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# The Dark Side of Valuation

## Dante meets DCF...

*“Abandon every hope, ye who enter here”*

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[www.damodaran.com](http://www.damodaran.com)

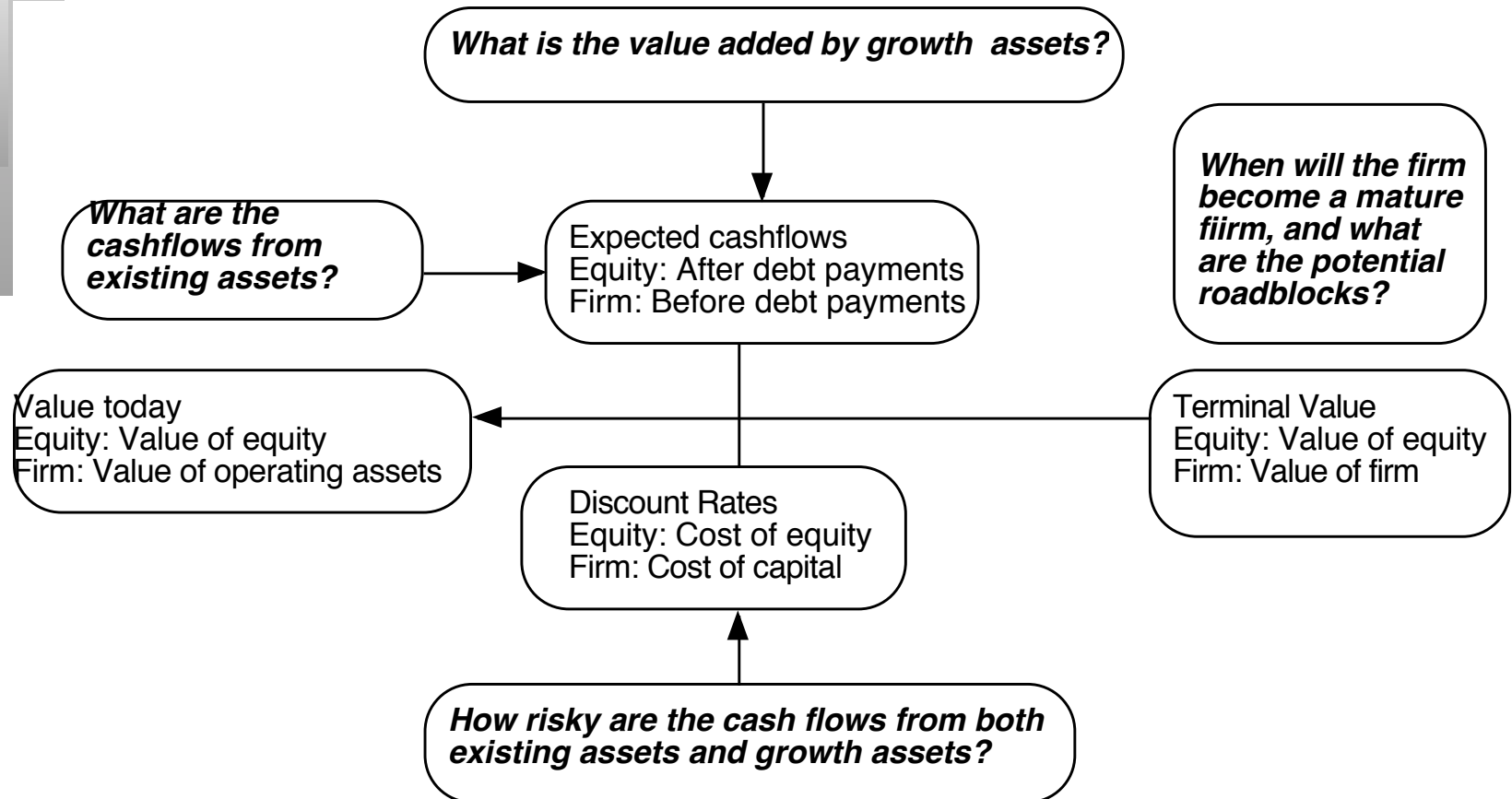
## DCF Choices: Equity versus Firm

**Firm Valuation:** Value the entire business by discounting cash flow to the firm at cost of capital

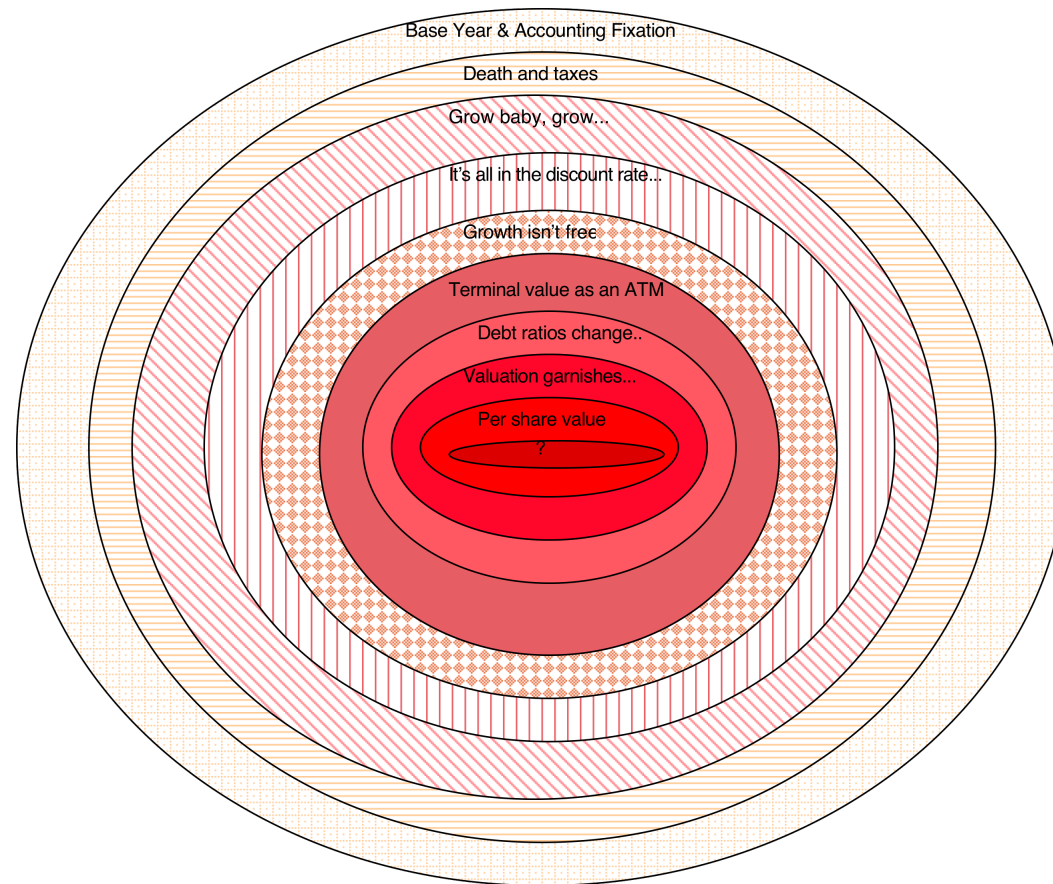
Assets		Liabilities	
Existing Investments Generate cashflows today Includes long lived (fixed) and short-lived (working capital) assets	Assets in Place	Debt	Fixed Claim on cash flows Little or No role in management <i>Fixed Maturity</i> <i>Tax Deductible</i>
Expected Value that will be created by future 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 by discounting cash flows to equity at the cost of equity

# The Value of a business rests on..



# The nine circles of valuation hell.. With a special bonus circle...



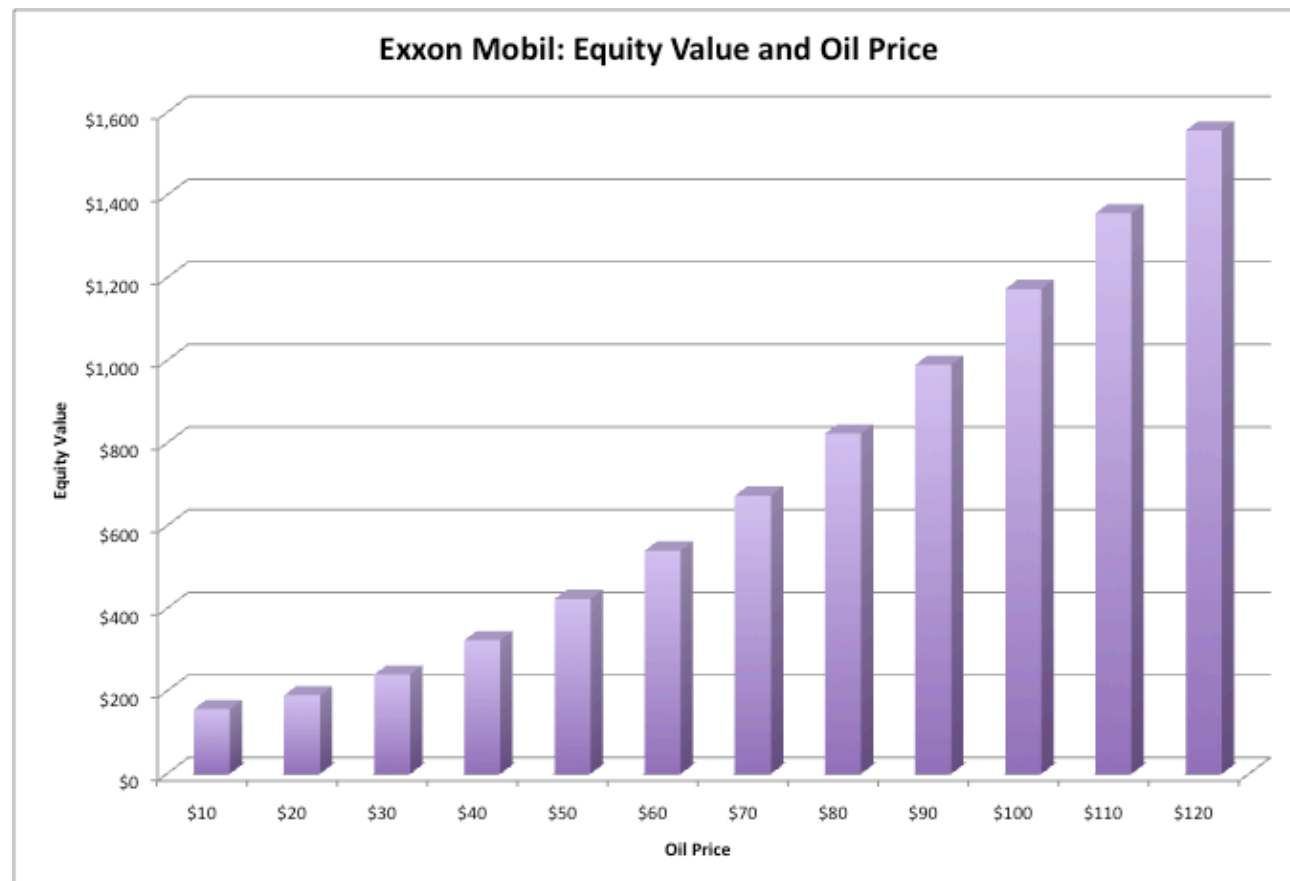
## Illustration 1: Base Year fixation....

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- You are valuing Exxon Mobil, using data from the most recent fiscal year (2008). The following provides the key numbers:

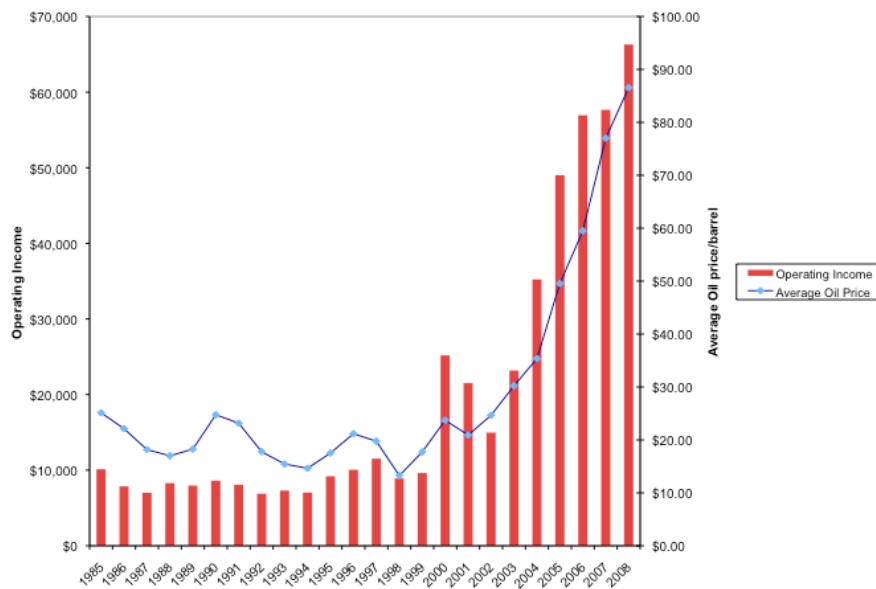
Revenues	\$477 billion
EBIT (1-t)	\$ 58 billion
Net Cap Ex	\$ 3 billion
Chg WC	\$ 1 billion
FCFF	\$ 54 billion
- The cost of capital for the firm is 8% and you use a very conservative stable growth rate of 2% to value the firm. The market cap for the firm is \$330 billion and it has \$ 10 billion in debt outstanding.
  - a. How under or over valued is the equity in the firm?
  - b. Would you buy the stock based on this valuation? Why or why not?

Normalization... not easy to do... but you don't have a choice...

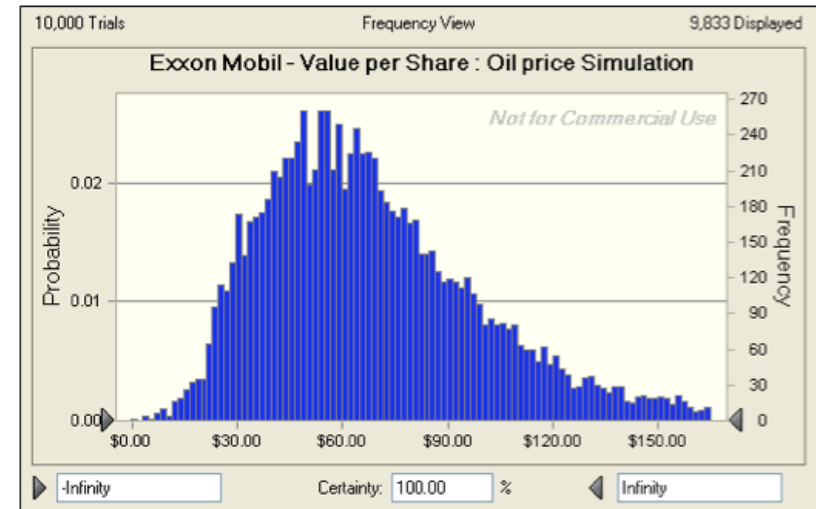


## And one possible response...

### Step 1: Look at history



### Step 3: Run simulation



### Step 2: Look for relationship

Regression of Exxon income against oil price

Op Inc = -6,934 + 911 (Price per barrel of oil)

R squared = 94%

## Illustration 2: Taxes and Value

- Assume that you have been asked to value a company and have been provided with the most recent year's financial statements:

EBITDA	140	
- DA	40	<i>Free Cash flow to firm</i>
EBIT	100	EBIT (1- tax rate)
- Interest exp	20	-(Cap Ex – Depreciation)
Taxable income	80	- Change in non-cash WC
Taxes	32	=FCFF
Net Income	48	

Assume also that cash flows will be constant and that there is no growth in perpetuity. What is the free cash flow to the firm?

- 88 million (Net income + Depreciation)
- 108 million (EBIT – taxes + Depreciation)
- 100 million (EBIT (1-tax rate)+ Depreciation)
- 60 million (EBIT (1- tax rate))
- 48 million (Net Income)
- 68 million (EBIT – Taxes)



## Illustration 3: High Growth for how long...

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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?

- < 5 years
- 5 years
- 10 years
- >10 years

## Reasons to be cautious..

### Growth fades quickly

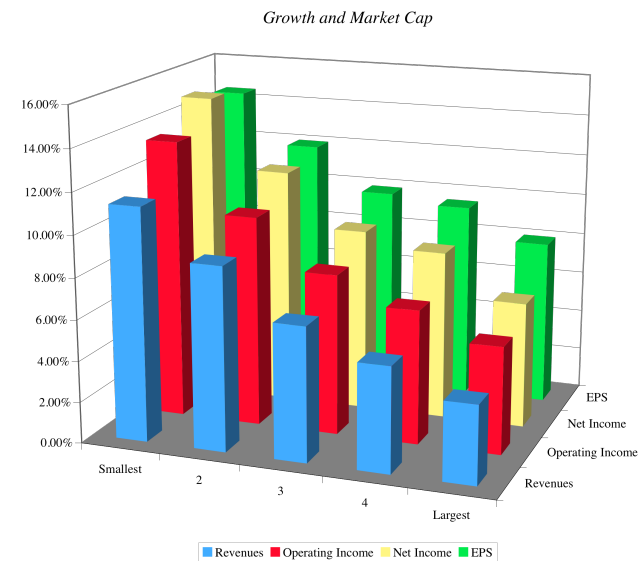
Typically, the revenue growth rate of a newly public company outpaces its industry average for only about five years.



Source: Andrew Metrick

The New York Times

### And does not scale up easily



## Illustration 4: The Cost of Capital

- The cost of capital for Chippewa Technologies, a US firm with 20% of its revenues from Brazil, has been computed using the following inputs:

Cost of equity

$$= \text{Riskfree Rate} \quad + \text{Beta} \quad (\text{ERP}) \quad + \text{Small firm premium} \\ = 5\% \quad + 1.20 \quad (5\%) \quad + 3\% \quad = 14\%$$

*Replaced current T.Bond rate of 3% with normalized rate of 5%*

*"Adjusted" Beta from Bloomberg*

*Both from Ibbotson data base, derived from 1926-2008 data  
ERP: Stocks - T.Bonds (Arithmetic average)  
Small firm: Small stocks - Overall market*

Cost of capital

$$= \text{Cost of equity} \left( \frac{\text{Equity}}{\text{Debt} + \text{Equity}} \right) + \text{Cost of debt} \quad (1 - \text{tax rate}) \quad \left( \frac{\text{Debt}}{\text{Debt} + \text{Equity}} \right) \\ = 14\% \quad \left( \frac{1000}{2000} \right) \quad + \quad 3\% \quad (1 - .30) \quad \left( \frac{1000}{2000} \right) = 8.05\%$$

*From above*

*Used market value of equity*

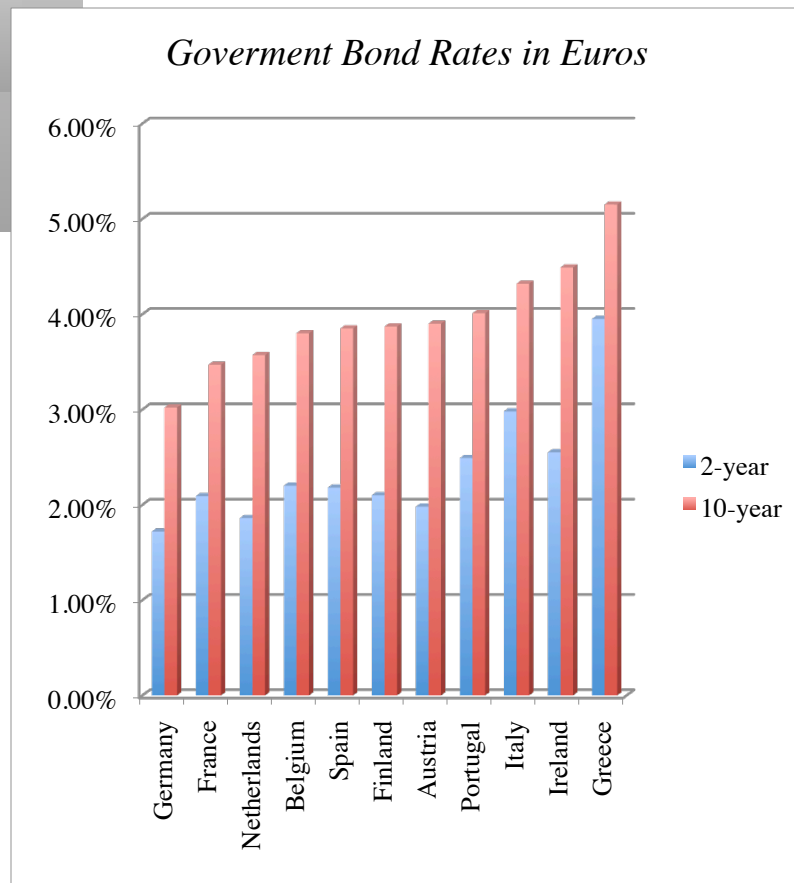
*Company is not rated and has no bonds. Used book interest rate = Int exp/ BV of debt*

*Used effective tax rate of 30%*

*To be conservative, counted all liabilities, other than equity, as debt and used book value.*

## 4.1: What is the riskfree rate?

When we use the T.Bond rate as a riskfree rate, we are assuming that there is no default risk in the US treasury. Is that reasonable? What if it is not?



The Indian government had 10-year Rupee bonds outstanding, with a yield to maturity of about 7% on January 1, 2010. In January 2010, the Indian government had a local currency sovereign rating of Ba2. The typical default spread (over a default free rate) for Baa2 rated country bonds in early 2010 was 2.5%. The risk free rate in Indian Rupees is:

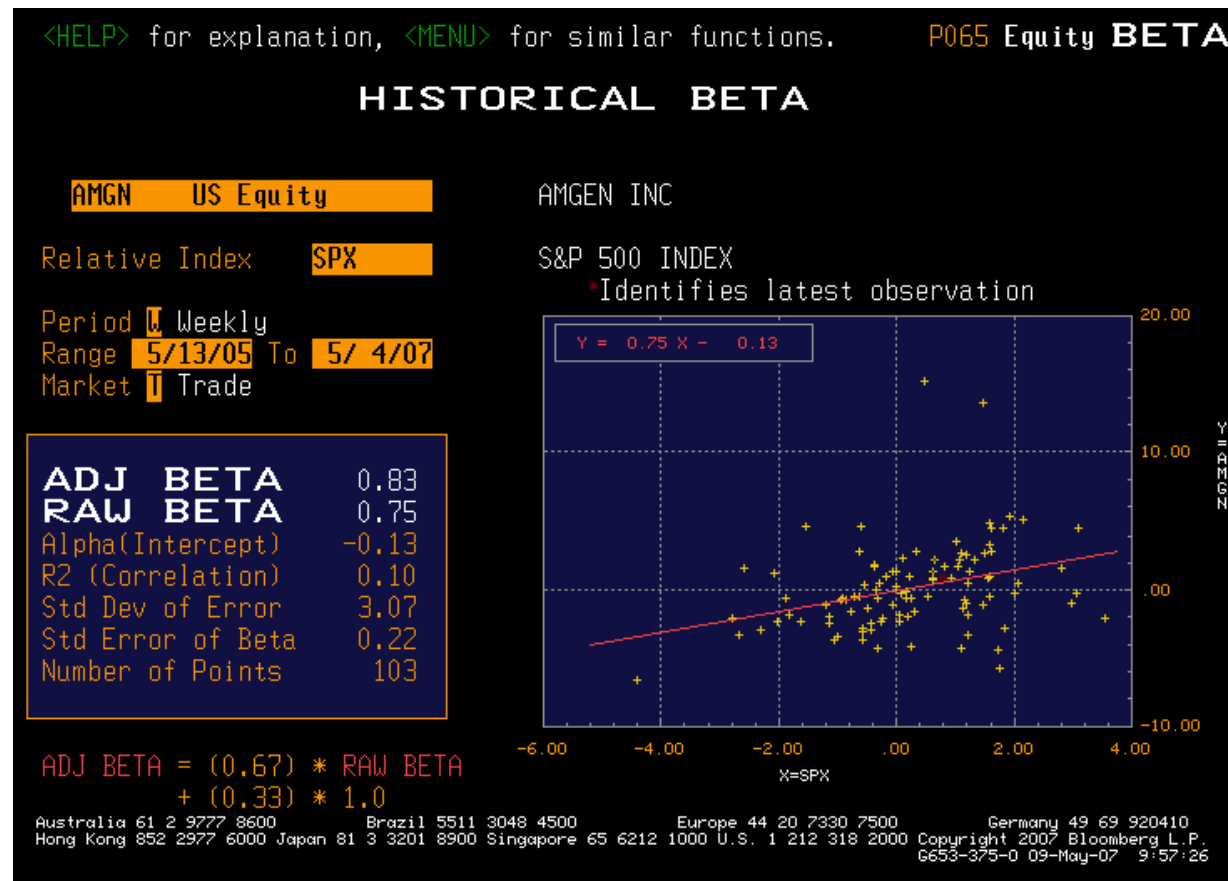
- The yield to maturity on the 10-year bond (7%)
- The yield to maturity on the 10-year bond + Default spread (9.5%)
- The yield to maturity on the 10-year bond – Default spread (4.5%)
- None of the above

## 4.2: Don't let your macro views color your valuation

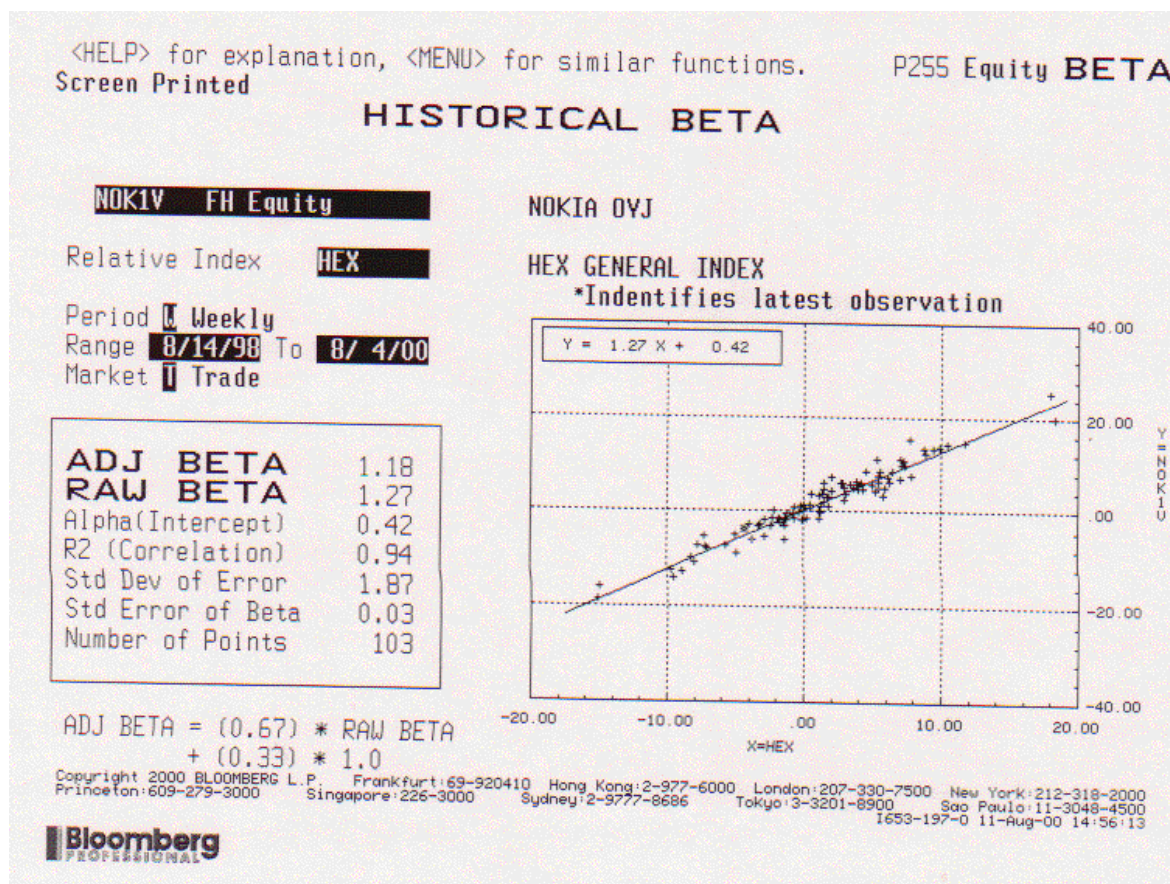
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- If you believe that interest rates will go up (down), that exchange rates will move adversely (in your favor) and that the economy will weaken (strengthen), should you try to bring them into your individual company valuations?
  - Yes
  - No
- If you do, and you conclude that a stock is overvalued (undervalued), how should I read this conclusion?

## 4.3: Betas do not come from regressions..



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



# Bottom-up Beta: Firm in Multiple Businesses

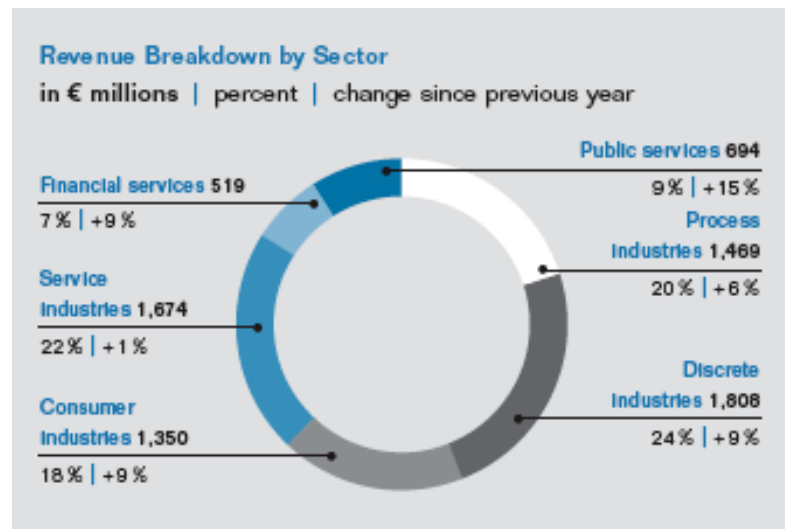
## SAP in 2004

### ■ Approach 1: Based on business mix

- SAP is in three business: software, consulting and training. We will aggregate the consulting and training businesses

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
<b>SAP</b>	<b>\$ 7.5</b>		<b>21.63</b>		<b>1.25</b>

### ■ Approach 2: Customer Base





## 4.4. And equity risk premiums matter..

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2009	7.53%	6.03%	5.56%	4.29%
	(2.28%)	(2.40%)		
1960-2009	5.48%	3.78%	4.09%	2.74%
	(2.42%)	(2.71%)		←
1999-2008	-1.59%	-5.47%	-3.68%	-7.22%
	(6.73%)	(9.22%)		

*Historical  
premium*

*In 2010, the actual cash returned to stockholders was 40.38. That was down about 40% from 2008 levels.*

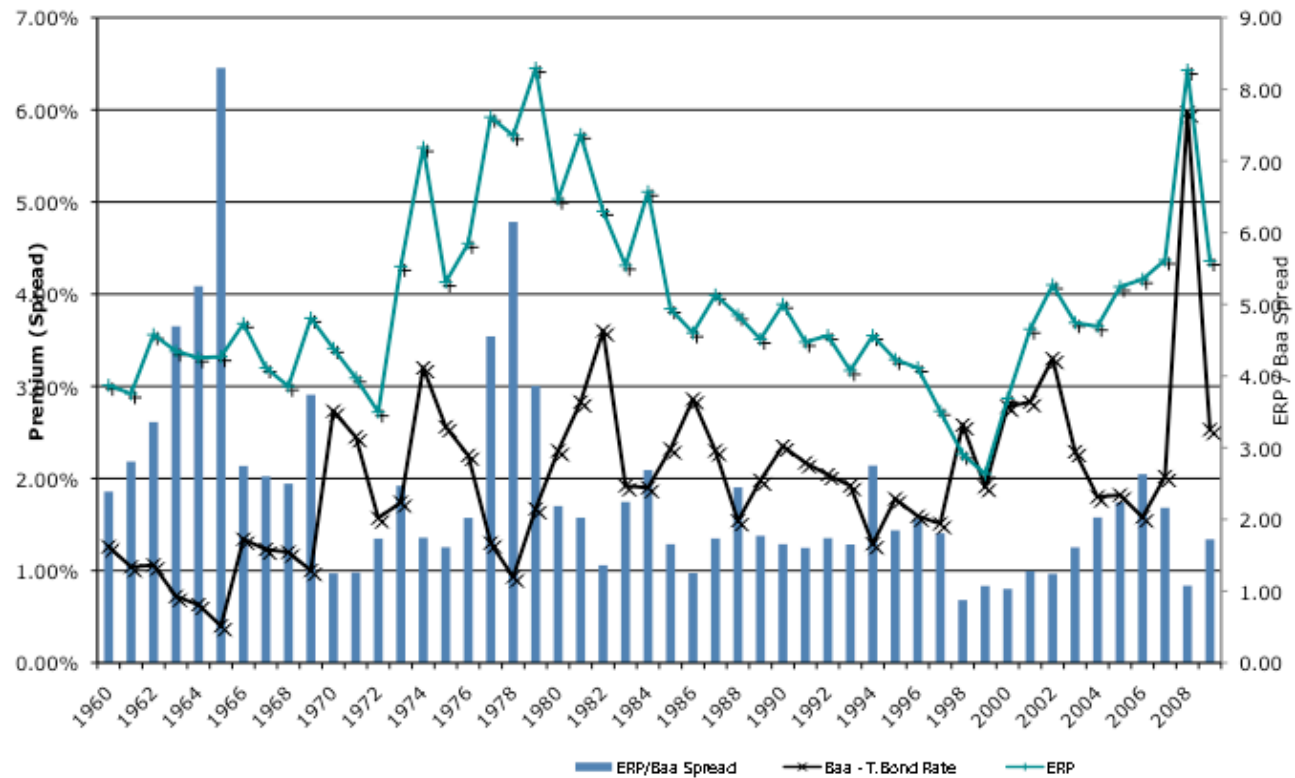
Analysts expect earnings to grow 21% in 2010, resulting in a compounded annual growth rate of 7.2% over the next 5 years. We will assume that dividends & buybacks will keep pace.

After year 5, we will assume that earnings on the index will grow at 3.84%, the same rate as the entire economy (= riskfree rate).

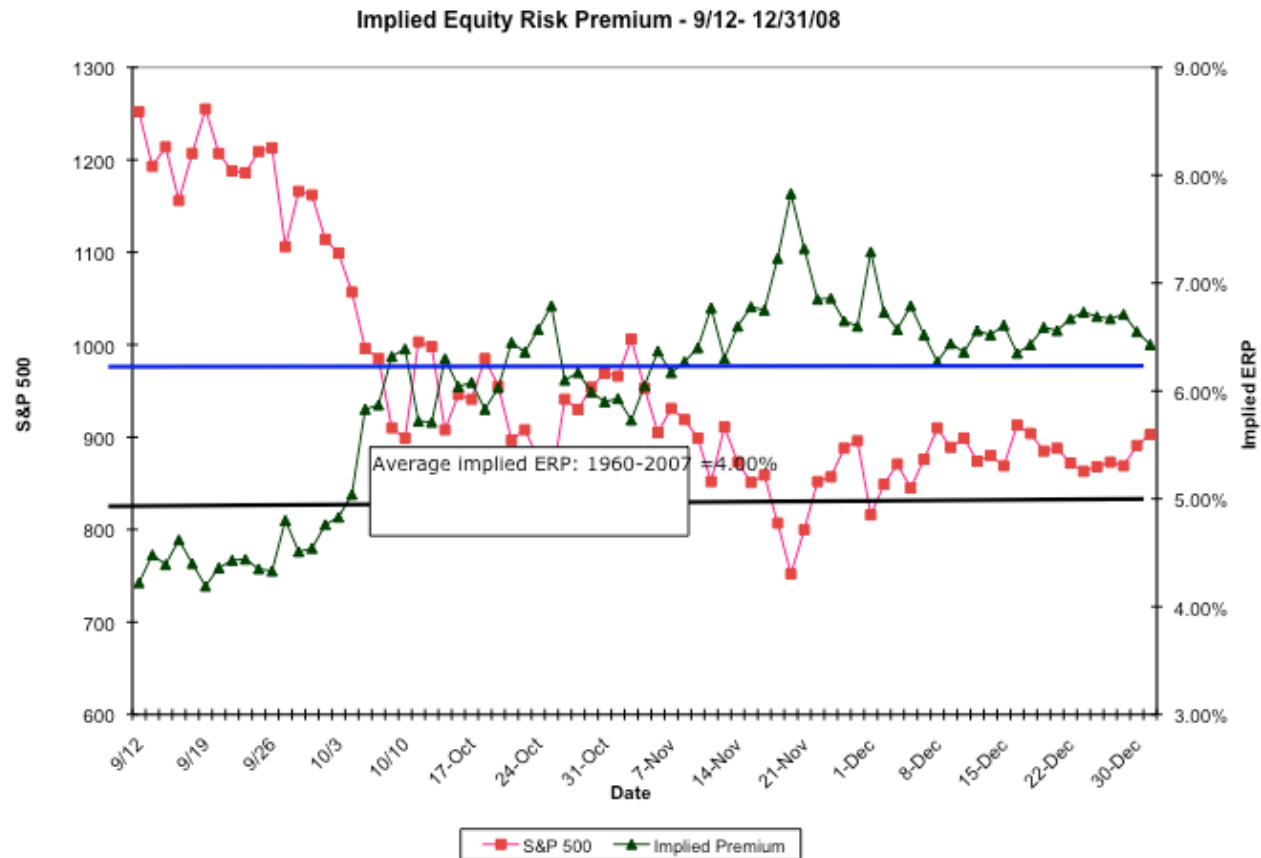
	43.29	46.40	49.74	53.32	57.16
January 1, 2010 S&P 500 is at 1115.10 Adjusted Dividends & Buybacks for 2008 = 40.38	$1115.10 = \frac{43.29}{(1+r)} + \frac{46.40}{(1+r)^2} + \frac{49.74}{(1+r)^3} + \frac{53.32}{(1+r)^4} + \frac{57.16}{(1+r)^5} + \frac{57.16(1.0384)}{(r - .0384)(1+r)^5}$				
	Expected Return on Stocks (1/1/10)		= 8.20%		
	T.Bond rate on 1/1/10		= 3.84 %		
	Equity Risk Premium = 8.20% - 3.84%		= 4.36%		

# Equity risk premiums changes over long periods... And so do default spreads...

Figure 9: Equity Risk Premiums and Bond Default Spreads



# And sometimes over short time periods: 9/12/2008 – 12/31/2008



## 4.5: Small Cap and other premiums

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- While it has become conventional practice to estimate and use small cap, liquidity and other premiums, when computing cost of equity, it is a dangerous practice because:
  1. These premiums are derived from historical data and come with very large standard errors. For instance, the standard error on the small cap premium estimated over the last 80 years is close to 2%...
  2. If small firms are riskier than large firms, we should consider the source of that risk – niche products, high operating leverage... - and build it in, rather than accept a fixed premium for all small firms.
  3. Small firms become larger as they grow over time.. Small cap premiums should be year-specific.
  4. The danger of double counting risk grows as we add more premiums – small cap, private business and illiquidity are overlapping issues, not independent ones.

## 4.6: With globalization of revenues... globalization of risk

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Proposition 1: There is more risk in operating in some countries than in others and the risk premium should reflect this additional risk. One approach to estimating this additional risk premium is to do the following:

- Start with the default spread for the country in question
- Scale up the default spread to reflect the additional risk of equity

$$\text{Country Risk Premium} = \text{Default Spread} * (\sigma_{\text{Equity}} / \sigma_{\text{Government Bond}})$$

$$\text{Country Risk Premium}_{\text{Brazil}} = 2.00\% (33\%/22\%) = 3.00\%$$

Proposition 2: Risk comes from your operations and not your country of incorporation. Developed market companies can be heavily exposed to emerging market companies, just as emerging market companies can find ways to reduce their exposure to emerging market risk. One simple proxy is to look at the revenues generated in a country, relative to the average company in that market.

- Proportion of Chippewa's revenues from Brazil = 20%
- Average Brazilian company's revenues from Brazil = 77%

$$\text{Lambda}_{\text{Chippewa}} = 20\% / 77\% = .26$$

# Country Risk Premiums January 2010

Canada	4.50%
Mexico	6.90%
United States of America	4.50%

Argentina	14.25%
Belize	14.25%
Bolivia	12.75%
Brazil	7.50%
Chile	5.85%
Colombia	7.50%
Costa Rica	8.25%
Ecuador	19.50%
El Salvador	19.50%
Guatemala	8.25%
Honduras	12.75%
Nicaragua	14.25%
Panama	8.25%
Paraguay	14.25%
Peru	7.50%
Uruguay	9.75%
Venezuela	11.25%

Austria [1]	4.50%
Belgium [1]	4.95%
Cyprus [1]	5.63%
Denmark	4.50%
Finland [1]	4.50%
France [1]	4.50%
Germany [1]	4.50%
Greece [1]	6.08%
Iceland	7.50%
Ireland [1]	4.95%
Italy [1]	5.40%
Malta [1]	5.85%
Netherlands [1]	4.50%
Norway	4.50%
Portugal [1]	5.40%
Spain [1]	4.50%
Sweden	4.50%
Switzerland	4.50%
United Kingdom	4.50%

Botswana	6.08%
Egypt	8.25%
Mauritius	7.20%
Morocco	8.25%
South Africa	6.30%
Tunisia	7.20%

Albania	11.25%
Armenia	9.00%
Azerbaijan	8.25%
Belarus	11.25%
Bosnia and Herzegovina	12.75%
Bulgaria	7.50%
Croatia	7.50%
Czech Republic	5.85%
Estonia	5.85%
Hungary	6.90%
Kazakhstan	7.20%
Latvia	7.50%
Lithuania	6.90%
Moldova	15.75%
Montenegro	9.75%
Poland	6.08%
Romania	7.50%
Russia	6.90%
Slovakia	5.85%
Slovenia [1]	5.40%
Turkmenistan	12.75%
Ukraine	12.75%

Bahrain	6.08%
Israel	5.85%
Jordan	7.50%
Kuwait	5.40%
Lebanon	12.75%
Oman	6.08%
Qatar	5.40%
Saudi Arabia	5.85%
United Arab Emirates	5.40%

Cambodia	12.75%
China	5.85%
Fiji Islands	11.25%
Hong Kong	5.40%
India	9.00%
Indonesia	9.00%
Japan	5.40%
Korea	6.08%
Macao	5.63%
Malaysia	6.30%
Mongolia	11.25%
Pakistan	14.25%
Papua New Guinea	11.25%
Philippines	9.75%
Singapore	4.50%
Taiwan	5.63%
Thailand	6.90%
Turkey	9.75%
Vietnam	9.75%

Australia	4.50%
New Zealand	4.50%

## 4.7: Not everything is debt...

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- To be treated as debt, there are three conditions that have to be met:
  - The liability must give rise to contractual obligations that have to be met no matter how the firm's operations are doing.
  - These obligations are usually tax deductible
  - Failing to meet these obligations can lead to loss of control of the business.
- When defining debt for cost of capital purposes, there are two rules to follow:
  - Use market values for debt, rather than book value, even if you have to estimate the market value.
  - Define debt narrowly to include only interest bearing debt and lease commitments, rather than everything on the balance sheet

## 4.8: The Cost of Debt

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- The cost of debt is the rate at which a firm can borrow money, long term and today, corrected for the tax benefits of debt.
  - Take all debt, short term as well as long term, and attach one long term cost of debt to it.
  - That long term cost of debt will be based upon the level of riskless rates today and the default risk of the company today (based on either an actual or a synthetic rating).
  - Interest saves you taxes at the margin. Consequently, the marginal tax rate should be used to compute the tax benefit.
- As a general rule, it is dangerous to start breaking debt down into individual pieces (senior, subordinated, unsecured...) and attaching different costs to each one.



## The Correct Cost of Capital for Chippewa

	<i>What was used...</i>	<i>What should have been used...</i>
Riskfree Rate	Normalized riskfree rate = 5%	Actual riskfree rate = 3%
Eta	Bloomberg Adjusted Beta = 1.20	Sector average adjusted beta = 1.60 Based on small cap companies in sector
Equity Risk Premium	Ibbotson Historical premium = 5%	Current implied equity risk premium = 4.50%
Other Adjustments to cost of equity	Small firm premium = 3%	No small cap premium Country risk exposure = $\text{Lambda} * \text{CRP}$ $= 0.26 * 3\% = 0.78\%$
Cost of Equity	$5\% + 1.2 (5\%) + 3\% = 14\%$	$3\% + 1.6 (4.5\%) + 0.78\% = 10.98\%$
Cost of Debt (pre-tax)	3%	$3\% + 4\% = 6.5\%$
Tax Rate	Effective tax rate = 30%	Marginal tax rate = 40%
Cost of Debt (after-tax)	$3\%(1-.3) = 2.1\%$	$6.5\%(1-.4) = 3.9\%$
Debt Ratio	Book ratio: :Liabilities = 50% Equity = 50%	Market Debt / Capital ratio = 50%
Cost of capital	$14\%(.5) + 2.1\%(.5) = 8.05\%$	$10.78\%(.7) + 3.9\%(.3) = 8.72\%$

## Illustration 5: The price of growth..

- You are looking at the projected cash flows provided by the management of the firm, for use in valuation

Year	Current	1	2	3	4
Growth rate		10%	10%	10%	10%
Revenues	\$100.00	\$110.00	\$121.00	\$133.10	\$146.41
EBIT (1-t)	\$30.00	\$33.00	\$36.30	\$39.93	\$43.92
+ Depreciation	\$15.00	\$16.50	\$18.15	\$19.97	\$21.96
- Cap Ex	\$18.00	\$19.80	\$21.78	\$23.96	\$26.35
- Chg in WC	\$3.00	\$3.30	\$3.63	\$3.99	\$4.39
FCFF	\$24.00	\$26.40	\$29.04	\$31.94	\$35.14

- a. How do you check to see if top-line growth is feasible?
- b. How do you ensure that the forecasts are internally consistent? (In other words, are all of the other forecasted numbers consistent with the growth forecast in revenues?)

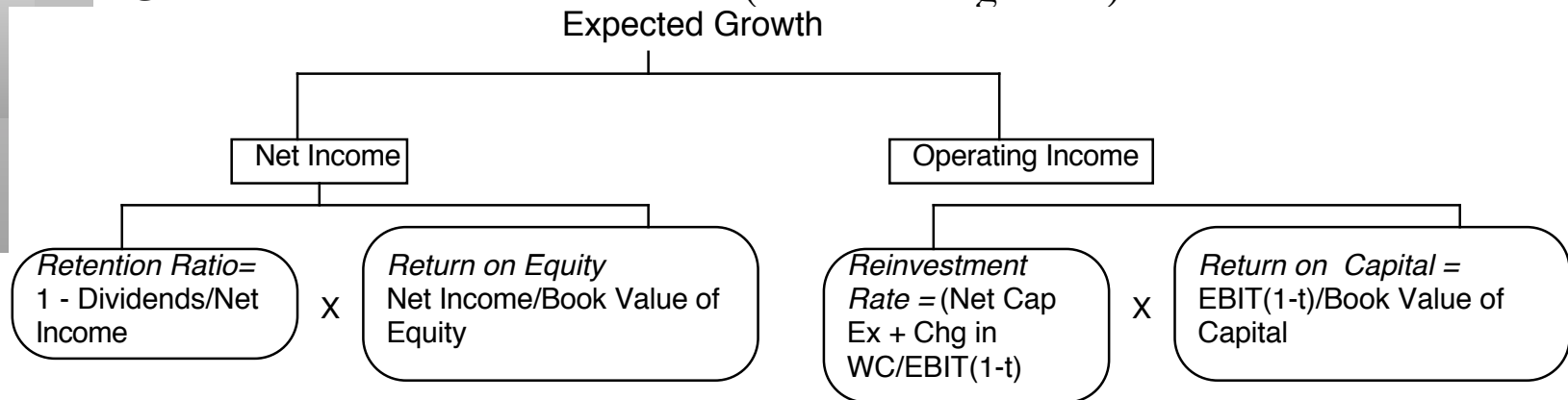
## 5.1. Is the growth feasible?

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- If the growth in a firm is coming from revenues increasing over time, the key question to ask is whether this growth is feasible. There are a couple of tests that you can use to make this determination.
- The Max Test: The revenues that you are projecting in the terminal year cannot exceed the overall market for the products and services produced by your company.
  - Define the market potential before you start forecasting.
  - Keep track of market share
- The Scaling test: Each year that you project high growth to continue makes your firm bigger and it becomes more difficult to maintain growth.
- The Big Player test: If there are much larger companies in the sector, check and see what their revenues are (to get a sense of what large is in this business) and how fast they are growing.

## 5.2: Growth and Consistency

- Growth from “new” investments (sustainable growth)



- Growth from efficiency

- When a company generates higher returns on its existing investments, this can create efficiency growth, measured as follows:
  - With equity income:  $(ROE_t - ROE_{t-1}) / ROE_{t-1}$
  - With operating income:  $(ROC_t - ROC_{t-1}) / ROC_{t-1}$
- This growth can last for the short term but not forever. (Why?)

## Illustration 6: The “fixed debt ratio” assumption

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- You have been asked to value Hormel Foods, a firm which currently has the following cost of capital:  
Cost of capital =  $7.31\% (.9) + 2.36\% (.1) = 6.8\%$
- a. You believe that the target debt ratio for this firm should be 30%. What will the cost of capital be at the target debt ratio?
  
- b. Which debt ratio (and cost of capital) should you use in valuing this company?

## 6.1: Cost of Capital and Debt Ratios Hormel Foods in 2009

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
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

As debt increases, your cost of equity should go up.  
Levered Beta = Unlevered beta (1+(1-t) (D/E))

As debt increases, interest expenses will go up more than proportionately. Holding operating income constant, coverage ratios decrease and ratings fall.

## 6.2: Changing Debt Ratios and Costs of Capital over time – Las Vegas Sands

Year	Beta	Cost of equity	Pre-tax Cost of debt	Debt Ratio	Cost of capital
1	3.14	21.82%	9.00%	73.50%	9.88%
2	3.14	21.82%	9.00%	73.50%	9.88%
3	3.14	21.82%	9.00%	73.50%	9.88%
4	3.14	21.82%	9.00%	73.50%	9.88%
5	3.14	21.82%	9.00%	73.50%	9.88%
6	2.75	19.50%	8.70%	68.80%	9.79%
7	2.36	17.17%	8.40%	64.10%	9.50%
8	1.97	14.85%	8.10%	59.40%	9.01%
9	1.59	12.52%	7.80%	54.70%	8.32%
10	1.20	10.20%	7.50%	50.00%	7.43%

## Illustration 7: The Terminal Value

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- The best way to compute terminal value is to
  - Use a stable growth model and assume cash flows grow at a fixed rate forever
  - Use a multiple of EBITDA or revenues in the terminal year
  - Use the estimated liquidation value of the assets

You have been asked to value a business. The business expects to \$ 120 million in after-tax earnings (and cash flow) next year and to continue generating these earnings in perpetuity. The firm is all equity funded and the cost of equity is 10%; the riskfree rate is 3% and the ERP is 7%. What is the value of the business?



## 7.1: Limits to stable growth..

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- Assume now that you were told that the firm can grow earnings at 2% a year forever. Estimate the value of the business.
- Now what if you were told that the firm can grow its earnings at 4% a year forever?
- What if the growth rate were 6% a year forever?

## 7.2: And reinvestment to go with growth...

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- To grow, a company has to reinvest. How much it will have to reinvest depends in large part on how fast it wants to grow and what type of return it expects to earn on the reinvestment.
  - $\text{Reinvestment rate} = \text{Growth Rate} / \text{Return on Capital}$
- Assume in the previous example that you were told that the return on capital was 10%. Estimate the reinvestment rate and the value of the business (with a 2% growth rate).
  
- What about with a 3% growth rate?

## 7.3: And you may not make it to Nirvana...

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- 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.

Current Revenue  
\$ 4,390

Current Margin:  
4.76%

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

**Stable Growth**  
Stable Revenue Growth: 3%  
Stable Operating Margin: 17%  
Stable ROC=10%  
Reinvest 30% of EBIT(1-t)

EBIT  
\$ 209m

Extended reinvestment break, due to investment in past

Industry average  
Expected Margin:  
-> 17%

Terminal Value =  $758 \cdot (.0743 - .03)$   
= \$ 17,129

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

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

Forever

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

**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

**Risk Premium**  
6%

Casino  
1.15

Current  
D/E: 277%

Base Equity  
Premium

Country Risk  
Premium

**Las Vegas Sands**  
**February 2009**  
**Trading @ \$4.25**

## The Distress Factor

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

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

- Solving for the probability of bankruptcy, we get:

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

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

## 8. From firm value to equity value: The Garnishing Effect...

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- For a firm with consolidated financial statements, you have discounted free cashflows to the firm at the cost of capital to arrive at a firm value of \$ 100 million. The firm has
  - A cash balance of \$ 15 million
  - Debt outstanding of \$ 20 million
  - A 5% holding in another company: the book value of this holding is \$ 5 million. (Market value of equity in this company is \$ 200 million)
  - Minority interests of \$ 10 million on the balance sheet
- What is the value of equity in this firm?
  
- How would your answer change if you knew that the firm was the target of a lawsuit it is likely to win but where the potential payout could be \$ 100 million if it loses?

## 8.1: A discount for cash...

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- The cash is invested in treasury bills, earning 3% a year. The cost of capital for the firm is 8% and its return on capital is 10%. An argument has been made that cash is a sub-optimal investment for the firm and should be discounted. Do you agree?
  - Yes
  - No
- If yes, what are the logical implications of firms paying dividends or buying back stock?
- If no, are there circumstances under which you would discount cash? How about attaching a premium?

## 8.2: Valuing Cross Holdings

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- 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.
- With limited on unreliable information, you can try one of these approximations:
  - 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.



## 8.3: The missed liabilities

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- When going from the value of the firm to the value of equity, we usually subtract out the debt of the firm. Since equity investors have a residual claim on the firm, after all other claim holders have been paid, this is our last chance to deal with claims on the firm.
- While almost all analysts bring in long-term interest bearing debt into their analysis, the claims that get missed most often include:
  - Short term interest bearing debt (often shown in current liabilities)
  - Lease and rental commitments
  - Underfunded pension obligations
  - Potential claims from lawsuits

## 8.4: The double counted liabilities...

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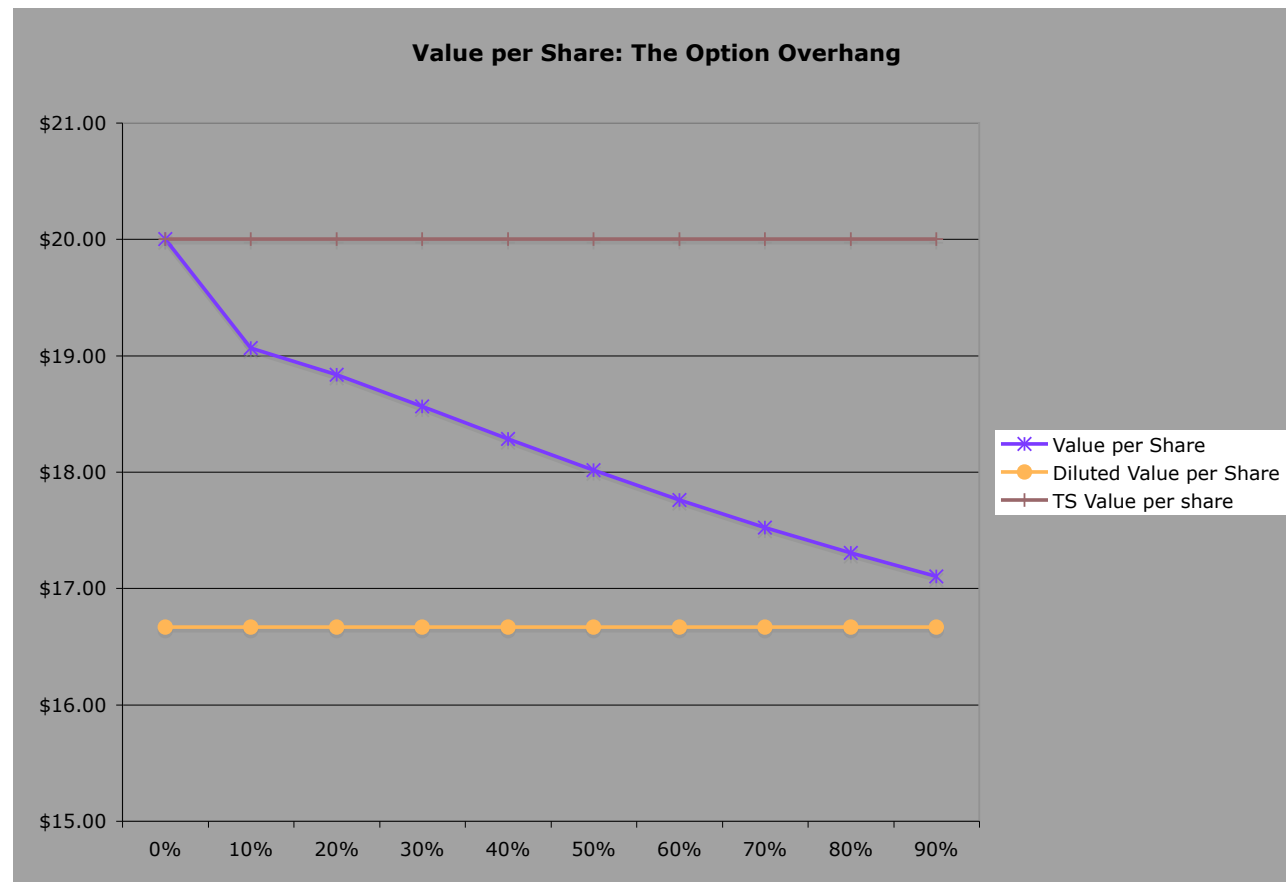
- In getting from firm value to equity, conservative analysts sometimes reach too far to detect claims against the firm that have already been considered elsewhere (often implicitly) in their valuation.
- Common examples of double counted liabilities include
  - Accounts payable, supplier credit and other non-interest bearing debt (which are not only treated as part of working capital but also have no explicit interest expense effect on income)
  - Expected debt issues from future years. Note that when we keep the debt ratio of a firm fixed over time, we are implicitly already assuming that dollar debt will increase at the same growth rate as the value of the firm is increasing by.

## 9. From equity value to equity value per share

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- You have valued the equity in a firm at \$ 200 million. Estimate the value of equity per share if there are 10 million shares outstanding..
- How would your answer change if you were told that there are 2 million employee options outstanding, with a strike price of \$ 20 a share and 5 years left to expiration?

# Value per share... as a function of stock price volatility and option maturity



# 10. The final circle of hell...

**Exhibit 8**  
KENNECOTT COPPER CORPORATION  
PROJECTED CARBORUNDUM COMPANY FINANCIAL DATA ADJUSTED TO REFLECT THE ACQUISITION OF CARBORUNDUM BY KENNECOTT  
AT A PRICE OF \$66 PER SHARE, 1977-1987  
(\$ millions except for per share and ratio data)

	1977		1977-1987										
	Unadjusted	Adjustments	Adjusted	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<b>Income statement</b>													
Sales	\$717.6		\$790.1	\$885.9	\$1,005.2	\$1,120.9	\$1,265.5	\$1,392.1	\$1,531.3	\$1,684.4	\$1,852.8	\$2,038.1	
Net income (before adjustments)	38.4		43.1	50.7	60.1	70.6	84.7	93.2	102.3	112.7	124.0	136.4	
Interest adjustments	0		6.5	7.8	8.5	9.2	9.8	10.7	11.7	12.8	14.0	15.4	
Goodwill adjustments	0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Plant write-up adjustment	0		2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	
Net income (after adjustments)	\$38.4		\$51.8	\$58.1	\$66.8	\$76.6	\$87.1	\$97.7	\$108.8	\$120.5	\$132.8	\$145.6	
<b>Balance sheet</b>													
Working capital	\$198.8	+ 37.0	\$198.8	\$222.0	\$248.1	\$274.2	\$302.8	\$329.3	\$358.6	\$390.7	\$426.1	\$465.0	
Property, plant, and equipment	181.8	+ 124.0	305.8	334.2	367.4	384.6	400.1	411.6	437.5	466.6	499.1	535.6	576.1
Goodwill	0	+ 80.0	80.0	78.0	76.0	74.0	72.0	70.0	68.0	66.0	64.0	62.0	60.0
Total assets	584.3	+ 201.0	785.3	824.0	889.9	948.4	1,007.0	1,065.8	1,135.5	1,213.1	1,299.0	1,394.6	1,500.3
Long-term debt	86.2	+ 100.0	186.2	220.9	238.8	252.9	266.8	280.1	297.7	317.5	339.4	363.9	391.0
Shareholders' equity	309.0	+ 101.0	410.0	410.1	443.5	469.7	495.4	520.2	553.0	589.6	630.3	675.7	726.0
Total capital	395.2	+ 201.0	596.2	631.0	682.3	722.6	762.2	800.3	850.7	907.1	969.7	1,039.6	1,117.0
<b>Capital sources</b>													
Profit retentions	\$ 0.1	\$33.4	\$26.2	\$25.7	\$24.8	\$24.8	\$24.8	\$24.8	\$24.8	\$24.8	\$24.8	\$24.8	\$24.8
Capital contributed by Kennecott	—	—	—	—	—	—	—	—	—	—	—	—	—
Debt financing (net)	34.7	17.9	14.1	13.9	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3
Total capital added	\$34.8	\$51.3	\$40.3	\$39.6	\$38.1	\$38.1	\$38.1	\$38.1	\$38.1	\$38.1	\$38.1	\$38.1	\$38.1
<b>Key financial ratios</b>													
Growth rate in sales (%)	16.9		10.1	12.1	13.5	12.4	12.0	10.0	10.0	10.0	10.0	10.0	10.0
Sales/assets	1.23		0.96	1.00	1.06	1.12	1.19	1.23	1.26	1.30	1.33	1.36	
Profit/sales	0.054		0.040	0.043	0.047	0.050	0.055	0.056	0.056	0.056	0.056	0.057	0.057
Assets/net worth	1.89		2.01	2.01	2.02	2.05	2.05	2.05	2.06	2.06	2.06	2.06	2.07
Profit/net worth	0.124		0.078	0.086	0.100	0.114	0.135	0.141	0.146	0.151	0.156	0.160	
<b>Cash flow to Kennecott</b>													
Acquisition of Carborandum			\$(550.0)										
Dividends to Kennecott			140.0	\$31.7	\$ 4.7	\$20.6	\$30.9	\$45.3	\$44.9	\$49.4	\$54.4	\$59.8	\$ 65.9
Utilization of Kennecott tax loss carryforwards			—	20.0	20.0	—	—	—	—	—	—	—	—
Tax shelter from plant write-up adj.			—	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Terminal value at 10 times earnings			—	—	—	—	—	—	—	—	—	—	—
Net cash flow			\$(410.0)	\$54.5	\$27.5	\$23.4	\$33.7	\$48.1	\$47.7	\$52.2	\$57.2	\$62.6	\$113.6
<b>Assumptions:</b>													
* Kennecott would pay \$550 million to acquire Carborandum's equity which had a book value of \$309 million. The \$241 million in excess of purchase price over book value of assets acquired would be allocated as follows: (a) \$37.0 million would be added to inventory to reflect the replacement cost of inventories; (b) \$110 million would be added to land to reflect the market value of land; (c) \$113 million would be added to net plant and equipment to reflect the depreciated replacement cost of plant and equipment; and (d) \$80 million would be added to goodwill. Immediately following the acquisition of Carborandum, Carborandum borrows \$100 million and then pays a \$140 million dividend to Kennecott. This dividend is financed with the \$100 million plus \$40 million of Carborandum's excess cash.													
† Interest at the rate of 10% (5% after taxes) is paid on the difference between the amount of Carborandum debt outstanding in Exhibit 8 and the amount of debt assumed to be outstanding in Exhibit 5. In Exhibit 8, it is assumed that Carborandum will have 35% debt in its total capital structure after 1977.													
‡ The \$80 million of goodwill created as a result of the acquisition is amortized over 40 years. This expense is not tax-deductible.													
§ The \$113 million write-up of plant and equipment is depreciated over a 20-year life, providing a reduction in profit after taxes and an increase in cash flow equal to (\$113/20) x .5. It is assumed that this added cash flow is paid to Kennecott as dividends.													
Dividends to Kennecott equal the difference between Carborandum's net profit (after adjustments) and the profit retention requirements needed to support Carborandum's growth.													
¶ The utilization of \$40 million of tax loss carry-forwards and investment tax credit carryforwards available to Kennecott are assumed to be utilized as a result of the Carborandum acquisition and that these would expire unutilized without the acquisition.													
** Carborandum is assumed to be sold at the end of ten years at a price equal to ten times earnings. The proceeds from this sale, \$1,162 million, are reduced by \$117.1 million as a result of taxes on the capital gain of \$1,162-\$726. Carborandum's net worth at 12/31/87 is assumed to be \$726 million.													
Sources: Exhibit 5 and casewriter projections.													

	Cost of Equity	Cost of Capital
Kennecott Corp (Acquirer)	13.0%	10.5%
Carborandum (Target)	16.5%	12.5%

## Some closing thoughts on valuation...

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- View “paradigm shifts” with skepticism.
- Focus on the big picture; don’t let the details trip you up.
- Keep your perspective; it is only a valuation.
- If you have to choose between valuation skills and luck....