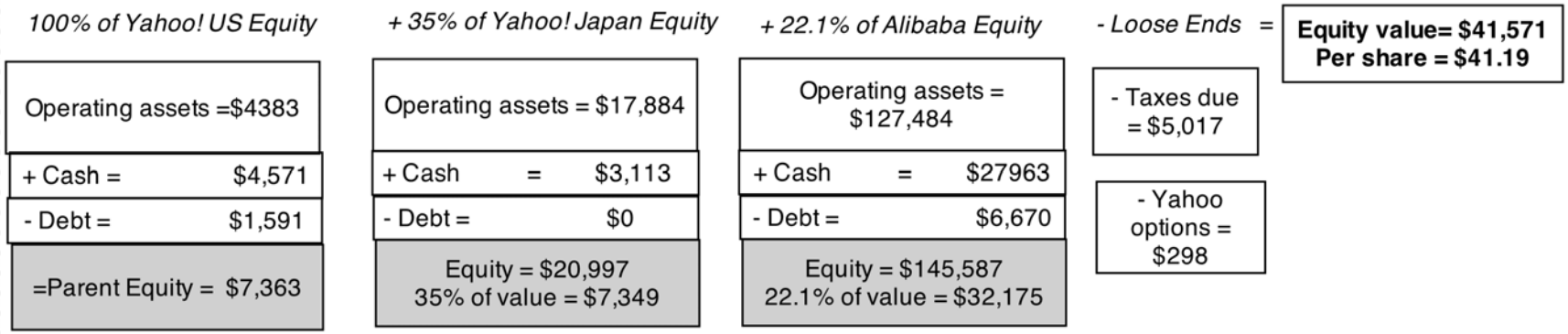
- Holdings in other firms can be categorized into
  - Minority passive holdings, in which case only the dividend from the holdings is shown in the balance sheet
  - Minority active holdings, in which case the share of equity income is shown in the income statements
  - Majority active holdings, in which 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.

Yahoo! An intrinsic valuation of cross holdings

In May 2014, Yahoo's core business in the US was struggling (with stagnant revenues & declining margins) but it had valuable minority holdings in Yahoo! Japan (35%) and Alibaba (22%).

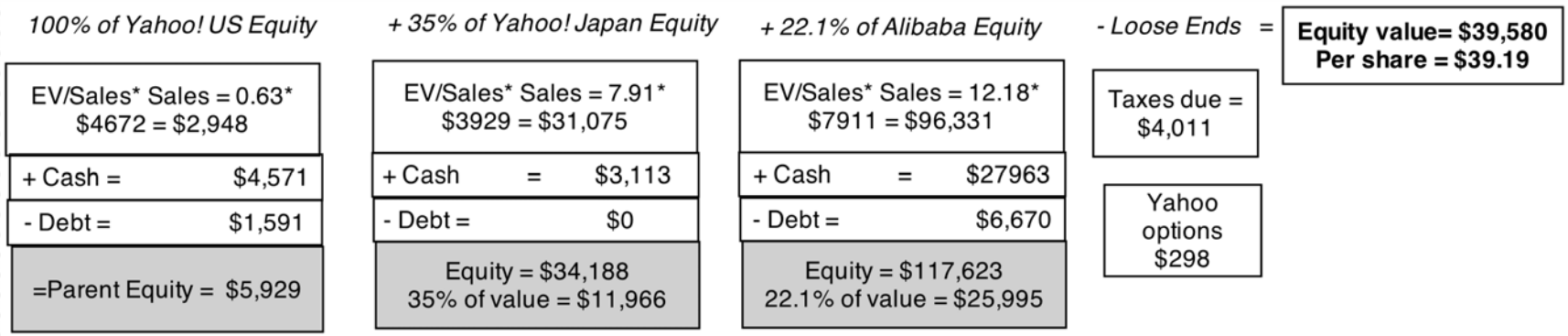


Yahoo! was trading at $33.76 in May 2014, just a few weeks prior to the IPO of Alibaba. The intrinsic valuations of Yahoo! Japan and Alibaba are based on their full financial statements.

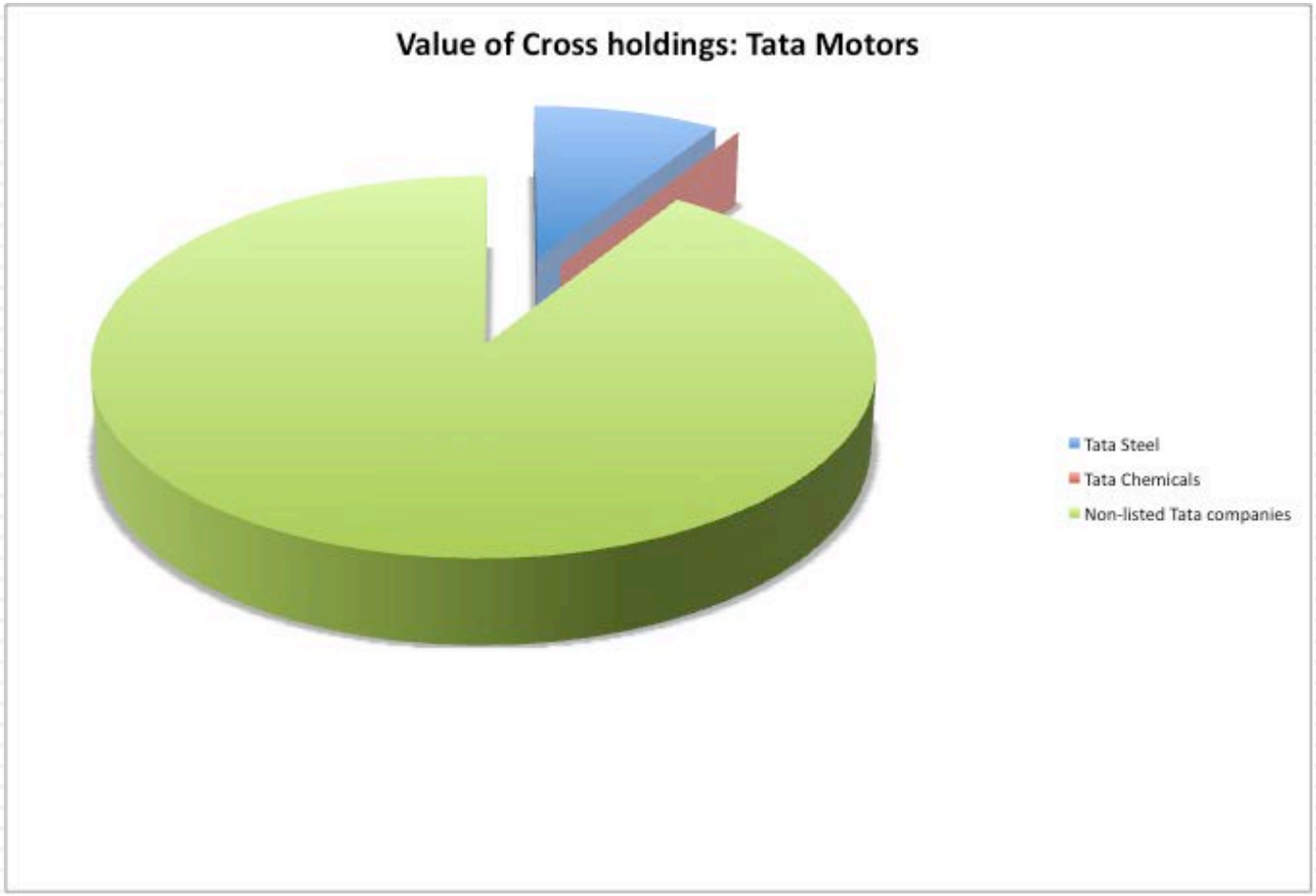
With insufficient information, two compromise solutions…

- 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.

Yahoo: A Relative Valuation



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	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. Brand name, great management, superb product …Are we short changing 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.

Categorizing Intangibles

	Independent and Cash flow generating intangibles	*Not independent and cash flow generating to the firm*	*No cash flows now but potential for cashflows in future*
Examples	Copyrights, trademarks, licenses, franchises, professional practices (medical, dental)	Brand names, Quality and Morale of work force, Technological expertise, Corporate reputation	Undeveloped patents, operating or financial flexibility (to expand into new products/markets or abandon existing ones)
Valuation approach	Estimate expected cashflows from the product or service and discount back at appropriate discount rate.	• Compare DCF value of firm with intangible with firm without (if you can find one) • Assume that all excess returns of firm are due to intangible. • Compare multiples at which firm trades to sector averages.	Option valuation • Value the undeveloped patent as an option to develop the underlying product. • Value expansion options as call options • Value abandonment options as put options.
Challenges	• Life is usually finite and terminal value may be small. • Cashflows and value may be person dependent (for professional practices)	With multiple intangibles (brand name and reputation for service), it becomes difficult to break down individual components.	• Need exclusivity. • Difficult to replicate and arbitrage (making option pricing models dicey)

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

6. 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

Book Value or Market Value

- For some firms that are in financial trouble, the book value of debt can be substantially higher than the market value of debt. Analysts worry that subtracting out the market value of debt in this case can yield too high a value for equity.
- A discounted cashflow valuation is designed to value a going concern. In a going concern, it is the market value of debt that should count, even if it is much lower than book value.
- In a liquidation valuation, you can subtract out the book value of debt from the liquidation value of the assets.
- Converting book debt into market debt,,,,,

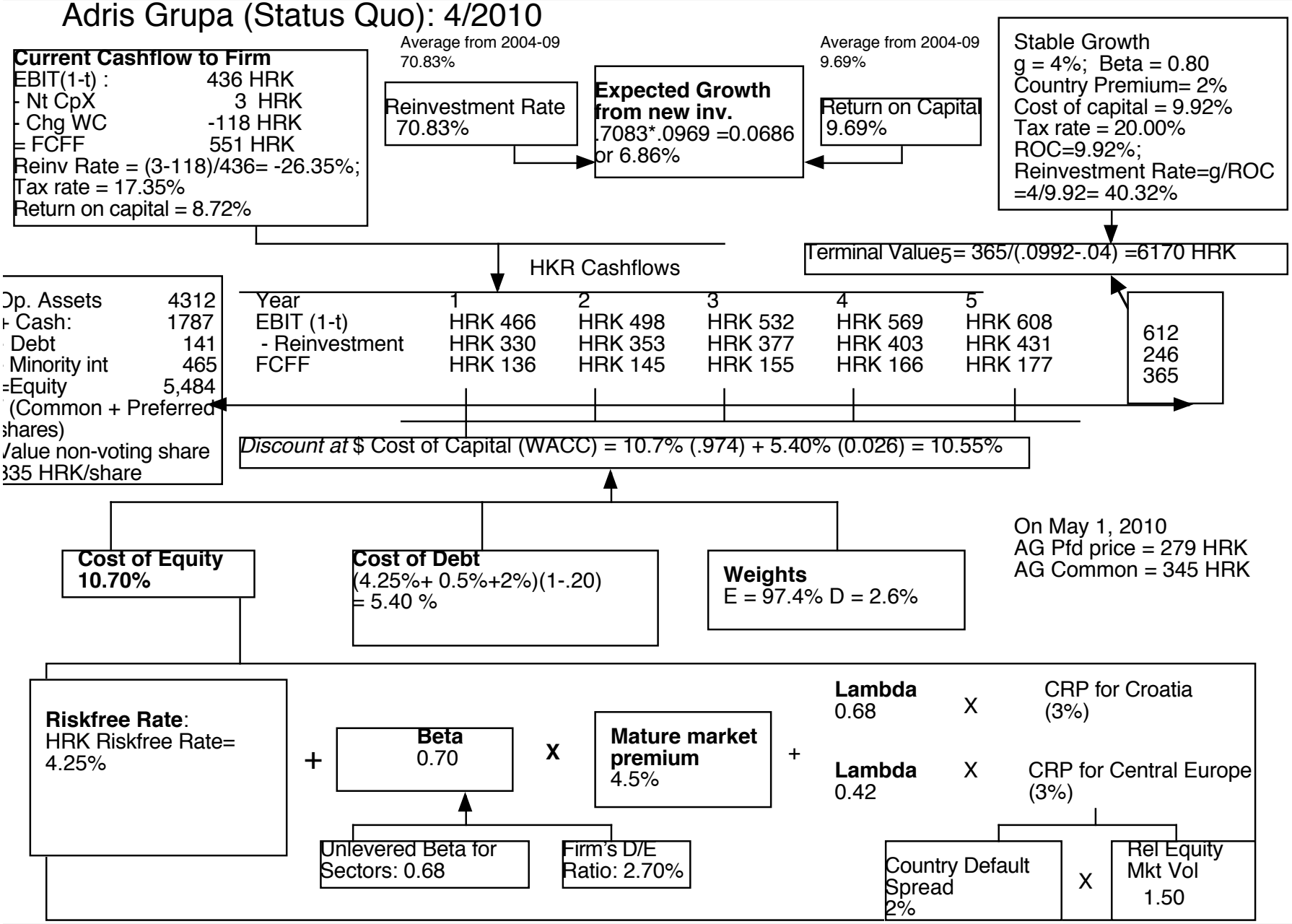
But you should consider other potential liabilities when getting to equity value

- 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

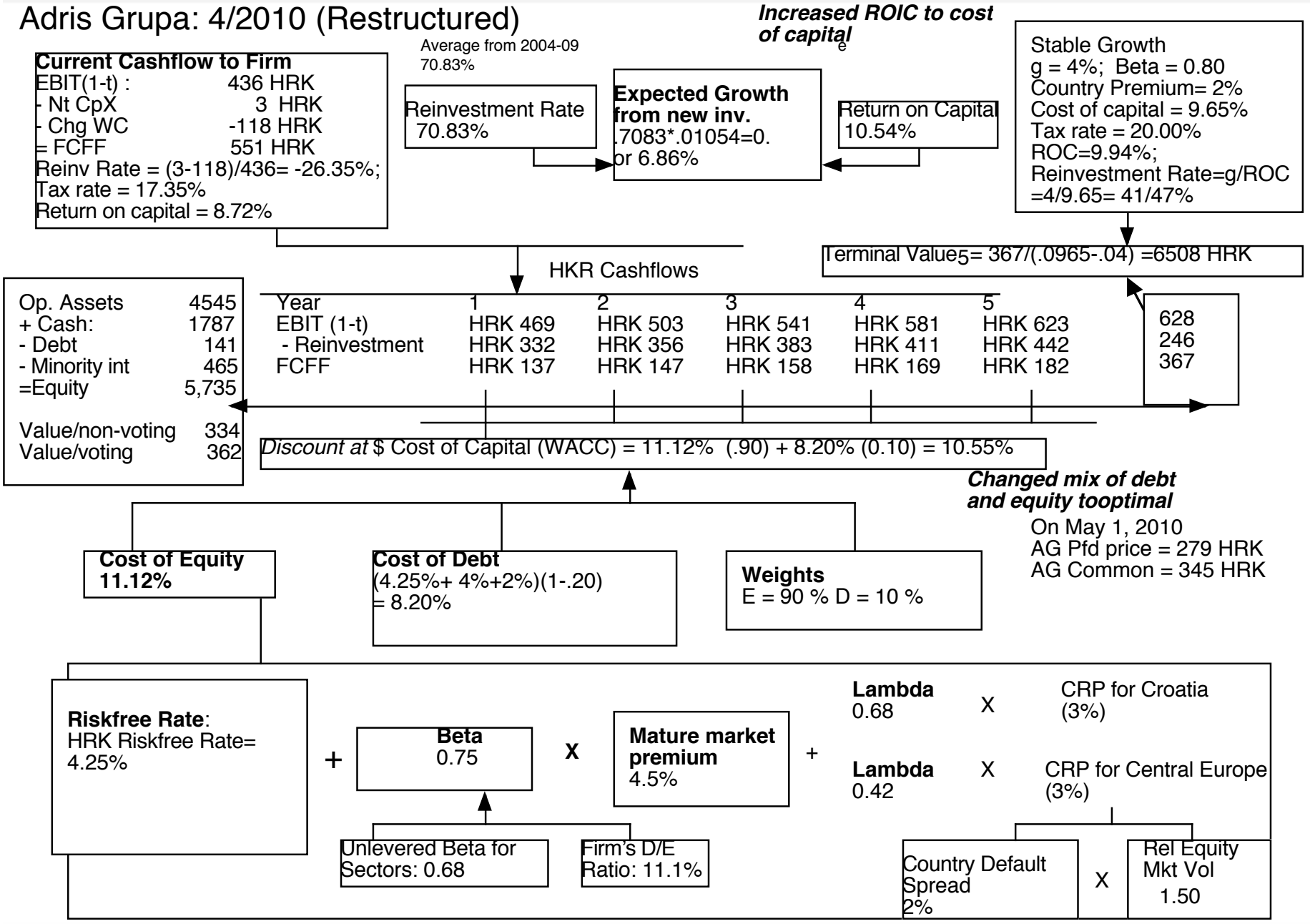
7. The Value of Control

- 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

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 (5484) 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 = 5,484 million HKR

  All shareholders, common and preferred, get an equal share of the status quo value.
- Value for a non-voting share = 5484/(9.616+6.748) = 334 HKR/share
- Optimal value of Equity = 5,735 million HKR
- Value of control at Adris Grupa = 5,735 – 5484 = 249 million HKR
- Only voting shares get a share of this value of control

  Value per voting share =334 HKR + 249/9.616 = 362 HKR

8. Truncation risk 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 of truncation risk (i.e, that the firm will cease to exist or that your equity position will be extinguished), the going concern assumption will over value a firm.

Examples of truncation risk

1. Acts of god: For much of recorded time, at least prior to insurance, the biggest risk to businesses came from acts of god – storms, earthquakes etc.
2. Terrorism & War: An otherwise healthy business can be devastated by an act of terrorism or in the event of war.
3. Nationalization: In some countries, successful businesses can be targeted by governments for nationalization, with equity investors getting well below fair value in compensation.
4. Default/Distress/Failure: If a business is unable to generate enough cash flows from operations and/or to raise money from external sources to keep going, the "gig" is up.

Three ways of dealing with truncation risk

- Adjust the expected cash flows: You can adjust the expected cash flows for the likelihood and consequences of catastrophic risk. Note that this will get progressively more difficult to do as you move through time, since you have consider the cumulative probabilities of events happening over long periods.
- Adjust the discount rate: You can "hike" up the discount rate to cover the likelihood of failure. While it has the desired "intuitive" effect, the "increased" discount rate is often arbitrary and becomes a negotiating tool rather than a measure of expected return.
- Put a decision tree front on the analysis:
  - In one branch of the tree, assume that the "truncation" risk will not occur and value the firm using conventional DCF valuation.
  - In the other branch, assume that truncation risk occurs and value the business/equity if it does.
  - Estimate an expected value across both branches.

9. Equity to Employees: Effect on Value

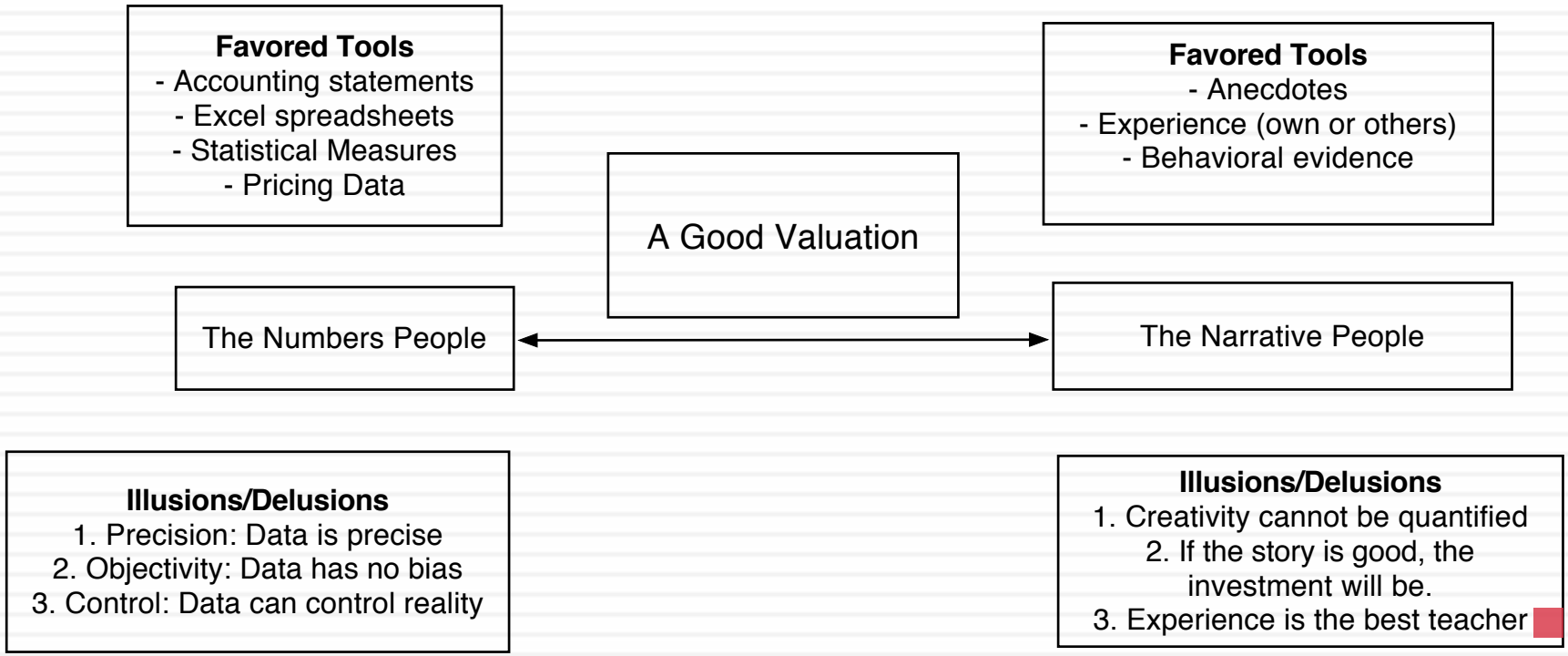
- In recent years, firms have turned to giving employees (and especially top managers) equity option packages as part of compensation. These options are usually
  - Long term
  - At-the-money when issued
  - On volatile stocks
- Are they worth money? And if yes, who is paying for them?
- Two key issues with employee options:
  - How do options granted in the past affect equity value per share today?
  - How do expected future option grants affect equity value today?

Equity Options and Value

- Options outstanding
  - Step 1: List all options outstanding, with maturity, exercise price and vesting status.
  - Step 2: Value the options, taking into account dilution, vesting and early exercise considerations
  - Step 3: Subtract from the value of equity and divide by the actual number of shares outstanding (not diluted or partially diluted).
- Expected future option and restricted stock issues
  - Step 1: Forecast value of options that will be granted each year as percent of revenues that year. (As firm gets larger, this should decrease)
  - Step 2: Treat as operating expense and reduce operating income and cash flows
  - Step 3: Take present value of cashflows to value operations or equity.

NARRATIVE AND NUMBERS: VALUATION AS A BRIDGE

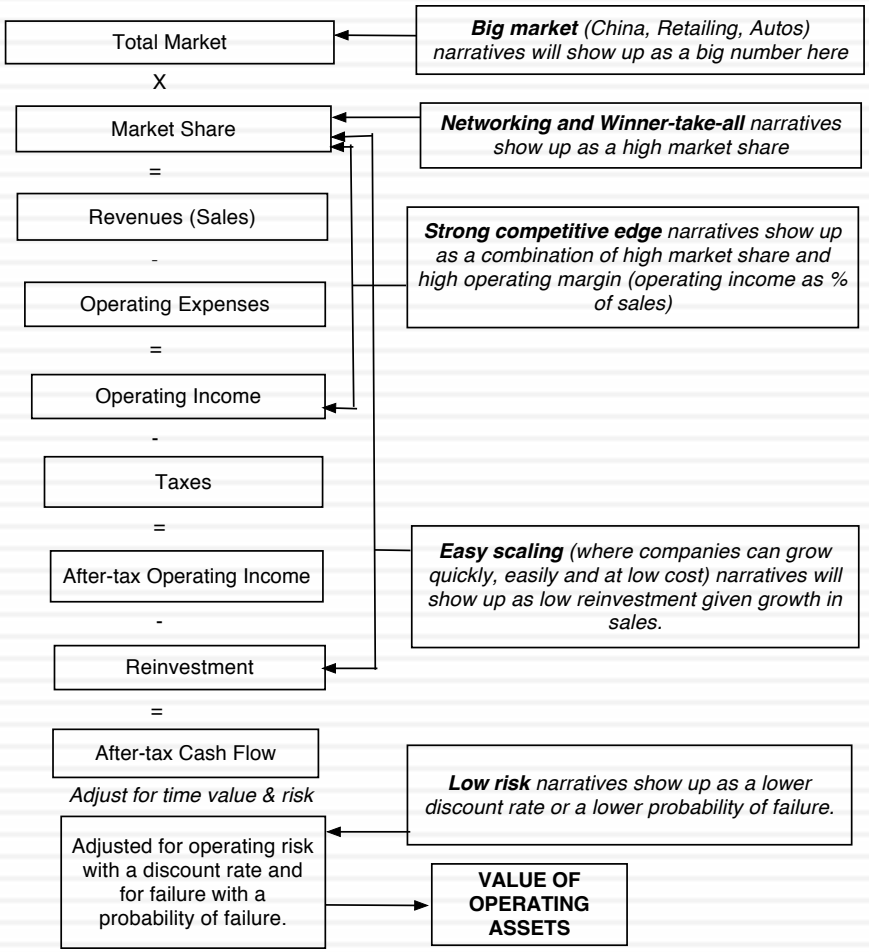
Bridging the Gap



Narrative to Numbers: A 5-step process

1. Create **your** narrative for the company that you are valuing.
2. Check that narrative against history, economic first principles and common sense.
3. Connect the narrative to value drivers
4. Create a valuation around the value drivers
5. Keep the feedback loop open and allow for changes in your narrative and numbers.

The key step: Value Drivers

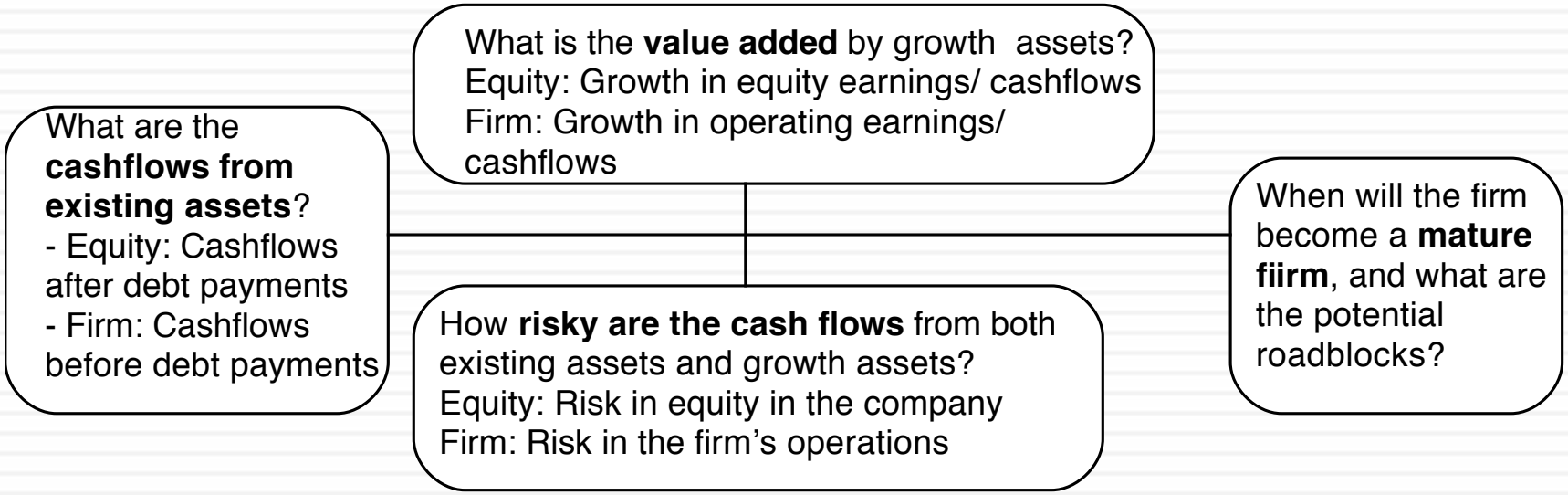


An example: My Uber valuation

Narrative	*Total Market*	*Market Share*	*Uber Cut*	*Cost of capital*	*Failure Probability*	*Value for Uber*
Car service company facing significant competitive and regulatory hurdles, forced to make trade off of lower profitability for market share .	$100 billion	10%	10%	12%	10%	$3.2 billion
Car service company with potential to expand into other logistics markets, significant market share, sustained profitability (Mine)	$100 billion	10%	20%	12% - >8%	10%	$5.9 billion + $2-3 billion for disruption option
Car service company with dominant market share (from networking effects) and sustained profitability (New York Times)	$100 billion	50%	20%	12% - >8%	0%	$29.1 billion
Logistics company with expansion of car service business model into other logistics businesses, while preserving profitability.	$600 billion	5%	20%	12% - >8%	0%	$17.5 billion

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

The fundamental determinants of value…



The Dark Side of Valuation…

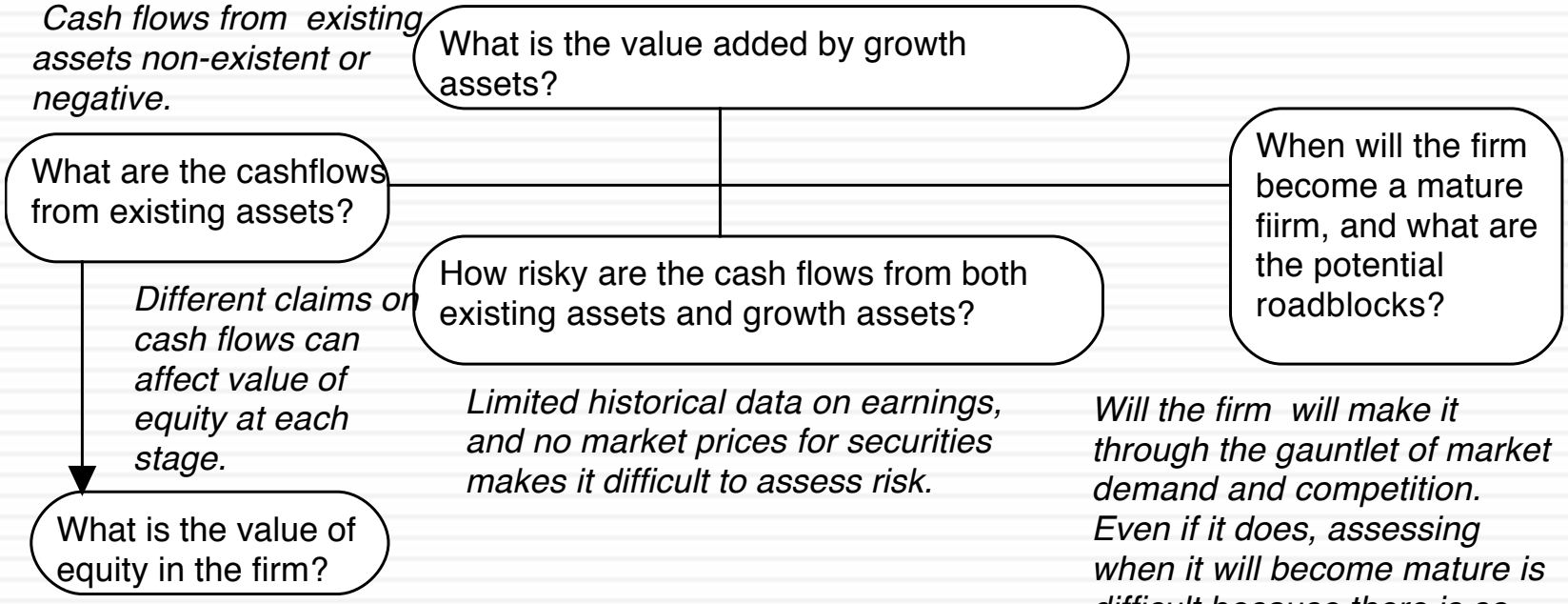
- Valuing stable, money making companies with consistent and clear accounting statements, a long and stable history and lots of comparable firms is easy to do.
- The true test of your valuation skills is when you have to value "difficult" companies. In particular, the challenges are greatest when valuing:
  - 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…

- 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 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.
- Across the ownership cycle
  - Privately owned businesses: Exposure to firm specific risk and illiquidity bedevil valuations.
  - VC and private equity: Different equity investors, with different perceptions of risk.
  - Closely held public firms: Part private and part public, sharing the troubles of both.

I. The challenge with young companies…

Making judgments on revenues/ profits difficult becaue 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…

- 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

Current Revenue $ 1,117

Current Margin: -36.71%

EBIT -410m

From previous years

NOL: 500 m

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

Sales Turnover Ratio: 3.00

Competitive Advantages

Revenue Growth: 42%

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

	1	2	3	4	5	6	7	8	9	10	Term. Year
Revenue Growth	150.00%	100.00%	75.00%	50.00%	30.00%	25.20%	20.40%	15.60%	10.80%	6.00%	6%
Revenues	$ 2,793	$ 5,585	$ 9,774	$ 14,661	$ 19,059	$ 23,862	$ 28,729	$ 33,211	$ 36,798	$ 39,006	$ 41,346
Operating Margin	-13.35%	-1.68%	4.16%	7.08%	8.54%	9.27%	9.64%	9.82%	9.91%	9.95%	10.00%
EBIT	-$373	-$94	$407	$1,038	$1,628	$2,212	$2,768	$3,261	$3,646	$3,883	$4,135
EBIT(1-t)	-$373	-$94	$407	$871	$1,058	$1,438	$1,799	$2,119	$2,370	$2,524	$2,688
- Reinvestment	$600	$967	$1,420	$1,663	$1,543	$1,688	$1,721	$1,619	$1,363	$961	$155
FCFF	-$931	-$1,024	-$989	-$758	-$408	-$163	$177	$625	$1,174	$1,788	$1,881

Forever

Cost of Equity	12.90%	12.90%	12.90%	12.90%	12.90%	12.42%	11.94%	11.46%	10.98%	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%
After-tax 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%	11.62%	11.08%	10.49%	9.61%

Value of Op Assets	$ 15,170
+ Cash	$ 26
= Value of Firm	$14,936
- Value of Debt	$ 349
= Value of Equity	$14,847
- Equity Options	$ 2,892
Value per share	$ 35.08

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

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 firrst 5 years
Convetional retailers after year 5

Riskfree Rate:
T. Bond rate = 6.5%

+ **Beta**
1.60 -> 1.00

X **Risk Premium**
4%

Internet/ Retail

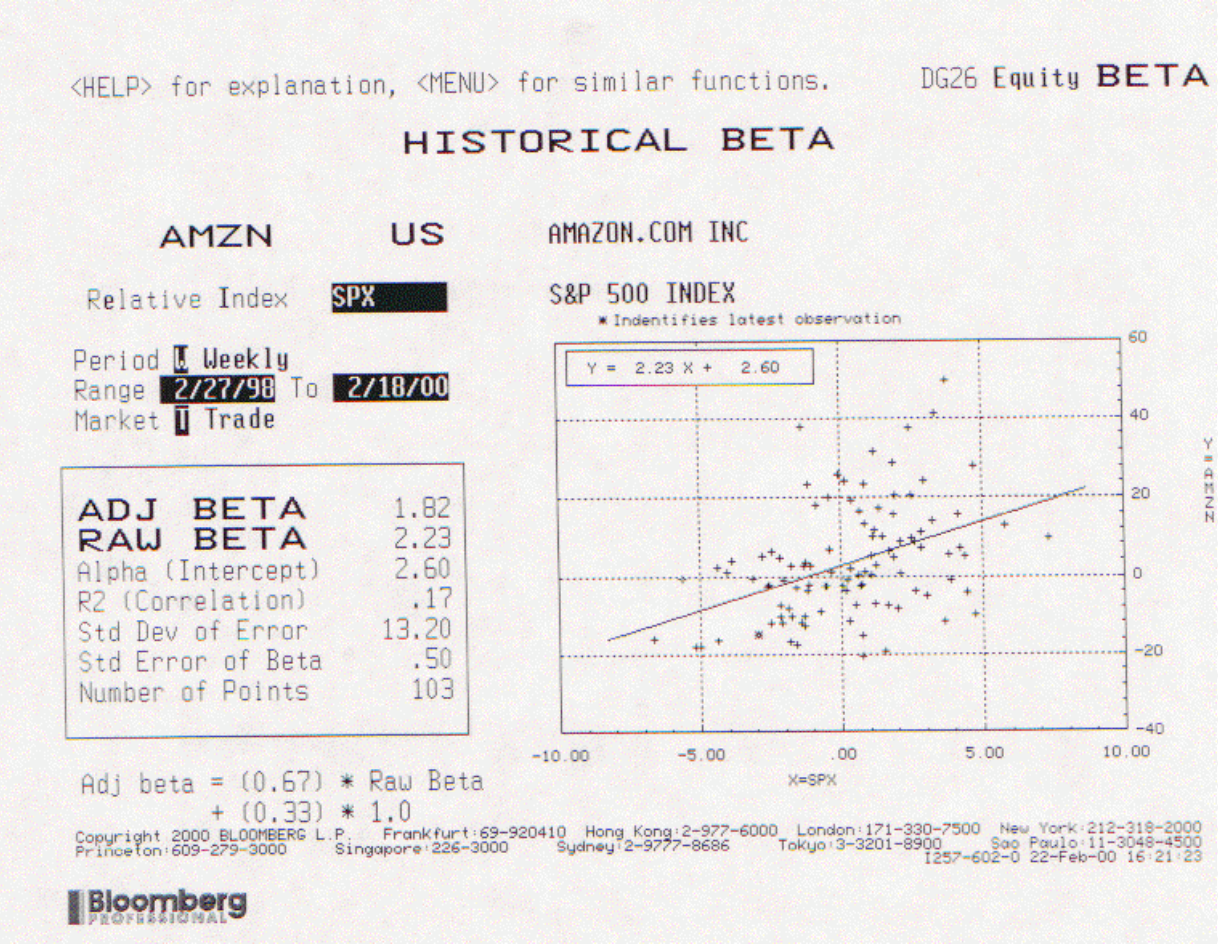
Operating Leverage

Current D/ E: 1.21%

Base Equity Premium

Country Risk Premium

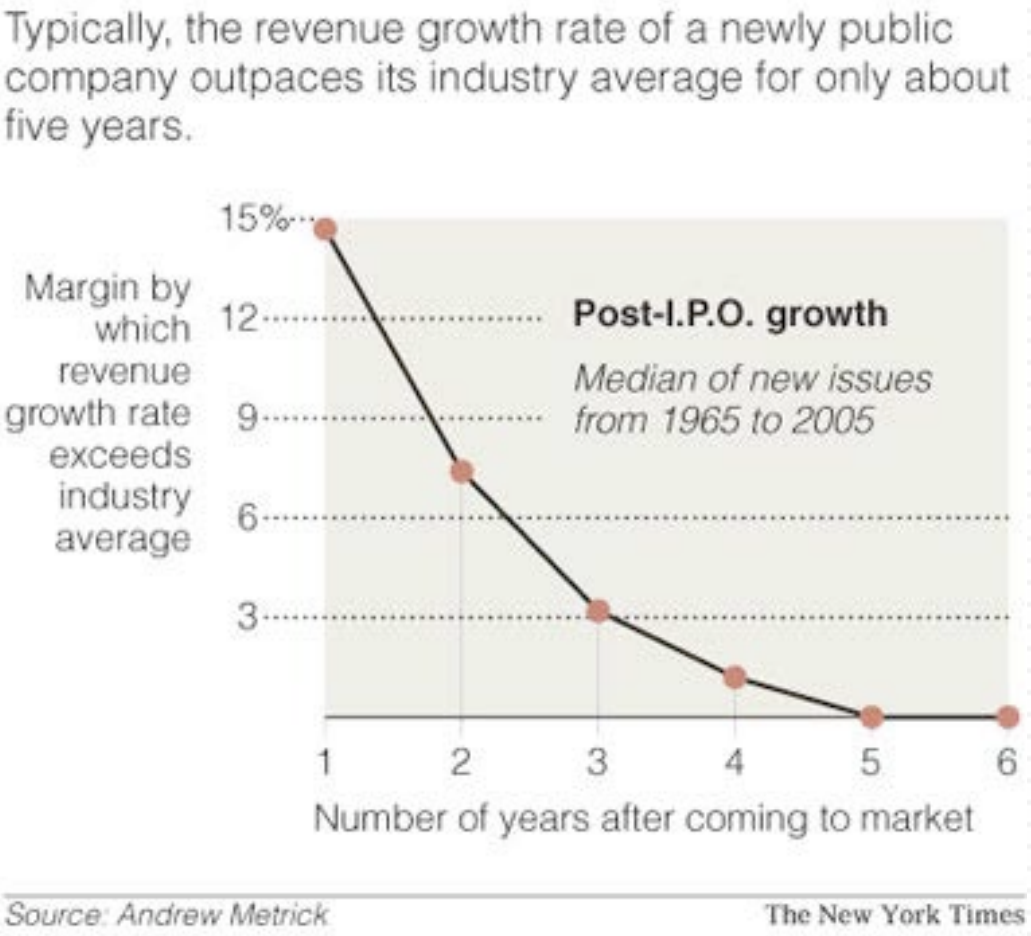
Lesson 1: Don't trust regression betas….



Lesson 2: Work backwards and keep it simple…

Year	Revenue Growth	Sales	Operating Margin	EBIT	EBIT (1-t)
Tr 12 mths		$1,117	-36.71%	-$410	-$410
1	150.00%	$2,793	-13.35%	-$373	-$373
2	100.00%	$5,585	-1.68%	-$94	-$94
3	75.00%	$9,774	4.16%	$407	$407
4	50.00%	$14,661	7.08%	$1,038	$871
5	30.00%	$19,059	8.54%	$1,628	$1,058
6	25.20%	$23,862	9.27%	$2,212	$1,438
7	20.40%	$28,729	9.64%	$2,768	$1,799
8	15.60%	$33,211	9.82%	$3,261	$2,119
9	10.80%	$36,798	9.91%	$3,646	$2,370
10	6.00%	$39,006	9.95%	$3,883	$2,524
TY	6.00%	$41,346	10.00%	$4,135	$2,688

Lesson 3: Scaling up is hard to do…



Lesson 4: Don't forget to pay for growth…

Year	Revenues	Δ Revenue	Sales/Cap	Δ Investment	Invested Capital	EBIT (1-t)	Imputed ROC
Tr 12 mths	$1,117				$ 487	-$410	
1	$2,793	$1,676	3.00	$559	$ 1,045	-$373	-76.62%
2	$5,585	$2,793	3.00	$931	$ 1,976	-$94	-8.96%
3	$9,774	$4,189	3.00	$1,396	$ 3,372	$407	20.59%
4	$14,661	$4,887	3.00	$1,629	$ 5,001	$871	25.82%
5	$19,059	$4,398	3.00	$1,466	$ 6,467	$1,058	21.16%
6	$23,862	$4,803	3.00	$1,601	$ 8,068	$1,438	22.23%
7	$28,729	$4,868	3.00	$1,623	$ 9,691	$1,799	22.30%
8	$33,211	$4,482	3.00	$1,494	$ 11,185	$2,119	21.87%
9	$36,798	$3,587	3.00	$1,196	$ 12,380	$2,370	21.19%
10	$39,006	$2,208	3.00	$736	$ 13,116	$2,524	20.39%
TY	$41,346	$2,340	NA		Assumed to be =		20.00%

Lesson 5: There are always scenarios where the market price can be justified…

	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

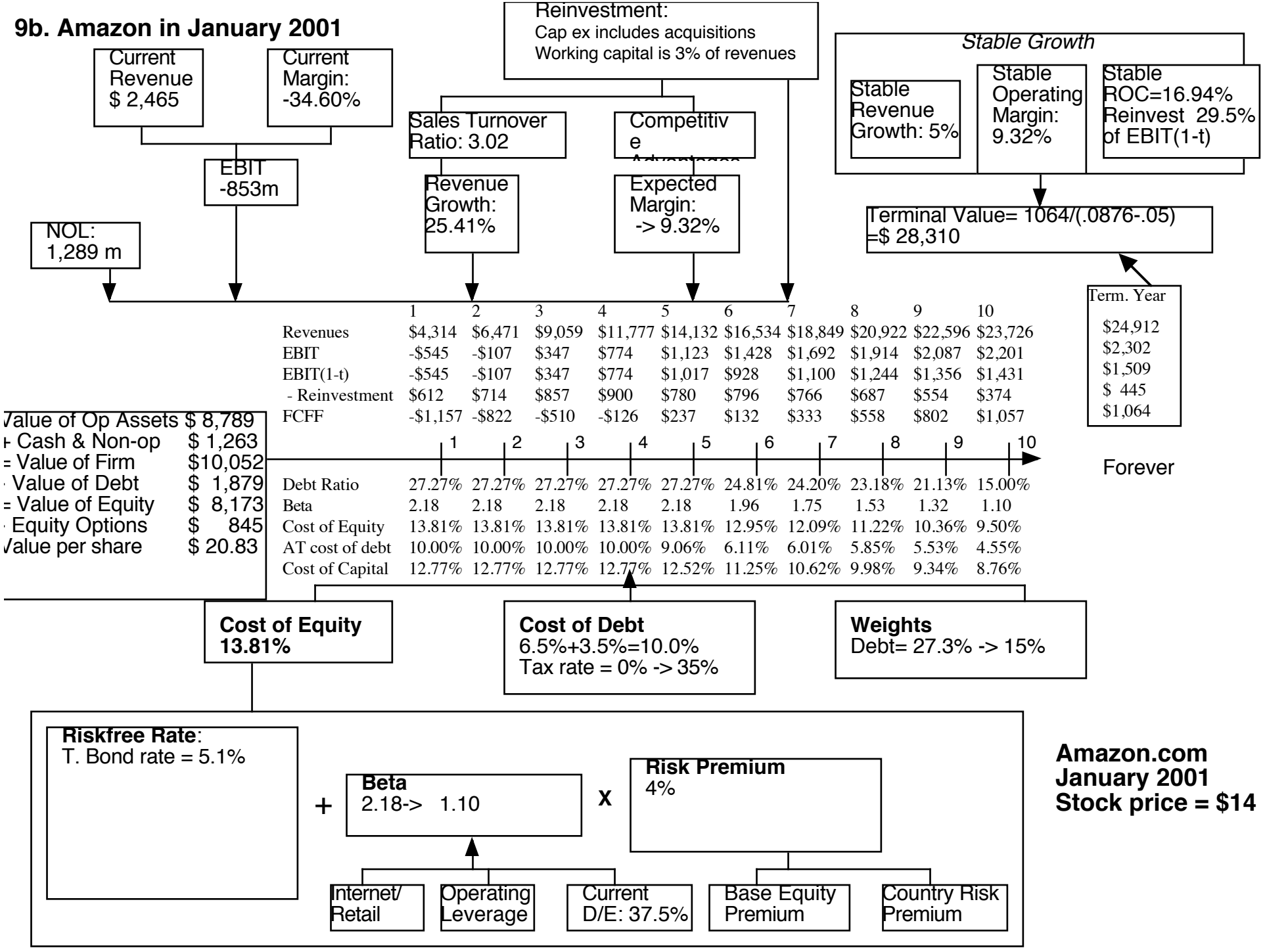
Lesson 6: Don't forget to mop up…

- Watch out for "other" equity claims: If you buy equity in a young, growth company, watch out for other (often hidden) claims on the equity that don't take the form of common shares. In particular, watch for options granted to managers, employees, venture capitalists and others (you will be surprised…).
  - Value these options as options (not at exercise value)
  - Take into consideration expectations of future option grants when computing expected future earnings/cash flows.
- Not all shares are equal: If there are differences in cash flow claims (dividends or liquidation) or voting rights across shares, value these differences.
  - Voting rights matter even at well run companies

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

- 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

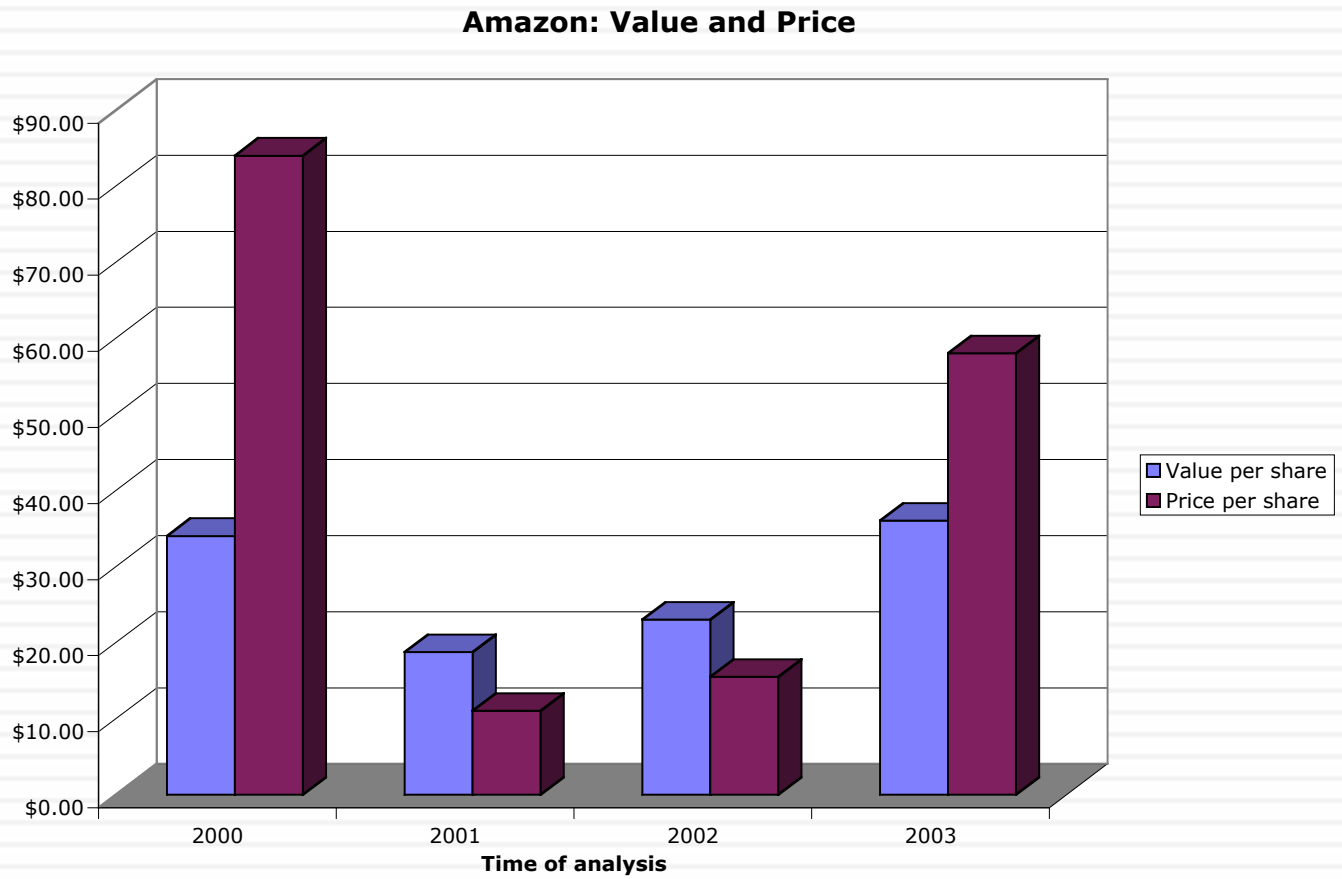


	1	2	3	4	5	6	7	8	9	10
Revenues	$4,314	$6,471	$9,059	$11,777	$14,132	$16,534	$18,849	$20,922	$22,596	$23,726
EBIT	-$545	-$107	$347	$774	$1,123	$1,428	$1,692	$1,914	$2,087	$2,201
EBIT(1-t)	-$545	-$107	$347	$774	$1,017	$928	$1,100	$1,244	$1,356	$1,431
- Reinvestment	$612	$714	$857	$900	$780	$796	$766	$687	$554	$374
FCFF	-$1,157	-$822	-$510	-$126	$237	$132	$333	$558	$802	$1,057

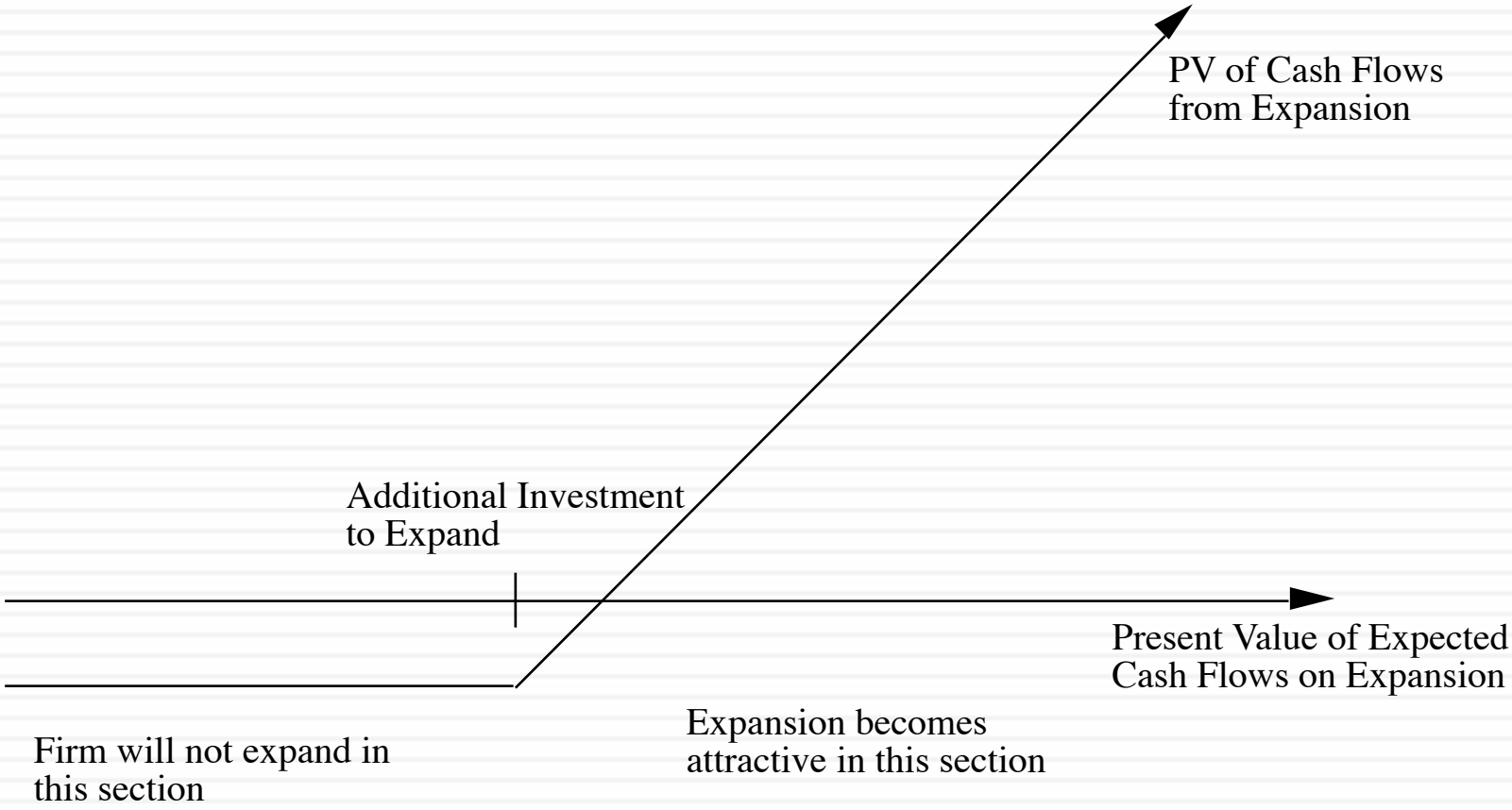
	1	2	3	4	5	6	7	8	9	10
Debt Ratio	27.27%	27.27%	27.27%	27.27%	27.27%	24.81%	24.20%	23.18%	21.13%	15.00%
Beta	2.18	2.18	2.18	2.18	2.18	1.96	1.75	1.53	1.32	1.10
Cost of Equity	13.81%	13.81%	13.81%	13.81%	13.81%	12.95%	12.09%	11.22%	10.36%	9.50%
AT cost of debt	10.00%	10.00%	10.00%	10.00%	9.06%	6.11%	6.01%	5.85%	5.53%	4.55%
Cost of Capital	12.77%	12.77%	12.77%	12.77%	12.52%	11.25%	10.62%	9.98%	9.34%	8.76%

Amazon.com
January 2001
Stock price = $14

And the market is often "more wrong"….



An "option premium": The option to add a product or enter a market



An Example of an Expansion Option

- You have complete a DCF valuation of a small anti-virus software company, Secure Mail, and estimated a value of $115 million.
- Assume that there is the possibility that the company could use the customer base that it develops for the anti-virus software and the technology on which the software is based to create a database software program sometime in the next 5 years.
  - It will cost Secure Mail about $500 million to develop a new database program, if they decided to do it today.
  - Based upon the information you have now on the potential for a database program, the company can expect to generate about $ 40 million a year in after-tax cashflows for ten years. The cost of capital for private companies that provide database software is 12%.
  - The annualized standard deviation in firm value at publicly traded database companies is 50%.
  - The five-year treasury bond rate is 3%.

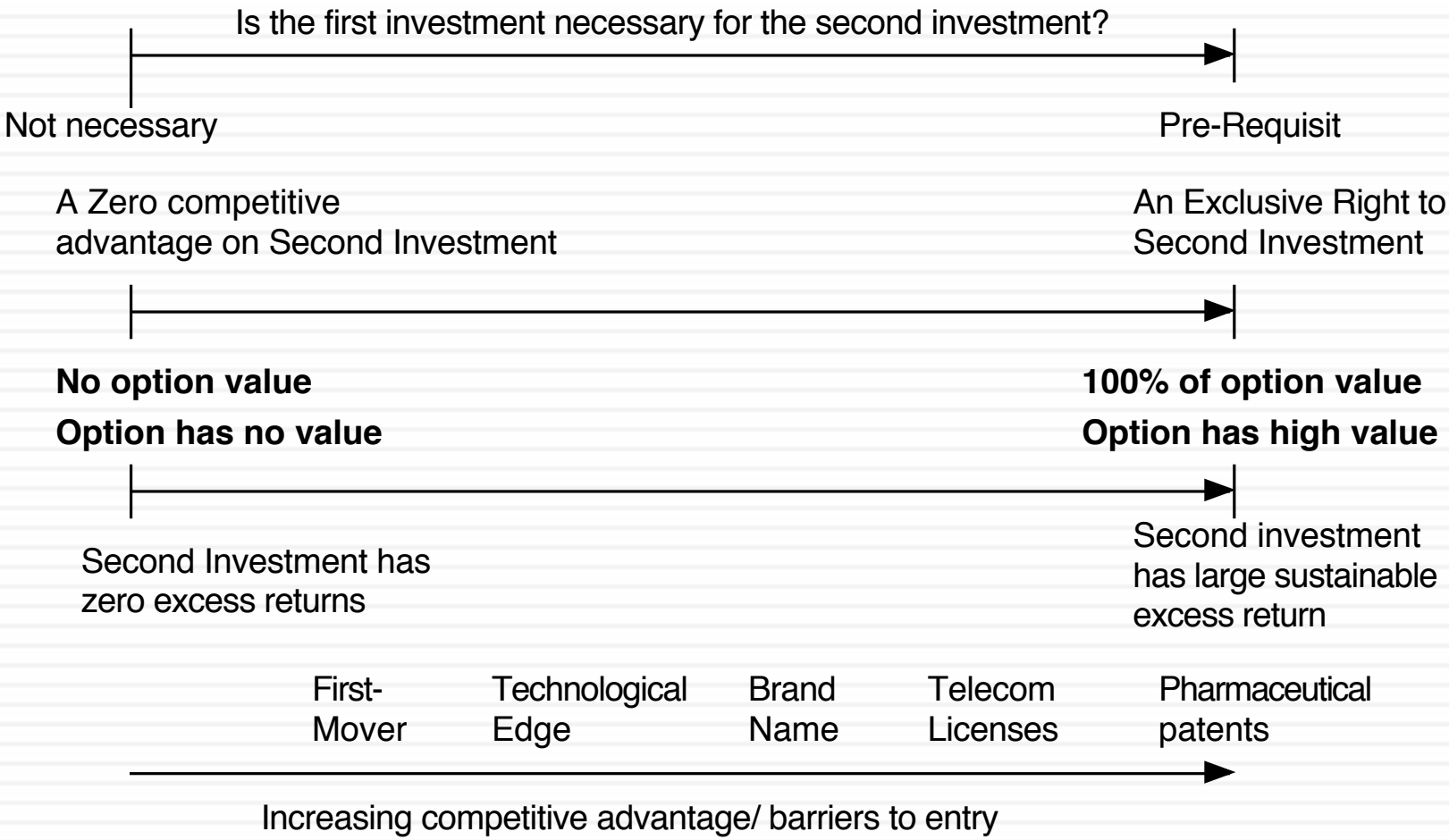
Valuing the Expansion Option

S = Value of entering the database software market
= PV of $40 million for 10 years @12% = $226 million
K = Cost of entering the database software market = $ 500 mil
t = Period over which you have the right to enter the market
= 5 years
σ = Standard deviation of stock prices of database firms = 50%
r = Riskless rate = 3%

Call Value= $ 56 Million

DCF valuation of the firm = $ 115 million
Value of Option to Expand to Database market = $ 56 million
Value of the company with option to expand = $ 171 million

A note of caution: Opportunities are not options…

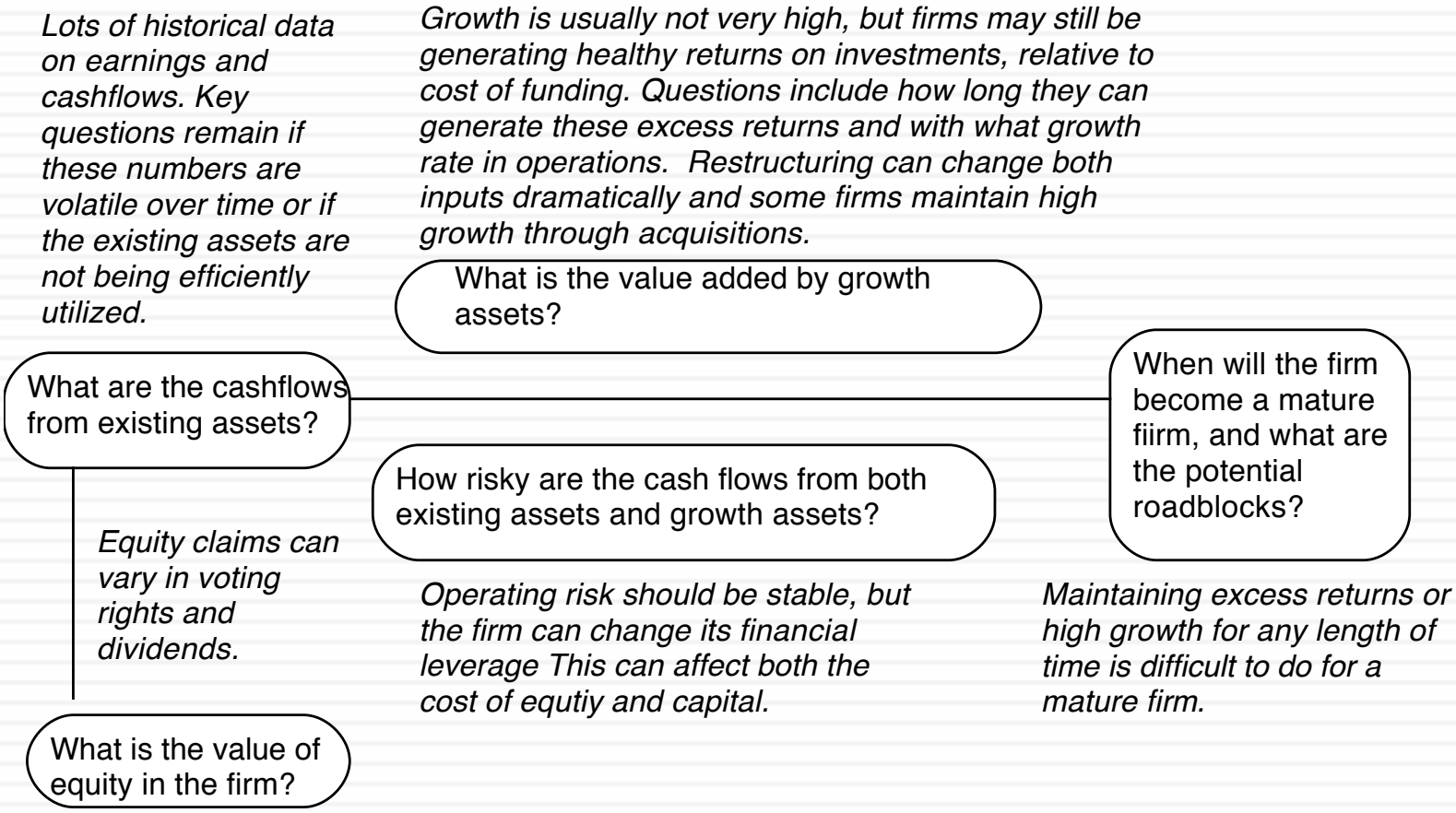


II. Mature Companies in transition..

- 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 tlength of growth (to 5 years), and higher debt ratio (20%).

Operating Restructuring (1)
Expected growth rate = ROC * Reinvestment Rate
Expected growth rae (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

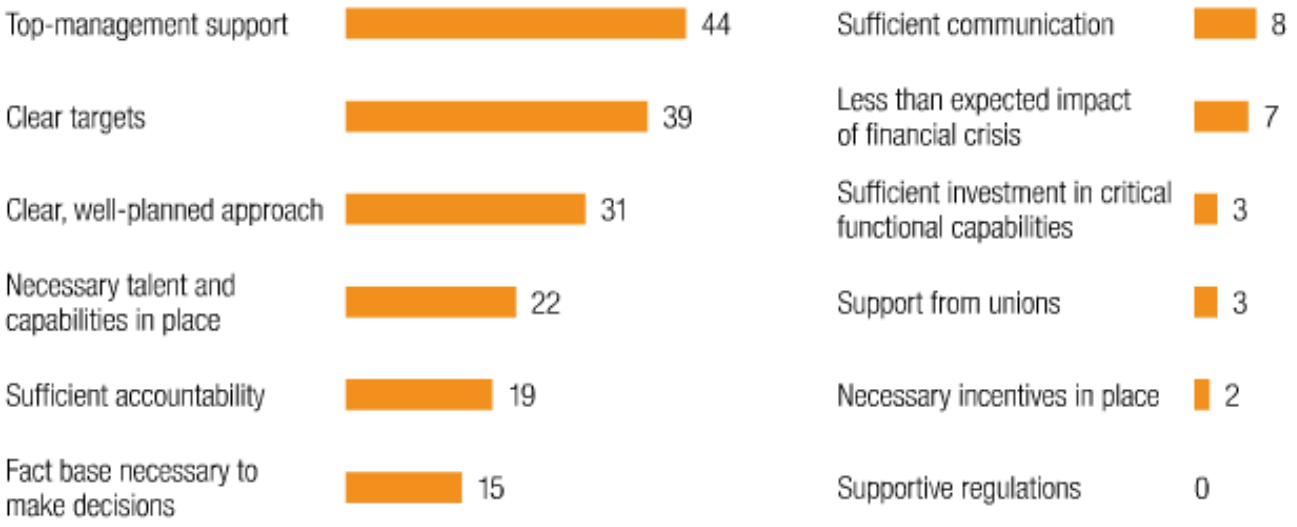
Probability of management change = 10% (3)
Expected value =$31.91 (.90) + $37.80 (.10) = $32.50 (4)

Lesson 1: Cost cutting and increased efficiency are easier on paper than in practice…

Exhibit 4: **Top factors for meeting targets** expand

% of respondents whose companies have met their cost reduction strategies,[1] n = 178

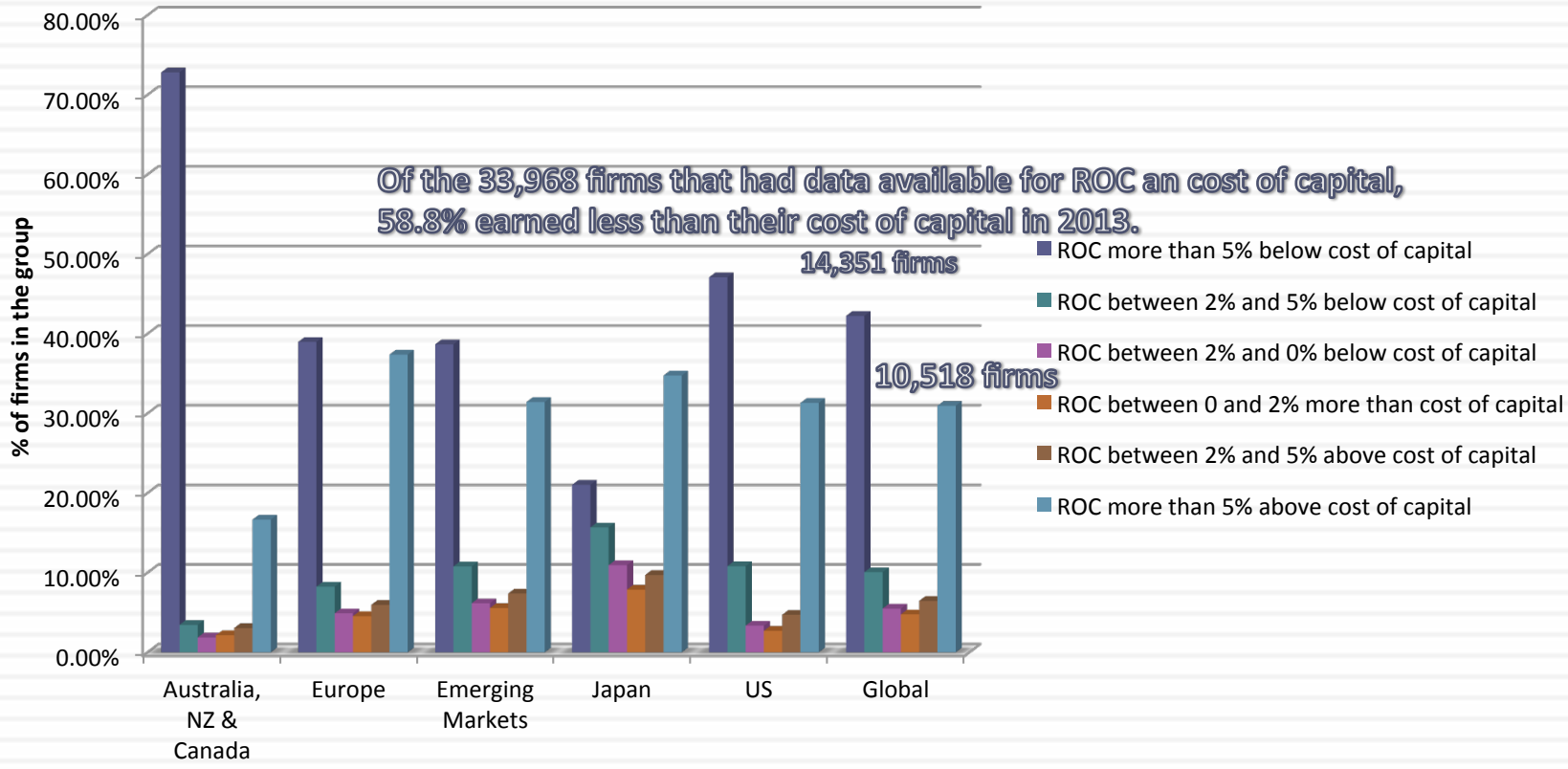
Top two factors most responsible for companies meeting cost targets or goals



[1]Respondents who answered "don't know" are not shown.

Lesson 2: Increasing growth is not always an option (or at least not a good option)

ROIC versus Cost of Capital: A Global Assessment for 2013



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

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

As debt ratio increases, equity becomes riskier.(higher beta) and cost of equity goes up. (1)

As firm borrows more money, its ratings drop and cost of debt rises (2)

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Firm Value (G)
0%	0.78	7.00%	AAA	3.60%	40.00%	2.16%	7.00%	$4,523
10%	0.83	7.31%	AAA	3.60%	40.00%	2.16%	6.80%	$4,665
10.39%	**0.83**	**7.33%**	**AAA**	**3.60%**	**40.00%**	**2.16%**	**6.79%**	**$4,680**
20%	0.89	7.70%	AAA	3.60%	40.00%	2.16%	6.59%	$4,815
30%	0.97	8.20%	A+	4.60%	40.00%	2.76%	6.57%	$4,834
40%	1.09	8.86%	A-	5.35%	40.00%	3.21%	6.60%	$4,808
50%	1.24	9.79%	B+	8.35%	40.00%	5.01%	7.40%	$4,271
60%	1.47	11.19%	B-	10.85%	40.00%	6.51%	8.38%	$3,757
70%	1.86	13.52%	CCC	12.35%	40.00%	7.41%	9.24%	$3,398
80%	2.70	18.53%	CC	14.35%	38.07%	8.89%	10.81%	$2,892
90%	5.39	34.70%	CC	14.35%	33.84%	9.49%	12.01%	$2,597

Current Cost of Capital

Optimal: Cost of capital lowest between 20 and 30%.

Debt ratio is percent of overall market value of firm that comes from debt financing.

At debt ratios > 80%, firm does not have enough operating income to cover interest expenses. Tax rate goes down to reflect lost tax benefits. (3)

As cost of capital drops, firm value rises (as operating cash flows remain unchanged)

III. Dealing with decline and distress…

Historial 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?

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

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

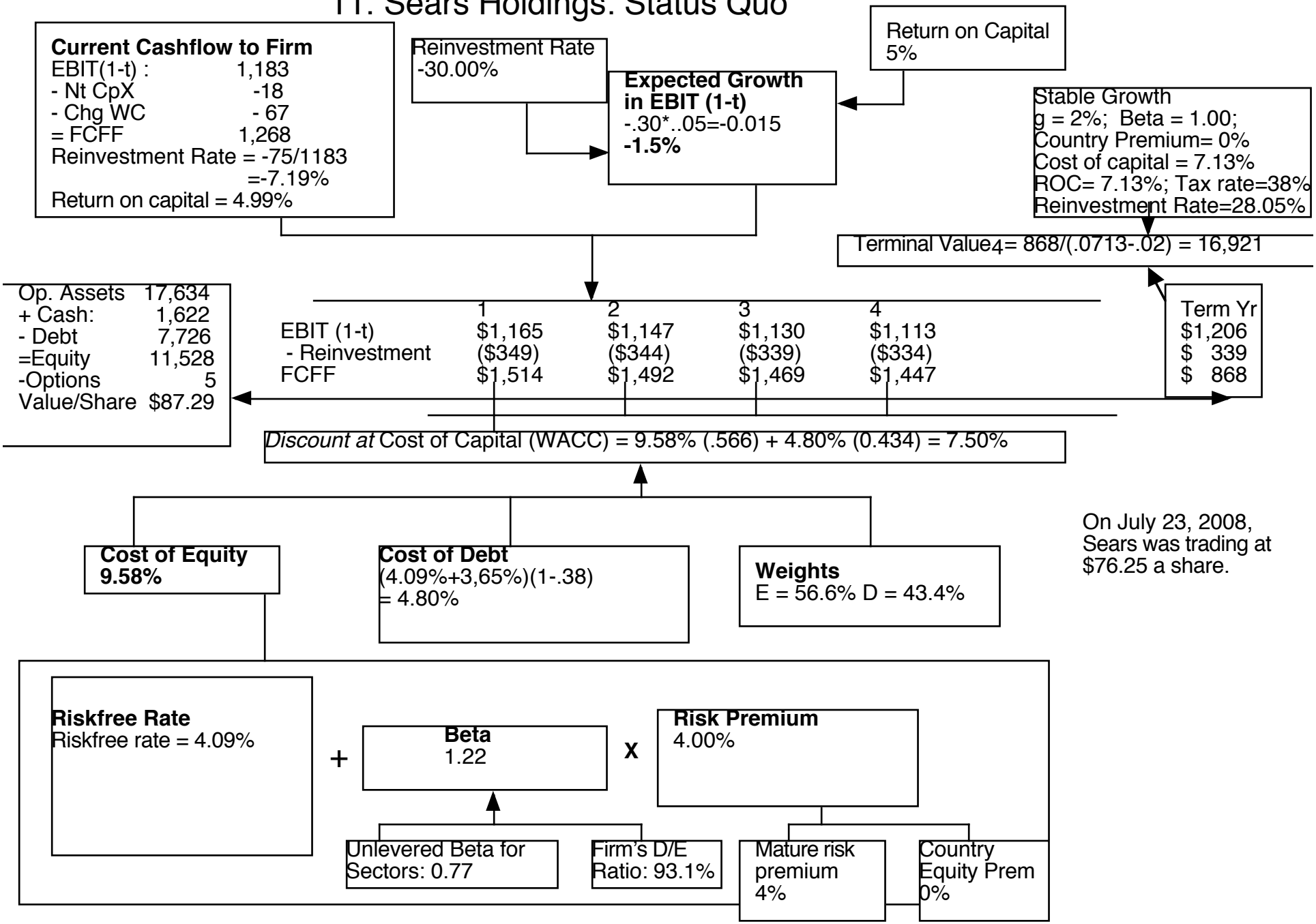
Depending upon the risk of the assets being divested and the use of the proceeds from the divestuture (to pay dividends or retire debt), the risk in both the firm and its equity can change.

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

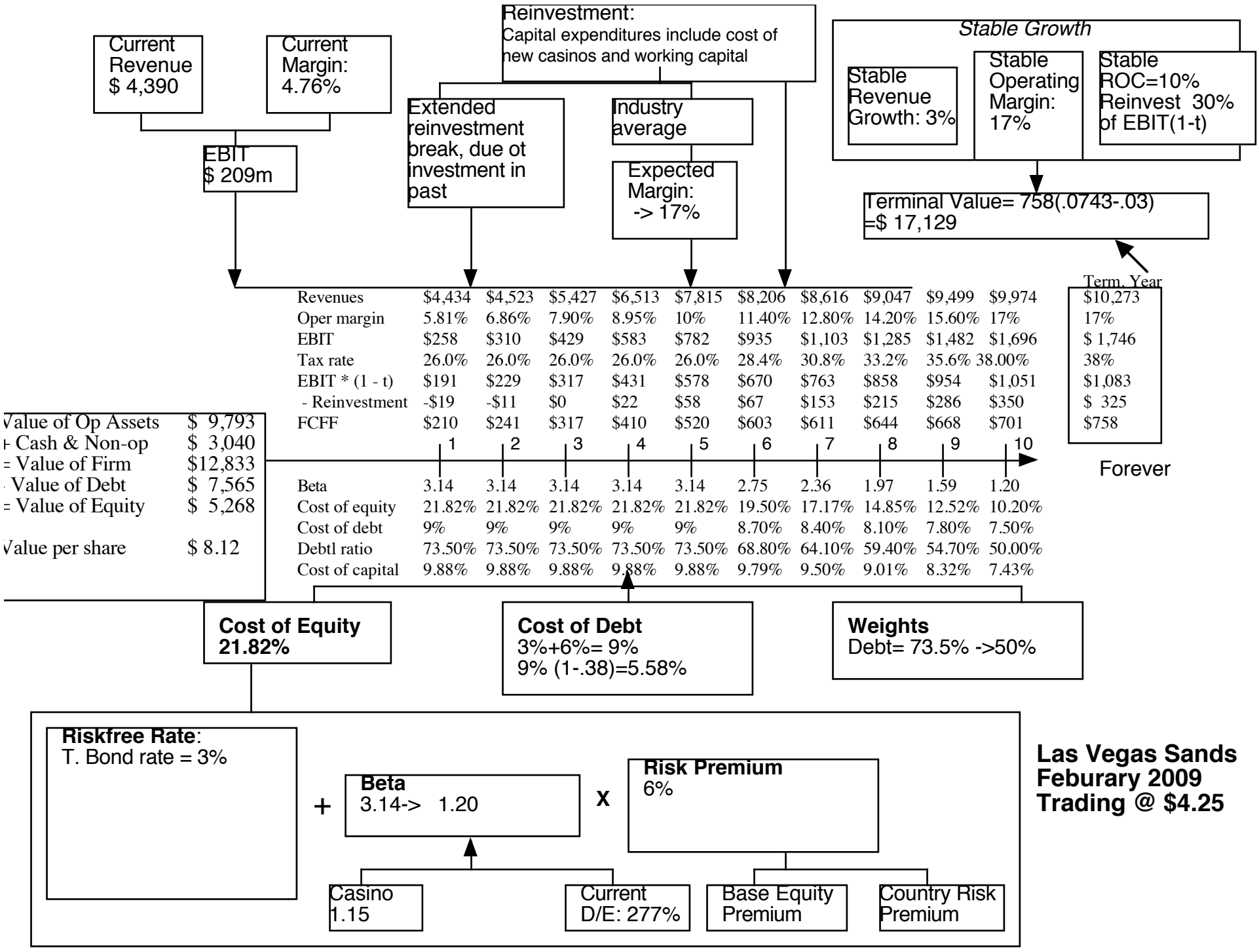
- In decline, firms often see declining revenues and lower margins, translating in negative expected growth over time.
- If these firms are run by good managers, they will not fight decline. Instead, they will adapt to it and shut down or sell investments that do not generate the cost of capital. This 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



b. Dealing with the "downside" of Distress

- 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 understate 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 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

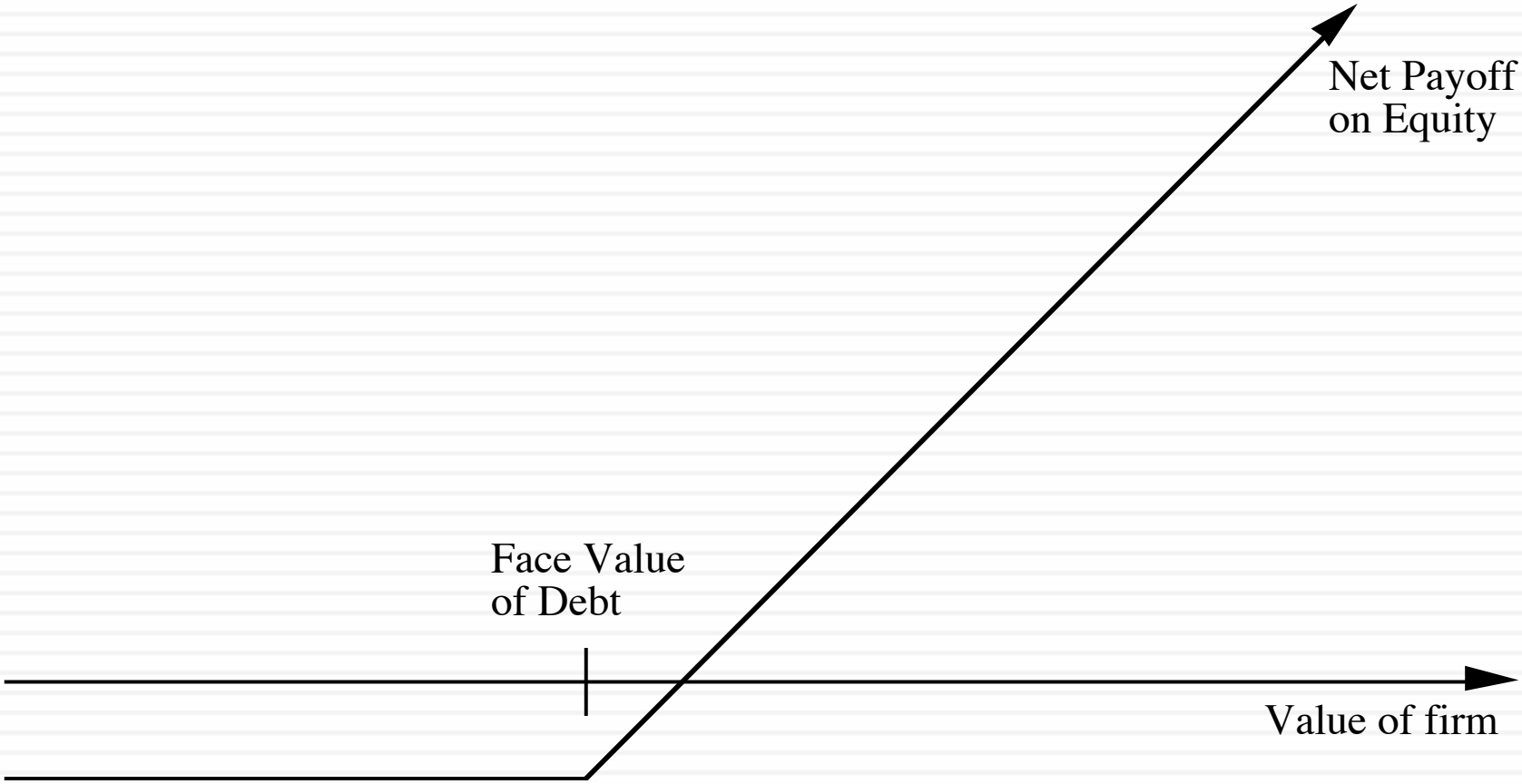
Adjusting the value of LVS for distress..

- 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:

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

- Solving for the probability of bankruptcy, we get:
- $\pi_{Distress}$ = 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

The “sunny” side of distress: Equity as a call option to liquidate the firm



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?

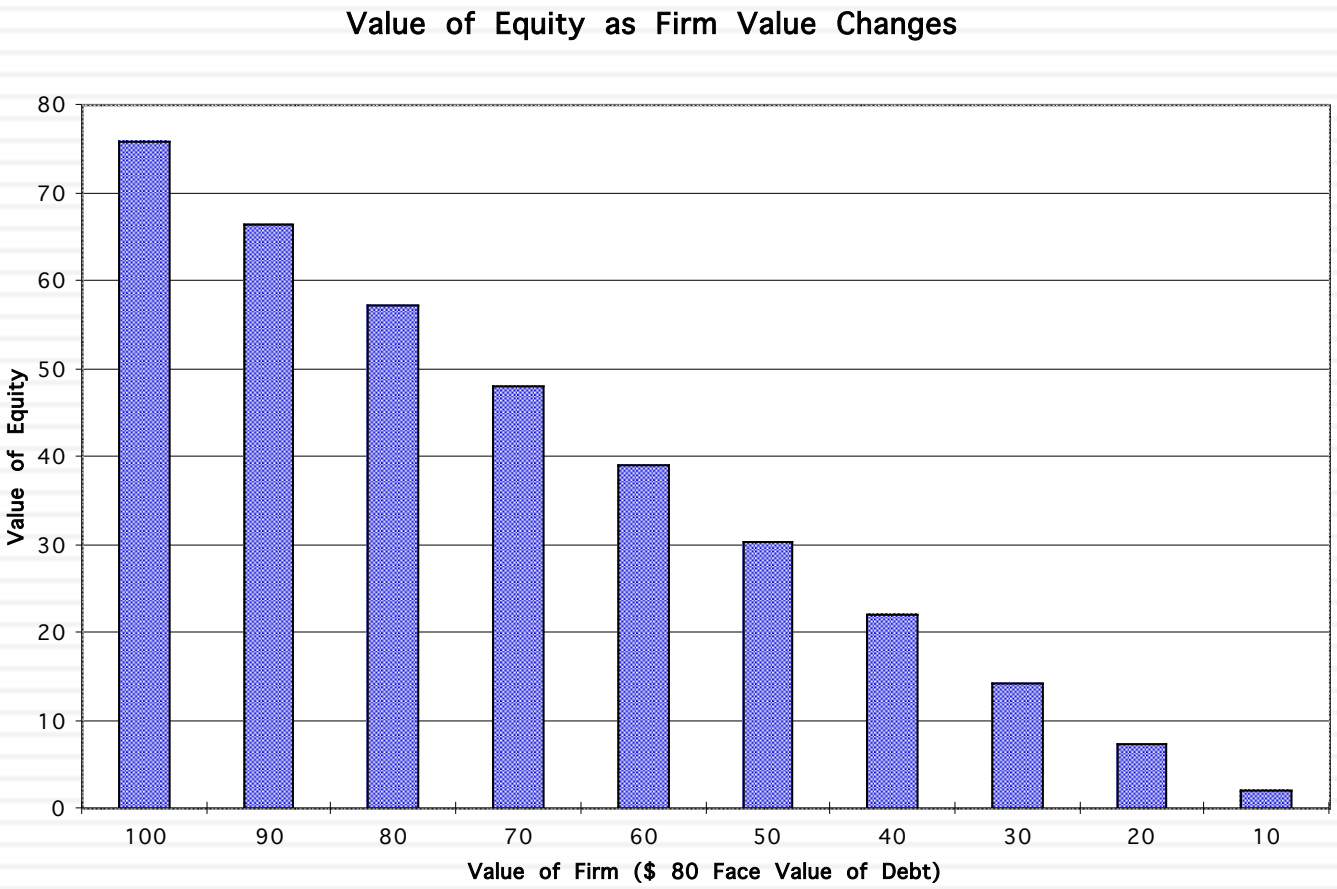
Model Parameters & Valuation

- The inputs
  - 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%
- The output
  - 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%

Firm value drops..

- 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.
- The inputs
  - Value of the underlying asset = S = Value of the firm = $ 50 million
  - All the other inputs remain unchanged
- The output
  - 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 = 50 (0.8534) - 80 $\exp^{(-0.10)(10)}$ (0.4155) = $30.44 million
  - Value of the bond= $50 - $30.44 = $19.56 million

Equity value persists .. As firm value declines..



Real World Approaches to Valuing Equity in Troubled Firms: Getting Inputs

Input	Estimation Process
Value of the Firm	• Cumulate market values of equity and debt (or) • Value the assets in place using FCFF and WACC (or) • Use cumulated market value of assets, if traded.
Variance in Firm Value	• If stocks and bonds are traded, $\sigma^2_{firm} = w_e^2 \sigma_e^2 + w_d^2 \sigma_d^2 + 2 w_e w_d \rho_{ed} \sigma_e \sigma_d$ where σ_e^2 = variance in the stock price w_e = MV weight of Equity σ_d^2 = the variance in the bond price w_d = MV weight of debt • If not traded, use variances of similarly rated bonds. • Use average firm value variance from the industry in which company operates.
Value of the Debt	• If the debt is short term, you can use only the face or book value of the debt. • If the debt is long term and coupon bearing, add the cumulated nominal value of these coupons to the face value of the debt.
Maturity of the Debt	• Face value weighted duration of bonds outstanding (or) • If not available, use weighted maturity

Valuing Equity as an option - Eurotunnel in early 1998

- Eurotunnel has been a financial disaster since its opening
  - In 1997, Eurotunnel had earnings before interest and taxes of -£56 million and net income of -£685 million
  - At the end of 1997, its book value of equity was -£117 million
- It had £8,865 million in face value of debt outstanding
  - The weighted average duration of this debt was 10.93 years

Debt Type	Face Value	Duration
Short term	935	0.50
10 year	2435	6.7
20 year	3555	12.6
Longer	1940	18.2
Total	£8,865 mil	10.93 years

The Basic DCF Valuation

- The value of the firm estimated using projected cashflows to the firm, discounted at the weighted average cost of capital was £2,312 million.
- This was based upon the following assumptions –
  - Revenues will grow 5% a year in perpetuity.
  - The COGS which is currently 85% of revenues will drop to 65% of revenues in yr 5 and stay at that level.
  - Capital spending and depreciation will grow 5% a year in perpetuity.
  - There are no working capital requirements.
  - The debt ratio, which is currently 95.35%, will drop to 70% after year 5. The cost of debt is 10% in high growth period and 8% after that.
  - The beta for the stock will be 1.10 for the next five years, and drop to 0.8 after the next 5 years.
  - The long term bond rate is 6%.

Other Inputs

- The stock has been traded on the London Exchange, and the annualized std deviation based upon ln (prices) is 41%.
- There are Eurotunnel bonds, that have been traded; the annualized std deviation in ln(price) for the bonds is 17%.
  - The correlation between stock price and bond price changes has been 0.5. The proportion of debt in the capital structure during the period (1992-1996) was 85%.
  - Annualized variance in firm value
  - $= (0.15)^2 (0.41)^2 + (0.85)^2 (0.17)^2 + 2 (0.15) (0.85)(0.5)(0.41)(0.17) = 0.0335$
- The 15-year bond rate is 6%. (I used a bond with a duration of roughly 11 years to match the life of my option)

Valuing Eurotunnel Equity and Debt

- Inputs to Model
  - Value of the underlying asset = S = Value of the firm = £2,312 million
  - Exercise price = K = Face Value of outstanding debt = £8,865 million
  - Life of the option = t = Weighted average duration of debt = 10.93 years
  - Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.0335
  - Riskless rate = r = Treasury bond rate corresponding to option life = 6%
- Based upon these inputs, the Black-Scholes model provides the following value for the call:
  - d1 = -0.8337 N(d1) = 0.2023
  - d2 = -1.4392 N(d2) = 0.0751
- Value of the call = 2312 (0.2023) - 8,865 $\exp^{(-0.06)(10.93)}$ (0.0751) = £122 million
- Appropriate interest rate on debt = $(8865/2190)^{1/10.93}$-1= 13.65%

IV. 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 is the value added by growth assets?

What are the cashflows from existing assets?

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

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

Preferred stock is a significant source of capital.

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 ot regulators. If they do not, they can be taken over and shut down.

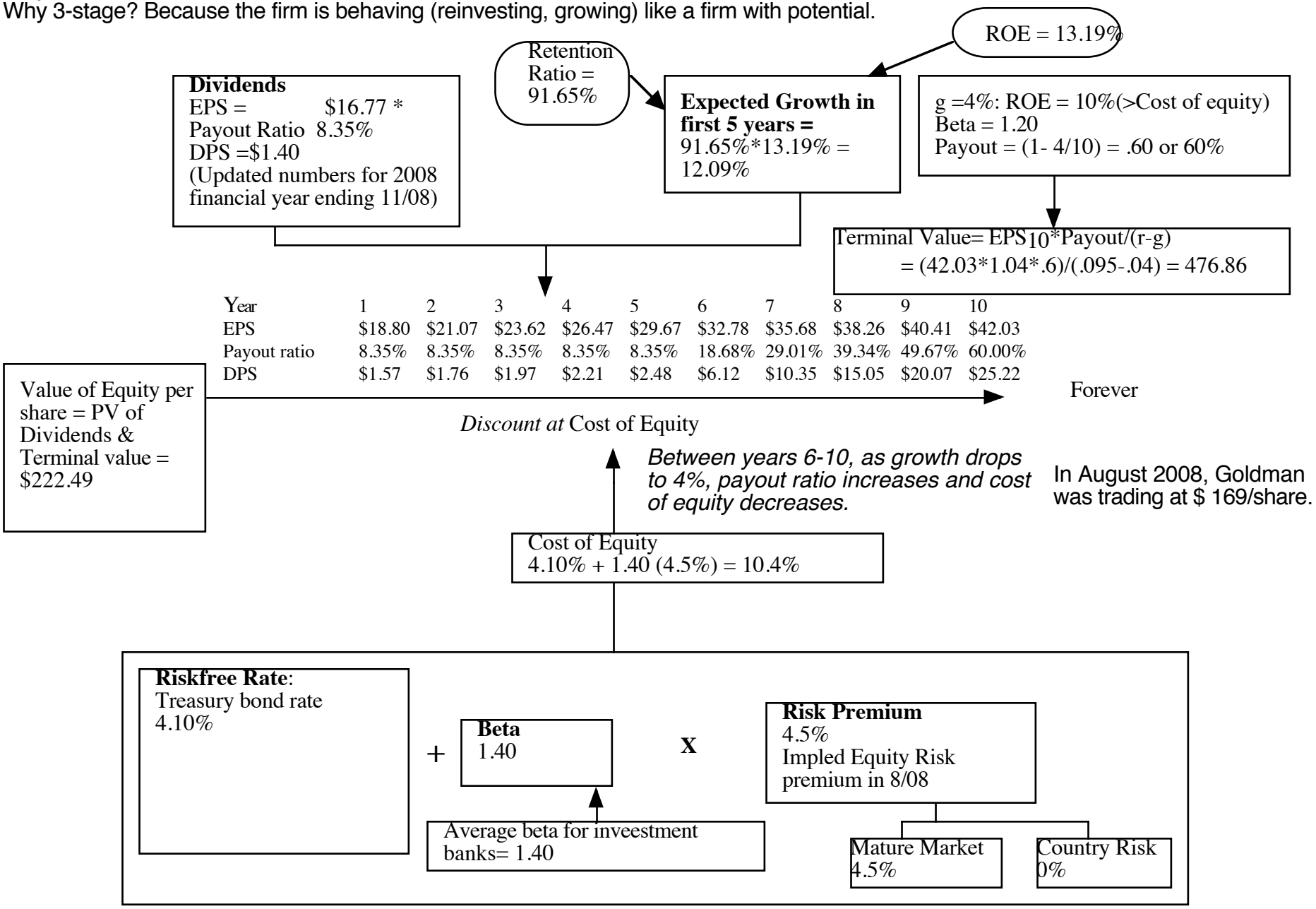
2b. Goldman Sachs: August 2008

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

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.



Lesson 1: Financial service companies are opaque…

- 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.

Lesson 2: For financial service companies, book value matters…

- 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 = Net Income – Reinvestment in regulatory capital (book equity)

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%
Retunr on equity = 10.20%;
Reinvestment Rate=g/ROE =3/10.20% = 29.41%

Terminal Value5= 2,823/(.102-.03) = 39,209 m

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 €	3,999
-Reinvestment	1,146 €	1,187 €	1,229 €	1,273 €	1,318 €	1,176
FCFE	2,014 €	2,142 €	2,276 €	2,417 €	2,565 €	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

Beta for commercial & Investment banking

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%
Deutshce Bank		0.60%

V. Valuing Companies with "intangible" assets

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.

What is the value added by growth assets?

What are the cashflows from existing assets?

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

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

The capital expenditures associated with acquiring intangible assets (technology, himan capital) are mis-categorized as operating expenses, leading to inccorect accounting earnings and measures of capital invested.

It ican be more difficult to borrow against intangible assets than it is against tangible assets. The risk in operations can change depending upon how stable the intangbiel asset is.

Intangbile assets such as brand name and customer loyalty can last for very long periods or dissipate overnight.

Lesson 1: Accounting rules are cluttered with inconsistencies…

- 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: Ddetermining 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 exoense

Year	*R&D Expense*	*Unamortized portion* (2)		*Amortization this year* (3)
Current	3030.00	1.00	3030.00	
-1	3266.00	0.90	2939.40	$326.60
-2	3366.00	0.80	2692.80	$336.60
-3	2314.00	0.70	1619.80	$231.40
-4	2028.00	0.60	1216.80	$202.80
-5	1655.00	0.50	827.50	$165.50
-6	1117.00	0.40	446.80	$111.70
-7	864.00	0.30	259.20	$86.40
-8	845.00	0.20	169.00	$84.50
-9	823.00	0.10	82.30	$82.30
-10	663.00	0.00	0.00	$66.30
			$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 (5)

	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.

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

	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

VI. Valuing cyclical and commodity companies

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

What is the value added by growth assets?

What are the cashflows from existing assets?

Historial revenue and earnings data are volatile, as the economic cycle and commodity prices change.

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

Primary risk is from the economy for cyclical firms and from commodity price movements for commodity companies. These risks can stay dormant for long periods of apparent prosperity.

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

For commodity companies, the fact that there are only finite amounts of the commodity may put a limit on growth forever. For cyclical firms, there is the peril that the next recession may put an end to the firm.

Valuing a Cyclical Company - Toyota in Early 2009

Year	Revenues	Operating Inco	EBITDA	Operating Marg
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 (Estin	¥22,661,325	¥267,904	¥1,310,304	1.18%
		¥1,306,867		7.33%

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

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%

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)

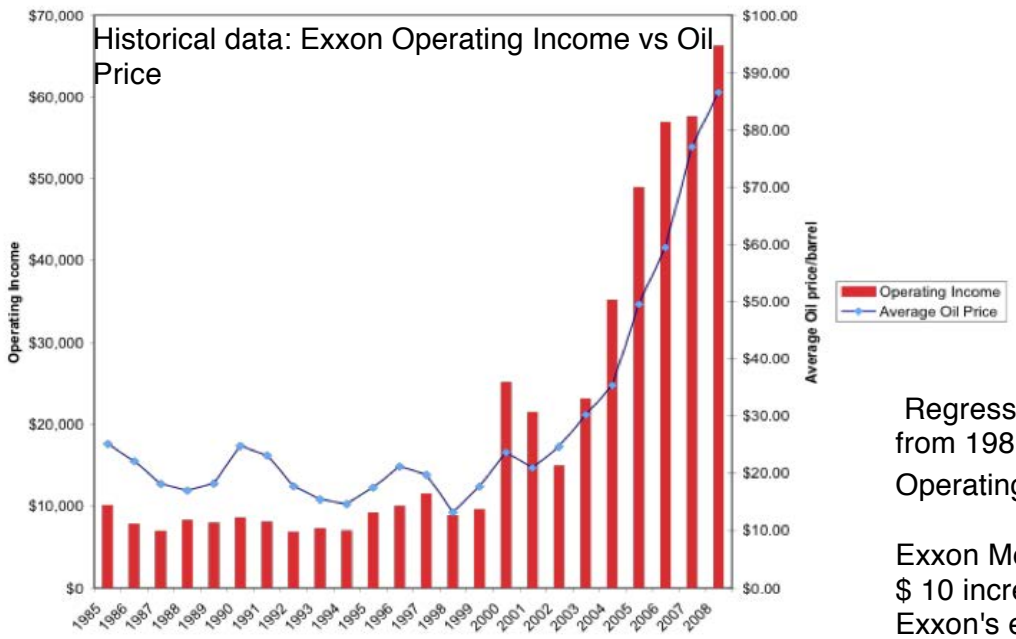
The cost of capital is computed using the average beta of automobile companies (1.10), and Toyota's cost of debt (3.25%) and debt ratio (52.9% debt ratio. We use the Japanese marginal tax rate of 40.7% for computing both the after-tax cost of debt and the after-tax operating income

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:

Operating Income = -6,395 + 911.32 (Average Oil Price) 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.

Estiimate 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 thisi price is

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.

Reinvestment Rate = g/ 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 equtiy funded company, and is explected to remain so, with a deb ratio of onlly 2.85%: It's 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%.

Cost of capital = 8.35% (.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.

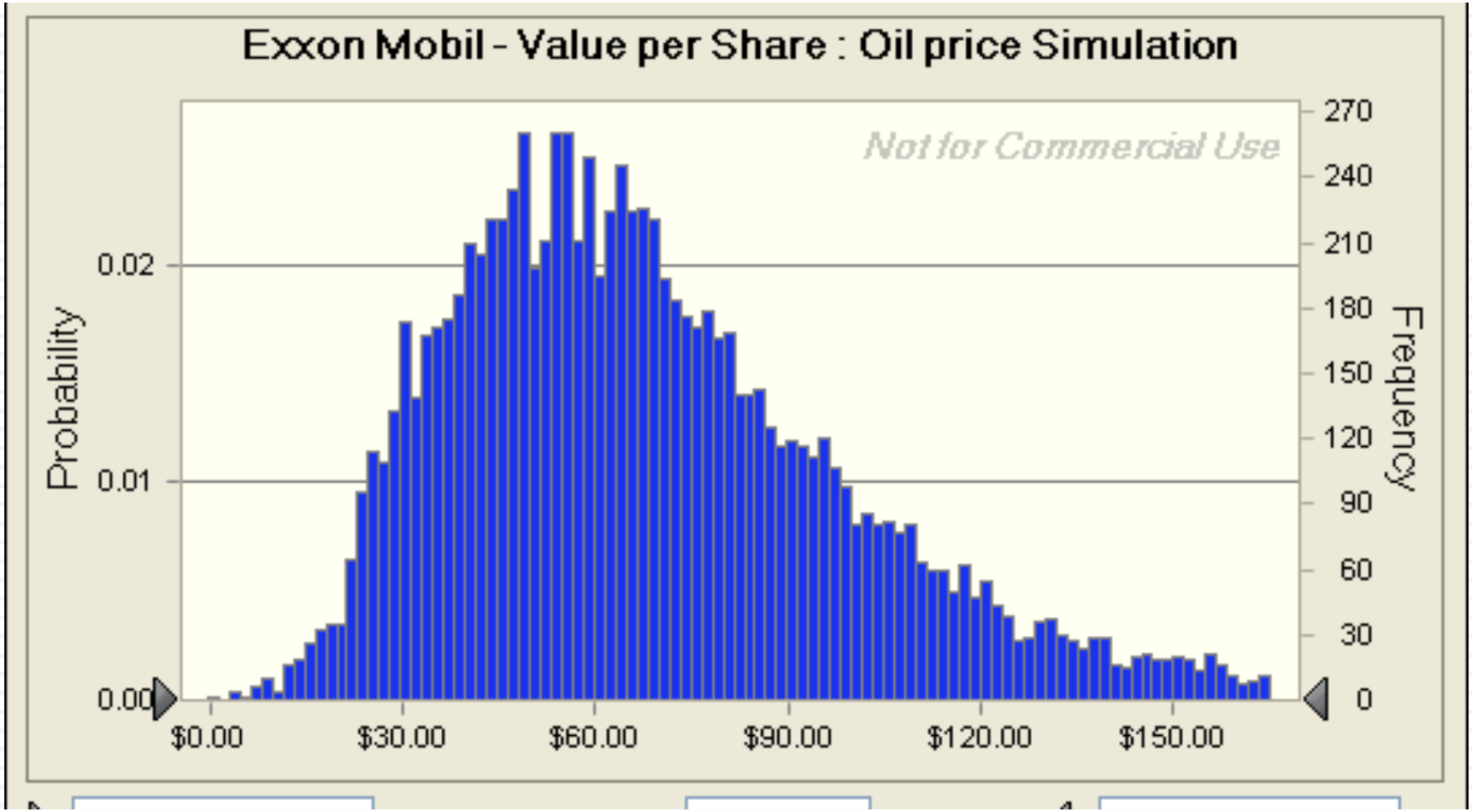
Lesson 1: With "macro" companies, it is easy to get lost in "macro" assumptions…

- 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.

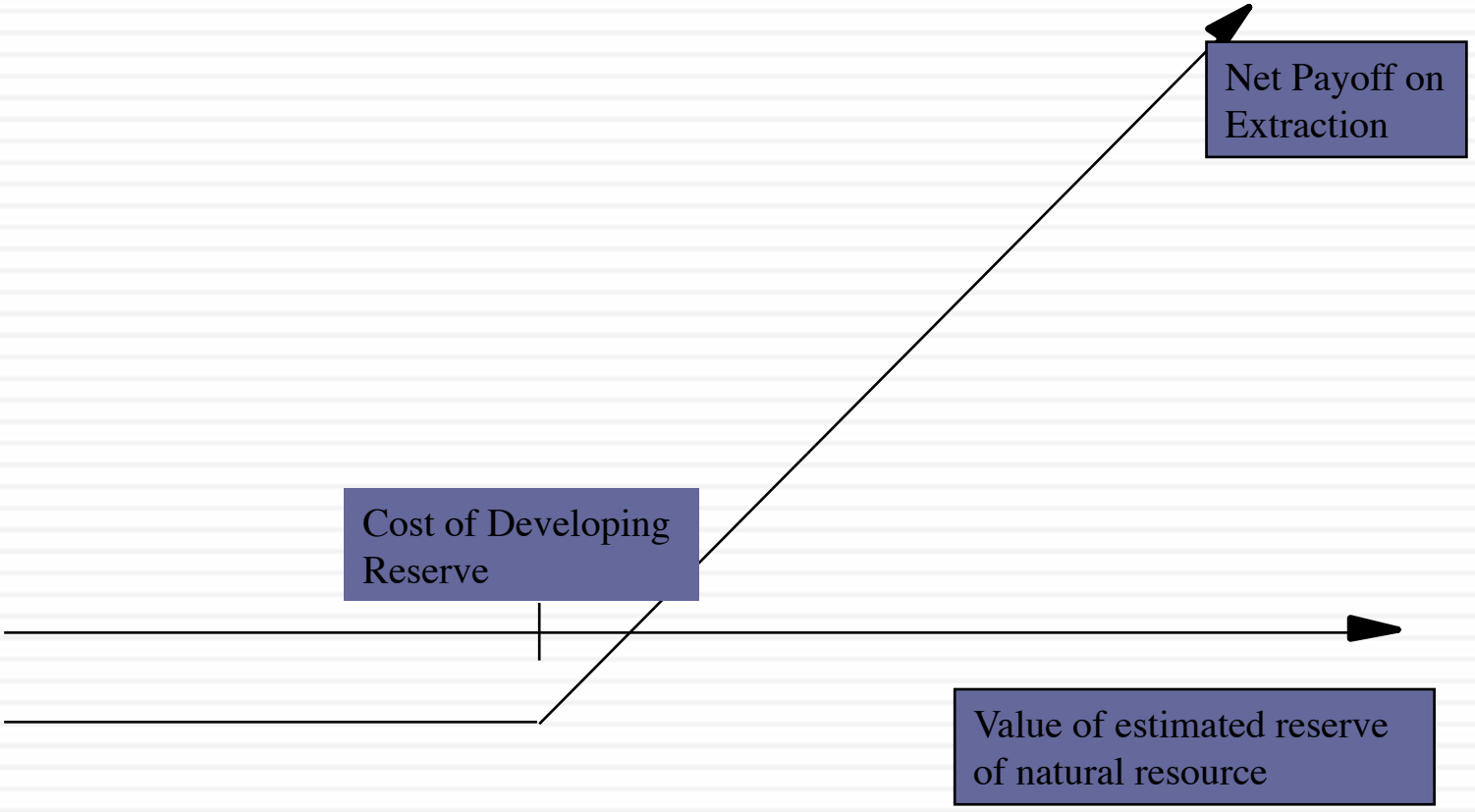
Lesson 2: Use probabilistic tools to assess value as a function of macro variables…

- 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



The optionality in commodities: Undeveloped reserves as an option



Valuing Gulf Oil

- Gulf Oil was the target of a takeover in early 1984 at $70 per share (It had 165.30 million shares outstanding, and total debt of $9.9 billion).
  - It had estimated reserves of 3038 million barrels of oil and the average cost of developing these reserves was estimated to be $10 a barrel in present value dollars (The development lag is approximately two years).
  - The average relinquishment life of the reserves is 12 years.
  - The price of oil was $22.38 per barrel, and the production cost, taxes and royalties were estimated at $7 per barrel.
  - The bond rate at the time of the analysis was 9.00%.
  - Gulf was expected to have net production revenues each year of approximately 5% of the value of the developed reserves. The variance in oil prices is 0.03.

Valuing Undeveloped Reserves

- Inputs for valuing undeveloped reserves
  - Value of underlying asset = Value of estimated reserves discounted back for period of development lag= 3038 * ($ 22.38 - $7) / 1.05^2 = $42,380.44
  - Exercise price = Estimated development cost of reserves = 3038 * $10 = $30,380 million
  - Time to expiration = Average length of relinquishment option = 12 years
  - Variance in value of asset = Variance in oil prices = 0.03
  - Riskless interest rate = 9%
  - Dividend yield = Net production revenue/ Value of developed reserves = 5%
- Based upon these inputs, the Black-Scholes model provides the following value for the call:
  - d1 = 1.6548 N(d1) = 0.9510
  - d2 = 1.0548 N(d2) = 0.8542
- Call Value= 42,380.44 $\exp^{(-0.05)(12)}$ (0.9510) -30,380 ($\exp^{(-0.09)(12)}$ (0.8542) = $ 13,306 million

The composite value…

- In addition, Gulf Oil had free cashflows to the firm from its oil and gas production of $915 million from already developed reserves and these cashflows are likely to continue for ten years (the remaining lifetime of developed reserves).
- The present value of these developed reserves, discounted at the weighted average cost of capital of 12.5%, yields:
  - Value of already developed reserves = 915 (1 - 1.125^{-10})/.125 = $5065.83
- Adding the value of the developed and undeveloped reserves
  - Value of undeveloped reserves = $ 13,306 million
  - Value of production in place = $ 5,066 million
  - Total value of firm = $ 18,372 million
  - Less Outstanding Debt = $ 9,900 million
  - Value of Equity = $ 8,472 million
  - Value per share = $ 8,472/165.3 = $51.25

VII. Valuing Multi-business companies

Figure 1.12: Estimation Issues - Multi -business and Global Businesses

Growth rates can vary widely across busineses and across countries. Trying to estimate "one" growth rate fro a firm can be difficult to do.

What is the value added by growth assets?

What are the cashflows from existing assets?

The firm reports aggregate earnings from its investments in many businesses and many countries as well as in many currencies. Breakdown of earnings and operating variables in either incomplete or misleading.

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

Since risk can vary widely depending upon the cash flow stream, estimating one cost of equity and capital for a multi-business, global company that can be maintained over time is an exercise in futility.

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

Different parts of the company will reach stable growth at different points in time.

Lesson 1: Value is additive

- We can value a company as a composite entity, with a collective cash flow and single set of fundamentals (growth rates, costs of capital etc.). In doing so, here are some of the issues that we will run into
  - Changing mix of businesses and geographies will translate into changing costs of capital, growth rates, ROIC etc. over time.
  - All cash flows have to be converted into one currency to do the valuation.
- If we have access to enough unit level information, we can value a company as the sum of its parts, preserving our flexibility to value each part in a different currency and with different fundamentals.

United Technologies: Raw Data - 2009

Division	*Business*	*Revenues*	*EBITDA*	*Pre-tax Operating Income*	*Capital Expenditures*	*Depreciation*	*Total Assets*
Carrier	Refrigeration systems	$14,944	$1,510	$1,316	$191	$194	$10,810
Pratt & Whitney	Defense	$12,965	$2,490	$2,122	$412	$368	$9,650
Otis	Construction	$12,949	$2,680	$2,477	$150	$203	$7,731
UTC Fire & Security	Security	$6,462	$780	$542	$95	$238	$10,022
Hamilton Sundstrand	Manufacturing	$6,207	$1,277	$1,099	$141	$178	$8,648
Sikorsky	Aircraft	$5,368	$540	$478	$165	$62	$3,985

The company also had corporate expenses, unallocated to the divisions of $408 million in the most recent year.

United Technologies: DCF parts valuation
Cost of capital, by business

Division	Unlevered Beta	Debt/Equity Ratio	Levered beta	Cost of equity	After-tax cost of debt	Debt to Capital	Cost of capital
Carrier	0.83	30.44%	0.97	9.32%	2.95%	23.33%	7.84%
Pratt & Whitney	0.81	30.44%	0.95	9.17%	2.95%	23.33%	7.72%
Otis	1.19	30.44%	1.39	12.07%	2.95%	23.33%	9.94%
UTC Fire & Security	0.65	30.44%	0.76	7.95%	2.95%	23.33%	6.78%
Hamilton Sundstrand	1.04	30.44%	1.22	10.93%	2.95%	23.33%	9.06%
Sikorsky	1.17	30.44%	1.37	11.92%	2.95%	23.33%	9.82%

UT has $12,919 million in debt outstanding at the company level but does not provide a divisional breakdown. I could have allocated the debt based on capital expenditure or total assets, but have chosen to leave the debt ratio for all divisions = debt ratio for UT (23.33%).

United Technologies: DCF valuation Fundamentals, by business

Division	*Total Assets*	*Capital Invested*	*Cap Ex*	*Allocated Reinvestment*	*Operating income after taxes*	*Return on capital*	*Reinvestment Rate*
Carrier	$10,810	$6,014	$191	$353	$816	13.57%	43.28%
Pratt & Whitney	$9,650	$5,369	$412	$762	$1,316	24.51%	57.90%
Otis	$7,731	$4,301	$150	$277	$1,536	35.71%	18.06%
UTC Fire & Security	$10,022	$5,575	$95	$176	$336	6.03%	52.27%
Hamilton Sundstrand	$8,648	$4,811	$141	$261	$681	14.16%	38.26%
Sikorsky	$3,985	$2,217	$165	$305	$296	13.37%	102.95%

Estimated total reinvestment for UT as a company to be $2,134 million and have allocated that expense across divisions, based upon the cap ex in each division.

United Technologies, DCF valuation Growth Choices

Division	Cost of capital	*Return on capital*	*Reinvestment Rate*	*Expected growth*	*Length of growth period*	*Stable growth rate*	*Stable ROC*
Carrier	7.84%	13.57%	43.28%	5.87%	5	3%	7.84%
Pratt & Whitney	7.72%	24.51%	57.90%	14.19%	5	3%	12.00%
Otis	9.94%	35.71%	18.06%	6.45%	5	3%	14.00%
UTC Fire & Security	6.78%	6.03%	52.27%	3.15%	0	3%	6.78%
Hamilton Sundstrand	9.06%	14.16%	38.26%	5.42%	5	3%	9.06%
Sikorsky	9.82%	13.37%	102.95%	13.76%	5	3%	9.82%

United Technologies, DCF valuation
Values of the parts

Business	*Cost of capital*	*PV of FCFF*	*PV of Terminal Value*	*Value of Operating Assets*
Carrier	7.84%	$2,190	$9,498	$11,688
Pratt & Whitney	7.72%	$3,310	$27,989	$31,299
Otis	9.94%	$5,717	$14,798	$20,515
UTC Fire & Security	6.78%	$0	$4,953	$4,953
Hamilton Sundstrand	9.06%	$1,902	$6,343	$8,245
Sikorsky	9.82%	-$49	$3,598	$3,550
Sum				*$80,250*

Lesson 2: When you sum the part, take care of the loose ends

- Unallocated expenses: The operating income reported at the divisions/businesses of a company are based upon accounting allocation of corporate expenses. In addition to the allocations being arbitrary, you have to also take care of any unallocated expenses.
- Double counting: If there are intra corporate transactions that show up as revenues in one business and expenses in another or as borrowed money in one and lent money in the other, make sure that you are not double counting.
- Cash, Debt & Cross holdings: To the extent that the cash, debt or cross holdings are held at the parent level, you have to adjust for this before you estimate the value of equity in the business.

United Technologies: From DCF to value of equity

Value of the parts = $80,250

Value of corporate expenses

$$= \frac{\text{Corporate Expenses}_{\text{Current}}(1-t)(1+g)}{(\text{Cost of capital}_{\text{Company}} - g)} = \frac{408(1-.38)(1.03)}{(.0868-.03)} = \$\ 4{,}587$$

Value of operating assets (sum of parts DCF) = $75,663

+ Cash held in United Technologies = $ 4,327

- Debt in United Technologies = $12,919

- Value of equity options (employees) = $ 544

Value of equity in common stock = $66,527

Value of equity per share (942.29 m shares) = $70.60

Lesson 3: The conglomerate discount will take care of itself

- If you use a discounted cash flow approach, valuing the pieces and adding up to an aggregate value, you do not have to apply a conglomerate discount to the value, since your inputs should reflect the "inefficiencies" that lead to the discount.
- If you use a relative valuation (apply a peer-group multiple to each division's earnings, revenues or book value) to get to a sum of the parts valuation, you have to grapple with the question of how much of a discount to apply.

VIII. Valuing Companies across the ownership cycle

Reported income and balance sheet are heavily affected by tax considerations rather than information disclosure requirements. The line between the personal and business expenses is a fine one.

What is the **value added** by growth assets?
Equity: Growth in equity earnings/ cashflows
Firm: Growth in operating earnings/ cashflows

What are the **cashflows from existing assets**?
- Equity: Cashflows after debt payments
- Firm: Cashflows before debt payments

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

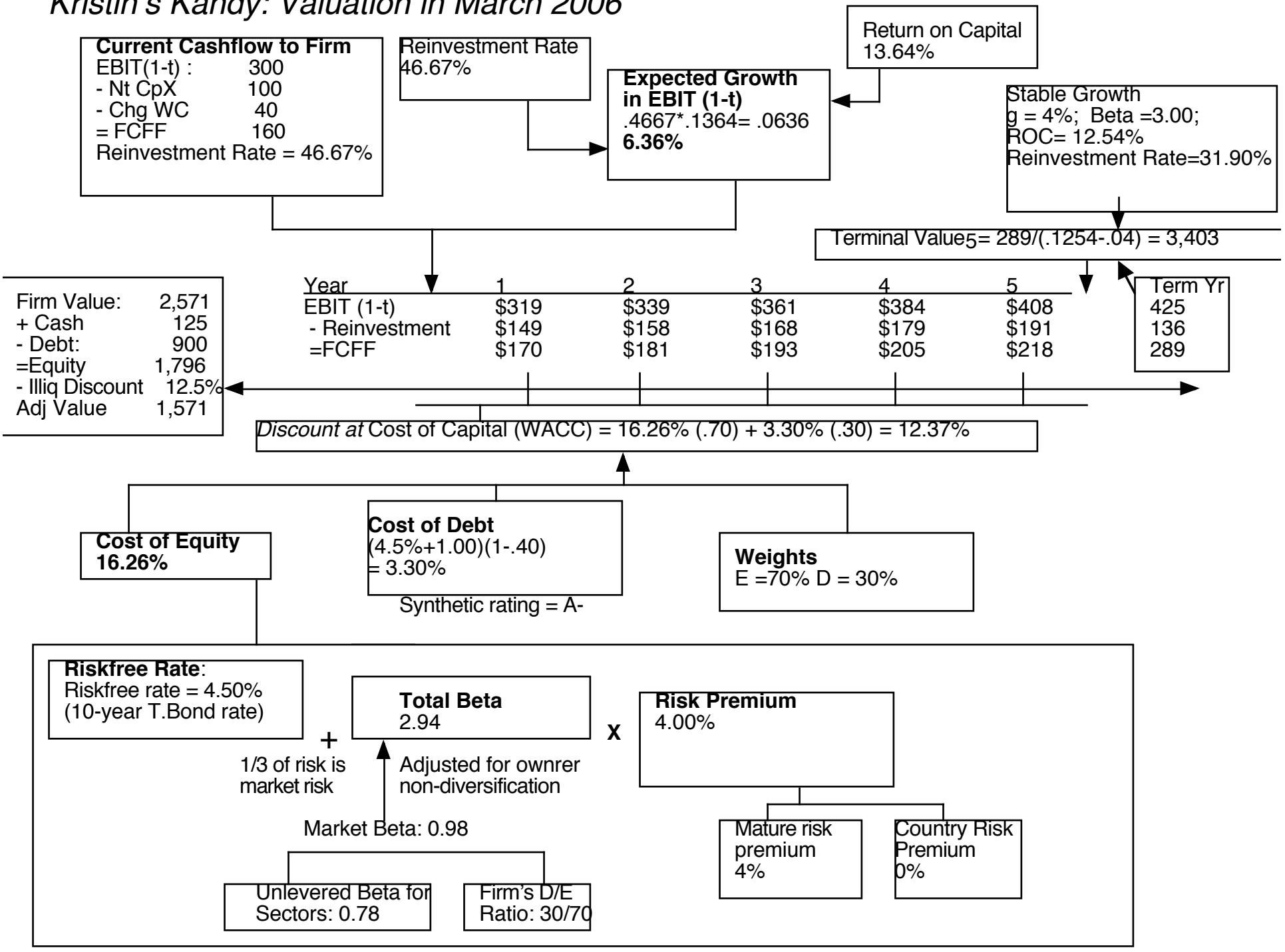
How **risky are the cash flows** from both existing assets and growth assets?
Equity: Risk in equity in the company
Firm: Risk in the firm's operations

Reversing investment mistakes is difficult to do. The need for and the cost of illiquidity has to be incorporated into current

Different buyers can perceive risk differently in the same private business, largely because what they see as risk will be a function of how diversified they are. The fall back positions of using market prices to extract risk measures does not

Many private businesses are finite life enterprises, not expected to last into perpetuity

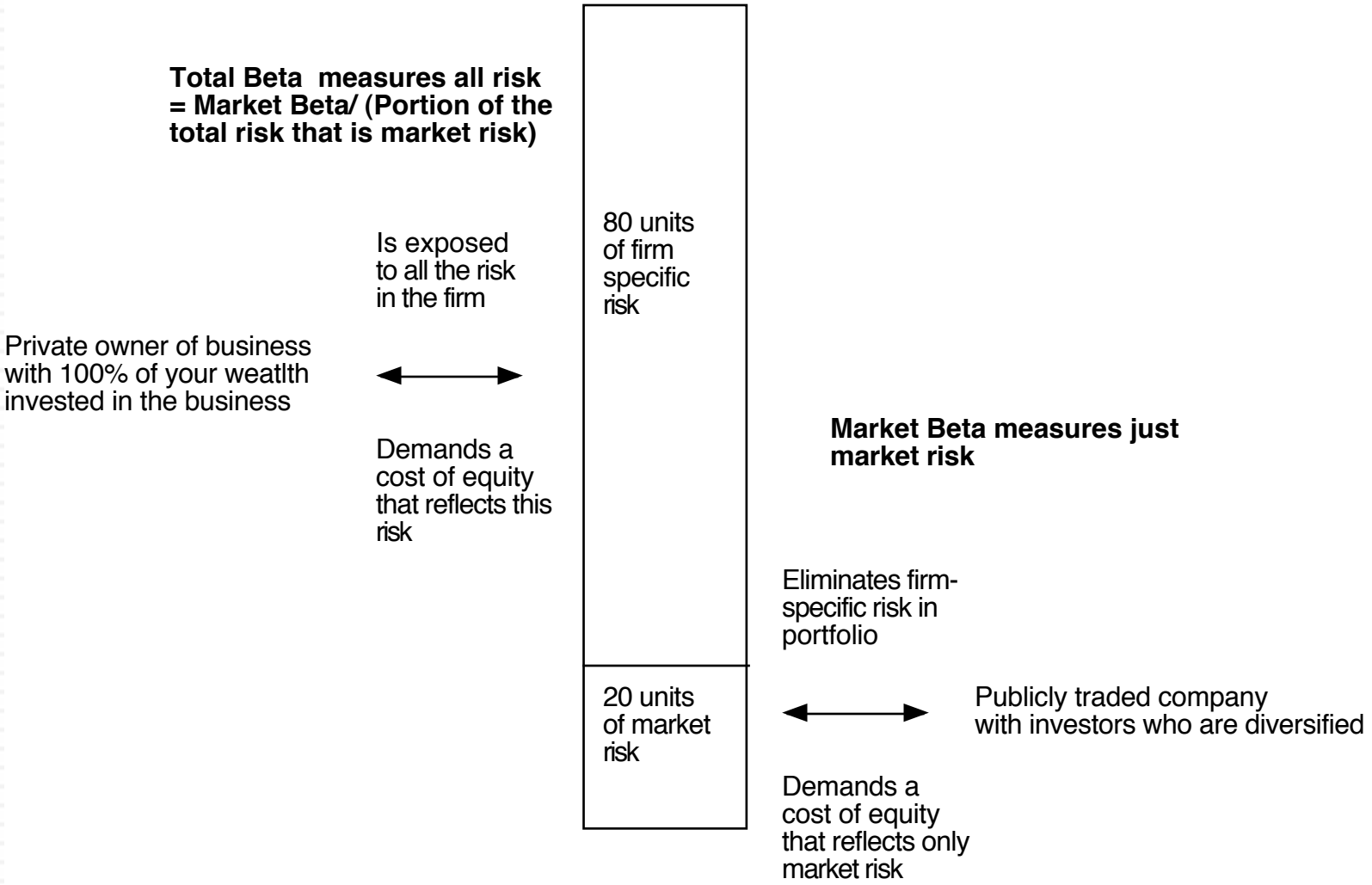
Kristin's Kandy: Valuation in March 2006



Lesson 1: In private businesses, risk in the eyes of the "beholder" (buyer)

Private business owner with entire wealth invested in the business	Venture capitalist, with multiple holdings in the sector.	Public company investor with diversified portfolio
Exposed to all risk in the company. Total beta measures exposure to total risk. Total Beta = Market Beta/ Correlation of firm with market	Partially diversified. Diversify away some firm specific risk but not all. Beta will fall berbetween total and market beta.	Firm-specific risk is diversified away. Market or macro risk exposure captured in a market beta or betas.

Private Owner versus Publicly Traded Company Perceptions of Risk in an Investment



Total Risk versus Market Risk

- Adjust the beta to reflect total risk rather than market risk. This adjustment is a relatively simple one, since the R squared of the regression measures the proportion of the risk that is market risk.
  - Total Beta = Market Beta / Correlation of the sector with the market
- To estimate the beta for Kristin Kandy, we begin with the bottom-up unlevered beta of food processing companies:
  - Unlevered beta for publicly traded food processing companies = 0.78
  - Average correlation of food processing companies with market = 0.333
  - Unlevered total beta for Kristin Kandy = 0.78/0.333 = 2.34
  - Debt to equity ratio for Kristin Kandy = 0.3/0.7 (assumed industry average)
  - Total Beta = 2.34 (1- (1-.40)(30/70)) = 2.94
  - Total Cost of Equity = 4.50% + 2.94 (4%) = 16.26%

Three assessment tools when the buyer falls in the middle…

- Build up: Start with cost of equity for a "diversified" investor and add premiums (based upon historical data) for other variables that capture the additional risk borne by "typical" buyer of a private business.
  - Strength: Numbers seem strong because they are backed up by data
  - Weakness: (1) Premiums are all from public markets (2) Double counting
- Total Beta plus: Look at potential buyer (what else the buyer has in his or her portfolio), assess the correlation of that portfolio with the market and estimate a "customized" total beta.
  - Strength: Ties the cost of equity to the buyer, as it should.
  - Weaknesses: (1) Buyers are under no obligation to give you this information (2) Treats private markets as extensions of public ones
- Survey: Find out what buyers of private businesses are demanding as a rate of return when they value private businesses.
  - Strength: Agnostic on risk and return models
  - Weakness: (1) Wide differences in what "required" means across survey respondents (2) Circular logic (3) Works if private capital markets are separate and unconnected to public markets.

Lesson 2: With financials, trust but verify..

- Different Accounting Standards: The accounting statements for private firms are often based upon different accounting standards than public firms, which operate under much tighter constraints on what to report and when to report.
- Intermingling of personal and business expenses: In the case of private firms, some personal expenses may be reported as business expenses.
- Separating "Salaries" from "Dividends": It is difficult to tell where salaries end and dividends begin in a private firm, since they both end up with the owner.
- The Key person issue: In some private businesses, with a personal component, the cashflows may be intertwined with the owner being part of the business.

Lesson 3: Illiquidity is a clear and present danger..

- In private company valuation, illiquidity is a constant theme. All the talk, though, seems to lead to a rule of thumb. The illiquidity discount for a private firm is between 20-30% and does not vary across private firms.
- But illiquidity should vary across:
  - Companies: Healthier and larger companies, with more liquid assets, should have smaller discounts than money-losing smaller businesses with more illiquid assets.
  - Time: Liquidity is worth more when the economy is doing badly and credit is tough to come by than when markets are booming.
  - Buyers: Liquidity is worth more to buyers who have shorter time horizons and greater cash needs than for longer term investors who don't need the cash and are willing to hold the investment.

The "standard" approaches to estimating illiquidity discounts…

- Restricted stock: These are stock issued by publicly traded companies to the market that bypass the SEC registration process but the stock cannot be traded for one year after the issue.
- Pre-IPO transactions: These are transactions prior to initial public offerings where equity investors in the private firm buy (sell) each other's stakes.
- In both cases, the discount is estimated the be the difference between the market price of the liquid asset and the observed transaction price of the illiquid asset.
  - Discount Restricted stock = Stock price – Price on restricted stock offering
  - DiscountIPO = IPO offering price – Price on pre-IPO transaction

The "alternative" approaches

- Bid-ask spreads: All traded assets are illiquid. The bid ask spread, measuring the difference between the price at which you can buy and sell the asset at the same point in time is the illiquidity measure. I few can extrapolate what we know about bid ask spreads with public companies into the private company space, we could have a more dynamic, complete measure of illiquidity.
  - Spread = 0.145 – 0.0022 ln (Annual Revenues) -0.015 (DERN) – 0.016 (Cash/Firm Value) – 0.11 ($ Monthly trading volume/ Firm Value)
- Option pricing: Liquidity can be viewed as a put option, where you get the right to sell at the prevailing market price. Illiquidity can therefore be viewed as the loss of this put option.

V. VALUE, PRICE AND INFORMATION: CLOSING THE DEAL

Are you valuing or pricing?

Tools for intrinsic analysis
- Discounted Cashflow Valuation (DCF)
- Intrinsic multiples
- Book value based approaches
- Excess Return Models

Tools for "the gap"
- Behavioral finance
- Price catalysts

Tools for pricing
- Multiples and comparables
- Charting and technical indicators
- Pseudo DCF

Value of cashflows, adjusted for time and risk

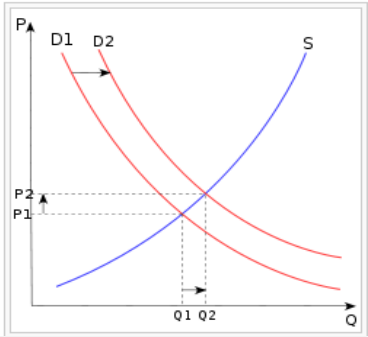
INTRINSIC VALUE

Value

THE GAP
Is there one?
Will it close?

Price

PRICE

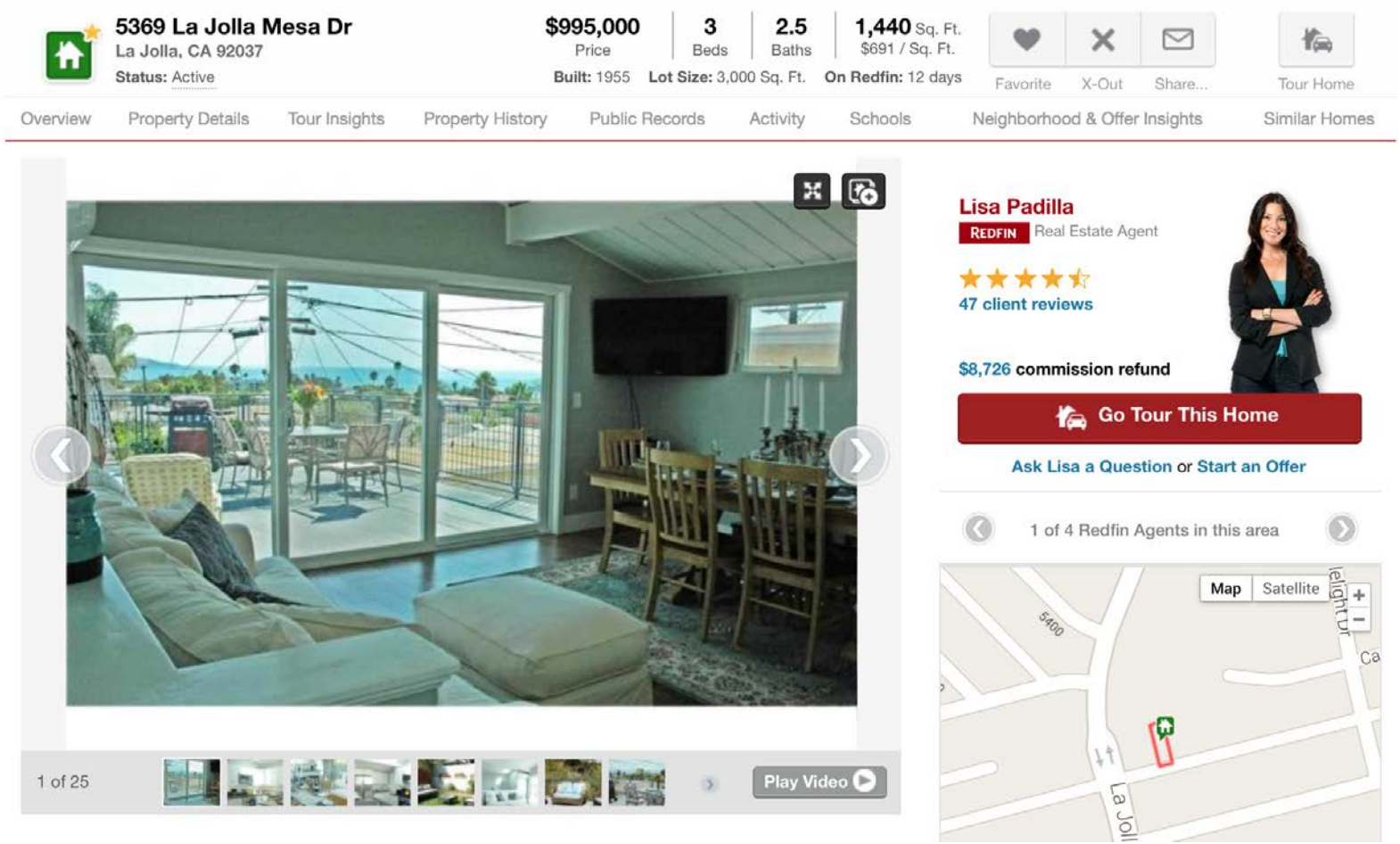


Drivers of intrinsic value
- Cashflows from existing assets
- Growth in cash flows
- Quality of Growth

Drivers of "the gap"
- Information
- Liquidity
- Corporate governance

Drivers of price
- Market moods & momentum
- Surface stories about fundamentals

Test 1: Are you pricing or valuing?



Test 2: Are you pricing or valuing?

286

Rating
Buy

Europe
Switzerland

Biotechnology
Biotechnology

Company
BB BIOTECH

Reuters	Bloomberg	Exchange	Ticker
BION.S	BION SW	SWX	BION

Date
13 August 2013

Forecast Change

Price at 12 Aug 2013 (CHF)	124.00
Price Target (CHF)	164.50
52-week range (CHF)	128.40 - 84.90

Strong sector and stock-picking continue

Impressive performance
Over the past two years, BB Biotech shares have roughly tripled, which could tempt investors to take profits. However, this performance has been well backed by a deserved revival of the biotech industry, encouraging fundamental news, M&A, and increased money flow into health care stocks. In addition, BBB returned to index outperformance by modifying its stock-picking approach. Hence, despite excellent performance, the shares still trade at a 23% discount to the net asset value of the portfolio. Hence, the shares are an attractive value vehicle to capture growth opportunities in an attractive sector.

Biotech industry remains attractive
With the re-rating of the pharma sector, investors have also showed increased interest in biotech stocks. Established biotech stocks have delivered encouraging financial results and approvals, while there has also been substantial industry consolidation, which is not surprising in times of "cheap" money and high liquidity. BB Biotech remains an attractive vehicle to capture the future potential of the biotech sector. In addition, investors benefit from a 23% discount to NAV and attractive cash distribution policy of 5% yield p.a. Hence, we reiterate our Buy on BB Biotech shares.

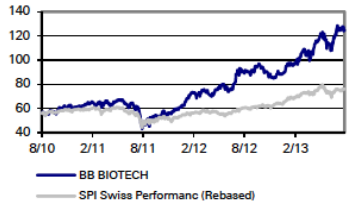
BB Biotech shares remain attractive
In the first 6M of 2013, BB Biotech increased its NAV by 36%, which marks good outperformance against the Nasdaq Biotech Index (NBI)'s 27%. This is a remarkable performance after 2012, when BBB's NAV increase of 45% also

Key changes

Target Price	106.50 to 164.50	↑	54.5%

Source: Deutsche Bank

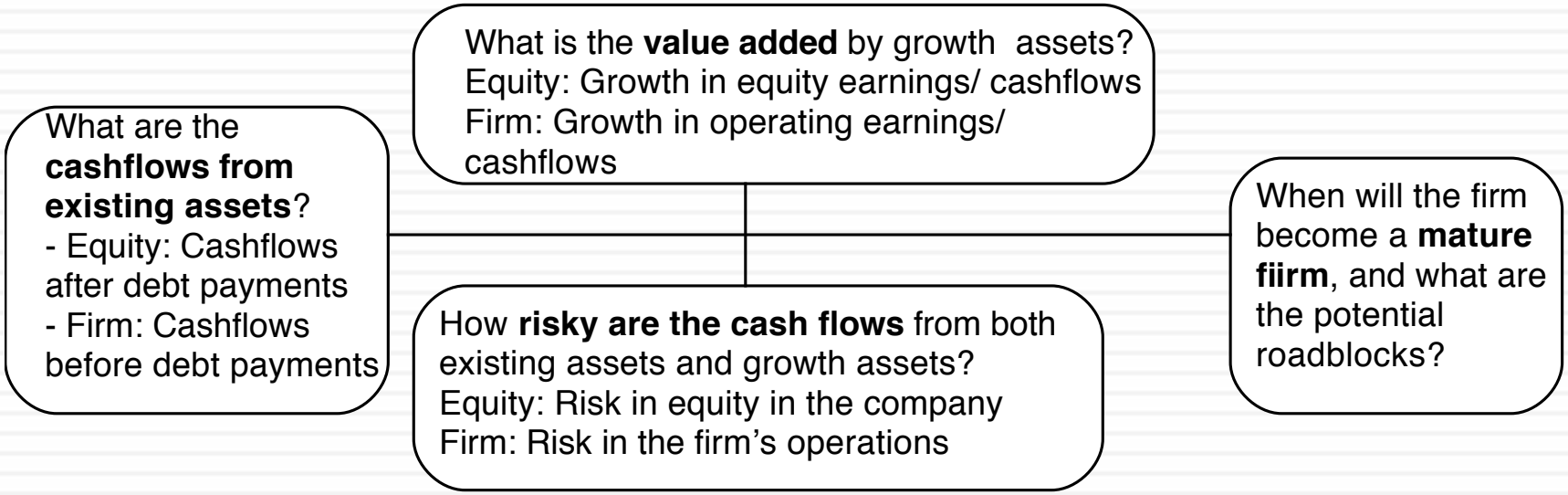
Price/price relative



Performance (%)	1m	3m	12m
Absolute	-1.4	5.4	37.4
SPI Swiss Performance IX	0.5	-1.4	26.4

Source: Deutsche Bank

The drivers of value



The determinants of price

Mood and Momentum
Price is determined in large part by mood and momentum, which, in turn, are driven by behavioral factors (panic, fear, greed).

Liquidity & Trading Ease
While the value of an asset may not change much from period to period, liquidity and ease of trading can, and as it does, so will the price.

The Market Price

Incremental information
Since you make money on price changes, not price levels, the focus is on incremental information (news stories, rumors, gossip) and how it measures up, relative to expectations

Group Think
To the extent that pricing is about gauging what other investors will do, the price can be determined by the "herd".

Three views of "the gap"

	View of the gap	Investment Strategies
The Efficient Marketer	The gaps between price and value, if they do occur, are random.	Index funds
The "value" extremist	You view pricers as dilettantes who will move on to fad and fad. Eventually, the price will converge on value.	Buy and hold stocks where value < price
The pricing extremist	Value is only in the heads of the "eggheads". Even if it exists (and it is questionable), price may never converge on value.	(1) Look for mispriced securities. (2) Get ahead of shifts in demand/momentum.

The “pricers” dilemma..

- No anchor: If you do not believe in intrinsic value and make no attempt to estimate it, you have no moorings when you invest. You will therefore be pushed back and forth as the price moves from high to low. In other words, everything becomes relative and you can lose perspective.
- Reactive: Without a core measure of value, your investment strategy will often be reactive rather than proactive.
- Crowds are fickle and tough to get a read on: The key to being successful as a pricer is to be able to read the crowd mood and to detect shifts in that mood early in the process. By their nature, crowds are tough to read and almost impossible to model systematically.

The valuer's dilemma and ways of dealing with it…

- Uncertainty about the magnitude of the gap:
  - Margin of safety: Many value investors swear by the notion of the "margin of safety" as protection against risk/uncertainty.
  - Collect more information: Collecting more information about the company is viewed as one way to make your investment less risky.
  - Ask what if questions: Doing scenario analysis or what if analysis gives you a sense of whether you should invest.
  - Confront uncertainty: Face up to the uncertainty, bring it into the analysis and deal with the consequences.
- Uncertainty about gap closing: This is tougher and you can reduce your exposure to it by
  - Lengthening your time horizon
  - Providing or looking for a catalyst that will cause the gap to close.

Option 1: Margin of Safety

- The margin of safety (MOS) is a buffer that you build into your investment decisions to protect yourself from investment mistakes. Thus, if your margin of safety is 30%, you will buy a stock only if the price is more than 30% below its "intrinsic" value.
- While value investors use the "margin of safety" as a shield against risk, keep in mind that:
  - MOS comes into play at the end of the investment process, not at the beginning.
  - MOS does not substitute for risk assessment and intrinsic valuation, but augments them.
  - The MOS cannot and should not be a fixed number, but should be reflective of the uncertainty in the assessment of intrinsic value.
  - Being too conservative can be damaging to your long term investment prospects. Too high a MOS can hurt you as an investor.

Option 2: Collect more information/ Do your homework

- There is a widely held view among value investors that they are not as exposed to risk as the rest of the market, because they do their homework, poring over financial statements or using ratios to screen for risky stocks. Put simply, they are assuming that the more they know about an investment, the less risky it becomes.
- That may be true from some peripheral risks and a few firm specific risks, but it definitely is not for the macro risks. You cannot make a cyclical company less cyclical by studying it more or take the nationalization risk out of Venezuelan company by doing more research.

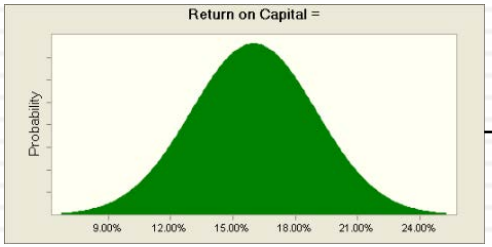
  Implication 1: The need for diversification does not decrease just because you are a value investor who picks stocks with much research and care.

  Implication 2: There is a law of diminishing returns to information. At a point, additional information will only serve to distract you.

Option 3: Build What-if analyses

- A valuation is a function of the inputs you feed into the valuation. To the degree that you are pessimistic or optimistic on any of the inputs, your valuation will reflect it.
- There are three ways in which you can do what-if analyses
  - Best-case, Worst-case analyses, where you set all the inputs at their most optimistic and most pessimistic levels
  - Plausible scenarios: Here, you define what you feel are the most plausible scenarios (allowing for the interaction across variables) and value the company under these scenarios
  - Sensitivity to specific inputs: Change specific and key inputs to see the effect on value, or look at the impact of a large event (FDA approval for a drug company, loss in a lawsuit for a tobacco company) on value.
- *Proposition 1: As a general rule, what-if analyses will yield large ranges for value, with the actual price somewhere within the range.*

Option 4: Confront uncertainty Simulations – The Amgen valuation



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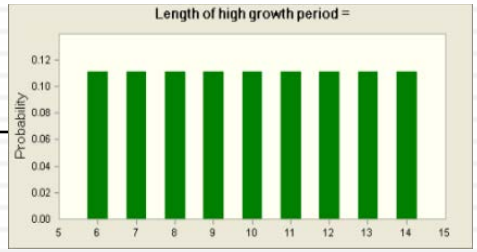
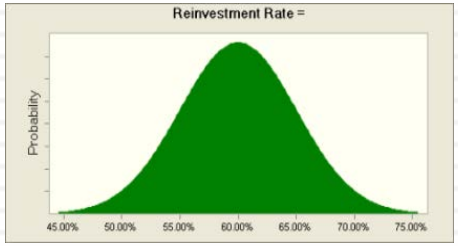
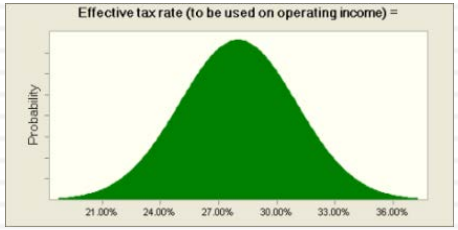
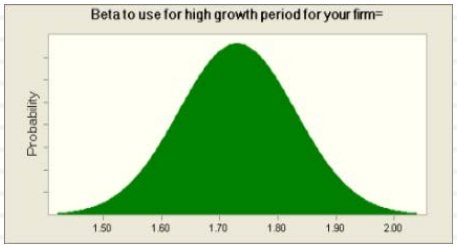
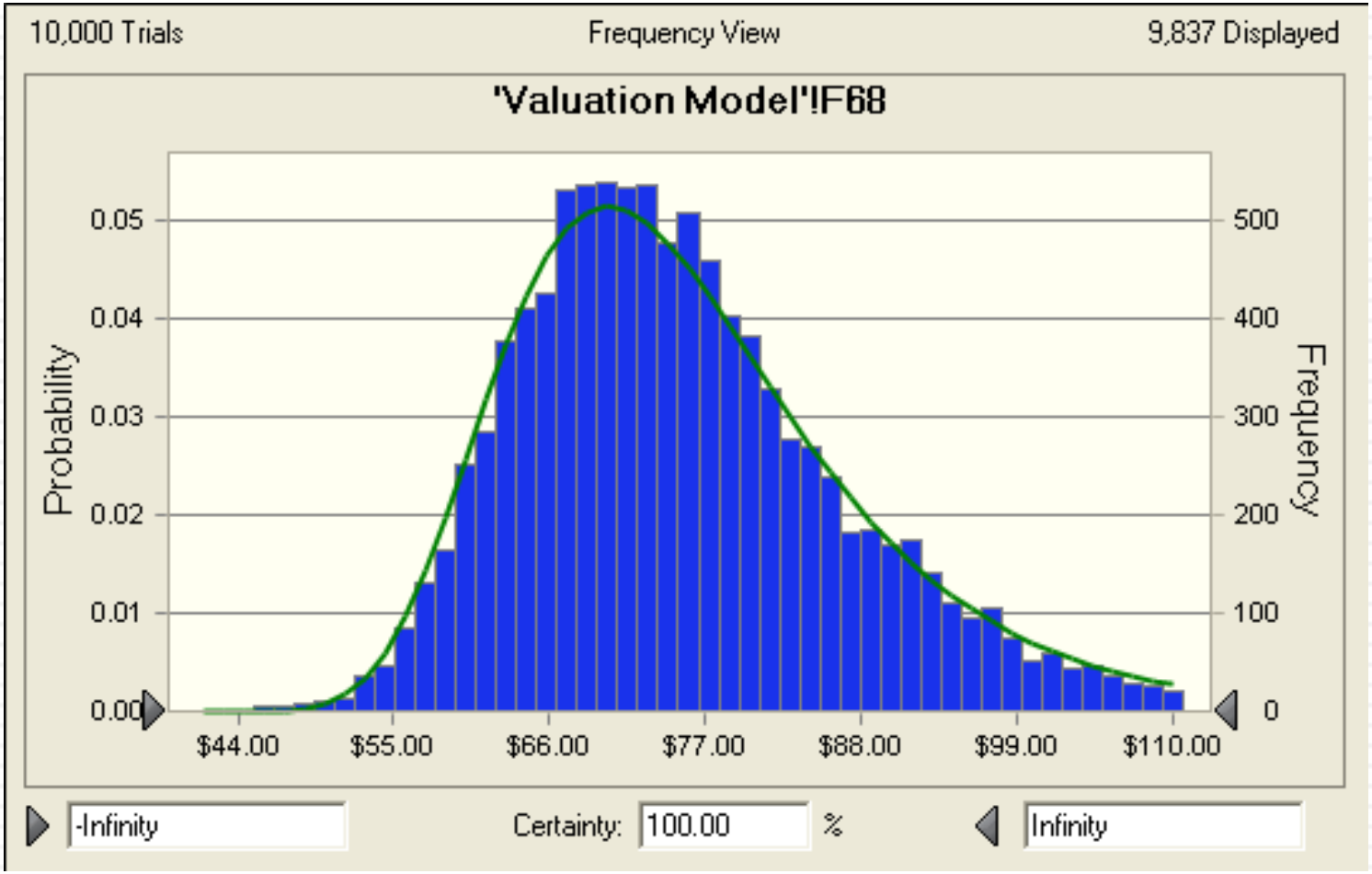








The Simulated Values of Amgen: What do I do with this output?



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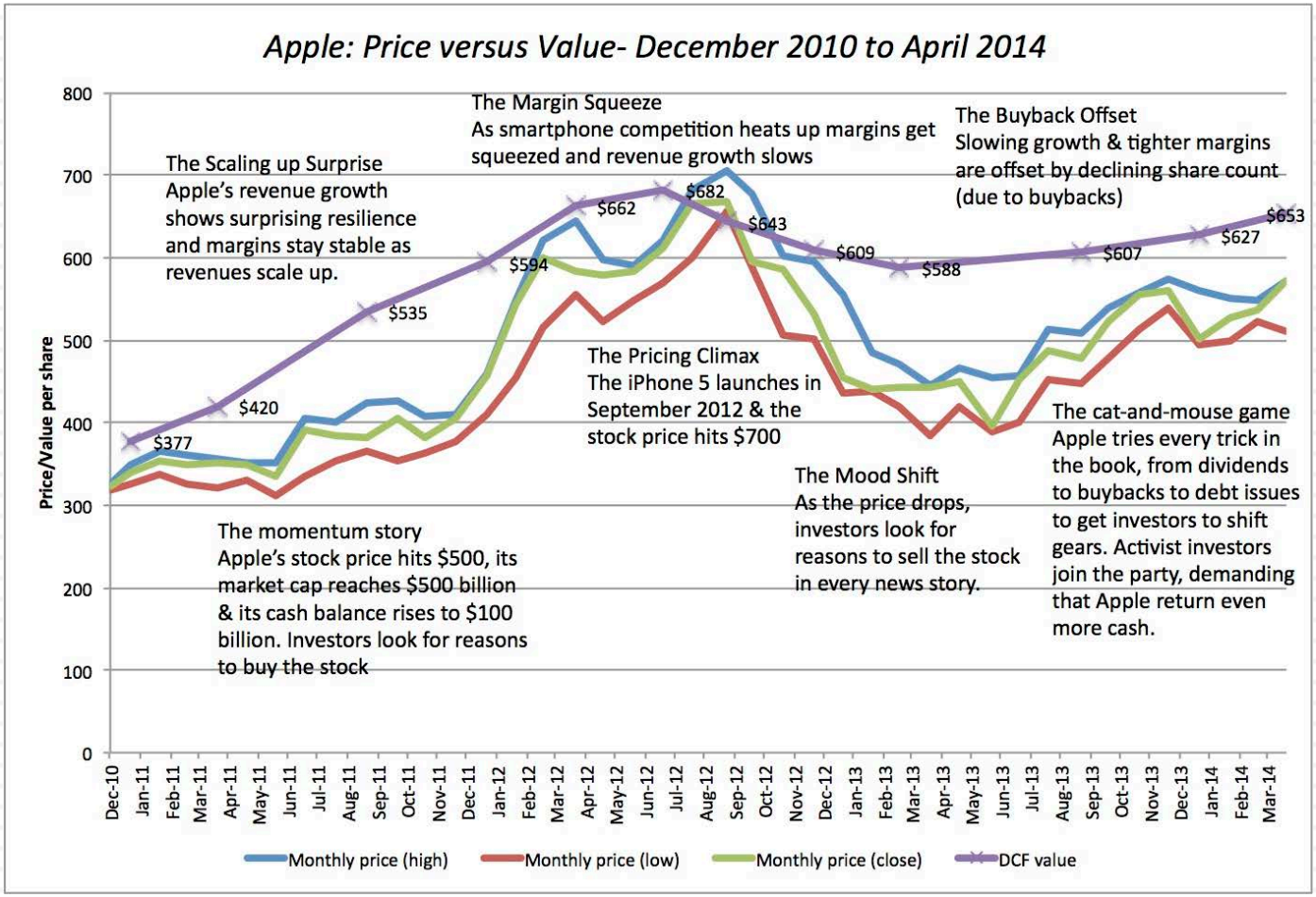
Strategies for managing the risk in the "closing" of the gap

- The "karmic" approach: In this one, you buy (sell short) under (over) valued companies and sit back and wait for the gap to close. You are implicitly assuming that given time, the market will see the error of its ways and fix that error.
- The catalyst approach: For the gap to close, the price has to converge on value. For that convergence to occur, there usually has to be a catalyst.
  - If you are an activist investor, you may be the catalyst yourself. In fact, your act of buying the stock may be a sufficient signal for the market to reassess the price.
  - If you are not, you have to look for other catalysts. Here are some to watch for: a new CEO or management team, a "blockbuster" new product or an acquisition bid where the firm is targeted.

An example: Apple – Price versus Value (my estimates) from 2011 to 2014



RELATIVE VALUATION

The Essence of relative valuation?

- In relative valuation, the value of an asset is compared to the values assessed by the market for similar or comparable assets.
- To do relative valuation then,
  - we need to identify comparable assets and obtain market values for these assets
  - convert these market values into standardized values, since the absolute prices cannot be compared This process of standardizing creates price multiples.
  - compare the standardized value or multiple for the asset being analyzed to the standardized values for comparable asset, controlling for any differences between the firms that might affect the multiple, to judge whether the asset is under or over valued

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 Market Imperative….

- Relative valuation is much more likely to reflect market perceptions and moods than discounted cash flow valuation. This can be an advantage when it is important that the price reflect these perceptions as is the case when
  - the objective is to sell a security at that price today (as in the case of an IPO)
  - investing on "momentum" based strategies
- With relative valuation, there will always be a significant proportion of securities that are under valued and over valued.
- Since portfolio managers are judged based upon how they perform on a relative basis (to the market and other money managers), relative valuation is more tailored to their needs
- Relative valuation generally requires less information than discounted cash flow valuation (especially when multiples are used as screens)

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.

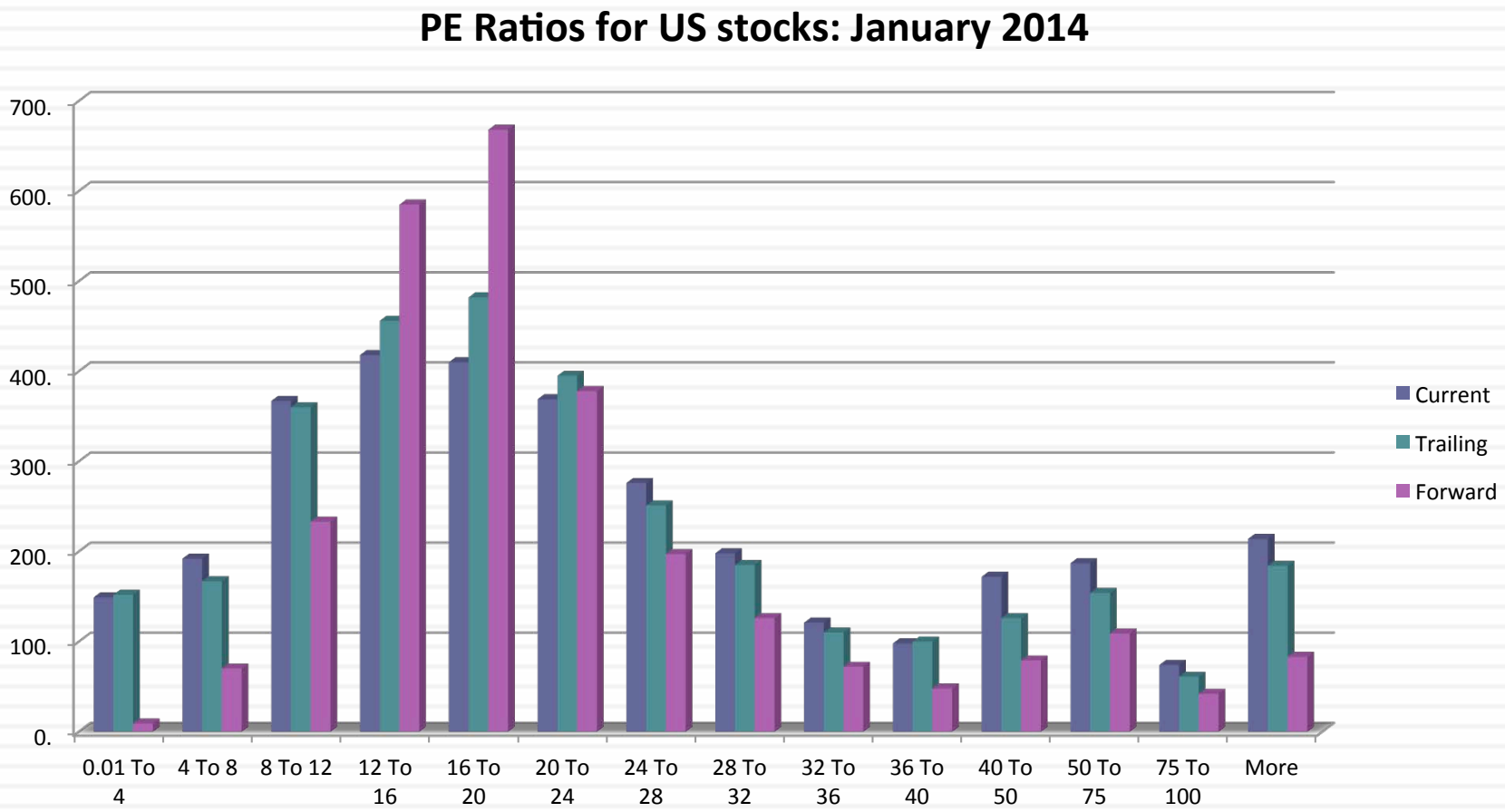
$$\frac{\text{Enterprise Value}}{\text{EBITDA}} = \frac{\text{Market Value of Equity} + \text{Market Value of Debt} - \text{Cash}}{\text{Earnings before Interest, Taxes and Depreciation}}$$

- 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?

1. Multiples have skewed distributions…



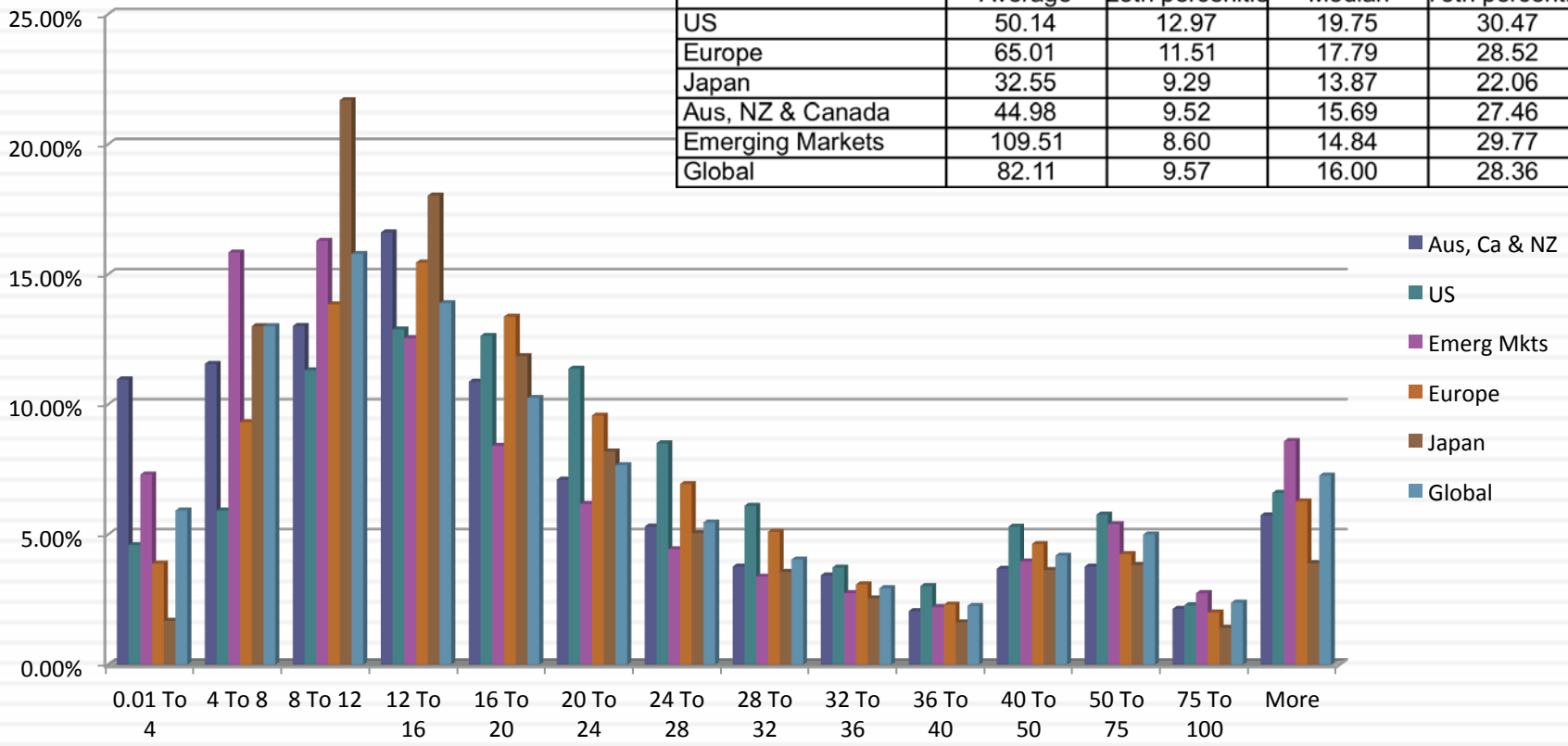
2. Making statistics "dicey"

	Current PE	*Trailing PE*	*Forward PE*
Number of firms	*7766*	*7766*	*7766*
Number with PE	3248	3186	2699
Average	52.13	50.14	38.62
Median	20.78	19.75	18.54
Minimum	0.25	0.4	0.52
Maximum	7,117.43	7,117.43	16,820.
Standard deviation	242.03	249.64	349.38
Standard error	4.25	4.42	6.72
Skewness	18.29	17.62	42.99
25th percentile	13.004	12.97	14.7
75th percentile	33.66	30.47	25.13

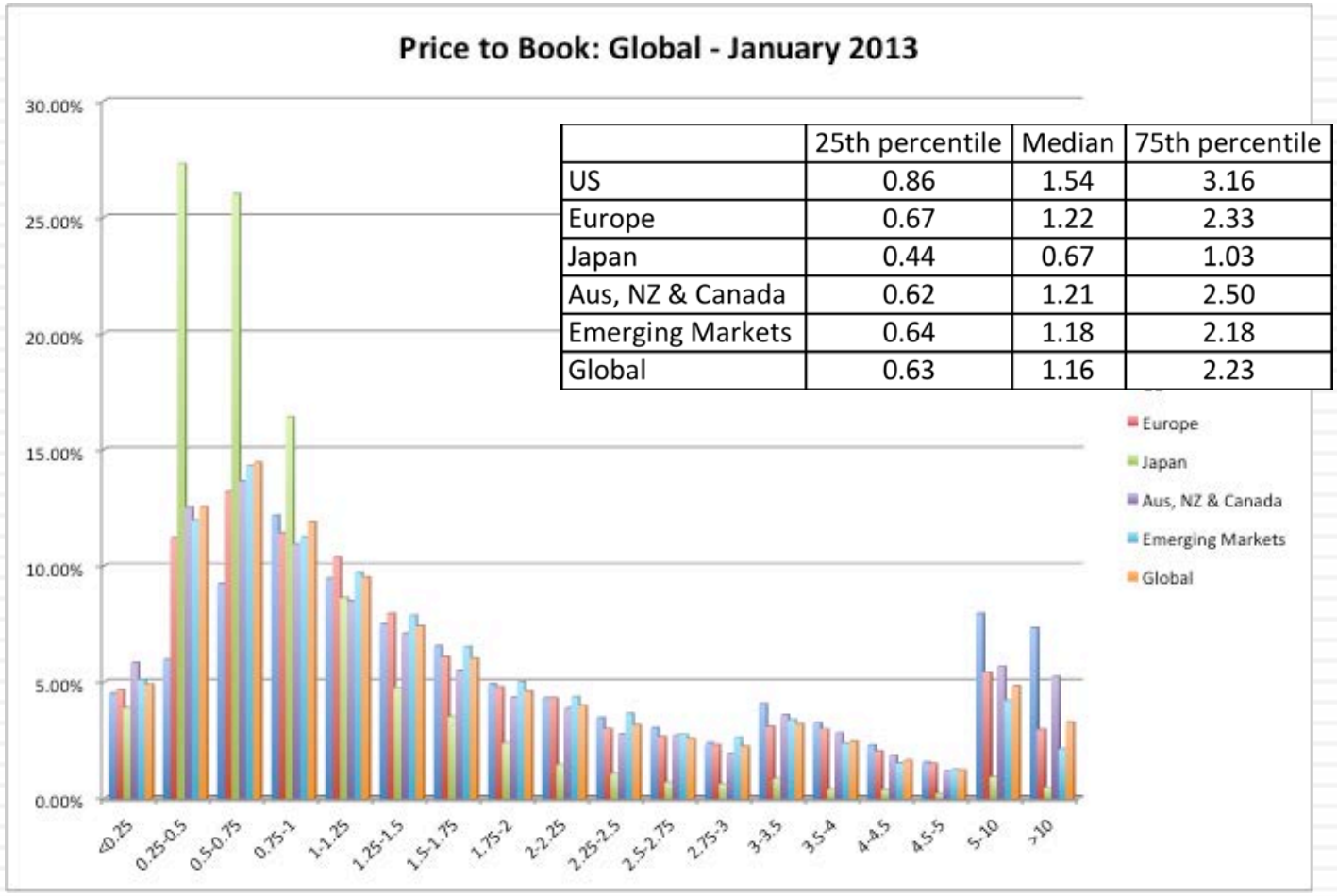
3. Markets have a lot in common
PE Ratios: January 2014

PE Ratio Distribution: Global Comparison in January 2014

	Average	25th percenitle	Median	75th percentile
US	50.14	12.97	19.75	30.47
Europe	65.01	11.51	17.79	28.52
Japan	32.55	9.29	13.87	22.06
Aus, NZ & Canada	44.98	9.52	15.69	27.46
Emerging Markets	109.51	8.60	14.84	29.77
Global	82.11	9.57	16.00	28.36

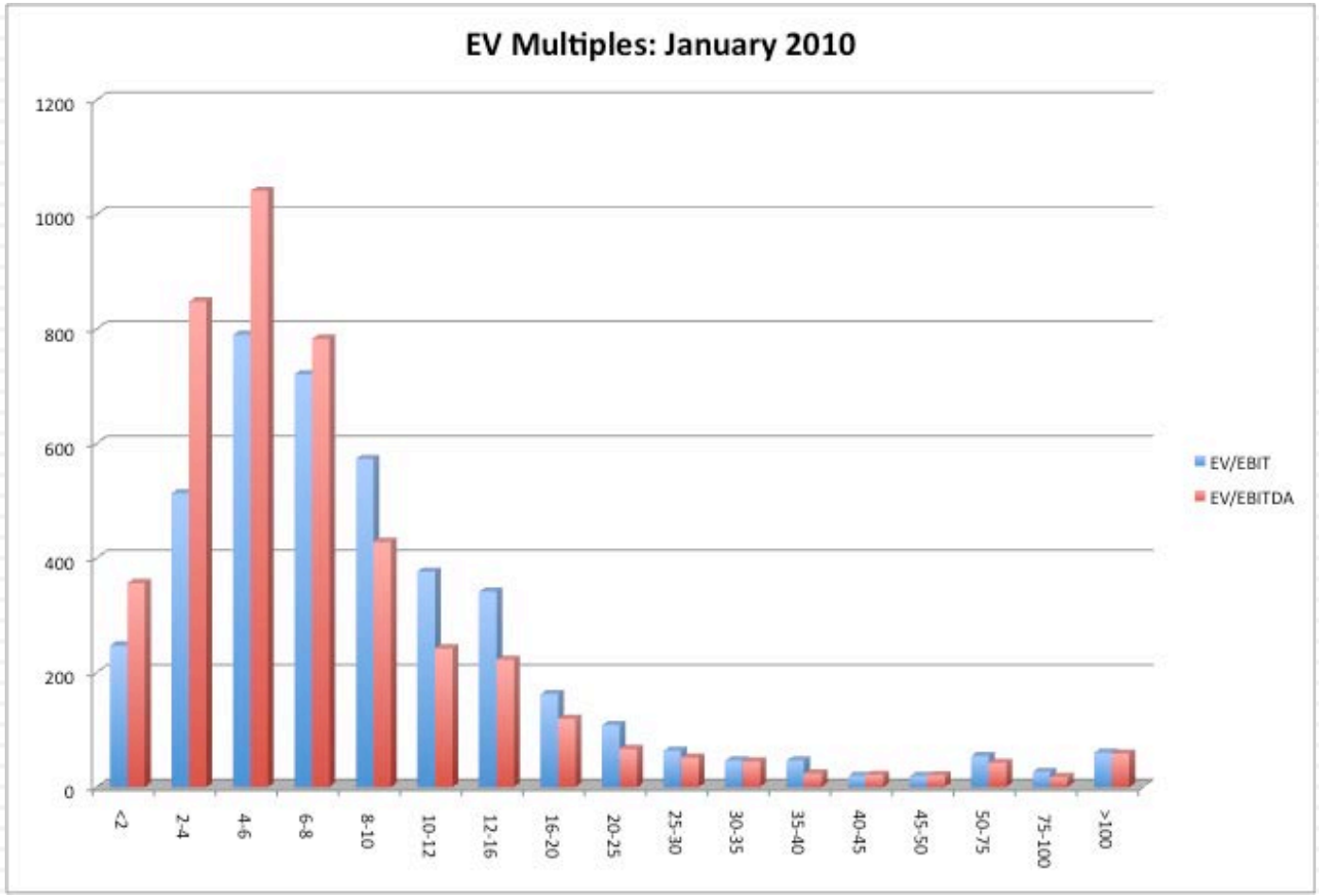


3a. And the differences are revealing…
Price to Book Ratios across globe – January 2013



	25th percentile	Median	75th percentile
US	0.86	1.54	3.16
Europe	0.67	1.22	2.33
Japan	0.44	0.67	1.03
Aus, NZ & Canada	0.62	1.21	2.50
Emerging Markets	0.64	1.18	2.18
Global	0.63	1.16	2.23

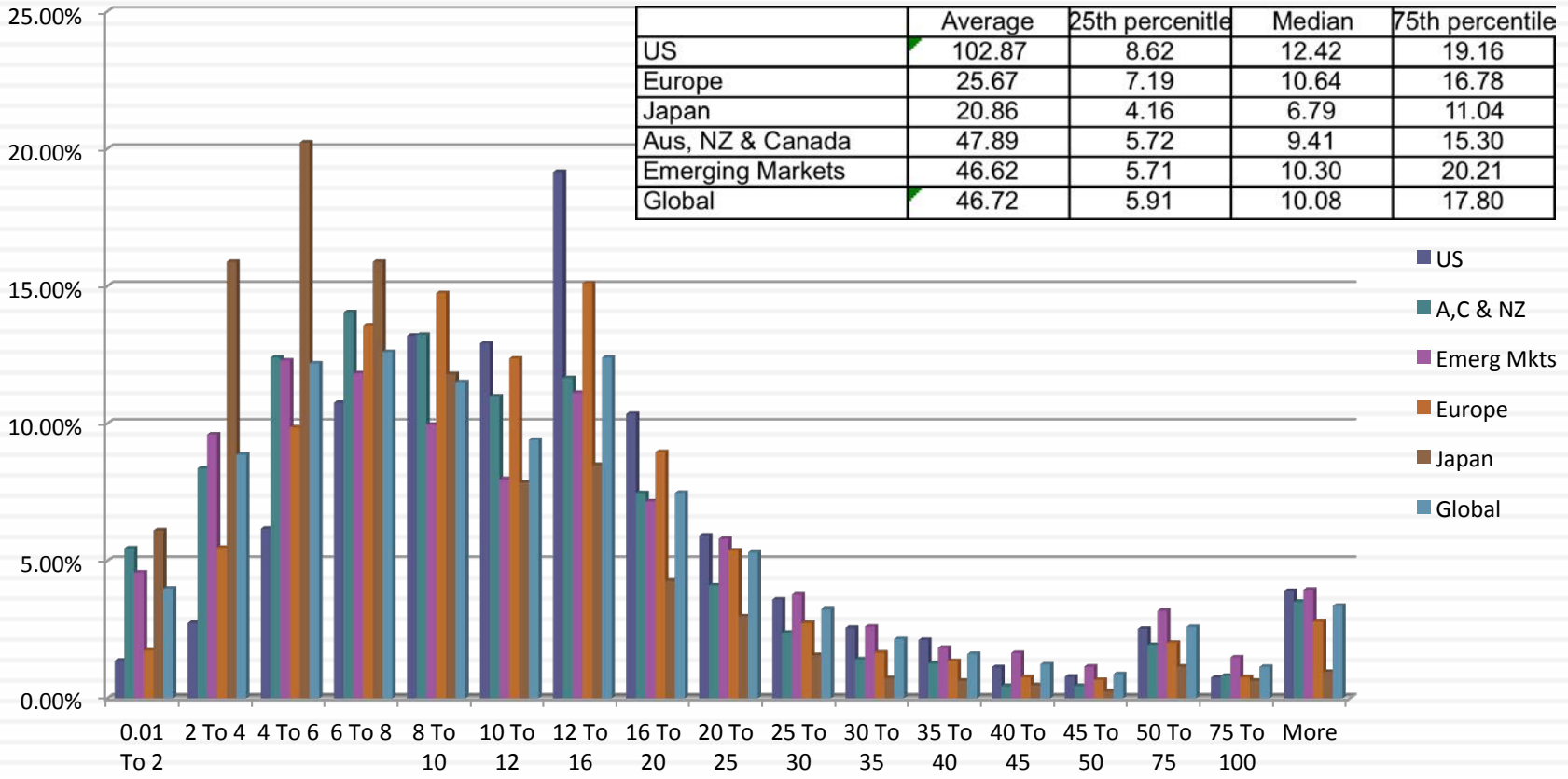
4. Simplistic rules almost always break down…6 times EBITDA was not cheap in 2010



But it may be in 2014, unless you are in Japan or in some emerging markets…

EV/EBITDA: A Global Comparison - January 2014

	Average	25th percenitle	Median	75th percentile
US	102.87	8.62	12.42	19.16
Europe	25.67	7.19	10.64	16.78
Japan	20.86	4.16	6.79	11.04
Aus, NZ & Canada	47.89	5.72	9.41	15.30
Emerging Markets	46.62	5.71	10.30	20.21
Global	46.72	5.91	10.08	17.80



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.

A Simple Analytical device

Equity Multiple or Firm Multiple

Equity Multiple

1. Start with an equity DCF model (a dividend or FCFE model)

$$P_0 = \frac{DPS_1}{r - g_n} \qquad P_0 = \frac{FCFE_1}{\text{Cost of equity} - g_n}$$

2. Isolate the denominator of the multiple in the model
3. Do the algebra to arrive at the equation for the multiple

Firm Multiple

1. Start with a firm DCF model (a FCFF model)

$$EV_0 = \frac{FCFF_1}{\text{Cost of capital} - g_n}$$

2. Isolate the denominator of the multiple in the model
3. Do the algebra to arrive at the equation for 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,

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

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

Using the Fundamental Model to Estimate PE For a High Growth Firm

- The price-earnings ratio for a high growth firm can also be related to fundamentals. In the special case of the two-stage dividend discount model, this relationship can be made explicit fairly simply:

$$P_0 = \frac{EPS_0 * \text{Payout Ratio} * (1+g) * \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)}{r-g} + \frac{EPS_0 * \text{Payout Ratio}_n * (1+g)^n * (1+g_n)}{(r-g_n)(1+r)^n}$$

  - For a firm that does not pay what it can afford to in dividends, substitute FCFE/Earnings for the payout ratio.

- Dividing both sides by the earnings per share:

$$\frac{P_0}{EPS_0} = \frac{\text{Payout Ratio} * (1+g) * \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)}{r-g} + \frac{\text{Payout Ratio}_n * (1+g)^n * (1+g_n)}{(r-g_n)(1+r)^n}$$

A Simple Example

- Assume that you have been asked to estimate the PE ratio for a firm which has the following characteristics:

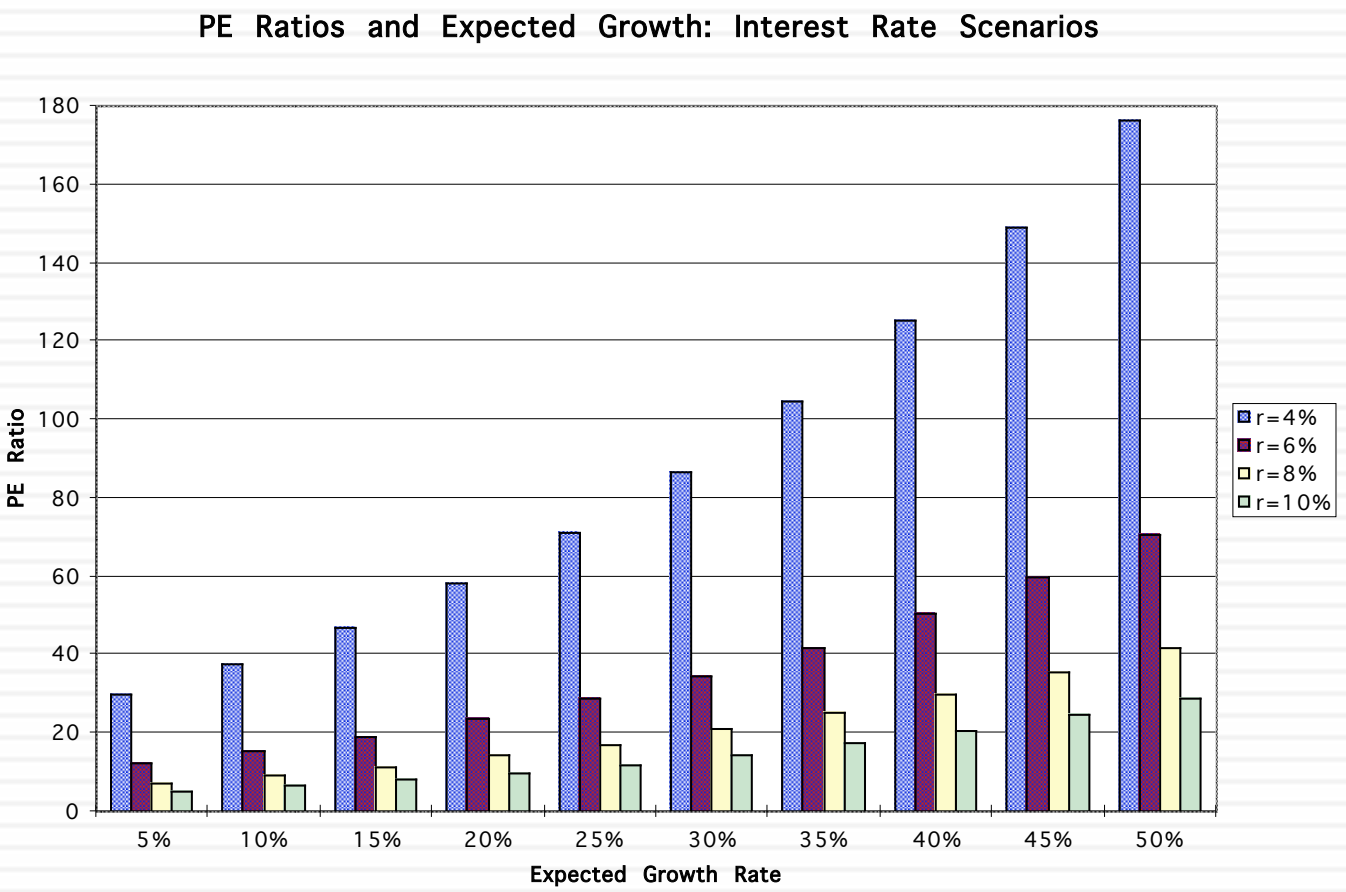
Variable	High Growth Phase	Stable Growth Phase
Expected Growth Rate	25%	8%
Payout Ratio	20%	50%
Beta	1.00	1.00
Number of years	5 years	Forever after year 5

Riskfree rate = T.Bond Rate = 6%

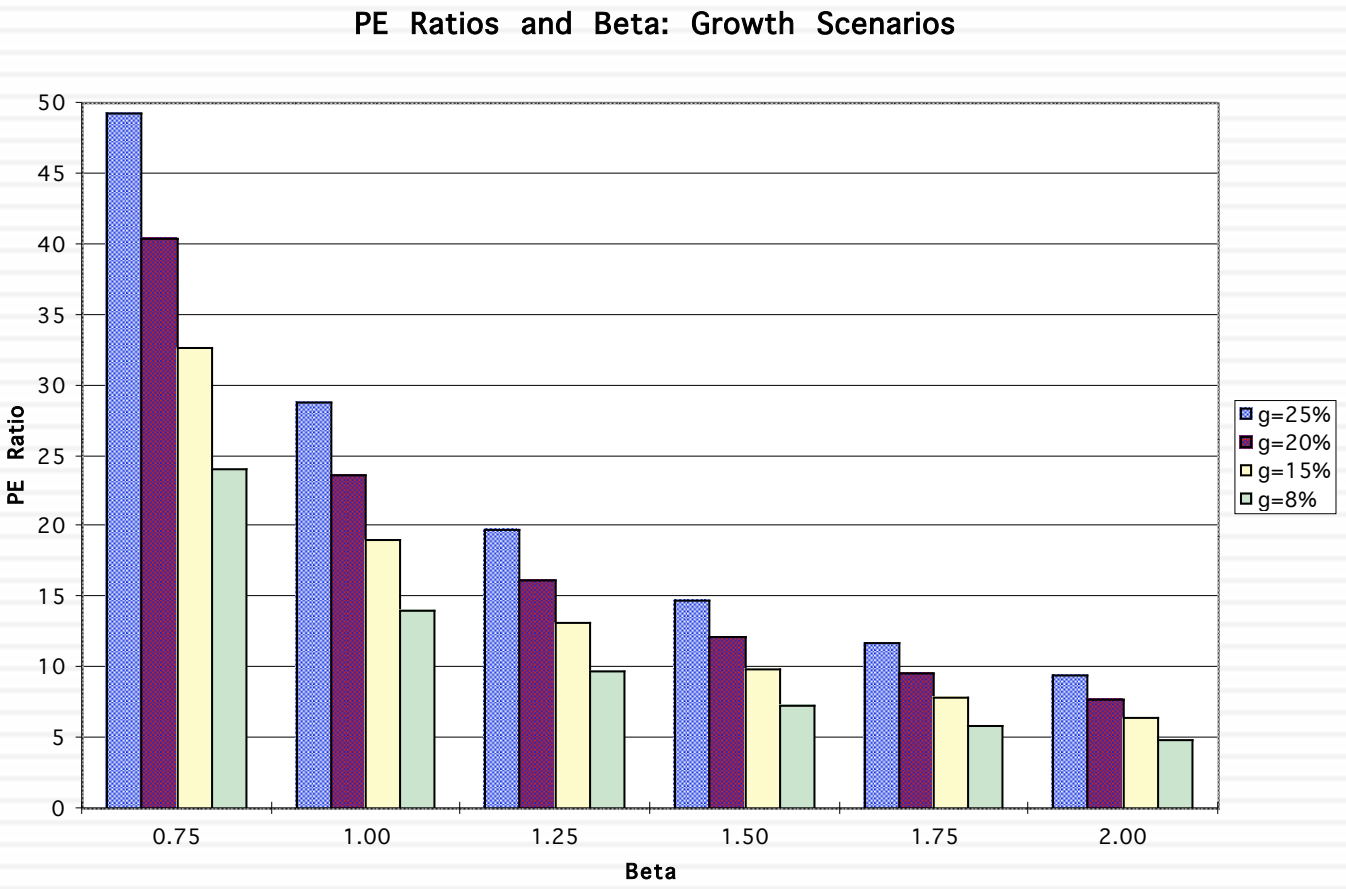
Required rate of return = 6% + 1(5.5%)= 11.5%

$$PE = \frac{0.2 * (1.25) * \left(1 - \frac{(1.25)^5}{(1.115)^5}\right)}{(.115 - .25)} + \frac{0.5 * (1.25)^5 * (1.08)}{(.115 - .08)(1.115)^5} = 28.75$$

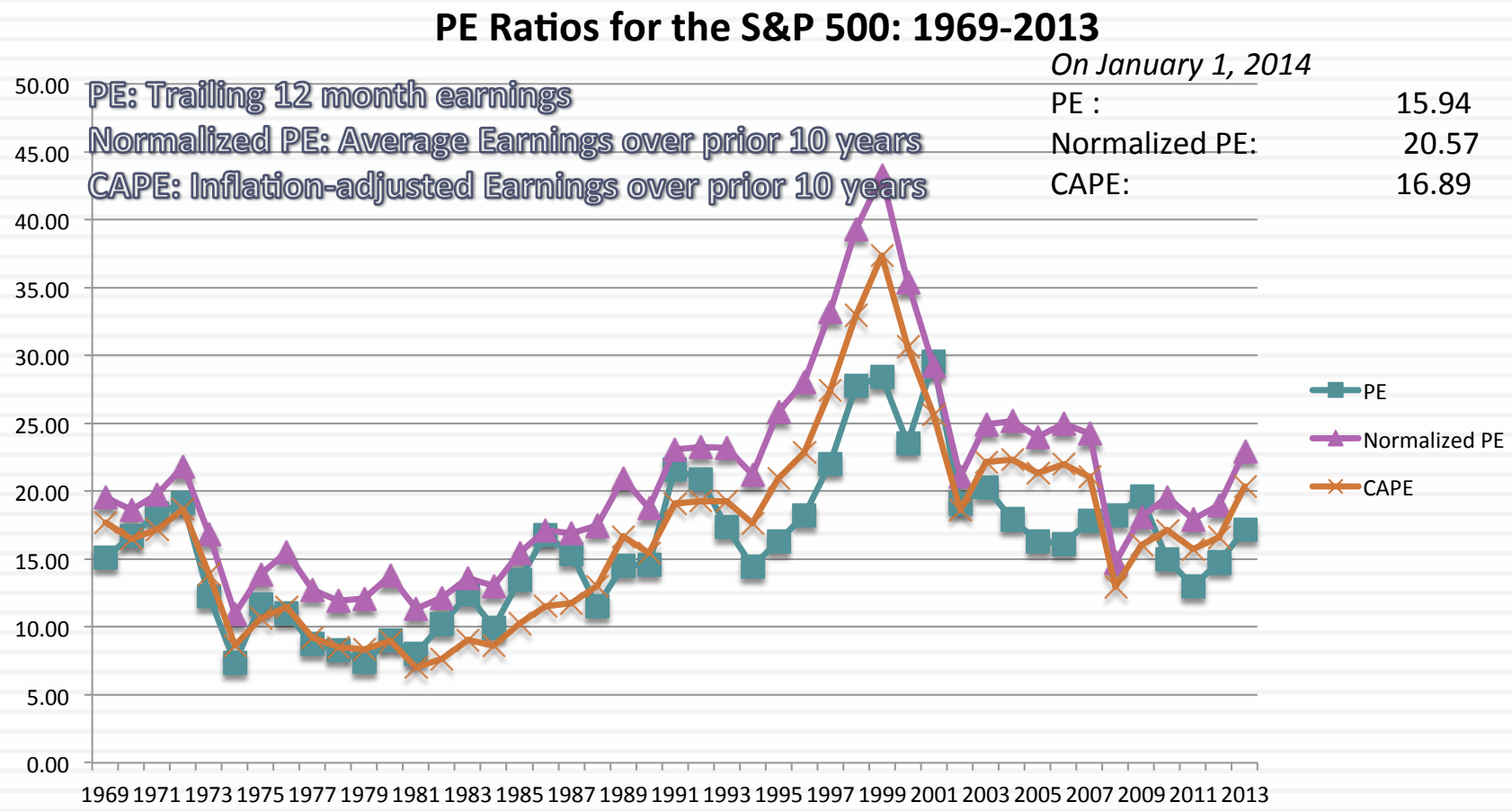
a. PE and Growth: Firm grows at x% for 5 years, 8% thereafter



b. PE and Risk: A Follow up Example



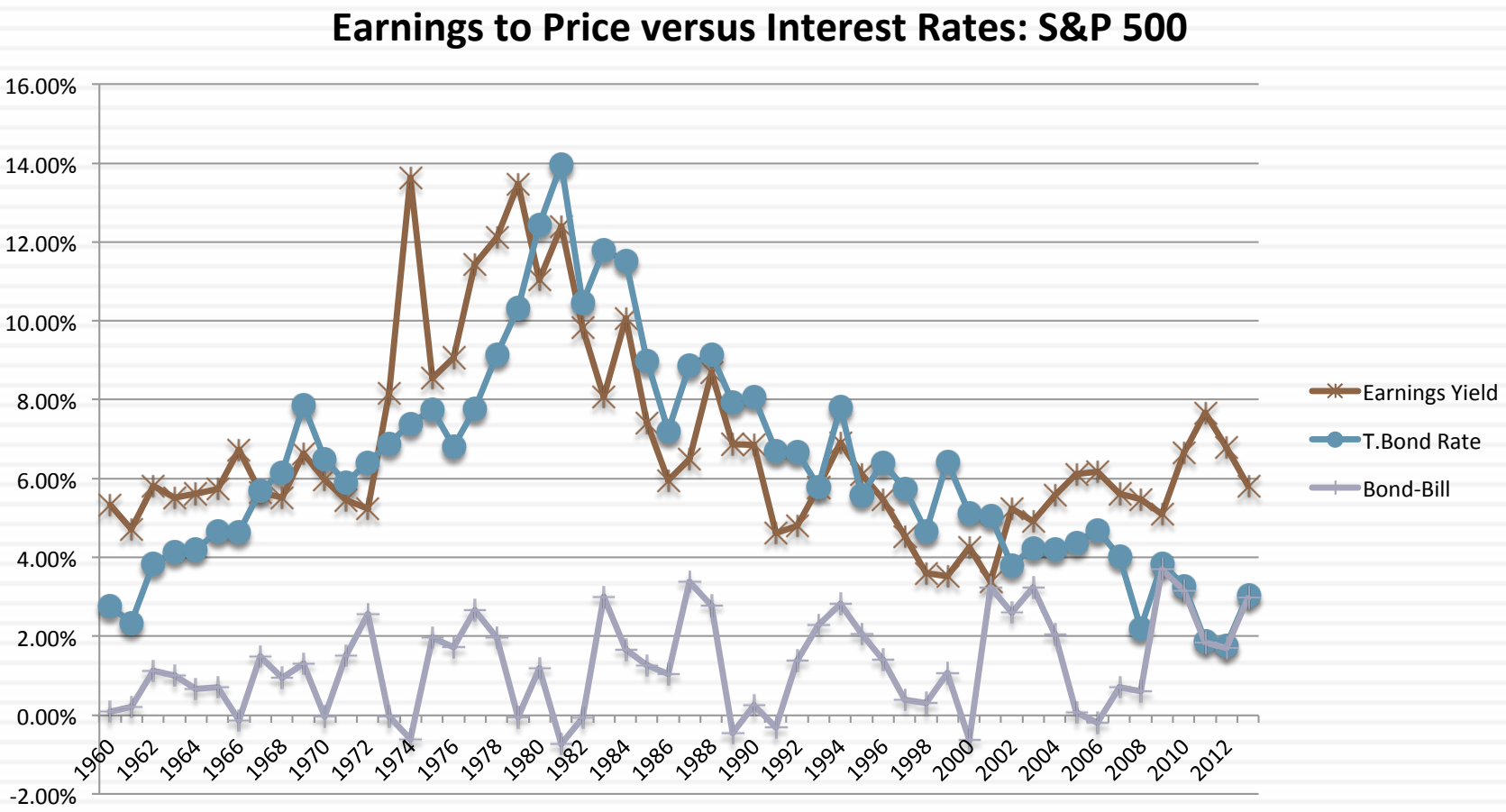
III. Comparisons of PE across time: PE Ratio for the S&P 500



Is low (high) PE cheap (expensive)?

- A market strategist argues that stocks are expensive because the PE ratio today is high relative to the average PE ratio across time. Do you agree?
  - Yes
  - No
- If you do not agree, what factors might explain the higher PE ratio today?

E/P Ratios , T.Bond Rates and Term Structure



Regression Results

- There is a strong positive relationship between E/P ratios and T.Bond rates, as evidenced by the correlation of 0.6538 between the two variables.,
- In addition, there is evidence that the term structure also affects the PE ratio.
- In the following regression, using 1960-2013 data, we regress E/P ratios against the level of T.Bond rates and a term structure variable (T.Bond - T.Bill rate)

  E/P = 3.39% + 0.5778 T.Bond Rate – 0.1535 (T.Bond Rate-T.Bill Rate)
  (4.71) (6.12) (-0.72)

  R squared = 41.10%

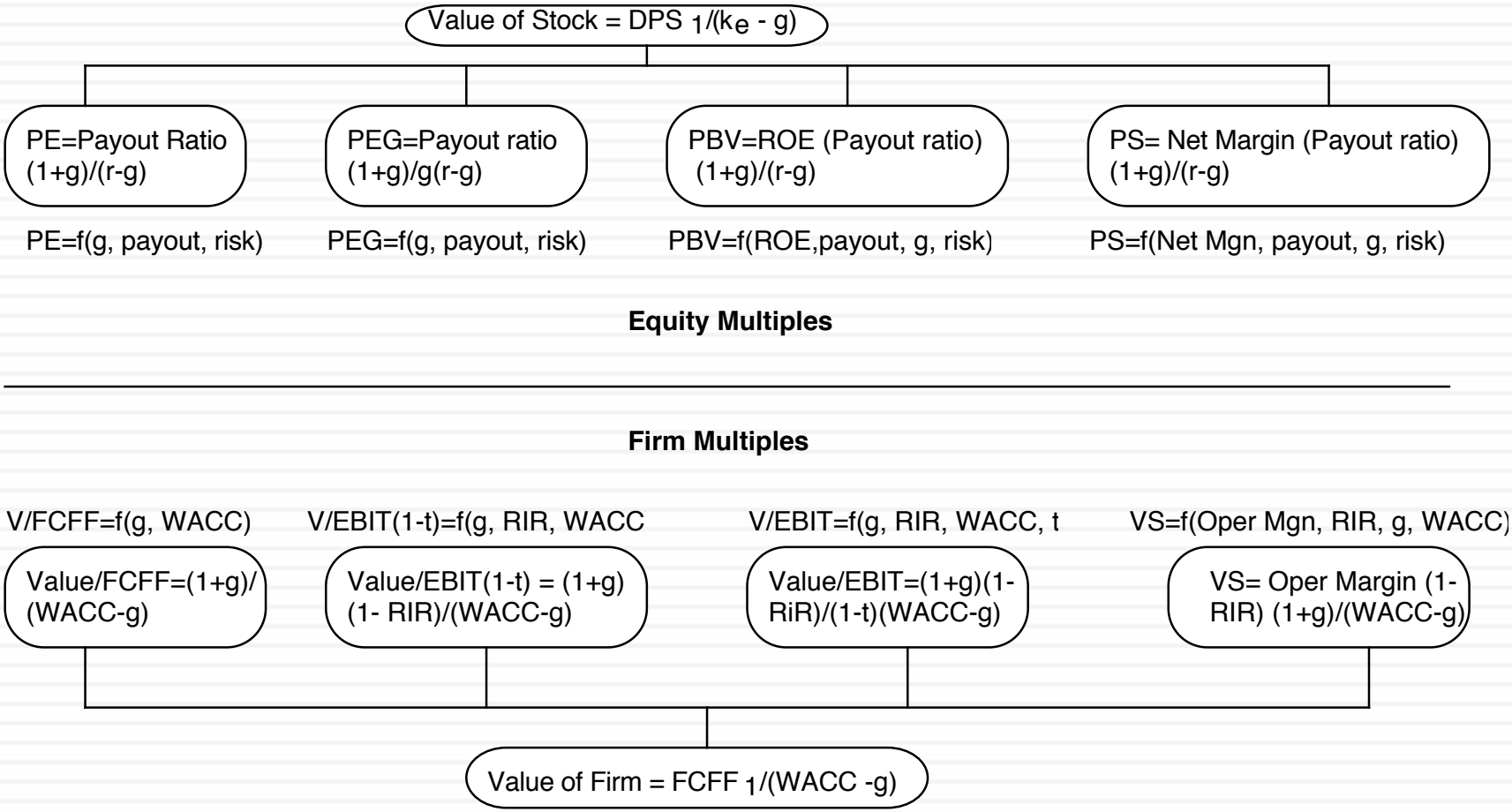
- Going back to 2008, this is what the regression looked like:

  E/P = 2.56% + 0.7044 T.Bond Rate – 0.3289 (T.Bond Rate-T.Bill Rate)
  (4.71) (7.10) (1.46)

  R squared = 50.71%

  The R-squared has dropped and the T.Bond rate and the differential with the T.Bill rate have noth lost significance. How would you read this result?

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.

I. 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%

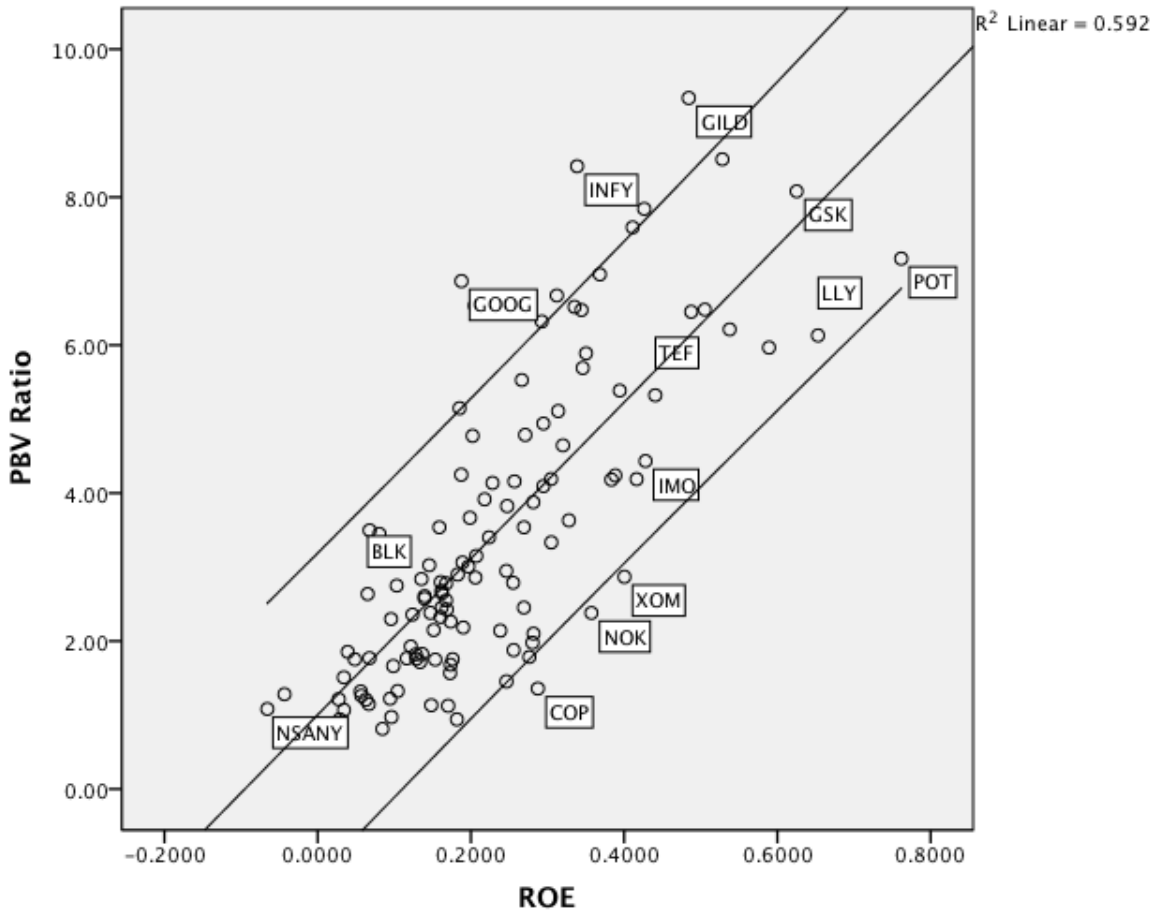
Variable	*Coefficient*	*SE*	*t-ratio*	*prob*
Constant	13.1151	3.471	3.78	0.0010
Growth rate	121.223	19.27	6.29	≤ 0.0001
Emerging Market	-13.8531	3.606	-3.84	0.0009

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

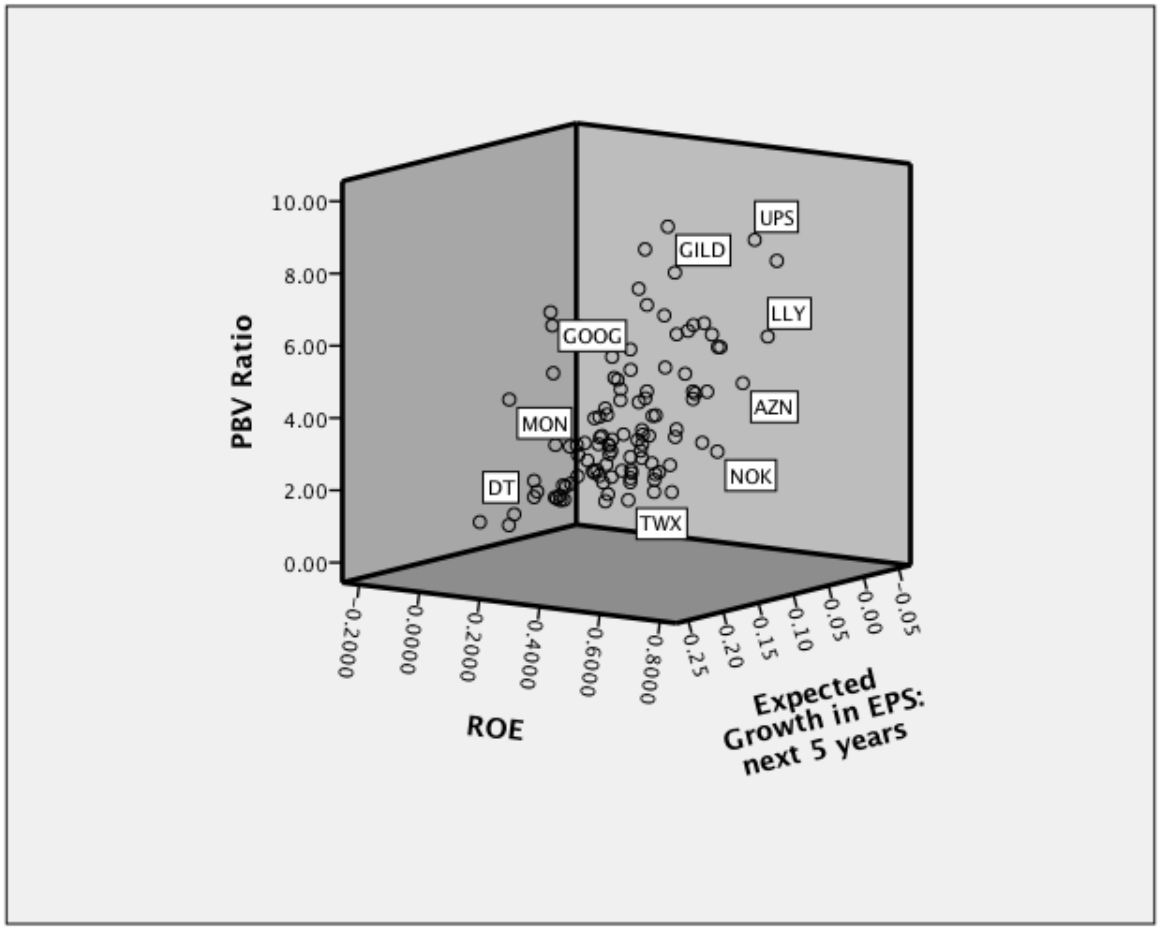
Is Telebras under valued?

- 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.

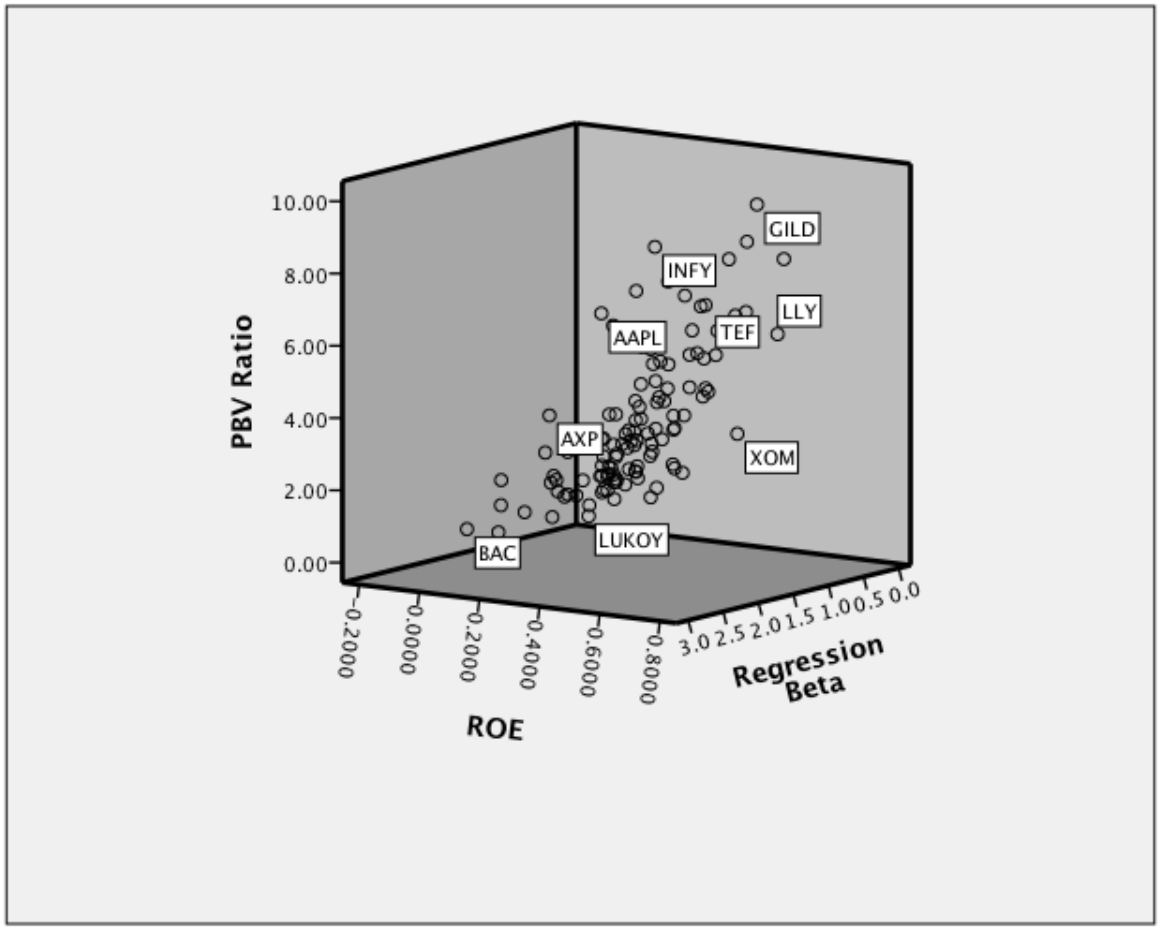
II. Price to Book vs ROE: Largest Market Cap Firms in the United States: January 2010



Missing growth?



PBV, ROE and Risk: Large Cap US firms



al

Bringing it all together… Largest US stocks

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.819[a]	.670	.661	1.19253

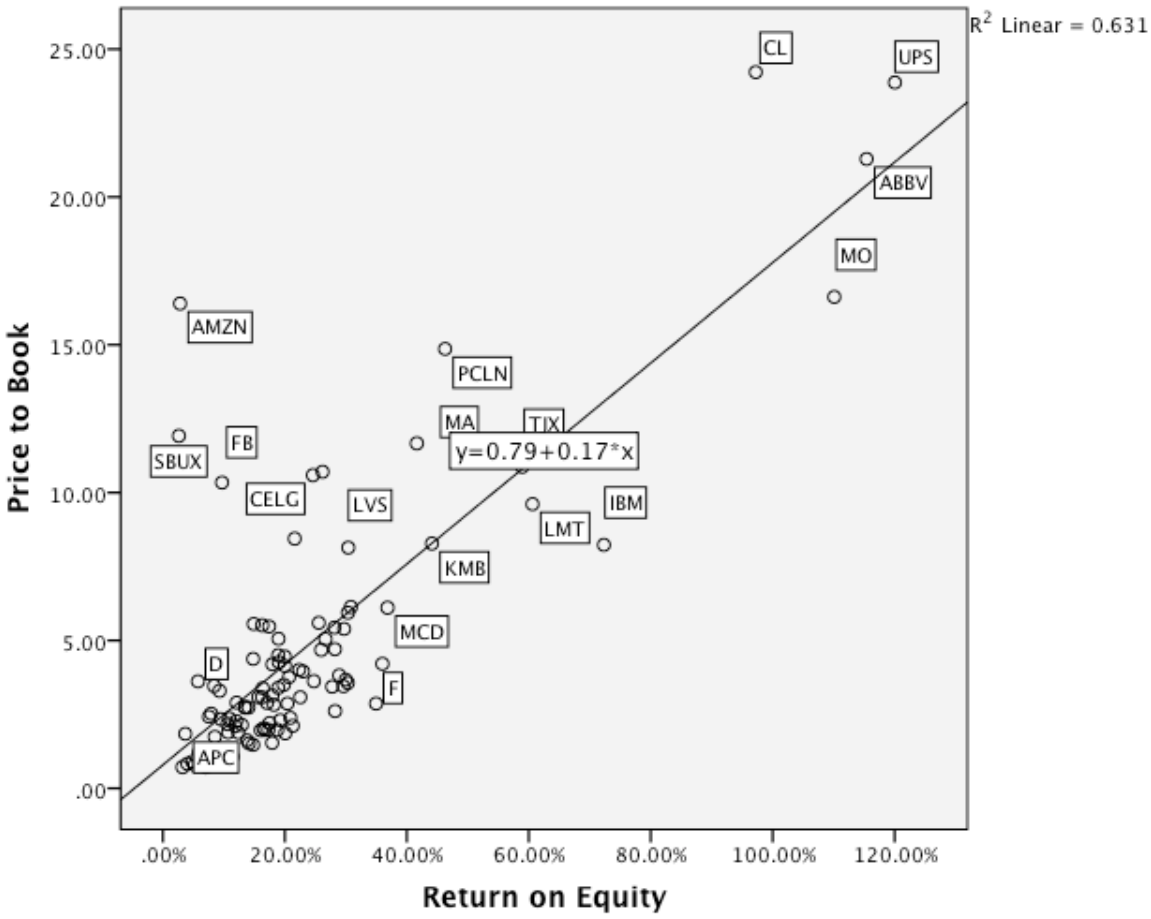
a. Predictors: (Constant), ROE, Expected Growth in EPS: next 5 years, Regression Beta

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.406	.424		.958	.340
	Regression Beta	-.065	.253	-.015	-.256	.799
	Expected Growth in EPS: next 5 years	9.340	2.366	.228	3.947	.000
	ROE	10.546	.771	.777	13.672	.000

a. Dependent Variable: PBV Ratio

Updated PBV Ratios – Largest Market Cap US companies: Updated to January 2014



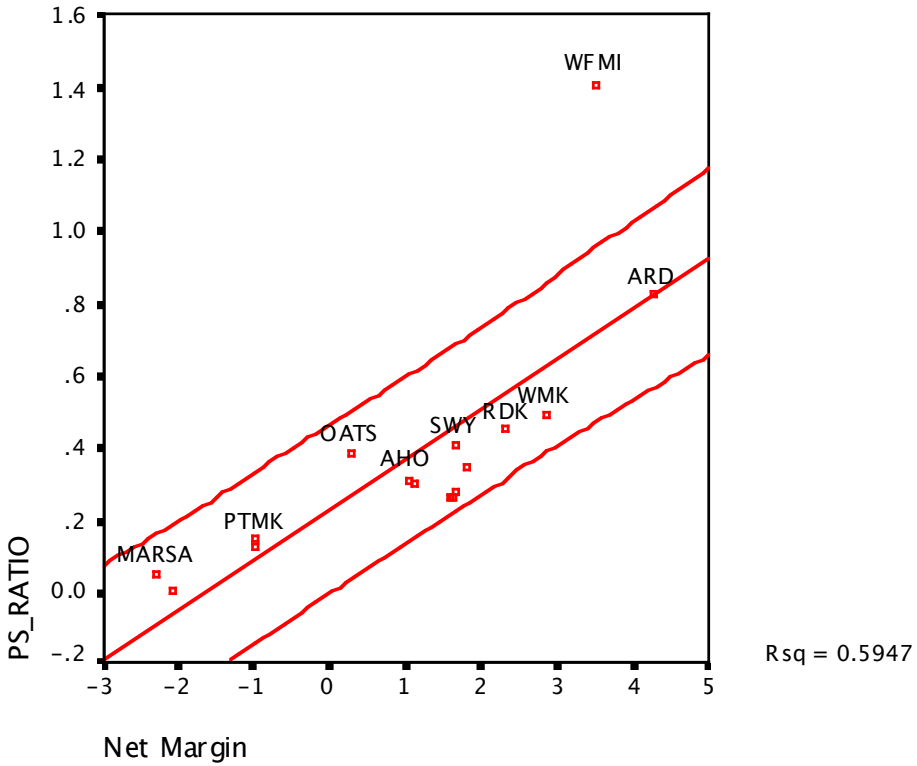
III. EV/EBITDA Multiple: Trucking Companies

Company Name	*Value*	*EBITDA*	*Value/EBITDA*
KLLM Trans. Svcs.	$ 114.32	$ 48.81	2.34
Ryder System	$ 5,158.04	$ 1,838.26	2.81
Rollins Truck Leasing	$ 1,368.35	$ 447.67	3.06
Cannon Express Inc.	$ 83.57	$ 27.05	3.09
Hunt (J.B.)	$ 982.67	$ 310.22	3.17
Yellow Corp.	$ 931.47	$ 292.82	3.18
Roadway Express	$ 554.96	$ 169.38	3.28
Marten Transport Ltd.	$ 116.93	$ 35.62	3.28
Kenan Transport Co.	$ 67.66	$ 19.44	3.48
M.S. Carriers	$ 344.93	$ 97.85	3.53
Old Dominion Freight	$ 170.42	$ 45.13	3.78
Trimac Ltd	$ 661.18	$ 174.28	3.79
Matlack Systems	$ 112.42	$ 28.94	3.88
XTRA Corp.	$ 1,708.57	$ 427.30	4.00
Covenant Transport Inc	$ 259.16	$ 64.35	4.03
Builders Transport	$ 221.09	$ 51.44	4.30
Werner Enterprises	$ 844.39	$ 196.15	4.30
Landstar Sys.	$ 422.79	$ 95.20	4.44
AMERCO	$ 1,632.30	$ 345.78	4.72
USA Truck	$ 141.77	$ 29.93	4.74
Frozen Food Express	$ 164.17	$ 34.10	4.81
Arnold Inds.	$ 472.27	$ 96.88	4.87
Greyhound Lines Inc.	$ 437.71	$ 89.61	4.88
USFreightways	$ 983.86	$ 198.91	4.95
Golden Eagle Group Inc.	$ 12.50	$ 2.33	5.37
Arkansas Best	$ 578.78	$ 107.15	5.40
Airlease Ltd.	$ 73.64	$ 13.48	5.46
Celadon Group	$ 182.30	$ 32.72	5.57
Amer. Freightways	$ 716.15	$ 120.94	5.92
Transfinancial Holdings	$ 56.92	$ 8.79	6.47
Vitran Corp. 'A'	$ 140.68	$ 21.51	6.54
Interpool Inc.	$ 1,002.20	$ 151.18	6.63
Intrenet Inc.	$ 70.23	$ 10.38	6.77
Swift Transportation	$ 835.58	$ 121.34	6.89
Landair Services	$ 212.95	$ 30.38	7.01
CNF Transportation	$ 2,700.69	$ 366.99	7.36
Budget Group Inc	$ 1,247.30	$ 166.71	7.48
Caliber System	$ 2,514.99	$ 333.13	7.55
Knight Transportation Inc	$ 269.01	$ 28.20	9.54
Heartland Express	$ 727.50	$ 64.62	11.26
Greyhound CDA Transn Corp	$ 83.25	$ 6.99	11.91
Mark VII	$ 160.45	$ 12.96	12.38
Coach USA Inc	$ 678.38	$ 51.76	13.11
US 1 Inds Inc.	$ 5.60	$ (0.17)	NA
Average			**5.61**

A Test on EBITDA

- Ryder System looks very cheap on a Value/EBITDA multiple basis, relative to the rest of the sector. What explanation (other than misvaluation) might there be for this difference?

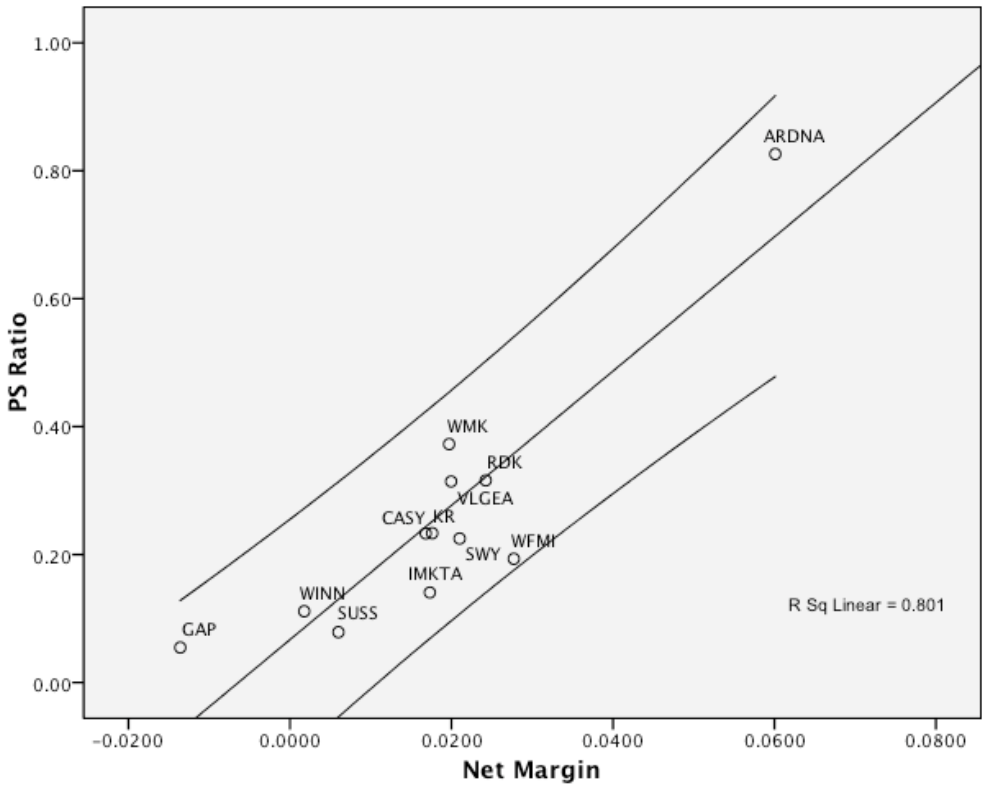
IV: Price to Sales Multiples: Grocery Stores - US in January 2007



Whole Foods: In 2007: Net Margin was 3.41% and Price/ Sales ratio was 1.41

Predicted Price to Sales = 0.07 + 10.49 (0.0341) = 0.43

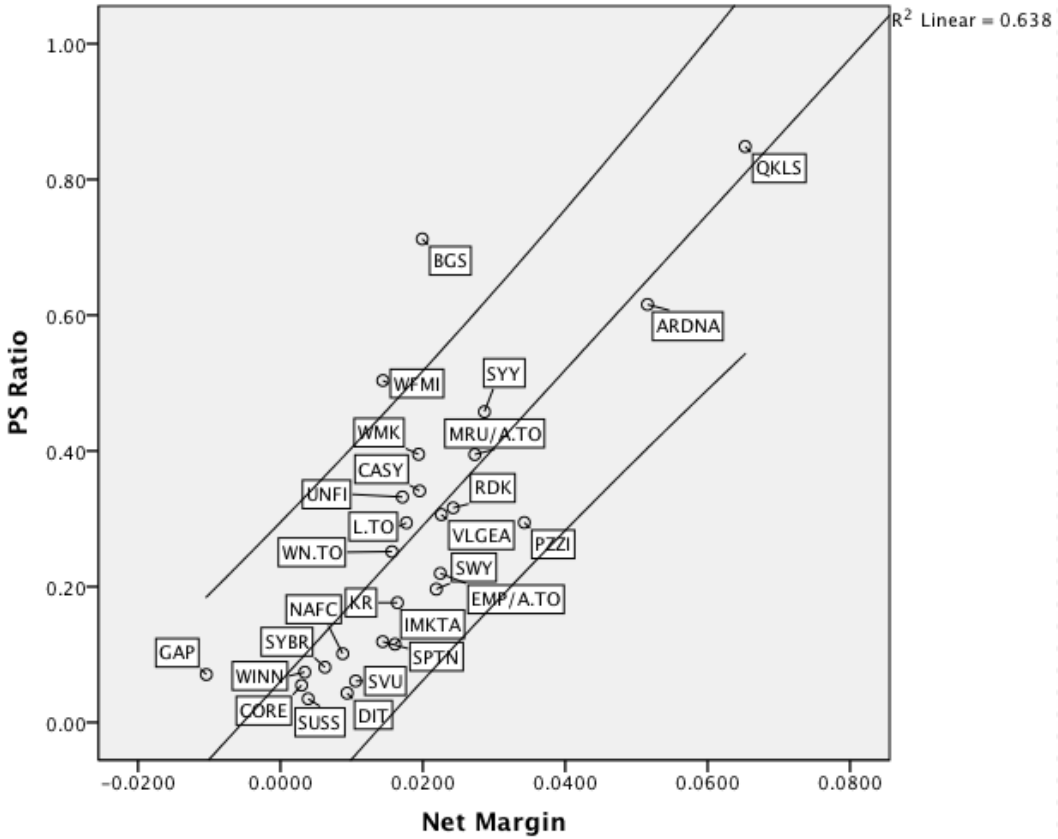
Reversion to normalcy: Grocery Stores - US in January 2009



Whole Foods: In 2009, Net Margin had dropped to 2.77% and Price to Sales ratio was down to 0.31.

Predicted Price to Sales = 0.07 + 10.49 (.0277) = 0.36

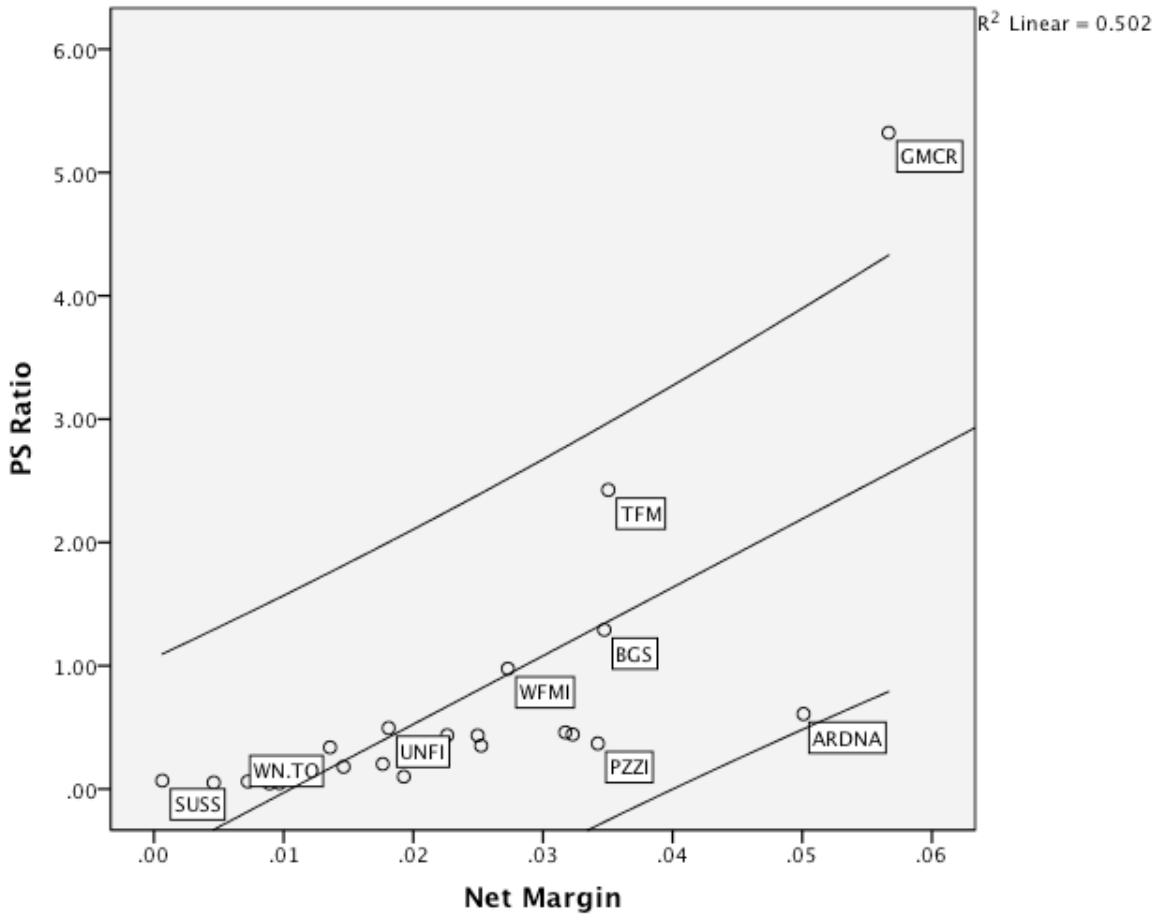
And again in 2010..



<u>Whole Foods</u>: In 2010, Net Margin had dropped to 1.44% and Price to Sales ratio increased to 0.50.

Predicted Price to Sales = 0.06 + 11.43 (.0144) = 0.22

Here is 2011…



PS Ratio= - 0.585 + 55.50 (Net Margin) R^2*= 48.2%*

PS Ratio for WFMI = -0.585 + 55.50 (.0273) = 0.93

At a PS ratio of 0.98, WFMI is slightly over valued.

V. Back to the Multi-business company
United Technologies: Raw Data - 2009

Division	*Business*	*Revenues*	*EBITDA*	*Pre-tax Operating Income*	*Capital Expenditures*	*Depreciation*	*Total Assets*
Carrier	Refrigeration systems	$14,944	$1,510	$1,316	$191	$194	$10,810
Pratt & Whitney	Defense	$12,965	$2,490	$2,122	$412	$368	$9,650
Otis	Construction	$12,949	$2,680	$2,477	$150	$203	$7,731
UTC Fire & Security	Security	$6,462	$780	$542	$95	$238	$10,022
Hamilton Sundstrand	Manufacturing	$6,207	$1,277	$1,099	$141	$178	$8,648
Sikorsky	Aircraft	$5,368	$540	$478	$165	$62	$3,985

The company also had corporate expenses, unallocated to the divisions of $408 million in the most recent year.

United Technologies: Relative Valuation Median Multiples

Division	*Business*	*EBITDA*	*EV/EBITDA for sector*	*Value of Business*
Carrier	Refrigeration systems	$1,510	5.25	$7,928
Pratt & Whitney	Defense	$2,490	8.00	$19,920
Otis	Construction	$2,680	6.00	$16,080
UTC Fire & Security	Security	$780	7.50	$5,850
Hamilton Sundstrand	Industrial Products	$1,277	5.50	$7,024
Sikorsky	Aircraft	$540	9.00	$4,860
Sum of the parts value for business =				$61,661

United Technologies: Relative Valuation Plus Scaling variable & Choice of Multiples

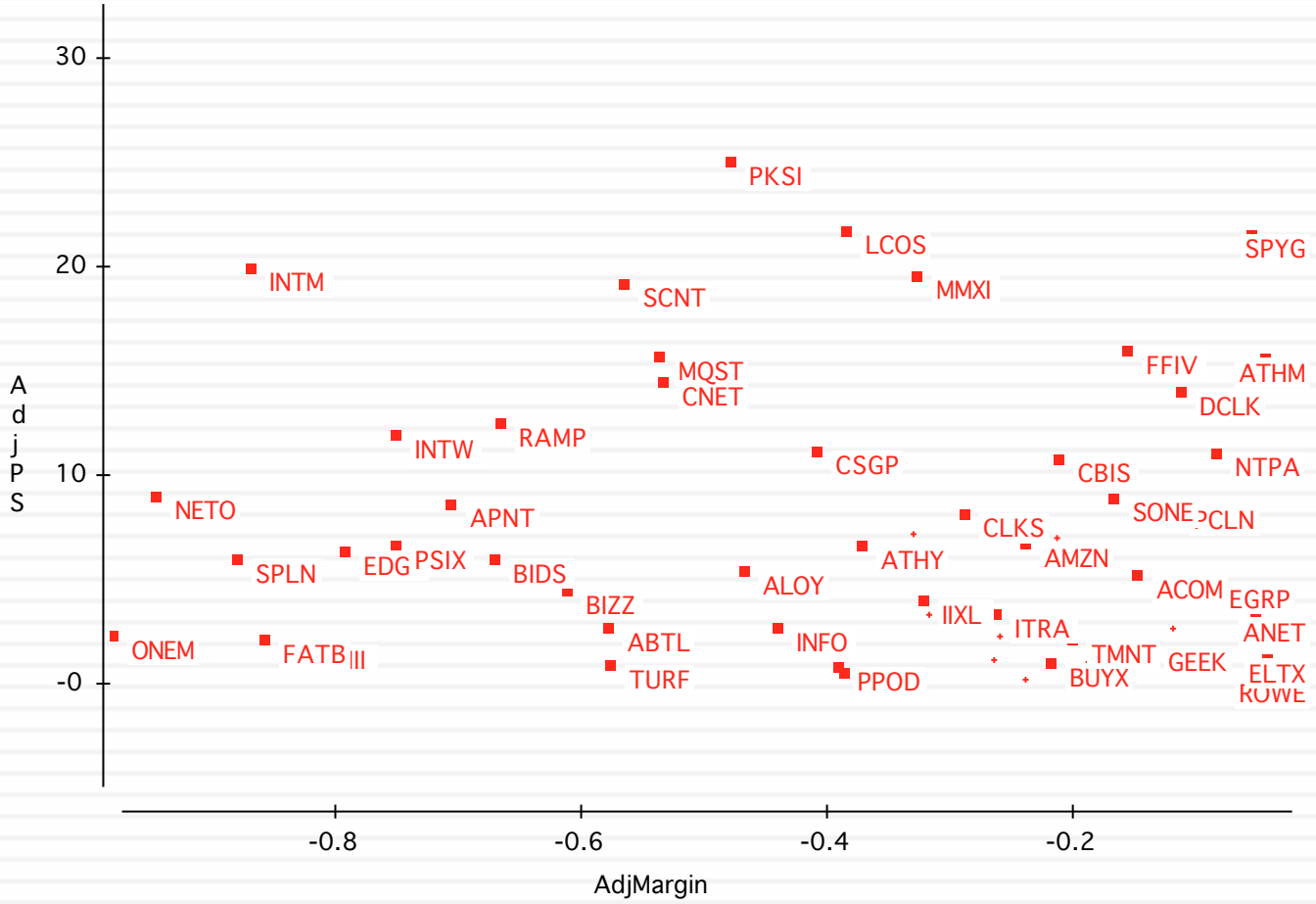
Division	Business	Revenues	EBITDA	Operating Income	Capital Invested
Carrier	Refrigeration systems	$14,944	$1,510	$1,316	$6,014
Pratt & Whitney	Defense	$12,965	$2,490	$2,122	$5,369
Otis	Construction	$12,949	$2,680	$2,477	$4,301
UTC Fire & Security	Security	$6,462	$780	$542	$5,575
Hamilton Sundstrand	Industrial Products	$6,207	$1,277	$1,099	$4,811
Sikorsky	Aircraft	$5,368	$540	$478	$2,217
Total		$58,895	$9,277	$8,034	$28,287

Business	Best Multiple	Regression	R^2
Refrigeration systems	EV/EBITDA	EV/EBITDA = 5.35 – 3.55 Tax Rate + 14.17 ROC	42%
Defense	EV/Revenues	EV/Revenues = 0.85 + 7.32 Pre-tax Operating Margin	47%
Construction	EV/EBITDA	EV/EBITDA = 3.17 – 2.87 Tax Rate + 14.66 ROC	36%
Security	EV/Capital	EV/ Capital = 0.55 + 8.22 ROC	55%
Industrial Products	EV/Revenues	EV/Revenues = 0.51 + 6.13 Pre-tax Operating Margin	48%
Aircraft	EV/Capital	EV/ Capital = 0.65 + 6.98 ROC	40%

United Technologies: Relative Valuation Sum of the Parts value

Division	Scaling Variable	Current value for scaling variable	ROC	Operating Margin	Tax Rate	Predicted Multiple	Estimated Value
Carrier	EBITDA	$1,510	13.57%	8.81%	38%	5.35 – 3.55 (.38) + 14.17 (.1357) =5.92	$8,944.47
Pratt & Whitney	Revenues	$12,965	24.51%	16.37%	38%	0.85 + 7.32 (.1637) =2.05	$26,553.29
Otis	EBITDA	$2,680	35.71%	19.13%	38%	3.17 – 2.87 (.38)+14.66 (.3571) =7.31	$19,601.70
UTC Fire & Security	Capital	$5,575	6.03%	8.39%	38%	0.55 + 8.22 (.0603) =1.05	$5,828.76
Hamilton Sundstrand	Revenues	$6,207	14.16%	17.71%	38%	0.51 + 6.13 (.1771) =1.59	$9,902.44
Sikorsky	Capital	$2,217	13.37%	8.90%	38%	0.65 + 6.98 (.1337) =1.58	$3,509.61
Sum of the parts value for operating assets =							$74,230.37

VI. Nothing's working!!! Internet Stocks in early 2000



PS Ratios and Margins are not highly correlated

- Regressing PS ratios against current margins yields the following

  PS = 81.36 - 7.54(Net Margin) R^2 = 0.04

  (0.49)

- This is not surprising. These firms are priced based upon expected margins, rather than current margins.

Solution 1: Use proxies for survival and growth: Amazon in early 2000

- Hypothesizing that firms with higher revenue growth and higher cash balances should have a greater chance of surviving and becoming profitable, we ran the following regression: (The level of revenues was used to control for size)

PS = 30.61 - 2.77 ln(Rev) + 6.42 (Rev Growth) + 5.11 (Cash/Rev)

(0.66) (2.63) (3.49)

- R squared = 31.8%

Predicted PS = 30.61 - 2.77(7.1039) + 6.42(1.9946) + 5.11 (.3069) = 30.42

- Actual PS = 25.63
- Stock is undervalued, relative to other internet stocks.

Solution 2: Use forward multiples

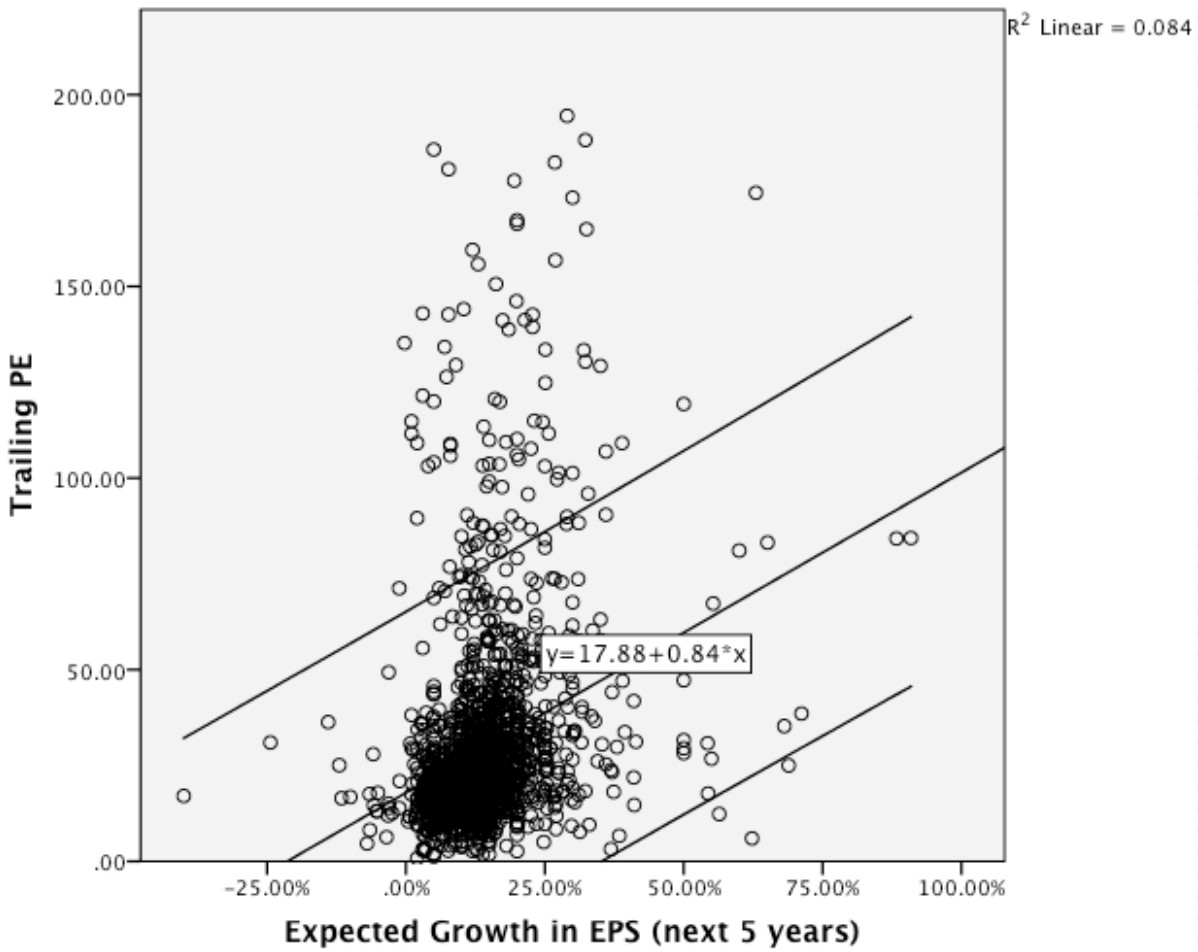
- Global Crossing lost $1.9 billion in 2001 and is expected to continue to lose money for the next 3 years. In a discounted cashflow valuation (see notes on DCF valuation) of Global Crossing, we estimated an expected EBITDA for Global Crossing in five years of $ 1,371 million.
- The average enterprise value/ EBITDA multiple for healthy telecomm firms is 7.2 currently.
- Applying this multiple to Global Crossing's EBITDA in year 5, yields a value in year 5 of
  - Enterprise Value in year 5 = 1371 * 7.2 = $9,871 million
  - Enterprise Value today = $ 9,871 million/ 1.138^5 = $5,172 million

  (The cost of capital for Global Crossing is 13.80%)
  - The probability that Global Crossing will not make it as a going concern is 77%.
  - Expected Enterprise value today = 0.23 (5172) = $1,190 million

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 versus Expected EPS Growth: January 2014



PE Ratio: Standard Regression for US stocks - January 2014

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.580[a]	.336	.335	1562.73006

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

The regression is run with growth and payout entered as decimals, i.e., 25% is entered as 0.25)

Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	4.199	1.255	3.346	.001
	Regression Beta	-2.864	.977	-2.932	.003
	Expected Growth in EPS (next 5 years)	149.0	5.56	26.819	.000
	Payout Ratio	13.39	.70	18.502	.000

The value of growth

Date	Market price of extra % growth	Implied ERP
Jan-14	1.49	4.96%
Jan-13	0.577	5.78%
Jan-12	0.408	6.04%
Jan-11	0.836	5.20%
Jan-10	0.55	4.36%
Jan-09	0.78	6.43%
Jan-08	1.427	4.37%
Jan-07	1.178	4.16%
Jan-06	1.131	4.07%
Jan-05	0.914	3.65%
Jan-04	0.812	3.69%
Jan-03	2.621	4.10%
Jan-02	1.003	3.62%
Jan-01	1.457	2.75%
Jan-00	2.105	2.05%

PE ratio regressions across markets

Region	Regression – January 2014	R^2
US	PE = 4.20 + 149.0 g_{EPS} + 13.40 Payout - 2.86 Beta	33.6%
Europe	PE = 11.51 + 41.73 g_{EPS} + 14.36 Payout - 1.75 Beta	37.7%
Japan	PE = 11.01+ 17.30 g_{EPS} + 31.22 Payout	16.9%
Emerging Markets	PE = 8.52 + 56.2 g_{EPS} + 10.04 Payout - 1.43 Beta	20.0%
Global	PE = 11.79 + 50.39 g_{EPS} + 15.86 Payout - 1.01 Beta - 61.15 ERP	33.1%

g_{EPS}=Expected Growth: Expected growth in EPS or Net Income: Next 5 years
Beta: Regression or Bottom up Beta
Payout ratio: Dividends/ Net income from most recent year. Set to zero, if net income < 0
ERP: Equity Risk Premium (total) for country in which company is incorporated

III. Price to Book Ratio
Fundamentals hold in every market: - January 2014

Region	Regression – January 2013	R^2
US	PBV= 1.81 + 9.30 g_{EPS} - 0.82 Beta + 7.0 ROE	36.1%
Europe	PBV= 2.08 + 21.79 g_{EPS} - 0.49 Beta + 7.93 ROE	41.8%
Japan	PBV= 1.38 + 1.62 g_{EPS} -0.45 Beta + 6.35 ROE	22.7%
Emerging Markets	PBV= 0.88 + 4.11 g_{EPS} - 0.66 Beta + 0.49 Payout + 8.36 ROE	38.6%
Global	PBV= 1.14 + 3.62 g_{EPS} - 0.55 Beta + 0.52 Payout + 11.19 ROE -6.79 ERP	47.6%

g_{EPS}=Expected Growth: Expected growth in EPS/ Net Income: Next 5 years
Beta: Regression or Bottom up Beta
Payout ratio: Dividends/ Net income from most recent year. Set to zero, if net income < 0
ROE: Net Income/ Book value of equity in most recent year.
ERP: Equity Risk Premium (total) for country in which company is incorporated

IV. EV/EBITDA – January 2013

Region	Regression – January 2011	R squared
United States	EV/EBITDA= 25.31 + 41.45 g - 20.32 DFR - 28.03 Tax Rate	16.5%
Europe	EV/EBITDA= 15.91 + 29.33 g - 7.53 DFR - 7.53 Tax Rate	21.0%
Japan	EEV/EBITDA= 10.14 + 45.06 g - 14.53 DFR - 18.40 Tax Rate	21.4%
Emerging Markets	EV/EBITDA= 17.99 + 52.73 g - 5.78 DFR - 34.12 Tax Rate	24.6%
Global	EV/EBITDA= 18.96 + 51.12 g - 4.54 DFR - 11.52 Tax Rate -76.14 ERP	20.1%

g = Expected Revenue Growth: Expected growth in revenues: Near term (2 or 5 years)
DFR = Debt Ratio : Total Debt/ (Total Debt + Market value of equity)
Tax Rate: Effective tax rate in most recent year
ERP: Equity Risk Premium of country in which company is incorporared

V. EV/Sales Regressions across markets…

Region	Regression – January 2011	R Squared
United States	EV/Sales = 0.78 + 5.24 g+ 7.12 Operating Margin + 5.39 DFR- 0.67 Tax rate	24.1%
Europe	EV/Sales = 0.22 + 7.54 g+ 9.99 Operating Margin + 4.66 DFR- 1.76 Tax rate	29.6%
Japan	EV/Sales = 1.11 - 7.64 g+ 9.43 Operating Margin +3.84 DFR- 2.62 Tax rate	25.5%
Emerging Markets	EV/Sales = 1.96 + 5.62 g+ 4.00 Operating Margin + 1.52 DFR- 2.51 Tax rate	11.0%
Global	EV/EBITDA= 18.96 + 51.12 g - 4.54 DFR - 11.52 Tax Rate -76.14 ERP	20.1%

g =Expected Revenue Growth: Expected growth in revenues: Near term (2 or 5 years)
ERP: ERP for country in which company is incorporated
Tax Rate: Effective tax rate in most recent year
Operating Margin: Operating Income/ Sales

Relative Valuation: Some closing propositions

- Proposition 1: In a relative valuation, all that you are concluding is that a stock is under or over valued, relative to your comparable group.
  - Your relative valuation judgment can be right and your stock can be hopelessly over valued at the same time.
- Proposition 2: In asset valuation, there are no similar assets. Every asset is unique.
  - If you don't control for fundamental differences in risk, cashflows and growth across firms when comparing how they are priced, your valuation conclusions will reflect your flawed judgments rather than market misvaluations.

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.

A More Intuitive Approach

- Managers in every sector tend to focus on specific variables when analyzing strategy and performance. The multiple used will generally reflect this focus. Consider three examples.
  - In retailing: The focus is usually on same store sales (turnover) and profit margins. Not surprisingly, the revenue multiple is most common in this sector.
  - In financial services: The emphasis is usually on return on equity. Book Equity is often viewed as a scarce resource, since capital ratios are based upon it. Price to book ratios dominate.
  - In technology: Growth is usually the dominant theme. PEG ratios were invented in this sector.

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

Reviewing: The Four Steps to Understanding Multiples

- Define the multiple
  - Check for consistency
  - Make sure that they are estimated uniformly
- Describe the multiple
  - Multiples have skewed distributions: The averages are seldom good indicators of typical multiples
  - Check for bias, if the multiple cannot be estimated
- Analyze the multiple
  - Identify the companion variable that drives the multiple
  - Examine the nature of the relationship
- Apply the multiple

A closing thought…