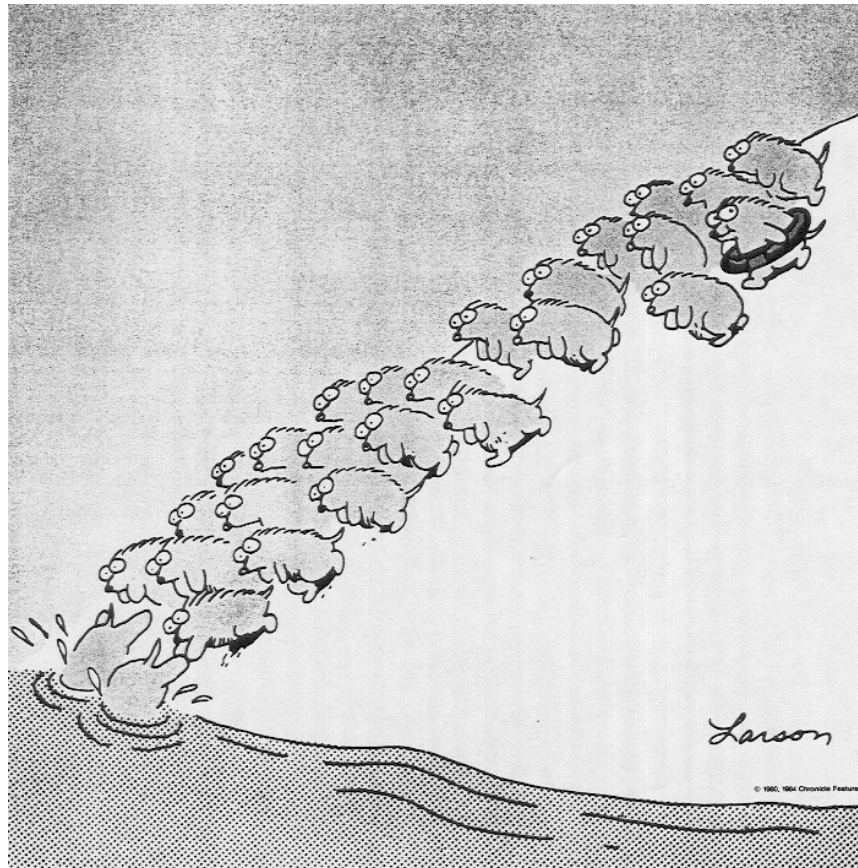# ~~Advanced~~ Valuation

Aswath Damodaran

www.damodaran.com

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 <u>life of the asset</u>
  - to estimate the <u>cash flows</u> during the life of the asset
  - to estimate the <u>discount rate</u> to apply to these cash flows to get present value

- **Market Inefficiency**: Markets are assumed to make <u>mistakes</u> in pricing assets <u>across time</u>, and are assumed to correct themselves over time, as new information comes out about assets.

Risk Adjusted Value: Three Basic Propositions

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

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

Proposition 1: If "it" does not affect the cash flows or alter risk (thus changing discount rates), "it" cannot affect value.

Proposition 2: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.

Proposition 3: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.
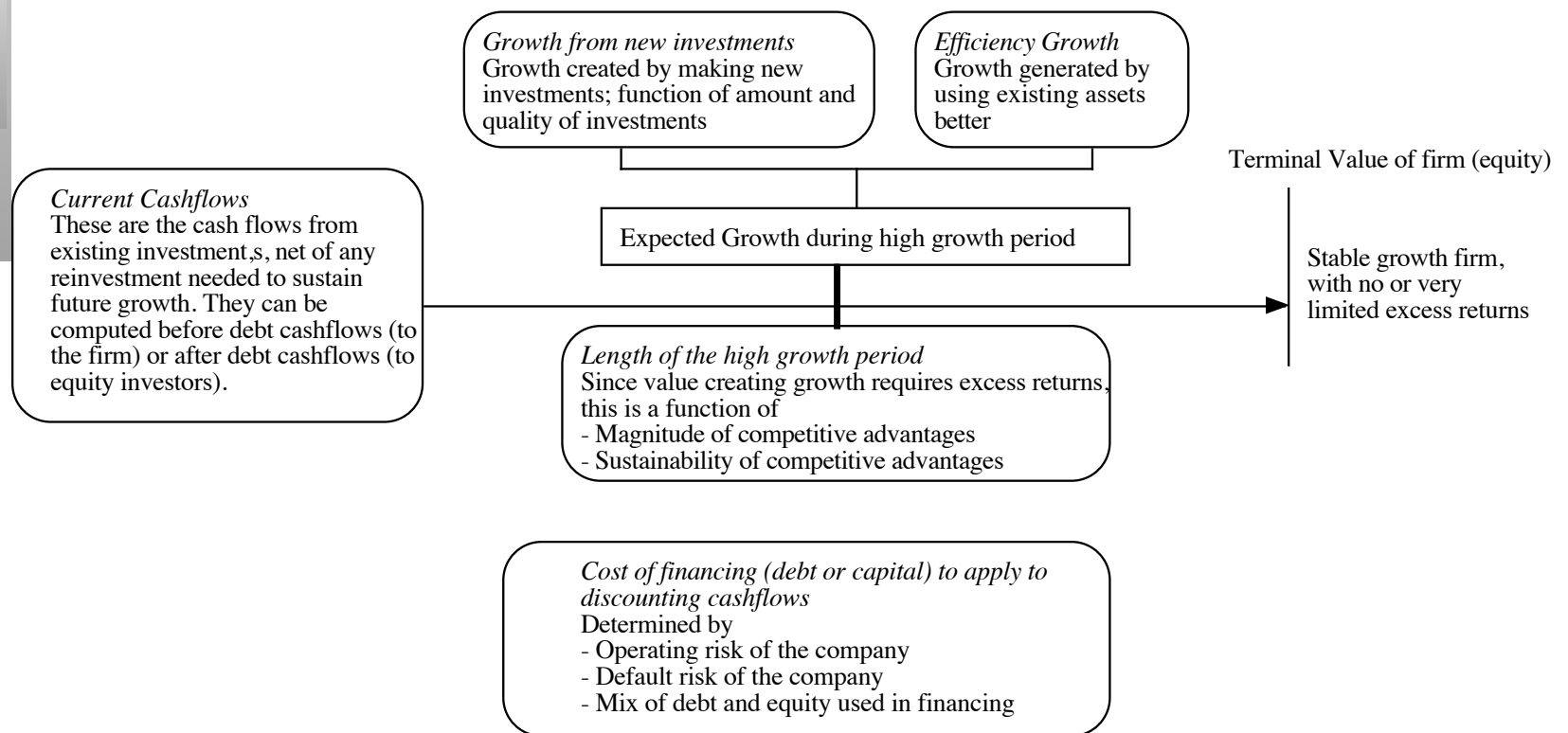
DCF Choices: Equity Valuation versus Firm Valuation

Firm Valuation: Value the entire business

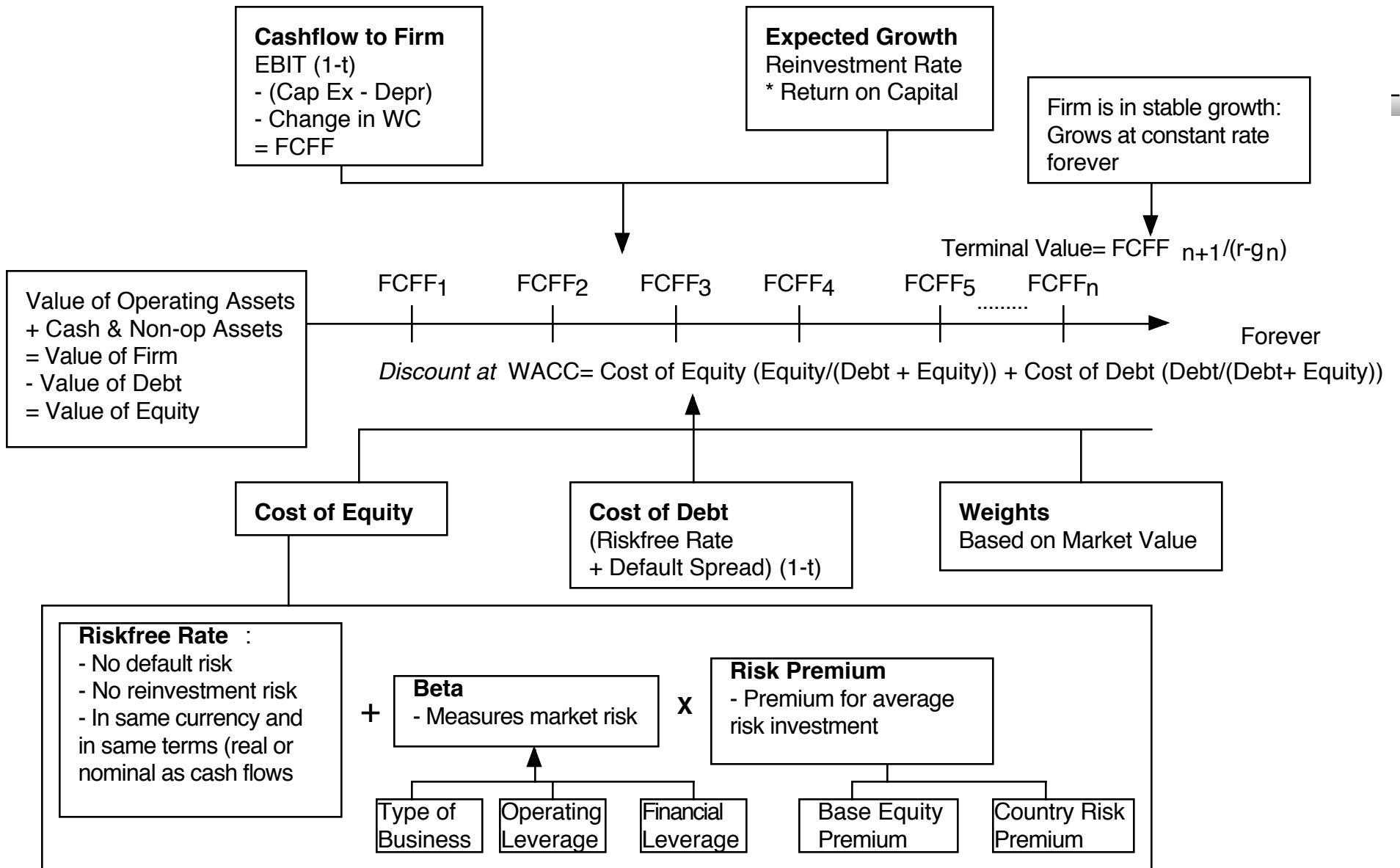| Assets		Liabilities	
Existing Investments Generate cashflows today Includes long lived (fixed) and short-lived(working capital) assets	Assets in Place	Debt	Fixed Claim on cash flows Little or No role in management *Fixed Maturity* *Tax Deductible*
Expected Value that will be created by future investments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

Equity valuation: Value just the equity claim in the business

The Drivers of Value…

Growth from new investments
Growth created by making new investments; function of amount and quality of investments

Efficiency Growth
Growth generated by using existing assets better

Terminal Value of firm (equity)

Current Cashflows
These are the cash flows from existing investment,s, net of any reinvestment needed to sustain future growth. They can be computed before debt cashflows (to the firm) or after debt cashflows (to equity investors).

Expected Growth during high growth period

Stable growth firm, with no or very limited excess returns

Length of the high growth period
Since value creating growth requires excess returns, this is a function of
- Magnitude of competitive advantages
- Sustainability of competitive advantages

Cost of financing (debt or capital) to apply to discounting cashflows
Determined by
- Operating risk of the company
- Default risk of the company
- Mix of debt and equity used in financing

DISCOUNTED CASHFLOW VALUATION

Cashflow to Firm
EBIT (1-t)
- (Cap Ex - Depr)
- Change in WC
= FCFF

Expected Growth
Reinvestment Rate
* Return on Capital

Firm is in stable growth:
Grows at constant rate
forever

Terminal Value= $FCFF_{n+1}/(r-g_n)$

Value of Operating Assets
+ Cash & Non-op Assets
= Value of Firm
- Value of Debt
= Value of Equity

$FCFF_1$ $FCFF_2$ $FCFF_3$ $FCFF_4$ $FCFF_5$ $FCFF_n$ ....

Forever

Discount at WACC= Cost of Equity (Equity/(Debt + Equity)) + Cost of Debt (Debt/(Debt+ Equity))

Cost of Equity

Cost of Debt
(Riskfree Rate
+ Default Spread) (1-t)

Weights
Based on Market Value

Riskfree Rate :
- No default risk
- No reinvestment risk
- In same currency and
in same terms (real or
nominal as cash flows

+

Beta
- Measures market risk

X

Risk Premium
- Premium for average
risk investment

Type of Business | Operating Leverage | Financial Leverage

Base Equity Premium | Country Risk Premium

Amgen: Status Quo

Cap Ex = Acc net Cap Ex(255) + Acquisitions (3975) + R&D (2216)

Current Cashflow to Firm
EBIT(1-t)= :7336(1-.**28**)= 6058
- Nt CpX= 6443
- Chg WC 37
= FCFF - 423
Reinvestment Rate = 6480/6058
=106.98%
Return on capital = 16.71%

Reinvestment Rate
60%

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%

Growth decreases gradually to 4%

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

First 5 years

Year	1	2	3	4	5	6	7	8	9	10	Term Yr
EBIT	$9,221	$10,106	$11,076	$12,140	$13,305	$14,433	$15,496	$16,463	$17,306	$17,998	18718
EBIT (1-t)	$6,639	$7,276	$7,975	$8,741	$9,580	$10,392	$11,157	$11,853	$12,460	$12,958	12167
- Reinvestment	$3,983	$4,366	$4,785	$5,244	$5,748	$5,820	$5,802	$5,690	$5,482	$5,183	4867
= FCFF	$2,656	$2,911	$3,190	$3,496	$3,832	$4,573	$5,355	$6,164	$6,978	$7,775	7300

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

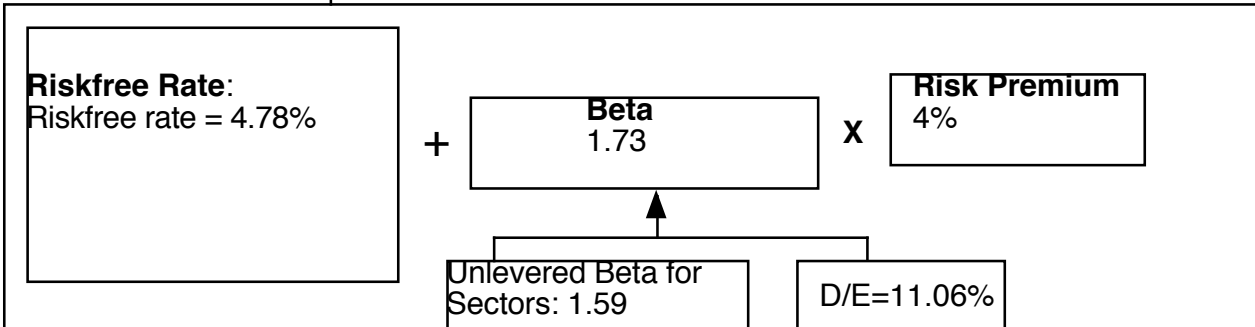Cost of Capital (WACC) = 11.7% (0.90) + 3.66% (0.10) = 10.90%

Debt ratio increases to 20%
Beta decreases to 1.10

On May 1,2007, Amgen was trading at $ 55/share

Cost of Equity
11.70%

Cost of Debt
(4.78%+..85%)(1-.35)
= 3.66%

Weights
E = 90% D = 10%

Riskfree Rate:
Riskfree rate = 4.78%

+

Beta
1.73

X

Risk Premium
4%

Unlevered Beta for Sectors: 1.59

D/E=11.06%

Aswath Damodaran

10

Tata Motors: April 2010

Current Cashflow to Firm
EBIT(1-t) :   Rs 20,116
- Nt CpX   Rs 31,590
- Chg WC   Rs   2,732
= FCFF   - Rs 14,205
Reinv Rate = (31590+2732)/20116 =
170.61%; Tax rate = 21.00%
Return on capital = 17.16%

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

Reinvestment Rate
70%

**Expected Growth
from new inv.**
.70*.1716=0.1201

Return on Capital
17.16%

Stable Growth
g = 5%; Beta = 1.00
Country Premium= 3%
Cost of capital = 10.39%
Tax rate = 33.99%
ROC= 10.39%;
Reinvestment Rate=g/ROC
=5/ 10.39= 48.11%

Terminal Value$_5$= 23493/(.1039-.05) = Rs 435,686

Op. Assets Rs210,813
+ Cash: 11418
+ Other NO   140576
- Debt   109198
=Equity   253,628

Value/Share Rs 614

Rs Cashflows

Year	1	2	3	4	5	6	7	8	9	10	
EBIT (1-t)	22533	25240	28272	31668	35472	39236	42848	46192	49150	51607	45278
- Reinvestment	15773	17668	19790	22168	24830	25242	25138	24482	23264	21503	21785
FCFF	6760	7572	8482	9500	10642	13994	17711	21710	25886	30104	23493

Discount at Cost of Capital (WACC) = 14.00% (.747) + 8.09% (0.253) = 12.50%

*Growth declines to 5%
and cost of capital
moves to stable period
level.*

**Cost of Equity
14.00%**

Cost of Debt
(5%+ 4.25%+3)(1-.3399)
= 8.09%

Weights
E = 74.7% D = 25.3%

On April 1, 2010
Tata Motors price = Rs 781

Riskfree Rate:
Rs Riskfree Rate= 5%

+

Beta
1.20

X

**Mature market
premium**
4.5%

+

Lambda
0.80

X

Country Equity Risk
Premium
4.50%

Unlevered Beta for
Sectors: 1.04

Firm's D/E
Ratio: 33%

Country Default
Spread
3%

X

Rel Equity
Mkt Vol
1.50

Kristin's Kandy: Valuation in March 2006

Current Cashflow to Firm
EBIT(1-t) :   300
- Nt CpX   100
- Chg WC   40
= FCFF   160
Reinvestment Rate = 46.67%

Reinvestment Rate
46.67%

Return on Capital
13.64%

Expected Growth in EBIT (1-t)
.4667*.1364= .0636
6.36%

Stable Growth
g = 4%; Beta =3.00;
ROC= 12.54%
Reinvestment Rate=31.90%

Terminal Value$_5$= 289/(.1254-.04) = 3,403

Year	1	2	3	4	5	Term Yr
EBIT (1-t)	$319	$339	$361	$384	$408	425
- Reinvestment	$149	$158	$168	$179	$191	136
=FCFF	$170	$181	$193	$205	$218	289

Firm Value: 2,571
+ Cash   125
- Debt: 900
=Equity   1,796
- Illiq Discount 12.5%
Adj Value   1,571

Discount at Cost of Capital (WACC) = 16.26% (.70) + 3.30% (.30) = 12.37%

Cost of Equity
16.26%

Cost of Debt
(4.5%+1.00)(1-.40)
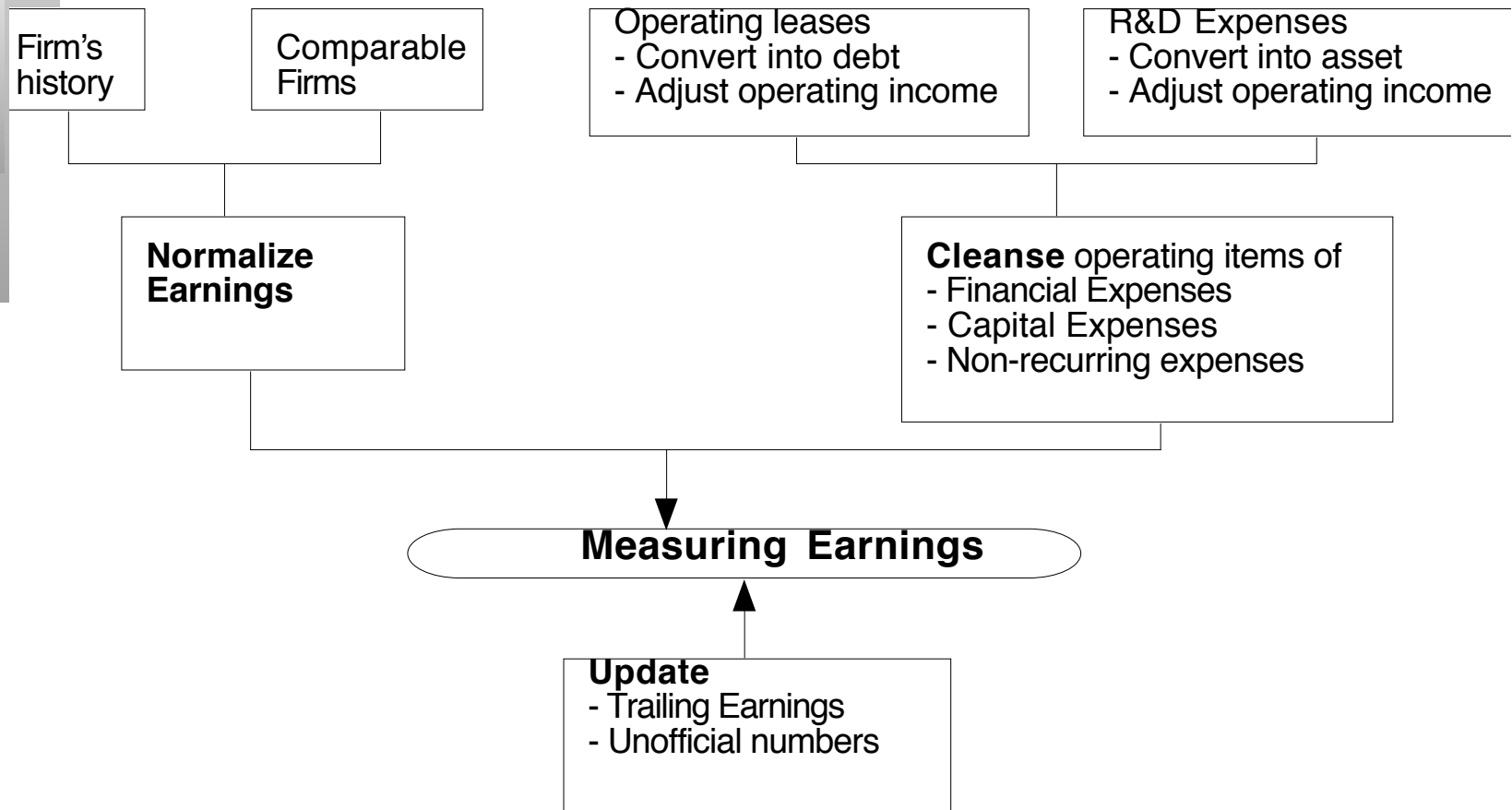= 3.30%
Synthetic rating = A-

Weights
E =70% D = 30%

Riskfree Rate:
Riskfree rate = 4.50%
(10-year T.Bond rate)

+

Total Beta
2.94
Adjusted for ownrer non-diversification

X

Risk Premium
4.00%

1/3 of risk is market risk

Market Beta: 0.98

Unlevered Beta for Sectors: 0.78

Firm's D/E Ratio: 30/70

Mature risk premium
4%

Country Risk Premium
0%
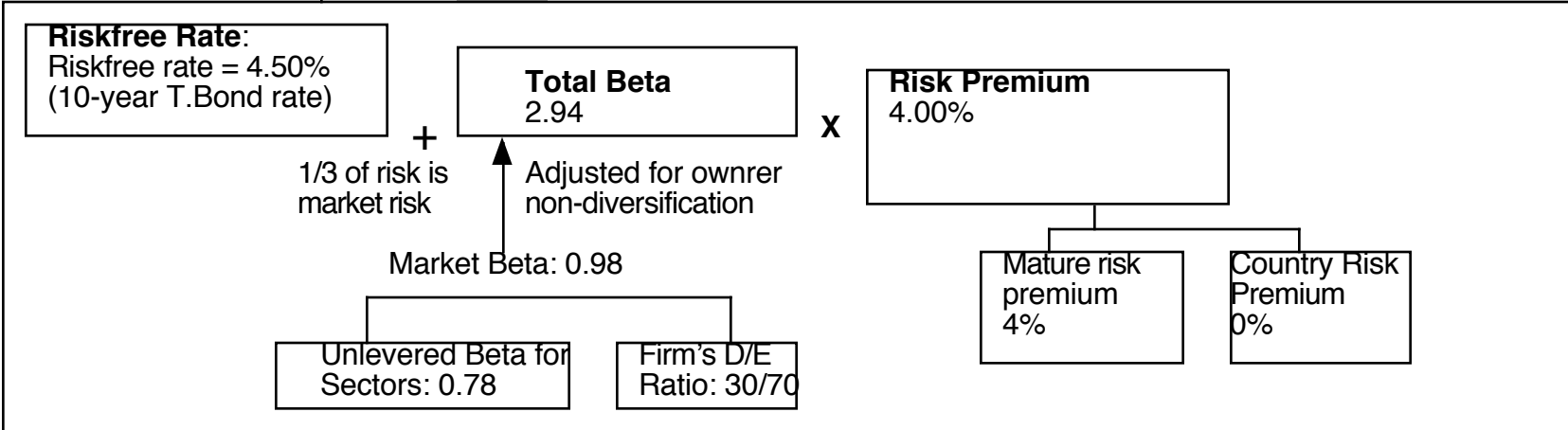
DCF Inputs

"Garbage in, garbage out"

I. Measure earnings right..


```
┌──────────┐  ┌──────────┐     ┌─────────────────────────┐  ┌─────────────────────────┐
│ Firm's   │  │Comparable│     │ Operating leases        │  │ R&D Expenses            │
│ history  │  │ Firms    │     │ - Convert into debt     │  │ - Convert into asset    │
└──────────┘  └──────────┘     │ - Adjust operating      │  │ - Adjust operating      │
                               │   income                │  │   income                │
                               └─────────────────────────┘  └─────────────────────────┘

          ┌──────────────┐              ┌────────────────────────────┐
          │ Normalize    │              │ Cleanse operating items of │
          │ Earnings     │              │ - Financial Expenses       │
          │              │              │ - Capital Expenses         │
          └──────────────┘              │ - Non-recurring expenses   │
                                        └────────────────────────────┘

                    ⬭ Measuring  Earnings ⬭

                       ┌─────────────────────┐
                       │ Update              │
                       │ - Trailing Earnings │
                       │ - Unofficial numbers│
                       └─────────────────────┘
```

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**
  - <u>Research and development expenses</u>, once they have been re-categorized as capital expenses.
  - <u>Acquisitions of other firms</u>, 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

■ The accounting net cap ex at Amgen is small:

Accounting Capital Expenditures =	$1,218 million
- Accounting Depreciation =	$ 963 million
Accounting Net Cap Ex =	$ 255 million

■ We define capital expenditures broadly to include R&D and acquisitions:

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… and are noisy…

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

Determinants of Betas

Beta of Equity

Beta of Firm

Nature of product or service offered by company:
Other things remaining equal, the more discretionary the product or service, the higher the beta.

Operating Leverage (Fixed Costs as percent of total costs):
Other things remaining equal the greater the proportion of the costs that are fixed, the higher the beta of the company.

Financial Leverage:
Other things remaining equal, the greater the proportion of capital that a firm raises from debt,the higher its equity beta will be

Implications
1. Cyclical companies should have higher betas than non-cyclical companies.
2. Luxury goods firms should have higher betas than basic goods.
3. High priced goods/service firms should have higher betas than low prices goods/services firms.
4. Growth firms should have higher betas.

Implications
1. Firms with high infrastructure needs and rigid cost structures shoudl have higher betas than firms with flexible cost structures.
2. Smaller firms should have higher betas than larger firms.
3. Young firms should have

Implciations
Highly levered firms should have highe betas than firms with less debt.

Aswath Damodaran

Bottom-up Betas

Step 1: Find the business or businesses that your firm operates in.

Possible Refinements

Step 2: Find publicly traded firms in each of these businesses and obtain their regression betas. Compute the simple average across these regression betas to arrive at an average beta for these publicly traded firms. Unlever this average beta using the average debt to equity ratio across the publicly traded firms in the sample.
Unlevered beta for business = Average beta across publicly traded firms/ (1 + (1- t) (Average D/E ratio across firms))

If you can, adjust this beta for differences between your firm and the comparable firms on operating leverage and product characteristics.

Step 3: Estimate how much value your firm derives from each of the different businesses it is in.

While revenues or operating income are often used as weights, it is better to try to estimate the value of each business.

Step 4: Compute a weighted average of the unlevered betas of the different businesses (from step 2) using the weights from step 3.
Bottom-up Unlevered beta for your firm = Weighted average of the unlevered betas of the individual business

If you expect the business mix of your firm to change over time, you can change the weights on a year-to-year basis.

Step 5: Compute a levered beta (equity beta) for your firm, using the market debt to equity ratio for your firm.
Levered bottom-up beta = Unlevered beta (1+ (1-t) (Debt/Equity))

If you expect your debt to equity ratio to change over time, the levered beta will change over time.

Two examples…

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

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

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

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

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2011	7.55%	5.79%	5.62%	4.10%
	2.22%	2.36%		
1962-2011	5.38%	3.36%	4.02%	2.35%
	2.39%	2.68%		
2002-2011	3.12%	-1.92%	1.08%	-3.61%
	6.46%	8.94%		

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

In the trailing 12 months, the cash returned to stockholders was 74.17. Using the average cash yield of 4.71% for 2002-2011 the cash returned would have been 59.29.

Analysts expect earnings to grow 9.6% in 2012, 11.9% in 2013, 8.2% in 2014, 4.5% in 2015 and 2% theraffer, resulting in a compounded annual growth rate of 7.18% over the next 5 years. We will assume that dividends & buybacks will grow 7.18% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 1.87%, the same rate as the entire economy (= riskfree rate).

63.54   68.11   73.00   78.24   83.86

January 1, 2012
S&P 500 is at 1257.60
Adjusted Dividends &
Buybacks for 2011 = 59.29

$$1257.60 = \frac{63.54}{(1+r)} + \frac{68.11}{(1+r)^2} + \frac{73.00}{(1+r)^3} + \frac{78.24}{(1+r)^4} + \frac{83.86}{(1+r)^5} + \frac{83.86(1.0187)}{(r-.0187)(1+r)^5}$$

Expected Return on Stocks (1/1/12)   = 7.91%
T.Bond rate on 1/1/12   = 1.87%
Equity Risk Premium = 8.03% - 3.29%   = 6.04%

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

Implied Premiums in the US: 1960-2011

Implied Premium for US Equity Market
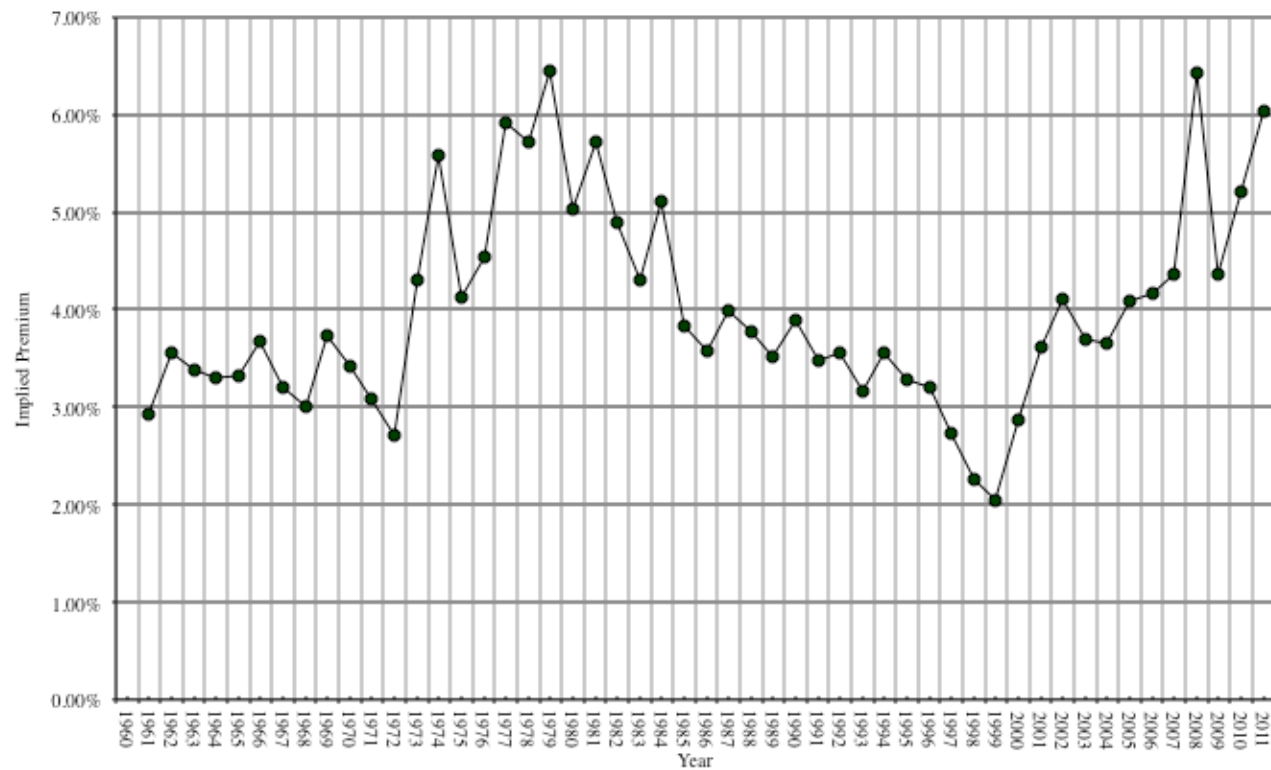
The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009

Implied Equity Risk Premium - 9/12- 12/31/08

Average implied ERP: 1960-2007 = 4.00%
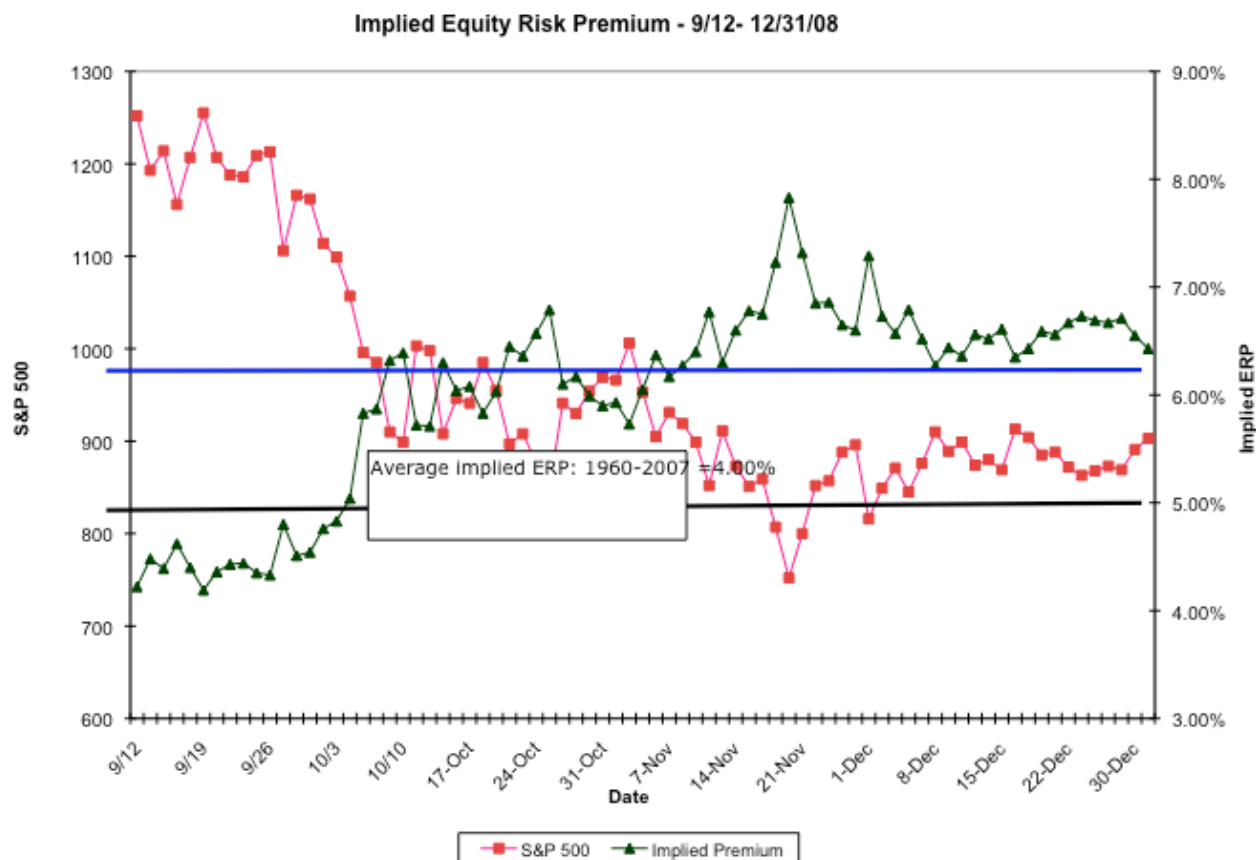
Implied Premium for India using the Sensex: April 2010

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

V. There is a downside to globalization…

■ Emerging markets offer growth opportunities but they are also riskier. If we want to count the growth, we have to also consider the risk.

■ Two ways of estimating the country risk premium:

- *Default spread on Country Bond*: In this approach, the country equity risk premium is set equal to the default spread of the bond issued by the country.
    - Equity Risk Premium for mature market = 4.5%
    - Equity Risk Premium for India = 4.5% + 3% = 7.5%

- *Adjusted for equity risk*: The country equity risk premium is based upon the volatility of the equity market relative to the government bond rate.

    Country risk premium= Default Spread* $\sigma_{Country\ Equity}$ / $\sigma_{Country\ Bond}$

    - Standard Deviation in Sensex = 30%
    - Standard Deviation in Indian government bond= 20%
    - Default spread on Indian Bond= 3%
    - Total equity risk premium for India = 4.5% + 3% (30/20) = 9%

Country Risk Premiums January 2012

Canada	6.00%
United States of America	6.00%

Argentina	15.00%
Belize	15.00%
Bolivia	12.00%
Brazil	8.63%
Chile	7.05%
Colombia	9.00%
Costa Rica	9.00%
Ecuador	18.75%
El Salvador	10.13%
Guatemala	9.60%
Honduras	13.50%
Mexico	8.25%
Nicaragua	15.00%
Panama	9.00%
Paraguay	12.00%
Peru	9.00%
Uruguay	9.60%
Venezuela	12.00%

Angola	10.88%
Botswana	7.50%
Egypt	13.50%
Mauritius	8.63%
Morocco	9.60%
Namibia	9.00%
South Africa	7.73%
Tunisia	9.00%

Austria [1]	6.00%
Belgium [1]	7.05%
Cyprus [1]	9.00%
Denmark	6.00%
Finland [1]	6.00%
France [1]	6.00%
Germany [1]	6.00%
Greece [1]	16.50%
Iceland	9.00%
Ireland [1]	9.60%
Italy [1]	7.50%
Malta [1]	7.50%
Netherlands [1]	6.00%
Norway	6.00%
Portugal [1]	10.13%
Spain [1]	7.28%
Sweden	6.00%
Switzerland	6.00%
United Kingdom	6.00%

Albania	12.00%
Armenia	10.13%
Azerbaijan	9.60%
Belarus	15.00%
Bosnia and Herzegovina	13.50%
Bulgaria	8.63%
Croatia	9.00%
Czech Republic	7.28%
Estonia	7.28%
Georgia	10.88%
Hungary	9.60%
Kazakhstan	8.63%
Latvia	9.00%
Lithuania	8.25%
Moldova	15.00%
Montenegro	10.88%
Poland	7.50%
Romania	9.00%
Russia	8.25%
Slovakia	7.28%
Slovenia [1]	7.28%
Ukraine	13.50%

Bahrain	8.25%
Israel	7.28%
Jordan	10.13%
Kuwait	6.75%
Lebanon	12.00%
Oman	7.28%
Qatar	6.75%
Saudi Arabia	7.05%
Senegal	12.00%
United Arab Emirates	6.75%

Bangladesh	10.88%
Cambodia	13.50%
China	7.05%
Fiji Islands	12.00%
Hong Kong	6.38%
India	9.00%
Indonesia	9.60%
Japan	7.05%
Korea	7.28%
Macao	7.05%
Malaysia	7.73%
Mongolia	12.00%
Pakistan	15.00%
Papua New Guinea	12.00%
Philippines	10.13%
Singapore	6.00%
Sri Lanka	12.00%
Taiwan	7.05%
Thailand	8.25%
Turkey	10.13%
Vietnam	12.00%

Australia	6.00%
New Zealand	6.00%

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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(Return)=Riskfree Rate+ β (US premium) + λ (Country ERP)

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

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

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

$\lambda_{Tata\ Motors}$ = 91%/80% = 1.14
λ_{TCS} = 7.62%/80% = 0.09

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

Estimating lambdas: Tata Motors versus TCS

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

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

- The inputs into the cost of capital - the cost of equity (beta), the cost of debt (default risk) and the debt ratio - can change over time. For younger firms, they should change over time.

- At the minimum, they should change when you get to your terminal year to inputs that better reflect a mature firm.

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

Expected Growth

```
            Expected Growth
           /               \
     Net Income         Operating Income
     /        \          /           \
```

Retention Ratio= 1 - Dividends/Net Income	X	*Return on Equity* Net Income/Book Value of Equity	
Reinvestment Rate = (Net Cap Ex + Chg in WC/EBIT(1-t)	X	*Return on Capital =* EBIT(1-t)/Book Value of Capital	
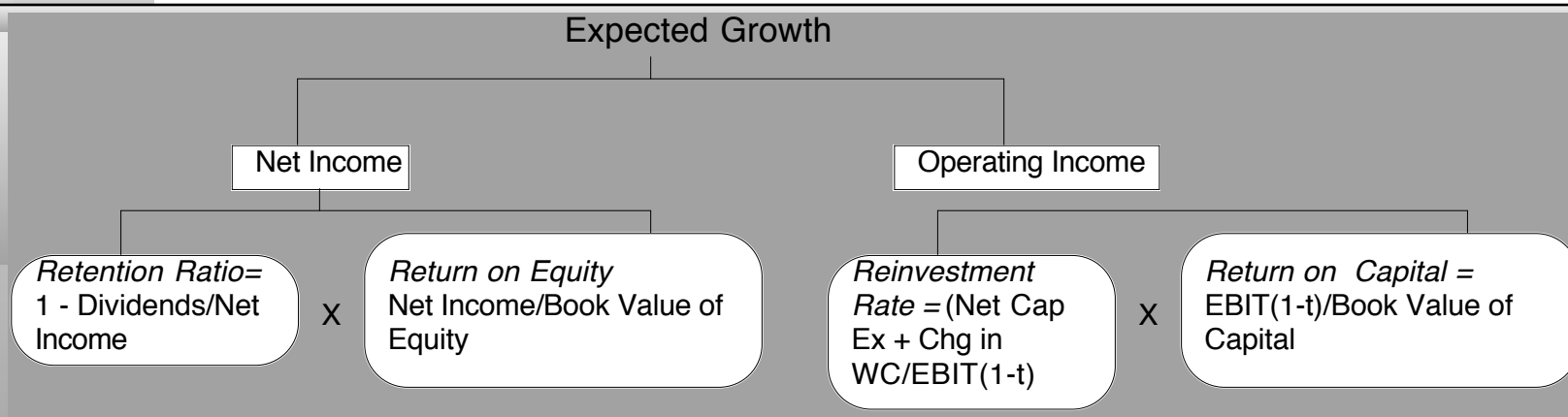
Adjust EBIT for
a. Extraordinary or one-time expenses or income
b. Operating leases and R&D
c. Cyclicality in earnings (Normalize)
d. Acquisition Debris (Goodwill amortization etc.)

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

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

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

Adjust book value of debt for
a. Capitalized operating leases

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

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

This tax rate locks in forever. Does it make sense to use an effective tax rate?

Are you reinvesting enough to sustain your stable growth rate? Check
Reinv Rate = g/ ROC

$$\text{Terminal Value}_n = \frac{EBIT_{n+1}\ (1 - \text{tax rate})\ (1 - \text{Reinvestment Rate})}{\text{Cost of capital} - \text{Expected growth rate}}$$

This is a mature company. It's cost of capital should reflect that.

This growth rate should be less than the nomilnal growth rate of the economy

Terminal Value and Growth

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

The loose ends in valuation…

The loose ends matter…

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

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1. The Value of Cash
An Exercise in Cash Valuation

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

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

Cash: Discount or Premium?

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

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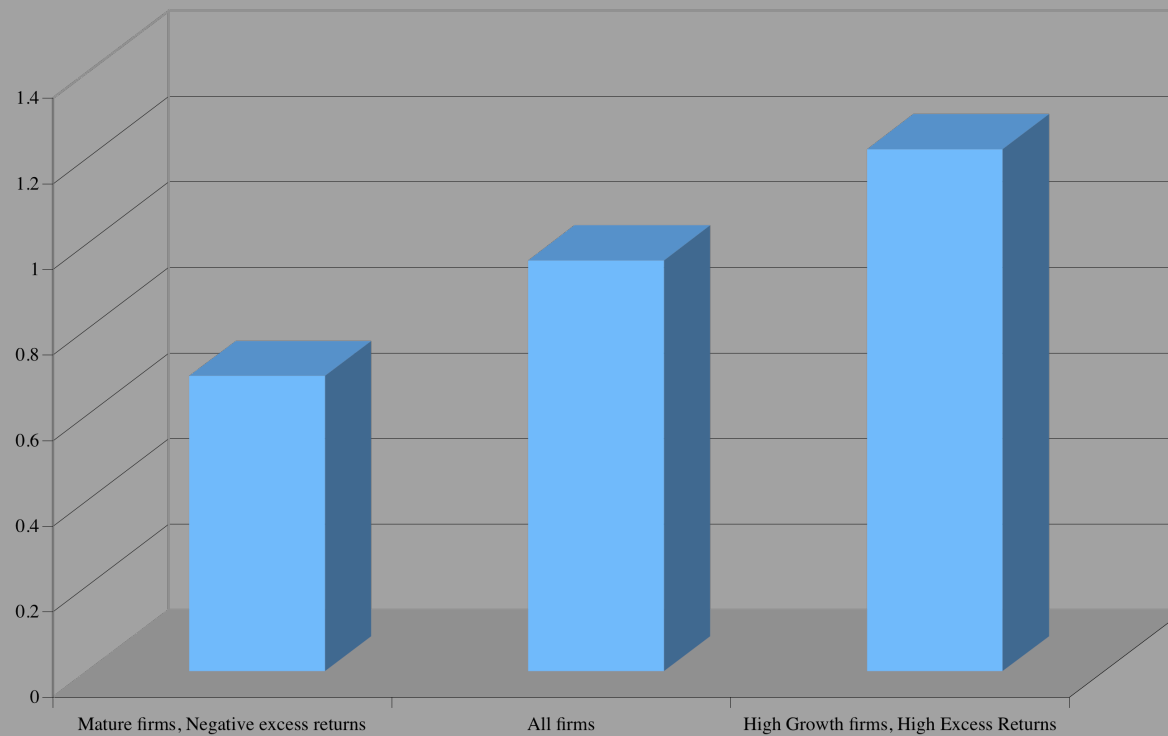
2. Dealing with Holdings in Other firms

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

- <u>The market value solution</u>: 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.

- <u>The relative value solution</u>: When there are too many cross holdings to value separately or when there is insufficient information provided on cross holdings, you can convert the book values of holdings that you have on the balance sheet (for both minority holdings and minority interests in majority holdings) by using the average price to book value ratio of the sector in which the subsidiaries operate.

Tata Motor's Cross Holdings

Legend:
- Tata Steel
- Tata Chemicals
- Non-listed Tata companies
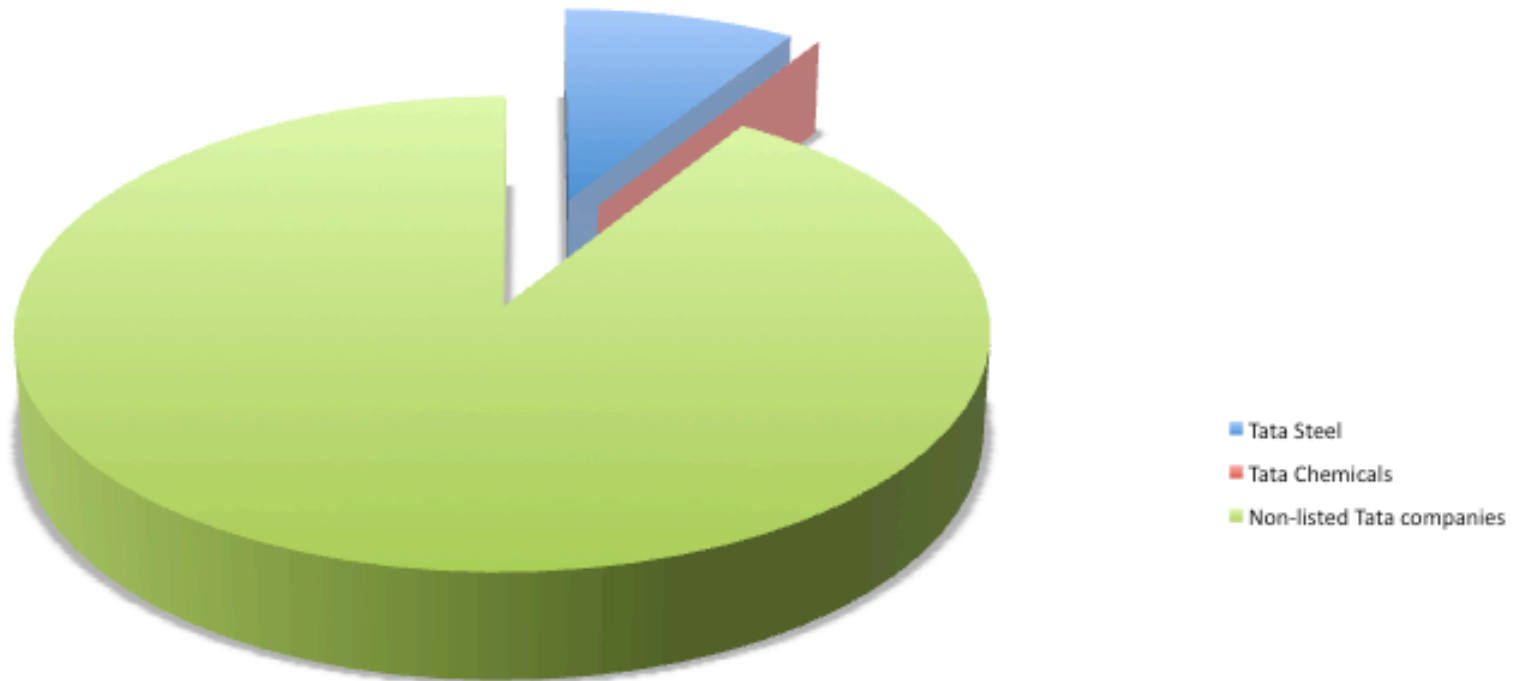
3. Other Assets that have not been counted yet..

■ **Unutilized assets**: If you have assets or property that are not being utilized (vacant land, for example), you have not valued it yet. You can assess a market value for these assets and add them on to the value of the firm.

■ **Overfunded pension plans**: If you have a defined benefit plan and your assets exceed your expected liabilities, you could consider the over funding with two caveats:
  • Collective bargaining agreements may prevent you from laying claim to these excess assets.
  • There are tax consequences. Often, withdrawals from pension plans get taxed at much higher rates.

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

4. A Discount for Complexity:
An Experiment

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

■ *Which firm would you value more highly?*

Measuring Complexity: Volume of Data in Financial Statements

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

Measuring Complexity: A Complexity Score

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

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Dealing with Complexity

In Discounted Cashflow Valuation

■ The Aggressive Analyst: Trust the firm to tell the truth and value the firm based upon the firm's statements about their value.

■ The Conservative Analyst: Don't value what you cannot see.

■ The Compromise: Adjust the value for complexity

- Adjust cash flows for complexity
- Adjust the discount rate for complexity
- Adjust the expected growth rate/ length of growth period
- Value the firm and then discount value for complexity

In relative valuation

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

With the hundred largest market cap firms, for instance:

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

5. The Value of Synergy

Synergy is created when two firms are combined and can be either financial or operating

Operating Synergy accrues to the combined firm as

Financial Synergy

Strategic Advantages

Economies of Scale

Tax Benefits

Added Debt Capacity

Diversification?

Higher returns on new investments

More new Investments

More sustainable excess returns

Cost Savings in current operations

Lower taxes on earnings due to
- higher depreciaiton
- operating loss carryforwards

Higher debt raito and lower cost of capital

May reduce cost of equity for private or closely held firm

Higher ROC

Higher Growth Rate

Higher Reinvestment

Higher Growth Rate

Longer Growth Period

Higher Margin

Higher Base-year EBIT

Valuing Synergy

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

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

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

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

Valuing Synergy: P&G + Gillette

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

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

■ There is often a temptation to add on premiums for intangibles. Among them are

- Brand name

- Great management

- Loyal workforce

- Technological prowess

■ There are two potential dangers:

- For some assets, the value may already be in your value and adding a premium will be double counting.

- For other assets, the value may be ignored but incorporating it will not be easy.

Valuing Brand Name

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

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

■ **General Rule**: Debt generally has the following characteristics:

- Commitment to make fixed payments in the future

- The fixed payments are tax deductible

- Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.

■ Defined as such, debt should include

- All interest bearing liabilities, short term as well as long term

- All leases, operating as well as capital

■ Debt should not include

- Accounts payable or supplier credit

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

■ If you have under funded pension fund or health care plans, you should consider the under funding at this stage in getting to the value of equity.

  • If you do so, you should not double count by also including a cash flow line item reflecting cash you would need to set aside to meet the unfunded obligation.

  • You should not be counting these items as debt in your cost of capital calculations….

■ If you have contingent liabilities - for example, a potential liability from a lawsuit that has not been decided - you should consider the expected value of these contingent liabilities

  • Value of contingent liability = Probability that the liability will occur * Expected value of liability

8. The Value of Control

■ The value of the control premium that will be paid to acquire a block of equity will depend upon two factors -

- **Probability that control of firm will change**: This refers to the probability that incumbent management will be replaced. this can be either through acquisition or through existing stockholders exercising their muscle.

- **Value of Gaining Control of the Company:** The value of gaining control of a company arises from two sources - the increase in value that can be wrought by changes in the way the company is managed and run, and the side benefits and perquisites of being in control

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

Increase Cash Flows

Increase Cash Flows

More efficient operations and cost cuttting: Higher Margins

Divest assets that have negative EBIT

Reduce tax rate
- moving income to lower tax locales
- transfer pricing
- risk management

Revenues

* Operating Margin

= EBIT

- Tax Rate * EBIT

EBIT (1-t)

+ Depreciation
- Capital Expenditures
- Chg in Working Capital
= FCFF

Live off past over-investment

Better inventory management and tighter credit policies

Reduce the cost of capital

Reduce the cost of capital

Make your product/service less discretionary

Reduce Operating leverage

Reduce beta

Cost of Equity * (Equity/Capital) + Pre-tax Cost of Debt (1- tax rate) * (Debt/Capital)

Match your financing to your assets: Reduce your default risk and cost of debt

Shift interest expenses to higher tax locales

Change financing mix to reduce cost of capital

Firm Value

Firm Value

Increase Expected Growth

Increase Expected Growth

Reinvest more in projects

Increase operating margins

Reinvestment Rate

* Return on Capital

= Expected Growth Rate

Do acquisitions

Increase capital turnover ratio

Increase length of growth period

Increase length of growth period

Build on existing competitive advantages

Create new competitive advantages
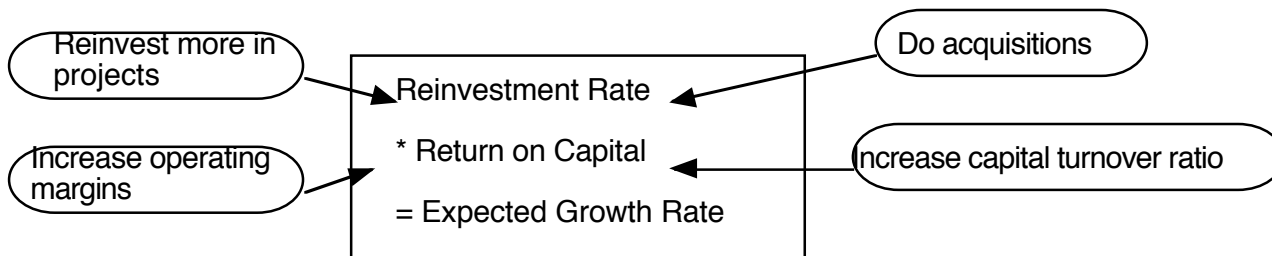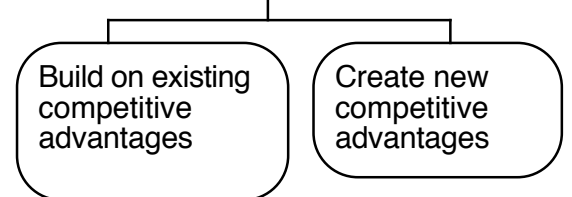
Adris Grupa (Status Quo): 4/2010

Current Cashflow to Firm
EBIT(1-t) :   436 HRK
- Nt CpX   3 HRK
- Chg WC   -118 HRK
= FCFF   551 HRK
Reinv Rate = (3-118)/436= -26.35%;
Tax rate = 17.35%
Return on capital = 8.72%

Average from 2004-09
70.83%

Reinvestment Rate
70.83%

Expected Growth from new inv.
.7083*.0969 =0.0686
or 6.86%

Average from 2004-09
9.69%

Return on Capital
9.69%

Stable Growth
g = 4%; Beta = 0.80
Country Premium= 2%
Cost of capital = 9.92%
Tax rate = 20.00%
ROC=9.92%;
Reinvestment Rate=g/ROC
=4/9.92= 40.32%

Terminal Value$_5$= 365/(.0992-.04) =6170 HRK

HKR Cashflows

Op. Assets   4312
+ Cash: 1787
- Debt   141
- Minority int   465
=Equity   5,484
(Common + Preferred shares)
Value non-voting share
335 HRK/share

Year	1	2	3	4	5	
EBIT (1-t)	HRK 466	HRK 498	HRK 532	HRK 569	HRK 608	612
- Reinvestment	HRK 330	HRK 353	HRK 377	HRK 403	HRK 431	246
FCFF	HRK 136	HRK 145	HRK 155	HRK 166	HRK 177	365

Discount at $ Cost of Capital (WACC) = 10.7% (.974) + 5.40% (0.026) = 10.55%

On May 1, 2010
AG Pfd price = 279 HRK
AG Common = 345 HRK

Cost of Equity
10.70%

Cost of Debt
(4.25%+ 0.5%+2%)(1-.20)
= 5.40 %

Weights
E = 97.4% D = 2.6%

Riskfree Rate:
HRK Riskfree Rate=
4.25%

+

Beta
0.70

X

Mature market premium
4.5%

+

Lambda
0.68

X

CRP for Croatia
(3%)

Lambda
0.42

X

CRP for Central Europe
(3%)

Unlevered Beta for
Sectors: 0.68

Firm's D/E
Ratio: 2.70%

Country Default
Spread
2%

X

Rel Equity
Mkt Vol
1.50

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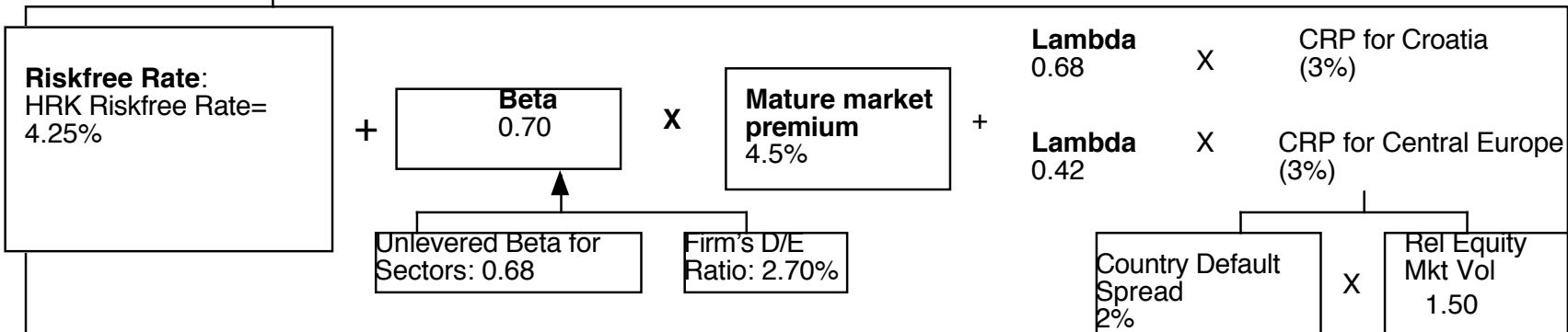
Adris Grupa: 4/2010 (Restructured)

Increased ROIC to cost of capital e

Current Cashflow to Firm
EBIT(1-t) :   436 HRK
- Nt CpX   3 HRK
- Chg WC   -118 HRK
= FCFF   551 HRK
Reinv Rate = (3-118)/436= -26.35%;
Tax rate = 17.35%
Return on capital = 8.72%

Average from 2004-09
70.83%

Reinvestment Rate
70.83%

Expected Growth from new inv.
.7083*.01054=0.
or 6.86%

Return on Capital
10.54%

Stable Growth
g = 4%; Beta = 0.80
Country Premium= 2%
Cost of capital = 9.65%
Tax rate = 20.00%
ROC=9.94%;
Reinvestment Rate=g/ROC
=4/9.65= 41/47%

Terminal Value$_5$= 367/(.0965-.04) =6508 HRK

HKR Cashflows

	Op. Assets 4545						

Year	1	2	3	4	5	
EBIT (1-t)	HRK 469	HRK 503	HRK 541	HRK 581	HRK 623	628
- Reinvestment	HRK 332	HRK 356	HRK 383	HRK 411	HRK 442	246
FCFF	HRK 137	HRK 147	HRK 158	HRK 169	HRK 182	367

Op. Assets   4545
+ Cash: 1787
- Debt   141
- Minority int   465
=Equity   5,735

Value/non-voting   334
Value/voting   362

Discount at $ Cost of Capital (WACC) = 11.12% (.90) + 8.20% (0.10) = 10.55%

Changed mix of debt and equity tooptimal

On May 1, 2010
AG Pfd price = 279 HRK
AG Common = 345 HRK

Cost of Equity
11.12%

Cost of Debt
(4.25%+ 4%+2%)(1-.20)
= 8.20%

Weights
E = 90 % D = 10 %

Riskfree Rate:
HRK Riskfree Rate=
4.25%

+

Beta
0.75

X

Mature market premium
4.5%

+

Lambda
0.68

X

CRP for Croatia
(3%)

Lambda
0.42

X

CRP for Central Europe
(3%)

Unlevered Beta for
Sectors: 0.68

Firm's D/E
Ratio: 11.1%

Country Default
Spread
2%

X

Rel Equity
Mkt Vol
1.50

Value of Control and the Value of Voting Rights

- The value of control at Adris Grupa can be computed as the difference between the status quo value (5469) and the optimal value (5735).

- The value of a voting share derives entirely from the capacity you have to change the way the firm is run. In this case, we have two values for Adris Grupa's Equity.

  Status Quo Value of Equity = 5,469 million HKR

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

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

  Optimal value of Equity = 5,735 million HKR

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

  Only voting shares get a share of this value of control

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

9. Analyzing the Effect of Illiquidity on Value

■ Investments which are less liquid should trade for less than otherwise similar investments which are more liquid.

■ The size of the illiquidity discount should vary across firms and also across time. The conventional practice of relying upon studies of restricted stocks or IPOs will fail sooner rather than later.

- Restricted stock studies are based upon small samples of troubled firms
- The discounts observed in IPO studies are too large for these to be arms length transactions. They just do not make sense.

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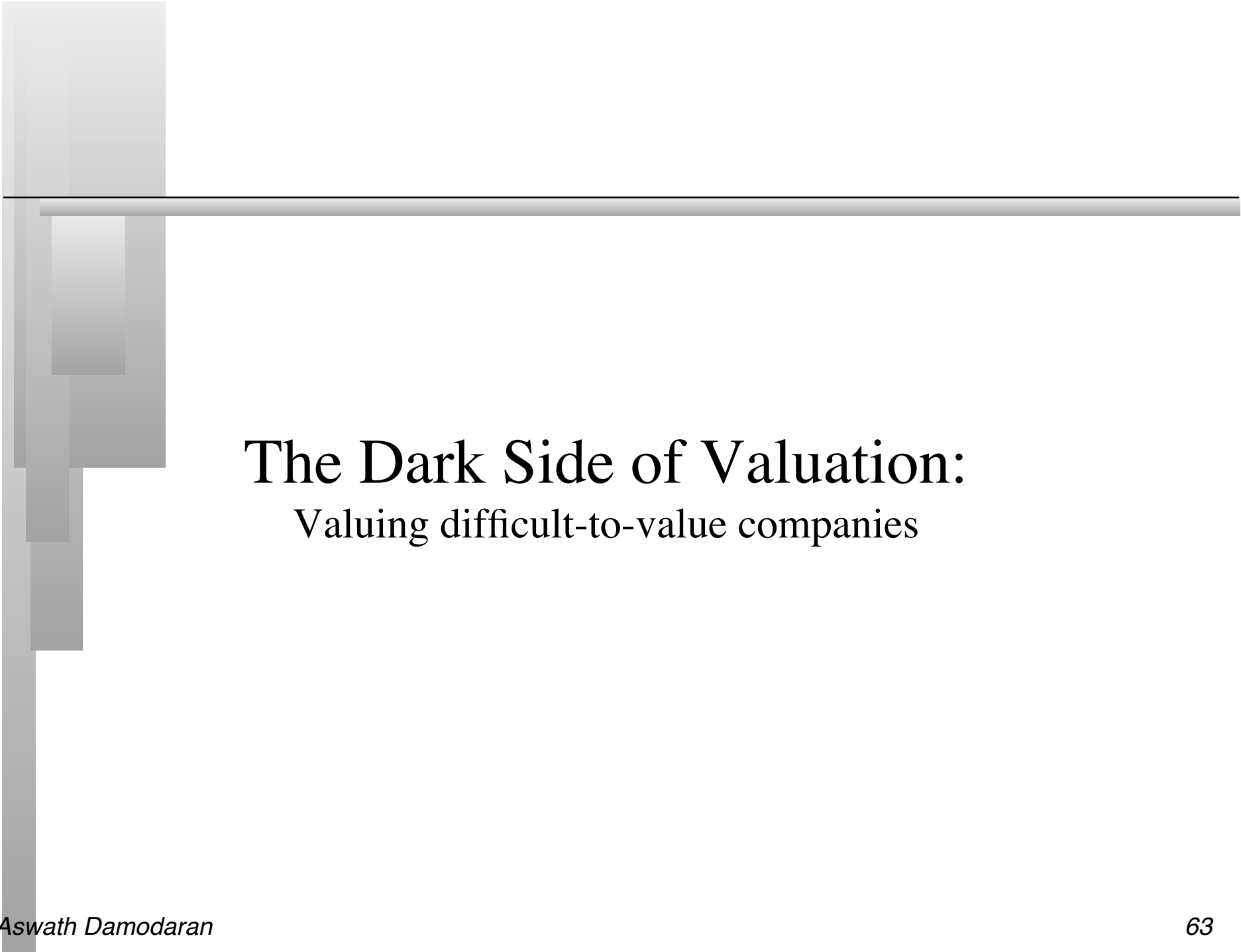
■ Using data from the end of 2000, for instance, we regressed the bid-ask spread against annual revenues, a dummy variable for positive earnings (DERN: 0 if negative and 1 if positive), cash as a percent of firm value and trading volume.

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

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

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

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

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

The Dark Side of Valuation:

Valuing difficult-to-value companies

The fundamental determinants of value…

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

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

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

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

The Dark Side of Valuation…

■ Valuing stable, money making companies with consistent and clear accounting statements, a long and stable history and lots of comparable firms is easy to do.

■ The true test of your valuation skills is when you have to value "difficult" companies. In particular, the challenges are greatest when valuing:

  • Young companies, early in the life cycle, in young businesses
  • Companies that don't fit the accounting mold
  • Companies that face substantial truncation risk (default or nationalization risk)

Difficult to value companies…

- ■ Across the life cycle:
  - Young, growth firms: Limited history, small revenues in conjunction with big operating losses and a propensity for failure make these companies tough to value.
  - Mature companies in transition: When mature companies change or are forced to change, history may have to be abandoned and parameters have to be reestimated.
  - Declining and Distressed firms: A long but no longer relevant history, declining markets, high debt loads and the likelihood of distress make these companies equally difficult to value.

- ■ Across sectors
  - Financial service firms: Opacity of financial statements and difficulties in estimating basic inputs leave us trusting managers to tell us what's going on.
  - Commodity and cyclical firms: Dependence of the underlying commodity prices or overall economic growth make these valuations susceptible to macro factors.
  - Firms with intangible assets: Violation of first principles by accountants requires us to restate all of the financial statements before we can make sense of value.

I. The challenge with young companies…

Making judgments on revenues/ profits difficult becaue you cannot draw on history. If you have no product/ service, it is difficult to gauge market potential or profitability. The company;s entire value lies in future growth but you have little to base your estimate on.

Cash flows from existing assets non-existent or negative.

What is the value added by growth assets?

What are the cashflows from existing assets?

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

Different claims on cash flows can affect value of equity at each stage.

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

What is the value of equity in the firm?

Limited historical data on earnings, and no market prices for securities makes it difficult to assess risk.

Will the firm will make it through the gauntlet of market demand and competition. Even if it does, assessing when it will become mature is difficult because there is so little to go on.

Upping the ante.. Young companies in young businesses…

■ When valuing a business, we generally draw on three sources of information
  - The firm's current financial statement
    - How much did the firm sell?
    - How much did it earn?
  - The firm's financial history, usually summarized in its financial statements.
    - How fast have the firm's revenues and earnings grown over time?
    - What can we learn about cost structure and profitability from these trends?
    - Susceptibility to macro-economic factors (recessions and cyclical firms)
  - The industry and comparable firm data
    - What happens to firms as they mature? (Margins.. Revenue growth… Reinvestment needs… Risk)

■ It is when valuing these companies that you find yourself tempted by the dark side, where
  - "Paradigm shifts" happen…
  - New metrics are invented …
  - The story dominates and the numbers lag…

9a. Amazon in January 2000

Current Revenue $ 1,117	Current Margin: -36.71%

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

Stable Growth

Stable Revenue Growth: 6%	Stable Operating Margin: 10.00%	Stable ROC=20% Reinvest 30% of EBIT(1-t)

EBIT -410m

From previous years

NOL: 500 m

Sales Turnover Ratio: 3.00	Competitive Advantages
Revenue Growth: 42%	Expected Margin: -> 10.00%
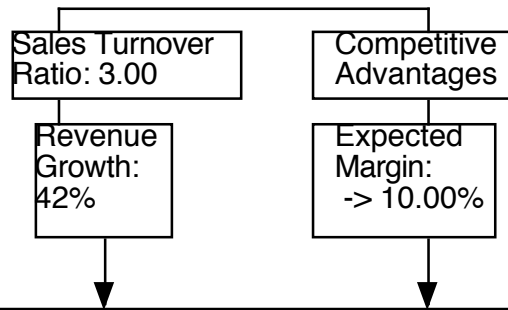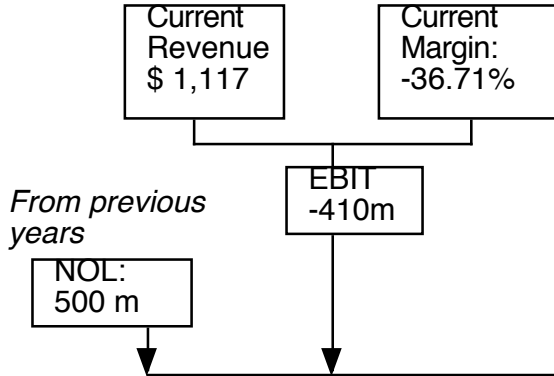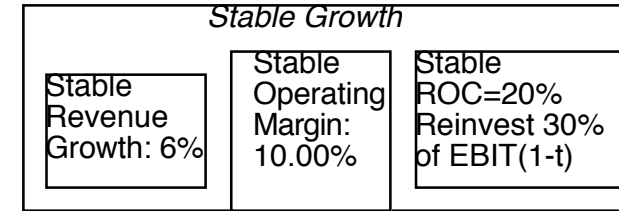
Terminal Value= 1881/(.0961-.06) =52,148

Value of Op Assets $ 14,910
+ Cash $ 26
= Value of Firm $14,936
- Value of Debt $ 349
= Value of Equity $14,587
- Equity Options $ 2,892
Value per share $ 34.32

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

	1	2	3	4	5	6	7	8	9	10
Revenues	$2,793	5,585	9,774	14,661	19,059	23,862	28,729	33,211	36,798	39,006
EBIT	-$373	-$94	$407	$1,038	$1,628	$2,212	$2,768	$3,261	$3,646	$3,883
EBIT (1-t)	-$373	-$94	$407	$871	$1,058	$1,438	$1,799	$2,119	$2,370	$2,524
- Reinvestment	$559	$931	$1,396	$1,629	$1,466	$1,601	$1,623	$1,494	$1,196	$736
FCFF	-$931	-$1,024	-$989	-$758	-$408	-$163	$177	$625	$1,174	$1,788

	1	2	3	4	5	6	7	8	9	10
Cost of Equity	12.90%	12.90%	12.90%	12.90%	12.90%	12.42%	12.30%	12.10%	11.70%	10.50%
Cost of Debt	8.00%	8.00%	8.00%	8.00%	8.00%	7.80%	7.75%	7.67%	7.50%	7.00%
AT cost of debt	8.00%	8.00%	8.00%	6.71%	5.20%	5.07%	5.04%	4.98%	4.88%	4.55%
Cost of Capital	12.84%	12.84%	12.84%	12.83%	12.81%	12.13%	11.96%	11.69%	11.15%	9.61%

Forever

Term. Year
$41,346
10.00%
35.00%
$2,688
$ 807
$1,881

Amazon was trading at $84 in January 2000.

Cost of Equity 12.90%

Used average interest coverage ratio over next 5 years to get BBB rating.

Cost of Debt 6.5%+1.5%=8.0% Tax rate = 0% -> 35%

Weights Debt= 1.2% -> 15%

Pushed debt ratio to retail industry average of 15%.

Dot.com retailers for firrst 5 years
Convetional retailers after year 5

Riskfree Rate: T. Bond rate = 6.5%	+	**Beta** 1.60 -> 1.00	X	**Risk Premium** 4%

Internet/ Retail	Operating Leverage	Current D/E: 1.21%	Base Equity Premium	Country Risk Premium

Aswath Damodaran
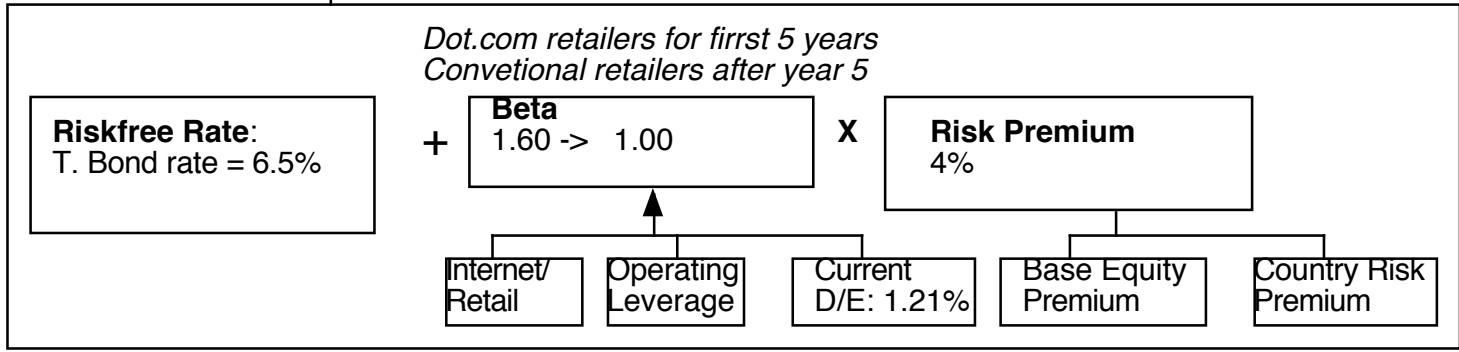
Lesson 1: Don't trust regression betas….
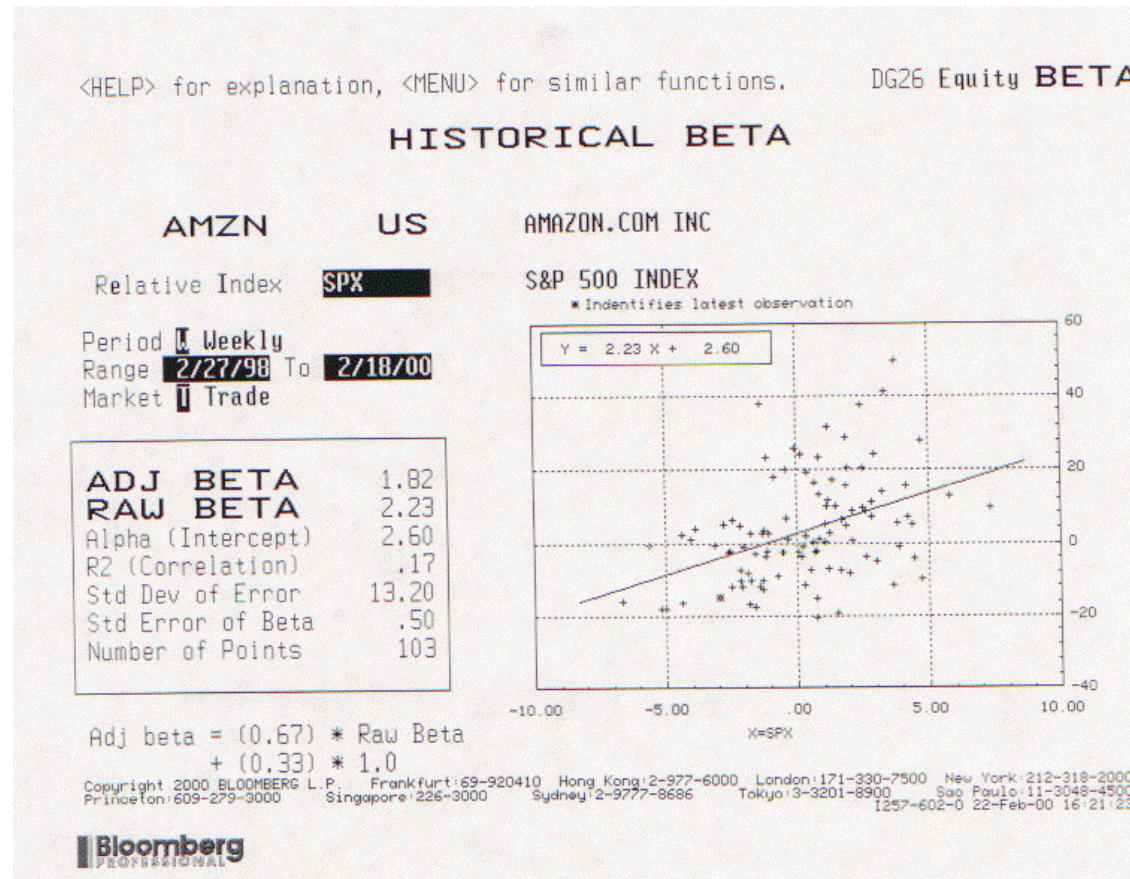
Lesson 2: The cost of capital will change over time…

Year	1	2	3	4	5
EBIT	-$373	-$94	$407	$1,038	$1,628
Taxes	$0	$0	$0	$167	$570
EBIT(1-t)	-$373	-$94	$407	$871	$1,058
Tax rate	0%	0%	0%	16.13%	35%
NOL	$500	$873	$967	$560	$0

	Yrs 1-3	4	5	6	7	8	9	10	Terminal year
Tax Rate	0.00%	16.13%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%
Debt Ratio	1.20%	1.20%	1.20%	3.96%	4.65%	5.80%	8.10%	15.00%	15.00%
Beta	1.60	1.60	1.60	1.48	1.36	1.24	1.12	1.00	1.00
Cost of Equity	12.90%	12.90%	12.90%	12.42%	11.94%	11.46%	10.98%	10.50%	10.50%
Cost of Debt	8.00%	8.00%	8.00%	7.80%	7.75%	7.67%	7.50%	7.00%	7.00%
After-tax cost of debt	8.00%	6.71%	5.20%	5.07%	5.04%	4.98%	4.88%	4.55%	4.55%
Cost of Capital	12.84%	12.83%	12.81%	12.13%	11.62%	11.08%	10.49%	9.61%	9.61%

Lesson 3: Work backwards and keep it simple…

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

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

Year	Revenue Growth	Chg in Revenue	Reinvestment	Chg Rev/ Chg Reinvestment	ROC
1	150.00%	$1,676	$559	3.00	-76.62%
2	100.00%	$2,793	$931	3.00	-8.96%
3	75.00%	$4,189	$1,396	3.00	20.59%
4	50.00%	$4,887	$1,629	3.00	25.82%
5	30.00%	$4,398	$1,466	3.00	21.16%
6	25.20%	$4,803	$1,601	3.00	22.23%
7	20.40%	$4,868	$1,623	3.00	22.30%
8	15.60%	$4,482	$1,494	3.00	21.87%
9	10.80%	$3,587	$1,196	3.00	21.19%
10	6.00%	$2,208	$736	3.00	20.39%

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

	6%	8%	10%	12%	14%
30%	$ (1.94)	$ 2.95	$ 7.84	$ 12.71	$ 17.57
35%	$ 1.41	$ 8.37	$ 15.33	$ 22.27	$ 29.21
40%	$ 6.10	$ 15.93	$ 25.74	$ 35.54	$ 45.34
45%	$ 12.59	$ 26.34	$ 40.05	$ 53.77	$ 67.48
50%	$ 21.47	$ 40.50	$ 59.52	$ 78.53	$ 97.54
55%	$ 33.47	$ 59.60	$ 85.72	$ 111.84	$ 137.95
60%	$ 49.53	$ 85.10	$ 120.66	$ 156.22	$ 191.77

Lesson 6: You will be wrong 100% of the time… and it really is not (always) your fault…

- No matter how careful you are in getting your inputs and how well structured your model is, your estimate of value will change both as new information comes out about the company, the business and the economy.

- As information comes out, you will have to adjust and adapt your model to reflect the information. Rather than be defensive about the resulting changes in value, recognize that this is the essence of risk.

- *A test: If your valuations are unbiased, you should find yourself increasing estimated values as often as you are decreasing values. In other words, there should be equal doses of good and bad news affecting valuations (at least over time).*

9b. Amazon in January 2001

Current Revenue $ 2,465

Current Margin: -34.60%

EBIT -853m

NOL: 1,289 m

Reinvestment:
Cap ex includes acquisitions
Working capital is 3% of revenues

Sales Turnover Ratio: 3.02

Revenue Growth: 25.41%

Competitive Advantage

Expected Margin: -> 9.32%

Stable Growth

Stable Revenue Growth: 5%

Stable Operating Margin: 9.32%

Stable ROC=16.94% Reinvest 29.5% of EBIT(1-t)

Terminal Value= 1064/(.0876-.05) =$ 28,310

	1	2	3	4	5	6	7	8	9	10	Term. Year
Revenues	$4,314	$6,471	$9,059	$11,777	$14,132	$16,534	$18,849	$20,922	$22,596	$23,726	$24,912
EBIT	-$545	-$107	$347	$774	$1,123	$1,428	$1,692	$1,914	$2,087	$2,201	$2,302
EBIT(1-t)	-$545	-$107	$347	$774	$1,017	$928	$1,100	$1,244	$1,356	$1,431	$1,509
- Reinvestment	$612	$714	$857	$900	$780	$796	$766	$687	$554	$374	$ 445
FCFF	-$1,157	-$822	-$510	-$126	$237	$132	$333	$558	$802	$1,057	$1,064

Value of Op Assets $ 8,789											
+ Cash & Non-op $ 1,263											
= Value of Firm $10,052											
- Value of Debt $ 1,879											
= Value of Equity $ 8,173											
- Equity Options $ 845											
Value per share $ 20.83											

Forever

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

Cost of Equity 13.81%

Cost of Debt 6.5%+3.5%=10.0% Tax rate = 0% -> 35%

Weights Debt= 27.3% -> 15%

Riskfree Rate: T. Bond rate = 5.1%

+

Beta 2.18-> 1.10

X

Risk Premium 4%

Internet/ Retail

Operating Leverage

Current D/E: 37.5%

Base Equity Premium

Country Risk Premium
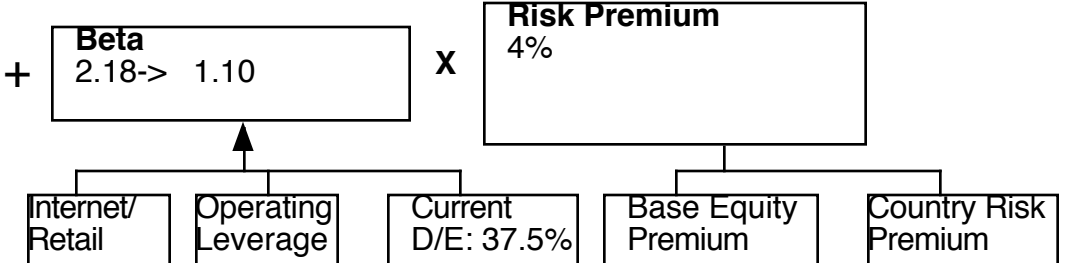
Amazon.com January 2001 Stock price = $14

And the market is often "more wrong"….
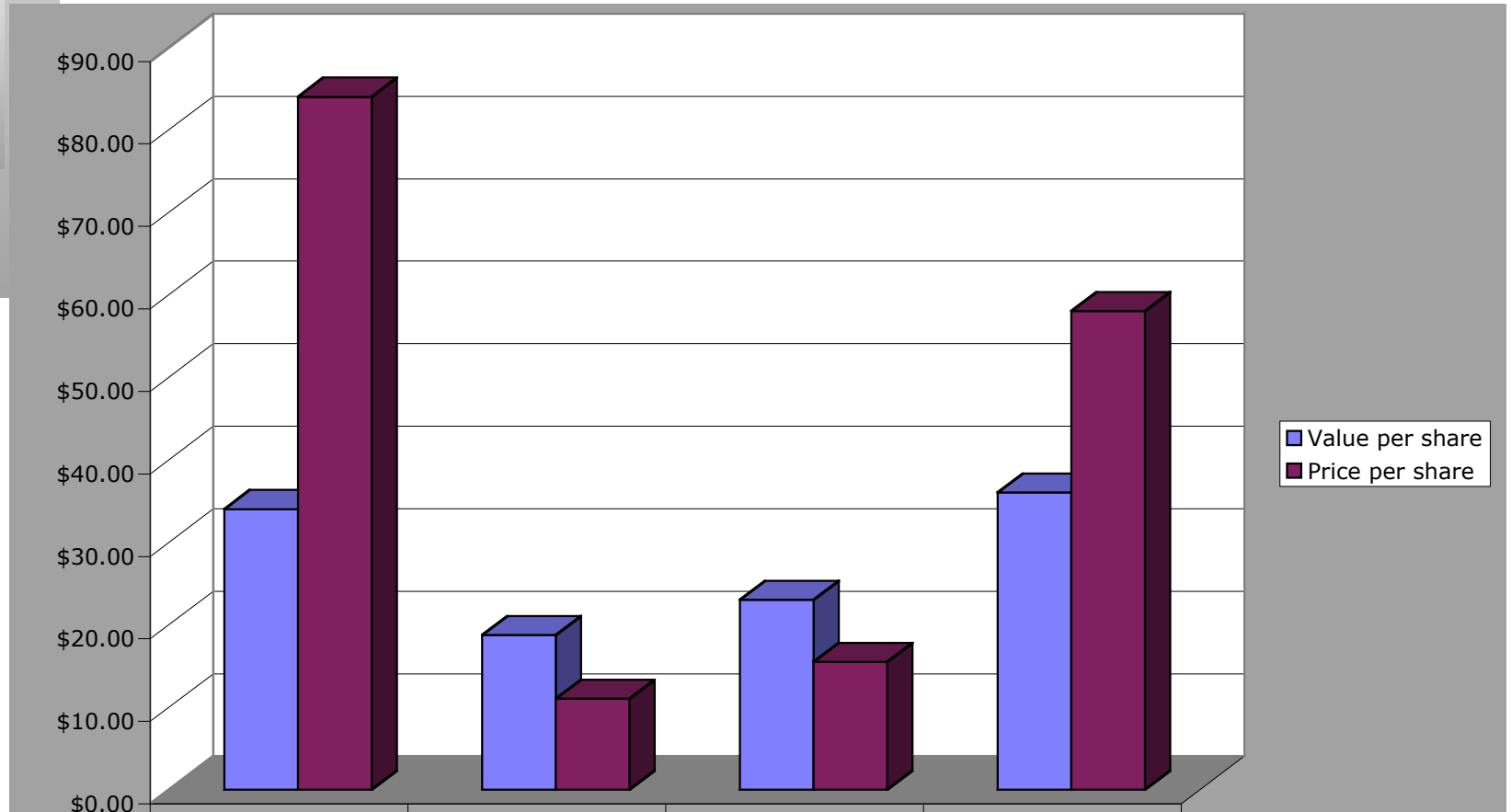
Exhibit 5.1: Value Drivers for a Young Growth Company - Evergreen Solar in Early 2009

<u>The setting</u>: Evergreen Solar, a manufacturer of solar power cells was founded in 2003 and is a Massachusetts-based company. Revenues at the firm increased from $24 million in 2004 to $70 million in 2007, yielding a compounded growth rate of 43% a year. In the trailing 12 months leading into this valuation, the company generated a pre-tax operating loss of $ 50 million on revenues of $ 90 million.

Revenue Growth ①
As revenues grow, the growth rate begins to drop off. Total revenues of $1.089 billion still small, relative to overall market.

Taxes ③
Net operating losses carried forward shield income from taxes until year 9.

Reinvestment ④
Assume that you need $1 in new investment for every $1.25 in revenue (industry average)

Access to capital ⑦
Firm will be able to raise fresh capital to cover its negative FCFF for the next 9 years.

Year	Revenues	Revenue growth rate	Pre-tax Margin	Pre-tax operating income	NOL	Taxes	After-tax Operating Income	Revenue change	Sales to Capital	Reinvestment	FCFF
Trailing 12 month	$89.89		-55.31%	-49.72	$98.00	$0.00	-$49.72				
1	$125.85	40.00%	-31.87%	-$40.11	$138.11	$0.00	-$40.11	$35.96	2.50	$14.38	-$54.50
2	$176.18	40.00%	-16.25%	-$28.63	$166.74	$0.00	-$28.63	$50.34	2.50	$20.14	-$48.76
3	$246.66	40.00%	-5.83%	-$14.39	$181.13	$0.00	-$14.39	$70.47	2.50	$28.19	-$42.58
4	$345.32	40.00%	1.11%	$3.84	$177.29	$0.00	$3.84	$98.66	2.50	$39.47	-$35.63
5	$483.45	40.00%	5.74%	$27.75	$149.54	$0.00	$27.75	$138.13	2.50	$55.25	-$27.50
6	$628.48	30.00%	8.83%	$55.48	$94.06	$0.00	$55.48	$145.03	2.50	$58.01	-$2.54
7	$785.61	25.00%	10.88%	$85.51	$8.55	$0.00	$85.51	$157.12	2.50	$62.85	$22.66
8	$942.73	20.00%	12.26%	$115.55	$0.00	$42.80	$72.75	$157.12	2.50	$62.85	$9.90
9	$1,084.14	15.00%	13.17%	$142.79	$0.00	$57.12	$85.68	$141.41	2.50	$56.56	$29.11
10	$1,192.55	10.00%	13.78%	$164.34	$0.00	$65.74	$98.60	$108.41	2.50	$43.37	$55.24

Survival ⑧
Firm will get larger, healthier and survive to generate value well into the future.

Target Operating Margins ②
As firms becomes larger, its margins converge on margins more typical of mature firms in the sector.

Terminal Value ⑥
Computed on the assumption that the earnings grow at 2.25% a year forever, and that the return on capital after year 10 is equal to the cost of capital of 7.23%.

$$\frac{\$134(1-.40)(1-.3112)}{(.0723-.0225)} = \$1,255$$

Cost of capital ⑤
High initially, with high beta (1.60) and cost of debt. As firm becomes larger and profitable, the cost of capital moves towards that of mature firms in the business.

An "option premium" for some young companies: The option to expand into a new product/market

PV of Cash Flows
from Expansion

Additional Investment
to Expand

Present Value of Expected
Cash Flows on Expansion

Firm will not expand in
this section

Expansion becomes
attractive in this section
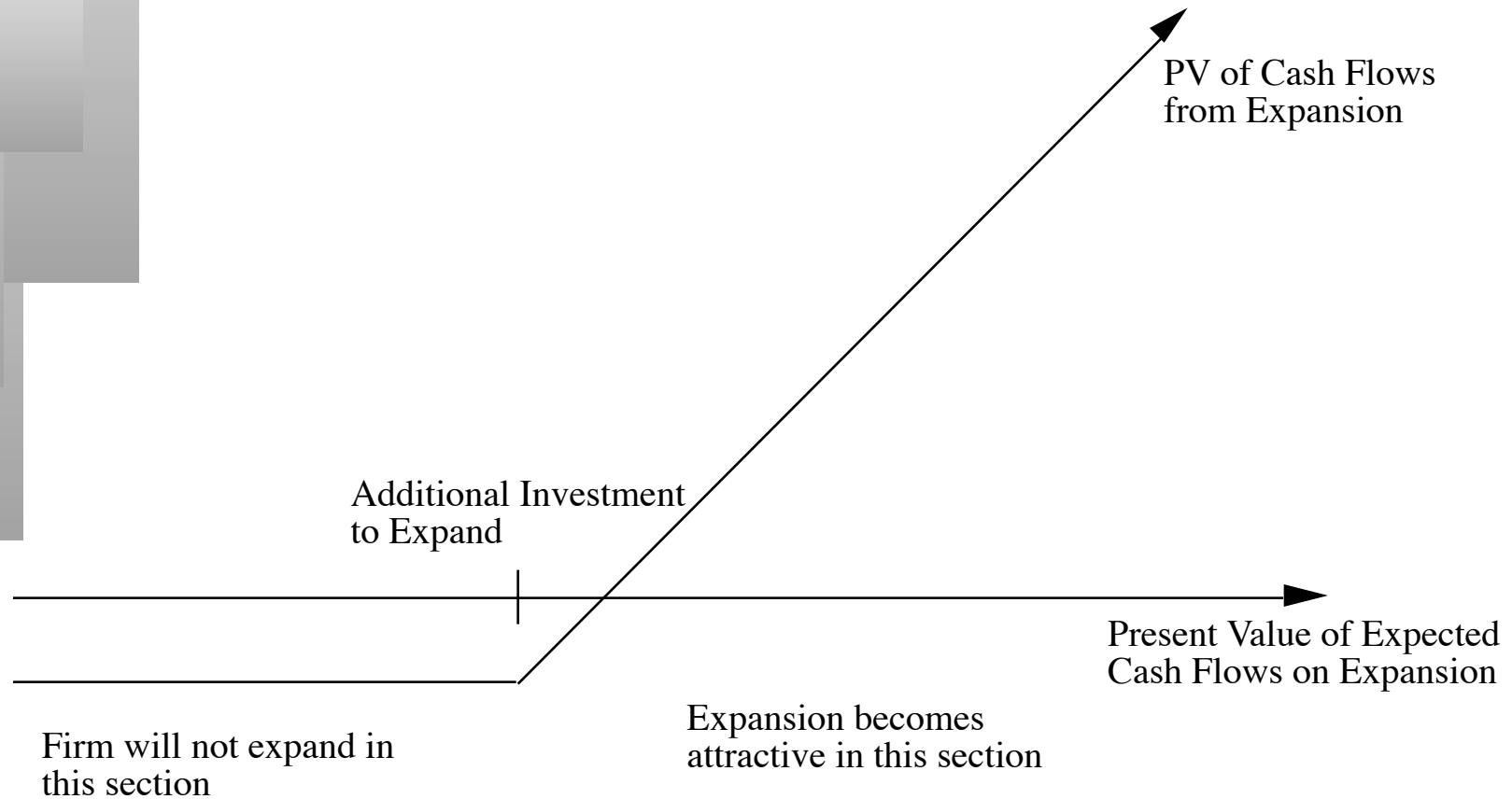
An Example of an Expansion Option

- Ambev is considering introducing a soft drink to the U.S. market. The drink will initially be introduced only in the metropolitan areas of the U.S. and the cost of this "limited introduction" is $ 500 million.

- A financial analysis of the cash flows from this investment suggests that the present value of the cash flows from this investment to Ambev will be only $ 400 million. Thus, by itself, the new investment has a **negative NPV of $ 100 million**.

- If the initial introduction works out well, Ambev **could go ahead with a full-scale introduction to the entire market** with **an additional investment of $ 1 billion** any time over the next 5 years. While the current expectation is that the cash flows from having this investment is only $ 750 million, there is considerable uncertainty about both the potential for the drink, leading to significant variance in this estimate.

Valuing the Expansion Option

■ Value of the Underlying Asset (S) = PV of Cash Flows from Expansion to entire U.S. market, if done now =$ 750 Million

■ Strike Price (K) = Cost of Expansion into entire U.S market = $ 1000 Million

■ We estimate the standard deviation in the estimate of the project value by using the annualized standard deviation in firm value of publicly traded firms in the beverage markets, which is approximately 34.25%.

  • Standard Deviation in Underlying Asset's Value = 34.25%

■ Time to expiration = Period for which expansion option applies = 5 years

Call Value= $ 234 Million

Considering the Project with Expansion Option

■ NPV of Limited Introduction = $ 400 Million - $ 500 Million

= - $ 100 Million

■ Value of Option to Expand to full market= $ 234 Million

■ NPV of Project with option to expand

= - $ 100 million + $ 234 million

= $ 134 million

■ **Invest in the project**

II. Mature Companies in transition..

- Mature companies are generally the easiest group to value. They have long, established histories that can be mined for inputs. They have investment policies that are set and capital structures that are stable, thus making valuation more grounded in past data.

- However, this stability in the numbers can mask real problems at the company. The company may be set in a process, where it invests more or less than it should and does not have the right financing mix. In effect, the policies are consistent, stable and bad.

- If you expect these companies to change or as is more often the case to have change thrust upon them,

The perils of valuing mature companies…

Figure 7.1: Estimation Issues - Mature Companies

Lots of historical data on earnings and cashflows. Key questions remain if these numbers are volatile over time or if the existing assets are not being efficiently utilized.

Growth is usually not very high, but firms may still be generating healthy returns on investments, relative to cost of funding. Questions include how long they can generate these excess returns and with what growth rate in operations. Restructuring can change both inputs dramatically and some firms maintain high growth through acquisitions.

What is the value added by growth assets?

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

What are the cashflows from existing assets?

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

Equity claims can vary in voting rights and dividends.

Operating risk should be stable, but the firm can change its financial leverage This can affect both the cost of equtiy and capital.

Maintaining excess returns or high growth for any length of time is difficult to do for a mature firm.

What is the value of equity in the firm?

Hormel Foods: The Value of Control Changing

Hormel Foods sells packaged meat and other food products and has been in existence as a publicly traded company for almost 80 years. In 2008, the firm reported after-tax operating income of $315 million, reflecting a compounded growth of 5% over the previous 5 years.

The Status Quo

Run by existing management, with conservative reinvestment policies (reinvestment rate = 14.34% and debt ratio = 10.4%.

Anemic growth rate and short growth period, due to reinvestment policy

Low debt ratio affects cost of capital

Year	Operating income after taxes	Expected growth rate	ROC	Reinvestment Rate	Reinvestment	FCFF	Cost of capital	Present Value
Trailing 12 months	$315							
1	$324	2.75%	14.34%	19.14%	$62	$262	6.79%	$245
2	$333	2.75%	14.34%	19.14%	$64	$269	6.79%	$236
3	$342	2.75%	14.34%	19.14%	$65	$276	6.79%	$227
Beyond	$350	2.35%	7.23%	32.52%	$114	$4,840	7.23%	$3,974
Value of operating assets								$4,682
(Add) Cash								$155
(Subtract) Debt								$491
(Subtract) Management Options								$53
Value of equity in common stock								$4,293
Value per share								$31.91

New and better management

More aggressive reinvestment which increases the reinvestment rate (to 40%) and tlength of growth (to 5 years), and higher debt ratio (20%).

Operating Restructuring ①
Expected growth rate = ROC * Reinvestment Rate
Expected growth rae (status quo) = 14.34% * 19.14% = 2.75%
Expected growth rate (optimal) = 14.00% * 40% = 5.60%
ROC drops, reinvestment rises and growth goes up.

Financial restructuring ②
Cost of capital = Cost of equity (1-Debt ratio) + Cost of debt (Debt ratio)
Status quo = 7.33% (1-.104) + 3.60% (1-.40) (.104) = 6.79%
Optimal = 7.75% (1-.20) + 3.60% (1-.40) (.20) = 6.63%
Cost of equity rises but cost of capital drops.

Year	Operating income after taxes	Expected growth rate	ROC	Reinvestment Rate	Reinvestment	FCFF	Cost of capital	Present Value
Trailing 12 months	$315							
1	$333	5.60%	14.00%	40.00%	$133	$200	6.63%	$187
2	$351	5.60%	14.00%	40.00%	$141	$211	6.63%	$185
3	$371	5.60%	14.00%	40.00%	$148	$223	6.63%	$184
4	$392	5.60%	14.00%	40.00%	$260	$235	6.63%	$182
5	$414	5.60%	14.00%	40.00%	$223	$248	6.63%	$180
Beyond	$423	2.35%	6.74%	34.87%	$148	$6,282	6.74%	$4,557
Value of operating assets								$5,475
(Add) Cash								$155
(Subtract) Debt								$491
(Subtract) Management Options								$53
Value of equity in common stock								$5,085
Value per share								$37.80

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

④

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

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

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

<30%	30–50%	51–60%	61–70%	71–80%	81–90%	91–100%	>100%
3	5	1	4	12	13	25	36
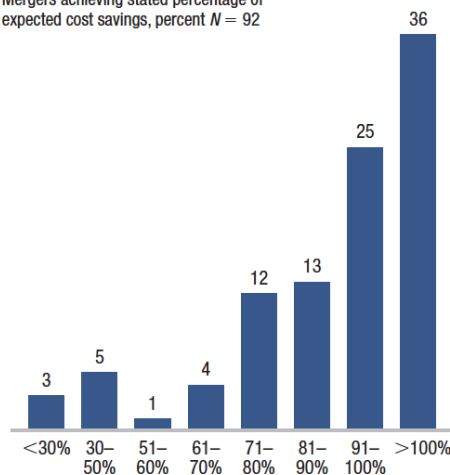
Typical sources of estimation error

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

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

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

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

Category of growth	Shareholder value created for incremental $1 million of growth/target acquisition size[1]	Revenue growth/acquisition size necessary to double typical company's share price,[2] $ billions
New-product market development	1.75–2.00	5–6
Expanding an existing market	0.30–0.75	13–33
Maintaining/growing share in a growing market	0.10–0.50	20–100
Competing for share in a stable market	−0.25–0.40	n/m–25
Acquisition (25th to 75th percentile result)[3]	−0.5–0.20	n/m–50

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

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

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

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

Current Cost of Capital

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

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

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

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

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

III. Dealing with decline and distress…

Historial data often reflects flat or declining revenues and falling margins. Investments often earn less than the cost of capital.

Growth can be negative, as firm sheds assets and shrinks. As less profitable assets are shed, the firm's remaining assets may improve in quality.

What is the value added by growth assets?

What are the cashflows from existing assets?

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

Underfunded pension obligations and litigation claims can lower value of equity. Liquidation preferences can affect value of equity

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

What is the value of equity in the firm?

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

There is a real chance, especially with high financial leverage, that the firm will not make it. If it is expected to survive as a going concern, it will be as a much smaller entity.

a. Dealing with Decline

■ In decline, firms often see declining revenues and lower margins, translating in negative expected growth over time.

■ If these firms are run by good managers, they will not fight decline. Instead, they will adapt to it and shut down or sell investments that do not generate the cost of capital. This can translate into negative net capital expenditures (depreciation exceeds cap ex), declining working capital and an overall negative reinvestment rate. The best case scenario is that the firm can shed its bad assets, make itself a much smaller and healthier firm and then settle into long-term stable growth.

■ As an investor, your worst case scenario is that these firms are run by managers in denial who continue to expand the firm by making bad investments (that generate lower returns than the cost of capital). These firms may be able to grow revenues and operating income but will destroy value along the way.

11. Sears Holdings: Status Quo

Current Cashflow to Firm
EBIT(1-t) :   1,183
- Nt CpX   -18
- Chg WC   - 67
= FCFF   1,268
Reinvestment Rate = -75/1183
                    =-7.19%
Return on capital = 4.99%

Reinvestment Rate
-30.00%

Return on Capital
5%

Expected Growth in EBIT (1-t)
-.30*..05=-0.015
-1.5%

Stable Growth
g = 2%; Beta = 1.00;
Country Premium= 0%
Cost of capital = 7.13%
ROC= 7.13%; Tax rate=38%
Reinvestment Rate=28.05%

Terminal Value$_4$= 868/(.0713-.02) = 16,921

Op. Assets   17,634
+ Cash: 1,622
- Debt   7,726
=Equity   11,528
-Options   5
Value/Share $87.29

	1	2	3	4	Term Yr
EBIT (1-t)	$1,165	$1,147	$1,130	$1,113	$1,206
- Reinvestment	($349)	($344)	($339)	($334)	$ 339
FCFF	$1,514	$1,492	$1,469	$1,447	$ 868

Discount at Cost of Capital (WACC) = 9.58% (.566) + 4.80% (0.434) = 7.50%

On July 23, 2008, Sears was trading at $76.25 a share.

Cost of Equity
9.58%

Cost of Debt
(4.09%+3,65%)(1-.38)
= 4.80%

Weights
E = 56.6% D = 43.4%

Riskfree Rate
Riskfree rate = 4.09%

+

Beta
1.22

X

Risk Premium
4.00%

Unlevered Beta for Sectors: 0.77

Firm's D/E Ratio: 93.1%

Mature risk premium 4%

Country Equity Prem 0%
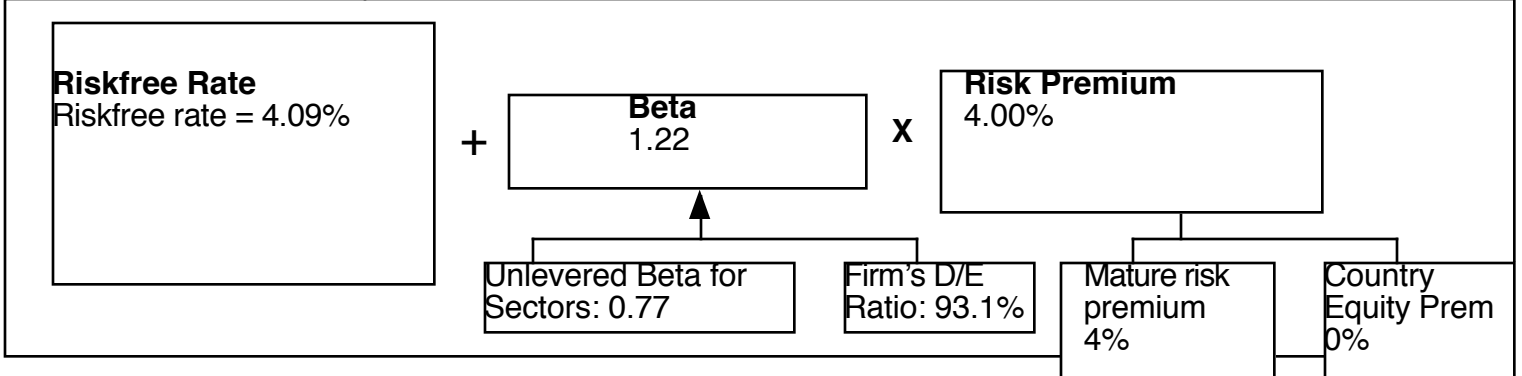
b. Dealing with the "downside" of Distress

- A DCF valuation values a firm as a going concern. If there is a significant likelihood of the firm failing before it reaches stable growth and if the assets will then be sold for a value less than the present value of the expected cashflows (a distress sale value), DCF valuations will understate the value of the firm.
- Value of Equity= DCF value of equity (1 - Probability of distress) + Distress sale value of equity (Probability of distress)
- There are three ways in which we can estimate the probability of distress:
  - Use the bond rating to estimate the cumulative probability of distress over 10 years
  - Estimate the probability of distress with a probit
  - Estimate the probability of distress by looking at market value of bonds..
- The distress sale value of equity is usually best estimated as a percent of book value (and this value will be lower if the economy is doing badly and there are other firms in the same business also in distress).

Current Revenue $ 4,390

Current Margin: 4.76%

EBIT $ 209m

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

Extended reinvestment break, due ot investment in past

Industry average

Expected Margin: -> 17%

Stable Growth

Stable Revenue Growth: 3%

Stable Operating Margin: 17%

Stable ROC=10% Reinvest 30% of EBIT(1-t)

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

Term. Year

	1	2	3	4	5	6	7	8	9	10	
Revenues	$4,434	$4,523	$5,427	$6,513	$7,815	$8,206	$8,616	$9,047	$9,499	$9,974	$10,273
Oper margin	5.81%	6.86%	7.90%	8.95%	10%	11.40%	12.80%	14.20%	15.60%	17%	17%
EBIT	$258	$310	$429	$583	$782	$935	$1,103	$1,285	$1,482	$1,696	$ 1,746
Tax rate	26.0%	26.0%	26.0%	26.0%	26.0%	28.4%	30.8%	33.2%	35.6%	38.00%	38%
EBIT * (1 - t)	$191	$229	$317	$431	$578	$670	$763	$858	$954	$1,051	$1,083
- Reinvestment	-$19	-$11	$0	$22	$58	$67	$153	$215	$286	$350	$ 325
FCFF	$210	$241	$317	$410	$520	$603	$611	$644	$668	$701	$758

Forever

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

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

X

Risk Premium 6%

Las Vegas Sands Feburary 2009 Trading @ $4.25

Casino 1.15

Current D/E: 277%

Base Equity Premium

Country Risk Premium

Adjusting the value of LVS for distress..

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

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

- Solving for the probability of bankruptcy, we get:

  $\pi_{Distress}$ = Annual probability of default = 13.54%
  - Cumulative probability of surviving 10 years = $(1 - .1354)^{10}$ = 23.34%
  - Cumulative probability of distress over 10 years = 1 - .2334 = .7666 or 76.66%

- If LVS is becomes distressed:
  - Expected distress sale proceeds = $2,769 million < Face value of debt
  - Expected equity value/share = $0.00

- Expected value per share = $8.12 (1 - .7666) + $0.00 (.7666) = $1.92

Exhibit 8.2: Valuing a Distressed firm: Las Vegas Sands in early 2009

Las Vegas Sands owns and operates the Venetian Casino and Sands Convention Center in Las Vegas and the Sands Macau Casino in Macau, China. While the revenues increased from $1.75 billion in 2005 to $4.39 billion in 2008 and it had two other casinos in development - it ran into significant financial trouble in the last quarter of 2008. Fears about whether the firm would be able to meet its debt obligations pushed down both stock prices (almost 90%) and bond prices (about 40%) in 2008.

Limited revenue growth (1)
Distress makes it difficult to build new casinos. So growth has to come from existing casinos.

Tax rate (3)
As tax benefits from investements fade and profits come back, tax rate rises to marginal tax rate.

Curtailed reinvestment (4)
Difficulty in raising new capital and debt repayment needs reduce cash available for reinvestment, at least for near term.

Return to financial health (5)
High debt ratio pushed up cost of equity and capital. As debt is repaid, debt ratio decreases and cost of capital drops.

Year	Revenue growth	Revenues	Operating Margin	Operating Income	Tax rate	After-tax Operating Income	Reinvestment Rate	Reinvestment	FCFF	Debt Ratio	Cost of capital	Present Value
Current		$4,390	4.76%	$209	26.00%	$155				73.50%		
1	1%	$4,434	5.81%	$258	26.00%	$191	-10.00%	-$19	$210	73.50%	9.88%	$191
2	2%	$4,523	6.86%	$310	26.00%	$229	-5.00%	-$11	$241	73.50%	9.88%	$200
3	20%	$5,427	7.90%	$429	26.00%	$317	0.00%	$0	$317	73.50%	9.88%	$239
4	20%	$6,513	8.95%	$583	26.00%	$431	5.00%	$22	$410	73.50%	9.88%	$281
5	20%	$7,815	10.00%	$58	26.00%	$578	10.00%	$58	$520	73.50%	9.88%	$325
6	5%	$8,206	11.40%	$935	28.40%	$670	10.00%	$67	$603	68.80%	9.79%	$343
7	5%	$8,616	12.80%	$1,103	30.80%	$763	20.00%	$153	$611	64.10%	9.50%	$317
8	5%	$9,047	14.20%	$1,285	33.20%	$858	25.00%	$215	$644	59.40%	9.01%	$307
9	5%	$9,499	15.60%	$1,482	35.60%	$954	30.00%	$286	$668	54.70%	8.32%	$294
10	5%	$9,974	17.00%	$1,696	38.00%	$1,051	33.30%	$350	$701	50.00%	7.43%	$7,298
Beyond	3%	$10,273	17%	$1,746	38.00%	1082.81468	33.30%	$325	$17,129	50.00%	7.43%	$9,793
Value of operating assets												$19,587
(Add) Cash												$3,040
(Subtract) Debt												$7,565
Value of equity												$5,268.01
Value per share (going concern)												$8.21
Probability of going concern												71.75%
Value per share (distress)												$0.00
Probability of distress												28.25%
Distress adjusted Value per share												$5.89

Terminal value (6)
With return to health, back to growth $\dfrac{1051\ (1.03)(1 - .30)}{(.0743 - .03)} = \$17{,}129$

Return to operating health (2)
Current margins are low. Operating margins improve as distress wanes and firm returns to health. The margin in year 11 is based on industry averages and the company's historical margins.

Distress sale value (8)
If the firm is unable to make debt payments, there will be no value to equity.

Risk of default (7)
The high debt ratio makes default a very real probability. Given the company's rating (BB), history suggests a 28.25% probability of default within 10 years.

Default adjusted value
Weighted average of going concern value and distress sale value: $8.25(.7175)+$0(.2125)

Aswath Damodaran

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

Net Payof
on Equity

Face Value
of Debt
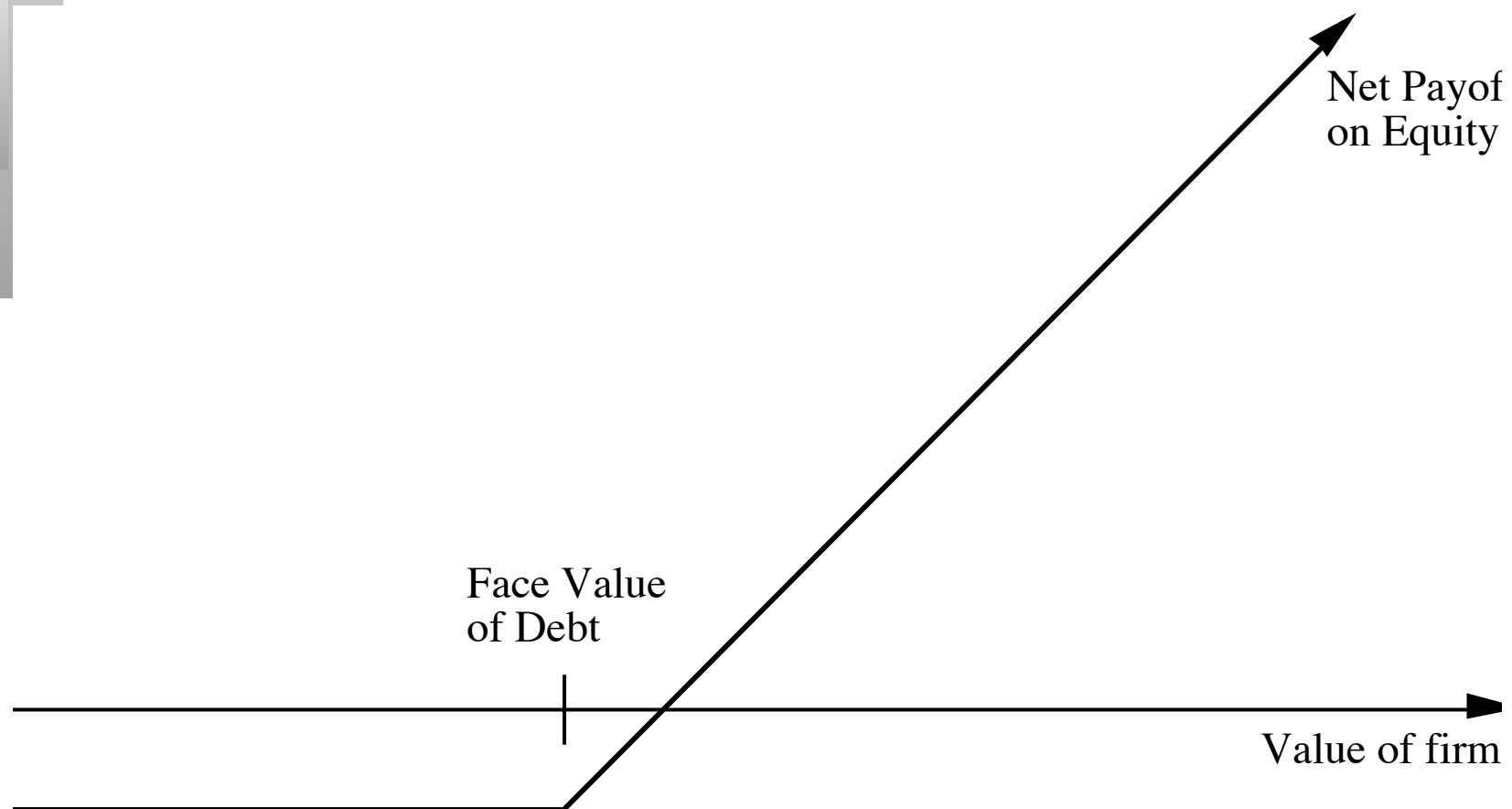
Value of firm

Application to valuation: A simple example

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

Model Parameters & Valuation

■ **The inputs**
- Value of the underlying asset = S = Value of the firm = $ 100 million
- Exercise price = K = Face Value of outstanding debt = $ 80 million
- Life of the option = t = Life of zero-coupon debt = 10 years
- Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.16
- Riskless rate = r = Treasury bond rate corresponding to option life = 10%

■ **The output**
- The Black-Scholes model provides the following value for the call:
  - d1 = 1.5994   N(d1) = 0.9451
  - d2 = 0.3345   N(d2) = 0.6310
- Value of the call = 100 (0.9451) - 80 $\exp^{(-0.10)(10)}$ (0.6310) = $75.94 million
- Value of the outstanding debt = $100 - $75.94 = $24.06 million
- Interest rate on debt = ($ 80 / $24.06)$^{1/10}$ -1 = 12.77%

Firm value drops..

■ Assume now that a catastrophe wipes out half the value of this firm (the value drops to $ 50 million), while the face value of the debt remains at $ 80 million.

■ The inputs
  - Value of the underlying asset = S = Value of the firm = $ 50 million
  - All the other inputs remain unchanged

■ The output
  - Based upon these inputs, the Black-Scholes model provides the following value for the call:
    - d1 = 1.0515   N(d1) = 0.8534
    - d2 = -0.2135   N(d2) = 0.4155
  - Value of the call = 50 (0.8534) - 80 exp$^{(-0.10)(10)}$ (0.4155) = $30.44 million
  - Value of the bond= $50 - $30.44 = $19.56 million

Equity value persists .. As firm value declines..

Value of Equity as Firm Value Changes
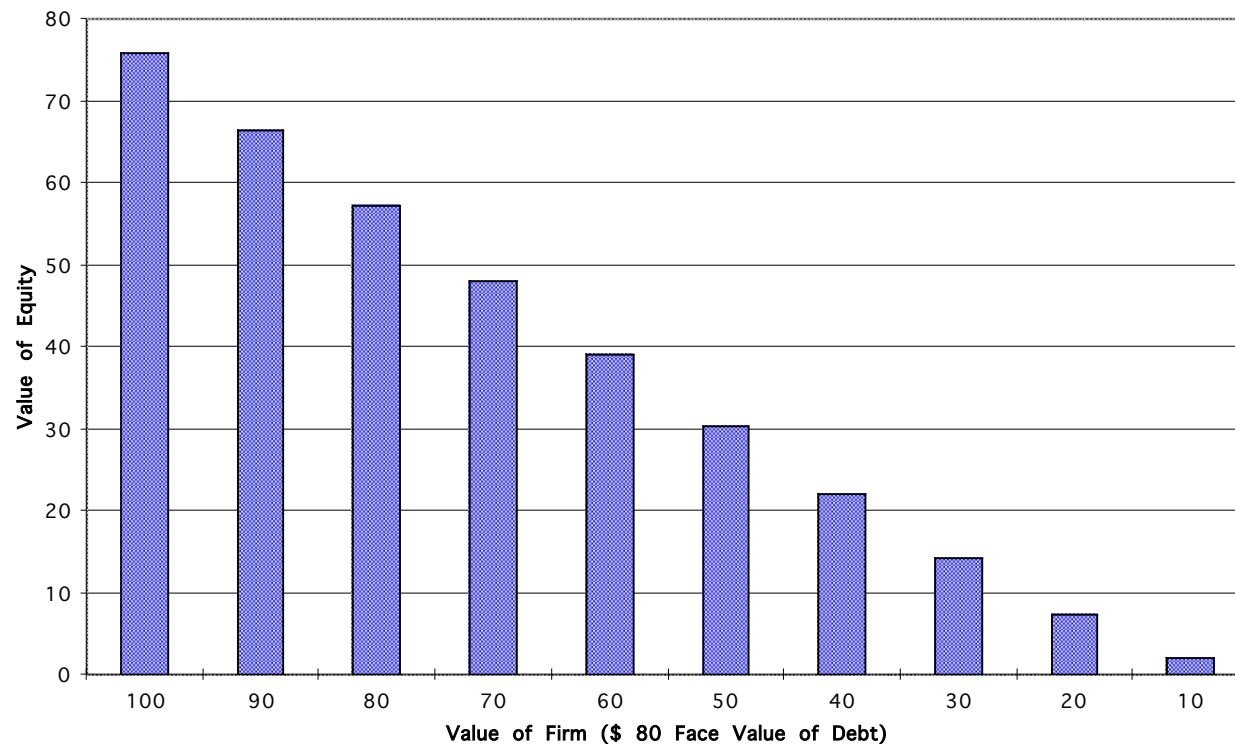
Valuing Equity as an option - Eurotunnel in early 1998

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

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

The Basic DCF Valuation

■ The value of the firm estimated using projected cashflows to the firm, discounted at the weighted average cost of capital was £2,312 million.

■ This was based upon the following assumptions –

- Revenues will grow 5% a year in perpetuity.
- The COGS which is currently 85% of revenues will drop to 65% of revenues in yr 5 and stay at that level.
- Capital spending and depreciation will grow 5% a year in perpetuity.
- There are no working capital requirements.
- The debt ratio, which is currently 95.35%, will drop to 70% after year 5. The cost of debt is 10% in high growth period and 8% after that.
- The beta for the stock will be 1.10 for the next five years, and drop to 0.8 after the next 5 years.
- The long term bond rate is 6%.

Other Inputs

- The stock has been traded on the London Exchange, and the annualized std deviation based upon ln (prices) is 41%.

- There are Eurotunnel bonds, that have been traded; the annualized std deviation in ln(price) for the bonds is 17%.

  - The correlation between stock price and bond price changes has been 0.5. The proportion of debt in the capital structure during the period (1992-1996) was 85%.

  - Annualized variance in firm value

  $= (0.15)^2 (0.41)^2 + (0.85)^2 (0.17)^2 + 2 (0.15) (0.85)(0.5)(0.41)(0.17) = 0.0335$

- The 15-year bond rate is 6%. (I used a bond with a duration of roughly 11 years to match the life of my option)

Valuing Eurotunnel Equity and Debt

- Inputs to Model
  - Value of the underlying asset = S = Value of the firm = £2,312 million
  - Exercise price = K = Face Value of outstanding debt = £8,865 million
  - Life of the option = t = Weighted average duration of debt = 10.93 years
  - Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.0335
  - Riskless rate = r = Treasury bond rate corresponding to option life = 6%
- Based upon these inputs, the Black-Scholes model provides the following value for the call:

d1 = -0.8337	N(d1) = 0.2023
d2 = -1.4392	N(d2) = 0.0751

- Value of the call = 2312 (0.2023) - 8,865 exp$^{(-0.06)(10.93)}$ (0.0751) = £122 million
- Appropriate interest rate on debt = $(8865/2190)^{(1/10.93)}$-1= 13.65%

Lesson 1: Truncation risk is hard to assess and impossible to build into discount rates…

■ When investing in a business, you are exposed to all types of risks. Some risks are continuous, i.e., interest rates changing or labor costs shifting, but others are discrete. The most extreme discrete risks such as distress and nationalization can shut a business down.

■ Analysts, when valuing businesses facing discrete risks, often torture themselves trying to figure out how to adjust discount rates for these risks. But discount rates are really designed to carry that burden: they are more attuned to measuring exposure to continuous risk.

■ Put simply, if you are concerned that your cash flows in year 3 could be wrong (because of macro or micro events), you can adjust discount rates to reflect that worry. If you are concerned that there might be no year 3, because the firm could cease to exist in years 1 or 2, you cannot adjust discount rates/

Lesson 2: There is information in "other" markets…

- When valuing an asset, we often develop tunnel vision and focus in only on the market for that asset to obtain information. Thus, to value real estate we look at the real estate market and to value stocks, we use information in the stock market.

- You can improve your valuation in any market by incorporating information in other markets. Thus, to value the equity in Las Vegas Sands, we utilized the information the pricing of the bonds issues by the company.

IV. Valuing Financial Service Companies

Existing assets are usually financial assets or loans, often marked to market. Earnings do not provide much information on underlying risk.

Defining capital expenditures and working capital is a challenge.Growth can be strongly influenced by regulatory limits and constraints. Both the amount of new investments and the returns on these investments can change with regulatory changes.

What is the value added by growth assets?

What are the cashflows from existing assets?

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

Preferred stock is a significant source of capital.

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

What is the value of equity in the firm?

For financial service firms, debt is raw material rather than a source of capital. It is not only tough to define but if defined broadly can result in high financial leverage, magnifying the impact of small operating risk changes on equity risk.

In addition to all the normal constraints, financial service firms also have to worry about maintaining capital ratios that are acceptable ot regulators. If they do not, they can be taken over and shut down.

Figure 9.1: A Dividend Discount Model Value of Wells Fargo in October 2008

Current dividends (1)
in the most recent 12 months the firm paid out dividends of $1.18 on earnigns per share of $2.16.

Expected Growth (2)
A product of the retention ratio and the ROE. (1-.5463) (.1351) = 6.13%

Quality of growth (3)
ROE in the future is expected to be lower than in trailing 12 months, to reflect an expected 30% increase in capital requirements, as a result of the crtisis.

Year	Earnings per share	Expected growth	Payout Ratio	Return on equity	Dividends per share	Cost of Equity	Present Value
Trailing 12 months	$2.16		54.63%	17.56%	$1.18		
1	$2.29	6.13%	54.63%	13.51%	$1.25	9.60%	$1.14
2	$2.43	6.13%	54.63%	13.51%	$1.33	9.60%	$1.14
3	$2.58	6.13%	54.63%	13.51%	$1.41	9.60%	$1.14
4	$2.74	6.13%	54.63%	13.51%	$1.50	9.60%	$1.14
5	$2.91	6.13%	54.63%	13.51%	$1.59	9.60%	$1.14
Terminal year	$3.00	3.00%	65.12%	8.60%	$34.83	8.60%	$22.03
Value per share today =							$27.74

Terminal Value (5)
In stable growth, we assume that the ROE = Cost of equity (8.60%) and compute the payout ratio accordingly:
Payout ratio = 1- 3/8.6 = 65.12%
The terminal value is computed as follows:

Risk (4)
The cost of equity is estimated using a beta of 1.20, reflecitng the increased risk in banking. In stable growth, the beta drops to 1.00 and the cost of equity reflects that. (Riskfree rate = 3.6%; Equity risk premium =5%)

Lesson 1: Financial service companies are opaque…

■ With financial service firms, we enter into a Faustian bargain. They tell us very little about the quality of their assets (loans, for a bank, for instance are not broken down by default risk status) but we accept that in return for assets being marked to market (by accountants who presumably have access to the information that we don't have).

■ In addition, estimating cash flows for a financial service firm is difficult to do. So, we trust financial service firms to pay out their cash flows as dividends. Hence, the use of the dividend discount model.

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

■ The book value of assets and equity is mostly irrelevant when valuing non-financial service companies. After all, the book value of equity is a historical figure and can be nonsensical. (The book value of equity can be negative and is so for more than a 1000 publicly traded US companies)

■ With financial service firms, book value of equity is relevant for two reasons:
  • Since financial service firms mark to market, the book value is more likely to reflect what the firms own right now (rather than a historical value)
  • The regulatory capital ratios are based on book equity. Thus, a bank with negative or even low book equity will be shut down by the regulators.

■ From a valuation perspective, it therefore makes sense to pay heed to book value. In fact, you can argue that reinvestment for a bank is the amount that it needs to add to book equity to sustain its growth ambitions and safety requirements:
  • FCFE = Net Income – Reinvestment in regulatory capital (book equity)

2d. Deutsche Bank: March 2009

Last 2 years

	2007	2008
Net Income	3,954 m	-3,855m
Dividends	2,146 m	285 m
Risk adjusted assets =		312,882m
Book Equity =		31,914 m
Regulatory Capital =		

Normalized Net Income for base year 3,000 m
Normalized ROE = 9.4%

Expected growth in asset base 4%

Target capital ratio 10%

Target ROE 10.2%

Stable Growth
g = 3%; Beta = 1.00
Cost of equity = 10.20%
Retunr on equity = 10.20%;
Reinvestment Rate=g/ROE
=3/10.20% = 29.41%

Terminal Value$_5$= 2,823/(.102-.03) = 39,209 m

Cashflows

	1	2	3	4	5	
Asset Base	325,398 €	338,414 €	351,950 €	366,028 €	380,669 €	
Capital ratio	10.16%	10.12%	10.08%	10.04%	10.00%	
Regulatory Capital	33,060 €	34,247 €	35,477 €	36,749 €	38,067 €	
Change in capital	1,146 €	1,187 €	1,229 €	1,273 €	1,318 €	
ROE	9.56%	9.72%	9.88%	10.04%	10.20%	
Net Income	3,161 €	3,329 €	3,505 €	3,690 €	3,883 €	3,999
-Reinvestment	1,146 €	1,187 €	1,229 €	1,273 €	1,318 €	1,176
FCFE	2,014 €	2,142 €	2,276 €	2,417 €	2,565 €	2,823

PV of CF = 31,383 m
/ # shares   581.85
Value/Share   53.94 €

Discount at Cost of equity = 3.60% + 1.162 * 6% + -0.60% = 11.172%

*In March 2009
Deutsche Bank price = 48
Euros/share (down from 89
Euros in early 2008)*

Riskfree Rate:
Euro Riskfree Rate= 3.6%

+

Beta
1.162

X

Mature market premium
6%

+

Beta for commercial & Investment banking

Region	Lambda	CRP
Western Europe	0.68	0.00%
United States	0.42	0.00%
Latin America	0.01	4.50%
Africa & Middle East	0.01	7.00%
Asia	0.11	3.50%
Eastern Europe	0.04	3.00%
Deutshce Bank		0.60%

V. Valuing Companies with "intangible" assets

operating expenses, it becomes very difficult to assess how much a firm is reinvesting for future growth and how well its investments are doing.

What is the value added by growth assets?

What are the cashflows from existing assets?

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

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

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

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

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

Lesson 1: Accounting rules are cluttered with inconsistencies…

■ If we start with accounting first principles, capital expenditures are expenditures designed to create benefits over many periods. They should not be used to reduce operating income in the period that they are made, but should be depreciated/amortized over their life. They should show up as assets on the balance sheet.

■ Accounting is consistent in its treatment of cap ex with manufacturing firms, but is inconsistent with firms that do not fit the mold.

- With pharmaceutical and technology firms, R&D is the ultimate cap ex but is treated as an operating expense.

- With consulting firms and other firms dependent on human capital, recruiting and training expenses are your long term investments that are treated as operating expenses.

- With brand name consumer product companies, a portion of the advertising expense is to build up brand name and is the real capital expenditure. It is treated as an operating expense.

Exhibit 11.1: Converting R&D expenses to R&D assets - Amgen

Step 1: Ddetermining an amortizable life for R & D expenses. ①
How long will it take, on an expected basis, for research to pay off at Amgen? Given the length of the approval process for new drugs by the Food and Drugs Administration, we will assume that this amortizable life is 10 years.

Step 2: Capitalize historical R&D exoense

Year	R&D Expense	Unamortized portion ②	Amortization this year ③
Current	3030.00	1.00	3030.00	
-1	3266.00	0.90	2939.40	$326.60
-2	3366.00	0.80	2692.80	$336.60
-3	2314.00	0.70	1619.80	$231.40
-4	2028.00	0.60	1216.80	$202.80
-5	1655.00	0.50	827.50	$165.50
-6	1117.00	0.40	446.80	$111.70
-7	864.00	0.30	259.20	$86.40
-8	845.00	0.20	169.00	$84.50
-9	823.00	0.10	82.30	$82.30
-10	663.00	0.00	0.00	$66.30
			$13283.60	$1,694.10

④
Current year's R&D expense = Cap ex = $3,030 million
R&D amortization = Depreciation = $ 1,694 million
Unamortized R&D = Capital invested (R&D) = $13,284 million

Step 3: Restate earnings, book value and return numbers

⑤

	Unadjusted	Adjusted for R&D	Comments
Net Income	$4,196	4,196 + 3030 − 1694 = $ 5,532	Add current year's R&D and subtract R&D amortization
Book value of equity	$17,869	17,869 + 13,284 = $ 31,153	Add unamortized R&D from prior years
Return on Equity	$\frac{4196}{17869} = 23.48\%$	$\frac{5532}{31153} = 17.75\%$	Return on equity drops when book equity is augmented by R&D, even though net income rises.
Pre-tax Operating Income	$5,594	5,594 + 3030 − 1694 = $ 6.930	Add current year's R&D and subtract R&D amortization
Book value of invested capital	$21,985	$21,985+$13,284 = $35,269	Add unamortized R&D from prior years
Pre-tax Return on Capital	$\frac{5594}{21985} = 25.44\%$	$\frac{6930}{35269} = 19.65\%$	Return on capital drops when capital is augmented by R&D, even though operating income rises.

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

	No R&D adjustment	R&D adjustment
EBIT	$5,071	$7,336
Invested Capital	$25,277	$33,173
ROIC	14.58%	18.26%
Reinvestment Rate	115.68%	106.98%
Value of firm	$58,617	$95,497
Value of equity	$50,346	$87,226
Value/share	$42.73	$74.33

VI. Valuing cyclical and commodity companies

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

What is the value added by growth assets?

What are the cashflows from existing assets?

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

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

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

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

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

Valuing a Cyclical Company - Toyota in Early 2009

In early 2009, Toyota Motors had the highest market share in the sector. However, the global economic recession in 2008-09 had pulled earnings down.

Year	Revenues	Operating Income	EBITDA	Operating Margin
FY1 1992	¥10,163,380	¥218,511	¥218,511	2.15%
FY1 1993	¥10,210,750	¥181,897	¥181,897	1.78%
FY1 1994	¥9,362,732	¥136,226	¥136,226	1.45%
FY1 1995	¥8,120,975	¥255,719	¥255,719	3.15%
FY1 1996	¥10,718,740	¥348,069	¥348,069	3.25%
FY1 1997	¥12,243,830	¥665,110	¥665,110	5.43%
FY1 1998	¥11,678,400	¥779,800	¥1,382,950	6.68%
FY1 1999	¥12,749,010	¥774,947	¥1,415,997	6.08%
FY1 2000	¥12,879,560	¥775,982	¥1,430,982	6.02%
FY1 2001	¥13,424,420	¥870,131	¥1,542,631	6.48%
FY1 2002	¥15,106,300	¥1,123,475	¥1,822,975	7.44%
FY1 2003	¥16,054,290	¥1,363,680	¥2,101,780	8.49%
FY1 2004	¥17,294,760	¥1,666,894	¥2,454,994	9.64%
FY1 2005	¥18,551,530	¥1,672,187	¥2,447,987	9.01%
FY1 2006	¥21,036,910	¥1,878,342	¥2,769,742	8.93%
FY1 2007	¥23,948,090	¥2,238,683	¥3,185,683	9.35%
FY1 2008	¥26,289,240	¥2,270,375	¥3,312,775	8.64%
FY 2009 (Estim	¥22,661,325	¥267,904	¥1,310,304	1.18%
		¥1,306,867		7.33%

Normalized Return on capital and Reinvestment ②
Once earnings bounce back to normal, we assume that Toyota will be able to earn a return on capital equal to its cost of capital (5.09%). This is a sector, where earning excess returns has proved to be difficult even for the best of firms.
To sustain a 1.5% growth rate, the reinvestment rate has to be:
Reinvestment rate = 1.5%/5.09%
= 29.46%

Normalized Earnings ①
As a cyclical company, Toyota's earnings have been volatile and 2009 earnings reflect the troubled global economy. We will assume that when economic growth returns, the operating margin for Toyota will revert back to the historical average.
Normalized Operating Income = Revenues in 2009 * Average Operating Margin (98--09)
= 22661 * .0733 =1660.7 billion yen

Operating Assets	19,640
+ Cash	2,288
+ Non-operating assets	6,845
- Debt	11,862
- Minority Interests	583
Value of Equity	
/ No of shares	/3,448
Value per share	¥4735

$$\text{Value of operating assets} = \frac{1660.7 \,(1.015)\,(1-.407)\,(1-.2946)}{(.0509-.015)} = 19{,}640 \text{ billion}$$

Normalized Cost of capital ③
The cost of capital is computed using the average beta of automobile companies (1.10), and Toyota's cost of debt (3.25%) and debt ratio (52.9% debt ratio. We use the Japanese marginal tax rate of 40.7% for computing both the after-tax cost of debt and the after-tax operating income
Cost of capital = 8.65% (.471) + 3.25% (1-.407) (.529) = 5.09%

Stable Growth ④
Once earnings are normalized, we assume that Toyota, as the largest market-share company, will be able to maintain only stable growth (1.5% in Yen terms)

Valuing a commodity company - Exxon in Early 2009

Historical data: Exxon Operating Income vs Oil Price
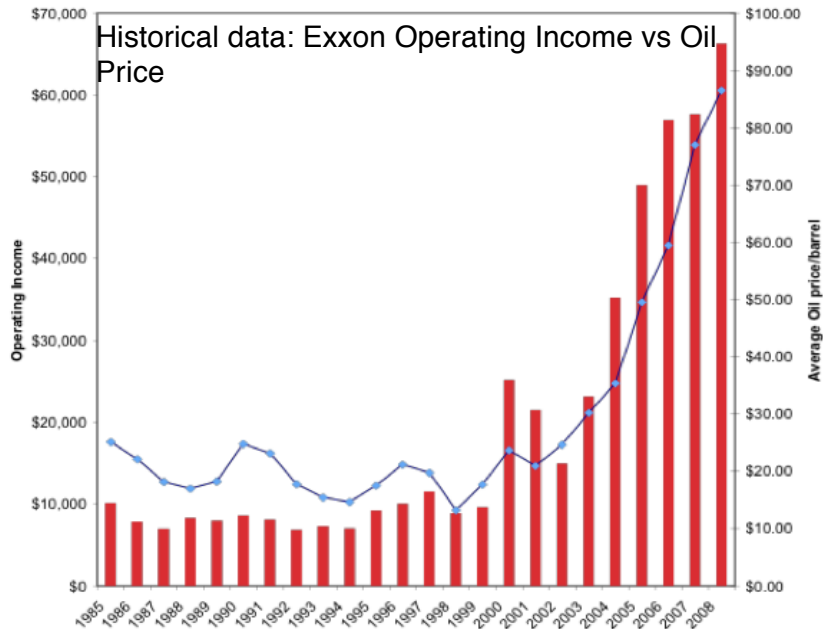
Regressing Exxon's operating income against the oil price per barrel from 1985-2008:

Operating Income = -6,395 + 911.32 (Average Oil Price) R^2 = 90.2%
            (2.95)   (14.59)

Exxon Mobil's operating income increases about $9.11 billion for every $10 increase in the price per barrel of oil and 90% of the variation in Exxon's earnings over time comes from movements in oil prices.

Estiimate normalized income based on current oil price ①
At the time of the valuation, the oil price was $ 45 a barrel. Exxon's operating income based on thisi price is
Normalized Operating Income = -6,395 + 911.32 ($45) = $34,614

Estimate return on capital and reinvestment rate based on normalized income ②
This operating income translates into a return on capital of approximately 21% and a reinvestment rate of 9.52%, based upon a 2% growth rate.
Reinvestment Rate = g/ ROC = 2/21% = 9.52%

$$\text{Value of operating assets} = \frac{34{,}614(1-.38)(1-.0952)}{(.0818-.02)} = \$320{,}472 \text{ million}$$

Exxon's cost of capital ④
Exxon has been a predominantly equtiy funded company, and is expected to remain so, with a deb ratio of onlly 2.85%: It's cost of equity is 8.35% (based on a beta of 0.90) and its pre-tax cost of debt is 3.75% (given AAA rating). The marginal tax rate is 38%.
Cost of capital = 8.35% (.9715) + 3.75% (1-.38) (.0285) = 8.18%.

Expected growth in operating income ③
Since Exxon Mobile is the largest oil company in the world, we will assume an expected growth of only 2% in perpetuity.

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

- With cyclical and commodity companies, it is undeniable that the value you arrive at will be affected by your views on the economy or the price of the commodity.

- Consequently, you will feel the urge to take a stand on these macro variables and build them into your valuation. Doing so, though, will create valuations that are jointly impacted by your views on macro variables and your views on the company, and it is difficult to separate the two.

- The best (though not easiest) thing to do is to separate your macro views from your micro views. Use current market based numbers for your valuation, but then provide a separate assessment of what you think about those market numbers.

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

- ■ If there is a key macro variable affecting the value of your company that you are uncertain about (and who is not), why not quantify the uncertainty in a distribution (rather than a single price) and use that distribution in your valuation.

- ■ That is exactly what you do in a Monte Carlo simulation, where you allow one or more variables to be distributions and compute a distribution of values for the company.

- ■ With a simulation, you get not only everything you would get in a standard valuation (an estimated value for your company) but you will get additional output (on the variation in that value and the likelihood that your firm is under or over valued)

Exxon Mobil Valuation: Simulation

Exxon Mobil – Value per Share : Oil price Simulation
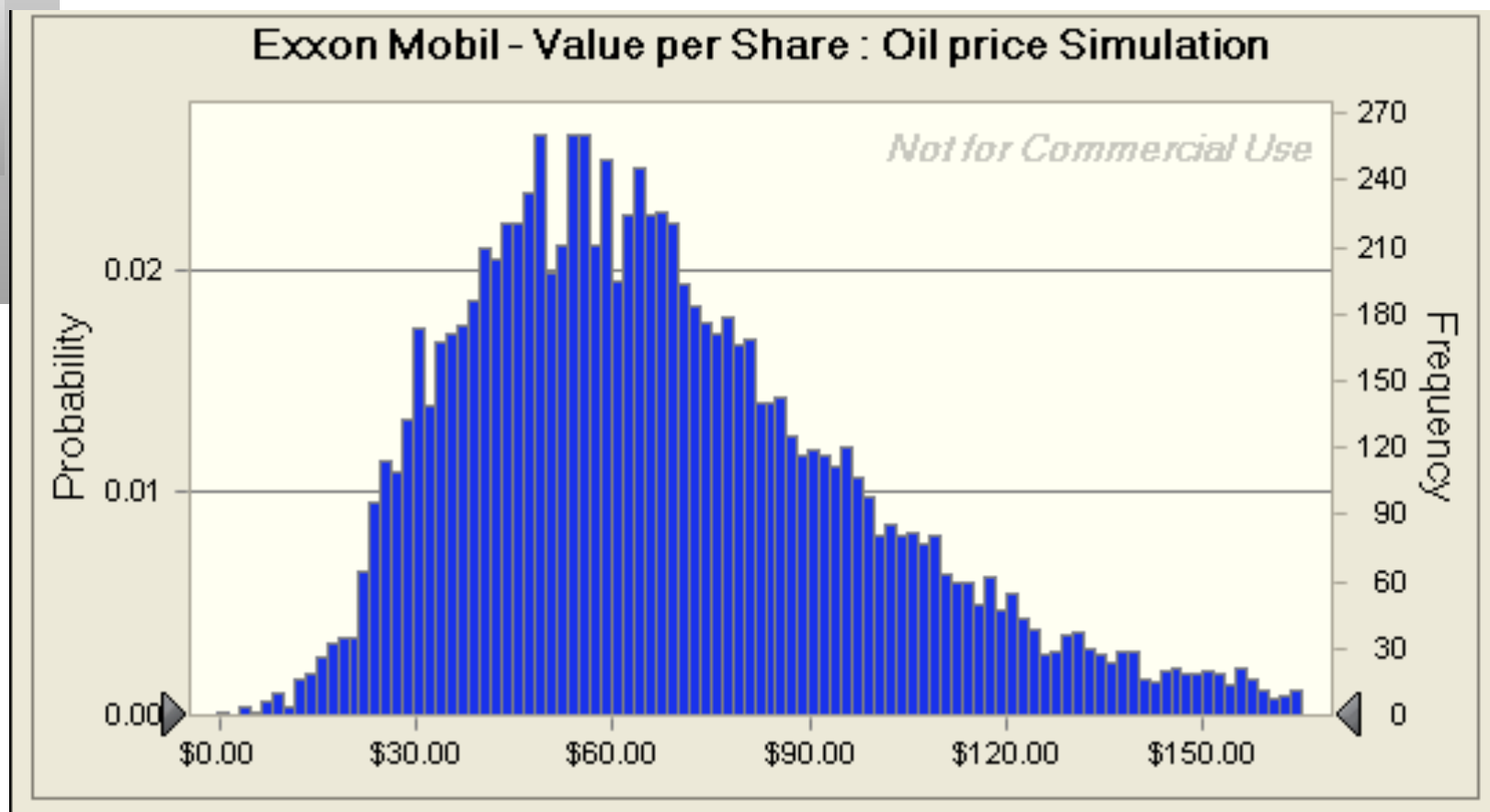
The optionality in commodities: Undeveloped reserves as an option

Net Payoff on Extraction

Cost of Developing Reserve

Value of estimated reserve of natural resource
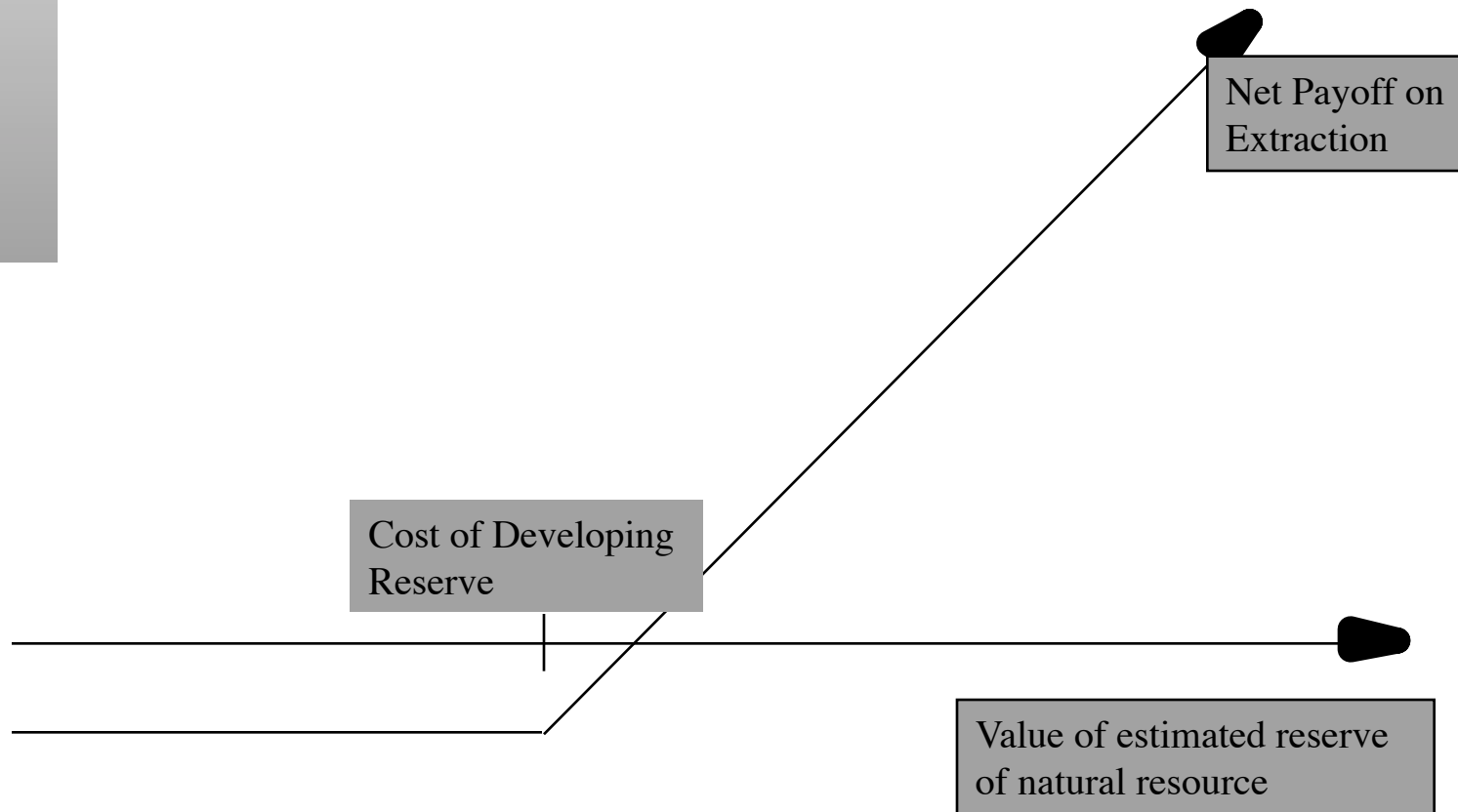
Estimating Inputs for Natural Resource Options

Input	Estimation Process
1. Value of Available Reserves of the Resource	• Expert estimates (Geologists for oil..); The present value of the after-tax cash flows from the resource are then estimated.
2. Cost of Developing Reserve (Strike Price)	• Past costs and the specifics of the investment
3. Time to Expiration	• Relinqushment Period: if asset has to be relinquished at a point in time. • Time to exhaust inventory - based upon inventory and capacity output.
4. Variance in value of underlying asset	• based upon variability of the price of the resources and variability of available reserves.
5. Net Production Revenue (Dividend Yield)	• Net production revenue every year as percent of market value.
6. Development Lag	• Calculate present value of reserve based upon the lag.

Valuing Gulf Oil

■ Gulf Oil was the target of a takeover in early 1984 at $70 per share (It had 165.30 million shares outstanding, and total debt of $9.9 billion).

- It had estimated reserves of 3038 million barrels of oil and the average cost of developing these reserves was estimated to be $10 a barrel in present value dollars (The development lag is approximately two years).

- The average relinquishment life of the reserves is 12 years.

- The price of oil was $22.38 per barrel, and the production cost, taxes and royalties were estimated at $7 per barrel.

- The bond rate at the time of the analysis was 9.00%.

- Gulf was expected to have net production revenues each year of approximately 5% of the value of the developed reserves. The variance in oil prices is 0.03.

Valuing Undeveloped Reserves

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

  d1 = 1.6548   N(d1) = 0.9510

  d2 = 1.0548   N(d2) = 0.8542
- ■ Call Value= 42,380.44 $\exp^{(-0.05)(12)}$ (0.9510) -30,380 ($\exp^{(-0.09)(12)}$ (0.8542)

  $$= \$ \, 13,306 \text{ million}$$

Valuing Gulf Oil

■ In addition, Gulf Oil had free cashflows to the firm from its oil and gas production of $915 million from already developed reserves and these cashflows are likely to continue for ten years (the remaining lifetime of developed reserves).

■ The present value of these developed reserves, discounted at the weighted average cost of capital of 12.5%, yields:

- Value of already developed reserves = $915 (1 - 1.125^{-10})/.125 = \$5065.83$

■ Adding the value of the developed and undeveloped reserves

Value of undeveloped reserves	= $ 13,306 million
Value of production in place	= $ 5,066 million
Total value of firm	= $ 18,372 million
Less Outstanding Debt	= $ 9,900 million
Value of Equity	= $ 8,472 million
Value per share	= $ 8,472/165.3 = $51.25

Closing Thoughts…

- Valuation becomes more difficult as we move away from the standard script: money making manufacturing companies with long histories.

- When valuation becomes more difficult, you will be tempted to abandon first principles in valuation and told that discounted cash flow (and intrinsic) valuation don't work for "these" companies. Instead, you will be asked to look at alternate metrics and models to price these companies.

- The architecture of conventional valuation is strong enough to allow us to value any company, but it does require us to be flexible (in our approaches and use of models) and creative (in making estimates and dealing with uncertainty).

- The payoff to doing intrinsic valuation is greatest with these "difficult to value" companies, because most people give up.

Relative Valuation

The Essence of relative valuation?

■ In relative valuation, the value of an asset is compared to the values assessed by the market for similar or comparable assets.

■ To do relative valuation then,

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

Relative valuation is pervasive…

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

The Reasons for the allure…

"If you think I'm crazy, you should see the guy who lives across the hall"
Jerry Seinfeld talking about Kramer in a Seinfeld episode

"A little inaccuracy sometimes saves tons of explanation"

H.H. Munro

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

Ex-portfolio manager

The Market Imperative….

■ Relative valuation is <u>much more likely to reflect market perceptions</u> and moods than discounted cash flow valuation. This can be an advantage when it is important that the price reflect these perceptions as is the case when
  - the objective is to sell a security at that price today (as in the case of an IPO)
  - investing on "momentum" based strategies

■ With relative valuation, there will always be a <u>significant proportion</u> of securities that are <u>under valued and over valued</u>.

■ Since portfolio managers are <u>judged</u> based upon how they perform <u>on a relative basis</u> (to the market and other money managers), relative valuation is more tailored to their needs

■ Relative valuation generally <u>requires less information</u> than discounted cash flow valuation (especially when multiples are used as screens)

The Four Steps to Deconstructing Multiples

- **Define the multiple**
  - In use, the same multiple can be defined in <u>different ways</u> by different users. When comparing and using multiples, estimated by someone else, it is critical that we <u>understand how the multiples have been estimated</u>

- **Describe the multiple**
  - Too many people who use a multiple have <u>no idea what its cross sectional distribution</u> 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 <u>understand the fundamentals</u> that drive each multiple, and the <u>nature of the relationship</u> between the multiple and each variable.

- **Apply the multiple**
  - Defining the <u>comparable universe</u> and <u>controlling for differences</u> is far more difficult in practice than it is in theory.

Definitional Tests

- Is the multiple consistently defined?
  - **Proposition 1: Both the value (the numerator) and the standardizing variable (the denominator) should be to the same claimholders in the firm. In other words, the value of equity should be divided by equity earnings or equity book value, and firm value should be divided by firm earnings or book value.**

- Is the multiple uniformly estimated?
  - The variables used in defining the multiple should be estimated uniformly across assets in the "comparable firm" list.
  - If earnings-based multiples are used, the accounting rules to measure earnings should be applied consistently across assets. The same rule applies with book-value based multiples.

Example 1: Price Earnings Ratio: Definition

PE = Market Price per Share / Earnings per Share

- There are a number of variants on the basic PE ratio in use. They are based upon how the price and the earnings are defined.

- Price: is usually the current price

                 is sometimes the average price for the year

- EPS: earnings per share in most recent financial year

                 earnings per share in trailing 12 months (Trailing PE)

                 forecasted earnings per share next year (Forward PE)

                 forecasted earnings per share in future year

Example 2: Enterprise Value /EBITDA Multiple

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

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

■ Why do we net out cash from firm value?

■ What happens if a firm has cross holdings which are categorized as:

- Minority interests?
- Majority active interests?

Descriptive Tests

■ What is the <u>average and standard deviation</u> for this multiple, across the universe (market)?

■ What is the <u>median</u> for this multiple?

- The median for this multiple is often a more reliable comparison point.

■ How <u>large are the outliers</u> to the distribution, and <u>how do we deal</u> 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 <u>cannot be estimated</u>? Will ignoring these cases lead to a <u>biased estimate</u> of the multiple?

■ How has this multiple <u>changed over time</u>?

1. Multiples have skewed distributions…
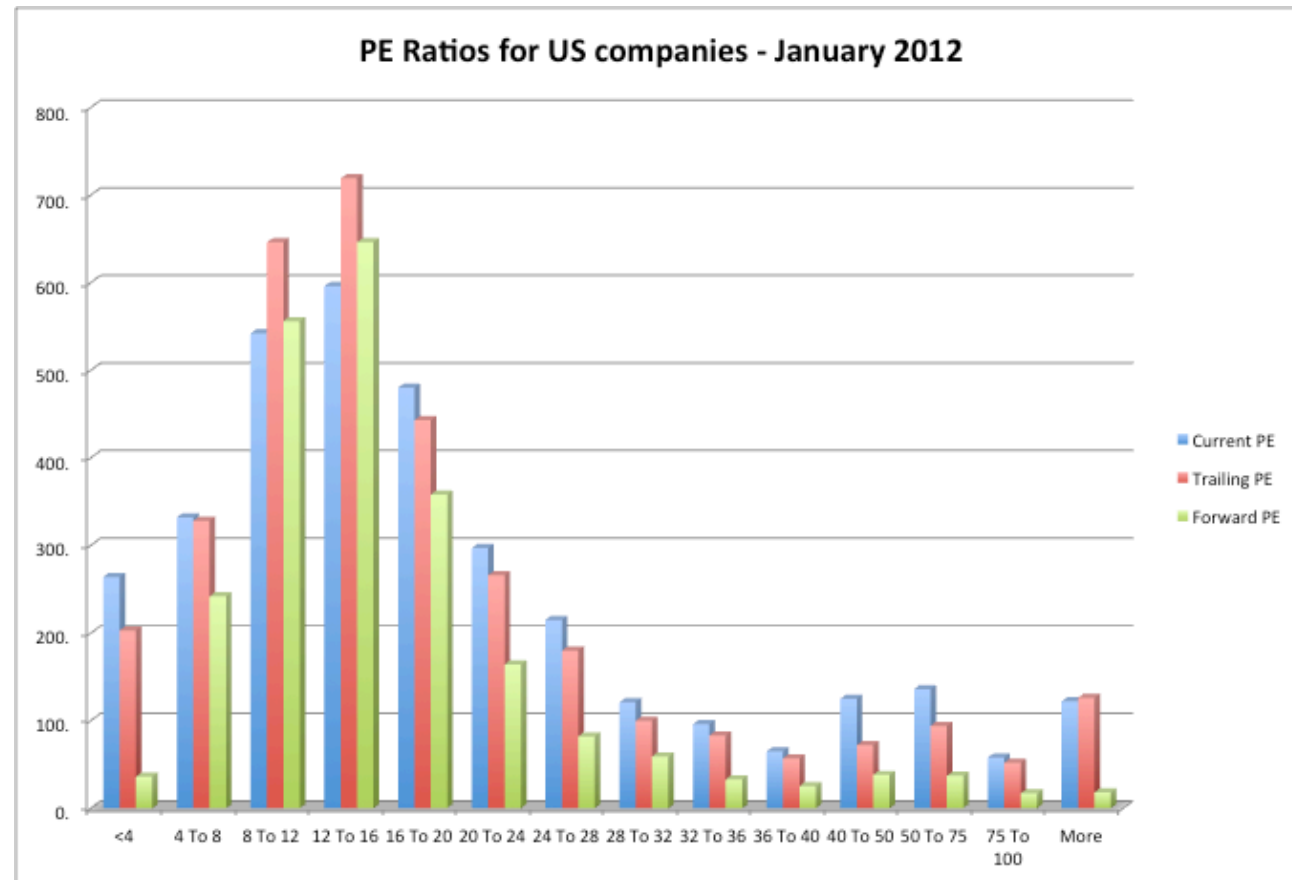
2. Making statistics "dicey"

	Current PE	Trailing PE	Forward PE
Total firms	5891	5891	5891
Number of firms with PE	3456	3375	2311
Average	42.56	33.67	18.28
Median	15.94	14.56	13.74
Minimum	0.1	0.2	0.44
25th percentile	10.11	10	10.34
75th percentile	25.34	22.34	18.69
Maximum	18358	5083	780
Standard deviation	7.26	3.00	0.62
Skewness	33.40	21.86	15.98

3. Markets have a lot in common
PE Ratios in US, Europe, Japan and Emerging Markets – January 2011

	Mean	Median	25th	75th
Australia, NZ & Canada	50.10	15.68	9.48	27.82
Developed Europe	43.63	15.97	10.00	28.20
Emerging Markets	59.82	15.64	9.63	27.93
Japan	54.78	16.02	9.72	29.12
US	46.04	15.88	9.56	30.19
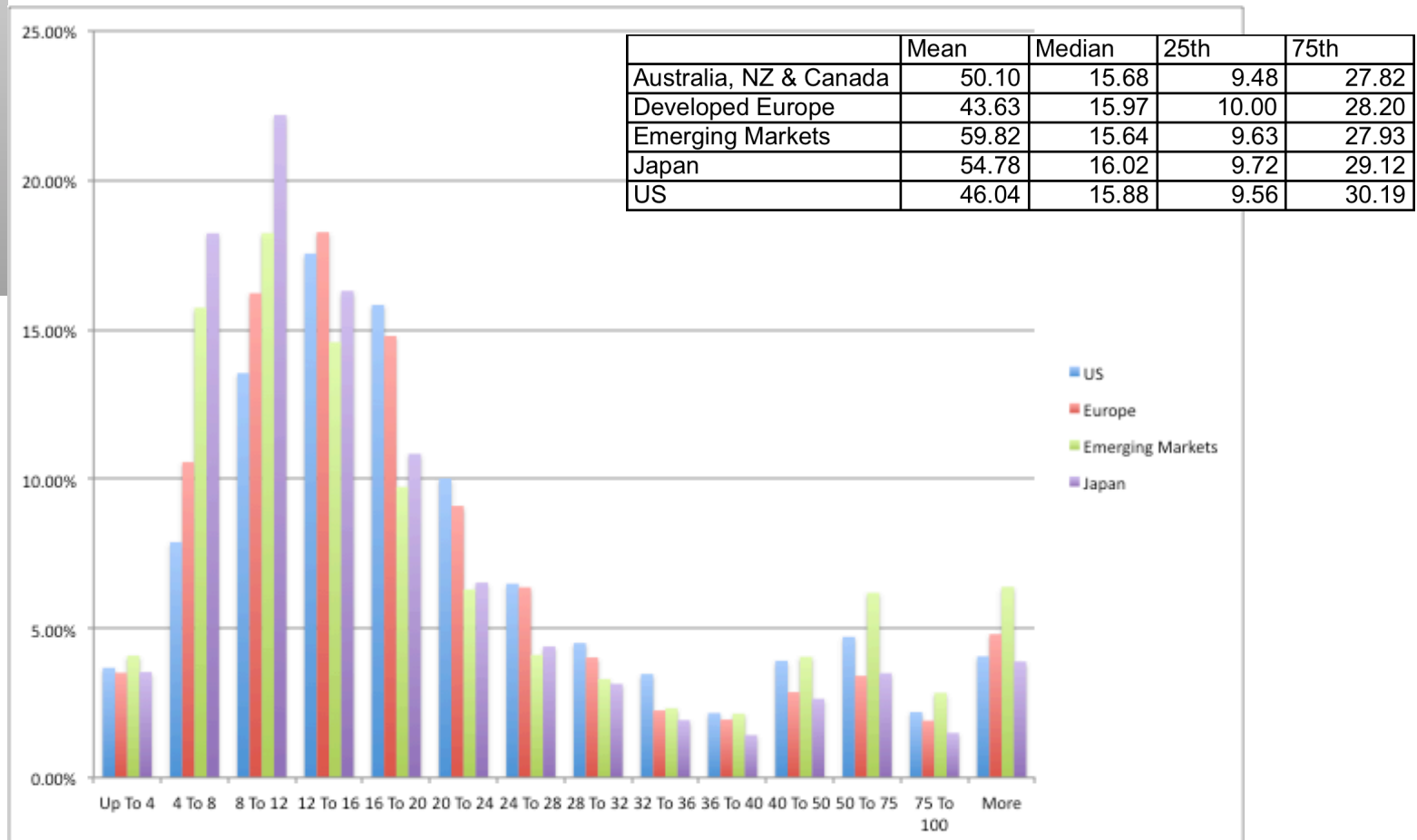
4. Simplistic rules almost always break down…6 times EBITDA may not be cheap…

Or it may be…

EV/EBIT & EV/EBITDA- US companies in January 2012
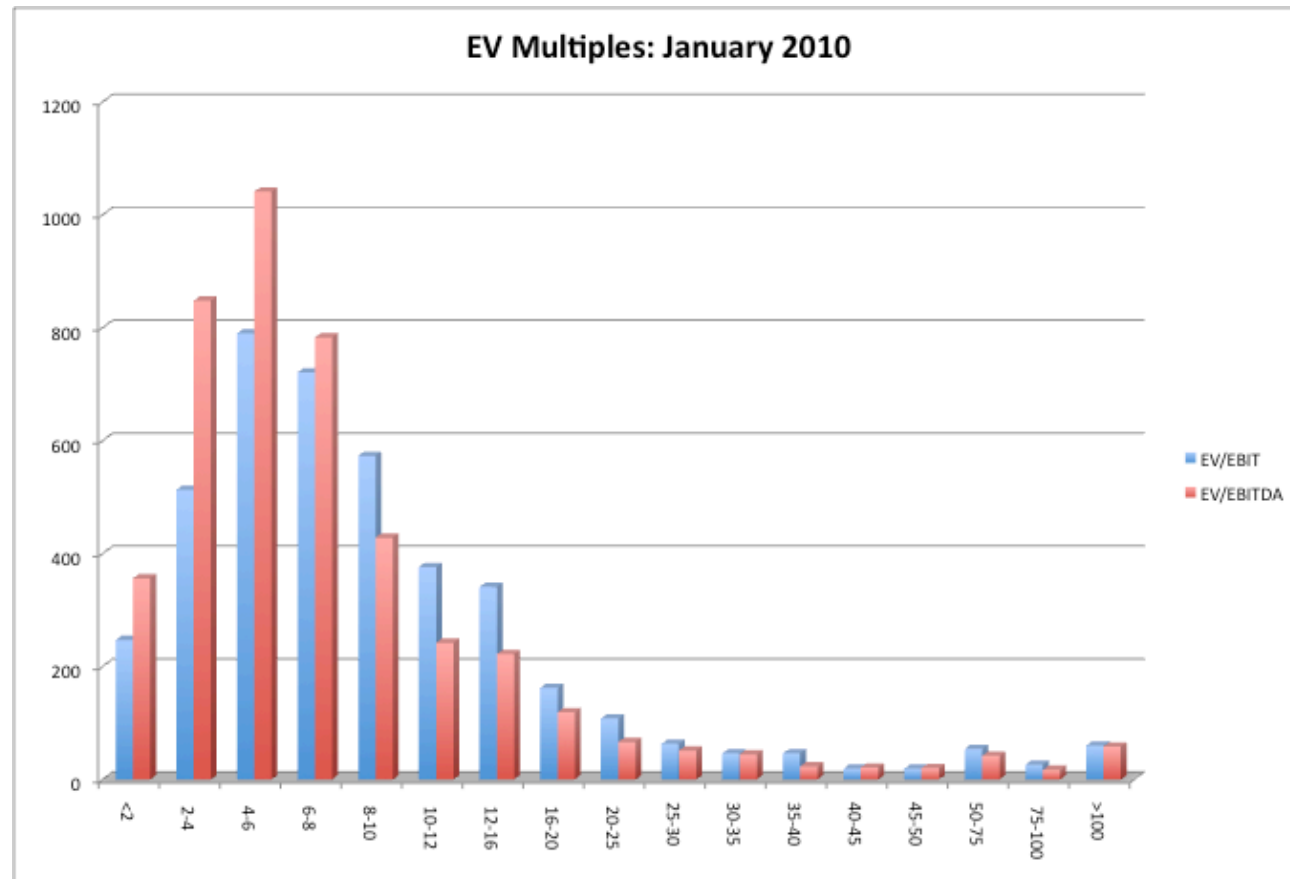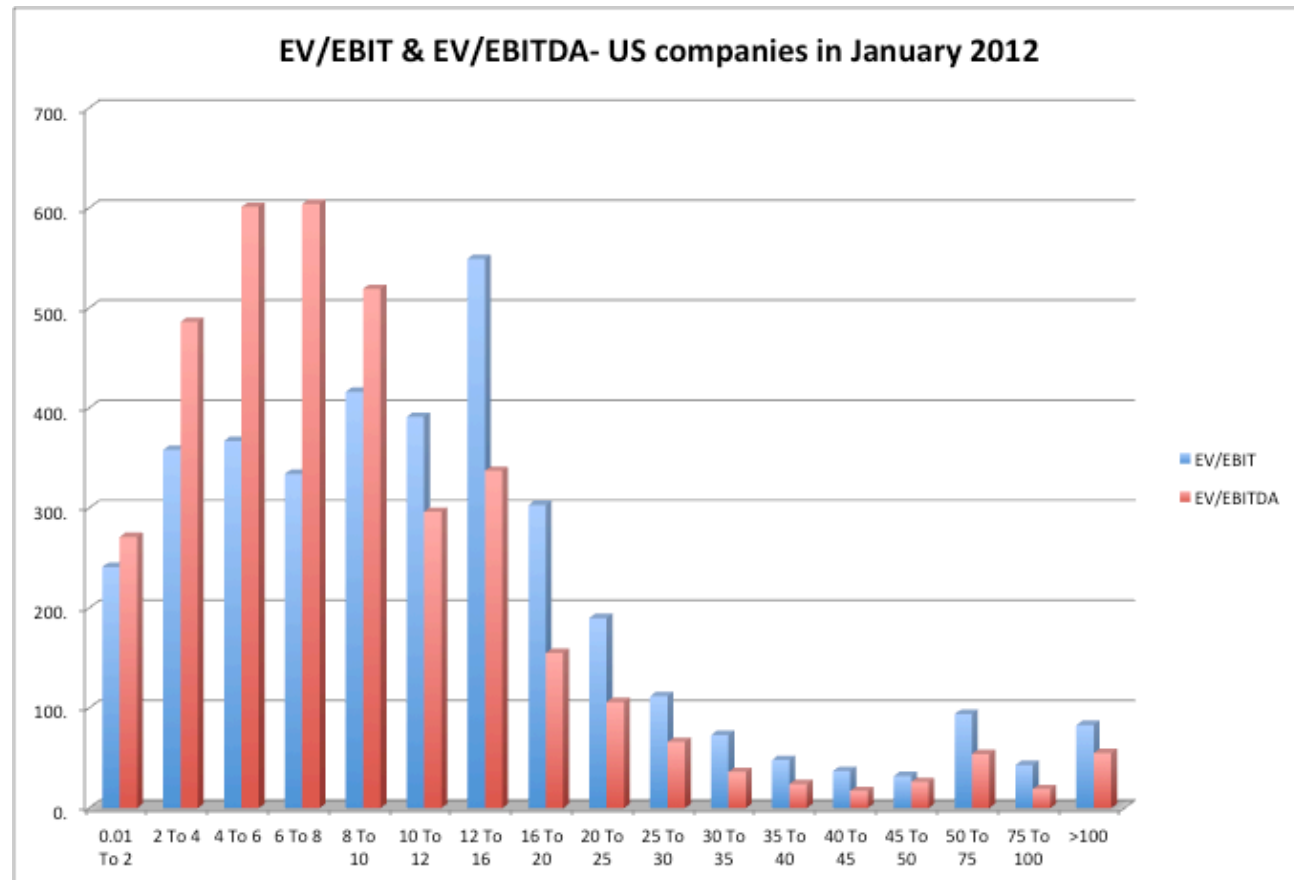
Analytical Tests

- **What are the <u>fundamentals</u> 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 <u>changes in these fundamentals </u>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 <u>equity</u> discounted cash flow model.

- With the dividend discount model,

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

- Dividing both sides by the current earnings per share,

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

- If this had been a FCFE Model,

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

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

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

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

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

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

■ Dividing both sides by the earnings per share:

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

A Simple Example

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

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

■ Riskfree rate = T.Bond Rate = 6%

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

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

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

PE Ratios and Expected Growth: Interest Rate Scenarios
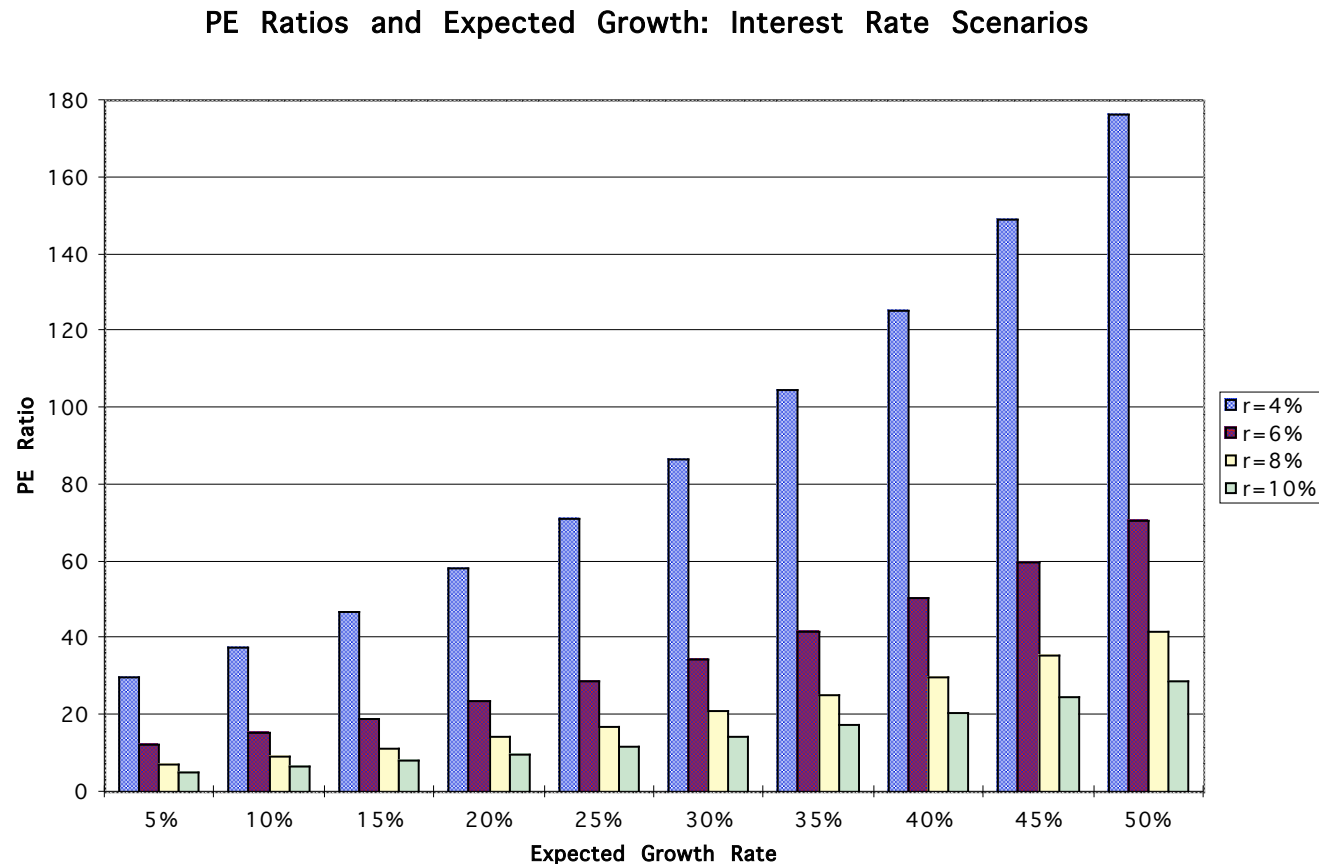
b. PE and Risk: A Follow up Example

PE Ratios and Beta: Growth Scenarios
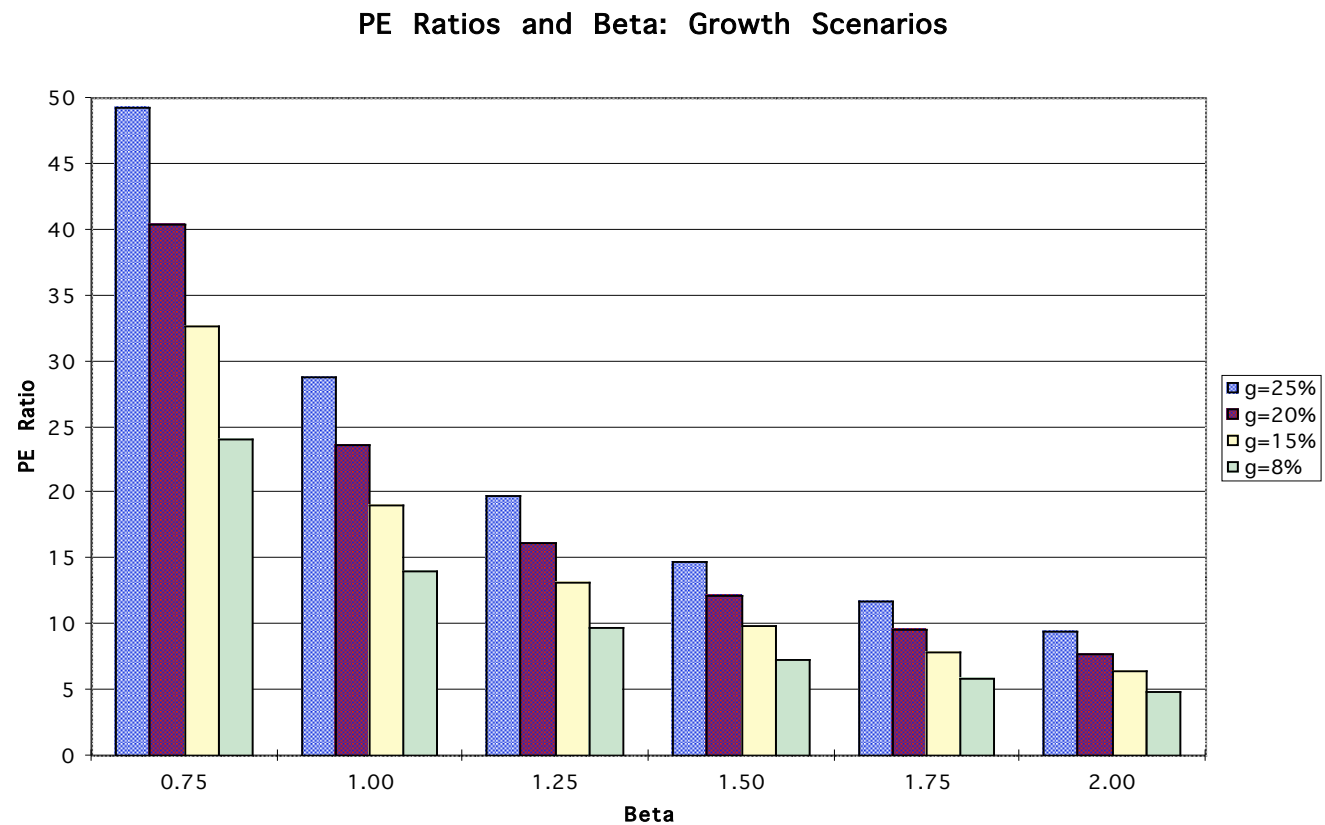
III. Comparisons of PE across time: PE Ratio for the S&P 500

PE on S&P 500 over time: 1960- 2010
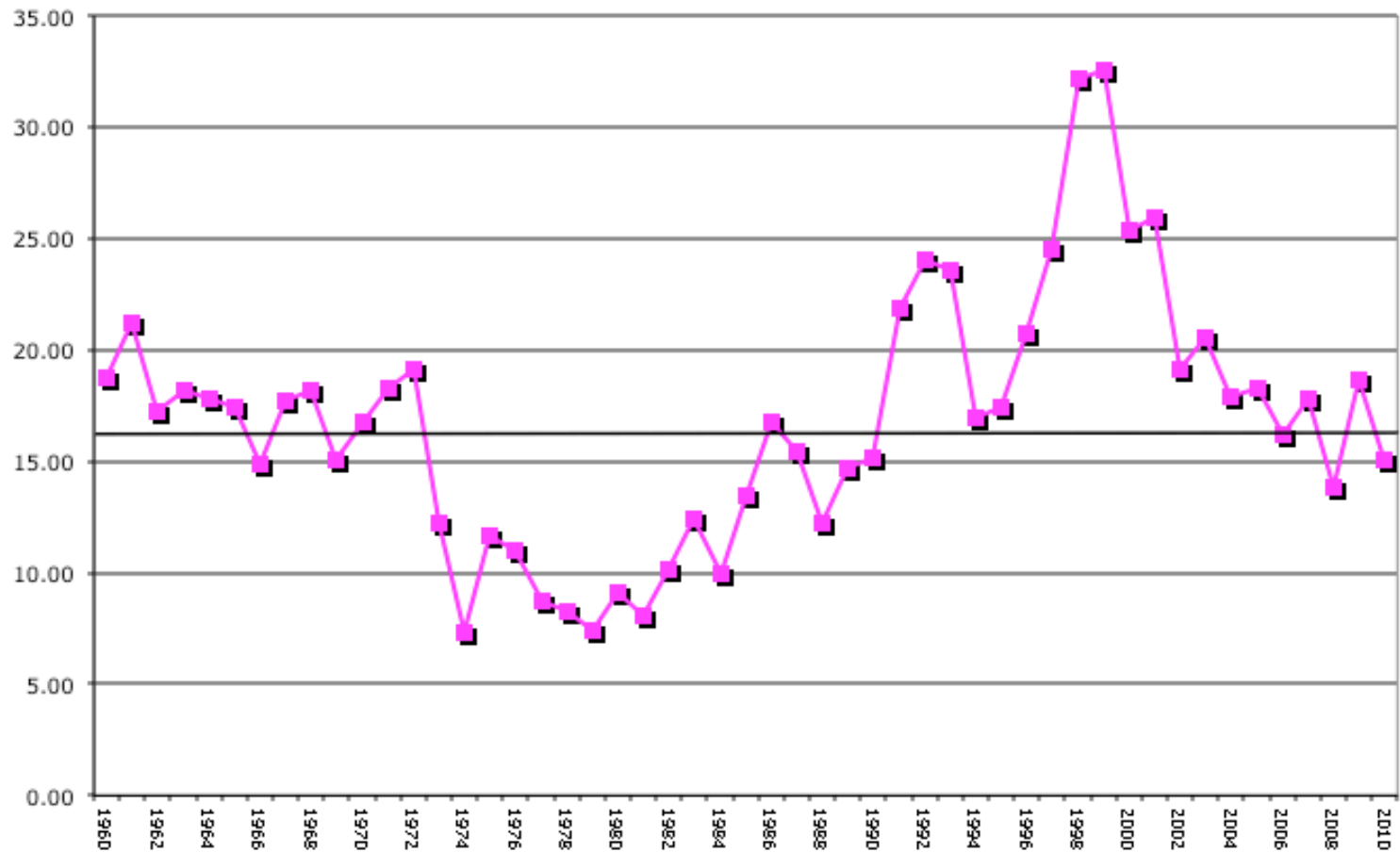
Is low (high) PE cheap (expensive)?

■ A market strategist argues that stocks are expensive because the PE ratio today is high relative to the average PE ratio across time. Do you agree?

❑ Yes

❑ No

■ If you do not agree, what factors might explain the higher PE ratio today?

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

EP Ratios versus Interest rates: US from 1960 -2011
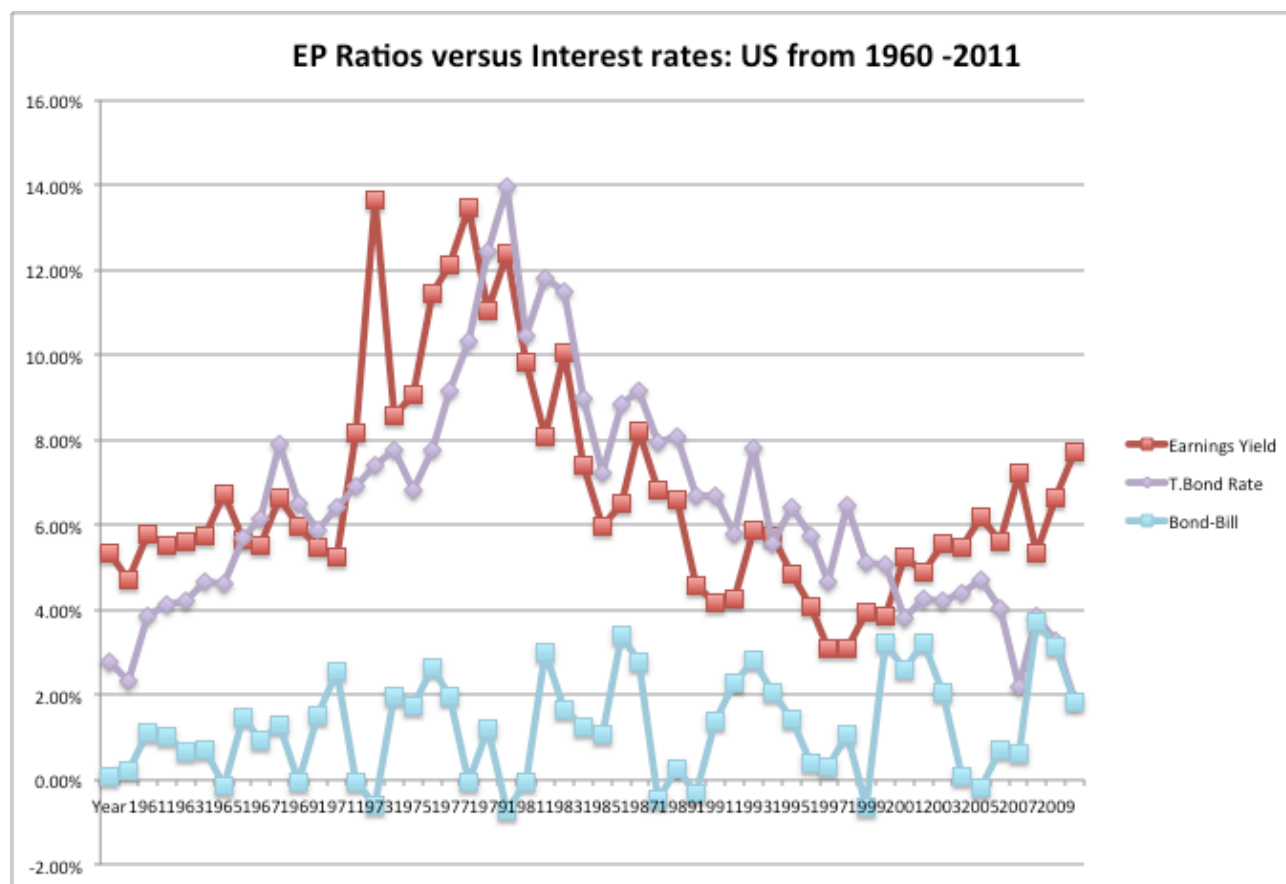
Regression Results

■ There is a strong positive relationship between E/P ratios and T.Bond rates, as evidenced by the correlation of 0.69 between the two variables.,

■ In addition, there is evidence that the term structure also affects the PE ratio.

■ In the following regression, using 1960-2011 data, we regress E/P ratios against the level of T.Bond rates and a term structure variable (T.Bond - T.Bill rate)

E/P = 3.16% + 0.597 T.Bond Rate – 0.213 (T.Bond Rate-T.Bill Rate)
  (3.98)   (5.71)   (-0.92)

R squared = 40.92%

Given the treasury bond rate and treasury bill rate today, is the market under or over valued today?

The Determinants of Multiples…

Value of Stock = DPS $_1$/(k$_e$ - g)

| PE=Payout Ratio (1+g)/(r-g) | PEG=Payout ratio (1+g)/g(r-g) | PBV=ROE (Payout ratio) (1+g)/(r-g) | PS= Net Margin (Payout ratio) (1+g)/(r-g) |

PE=f(g, payout, risk)   PEG=f(g, payout, risk)   PBV=f(ROE,payout, g, risk)   PS=f(Net Mgn, payout, g, risk)

Equity Multiples

Firm Multiples

V/FCFF=f(g, WACC)   V/EBIT(1-t)=f(g, RIR, WACC   V/EBIT=f(g, RIR, WACC, t   VS=f(Oper Mgn, RIR, g, WACC)

| Value/FCFF=(1+g)/ (WACC-g) | Value/EBIT(1-t) = (1+g) (1- RIR)/(WACC-g) | Value/EBIT=(1+g)(1- RiR)/(1-t)(WACC-g) | VS= Oper Margin (1- RIR) (1+g)/(WACC-g) |

Value of Firm = FCFF $_1$/(WACC -g)

Application Tests

■ Given the firm that we are valuing, what is a "comparable" firm?

- While traditional analysis is built on the premise that firms in the same sector are comparable firms, valuation theory would suggest that a comparable firm is one which is similar to the one being analyzed in terms of fundamentals.

- **Proposition 4: There is no reason why a firm cannot be compared with another firm in a very different business, if the two firms have the same risk, growth and cash flow characteristics.**

■ Given the comparable firms, how do we adjust for differences across firms on the fundamentals?

- **Proposition 5: It is impossible to find an exactly identical firm to the one you are valuing.**

I. Comparing PE Ratios across a Sector: PE

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

PE, Growth and Risk

Dependent variable is: PE

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

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

Emerging Market is a dummy: 1 if emerging market

0 if not

Is Telebras under valued?

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

II. Price to Book vs ROE: Largest Market Cap Firms in the United States: January 2010
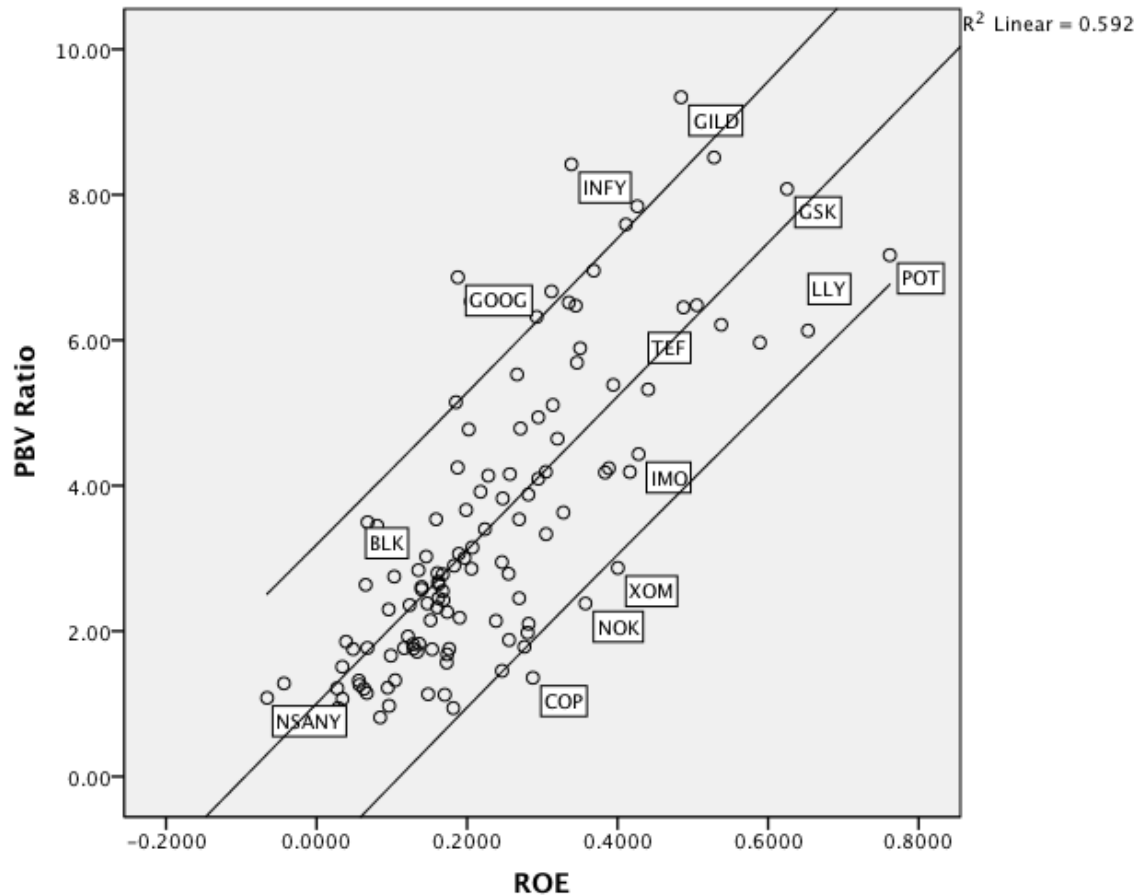
Missing growth?
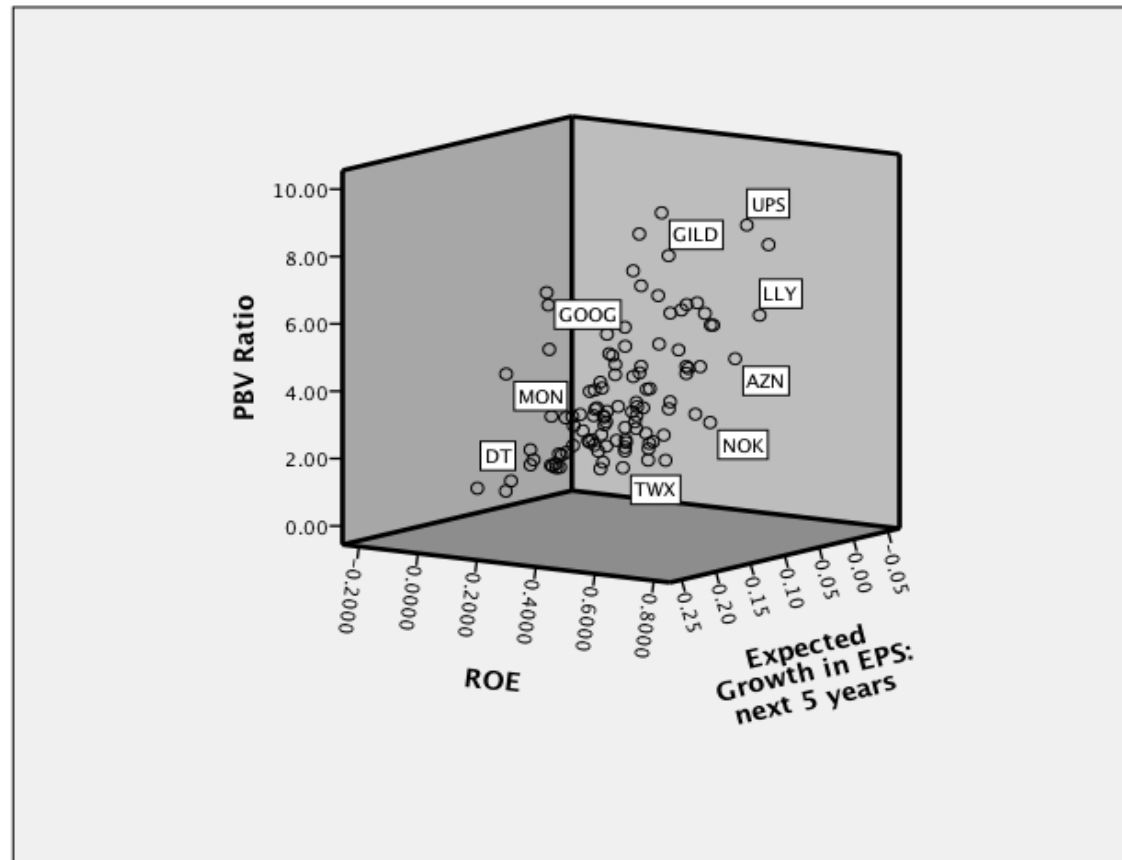
PBV, ROE and Risk: Large Cap US firms
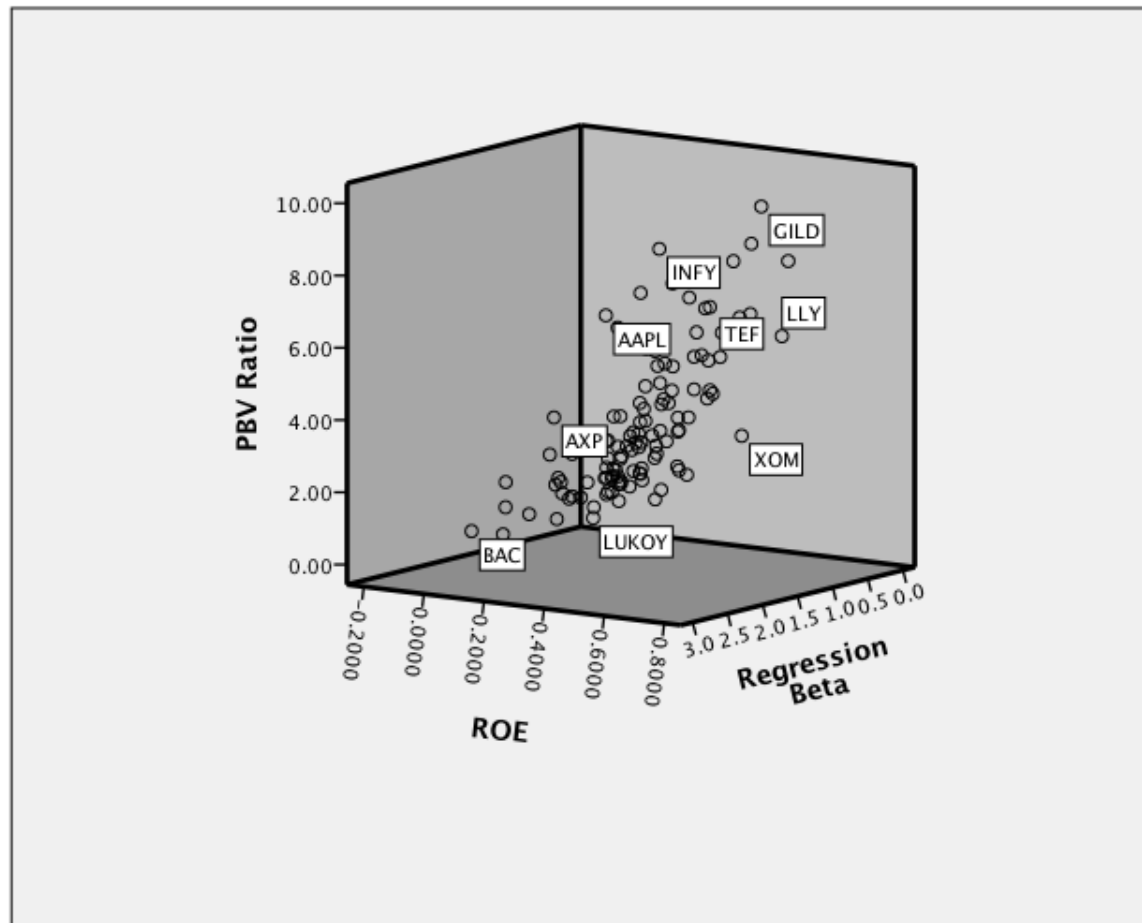
al

Bringing it all together… Largest US stocks

Model Summary

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

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

Coefficients[a]

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

a. Dependent Variable: PBV Ratio

Updated PBV Ratios – Largest Market Cap US companies
Updated to January 2011
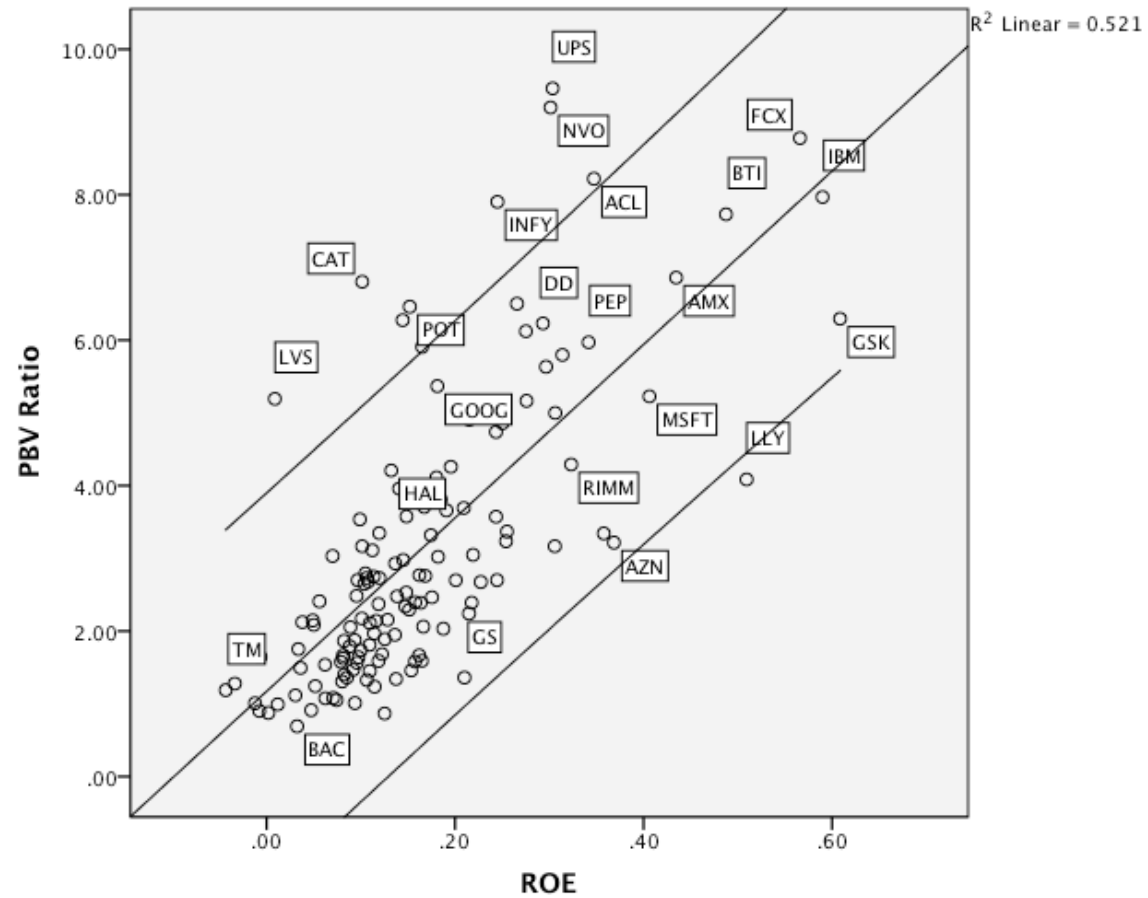
III. Value/EBITDA Multiple: Trucking Companies

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

A Test on EBITDA

■ Ryder System looks very cheap on a Value/EBITDA multiple basis, relative to the rest of the sector. What explanation (other than misvaluation) might there be for this difference?
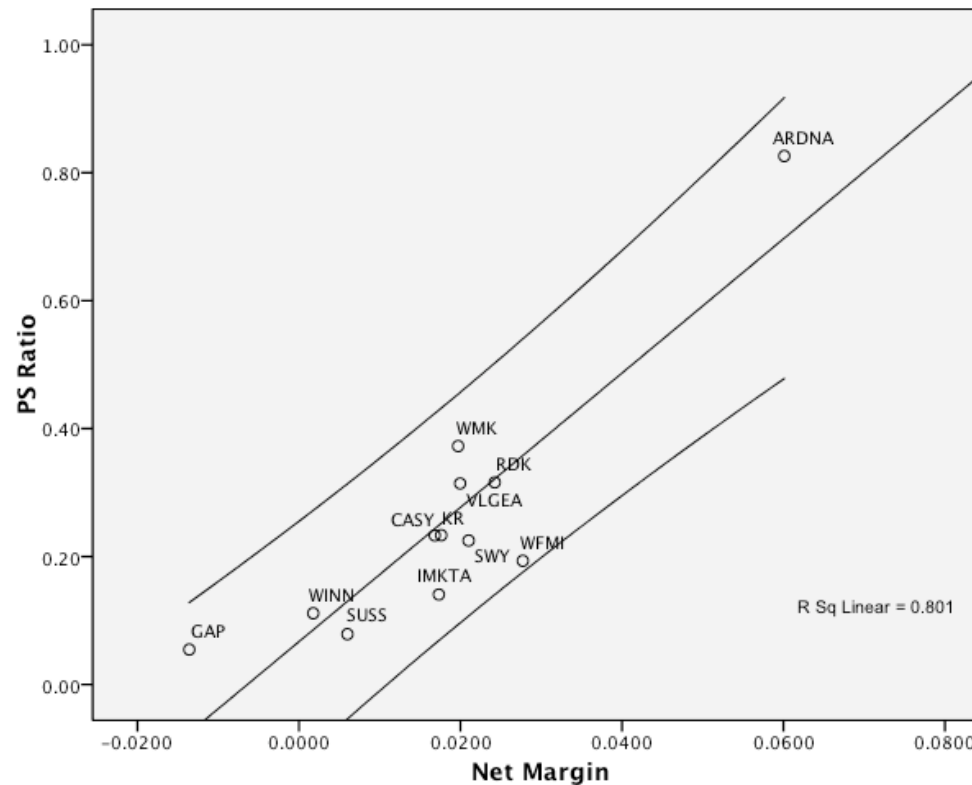
IV: Price to Sales Multiples: Grocery Stores - US in January 2007
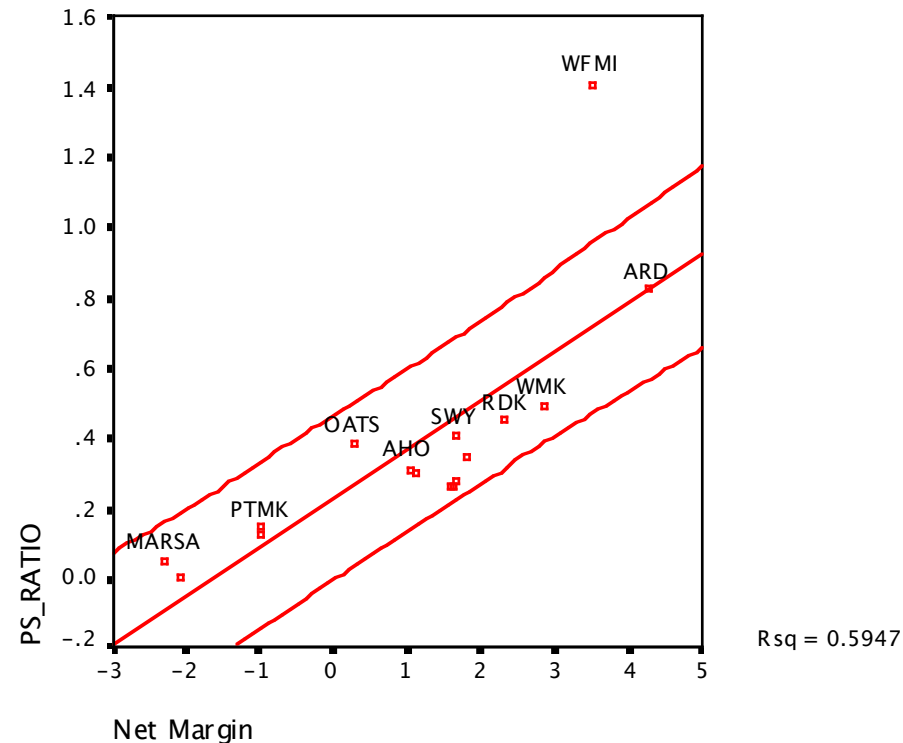
Whole Foods: In 2007: Net Margin was 3.41% and Price/ Sales ratio was 1.41

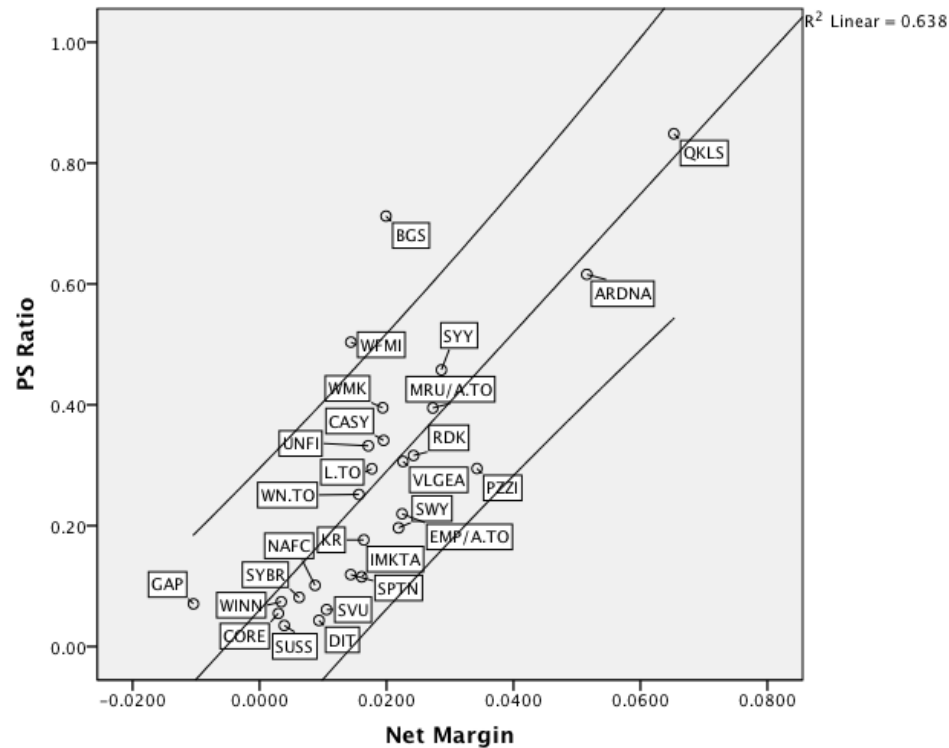*Predicted Price to Sales = 0.07 + 10.49 (0.0341) = 0.43*

Reversion to normalcy: Grocery Stores - US in January 2009

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

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

And again in 2010..

Whole Foods: In 2010, Net Margin had dropped to 1.44% and Price to Sales ratio increased to 0.50. Predicted Price to Sales = 0.06 + 11.43 (.0144) = 0.22

Here is 2011…
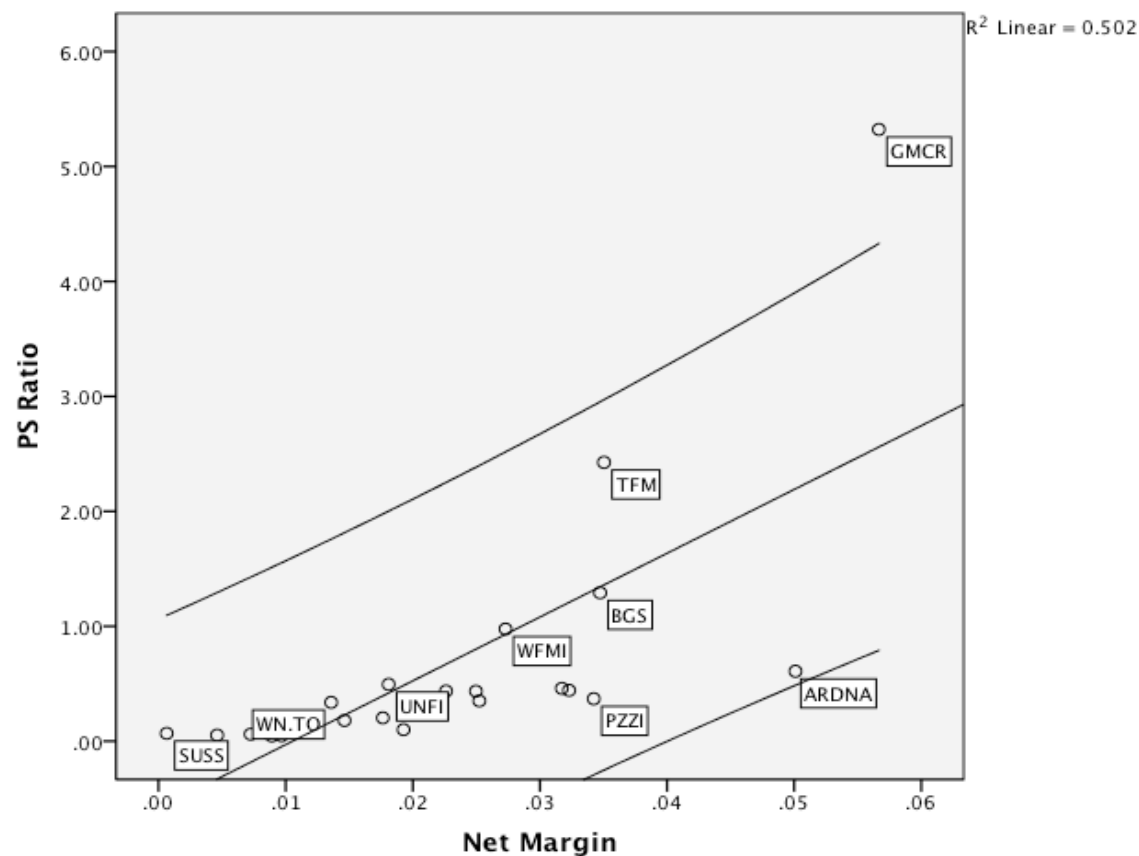
$$PS\ Ratio = -0.585 + 55.50\ (Net\ Margin) \qquad R^2 = 48.2\%$$
$$PS\ Ratio\ for\ WFMI = -0.585 + 55.50\ (.0273) = 0.93$$
At a PS ratio of 0.98, WFMI is slightly over valued.
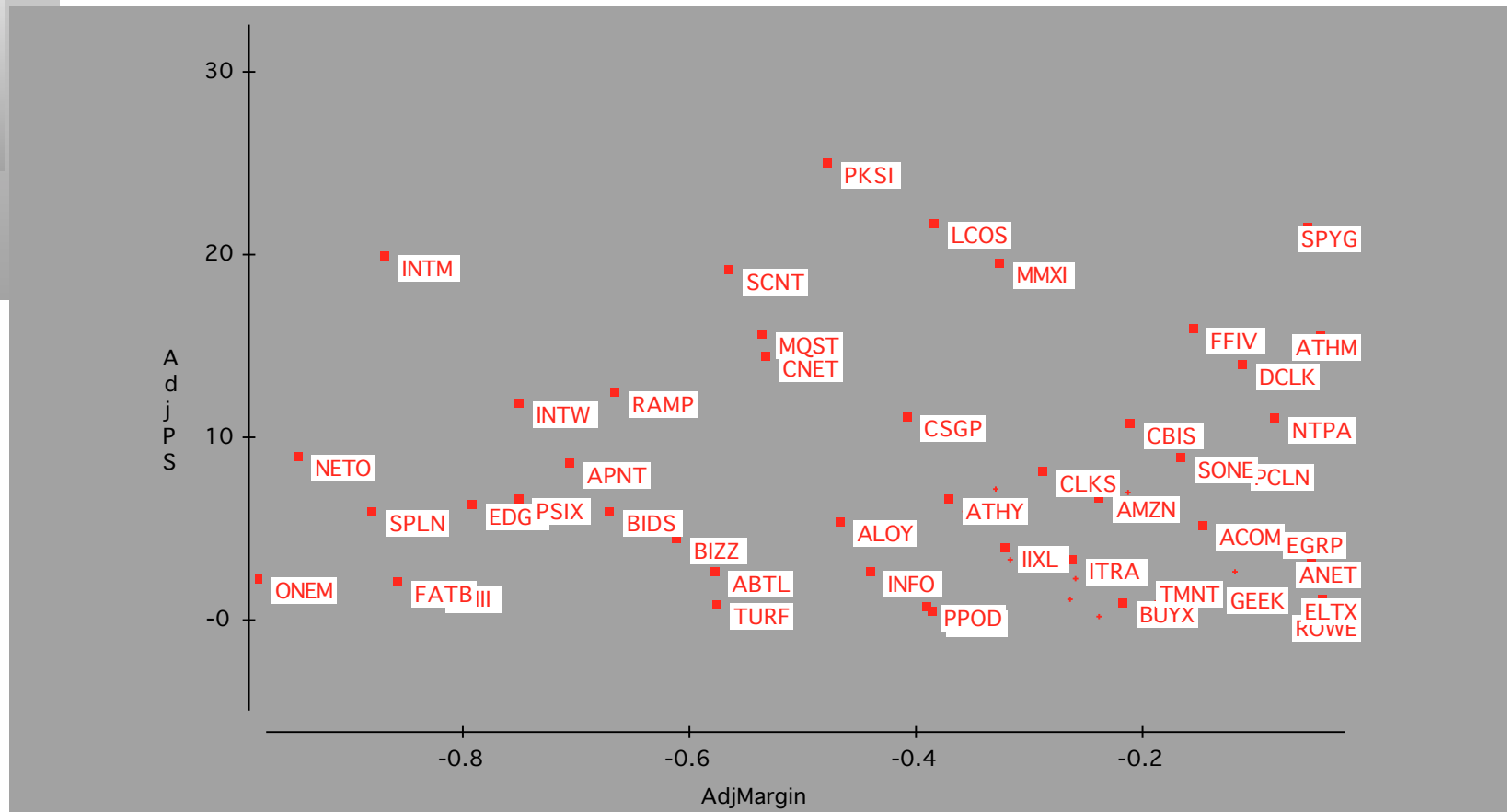
PS Ratios and Margins are not highly correlated

■ Regressing PS ratios against current margins yields the following

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

　　　　　　　　　　　　(0.49)

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

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

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

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

　　　　　　　　　(0.66)　　　　　　(2.63)　　　　　　(3.49)

R squared = 31.8%

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

Actual PS = 25.63

Stock is undervalued, relative to other internet stocks.

Solution 2: Use forward multiples

- Global Crossing lost $1.9 billion in 2001 and is expected to continue to lose money for the next 3 years. In a discounted cashflow valuation (see notes on DCF valuation) of Global Crossing, we estimated an expected EBITDA for Global Crossing in five years of $ 1,371 million.

- The average enterprise value/ EBITDA multiple for healthy telecomm firms is 7.2 currently.

- Applying this multiple to Global Crossing's EBITDA in year 5, yields a value in year 5 of

  - Enterprise Value in year 5 = 1371 * 7.2 = $9,871 million
  - Enterprise Value today = $ 9,871 million/ 1.138^5 = $5,172 million

  (The cost of capital for Global Crossing is 13.80%)

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

Comparisons to the entire market: Why not?

■ In contrast to the 'comparable firm' approach, the information in the entire cross-section of firms can be used to predict PE ratios.

■ The simplest way of summarizing this information is with a multiple regression, with the PE ratio as the dependent variable, and proxies for risk, growth and payout forming the independent variables.

PE versus Expected EPS Growth: January 2012
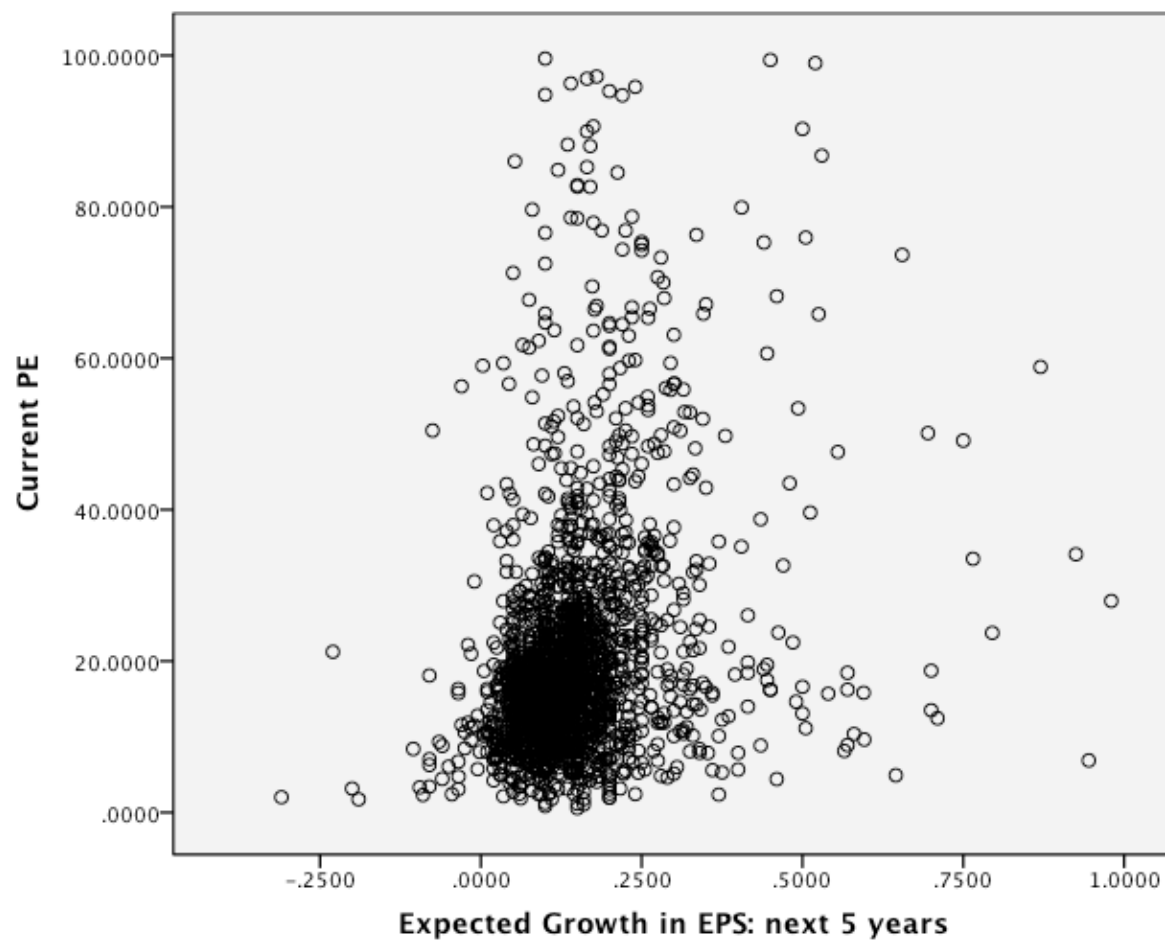
PE Ratio: Standard Regression for US stocks - January 2011

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.340[a]	.116	.114	1068.79044

a. Predictors: (Constant), Payout Ratio, 3–yr Regression Beta, Expected Growth in EPS: next 5 years

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.477	.760		17.734	.000
	Expected Growth in EPS: next 5 years	40.841	2.627	.354	15.545	.000
	3–yr Regression Beta	−2.006	.499	−.092	−4.023	.000
	Payout Ratio	2.881	.992	.066	2.905	.004

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

The value of growth

Time Period	PE Value of extra 1% of growth	Equity Risk Premium
January 2012	0.408	6.04%
January 2011	0.836	5.20%
January 2010	0.550	4.36%
January 2009	0.780	6.43%
January 2008	1.427	4.37%
January 2007	1.178	4.16%
January 2006	1.131	4.07%
January 2005	0.914	3.65%
January 2004	0.812	3.69%
January 2003	2.621	4.10%
January 2002	1.003	3.62%
January 2001	1.457	2.75%
January 2000	2.105	2.05%

Fundamentals hold in every market: PBV regressions across markets- January 2012

Region	Regression – January 2012	R squared
Australia, NZ & Canada	PBV = 0.90 + 0.92 Payout – 0.18 Beta + 5.43 ROE	38.6%
Europe	PBV = 1.14 + 0.76 Payout – 0.67 Beta + 7.56 ROE	47.2%
Japan	PBV = 1.21 + 0.67 Payout – 0.40 Beta + 3.26 ROE	22.1%
Emerging Markets	PBV = 0.77 + 1.16 Payout – 0.17 Beta + 5.78 ROE	20.8%
US	PBV = 1.30 + 0.06 Payout – 0.32 Beta + 9.56 ROE	52.7%

Relative Valuation: Some closing propositions

■ Proposition 1: In a relative valuation, all that you are concluding is that a stock is under or over valued, relative to your comparable group.

  • Your relative valuation judgment can be right and your stock can be hopelessly over valued at the same time.

■ Proposition 2: In asset valuation, there are no similar assets. Every asset is unique.

  • If you don't control for fundamental differences in risk, cashflows and growth across firms when comparing how they are priced, your valuation conclusions will reflect your flawed judgments rather than market misvaluations.

Choosing Between the Multiples

- As presented in this section, there are dozens of multiples that can be potentially used to value an individual firm.

- In addition, relative valuation can be relative to a sector (or comparable firms) or to the entire market (using the regressions, for instance)

- Since there can be only one final estimate of value, there are three choices at this stage:

  - Use a simple average of the valuations obtained using a number of different multiples

  - Use a weighted average of the valuations obtained using a nmber of different multiples

  - Choose one of the multiples and base your valuation on that multiple

Picking one Multiple

■ This is usually the best way to approach this issue. While a range of values can be obtained from a number of multiples, the "best estimate" value is obtained using one multiple.

■ The multiple that is used can be chosen in one of two ways:
  • Use the multiple that <u>best fits your objective</u>. Thus, if you want the company to be undervalued, you pick the multiple that yields the highest value.
  • Use the multiple that <u>has the highest R-squared</u> 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 <u>make the most sense</u> for that sector, given how value is measured and created.

A More Intuitive Approach

■ Managers in every sector tend to focus on specific variables when analyzing strategy and performance. The multiple used will generally reflect this focus. Consider three examples.

- In retailing: The focus is usually on same store sales (turnover) and profit margins. Not surprisingly, the revenue multiple is most common in this sector.

- In financial services: The emphasis is usually on return on equity. Book Equity is often viewed as a scarce resource, since capital ratios are based upon it. Price to book ratios dominate.

- In technology: Growth is usually the dominant theme. PEG ratios were invented in this sector.

Conventional usage…

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

Reviewing: The Four Steps to Understanding Multiples

- **Define the multiple**
  - Check for consistency
  - Make sure that they are estimated uniformly

- **Describe the multiple**
  - Multiples have skewed distributions: The averages are seldom good indicators of typical multiples
  - Check for bias, if the multiple cannot be estimated

- **Analyze the multiple**
  - Identify the companion variable that drives the multiple
  - Examine the nature of the relationship

- **Apply the multiple**

Back to Lemmings...

WHAT LEMMINGS BELIEVE