

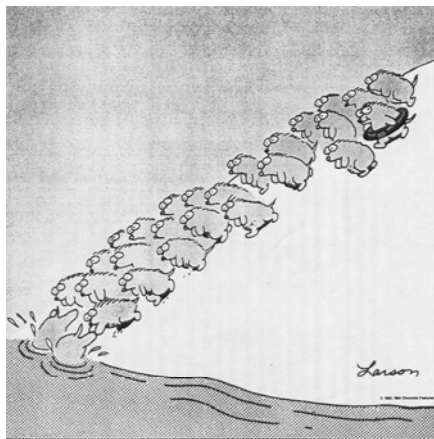
# Twelve Myths in Valuation

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## Why do valuation?

"One hundred thousand lemmings cannot be wrong"

*Graffiti*

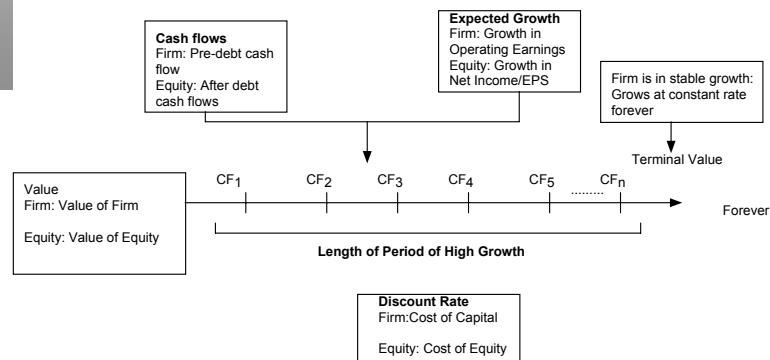


## 1. Valuation is a science that yields precise answers...

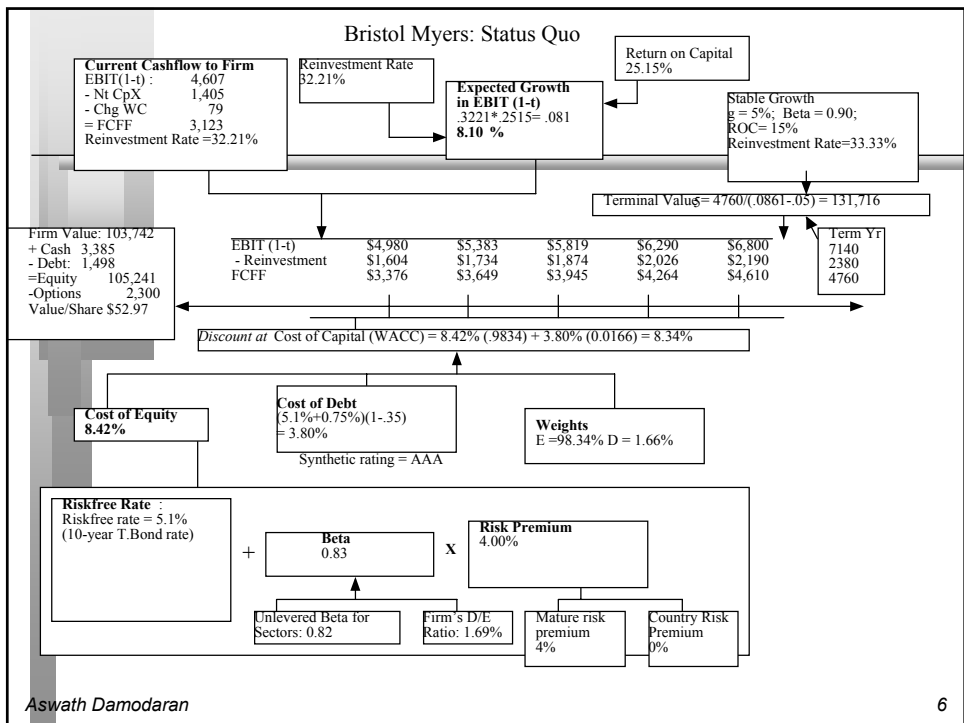
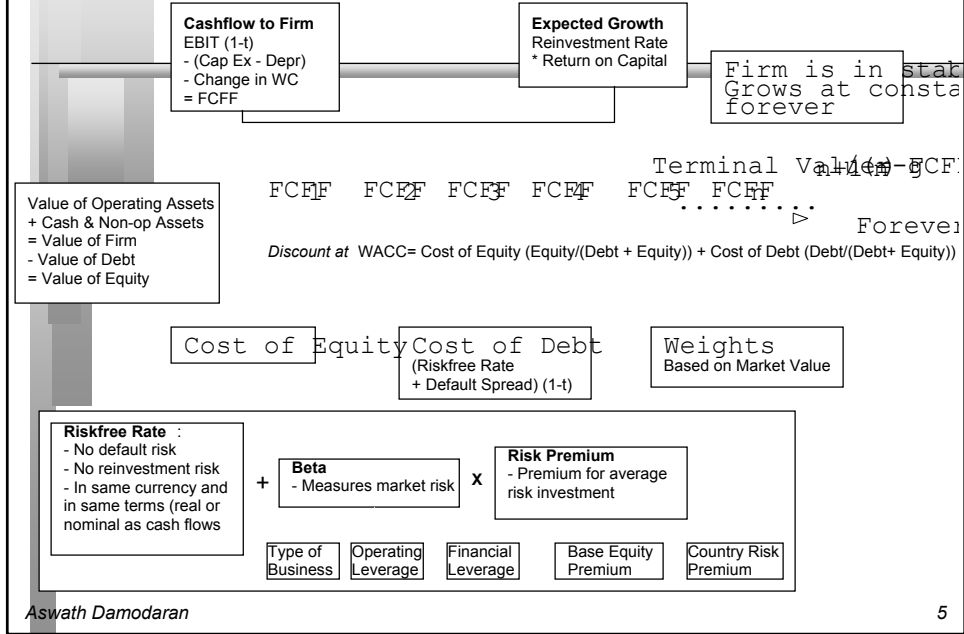
- Reality 1: Valuations are always biased...
  - Truth 1.1: All valuations are biased. The only questions are how much and in which direction.
  - Truth 1.2: The direction and magnitude of the bias in your valuation is directly proportional to who pays you and how much you are paid.
- Reality 2: Equity valuations are always imprecise but they are most valuable when they are most imprecise.
  - Truth 2.1: There are no precise valuations
  - Truth 2.2: The payoff to valuation is greatest when valuation is least precise.
- Reality 3: Complex valuations do not yield better estimates of value.
  - 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.

## 2. Valuation is complicated and there are hundreds of models out there...

### DISCOUNTED CASHFLOW VALUATION

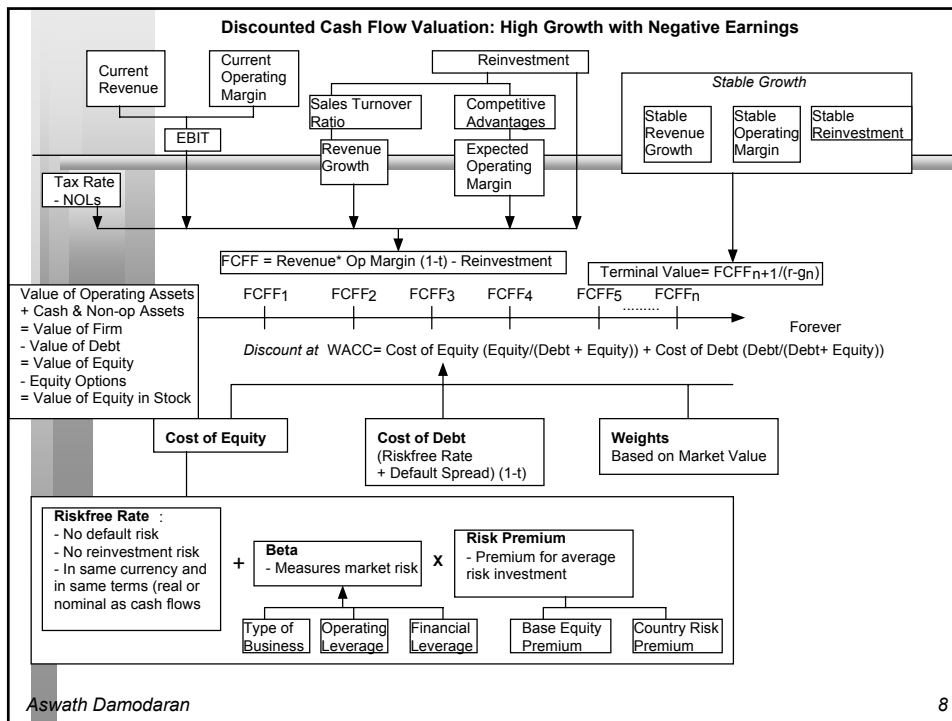


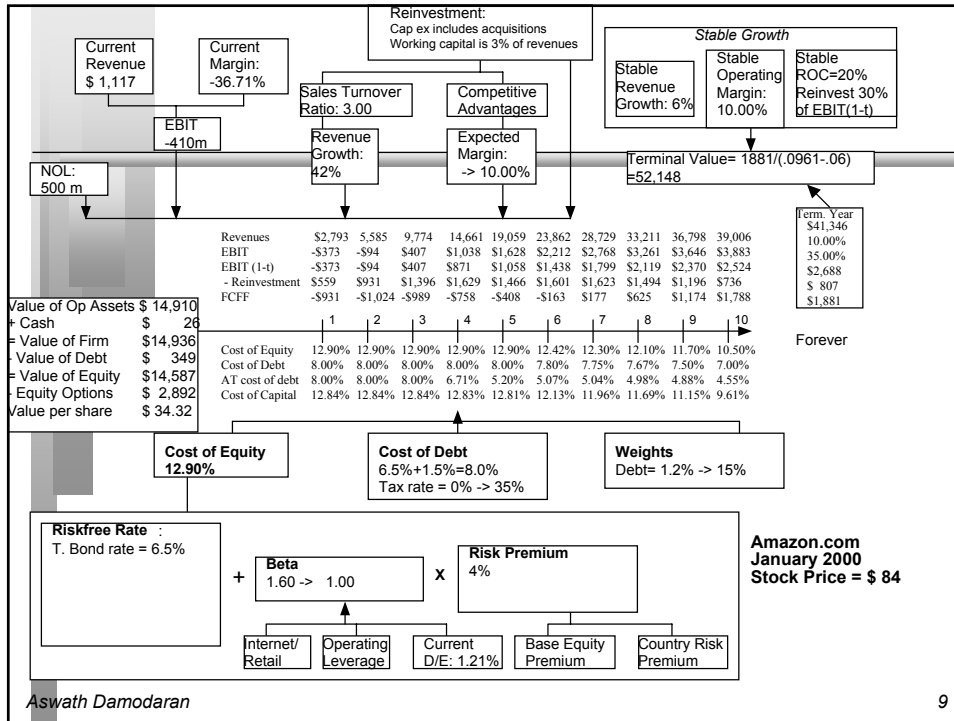
## DISCOUNTED CASHFLOW VALUATION



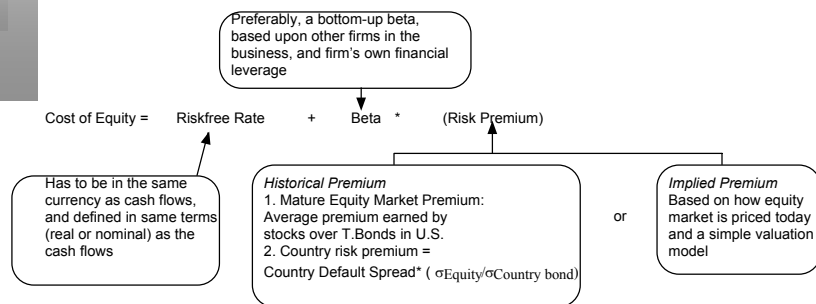
### 3. You cannot value young companies that are losing money...

- 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)
- Valuation is most difficult when a company
  - Has negative earnings and low revenues in its current financial statements
  - No history
  - No comparables ( or even if they exist, they are all at the same stage of the life cycle as the firm being valued)





#### 4. Cost of Equity Myths: T. Bills are riskless, Betas come from regressions and Risk Premiums from Ibbotson...



## Short term Governments are not riskfree

- 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
- Thus, the riskfree rates in valuation will depend upon when the cash flow is expected to occur and will vary across time
- A simpler approach is to match the duration of the analysis (generally long term) to the duration of the riskfree rate (also long term)
- In emerging markets, there are two problems:
  - The government might not be viewed as riskfree (Brazil, Indonesia)
  - There might be no market-based long term government rate (China)

## Everyone uses historical premiums, but..

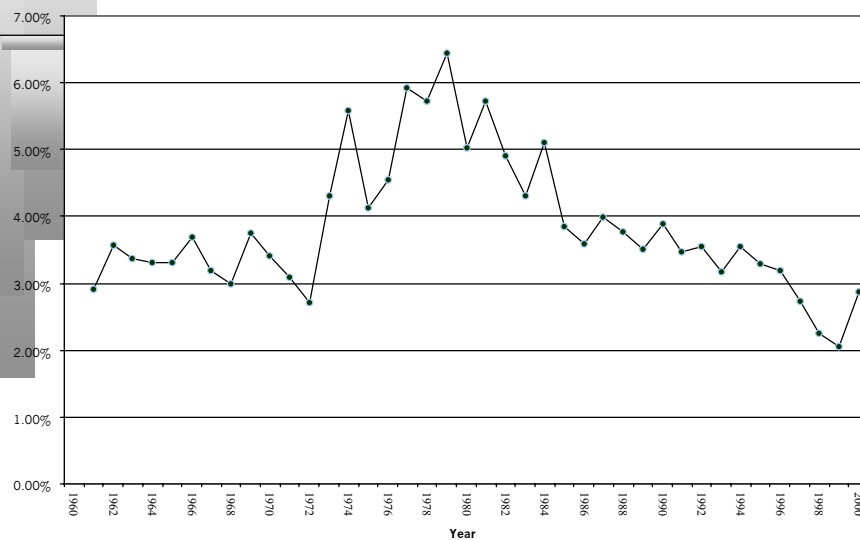
- The historical premium is the premium that stocks have historically earned over riskless securities.
- Practitioners never seem to agree on the premium; it is sensitive to
  - How far back you go in history...
  - Whether you use T.bill rates or T.Bond rates
  - Whether you use geometric or arithmetic averages.
- For instance, looking at the US:

<i>Historical period</i>	<i>Stocks - T.Bills</i>		<i>Stocks - T.Bonds</i>	
	<i>Arith</i>	<i>Geom</i>	<i>Arith</i>	<i>Geom</i>
1928-2000	8.41%	7.17%	6.53%	5.51%
1962-2000	6.41%	5.25%	5.30%	4.52%
1990-2000	11.42%	7.64%	12.67%	7.09%

## Implied Equity Premiums make more sense...

- If we use a basic discounted cash flow model, we can estimate the implied risk premium from the current level of stock prices.
- For instance, if stock prices are determined by the simple Gordon Growth Model:
  - $\text{Value} = \text{Expected Dividends next year} / (\text{Required Returns on Stocks} - \text{Expected Growth Rate})$
  - Plugging in the current level of the index, the dividends on the index and expected growth rate will yield a "implied" expected return on stocks. Subtracting out the riskfree rate will yield the implied premium.
- The problems with this approach are:
  - the discounted cash flow model used to value the stock index has to be the right one.
  - the inputs on dividends and expected growth have to be correct
  - it implicitly assumes that the market is currently correctly valued

Implied Premium for US Equity Market



## An Intermediate Solution

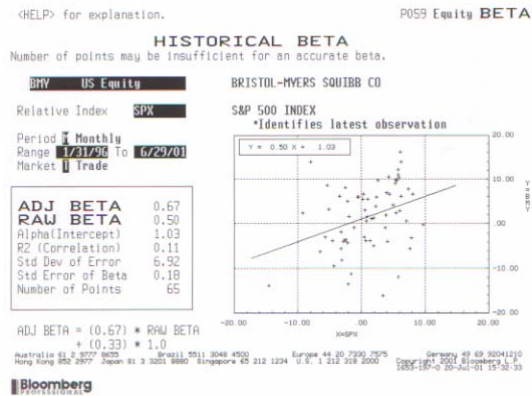
- The historical risk premium of 5.51% for the United States is too high a premium to use in valuation. It is
  - As high as the highest implied equity premium that we have ever seen in the US market (making your valuation a worst case scenario)
  - Much higher than the actual implied equity risk premium in the market
- The current implied equity risk premium is too low because
  - It is lower than the equity risk premiums in the 60s, when inflation and interest rates were as low
- The average implied equity risk premium between 1960-2000 in the United States is about 4%. We will use this as the premium for a mature equity market.

## Estimating Beta

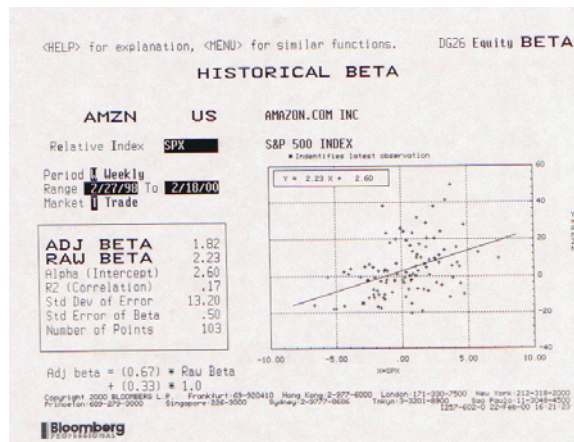
- The standard procedure for estimating betas is to regress stock returns ( $R_j$ ) against market returns ( $R_m$ ) -
$$R_j = a + b R_m$$
  - where  $a$  is the intercept and  $b$  is the slope of the regression.
- The slope of the regression corresponds to the beta of the stock, and measures the riskiness 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 Estimation: The Noise Problem



## Beta Estimation: Amazon



## Determinants of Betas

- **Product or Service:** The beta value for a firm depends upon the sensitivity of the demand for its products and services and of its costs to macroeconomic factors that affect the overall market.
  - Cyclical companies have higher betas than non-cyclical firms
  - Firms which sell more discretionary products will have higher betas than firms that sell less discretionary products
- **Operating Leverage:** The greater the proportion of fixed costs in the cost structure of a business, the higher the beta will be of that business. This is because higher fixed costs increase your exposure to all risk, including market risk.
- **Financial Leverage:** The more debt a firm takes on, the higher the beta will be of the equity in that business. Debt creates a fixed cost, interest expenses, that increases exposure to market risk. The beta of equity alone can be written as a function of the unlevered beta and the debt-equity ratio

$$\beta_L = \beta_u (1 + ((1-t)D/E))$$

where

$\beta_L$  = Levered or Equity Beta  
 t = Corporate marginal tax rate  
 E = Market Value of Equity

$\beta_u$  = Unlevered Beta  
 D = Market Value of Debt

## The Solution: Bottom-up Betas

- The bottom up beta can be estimated by :
  - Taking a weighted (by sales or operating income) average of the unlevered betas of the different businesses a firm is in.

$$\sum_{j=1}^k \beta_j \left[ \frac{\text{Operating Income}_j}{\text{Operating Income}_{\text{firm}}} \right]$$

(The unlevered beta of a business can be estimated by looking at other firms in the same business)

- Lever up using the firm's debt/equity ratio

$$\beta_{\text{levered}} = \beta_{\text{unlevered}} [1 + (1 - \text{tax rate}) (\text{Current Debt/Equity Ratio})]$$

- The bottom up beta will give you a better estimate of the true beta when
  - It has lower standard error ( $SE_{\text{average}} = SE_{\text{firm}} / \sqrt{n}$  (n = number of firms))
  - It reflects the firm's current business mix and financial leverage
  - It can be estimated for divisions and private firms.

## Bristol Myer's Bottom-up Beta

<i>Business</i>	<i>Unlevered Beta</i>	<i>D/E Ratio</i>	<i>Levered Beta</i>	<i>Proportion of Value</i>
Pharmaceuticals	0.82	1.68%	0.83	100%

If a firm is in multiple businesses, the proportion of value can be estimated for each division by multiplying the revenues of each division by the average value to sales ratios of other firms in that business. For instance, if Bristol Myers derived some of its revenues from cosmetics and the value to sales ratio for cosmetic firms was 2 while the value to sales ratio for pharmaceutical firms is 5, you would estimate a bottom-up beta as follows:

<i>Business</i>	<i>Revenues</i>	<i>Value/Sales</i>	<i>Estimated Value</i>	<i>Weights</i>	<i>Unlevered Beta</i>
Pharmaceuticals	\$ 18	5.00	90	.90	0.82
Cosmetics	\$ 5	2.00	10	.10	1.10
Firm					=0.9(0.82) +0.10(1.10) = 0.85

## Amazon's Bottom-up Beta

Unlevered beta for firms in internet retailing = 1.60  
 Unlevered beta for firms in specialty retailing = 1.00

- Amazon is a specialty retailer, but its risk currently seems to be determined by the fact that it is an online retailer. Hence we will use the beta of internet companies to begin the valuation
- By the fifth year, we are estimating substantial revenues for Amazon and we move the beta towards to beta of the retailing business.

## 5. The rate you borrowed at is your cost of debt...

- The cost of debt is not your historical borrowing rate, but the rate at which you can borrow at today.
- The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, the rating can be estimated from the interest coverage ratio

Interest Coverage Ratio = EBIT / Interest Expenses

- For Bristol Myers, the earnings before interest and taxes in 2000 was \$5,986 million and interest expenses were \$ 108 million. The interest coverage ratio for Bristol Myers is

Interest coverage ratio = EBIT/ Interest expense = 5986/108= 55.43

- Amazon.com has negative operating income; this yields a negative interest coverage ratio, which should suggest a low rating. We computed an average interest coverage ratio of 2.82 over the next 5 years. This yields an average rating of BBB for Amazon.com for the first 5 years. (In effect, the rating will be lower in the earlier years and higher in the later years than BBB)

## Interest Coverage Ratios, Ratings and Default Spreads

If Interest Coverage Ratio is	Estimated Bond Rating	Default Spread(1/00)	Default Spread(1/01)
> 8.50	AAA	0.20%	0.75%
6.50 - 8.50	AA	0.50%	1.00%
5.50 - 6.50	A+	0.80%	1.50%
4.25 - 5.50	A	1.00%	1.80%
3.00 - 4.25	A-	1.25%	2.00%
2.50 - 3.00	BBB	1.50%	2.25%
2.00 - 2.50	BB	2.00%	3.50%
1.75 - 2.00	B+	2.50%	4.75%
1.50 - 1.75	B	3.25%	6.50%
1.25 - 1.50	B-	4.25%	8.00%
0.80 - 1.25	CCC	5.00%	10.00%
0.65 - 0.80	CC	6.00%	11.50%
0.20 - 0.65	C	7.50%	12.70%
< 0.20	D	10.00%	15.00%

## Estimating the cost of debt for a firm

- The synthetic rating for Bristol Myers in 2001 is AAA. Using the 2001 default spread of 0.75%, we estimate a cost of debt of 5.85% (using a T.Bond rate of 5.1%):

$$\text{Cost of debt for Bristol Myers} = 5.1\% + 0.75\% = 5.85\%$$

- The synthetic rating for Amazon.com in 2000 was BBB. The default spread for BBB rated bond was 1.50% in 2000 and the treasury bond rate was 6.5%.

$$\begin{aligned} \text{Pre-tax cost of debt} &= \text{Riskfree Rate} + \text{Default spread} \\ &= 6.50\% + 1.50\% = 8.00\% \end{aligned}$$

- After-tax cost of debt = 8.00% (1 - 0) = 8.00%: The firm is paying no taxes currently. As the firm's tax rate changes and its cost of debt changes, the after tax cost of debt will change as well.

	1	2	3	4	5	6	7	8	9	10
Pre-tax	8.00%	8.00%	8.00%	8.00%	8.00%	7.80%	7.75%	7.67%	7.50%	7.00%
Tax rate	0%	0%	0%	16.13%	35%	35%	35%	35%	35%	35%
After-tax	8.00%	8.00%	8.00%	6.71%	5.20%	5.07%	5.04%	4.98%	4.88%	4.55%

## 6. Using book value debt ratios to get to your cost of capital is conservative....

- Equity

- Cost of Equity = 6.50% + 1.60 (4.00%) = 12.90%
- Market Value of Equity = \$ 84/share\* 340.79 mil shs = \$ 28,626 mil (98.8%)

- Debt

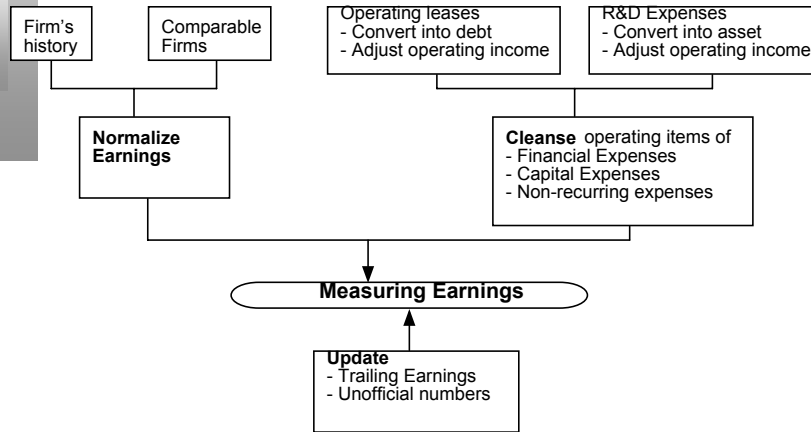
- Cost of debt = 6.50% + 1.50% (default spread) = 8.00%
- Market Value of Debt = \$ 349 mil (1.2%)

- Cost of Capital

$$\text{Cost of Capital} = 12.9\% (.988) + 8.00\% (1 - 0) (.012) = 12.84\%$$

- Amazon had a book value of equity of \$ 139 million and a book value of debt of approximately \$ 400 million. If you had used book value weights....

## 7. Accountants know how to measure earnings...



## The Importance of Updating

- The operating income and revenue that we use in valuation should be updated numbers. One of the problems with using financial statements is that they are dated.
- As a general rule, it is better to use 12-month trailing estimates for earnings and revenues than numbers for the most recent financial year. This rule becomes even more critical when valuing companies that are evolving and growing rapidly.

	<i>Last 10-K</i>	<i>Trailing 12-month</i>
Revenues	\$ 610 million	\$1,117 million
EBIT	- \$125 million	- \$ 410 million

## Normalizing Earnings: Amazon

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

## Converting Operating Leases into Debt: Bristol Myers

- Debt Value of Operating Leases = PV of Operating Lease Expenses at the pre-tax cost of debt

- The pre-tax cost of debt for Bristol Myers is 5.85%

Year	Commitment	Present Value
1	\$102.00	\$96.36
2	\$81.00	\$72.29
3	\$61.00	\$51.43
4	\$48.00	\$38.24
5	\$42.00	\$31.61
6 & 7	\$70.50 each year	\$97.48
Debt Value of leases =		\$387.41

Debt outstanding at Bristol Myers = \$1,498 + \$387 = \$1,885 mil

- Add to Operating Income = Pre-tax cost of Debt \* PV of Operating Leases = \$387.41 (.0585) = \$ 22.66 mil

## Capitalizing R&D Expenses: The Process

- 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...:

## Bristol Myers: R&D

<i>Year</i>	<i>R&amp;D Expense</i>	<i>Unamortized portion</i>	<i>Amortization this year</i>	
Current	1939.00	1.00	1939.00	
-1	1759.00	0.90	1583.10	\$175.90
-2	1577.00	0.80	1261.60	\$157.70
-3	1385.00	0.70	969.50	\$138.50
-4	1276.00	0.60	765.60	\$127.60
-5	1199.00	0.50	599.50	\$119.90
-6	1108.00	0.40	443.20	\$110.80
-7	1128.00	0.30	338.40	\$112.80
-8	1083.00	0.20	216.60	\$108.30
-9	983.00	0.10	98.30	\$98.30
-10	881.00	0.00	0.00	\$88.10
<b>Value of Research Asset =</b>			<b>\$8,214.80</b>	<b>\$1,237.90</b>



## 8. Statements of cashflows tell us what we need to know about capital expenditures...

- Capital spending in the statement of cashflows generally include only internal investments in long term, tangible assets.
- Capital expenditures should also include
  - Research and development expenses, once they have been re-categorized as capital expenses. The adjusted net cap ex will be
$$\text{Adjusted Net Capital Expenditures} = \text{Net Capital Expenditures} + \text{Current year's R\&D expenses} - \text{Amortization of Research Asset}$$
  - Acquisitions of other firms, since these are like capital expenditures. The adjusted net cap ex will be
$$\text{Adjusted Net Cap Ex} = \text{Net Capital Expenditures} + \text{Acquisitions of other firms} - \text{Amortization of such acquisitions}$$

## 9. Working capital = Current assets - Current liabilities

- 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.

## Estimating FCFF: Bristol Myers

	Unadjusted	Adjusted for R&D
EBIT =	\$ 5,986 mil	\$6,710 mil
EBIT (1-t)	\$ 3,891 mil	\$4,607 mil
Capital spending =	\$1,420 mil	\$ 3,444 mil
Depreciation =	\$ 746 mil	\$ 2,039 mil
Non-cash WC Change =	\$ 79 mil	\$ 79 mil
<b>■ Estimating FCFF</b>		
Current EBIT * (1 - tax rate) = 6710 (1-.35) =		\$4,607
- (Capital Spending - Depreciation)		\$1,405
- Change in Working Capital		\$ 79
Current FCFF		\$3,123 million

## Estimating FCFF: Amazon.com

- EBIT (Trailing 1999) = -\$ 410 million
- Tax rate used = 0% (Assumed Effective = Marginal)
- Capital spending (Trailing 1999) = \$ 243 million
- Depreciation (Trailing 1999) = \$ 31 million
- Non-cash Working capital Change (1999) = - 80 million
- Estimating FCFF (1999)
 

Current EBIT * (1 - tax rate) = - 410 (1-0)	= - \$410 million
- (Capital Spending - Depreciation)	= \$212 million
- Change in Working Capital	= - \$ 80 million
Current FCFF	= - \$542 million

## 10. Expected Growth Rates in valuation are exogenous variables..

- In most valuations, growth comes from analyst estimates. In reality, growth is a function of how much a firm reinvests and how well it reinvests.

$$g_{\text{EBIT}} = (\text{Net Capital Expenditures} + \text{Change in WC}) / \text{EBIT}(1-t) * \text{ROC} \\ = \text{Reinvestment Rate} * \text{ROC}$$

- For Bristol Myers

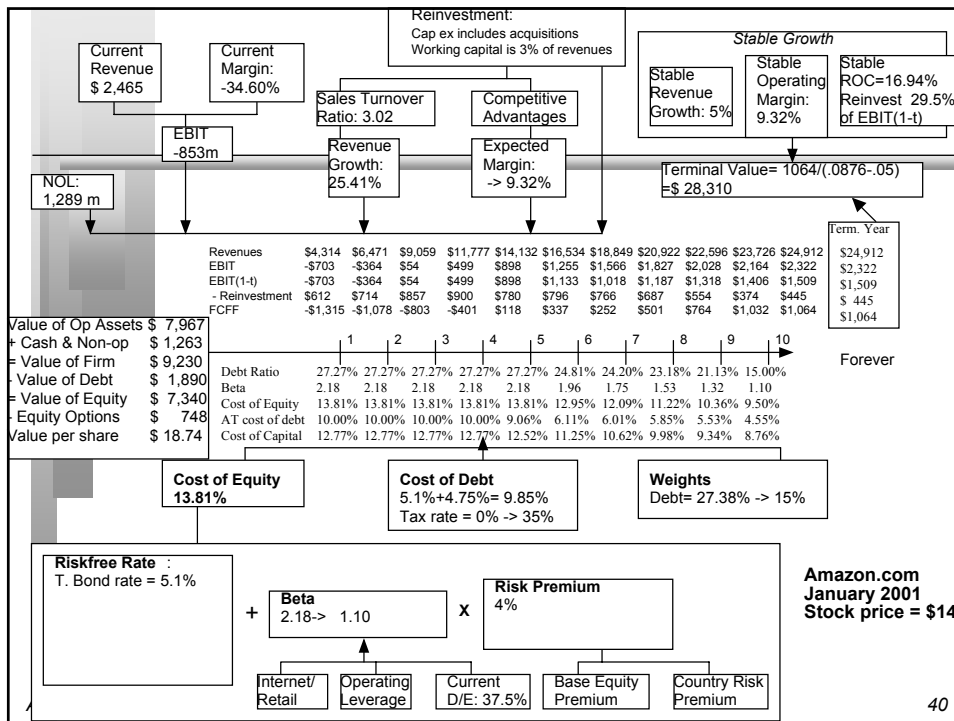
- $\text{ROC} = \text{EBIT} (1 - \text{tax rate}) / (\text{BV of Debt} + \text{BV of Equity})$   
 $= 4607 / (2161 + 16159) = 25.15\%$
- $\text{Reinv. Rate} = (\text{Net Cap Ex} + \text{Chg in WC}) / \text{EBIT} (1-t)$   
 $= (1405 + 79) / 4607 = 32.21\%$
- $\text{Expected Growth Rate} = (.2515) * (.3221) = 8.10\%$

## 11. Once you finish discounting cashflows, you are done with your valuation....

- + Cash and Marketable Securities: The simplest and most direct way of dealing with cash and marketable securities is to keep them out of the valuation - the cash flows should be before interest income from cash and securities, and the discount rate should not be contaminated by the inclusion of cash.
- + Cross Holdings: To value these correctly, you have to value each cross holding and take the percentage owned by your firm. If there are a large number of holdings, and many of these are in private firms, it is almost impossible to value cross holdings correctly.
- Value of Management Options: When firms give options to their employees and managers, they reduce the value of equity to their common stockholders. You need to value these options (not the exercise value, but the option value) and subtract them from the value of equity.

## 12. Good valuations do not change...

- No valuation is timeless. Each of the inputs to the model are susceptible to change as new information comes out about the firm, its competitors and the overall economy.
  - Market Wide Information
    - Interest Rates
    - Risk Premiums
    - Economic Growth
  - Industry Wide Information
    - Changes in laws and regulations
    - Changes in technology
  - Firm Specific Information
    - New Earnings Reports
    - Changes in the Fundamentals (Risk and Return characteristics)



## Back to Lemmings...

