



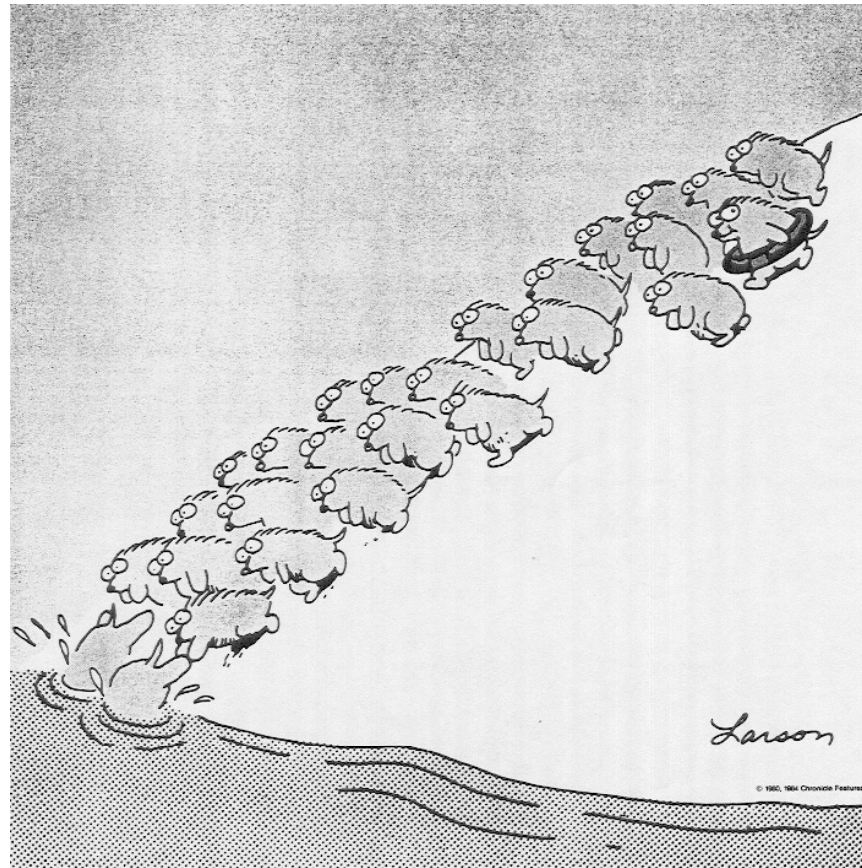
Valuation

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Some Initial Thoughts

" One hundred thousand lemmings cannot be wrong"

Graffiti



Misconceptions about Valuation

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

Approaches to Valuation

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

Discounted Cash Flow Valuation

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

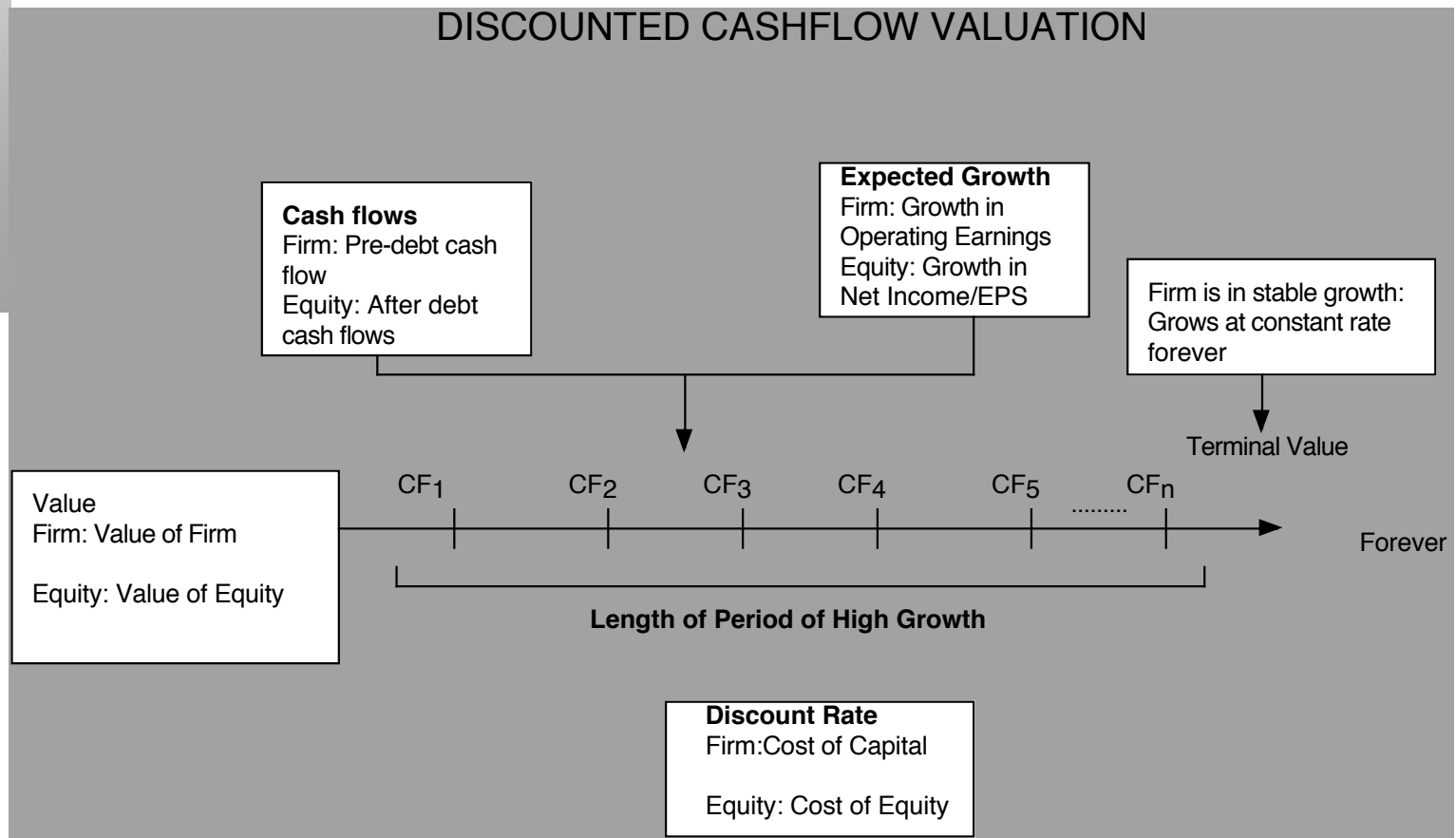
DCF Choices: Equity Valuation versus Firm Valuation

Firm Valuation: Value the entire business

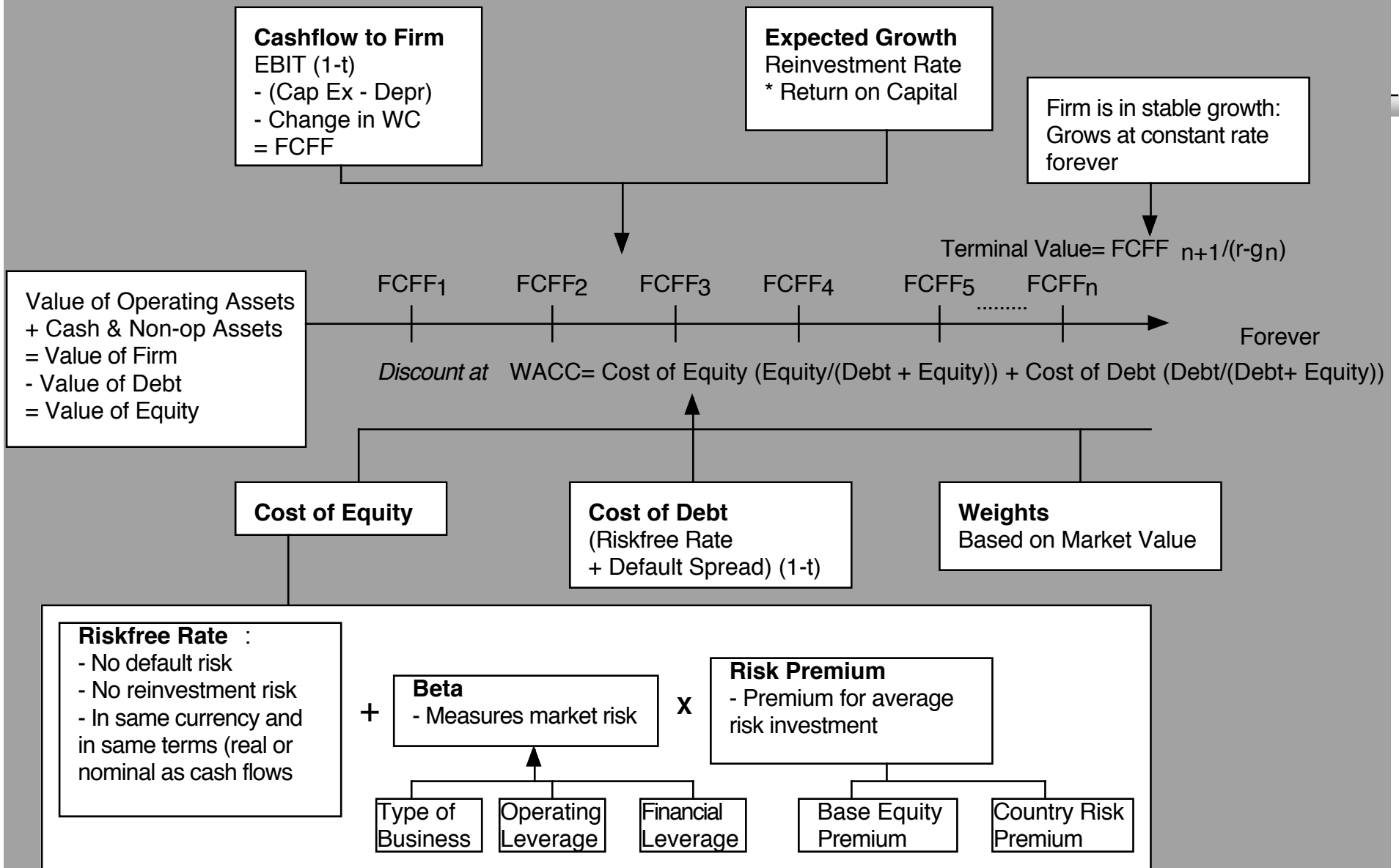
Assets		Liabilities	
Existing Investments Generate cashflows today Includes long lived (fixed) and short-lived (working capital) assets	Assets in Place	Debt	Fixed Claim on cash flows Little or No role in management <i>Fixed Maturity</i> <i>Tax Deductible</i>
Expected Value that will be created by future investments	Growth Assets	Equity	Residual Claim on cash flows Significant Role in management <i>Perpetual Lives</i>

Equity valuation: Value just the equity claim in the business

Valuation with Infinite Life



DISCOUNTED CASHFLOW VALUATION



Amgen: Status Quo

Cap Ex = Acc Cap Ex(1218) + Acquisitions (3975) + R&D (2216)

Current Cashflow to Firm
 EBIT(1-t) = :7336(1-.28)= 6058
 - Nt CpX= 6443
 - Chg WC 37
 = FCFE - 423
 Reinvestment Rate = 6480/6058 = 106.98%
 Return on capital = 18.26%

Reinvestment Rate 60%

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

Return on Capital 16%

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

Terminal Value₁₀ = 7300 / (.0808 - .04) = 179,099

First 5 years Growth decreases gradually to 4%

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

Year	1	2	3	4	5	6	7	8	9	10	Term Yr
EBIT	\$9,221	\$11,195	\$7,975	\$8,741	\$9,580	\$10,392	\$11,157	\$11,853	\$12,460	\$12,958	16898
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
= FCFE	\$2,656	\$2,911	\$3,190	\$3,496	\$3,832	\$4,573	\$5,355	\$6,164	\$6,978	\$7,775	7300

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

Debt ratio increases to 20%
 Beta decreases to 1.10

On May 11, 2007, Amgen was trading at \$63.65/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%

SAP: Status Quo

Avg Reinvestment rate = 36.94%

Current Cashflow to Firm
 EBIT(1-t) : 1414
 - Nt CpX 831
 - Chg WC - 19
 = FCFF 602
 Reinvestment Rate = 812/1414 = 57.42%

Reinvestment Rate 57.42%

Expected Growth in EBIT (1-t)
 $.5742 * .1993 = .1144$
 11.44%

Return on Capital 19.93%

Stable Growth
 $g = 3.41\%$; Beta = 1.00;
 Debt Ratio = 20%
 Cost of capital = 6.62%
 ROC = 6.62%; Tax rate = 35%
 Reinvestment Rate = 51.54%

Terminal Value₁₀ = $1717 / (.0662 - .0341) = 53546$

First 5 years

Growth decreases gradually to 3.41%

Op. Assets 31,615
 + Cash: 3,018
 - Debt 558
 - Pension Lian 305
 - Minor. Int. 55
 = Equity 34,656
 - Options 180
 Value/Share 106.12

Year	1	2	3	4	5	6	7	8	9	10	Term Yr
EBIT	2,483	2,767	3,083	3,436	3,829	4,206	4,552	4,854	5,097	5,271	5451
EBIT(1-t)	1,576	1,756	1,957	2,181	2,430	2,669	2,889	3,080	3,235	3,345	3543
- Reinvestm	905	1,008	1,124	1,252	1,395	1,501	1,591	1,660	1,705	1,724	1826
= FCFF	671	748	833	929	1,035	1,168	1,298	1,420	1,530	1,621	1717

Cost of Capital (WACC) = 8.77% (0.986) + 2.39% (0.014) = 8.68%

Debt ratio increases to 20%
 Beta decreases to 1.00

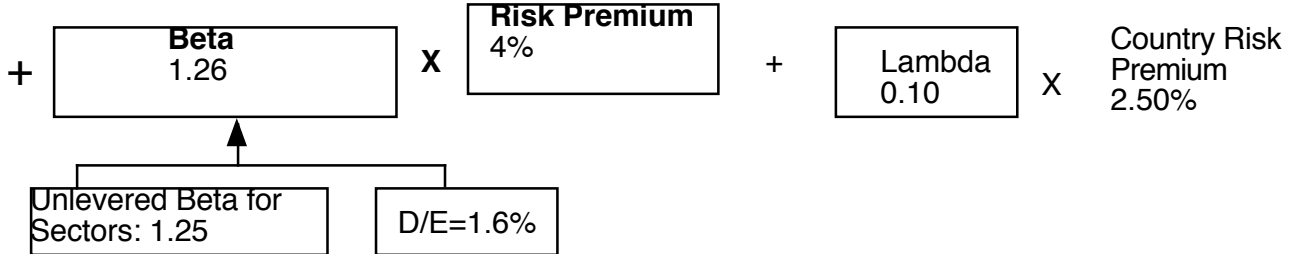
On May 5, 2005, SAP was trading at 122 Euros/share

Cost of Equity 8.77%

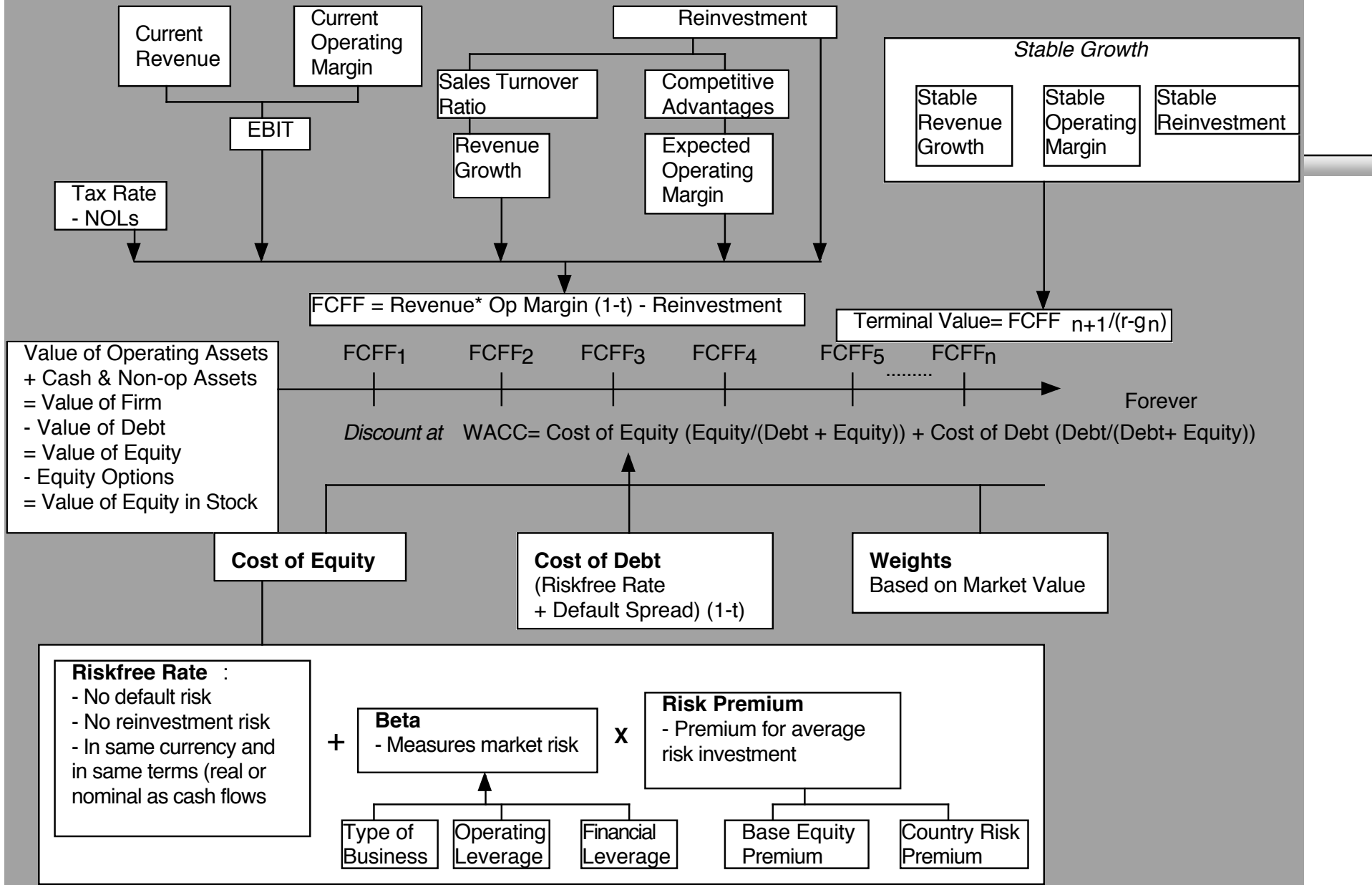
Cost of Debt
 $(3.41\% + .35\%)(1 - .3654) = 2.39\%$

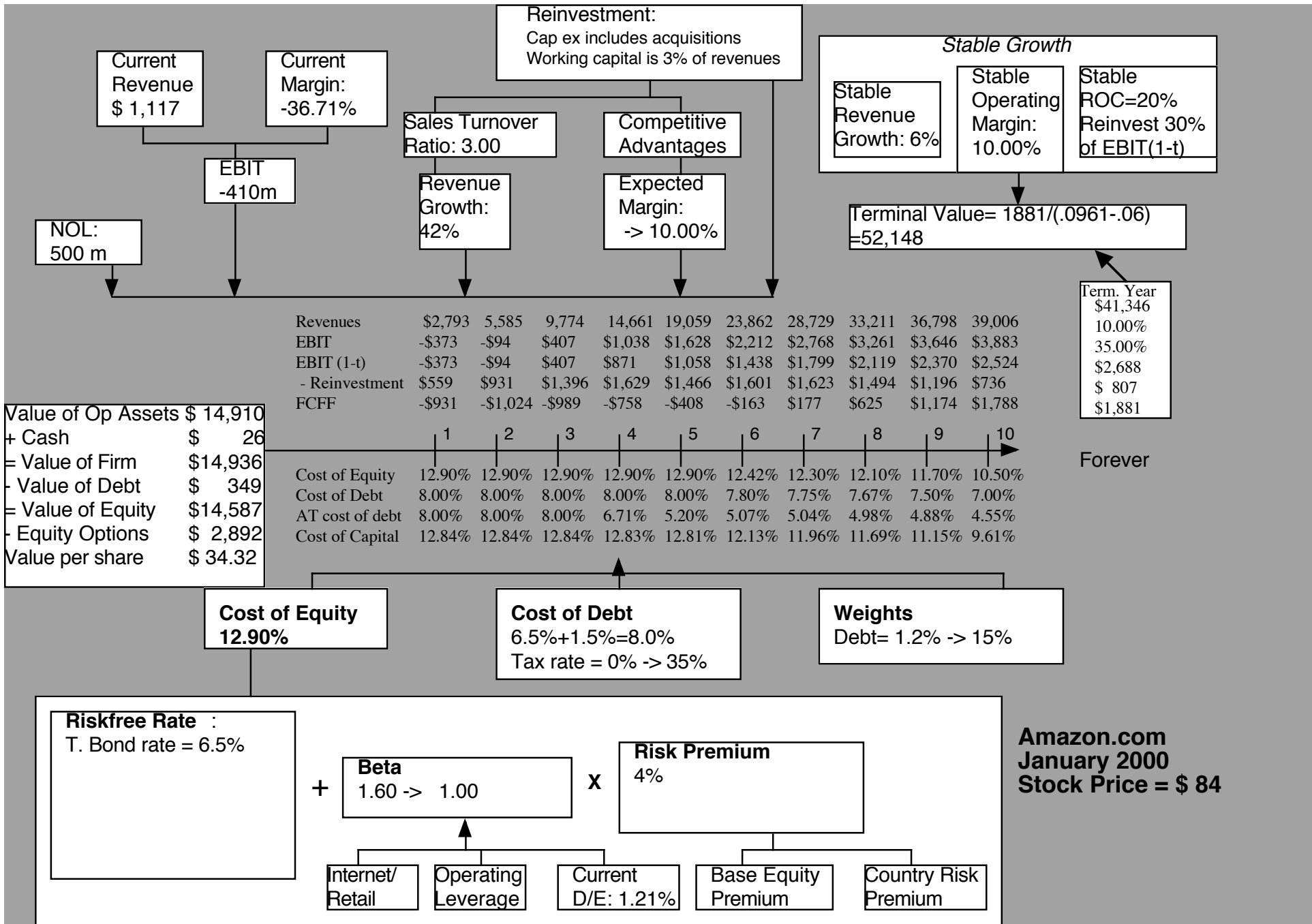
Weights
 E = 98.6% D = 1.4%

Riskfree Rate:
 Euro riskfree rate = 3.41%

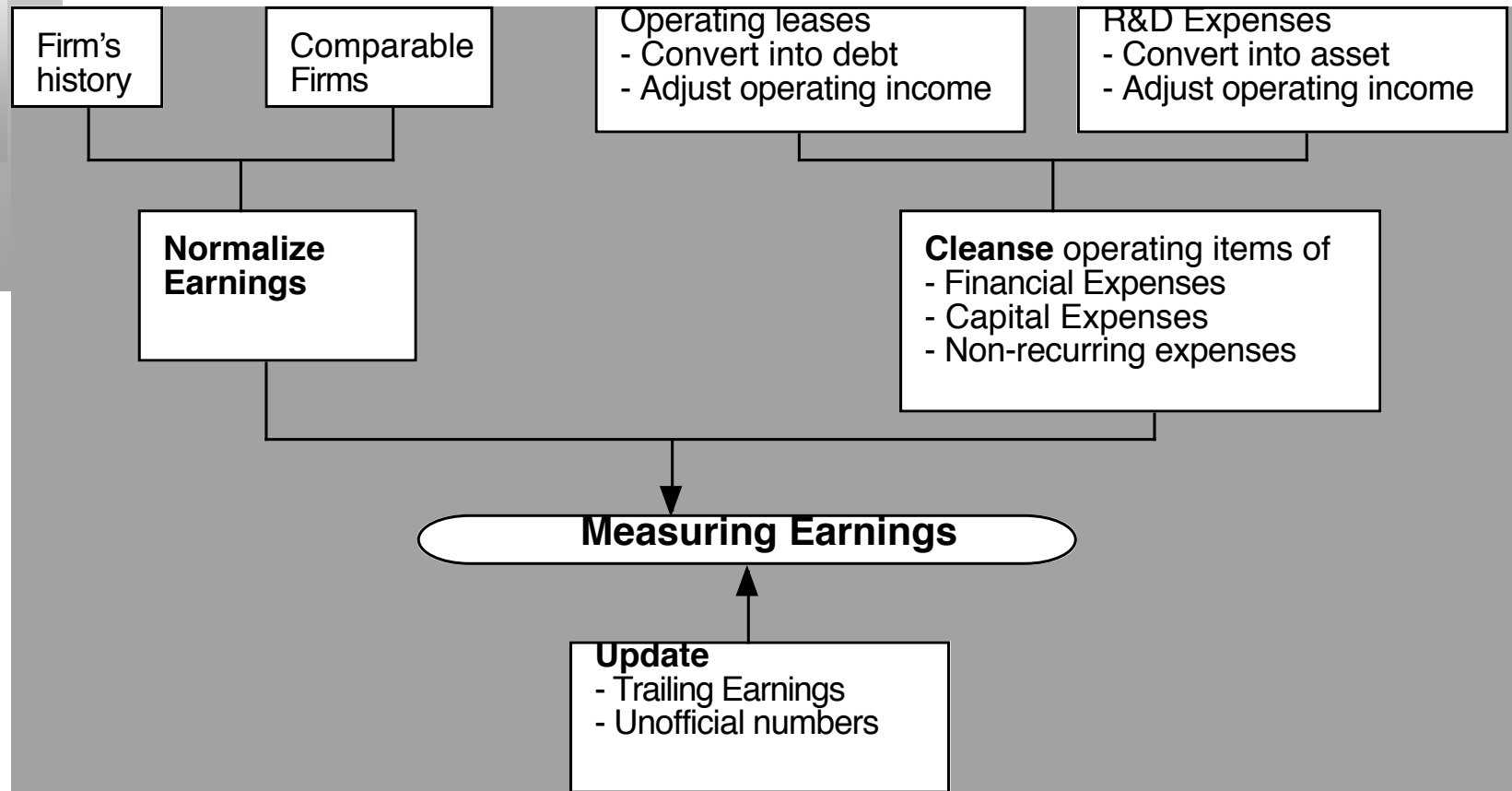


Discounted Cash Flow Valuation: High Growth with Negative Earnings





I. Measure earnings right..



Operating Leases at Amgen in 2007

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

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

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

Capitalizing R&D Expenses: Amgen

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

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

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

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

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

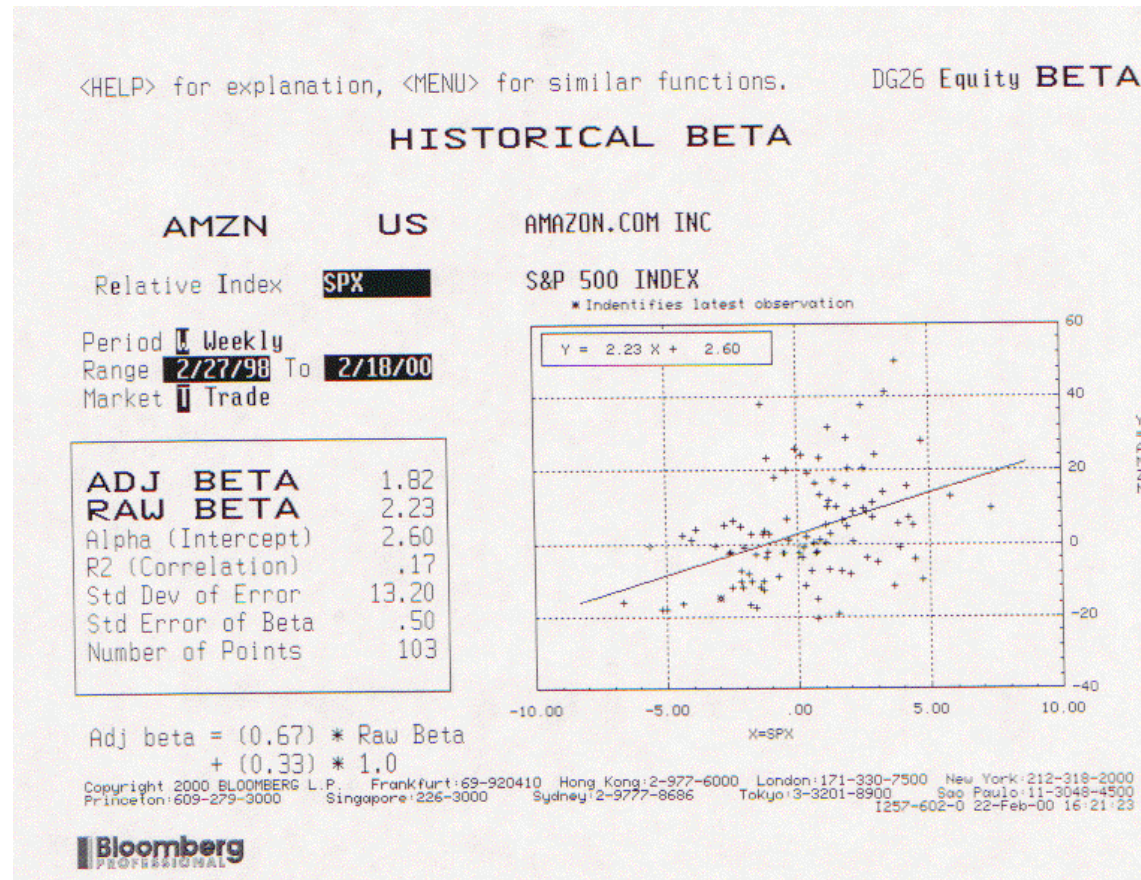
- Capital expenditures should include
 - Research and development expenses, once they have been re-categorized as capital expenses.
 - Acquisitions of other firms, whether paid for with cash or stock.
- Working capital should be defined not as the difference between current assets and current liabilities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

Amgen's Net Capital Expenditures

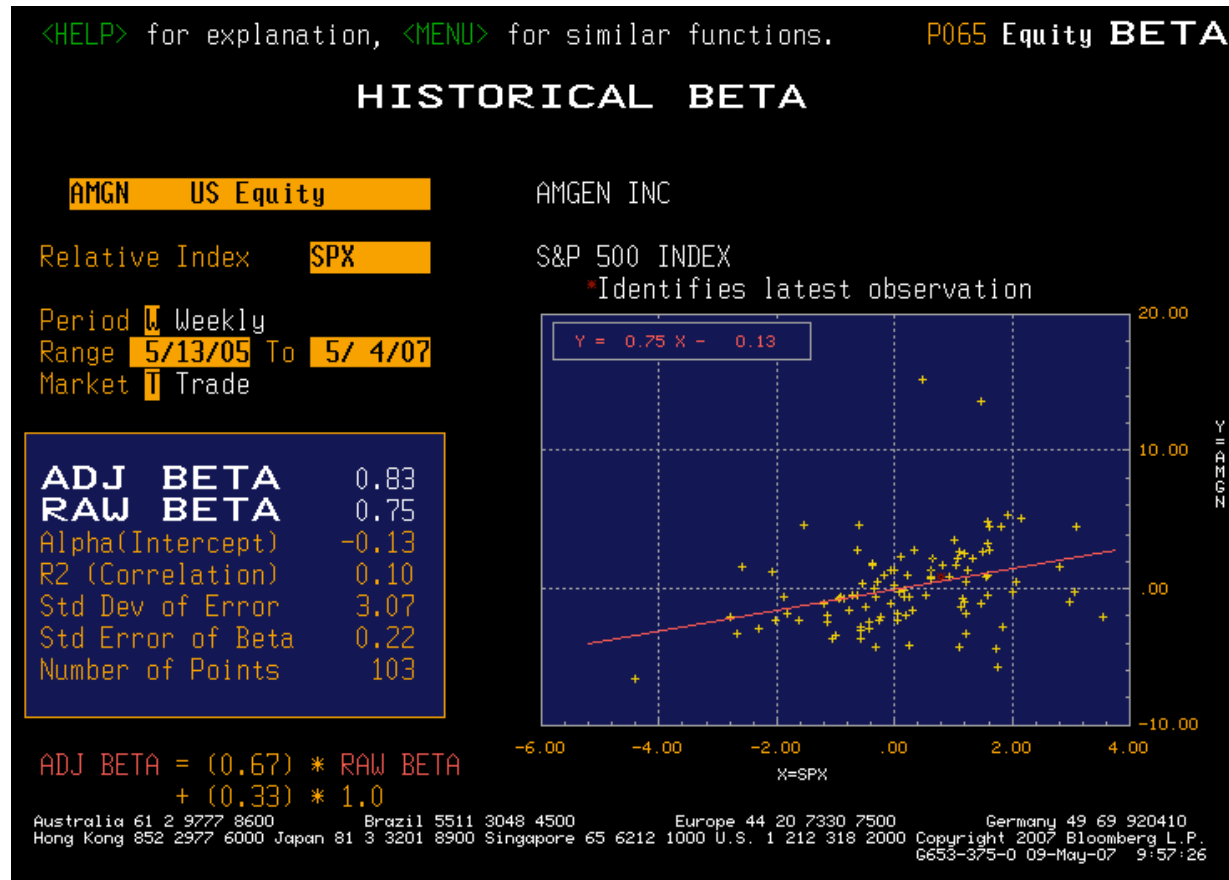
- If we define capital expenditures broadly to include R&D and acquisitions:

Accounting Capital Expenditures =	\$1,218 million
- Accounting Depreciation =	\$ 963 million
Accounting Net Cap Ex =	\$ 255 million
Net R&D Cap Ex = (3366-1150) =	\$2,216 million
Acquisitions in 2006 =	\$3,975 million
Total Net Capital Expenditures =	\$ 6,443 million
- Acquisitions have been a volatile item. Amgen was quiet on the acquisition front in 2004 and 2005 and had a significant acquisition in 2003.

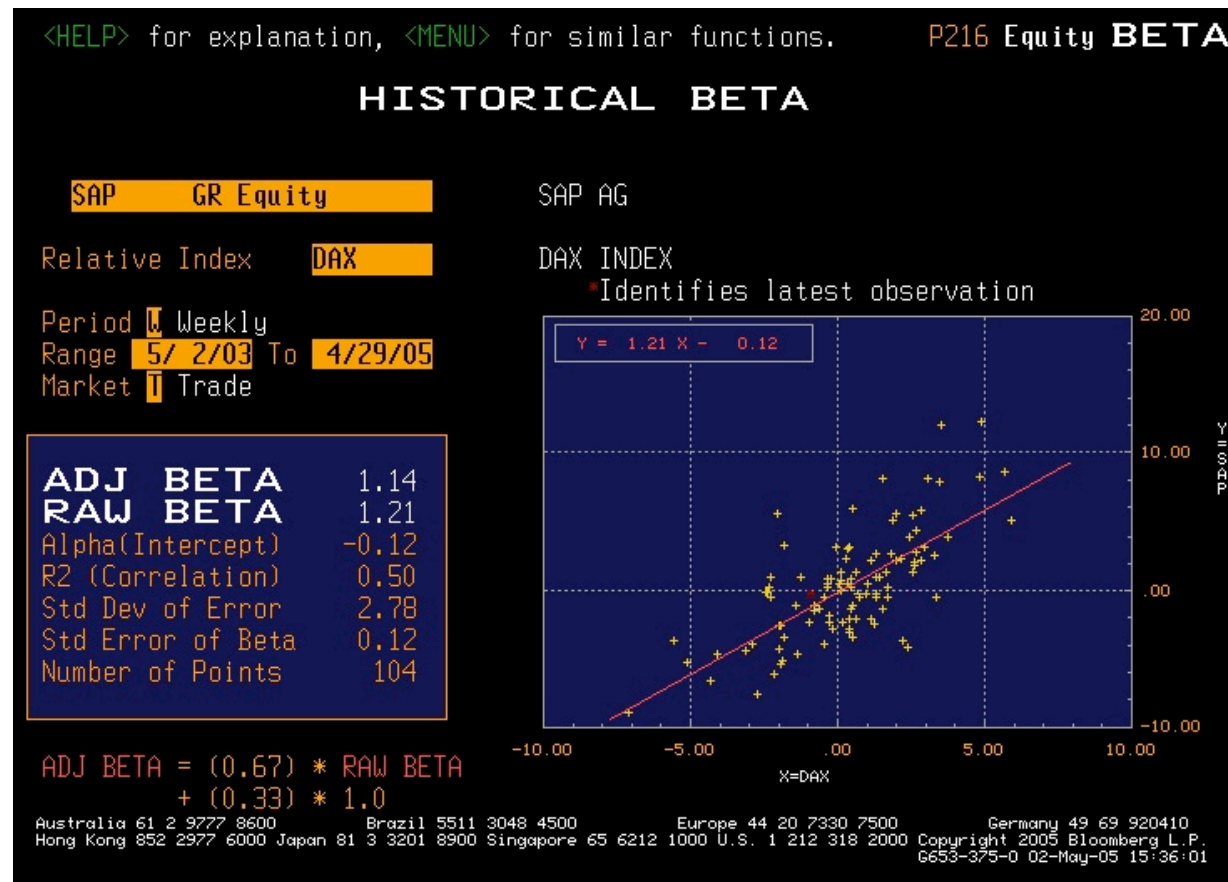
III. Betas do not come from regressions...



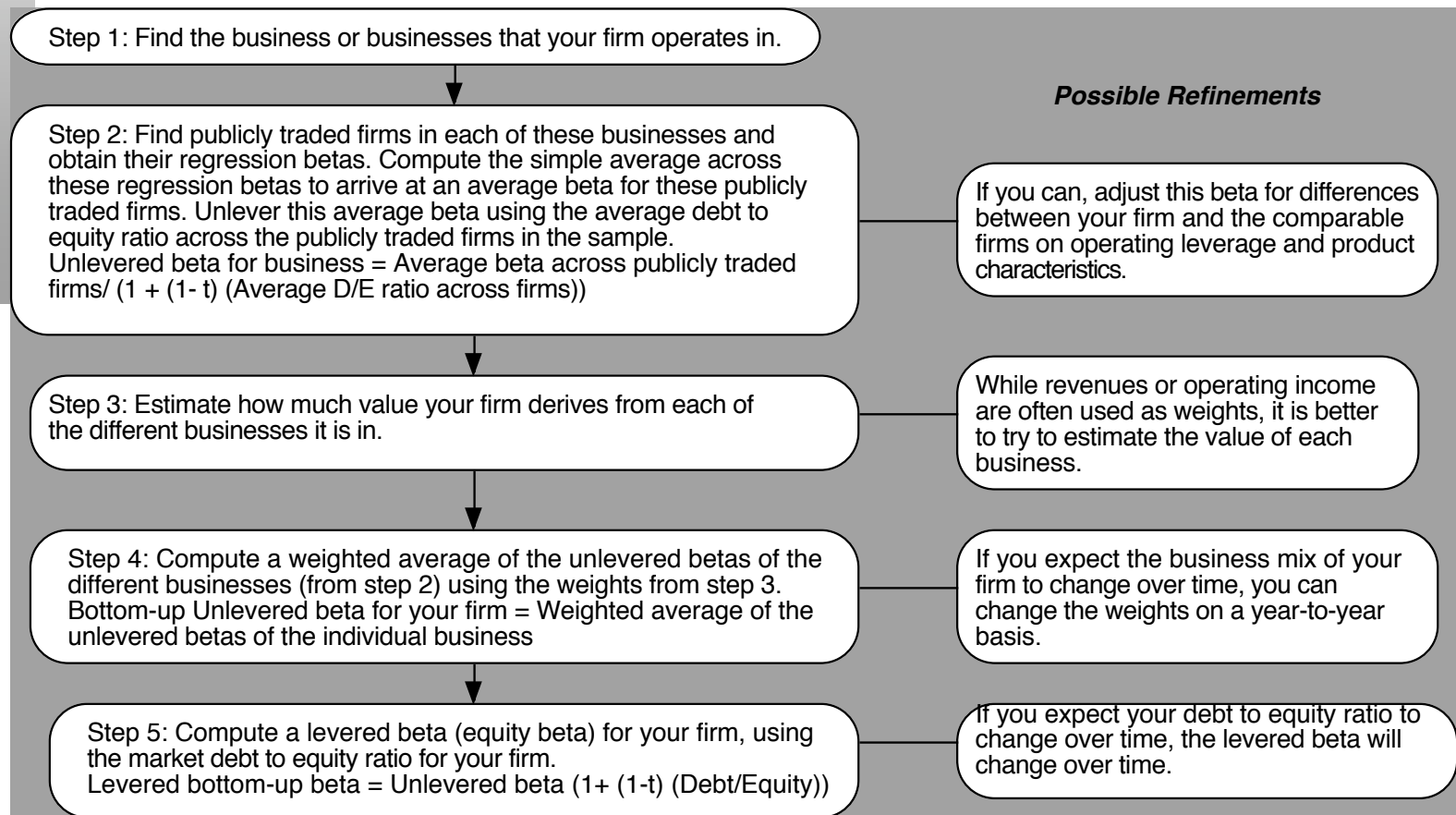
Carry much noise...



And cannot be trusted even if they look good...



Bottom-up Betas



Two examples...

■ Amgen

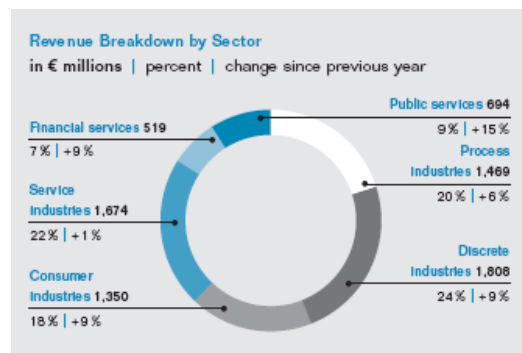
- The unlevered beta for pharmaceutical firms is 1.59. Using Amgen's debt to equity ratio of 11%, the bottom up beta for Amgen is
- Bottom-up Beta = $1.59 (1 + (1 - .35)(.11)) = 1.73$

■ SAP

■ Approach 1: Based on business mix

Business	Revenues	EV/Sales	Value	Weights	Beta
Software	€ 5.3	3.25	17.23	80%	1.30
Consulting	€ 2.2	2.00	4.40	20%	1.05
SAP	€ 7.5		21.63		1.25

■ Approach 2: Customer Base



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

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

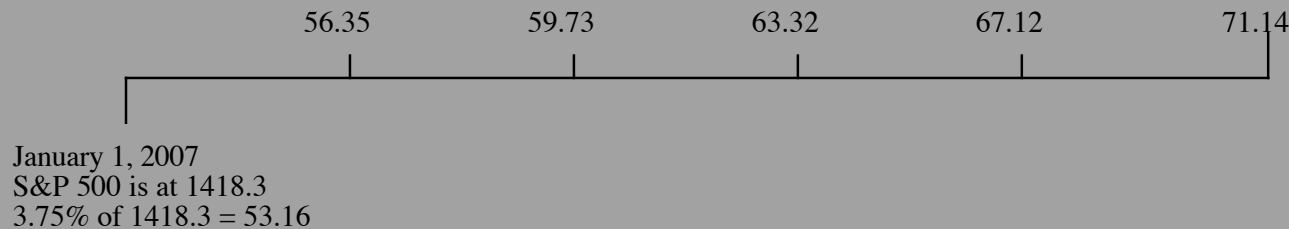
Historical Period	<i>Arithmetic average</i>		<i>Geometric Average</i>	
	Stocks - T.Bills	Stocks - T.Bonds	Stocks - T.Bills	Stocks - T.Bonds
1928-2006	7.87%	6.57%	6.01%	4.91%
1966-2006	5.57%	4.13%	4.34%	3.25%
1996-2006	6.91%	5.14%	5.42%	3.90%

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

Between 2001 and 2006, dividends and stock buybacks averaged 3.75% of the index each year.

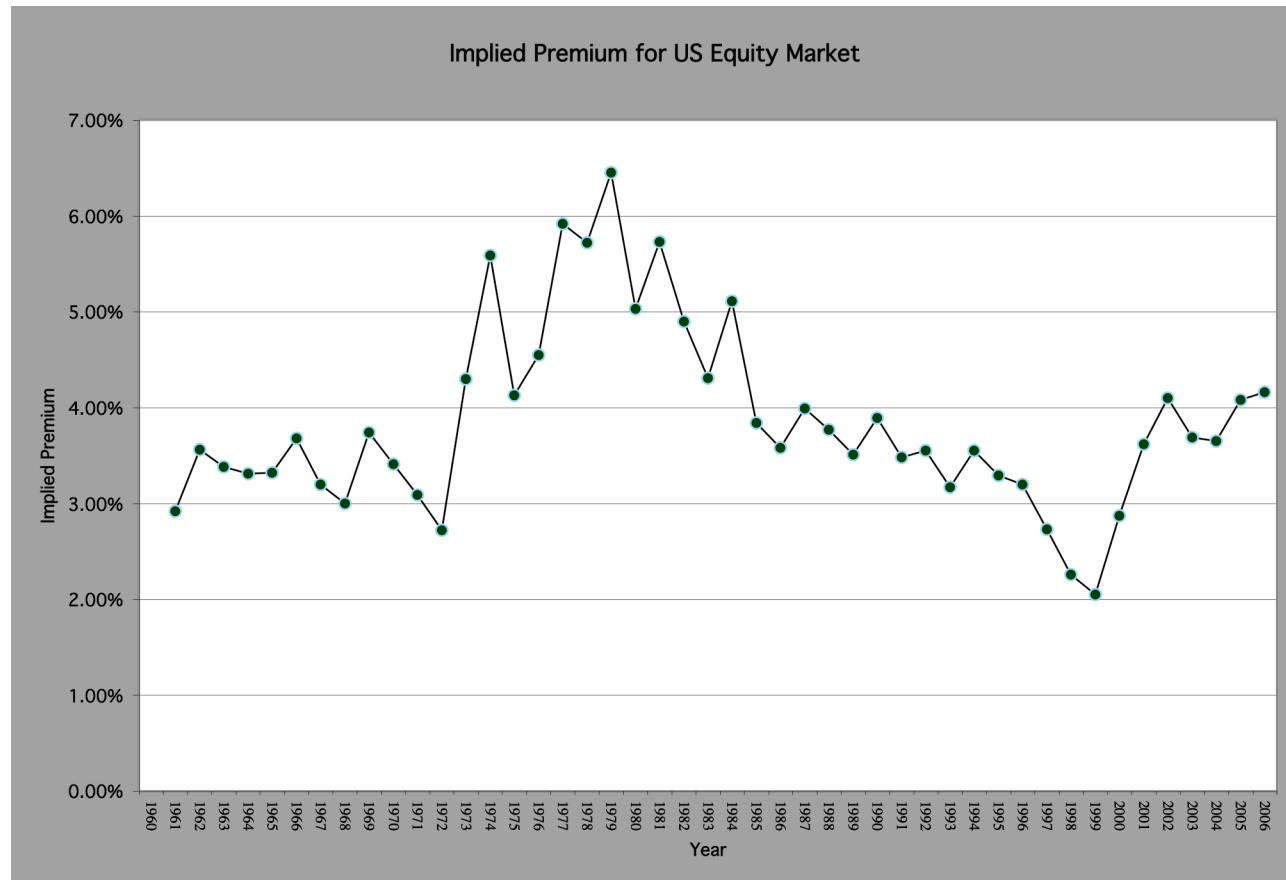
Analysts expect earnings (53.16) to grow 6% a year for the next 5 years .

After year 5, we will assume that earnings on the index will grow at 4.7%, the same rate as the entire economy



- Implied Equity risk premium = Expected return on stocks - Treasury bond rate = 8.76%-4.70% = 4.16%

Implied Premiums in the US



V. There is a downside to globalization...

- Emerging markets offer growth opportunities but they are also riskier. If we want to count the growth, we have to also consider the risk.
- Consider, for example, India as a country. In mid-2004, India was rated Baa2, with a default spread of 1.30%.
 - To estimate the country equity risk premium, we scaled up the default spread to reflect the additional risk in equities.
 - Standard Deviation in BSE = 32%
 - Standard Deviation in Indian Government Bond = 16%
 - Additional country risk premium = 1.30% $(32/16) = 2.60\%$

Equity Risk Premiums in Asia

<i>Country</i>	<i>Rating</i>	<i>Typical Default Spread</i>	<i>Relative Equity Market volatility</i>	<i>Equity Risk Premium</i>
China	A2	90	2.25	2.03%
Hong Kong	A1	80	1.8	1.44%
India	Baa2	130	2	2.60%
Indonesia	B2	550	1.8	9.90%
Malaysia	A3	95	2.5	2.38%
Pakistan	B2	550	1.75	9.63%
Singapore	Aaa	0	2.2	0.00%
Taiwan	Aa3	70	2.5	1.75%
Thailand	Baa1	120	2.2	2.64%
Vietnam	B1	450	1.6	7.20%
Weighted average risk premium =				2.50%

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

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

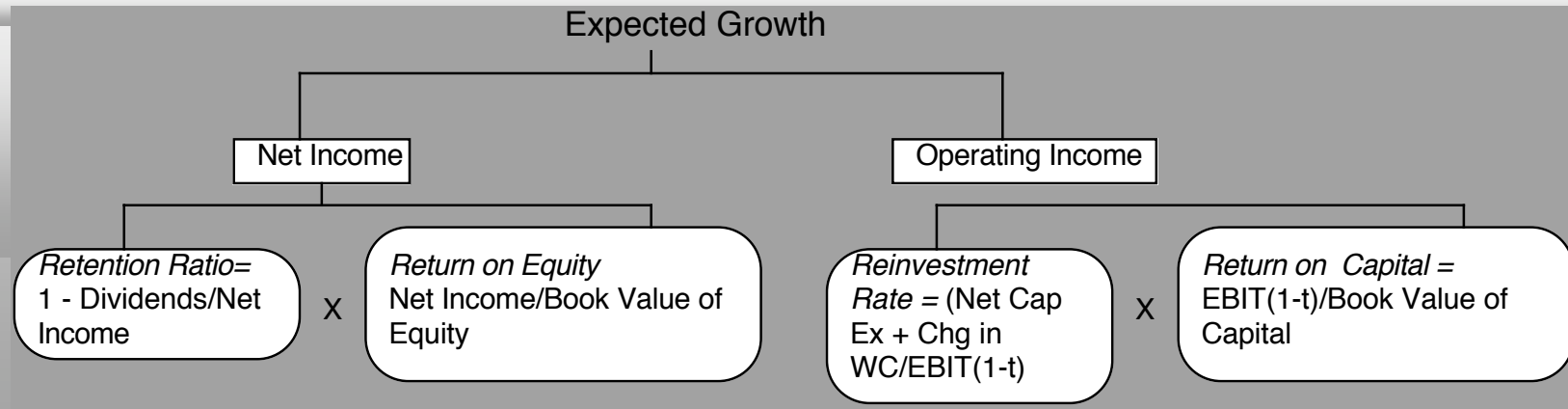
$$E(\text{Return}) = \text{Riskfree Rate} + \beta (\text{US premium}) + \lambda (\text{Country ERP})$$

- The easiest and most accessible data is on revenues. Most companies break their revenues down by region. One simplistic solution would be to do the following:
$$\lambda = \% \text{ of revenues domestically}_{\text{firm}} / \% \text{ of revenues domestically}_{\text{avg firm}}$$
- Consider, for instance, the fact that SAP got about 11.5% of its revenues from Asia, and Latin America. Assuming that about 7.5% of its sales are in “Emerging Asia”, we can estimate a lambda for SAP for Asia (using the assumption that the typical Asian firm gets about 75% of its revenues in Asia)
 - $\text{Lambda}_{\text{SAP, Asia}} = 7.5\% / 75\% = 0.10$
- There are two implications
 - A company’s risk exposure is determined by where it does business and not by where it is located
 - Firms might be able to actively manage their country risk exposures

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

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

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



Adjust EBIT for

- Extraordinary or one-time expenses or income
- Operating leases and R&D
- Cyclicality in earnings (Normalize)
- 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

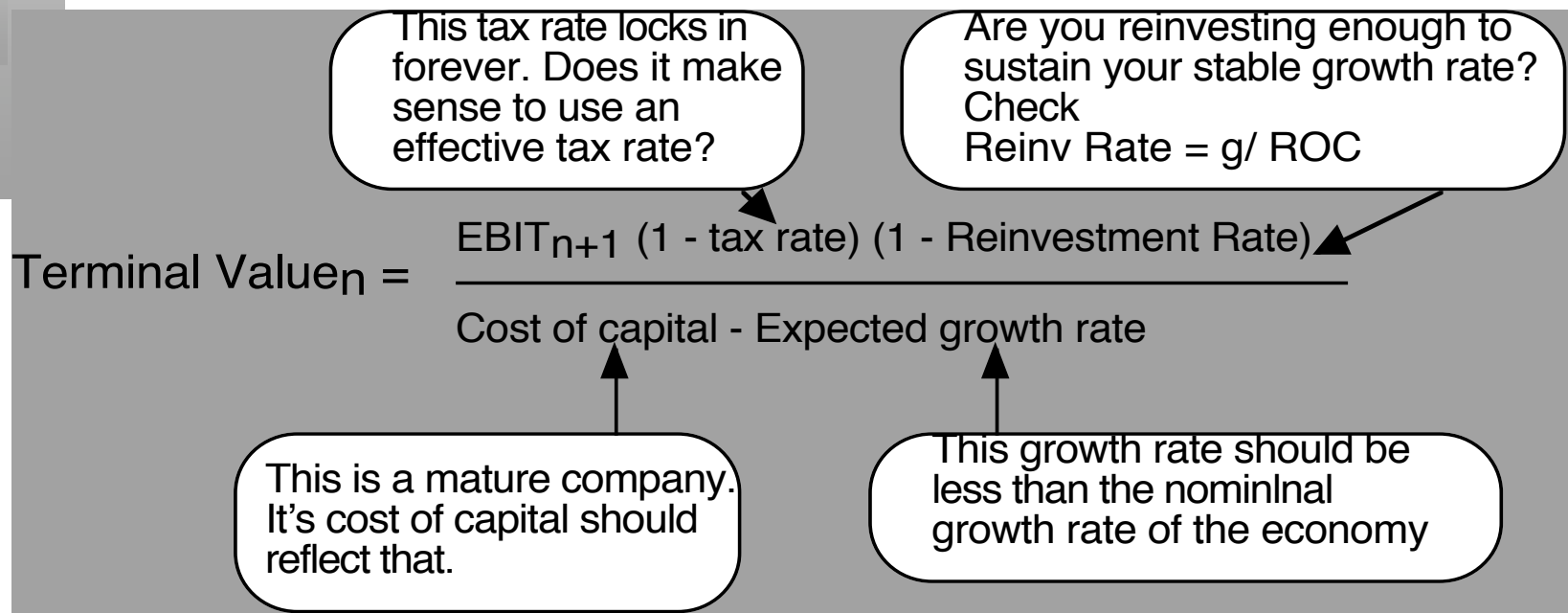
- Capitalized R&D
- Acquisition Debris (Goodwill)

Adjust book value of debt for

- Capitalized operating leases

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

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



X. The loose ends matter...

Value of Operating Assets	Since this is a discounted cashflow valuation, should there be a real option premium?
+ Cash and Marketable Securities	Operating versus Non-operating 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 utilized 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?

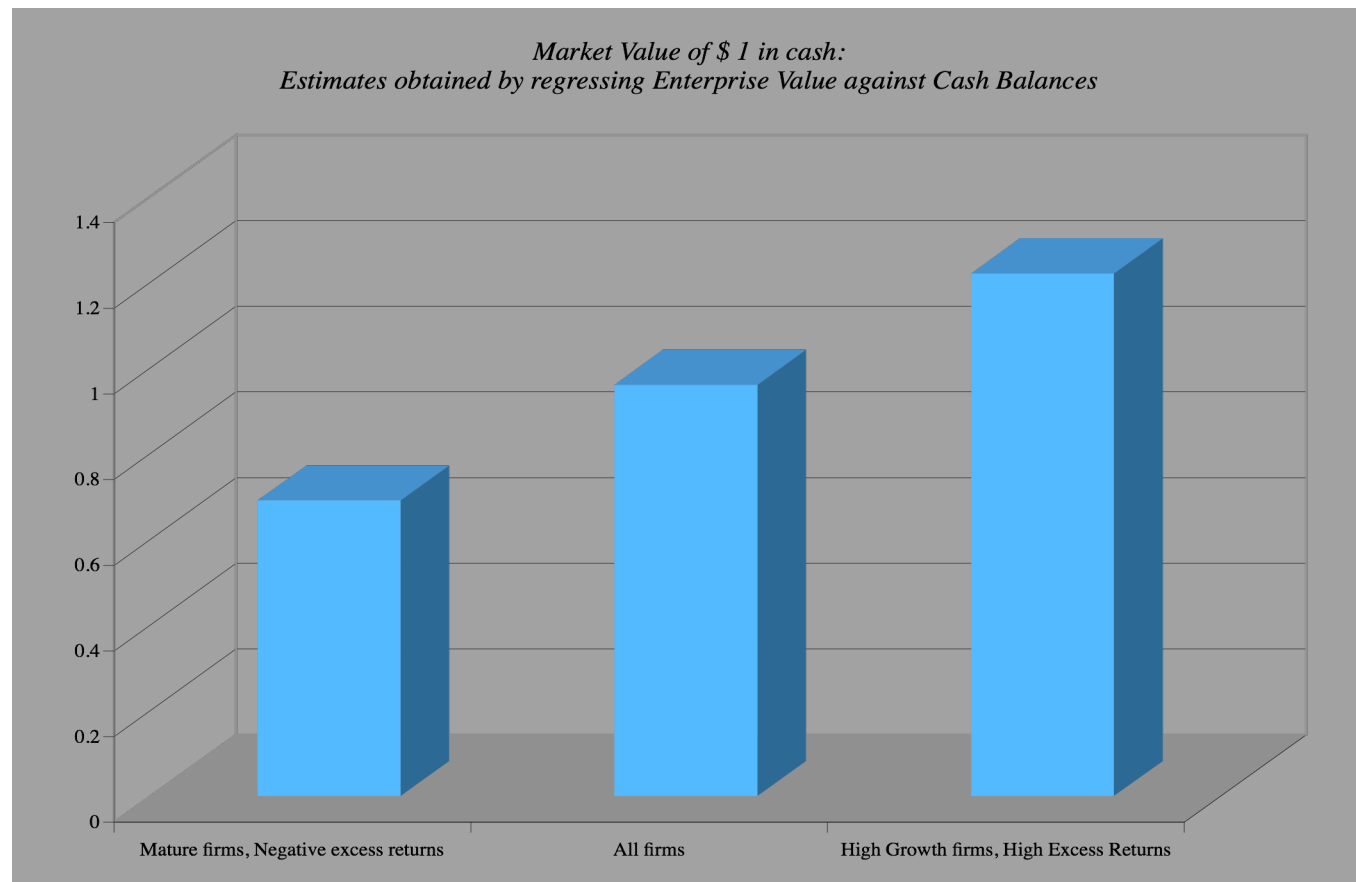
I. The Value of Cash

An Exercise in Cash Valuation

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

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

Cash: Discount or Premium?



2. Dealing with Holdings in Other firms

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

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

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

Two compromise solutions...

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

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

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

- *Which firm would you value more highly?*

Measuring Complexity: Volume of Data in Financial Statements

<i>Company</i>	<i>Number of pages in last 10Q</i>	<i>Number of pages in last 10K</i>
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

<i>Item</i>	<i>Factors</i>	<i>Follow-up Question</i>	<i>Answer</i>	<i>Complexity score</i>
Operating Income	1. Multiple Businesses	Number of businesses (with more than 10% of revenues) =	2	4
	2. One-time income and expenses	Percent of operating income =	20%	1
	3. Income from unspecified sources	Percent of operating income =	15%	0.75
	4. Items in income statement that are volatile	Percent of operating income =	5%	0.25
Tax Rate	1. Income from multiple locales	Percent of revenues from non-domestic locales =	100%	3
	2. Different tax and reporting books	Yes or No	Yes	3
	3. Headquarters in tax havens	Yes or No	Yes	3
	4. Volatile effective tax rate	Yes or No	Yes	2
Capital Expenditures	1. Volatile capital expenditures	Yes or No	Yes	2
	2. Frequent and large acquisitions	Yes or No	Yes	4
	3. Stock payment for acquisitions and investments	Yes or No	Yes	4
Working capital	1. Unspecified current assets and current liabilities	Yes or No	Yes	3
	2. Volatile working capital items	Yes or No	Yes	2
Expected Growth rate	1. Off-balance sheet assets and liabilities (operating leases and R&D)	Yes or No	Yes	3
	2. Substantial stock buybacks	Yes or No	Yes	3
	3. Changing return on capital over time	Is your return on capital volatile?	Yes	5
	4. Unsustainably high return	Is your firm's ROC much higher than industry average?	Yes	5
Cost of capital	1. Multiple businesses	Number of businesses (more than 10% of revenues) =	2	2
	2. Operations in emerging markets	Percent of revenues=	30%	1.5
	3. Is the debt market traded?	Yes or No	Yes	0
	4. Does the company have a rating?	Yes or No	Yes	0
	5. Does the company have off-balance sheet debt?	Yes or No	No	0
Complexity Score =				51.5

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

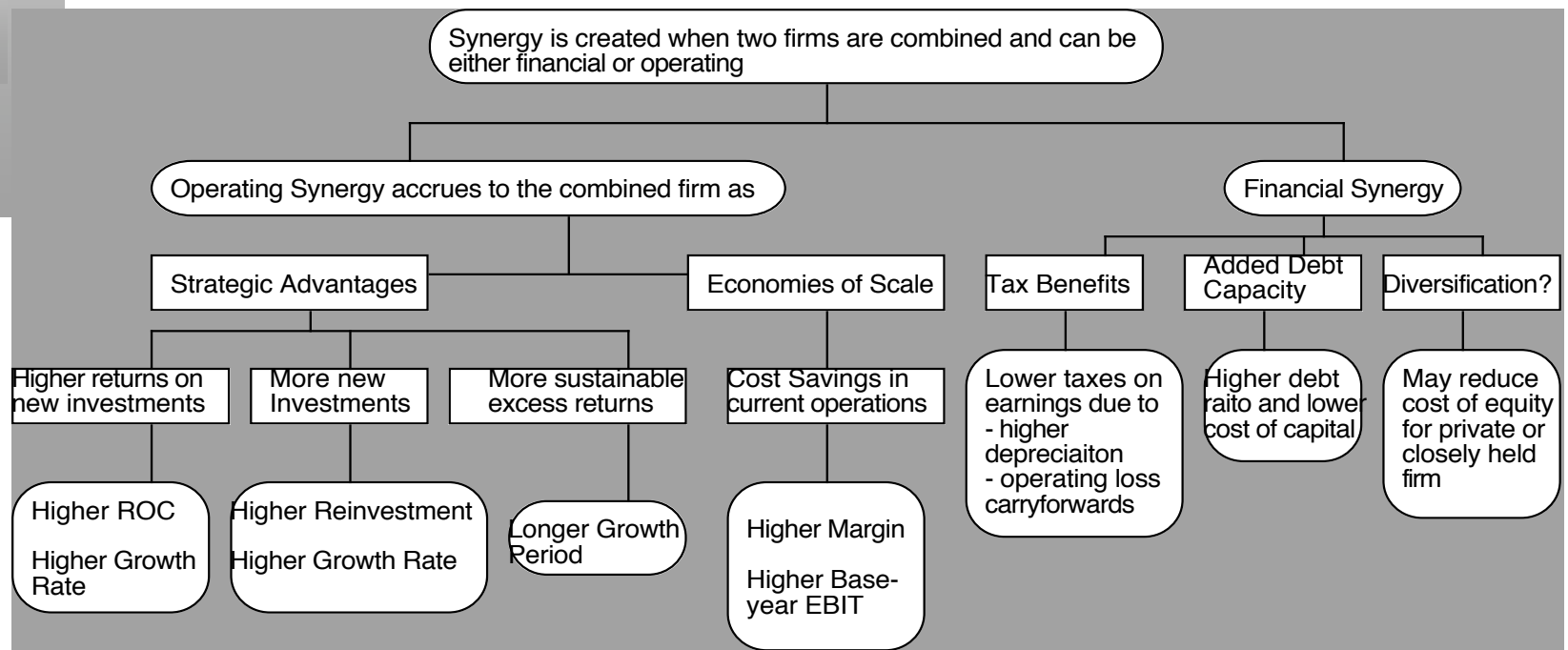
In relative valuation

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:

$PBV = 0.65 + 15.31 \text{ ROE} - 0.55 \text{ Beta} + 3.04 \text{ Expected growth rate} - 0.003 \text{ \# Pages in 10K}$

5. The Value of Synergy



Valuing Synergy

- (1) the firms involved in the merger are **valued independently**, by discounting expected cash flows to each firm at the weighted average cost of capital for that firm.
- (2) the **value of the combined firm, with no synergy**, is obtained by adding the values obtained for each firm in the first step.
- (3) The **effects of synergy are built into expected growth rates and cashflows**, and the combined firm is re-valued with synergy.

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

Valuing Synergy: P&G + Gillette

	P&G	Gillette	Piglet: No Synergy	Piglet: Synergy	
Free Cashflow to Equity	\$5,864.74	\$1,547.50	\$7,412.24	\$7,569.73	Annual operating expenses reduced by \$250 million
Growth rate for first 5 years	12%	10%	11.58%	12.50%	Slightly 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

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

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

Categorizing Intangibles

	<i>Independent and Cash flow generating intangibles</i>	<i>Not independent and cash flow generating to the firm</i>	<i>No cash flows now but potential for cashflows in future</i>
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.	<ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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

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

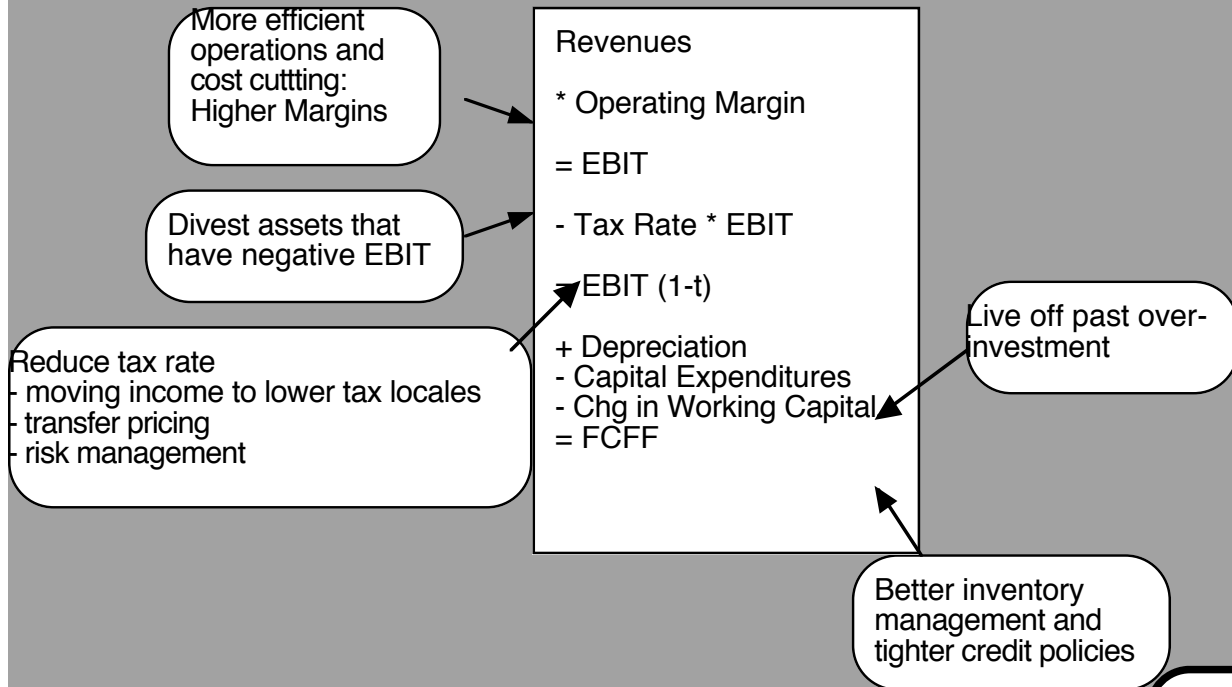
- If you have under funded pension fund or health care plans, you should consider the under funding at this stage in getting to the value of equity.
 - If you do so, you should not double count by also including a cash flow line item reflecting cash you would need to set aside to meet the unfunded obligation.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

7. The Value of Control

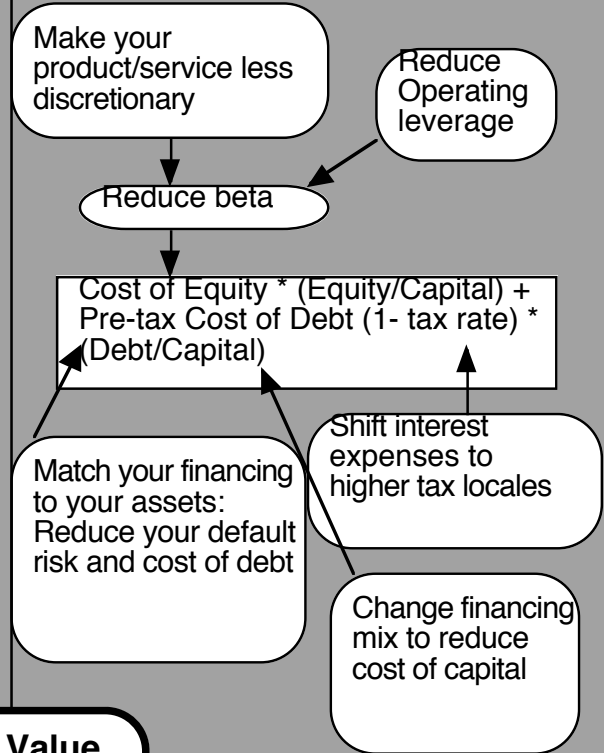
- The value of the control premium that will be paid to acquire a block of equity will depend upon two factors -
 - **Probability that control of firm will change:** This refers to the probability that incumbent management will be replaced. this can be either through acquisition or through existing stockholders 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

Increase Cash Flows

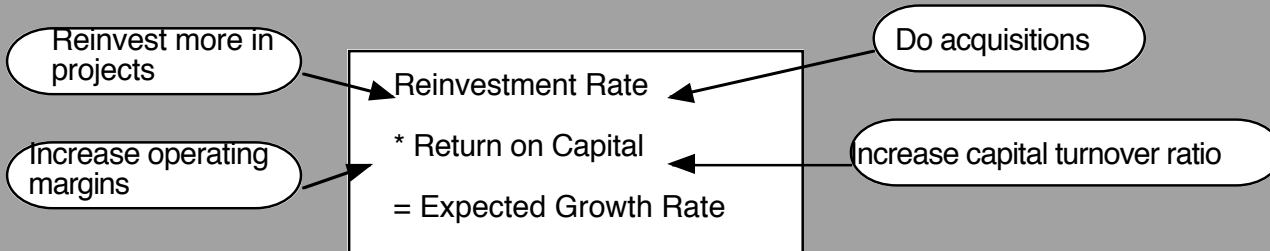


Reduce the cost of capital

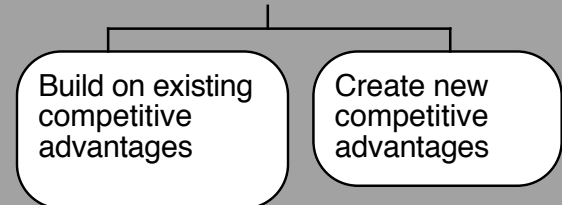


Firm Value

Increase Expected Growth



Increase length of growth period



SAP: Restructured

Avg Reinvestment rate = 36.94%

Reinvest more in emerging markets

Return on Capital 19.93%

Current Cashflow to Firm

EBIT(1-t) : 1414
 - Nt CpX 831
 - Chg WC - 19
 = FCFF 602
 Reinvestment Rate = 812/1414 = 57.42%

Reinvestment Rate 70%

Expected Growth in EBIT (1-t)
 $.70 * .1993 = .1144$
13.99%

Stable Growth
 $g = 3.41%$; Beta = 1.00;
 Debt Ratio = 30%
 Cost of capital = 6.27%
 ROC = 6.27%; Tax rate = 35%
 Reinvestment Rate = 54.38%

First 5 years

Growth decreases gradually to 3.41%

Terminal Value₁₀ = 1898 / (.0627 - .0341) = 66367

Op. Assets 38045
 + Cash: 3,018
 - Debt 558
 - Pension Lian 305
 - Minor. Int. 55
 = Equity 40157
 - Options 180
 Value/Share 126.51

Year	2	3	4	5	6	7	8	9	10	Term Yr
EBIT	2,543	2,898	3,304	3,766	4,293	4,802	5,271	5,673	5,987	6,191
EBIT(1-t)	1,614	1,839	2,097	2,390	2,724	3,047	3,345	3,600	3,799	3,929
- Reinvest	1,130	1,288	1,468	1,673	1,907	2,011	2,074	2,089	2,052	1,965
= FCFF	484	552	629	717	817	1,036	1,271	1,512	1,747	1,963

Term Yr
 6402
 4161
 2263
 1898

Cost of Capital (WACC) = 10.57% (0.70) + 2.80% (0.30) = 8.24%

Cost of Equity 10.57%

Cost of Debt
 $(3.41% + 1.00%)(1 - .3654)$
 = 2.80%

Weights
 E = 70% D = 30%

On May 5, 2005, SAP was trading at 122 Euros/share

Use more debt financing.

Riskfree Rate:
 Euro riskfree rate = 3.41%

+

Beta
 1.59

x

Risk Premium
 4.50%

Unlevered Beta for Sectors: 1.25

Mature risk premium 4%

Country Equity Prem 0.5%

Minority Discounts and Voting Shares

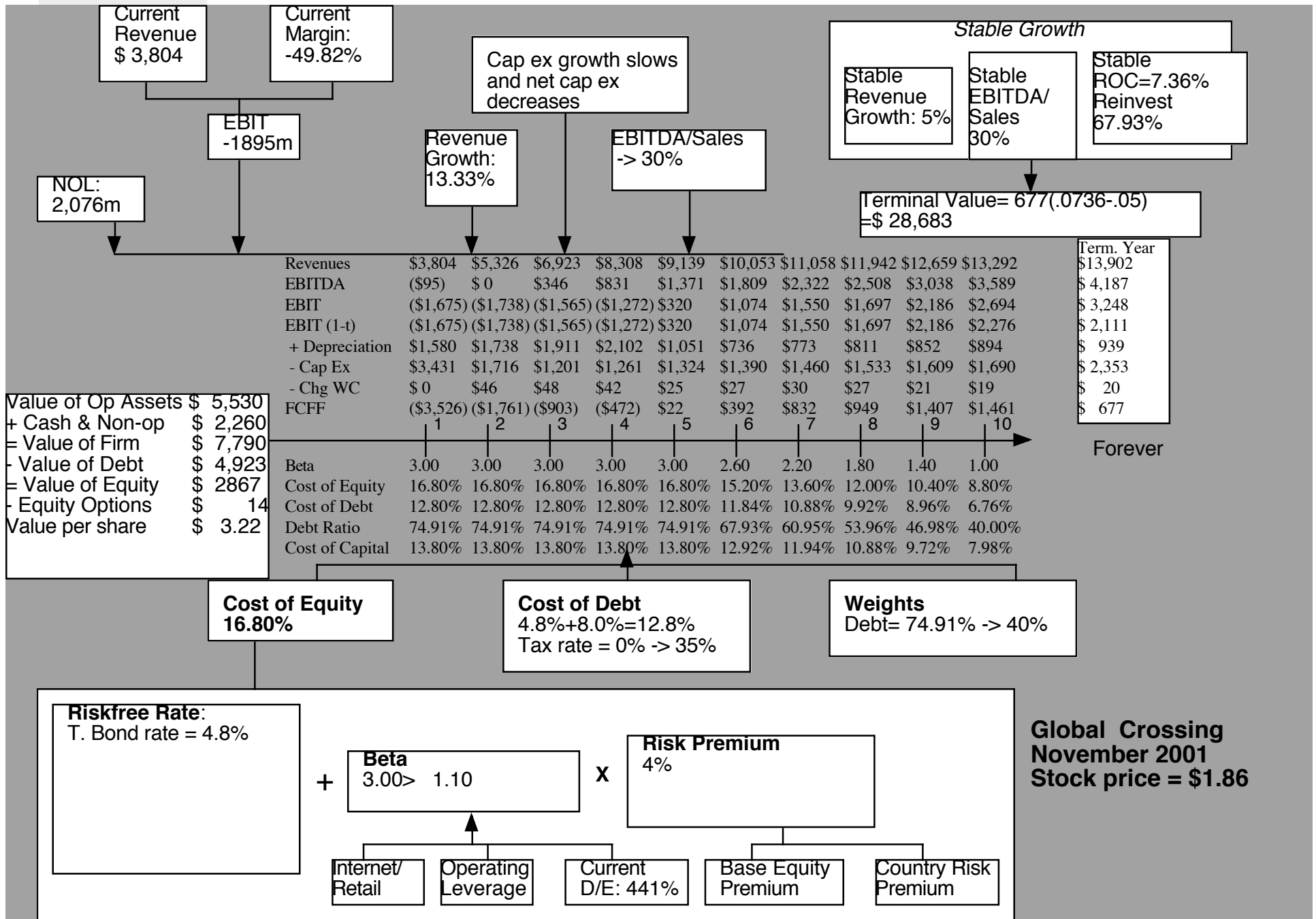
- Assume that a firm has a value of \$ 100 million run by incumbent managers and \$ 150 million run optimally.
- Proposition 1: The market price will reflect the expected value of control
 - The firm has 10 million voting shares outstanding.
 - Since the potential for changing management is created by this offering, the value per share will fall between \$10 and \$15, depending upon the probability that is attached to the management change. Thus, if the probability of the management change is 60%, the value per share will be \$13.00.

$$\text{Value/Share} = (150 \cdot .6 + 100 \cdot .4) / 10 = \$13$$

- Proposition 2: If you have shares with different voting rights, the voting shares will get a disproportionate share of the value of control...
- Proposition 3: The value of a minority interest (49%) of a private business will be significantly lower than the value of a majority stake in the same business if control has value.

8. Distress and the Going Concern Assumption

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



Valuing Global Crossing with Distress

■ Probability of distress

- Price of 8 year, 12% bond issued by Global Crossing = \$ 653

$$653 = \sum_{t=1}^{t=8} \frac{120(1 - \pi_{Distress})^t}{(1.05)^t} + \frac{1000(1 - \pi_{Distress})^8}{(1.05)^8}$$

- Probability of distress = 13.53% a year
- Cumulative probability of survival over 10 years = $(1 - .1353)^{10} = 23.37\%$

■ Distress sale value of equity

- Book value of capital = \$14,531 million
- Distress sale value = 15% of book value = $.15 * 14531 = \$2,180$ million
- Book value of debt = \$7,647 million
- Distress sale value of equity = \$ 0

■ Distress adjusted value of equity

- Value of Global Crossing = $\$3.22 (.2337) + \$0.00 (.7663) = \$0.75$

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.

10. Analyzing the Effect of Illiquidity on Value

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

Illiquidity Discounts from Bid-Ask Spreads

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

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

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

$$\begin{aligned} \text{Spread} &= 0.145 - 0.0022 \ln(\text{Annual Revenues}) - 0.015 (\text{DERN}) - 0.016 (\text{Cash/Firm Value}) - \\ &0.11 (\text{\$ Monthly trading volume/ Firm Value}) \\ &= 0.145 - 0.0022 \ln(5) - 0.015 (1) - 0.016 (.08) - 0.11 (0) = .12.52\% \end{aligned}$$

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



Relative Valuation

Aswath Damodaran

Relative valuation is pervasive...

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

The Reasons for the allure...

“If you think I’m crazy, you should see the guy who lives across the hall”

Jerry Seinfeld talking about Kramer in a Seinfeld episode

“ A little inaccuracy sometimes saves tons of explanation”

H.H. Munro

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

Ex-portfolio manager

The Four Steps to Deconstructing Multiples

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

Definitional Tests

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

Example 1: Price Earnings Ratio: Definition

$$\text{PE} = \text{Market Price per Share} / \text{Earnings per Share}$$

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

Example 2: Enterprise Value /EBITDA Multiple

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

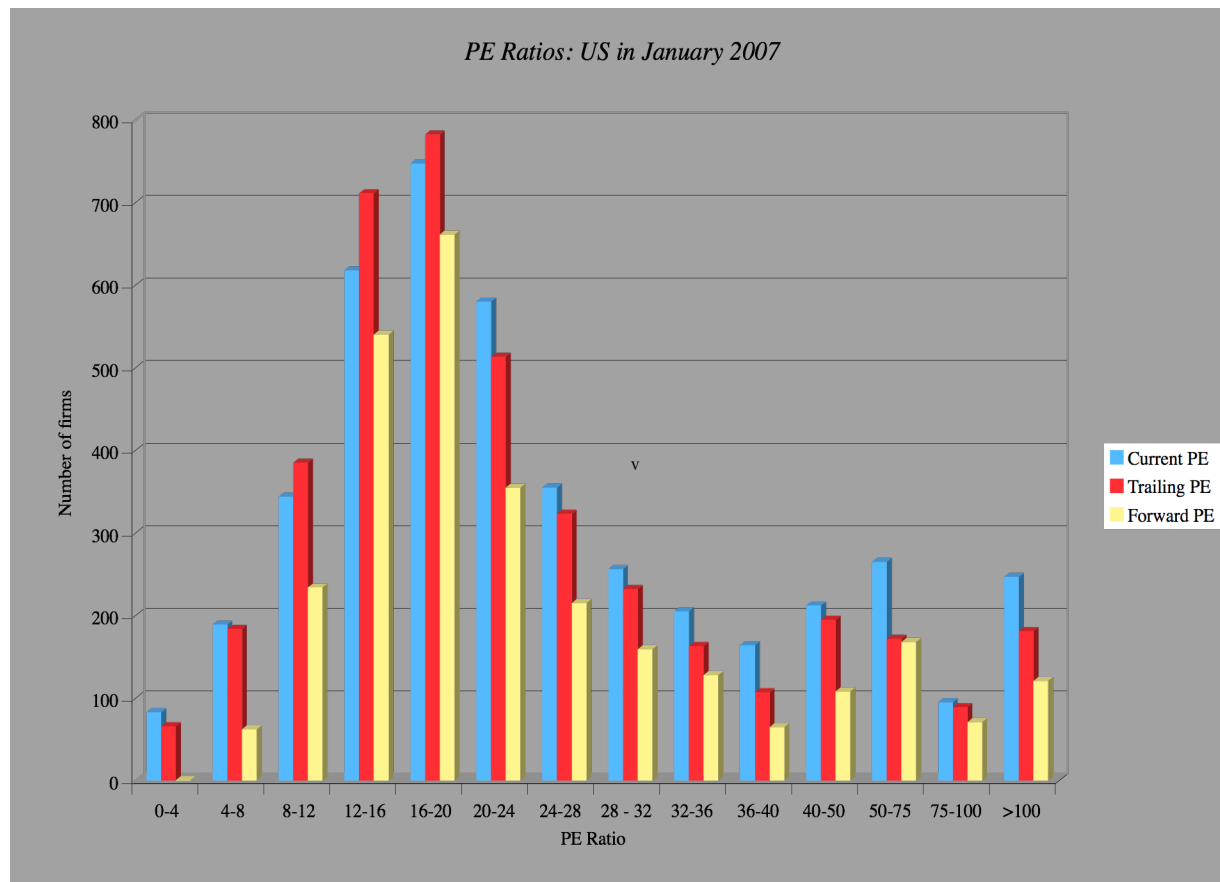
$$\frac{\text{Enterprise Value}}{\text{EBITDA}} = \frac{\text{Market Value of Equity} + \text{Market Value of Debt} - \text{Cash}}{\text{Earnings before Interest, Taxes and Depreciation}}$$

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

Descriptive Tests

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

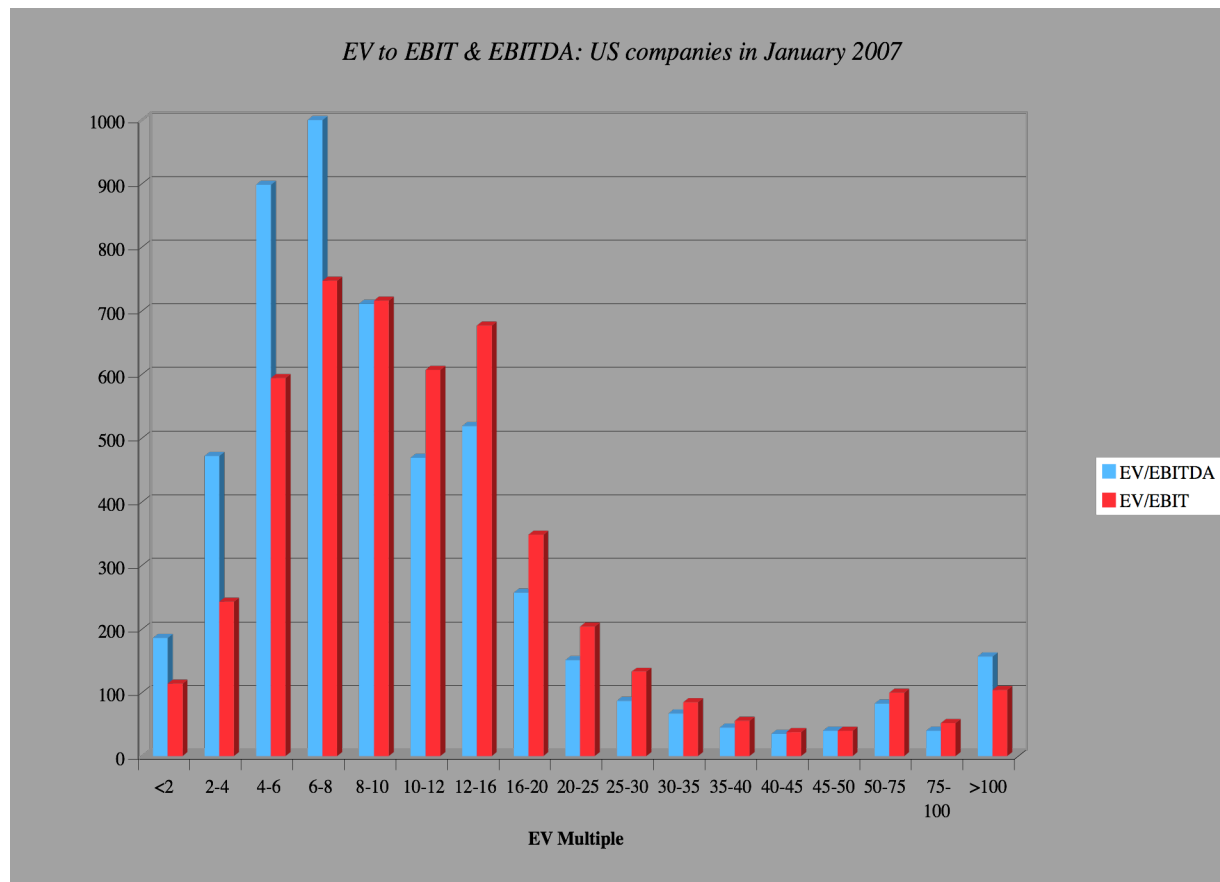
Looking at the distribution...



PE: Deciphering the Distribution

	Current PE	Trailing PE	Forward PE
Mean	40.77	39.67	34.46
Standard Error	1.80	5.08	2.12
Median	21.21	19.20	19.62
Standard Deviation	119.08	330.10	114.32
Kurtosis	355.27	2921.11	1111.11
Skewness	16.53	50.83	30.77
Range	12170.00	19561.00	4562.00
Minimum	2.45	4.16	4.38
Maximum	19561.00	13355.00	4562.00
Count	4363	4229	2894
90th percentile	66.64	54.28	44.98
10th percentile	9.89	8.35	13.05

And 8 times EBITDA is not cheap



Analytical Tests

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

PE Ratio: Understanding the Fundamentals

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

- With the dividend discount model,

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

- Dividing both sides by the current earnings per share,

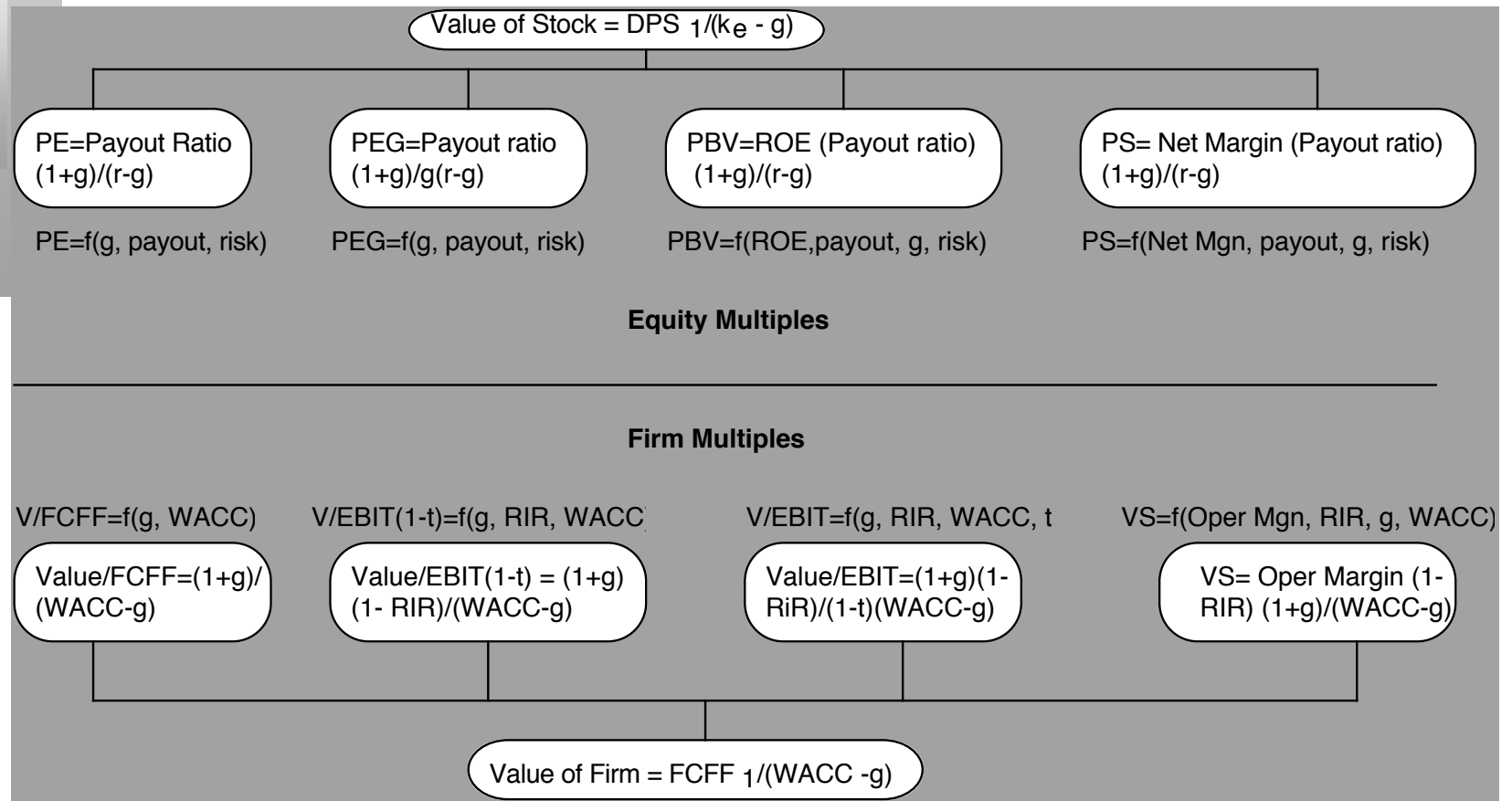
$$\frac{P_0}{EPS_0} = PE = \frac{\text{Payout Ratio} * (1 + g_n)}{r - g_n}$$

- If this had been a FCFE Model,

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

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

The Determinants of Multiples...



Application Tests

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

An Example: Comparing PE Ratios across a Sector: PE

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

PE, Growth and Risk

Dependent variable is: PE

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

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

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

Is Telebras under valued?

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

Amgen's Relative Value

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

The Drivers of PE Ratios...

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

Comparisons to the entire market: Why not?

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

PE Ratio: Standard Regression for US stocks - January 2007

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.644 ^a	.414	.413	1125.459118189800000

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

Coefficients^{a,b}

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.645	1.204		8.844	.000
	Expected Growth in EPS: next 5 years	1.178	.033	.659	36.211	.000
	Value Line Beta	-2.621	1.074	-.043	-2.441	.015
	Payout Ratio	7.419E-03	.011	.012	.686	.493

a. Dependent Variable: Current PE

b. Weighted Least Squares Regression - Weighted by Market Cap

Amgen valued relative to the market

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

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 number 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.

In Practice...

- As a general rule of thumb, the following table provides a way of picking a multiple for a sector

<i>Sector</i>	<i>Multiple Used</i>	<i>Rationale</i>
Cyclical Manufacturing	PE, Relative PE	Often with normalized earnings
High Tech, High Growth	PEG	Big differences in growth across firms
High Growth/No Earnings	PS, VS	Assume future margins will be good
Heavy Infrastructure	VEBITDA	Firms in sector have losses in early years and reported earnings can vary depending on depreciation method
REITa	P/CF	Generally no cap ex investments from equity earnings
Financial Services	PBV	Book value often marked to market
Retailing	PS	If leverage is similar across firms
	VS	If leverage is different

Back to Lemmings...

