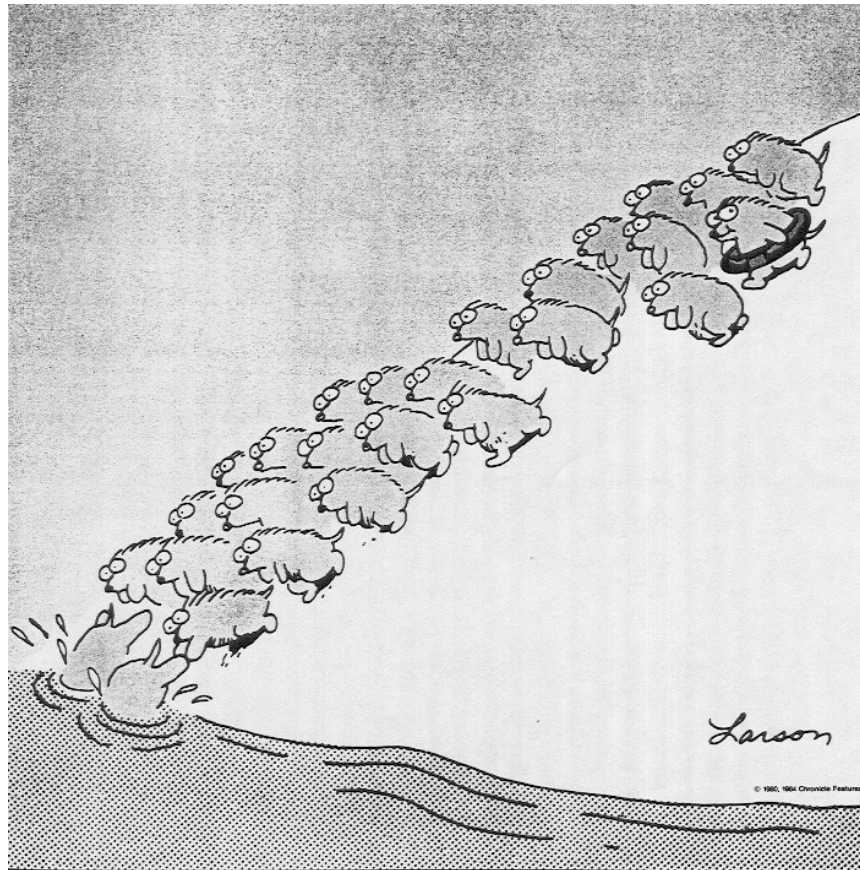# ~~Advanced~~ Valuation

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.
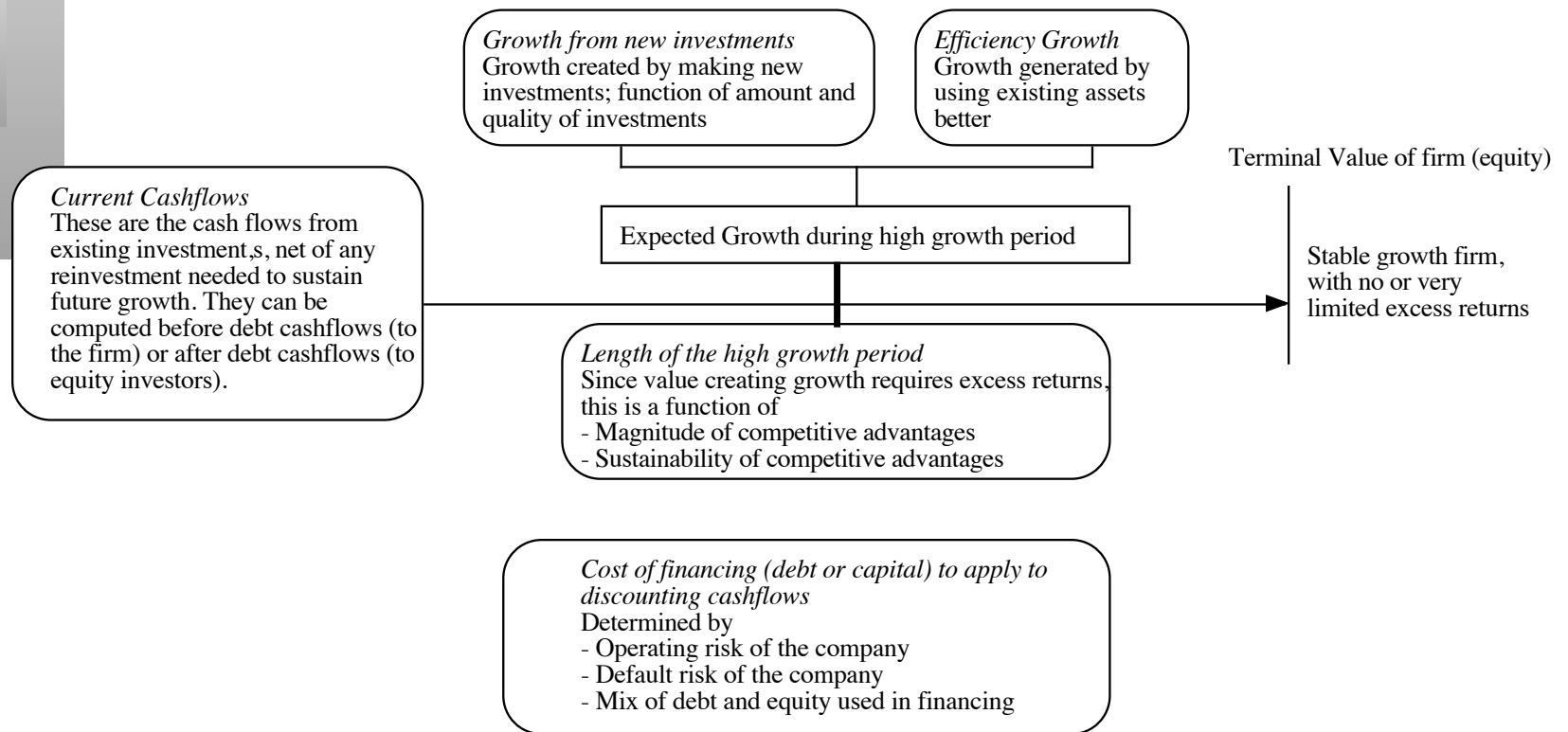
DCF Choices: Equity Valuation versus Firm Valuation

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

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

Terminal Value of firm (equity)

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 |

Isagen: Status Quo (7/2010)

Current Cashflow to Firm
EBIT(1-t) :   COP 347,755
- Nt CpX   COP 190,039
- Chg WC   COP   15,590
= FCFF   COP   142,127
Reinv Rate = (190,039+15,590)
/347,753= 59.1%
ROC in 2009= 10.27%

Reinvestment Rate
60%

Average: 2005-09

Return on Capital
10.72%

Expected Growth in EBIT (1-t)
..60*.1072=0.0643
6.43%

Stable Growth
g = 5%; Beta = 0.80
Country Premium= 2%
Cost of capital = 10.02%
ROC= 10.02%;
Reinvestment Rate=g/ROC
=5/ 10.02 = 49.9%

Terminal Value$_5$=256.2(.1002-.05) = 4,849

Cashflows

Op. Assets COP 3644
+ Cash: 906
- Debt   1102
- Minor. Int.   0
=Equity   3448

Value/Share COP 1265

Year	1	2	3	4	5
EBIT (1-t)	COP 370.1	COP 393.9	COP 419.3	COP 446.2	COP 474.9
- Reinvestment	COP 222.1	COP 236.4	COP 251.6	COP 267.7	COP 285.0
FCFF	COP 148.0	COP 157.6	COP 167.7	COP 178.5	COP 190.0

498.7
242.5
256.2

49.9%
of 498.7

Discount at $ Cost of Capital (WACC) = 10.80% (.849) + 5.43% (0.151) = 9.99%

In July 2010, Isagen was trading at 2,265 COP/share.

**Cost of Equity
10.80%**

Cost of Debt
(5.35%+ 2%+ 0.75%)(1-.33)
= 5.43%

Weights
E = 84.9% D = 15.1%

Riskfree Rate:
Riskfree Rate= 5.35%

+

Beta
0.60

X

Mature market premium
4.5%

+

Lambda
1.10

X

Country Equity Risk Premium
2.50%

Unlevered Beta for Sectors: 0.535

Firm's D/E Ratio: 17.84%

Country Default Spread
2%

X

Rel Equity Mkt Vol
1.25

Cementos Pacasmayo: $ in 2009

Return on Capital
16.45%

Stable Growth
g = 3.5%; Beta = 1.00
Country Premium= 2.5%
Cost of capital = 11.55%
ROC= 11.55%;
Reinvestment Rate=g/ROC
=3.5/ 11.55= 30.30%

Reinvestment Rate
48.2%

Expected Growth in EBIT (1-t)
..482*.1645=0.0793
7.93%

Current Cashflow to Firm
EBIT(1-t) :	PEN 112.35
- Nt CpX	PEN 49.50
- Chg WC	PEN 4.65
= FCFF	PEN 58.20
PEN/ US $	3.23

Reinv Rate = (49.5+4.65)/112.35 = 48.2%

Terminal Value$_5$= 33.14(.1155-.035) = $411.6

Op. Assets $289.06
+ Cash:	12.06
- Debt	77.04
- Minor. Int.	0.60
=Equity	$223.48
Exchange	3.01
Equity	PEN 672.67
Value/Share PEN 1.60	

$ Cashflows

Year	1	2	3	4	5	
EBIT (1-t)	PEN 121	PEN 131	PEN 141	PEN 152	PEN 165	170.30
- Reinvestment	PEN 58	PEN 63	PEN 68	PEN 73	PEN 79	51.60
FCFF	PEN 63	PEN 68	PEN 73	PEN 79	PEN 85	118.70
Exchange rate	3.10	3.19	3.28	3.38	3.48	3.58
FCFF (In US $)	$20.27	$21.26	$22.29	$23.37	$24.50	$ 33.14

Discount at $ Cost of Capital (WACC) = 15.48% (.849) + 5.95 (0.151) = 14.04%

Expected inflation
US = 2%
Peru= 5%

Cost of Equity
15.48%

Cost of Debt
(3.5%+ 2.5%+ 2.5%)(1-.30)
= 5.95%

Weights
E = 84.9% D = 15.1%

On July 1, 2009
Cementos Price = PEN 3.01

Riskfree Rate:
$ Riskfree Rate= 3.5%

+

Beta
1.15

X

Mature market premium
6%

+

Lambda
1.22

X

Country Equity Risk Premium
4.17%

Unlevered Beta for Sectors: 1.02

Firm's D/E Ratio: 17.8%

Country Default Spread
2.5%

X

Rel Equity Mkt Vol
1.67
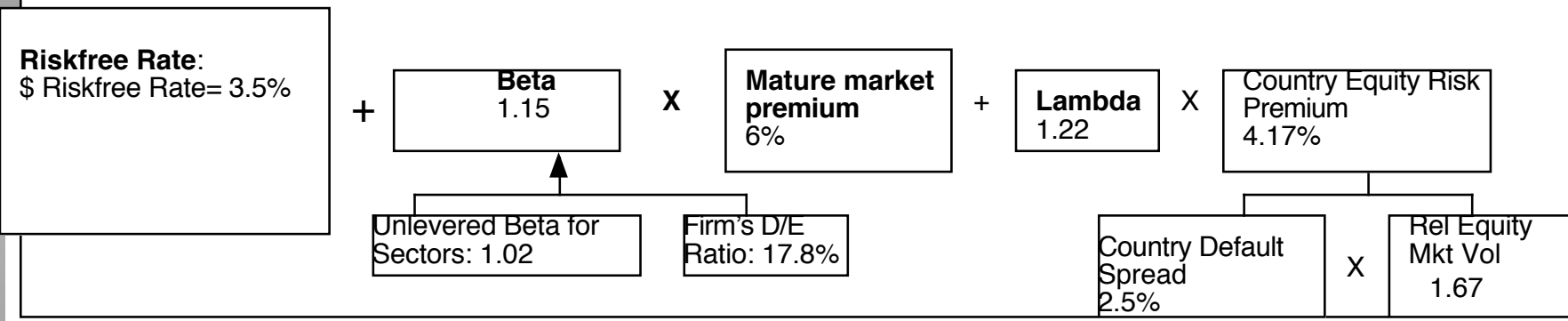
Kristin's Kandy: Valuation in March 2006

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

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

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

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

1/3 of risk is
market risk

X

Risk Premium
4.00%

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%

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

Stable Growth

| Current Revenue $ 1,117 | Current Margin: -36.71% | | | Stable Revenue Growth: 6% | Stable Operating Margin: 10.00% | Stable ROC=20% Reinvest 30% of EBIT(1-t) |

EBIT -410m

NOL: 500 m

Sales Turnover Ratio: 3.00

Competitive Advantages

Revenue Growth: 42%

Expected Margin: -> 10.00%

Terminal Value= 1881/(.0961-.06) =52,148

			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

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

	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

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

Cost of Equity 12.90%

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

Weights
Debt= 1.2% -> 15%

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
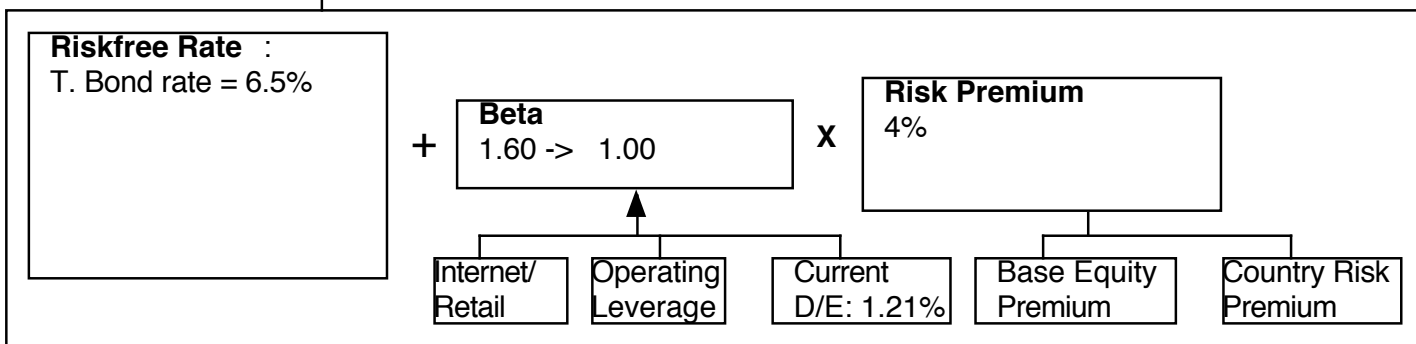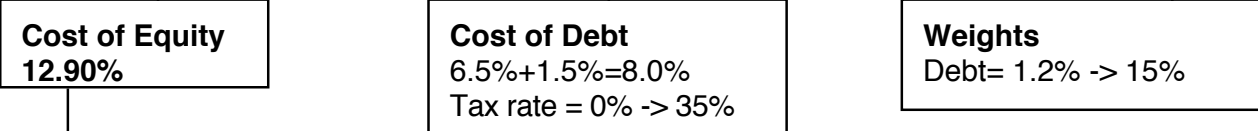
**Amazon.com
January 2000
Stock Price = $ 84**

I. Choose a currency… and a riskfree rate..

*The riskfree rate is what you can earn on a long term, default free investment in that currency.*

■ In US dollars…

- The ten-year US treasury bond rate is the riskfree rate. In July 2010, it was priced to yield 2.5%.
- In July 2010, the Colombian government had 10-year US dollar denominated bonds that were priced to yield 4%. Why should this not be used as the riskfree rate? (The Colombian foreign currency rating was Ba1)

■ In Colombian pesos

- The ten-year peso-denominated Colombian government bond was priced to yield about 7.35% in August 2010.
- The Colombian government has a local currency rating of Baa3. The default spread on Baa3 rated sovereign bonds is approximately 2%.
- Riskfree rate in Pesos= 7.35% -2% = 5.35%

Comparing Risk free rates…
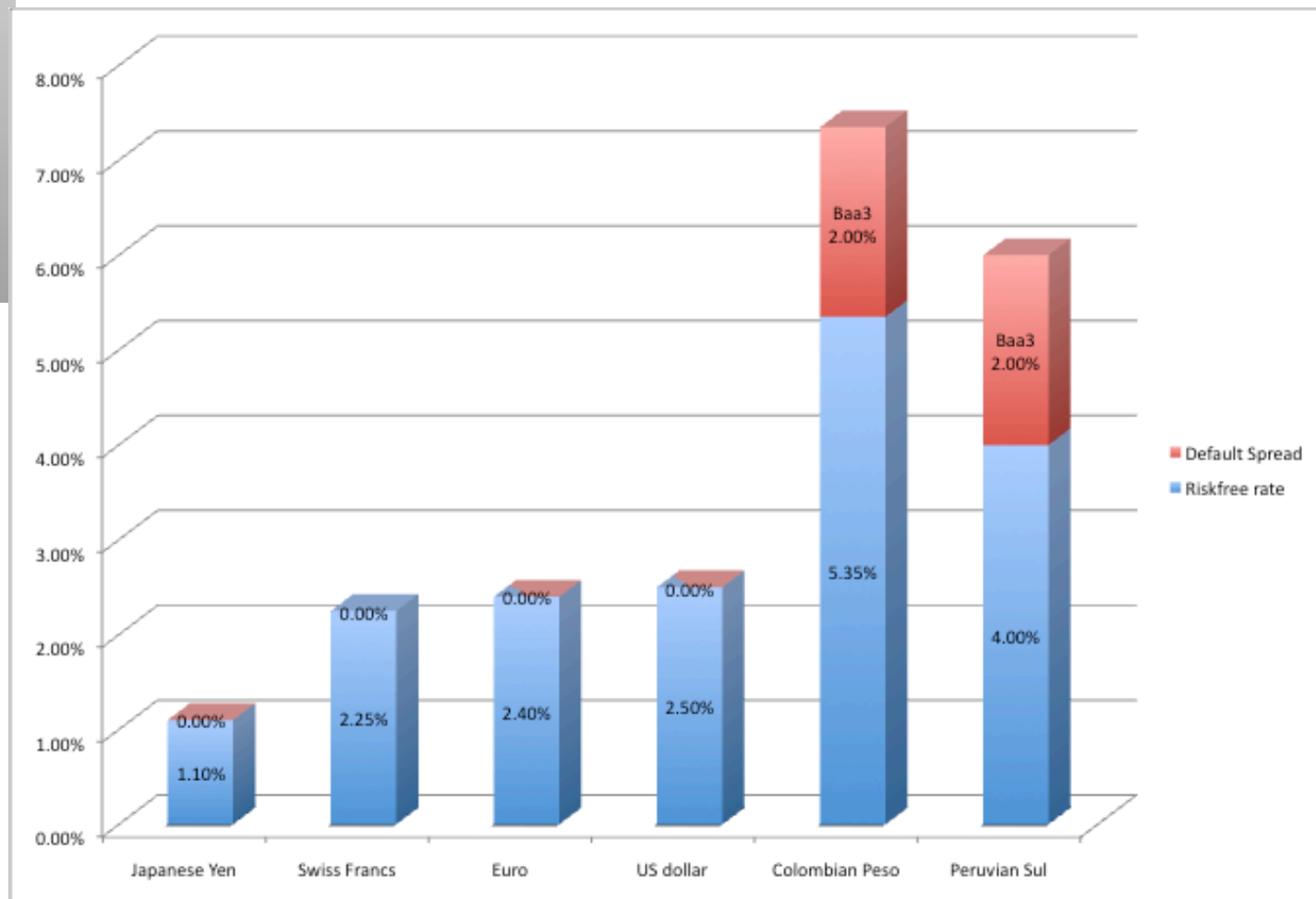
Estimating Default Spreads…

■ Direct Measures of Default Spreads

- Compare the interest rate on a dollar denominated bond issued by the country with the treasury bond rate.

  Default spread = Interest rate on $ denominated bond – Treasury bond rate

- Credit Default Swap (CDS) prices
- A default spread based upon the sovereign rating for the country

■ For Colombia,

- Default Spread on dollar denominated bond = 4% - 2.5% = 1.5%
- CDS spread on August 1, 2010 for 10-year Colombian CDS = 1.48%
- Bond rating: Ba1 for $ denominated bonds, Baa3 for local currency bonds
  - Default spread based on Baa3 rating (for local currency) = 2%

To make your valuations currency invariant, be consistent..

■ **To convert cash flows**
- Estimate expected exchange rates (ER), using purchasing power parity.

$$ER_t = \text{Spot rate}_{LC,\$}\ \frac{(1 + \text{Inflation rate}_{\text{Local currency}})}{(1 + \text{Inflation rate}_{US\,\$})}$$

- Convert expected cash flows, using expected exchange rates into currency of choice.

■ **To convert discount rates**
- Adjust discount rates using same expected inflation rate difference:

$$r_{LC} = (1 + r_{\$})\frac{(1 + \text{Inflation rate}_{\text{Local currency}})}{(1 + \text{Inflation rate}_{US\,\$})} - 1$$

Cementos Pacasmayo: PEN in 2009

Current Cashflow to Firm
EBIT(1-t) :   PEN 112.35
- Nt CpX   PEN   49.50
- Chg WC   PEN   4.65
= FCFF   PEN   58.20
PEN/ US $ 3.23
Reinv Rate = (49.5+4.65)/112.35
= 48.2%

Reinvestment Rate
48.2%

Return on Capital
16.45%

**Expected Growth
in EBIT (1-t)**
..482*.1645=0.0793
7.93%

Stable Growth
g = 6.54%; Beta = 1.00
Country Premium= 2.5%
Cost of capital = 14.83%
ROC= 14.83%;
Reinvestment Rate=g/ROC
=6.54/ 14.83= 30.30%

Terminal Value5= 118.7(.1483-.0654) = 1,432

Op. Assets   870.07
+ Cash: 36.30
- Debt   231.09
- Minor. Int.   1.80
=Equity   672.67
Value/Share PEN 1.60

$ Cashflows

Year	1	2	3	4	5	
EBIT (1-t)	PEN 121	PEN 131	PEN 141	PEN 152	PEN 165	170.30
- Reinvestment	PEN 58	PEN 63	PEN 68	PEN 73	PEN 79	51.60
FCFF	PEN 63	PEN 68	PEN 73	PEN 79	PEN 85	118.70

PEN Cost of Capiital = (1.1404) (1.05/1.02) -1 = 17.39%

$ Cost of Capital (WACC) = 15.48% (.849) + 5.95 (0.151) = 14.04%

Expected inflation
US = 2%
Peru= 5%

**Cost of Equity
15.48%**

Cost of Debt
(3.5%+ 2.5%+ 2.5%)(1-.30)
= 5.95%

Weights
E = 84.9% D = 15.1%

On July 1, 2009
Cementos Price = PEN 3.01

Riskfree Rate:
$ Riskfree Rate= 3.5%

+

Beta
1.15

X

**Mature market
premium**
6%

+

Lambda
1.22

X

Country Equity Risk
Premium
4.17%

Unlevered Beta for
Sectors: 1.02

Firm's D/E
Ratio: 17.8%

Country Default
Spread
2.5%

X

Rel Equity
Mkt Vol
1.67

Aswath Damodaran

17

II. Measure earnings right..

		Operating leases	R&D Expenses
Firm's history	**Comparable Firms**	- Convert into debt - Adjust operating income	- Convert into asset - Adjust operating income

Normalize Earnings

Cleanse operating items of
- Financial Expenses
- Capital Expenses
- Non-recurring expenses

Measuring Earnings

Update
- Trailing Earnings
- Unofficial numbers
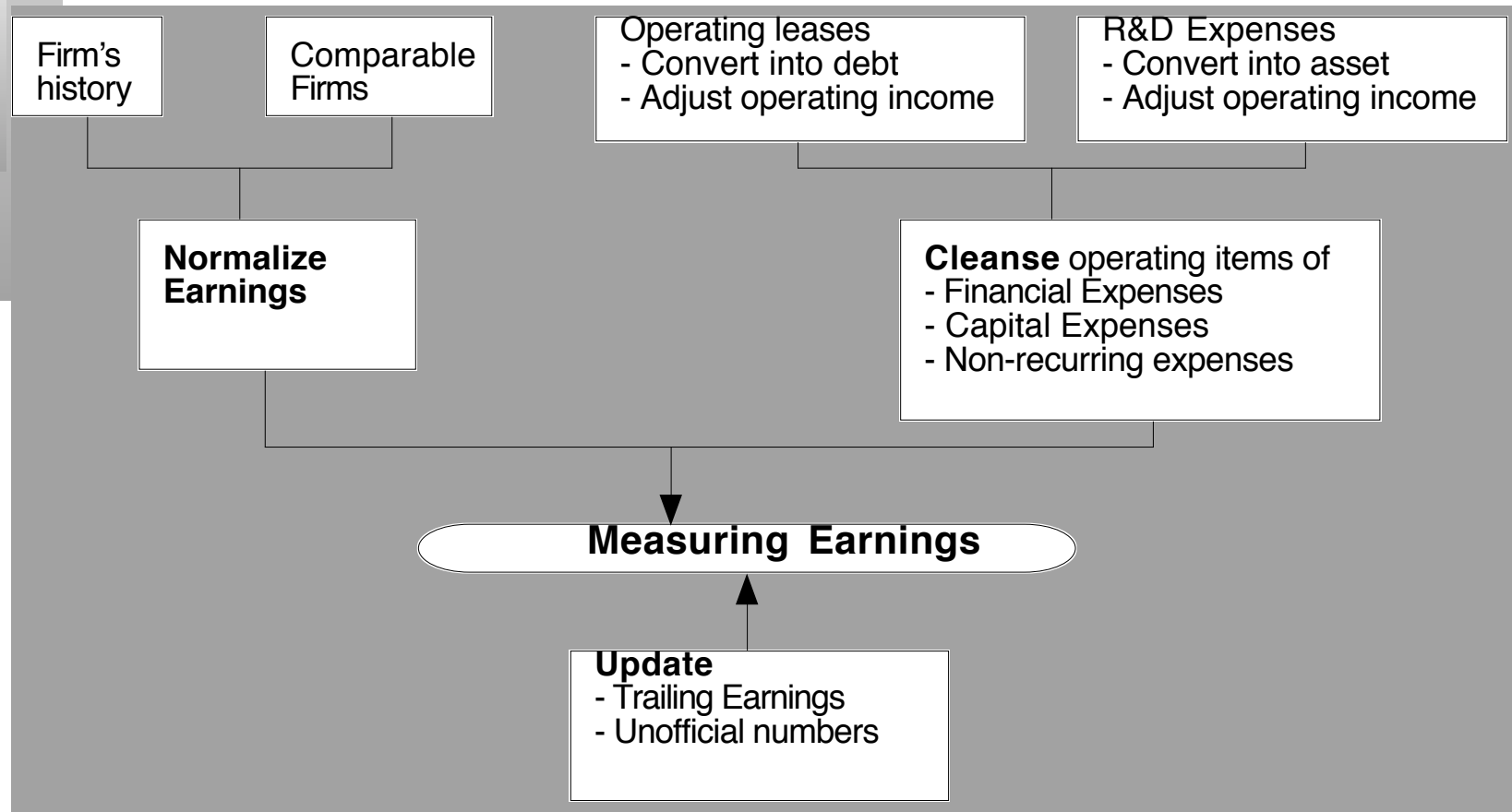
A. Normalizing Earnings: Sociedad Minera Peruvian Copper Mining Company

	2004	2005	2006	2007	2008
Revenues	$295	$359	$668	$1,795	$1,840
EBIT	$140	$204	$432	$1,164	$1,011
BV of debt	$4	$5	$25	$184	$74
BV of equity	$193	$266	$794	$1,261	$1,446
Cash holdings	$29	$157	$265	$355	$630
Invested Capital	$168	$114	$554	$1,090	$890
Pre-tax ROIC	$1	$2	$1	$1	$1
Copper Prices	$2,726	$3,773	$5,363	$6,503	$4,873
Deflated EBIT	$140	$147	$220	$488	$566
Deflated Revenue	$295	$259	$340	$752	$1,029

1. *Base year numbers: In valuing Sociedad, it may make more sense to look at the operating income that the firm would have had at normalized copper prices (closer to $ 4500) than the current number.*
2. *Past growth: Almost half of the historical growth in earnings has come from rising copper prices. Looking forward, it is important that we separate how much of the growth is due to real output and how much can be attributed to commodity prices.*

Historical growth rate in revenues = 58%
Adjusted for commodity price increase = 38%

B. Dealing with Operating Leases – An Example with the Gap

■ The Gap has conventional debt of about $ 1.97 billion on its balance sheet and its pre-tax cost of debt is about 6%. Its operating lease payments in the 2003 were $978 million and its commitments for the future are below:

Year	Commitment (millions)	Present Value (at 6%)
1	$899.00	$848.11
2	$846.00	$752.94
3	$738.00	$619.64
4	$598.00	$473.67
5	$477.00	$356.44
6&7	$982.50 each year	$1,346.04
Debt Value of leases =		$4,396.85 (Also value of leased asset)

■ Debt outstanding at The Gap = $1,970 m + $4,397 m = $6,367 m

■ Adjusted Operating Income = Stated OI + OL exp this year - Deprec'n
= $1,012 m + 978 m - 4397 m /7 = $1,362 million (7 year life for assets)

■ Approximate OI = $1,012 m + $ 4397 m (.06) = $1,276 m

The Collateral Effects of Treating Operating Leases as Debt

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

C. Capitalizing R&D Expenses: An Example with SAP

■ R & D was assumed to have a 5-year life.

Year	R&D Expense	Unamortized portion		Amortization this year
Current	1020.02	1.00	1020.02	
-1	993.99	0.80	795.19	€ 198.80
-2	909.39	0.60	545.63	€ 181.88
-3	898.25	0.40	359.30	€ 179.65
-4	969.38	0.20	193.88	€ 193.88
-5	744.67	0.00	0.00	€ 148.93

Value of research asset = € 2,914 million

Amortization of research asset in 2004 = € 903 million

Increase in Operating Income = 1020 - 903 = € 117 million

The Effect of Capitalizing R&D at SAP

C o nventional Accounting	R&D treated as capital expenditure

Income Statement
      EBIT& R&D = 3045
      - R&D   = 1020
      EBIT   = 2025
      EBIT (1-t)   = 1285 m
	Income Statement
	      EBIT& R&D = 3045
	      - Amort: R&D = 903
	      EBIT = 2142 (Increase of 117 m)
	      EBIT (1-t) = 1359 m
	 Ignored tax benefit = (1020-903)(.3654) = 43
	 Adjusted EBIT (1-t) = 1359+43 = 1402 m
	 (Increase of 117 million)
	 Net Income will also increase by 117 million

Balance Sheet
 Off balance sheet asset. Book value of equity at 3,768 million Euros is understated because biggest asset is off the books.
	Balance Sheet
	      Asset Liability
	      R&D Asset 2914 Book Equity +2914
	 Total Book Equity = 3768+2914= 6782 mil

Capital Expenditures
      Conventional net cap ex of 2 million Euros
	Capital Expenditures
	      Net Cap ex = 2+ 1020 – 903 = 119 mil

Cash Flows
      EBIT (1-t)   = 1285
      - Net Cap Ex   =   2
      FCFF   = 1283
	Cash Flows
	      EBIT (1-t) = 1402
	      - Net Cap Ex = 119
	      FCFF = 1283 m

Return on capital = 1285/(3768+530)
             = 29.90%
	Return on capital = 1402/(6782+530)
	             = 19.93%

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

- Capital expenditures should include
  - Research and development expenses, once they have been re-categorized as capital expenses.
  - Acquisitions of other firms, whether paid for with cash or stock.

- Working capital should be defined not as the difference between current assets and current liabilities but as the difference between non-cash current assets and non-debt current liabilities.

- On both items, start with what the company did in the most recent year but do look at the company's history and at industry averages.

IV. A Regression beta is noisy…

Backward looking…

And cannot be trusted even when it looks good…

Bottom-up Betas

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

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))

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

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

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))

Possible Refinements

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

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

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

Two examples…

- **Isagen**
  - The company is in only one business – electricity generation. The average unlevered beta of electricity generating firms is 0.535.
  - The marginal tax rate in Colombia is 33% and the debt to equity ratio for Isagen is 17.8%.
  - Levered beta = 0.535 (1+ (1-.33)(.178)) = 0.60

- **Cementos Pacasmayo**

Business	Revenues	EV/Sales	Estimated Value	Weights	Unlevered Beta
Cement	436	1.2	523.2	65.75%	1.09
Construction Material	188	1.45	272.6	34.25%	0.89
Cementos Pacasmayo			795.8		1.02

  - The marginal tax rate in Peru is 30% and the debt to equity ratio for Cementos is 17.81%.
  - Bottom-up Beta = 1.02 (1+ (1-.30)(.1781)) = 1.15

V. 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
1928-2009	7.53%	6.03%	5.56%	4.29%
	(2.28%)	(2.40%)		
1960-2009	5.48%	3.78%	4.09%	2.74%
	(2.42%)	(2.71%)		
2000-2009	-1.59%	-5.47%	-3.68%	-7.22%
	(6.73%)	(9.22%)		

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

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

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

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

43.29   46.40   49.74   53.32   57.16

January 1, 2010
S&P 500 is at 1115.10
Adjusted Dividends &
Buybacks for 2008 = 40.38

$$115.10 = \frac{43.29}{(1+r)} + \frac{46.40}{(1+r)^2} + \frac{49.74}{(1+r)^3} + \frac{53.32}{(1+r)^4} + \frac{57.16}{(1+r)^5} + \frac{57.16(1.0384)}{(r-.0384)(1+r)^5}$$

Expected Return on Stocks (1/1/10)   = 8.20%
T.Bond rate on 1/1/10   = 3.84 %
Equity Risk Premium = 8.20% - 3.84%   = 4.36%

Implied Premiums in the US

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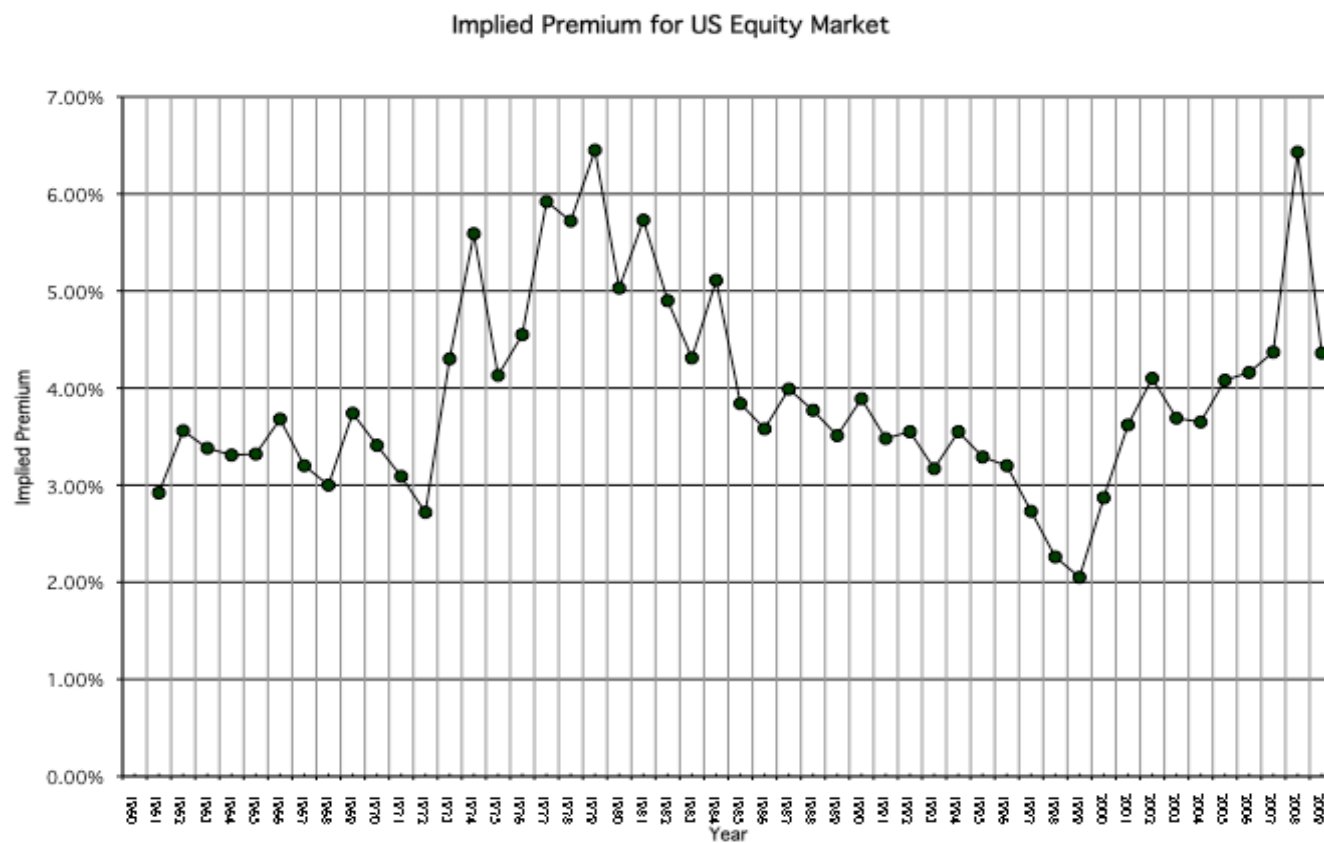
The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009

Implied Equity Risk Premium - 9/12- 12/31/08
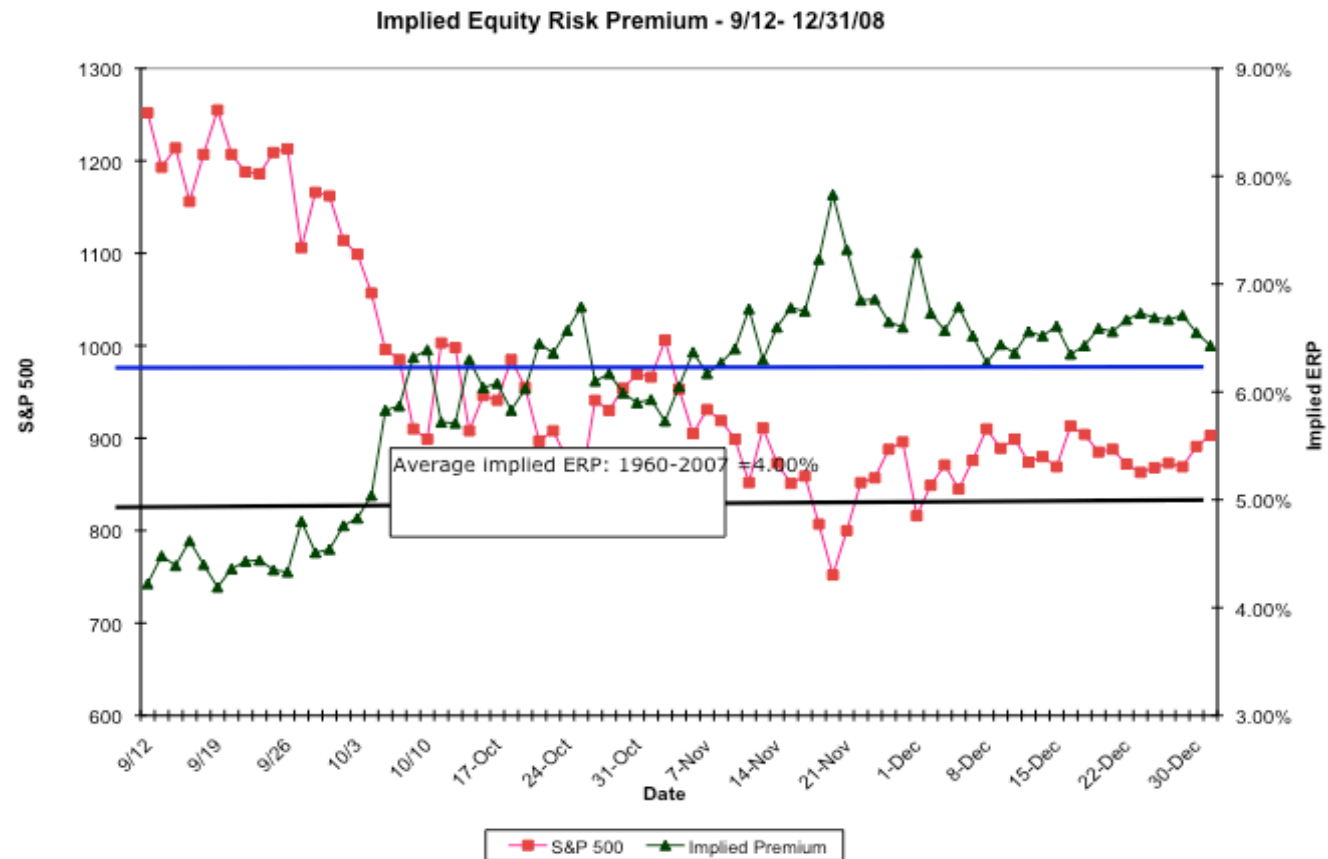
Implied Premium for Peruvian Equities: July 2009

- Level of the Index = 13,317
- FCFE on the Index = 7.55% (Estimated FCFE for companies in index as % of market value of equity)
- Other parameters
  - Riskfree Rate = 3.5% (in US dollars)
  - Expected Growth (in US dollars)
    - Next 5 years = 8% (Used expected growth rate in Earnings)
    - After year 5 = 3.5%
- Solving for the expected return:
  - Expected return on Equity = 12.88%
  - Implied Equity premium = 12.88% - 3.5% = 9.38%
- The implied equity risk premium in the United States at the same time was approximately 6%, leading to an additional country risk premium of 3.38% for Peru.

Implied Premium for Colombian Equities: July 2010

- Level of the Index (IGBC) = 11,602
- FCFE on the Index = 5.5% (Estimated FCFE for companies in index as % of market value of equity)
- Other parameters
  - Riskfree Rate = 2.5% (in US dollars)
  - Expected Growth (in US dollars)
    - Next 5 years = 8% (Used expected growth rate in Earnings)
    - After year 5 = 3.5%
- Solving for the expected return:
  - Expected return on Equity = 9.47%
  - Implied Equity premium = 9.47% - 2.5% = 6.97%
- The implied equity risk premium in the United States at the same time was approximately 4.7%, leading to an additional country risk premium of 2.27% for Colombia.

VI. There is a downside to globalization…

- **Standard Approach: Country bond default spread**
  - The rate on a 10-year Peruvian dollar denominated bond was 6% in July 2009. The US 10-year treasury bond rate was 3.5%.

    Default Spread = 6% - 3.5% = **2.5%** = Country Equity Risk Premium
  - Colombia's country rating is Baa3; the default spread based upon the rating is 2%.

- **Modified Approach: Relative Volatility**
  - The standard deviation in the Lima General Index between July 2007-July 2009 was 50%. The standard deviation in the Peruvian 10-year bond between 2007-09 was 30%. (Both were computed used weekly returns)

    Country Equity Risk Premium (Peru) in 7/09 = 2.5% (50/30) = **4.17%**
  - The standard deviation in Colombian equities between 2008-10 was 25% and the standard deviation in the Colombian bond was 20%

    Country Equity Risk Premium (Colombia) in 7/10 = 2% (25/20) = 2.50%

Country Risk Premiums
January 2010

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

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

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

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

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

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

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

Australia	4.50%
New Zealand	4.50%

Aswath Damodaran

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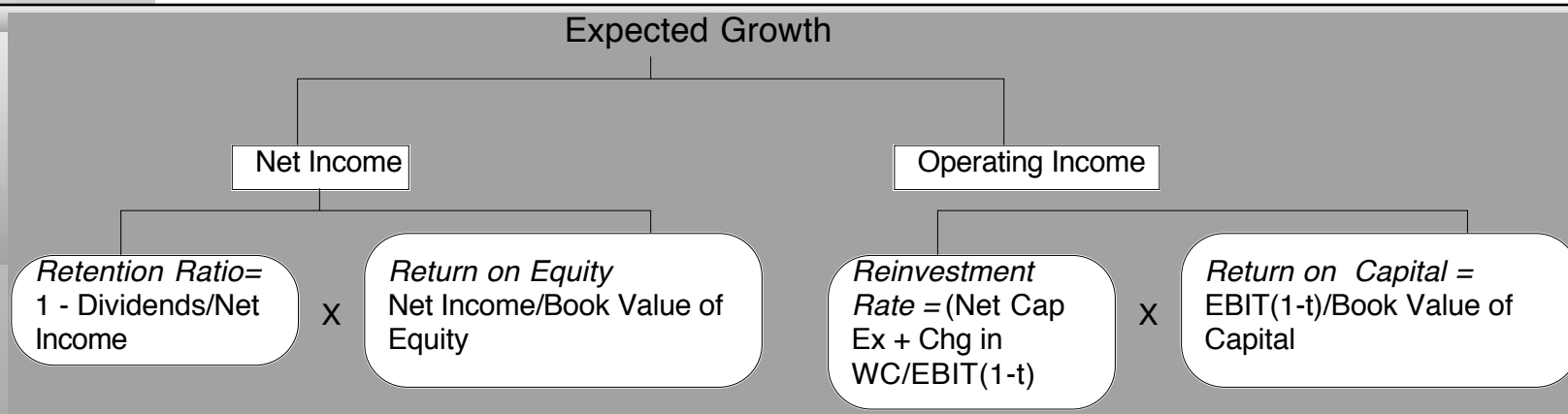
$$E(Return) = \text{Riskfree Rate} + \beta \text{ (US premium)} + \lambda \text{ (Country ERP)}$$

■ The lambda should be a function of
  - <u>Revenue sources</u>: Companies that derive more of their revenues in a country should be more exposed to country risk.
  - <u>Production/ Manufacturing</u>: The greater the concentration of production facilitieis in a countries, the greater the exposure to country risk
  - Flexibility: The more difficult it is to move operations (in the event of a crisis), the greater the exposure to country risk.

  Lambda for Isagen= 1.10   Lambda for Cementos = 1.22

■ 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

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

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

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

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

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

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

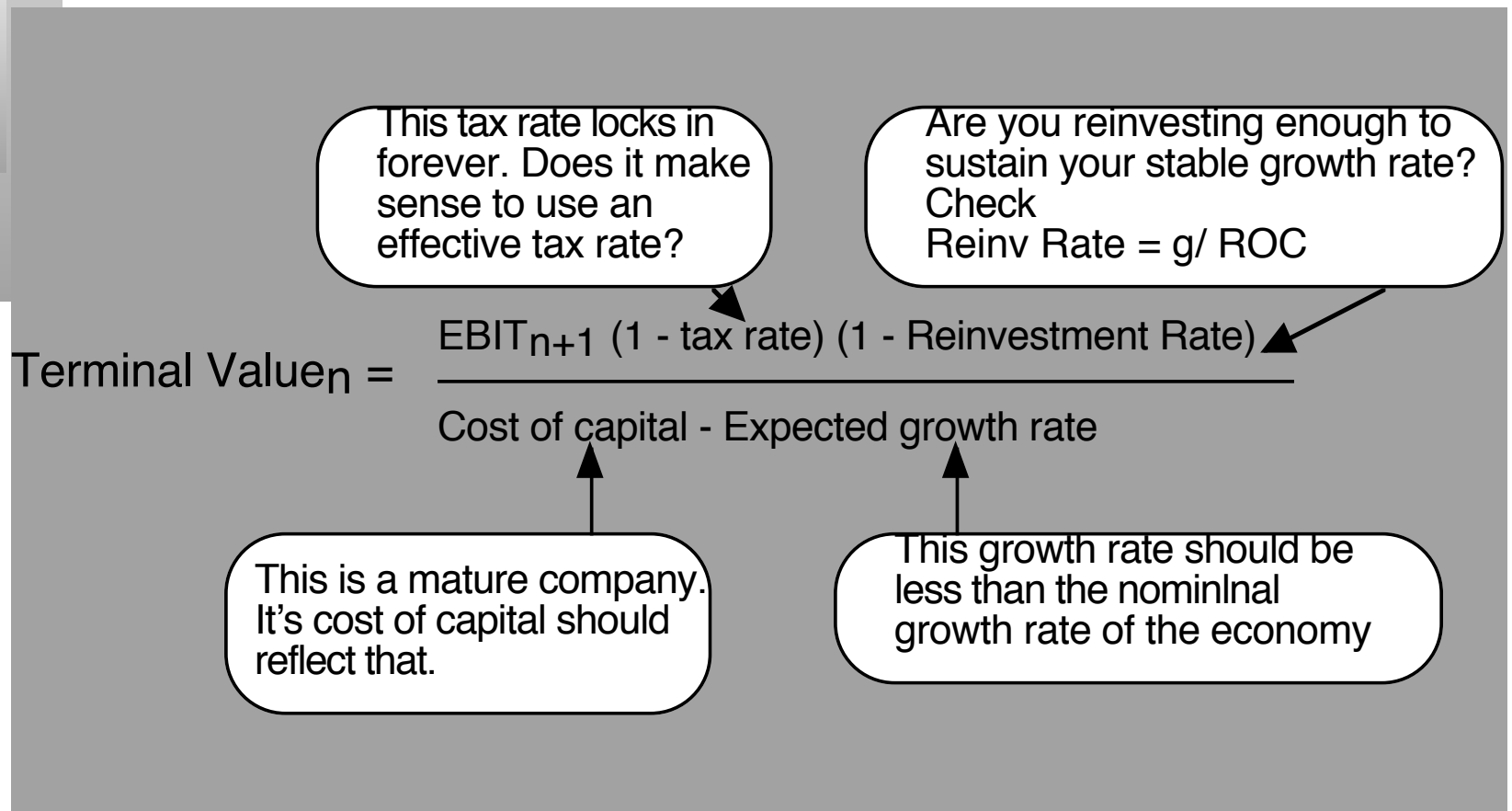# Value Creating Growth… Evaluating the Alternatives..

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

Seven reasons why acquisitions fail…

1. <u>Risk Transference</u>: Attributing acquiring company risk characteristics to the target firm. Just because you are a safe firm and operate in a secure market, does not mean that you can transfer these characteristics to a target firm.

2. <u>Debt subsidies</u>: Subsiding target firm stockholders for the strengths of the acquiring firm is providing them with a benefit they did not earn.

3. <u>Auto-pilot Control</u>: Adding 20% or some arbitrary number to the market price just because other people do it is a recipe for overpayment. Using silly rules such as EPS accretion just makes the problem worse.

4. <u>Elusive Synergy</u>: While there is much talk about synergy in mergers, it is seldom valued realistically or appropriately.

5. <u>Its all relative</u>: The use of transaction multiples (multiples paid by other acquirers in acquisitions) perpetuates over payment.

6. <u>Verdict first, trial afterwards</u>: Deciding you want to do an acquisition first and then looking for justification for the price paid does not make sense.

7. <u>It's not my fault</u>: Holding no one responsible for delivering results is a sure-fire way not to get results…

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

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

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

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

Cementos: Terminal Value and Growth

Growth Rate	Reinvestment Rate	FCFF	Terminal value
0%	0.00%	$47.55	$411.61
1%	8.66%	$43.43	$411.61
2%	17.31%	$39.31	$411.61
3%	25.97%	$35.20	$411.61
4%	34.63%	$31.08	$411.61
5%	43.29%	$26.96	$411.61

As growth increases, value does not change. Why?
Under what conditions will value increase as growth increases?
Under what conditions will value decrease as growth increases?

X. The loose ends matter…

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

1. The Value of Cash
An Exercise in Cash Valuation

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

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

Cash: Discount or Premium?

Market Value of $ 1 in cash:
Estimates obtained by regressing Enterprise Value against Cash Balances
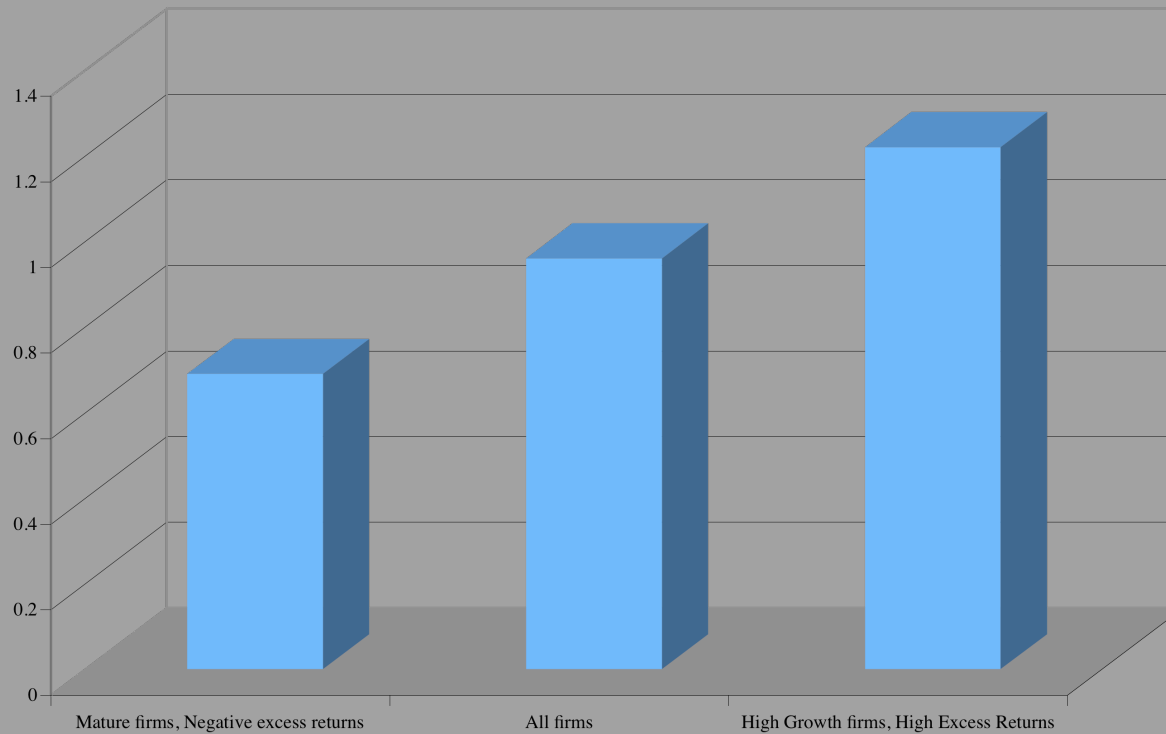
2. Dealing with Holdings in Other firms

- Holdings in other firms can be categorized into
  - <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…

■ The market value solution: When the subsidiaries are publicly traded, you could use their traded market capitalizations to estimate the values of the cross holdings. You do risk carrying into your valuation any mistakes that the market may be making in valuation.

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

3. Other Assets that have not been counted yet..

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

■ **Overfunded pension plans**: If you have a defined benefit plan and your assets exceed your expected liabilities, you could consider the over funding with two caveats:

• Collective bargaining agreements may prevent you from laying claim to these excess assets.

• There are tax consequences. Often, withdrawals from pension plans get taxed at much higher rates.

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

4. A Discount for Complexity:
An Experiment

	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

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

J.P. Morgan's estimate of total synergies in Labatt/Ambev Merger

Valuation methodology for synergies

Cost synergies

- Achievement of full synergies by 2008
  - Synergies are gradually phased in over four years with 0%, 30%, 30%, 40% and 100% being realized in 2004 through 2008
    - Realization of synergies requires cash outlays in the 2005-2007 period which are reflected in the net present value
  - Capex synergies only begin in 2008

- Decreased tax shield taken into account at full statutory tax rate, does not take into account potential additional upside as a result of lower effective historical tax rate

- Synergies realized in Canada discounted at Labatt Canada's WACC (6.5%) while synergies realized in Brazil discounted at AmBev's WACC (12.4%)

Revenue synergies

- Achievement of full synergies by 2008
  - Synergies are gradually phased in over four years with 0%, 30%, 30%, 40% and 100% being realized in 2004 through 2008

- Discounted at 14.4%, reflecting AmBev's WACC plus an additional spread to reflect higher risk of realizing such synergies

Interest on own capital

- Tax benefits generated through increased interest on AmBev's capital payments due to AmBev's increased shareholders' equity after acquisition of Labatt

- Discounted at AmBev's cost of equity (13.6%)

Present value of potential synergies[1] (US$ mm)

Waterfall chart values: Admin. expenses 203; Var. prod. costs 296; Fixed costs (value obscured); Capex 108; Distribution 155; Commercial 349; Total operational synergies 1,180; Interest on own capital 798; Total synergies 1,978.
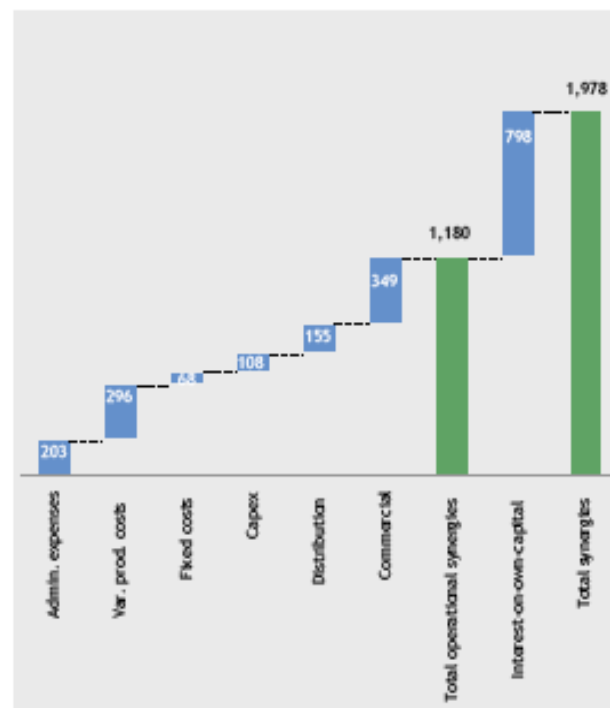
5. Brand name, great management, superb product …Are we short changing the intangibles?

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

Categorizing Intangibles

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

Valuing Brand Name

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

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

- **General Rule**: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.
- Defined as such, debt should include
  - All interest bearing liabilities, short term as well as long term
  - All leases, operating as well as capital
- Debt should not include
  - Accounts payable or supplier credit

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

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

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

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

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

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

7. The Value of Control

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

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

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

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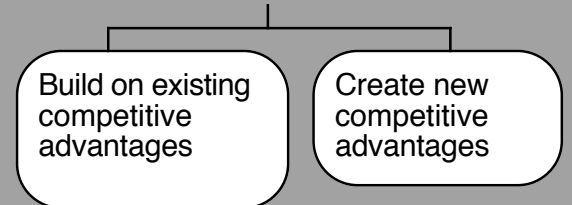
Increase Cash Flows

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

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
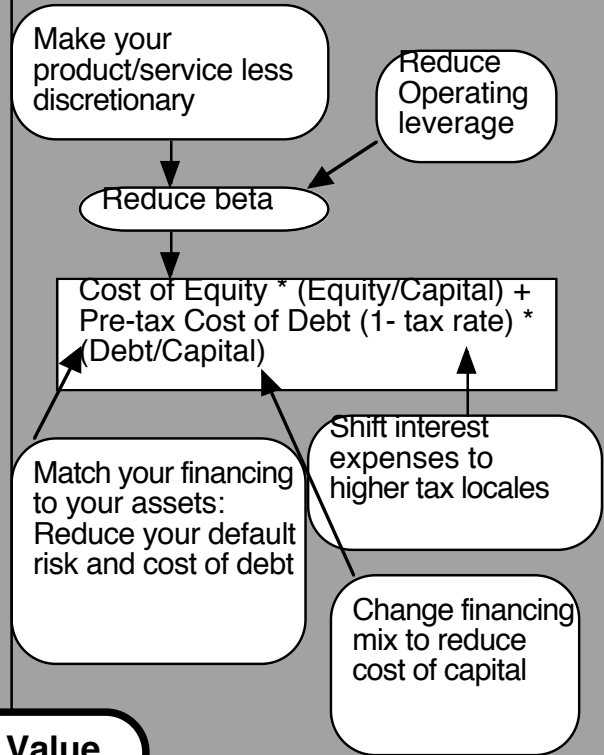
Firm Value

Increase Expected Growth

Reinvest more in projects

Increase operating margins

Do acquisitions

Increase capital turnover ratio

Reinvestment Rate

* Return on Capital

= Expected Growth Rate
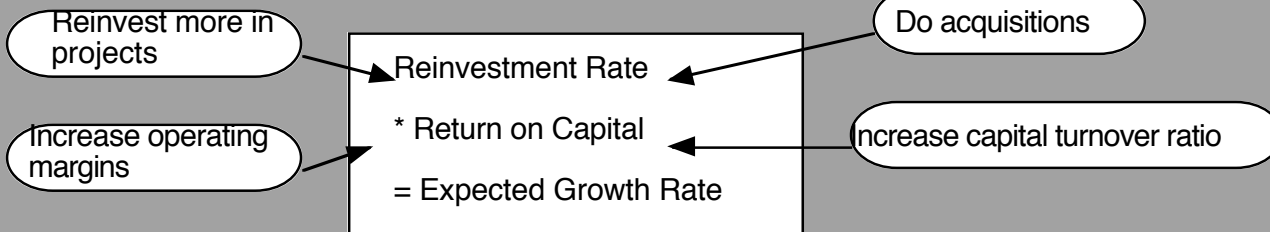
Increase length of growth period

Build on existing competitive advantages

Create new competitive advantages

Aswath Damodaran

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Optimal Capital Structure: Isagen & Cementos

Isagen: Optimal Debt Ratio

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Firm Value (G)
0%	0.54	7.76%	AAA	7.85%	33.00%	5.26%	7.76%	COP 6,930,318
10%	0.58	7.94%	A+	8.35%	33.00%	5.59%	7.71%	COP 7,101,572
20%	0.63	8.17%	BB	11.35%	33.00%	7.60%	8.05%	COP 6,140,451
30%	0.69	8.45%	B-	12.85%	33.00%	8.61%	8.50%	COP 5,213,325
40%	0.78	8.84%	CC	17.35%	33.00%	11.62%	9.95%	COP 3,445,615
50%	0.94	9.59%	C	19.35%	24.33%	14.64%	12.11%	COP 2,220,382
60%	1.18	10.65%	C	19.35%	20.28%	15.43%	13.51%	COP 1,772,882
70%	1.57	12.41%	C	19.35%	17.38%	15.99%	14.91%	COP 1,456,390
80%	2.40	16.14%	D	22.35%	13.17%	19.41%	18.75%	COP 927,713
90%	4.79	26.93%	D	22.35%	11.70%	19.73%	20.45%	COP 779,478

Cementos: Optimal Debt Ratio

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Firm Value (G)
0%	0.98	13.46%	AAA	7.25%	30.00%	5.08%	13.46%	PEN 1,618
10%	1.06	14.24%	AAA	7.25%	30.00%	5.08%	13.32%	PEN 1,642
20%	1.15	15.21%	A-	9.00%	30.00%	6.30%	13.43%	PEN 1,625
30%	1.27	16.45%	B+	12.00%	30.00%	8.40%	14.04%	PEN 1,527
40%	1.44	18.11%	B-	14.50%	30.00%	10.15%	14.93%	PEN 1,404
50%	1.67	20.44%	CC	18.00%	30.00%	12.60%	16.52%	PEN 1,225
60%	2.03	24.16%	CC	18.00%	28.45%	12.88%	17.39%	PEN 1,145
70%	2.79	31.85%	C	21.00%	20.90%	16.61%	21.18%	PEN 887
80%	4.32	47.43%	D	26.00%	14.77%	22.16%	27.21%	PEN 647
90%	8.64	91.36%	D	26.00%	13.13%	22.59%	29.46%	PEN 586

Cementos Pacasmayo- Restructured: $ in 2009

Return on Capital 18%

Stable Growth
g = 3.5%; Beta = 1.00
Country Premium= 2.5%
Cost of capital = 11.55%
ROC= 11.55%;
Reinvestment Rate=g/ROC
=3.5/ 11.55= 30.30%

Current Cashflow to Firm
EBIT(1-t) :	PEN 112.35
- Nt CpX	PEN 49.50
- Chg WC	PEN 4.65
= FCFF	PEN 58.20
PEN/ US $	3.23

Reinv Rate = (49.5+4.65)/112.35
= 48.2%

Reinvestment Rate 60%

Expected Growth in EBIT (1-t)
..60*.18=0.108
10.8%

Terminal Value$_5$= 37.79(.1155-.035) = $469.34

$ Cashflows

Year	1	2	3	4	5	
EBIT (1-t)	PEN 124	PEN 138	PEN 153	PEN 169	PEN 188	194.18
- Reinvestment	PEN 75	PEN 83	PEN 92	PEN 102	PEN 113	58.83
FCFF	PEN 50	PEN 55	PEN 61	PEN 68	PEN 75	135.35
Exchange rate	3.10	3.19	3.28	3.38	3.48	3.58
FCFF (In US $)	$16.07	$17.30	$18.62	$20.04	$21.57	$ 37.79

Op. Assets	$307.36
+ Cash:	12.06
- Debt	77.04
- Minor. Int.	0.60
=Equity	$241.78
Exchange	3.01
Equity	PEN 727.74
Value/Share	PEN 1.73

Discount at $ Cost of Capital (WACC) = 14.94% (.90) + 5.08 (0.10) = 14.04%

Expected inflation
US = 2%
Peru= 5%

Cost of Equity
14.94%

Cost of Debt
(3.5%+ 2.5%+ 1.25%)(1-.30)
= 5.08%

Weights
E = 90% D = 10%

On July 1, 2009
Cementos Price = PEN 3.01

Riskfree Rate:
$ Riskfree Rate= 3.5%

+

Beta
1.06

X

Mature market premium
6%

+

Lambda
1.22

X

Country Equity Risk Premium
4.17%

Unlevered Beta for Sectors: 1.02

Firm's D/E Ratio: 17.8%

Country Default Spread
2.5%

X

Rel Equity Mkt Vol
1.67

Aswath Damodaran

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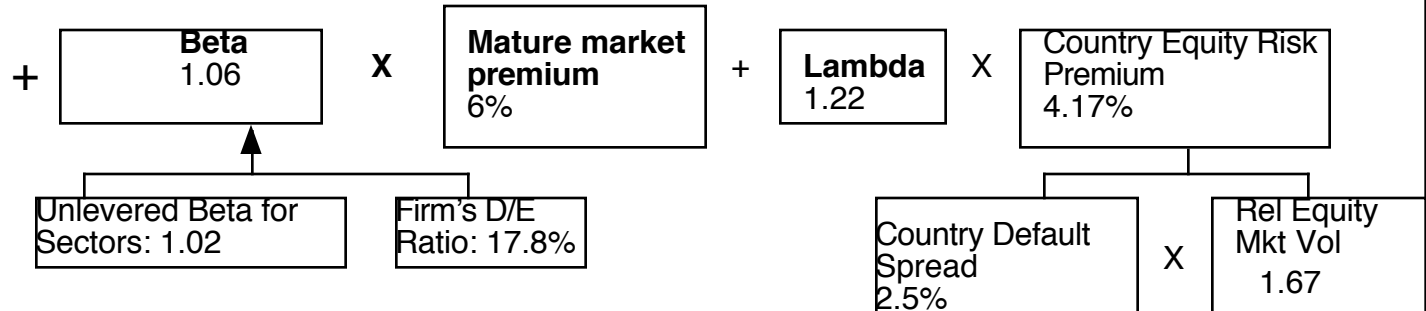
Implications of the Value of Control

■ If the value of a firm run optimally is significantly higher than the value of the firm with the status quo (or incumbent management), you can write the value that you should be willing to pay as:

Value of control = Value of firm optimally run - Value of firm with status quo

Value of control at Cementos= 1.73 PEN– 1.60 PEN= 0.13 PEN per share

■ Implications:

  • In an acquisition, this is the most that you would be willing to pay as a premium (assuming no other synergy)

  • As a stockholder, you will be willing to pay a value between 1.60 and 1.73 PEN, depending upon your views on whether control will change.

  • If there are voting and non-voting shares, the difference in prices between the two should reflect the value of control.

8. Distress and the Going Concern Assumption

- Traditional valuation techniques are built on the assumption of a going concern, i.e., a firm that has continuing operations and there is no significant threat to these operations.

    - In discounted cashflow valuation, this going concern assumption finds its place most prominently in the terminal value calculation, which usually is based upon an infinite life and ever-growing cashflows.

    - In relative valuation, this going concern assumption often shows up implicitly because a firm is valued based upon how other firms - most of which are healthy - are priced by the market today.

- When there is a significant likelihood that a firm will not survive the immediate future (next few years), traditional valuation models may yield an over-optimistic estimate of value.

		Current Revenue $ 4,390		Current Margin: 4.76%				**Reinvestment:** Capital expenditures include cost of new casinos and working capital								*Stable Growth*		

Current Revenue $ 4,390

Current Margin: 4.76%

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

Stable Growth

Stable Revenue Growth: 3%

Stable Operating Margin: 17%

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

EBIT $ 209m

Extended reinvestment break, due ot investment in past

Industry average

Expected Margin: -> 17%

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

Term. Year

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

Forever

	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%

Casino 1.15

Current D/E: 277%

Base Equity Premium

Country Risk Premium

Las Vegas Sands Feburary 2009 Trading @ $4.25

The Distress Factor

■ 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:

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

■ 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

9. Equity to Employees: Effect on Value

■ In recent years, firms have turned to giving employees (and especially top managers) equity option packages as part of compensation. These options are usually

  • Long term

  • At-the-money when issued

  • On volatile stocks

■ Are they worth money? And if yes, who is paying for them?

■ Two key issues with employee options:

  • How do options granted in the past affect equity value per share today?

  • How do expected future option grants affect equity value today?

Equity Options and Value

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

10. Analyzing the Effect of Illiquidity on Value

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

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

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

Illiquidity Discounts from Bid-Ask Spreads

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

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.

Relative Valuation

Aswath Damodaran

Relative valuation is pervasive…

■ Most asset valuations are relative.

■ Most equity valuations on Wall Street are relative valuations.

- Almost 85% of equity research reports are based upon a multiple and comparables.

- More than 50% of all acquisition valuations are based upon multiples

- Rules of thumb based on multiples are not only common but are often the basis for final valuation judgments.

■ While there are more discounted cashflow valuations in consulting and corporate finance, they are often relative valuations masquerading as discounted cash flow valuations.

- The objective in many discounted cashflow valuations is to back into a number that has been obtained by using a multiple.

- The terminal value in a significant number of discounted cashflow valuations is estimated using a multiple.

The Reasons for the allure…

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

" A little inaccuracy sometimes saves tons of explanation"

H.H. Munro

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

The Four Steps to Deconstructing Multiples

- ■ Define the multiple
  - In use, the same multiple can be defined in <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>

Looking at the distribution of PE ratios… in the US

PE Ratios - US in January 2009
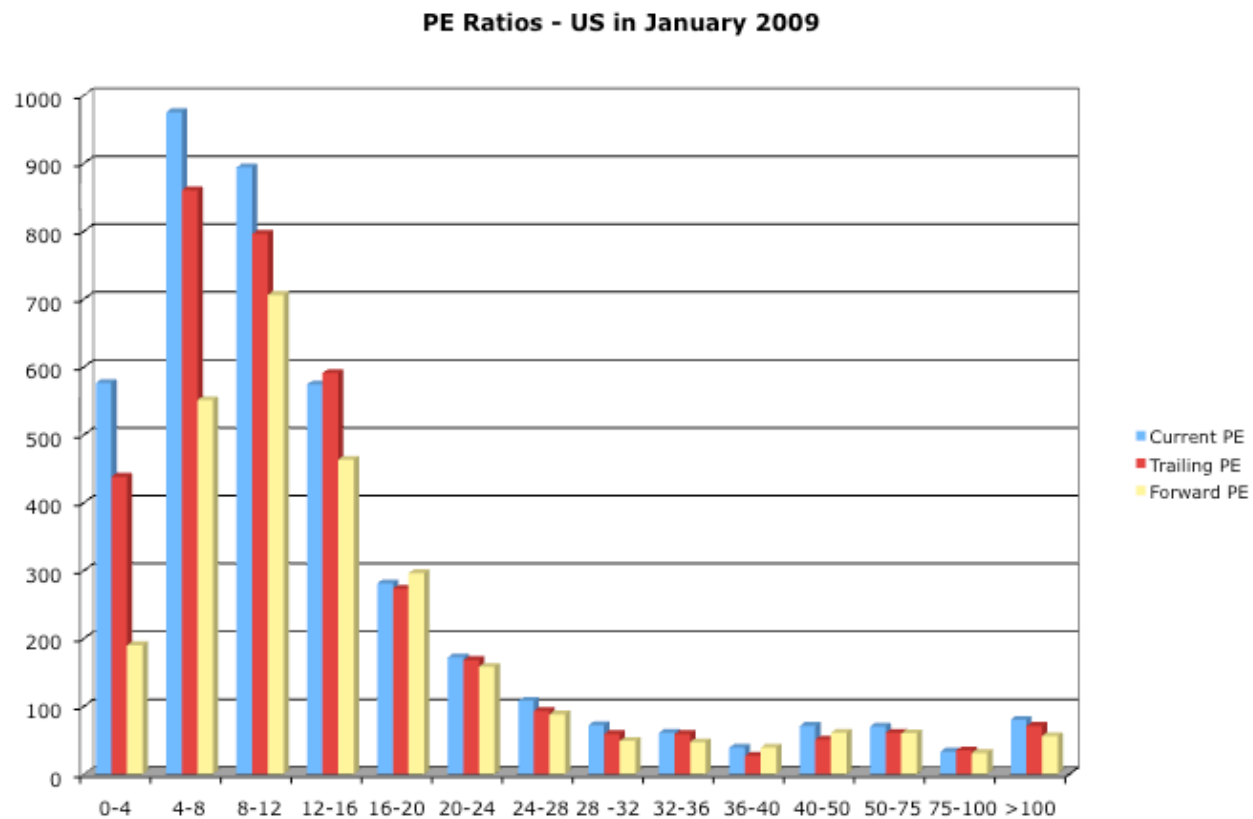
PE: Deciphering the Distribution

	Jan-09			Jan-08		
	Current PE	Trailing PE	Forward PE	Current PE	Trailing PE	Forward PE
Mean	18.91	17.48	20.04	45.02	32.44	32.21
Standard Error	0.98	0.91	0.87	4.64	1.96	1.47
Median	9.80	9.89	11.69	18.16	17.00	17.28
Standard Deviation	61.97	55.61	45.74	299.11	123.29	80.82
Kurtosis	668.30	1073.76	174.18	1618.20	1241.97	269.80
Skewness	21.06	27.18	11.66	35.41	30.30	14.23
Maximum	2442.83	2475.71	933.00	15126.20	5713.00	1912.33
Count	4010	3737	2795	4155	3944	3004
Sample size	6871	6871	6871	7155	7155	7155
Largest(400)	29.50	26.18	25.06			
Smallest(400)	3.00	2.76	5.74			

Comparing PE Ratios: US, Europe, Japan and Emerging Markets

PE ratios across markets

	Median PE
Japan	12.26
US	9.8
Europe	7.7
Emerging Mkts	7.5
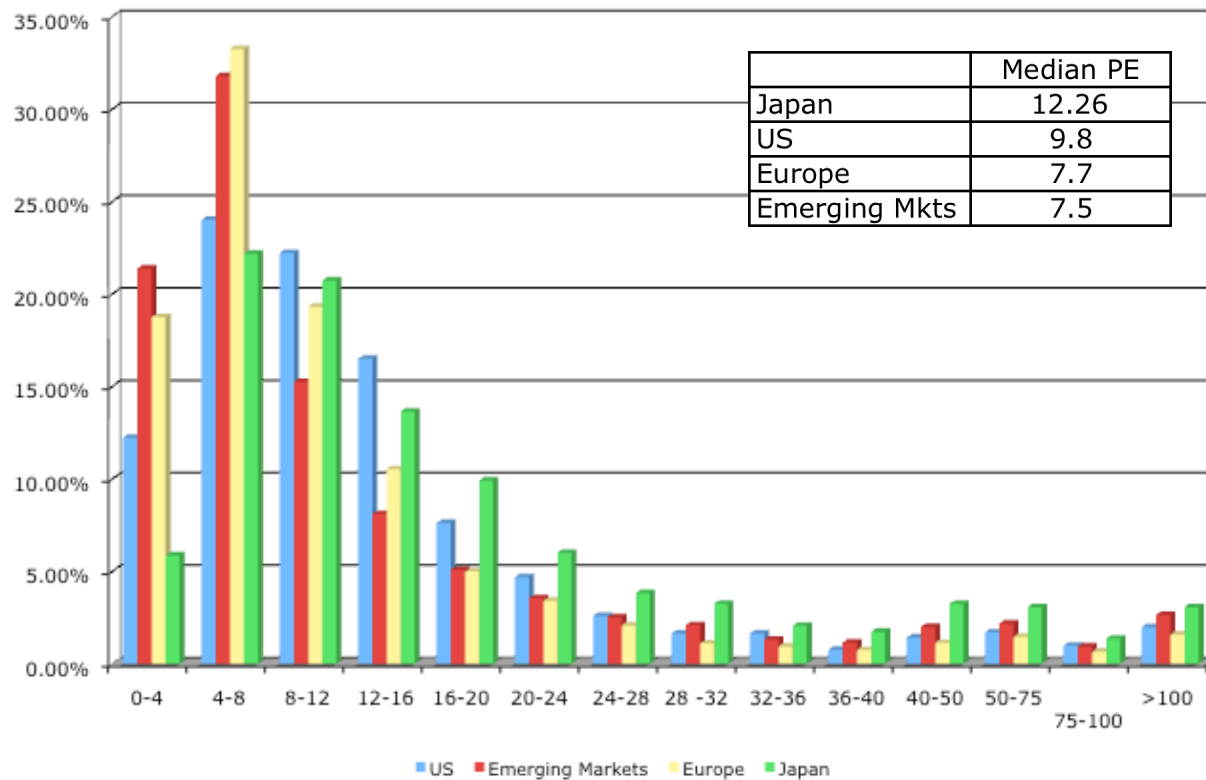
And 6 times EBITDA may not be cheap…

EV Multiples - US in January 2009

Legend: EV/EBIT, EV/EBITDA

X-axis: <2, 2-4, 4-6, 6-8, 8-10, 10-12, 12-16, 16-20, 20-25, 25-30, 30-35, 35-40, 40-45, 45-50, 50-75, 75-100, >100
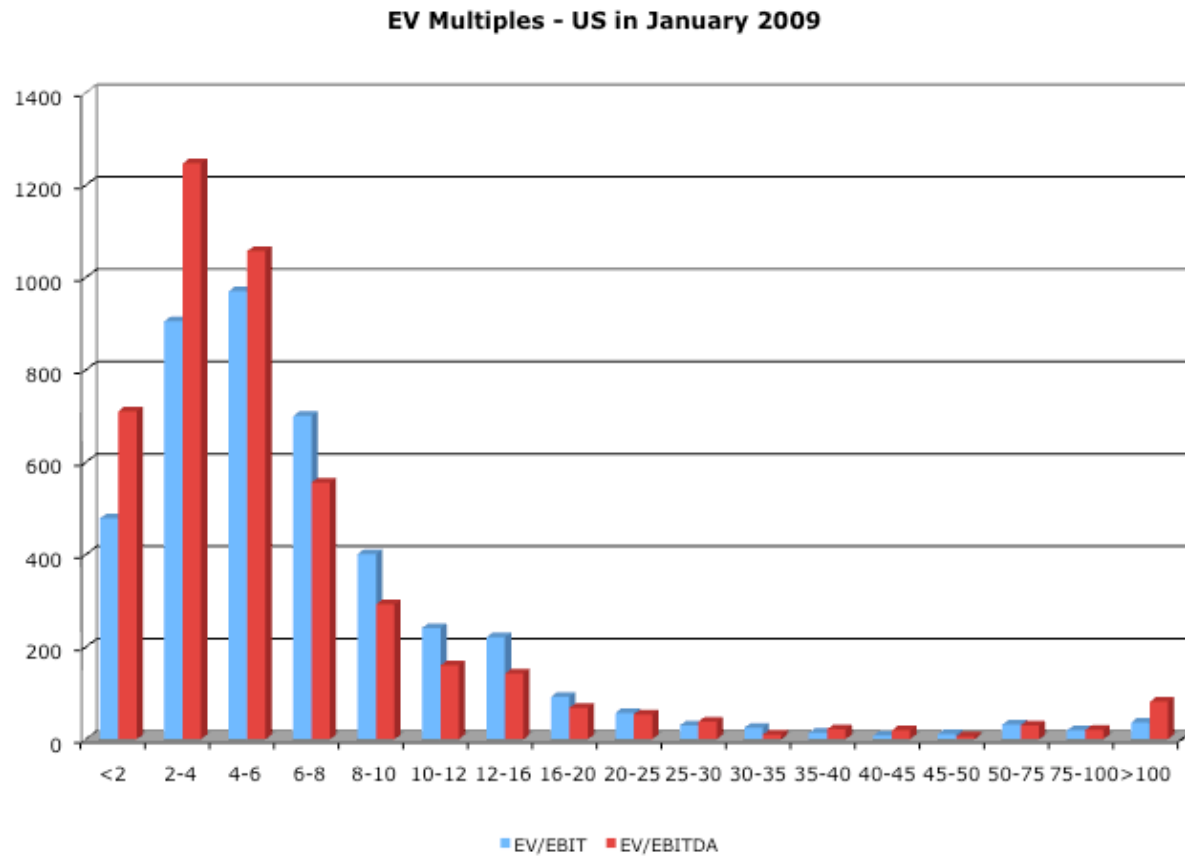
Analytical Tests

■ 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,

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

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

The Determinants of Multiples…

$$\text{Value of Stock} = DPS_1/(k_e - g)$$

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)

$$\text{Value of Firm} = FCFF_1/(WACC - g)$$

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.**

An Example: Comparing PE Ratios across a Sector: Telecom ADRs

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.

Comparisons to the entire market: Why not?

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

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

PE Ratio: Standard Regression for US stocks - January 2009

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.535[a]	.287	.286	7.0614177E2

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

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.623	.869		8.773	.000
	Expected Growth in EPS: next 5 years	77.983	2.920	.508	26.707	.000
	Value Line Beta	-5.371	.745	-.138	-7.212	.000
	Payout Ratio	7.670	.586	.255	13.094	.000

a. Dependent Variable: Current PE

b. Weighted Least Squares Regression – Weighted by Market Cap

And for other markets…

Region	Regression – January 2009	R squared
Europe	PE = 10.07 – 5.23 Beta + 7.78 Payout + 27.51 Expected growth rate	53.8%
Japan	PE = 9.28 – 4.50 Beta + 42.29 Payout + 62	48.3%
Emerging Markets	PE = 5.63 + 062 Beta + 9.65 Payout + 13.05 Expected growth rate	27.4%

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.

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

Real Options: Fact and Fantasy

Aswath Damodaran

The Basis for Real Options

■ In the last few years, there are some who have argued that discounted cashflow valuations under valued some companies and that a real option premium should be tacked on to DCF valuations. To understanding its moorings, compare the two trees below:

A bad investment…………………….. Becomes a good one..
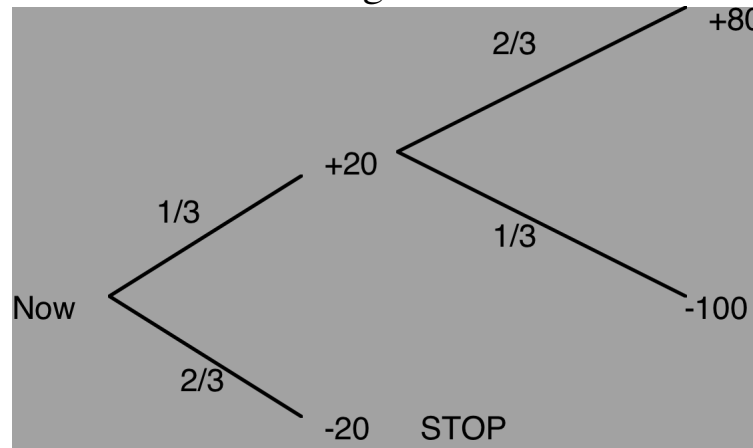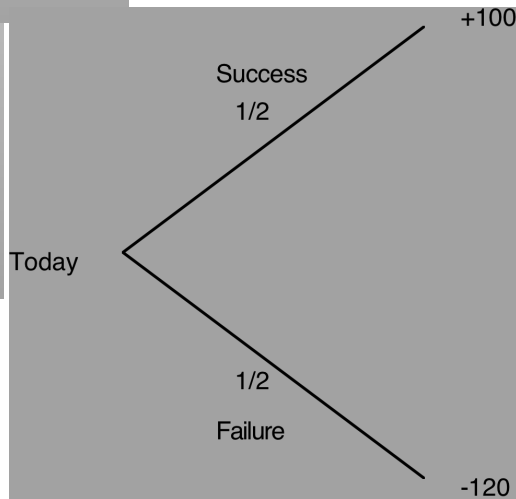
1. Learn at relatively low cost
2. Make better decisions based on learning

Three Basic Questions

■ When is there a real option embedded in a decision or an asset?

■ When does that real option have significant economic value?

■ Can that value be estimated using an option pricing model?

When is there an option embedded in an action?

- An option provides the holder with the **right** to buy or sell a specified quantity of an underlying asset at a fixed price (called a strike price or an exercise price) at or before the expiration date of the option.

- There has to be a <u>clearly defined underlying asset</u> whose value changes over time in unpredictable ways.

- The <u>payoffs on this asset</u> (real option) have to be <u>contingent on an specified event</u> occurring within a finite period.

Example 1: Product Patent as an Option

PV of Cash Flows
from Project

Initial Investment in
Project

Present Value of Expected
Cash Flows on Product

Project's NPV turns
positive in this section

Project has negative
NPV in this section
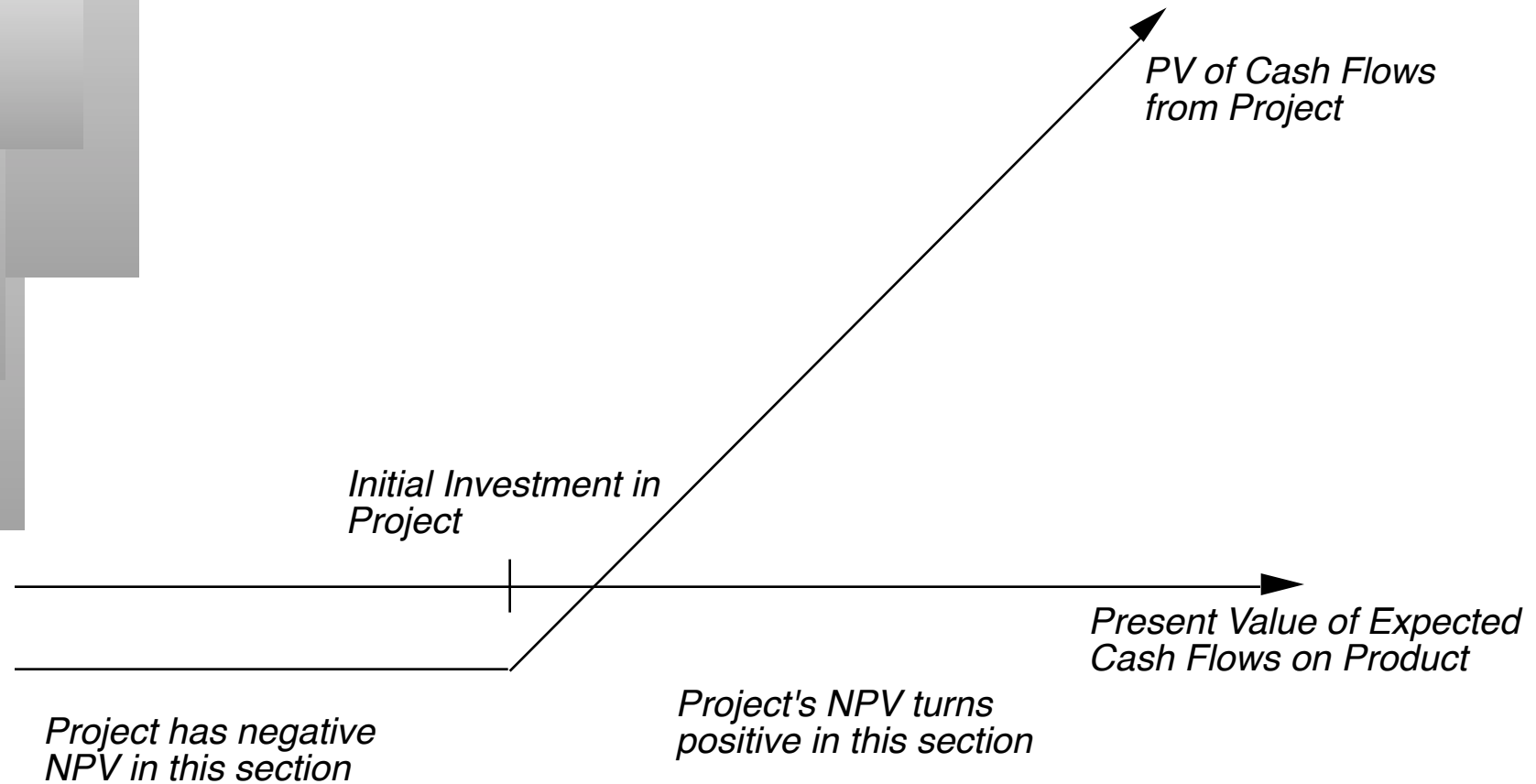
Example 2: Undeveloped Reserves as Options

Net Payoff on
Extraction

Cost of Developing
Reserve

Value of estimated reserve
of natural resource
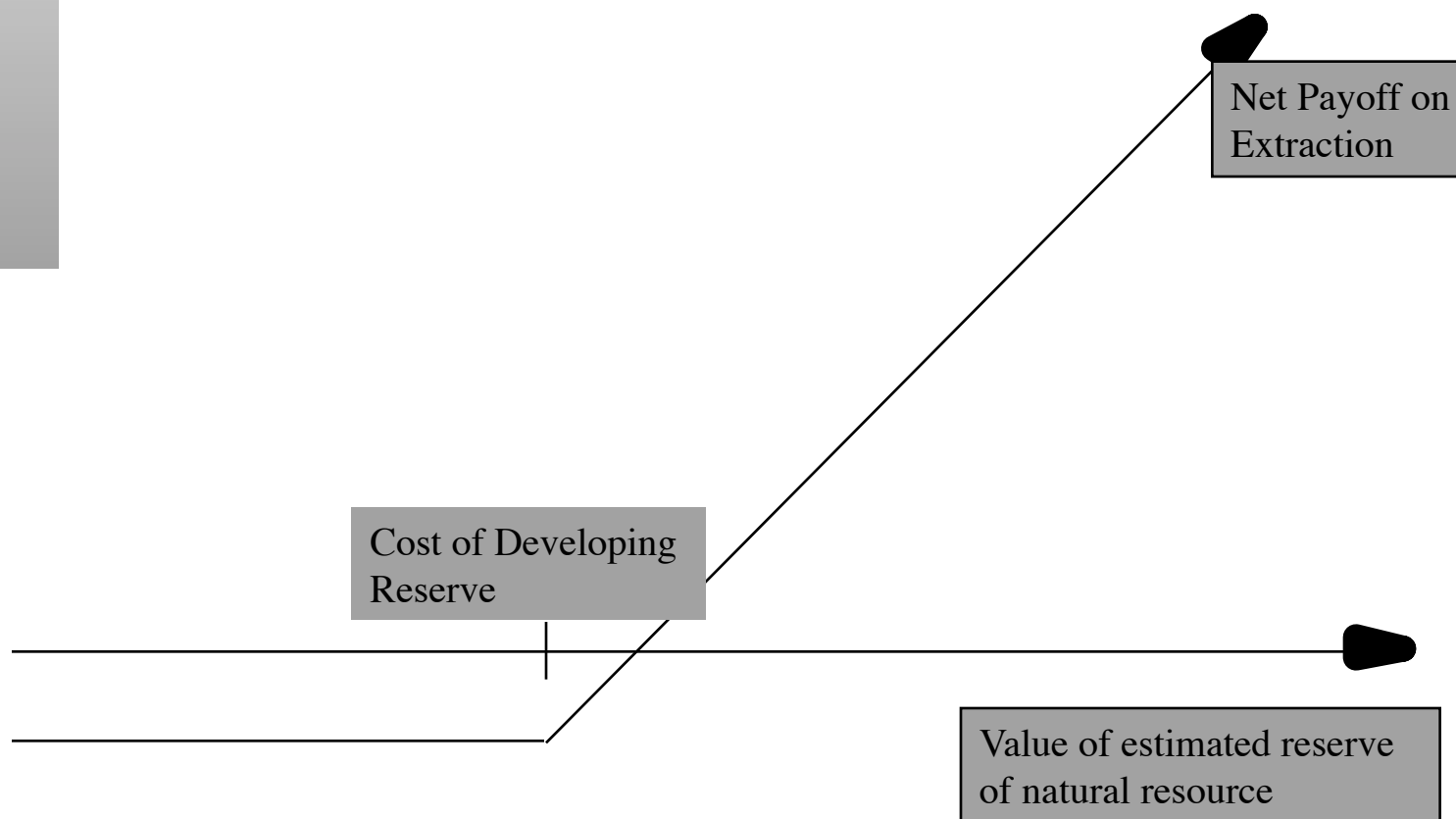
Example 3: Expansion of existing project as an option

PV of Cash Flows
from Expansion

Additional Investment
to Expand

Present Value of Expected
Cash Flows on Expansion

Expansion becomes
attractive in this section

Firm will not expand in
this section
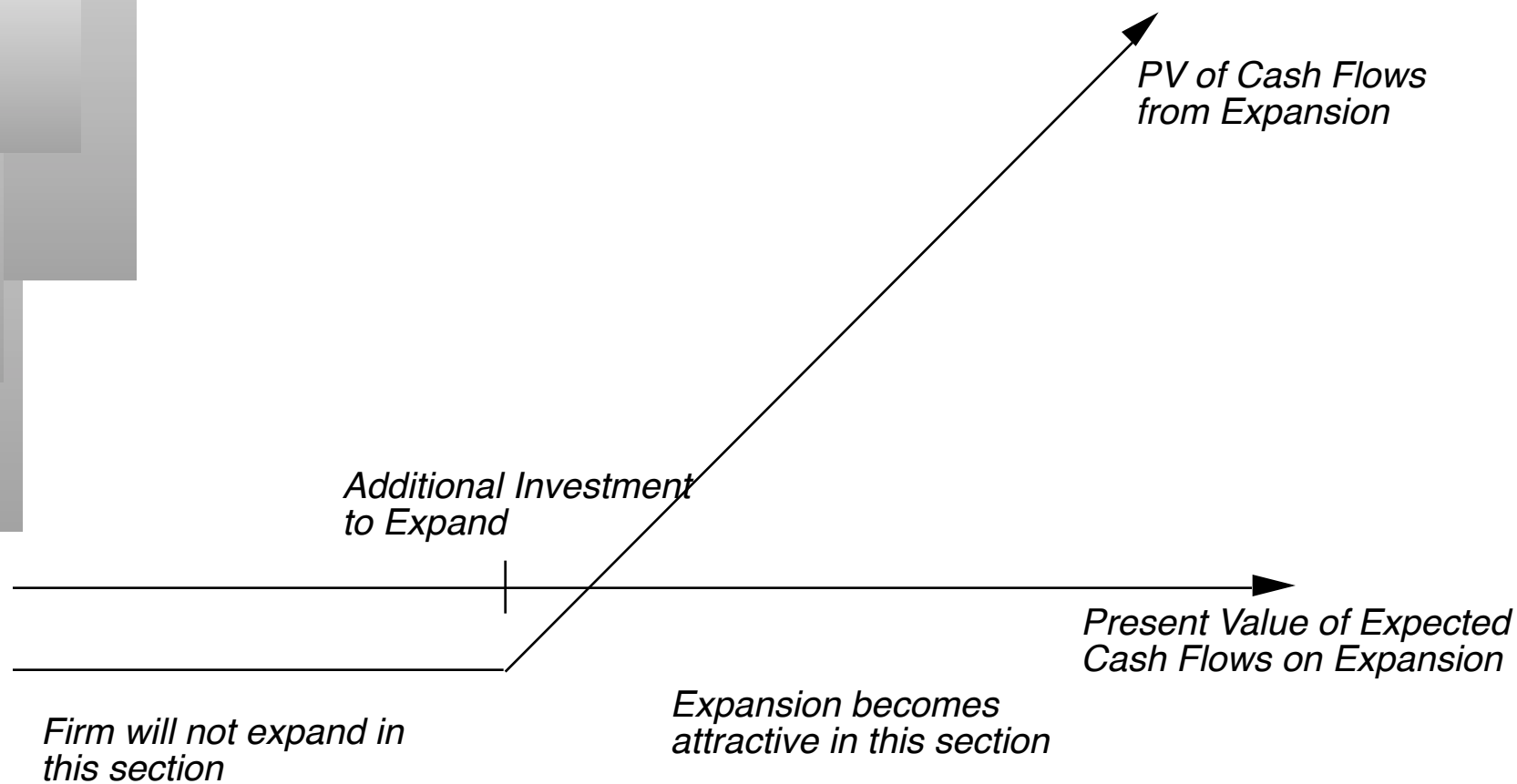
When does the option have significant economic value?

■ For an option to have significant economic value, there has to be a <u>restriction on competition in the event of the contingency</u>. In a perfectly competitive product market, no contingency, no matter how positive, will generate positive net present value.

■ At the limit, real options are <u>most valuable when you have exclusivity</u> - you and only you can take advantage of the contingency. They become less valuable as the barriers to competition become less steep.

Exclusivity: Putting Real Options to the Test

- Product Options: Patent on a drug
  - Patents restrict competitors from developing similar products
  - Patents do not restrict competitors from developing other products to treat the same disease.

- Natural Resource options: An undeveloped oil reserve or gold mine.
  - Natural resource reserves are limited.
  - It takes time and resources to develop new reserves

- Growth Options: Expansion into a new product or market
  - Barriers may range from strong (exclusive licenses granted by the government - as in telecom businesses) to weaker (brand name, knowledge of the market) to weakest (first mover).

Determinants of option value

- ■ Variables Relating to Underlying Asset
  - • Value of Underlying Asset; as this value increases, the right to buy at a fixed price (calls) will become more valuable and the right to sell at a fixed price (puts) will become less valuable.
  - • Variance in that value; as the variance increases, both calls and puts will become more valuable because all options have limited downside and depend upon price volatility for upside.
  - • Expected dividends on the asset, which are likely to reduce the price appreciation component of the asset, reducing the value of calls and increasing the value of puts.
- ■ Variables Relating to Option
  - • Strike Price of Options; the right to buy (sell) at a fixed price becomes more (less) valuable at a lower price.
  - • Life of the Option; both calls and puts benefit from a longer life.
- ■ Level of Interest Rates; as rates increase, the right to buy (sell) at a fixed price in the future becomes more (less) valuable.

The Building Blocks for Option Pricing Models: Arbitrage and Replication

■ The objective in creating a replicating portfolio is to use a combination of riskfree borrowing/lending and the underlying asset to create the same cashflows as the option being valued.

- Call = Borrowing + Buying Δ of the Underlying Stock
- Put = Selling Short Δ on Underlying Asset + Lending
- The number of shares bought or sold is called the **option delta**.

■ The principles of arbitrage then apply, and the value of the option has to be equal to the value of the replicating portfolio.

When can you use option pricing models to value real options?

■ The notion of a replicating portfolio that drives option pricing models makes them most suited for valuing real options where

- The underlying asset is traded - this yield not only observable prices and volatility as inputs to option pricing models but allows for the possibility of creating replicating portfolios

- An active marketplace exists for the option itself.

- The cost of exercising the option is known with some degree of certainty.

■ When option pricing models are used to value real assets, we have to accept the fact that

- The value estimates that emerge will be far more imprecise.

- The value can deviate much more dramatically from market price because of the difficulty of arbitrage.

Example: Valuing an Oil Company

■ 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)

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

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

One final example: Equity as a Liquidation Option

Net Payoff
on Equity

Face Value
of Debt
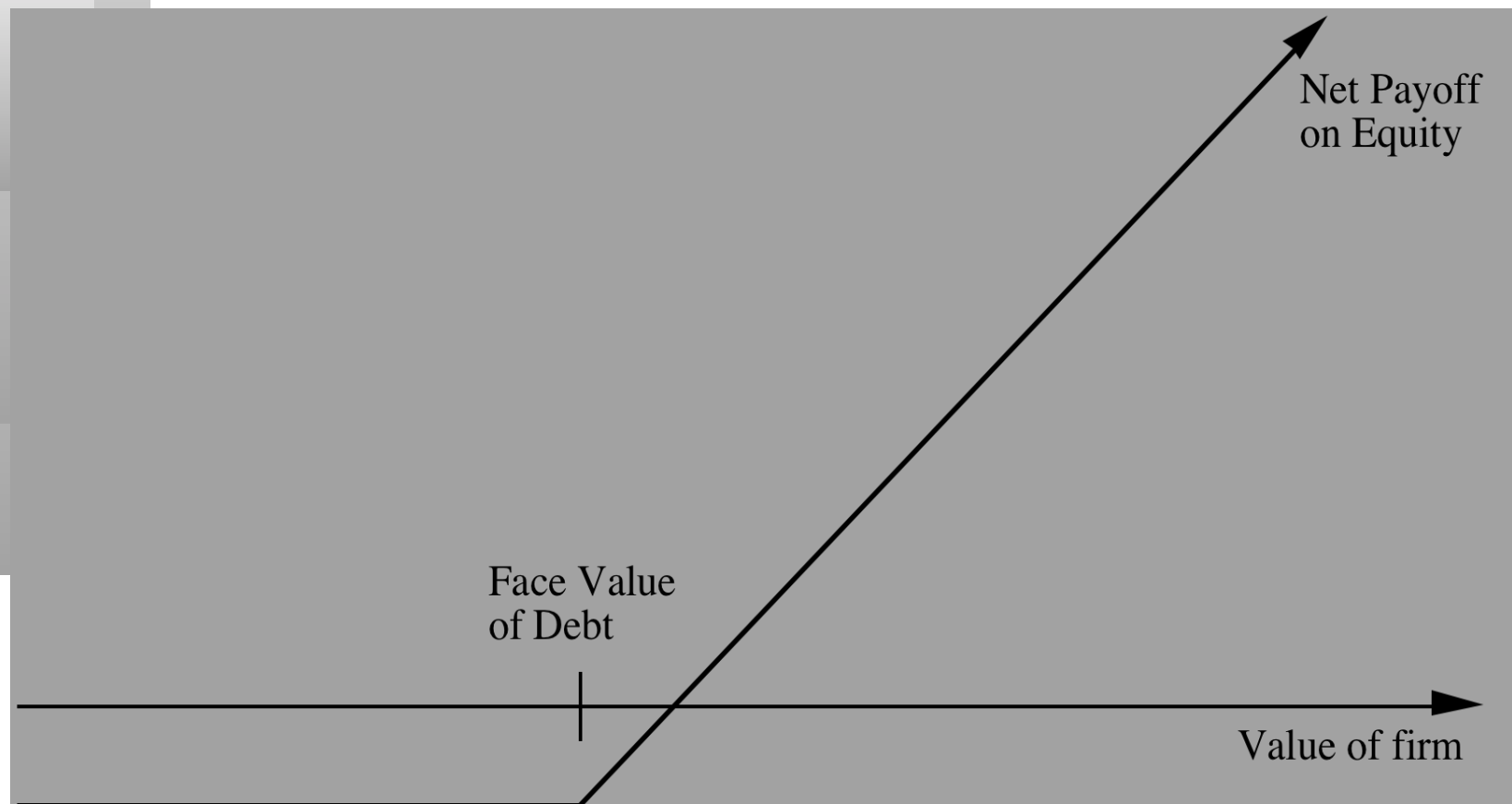
Value of firm

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?
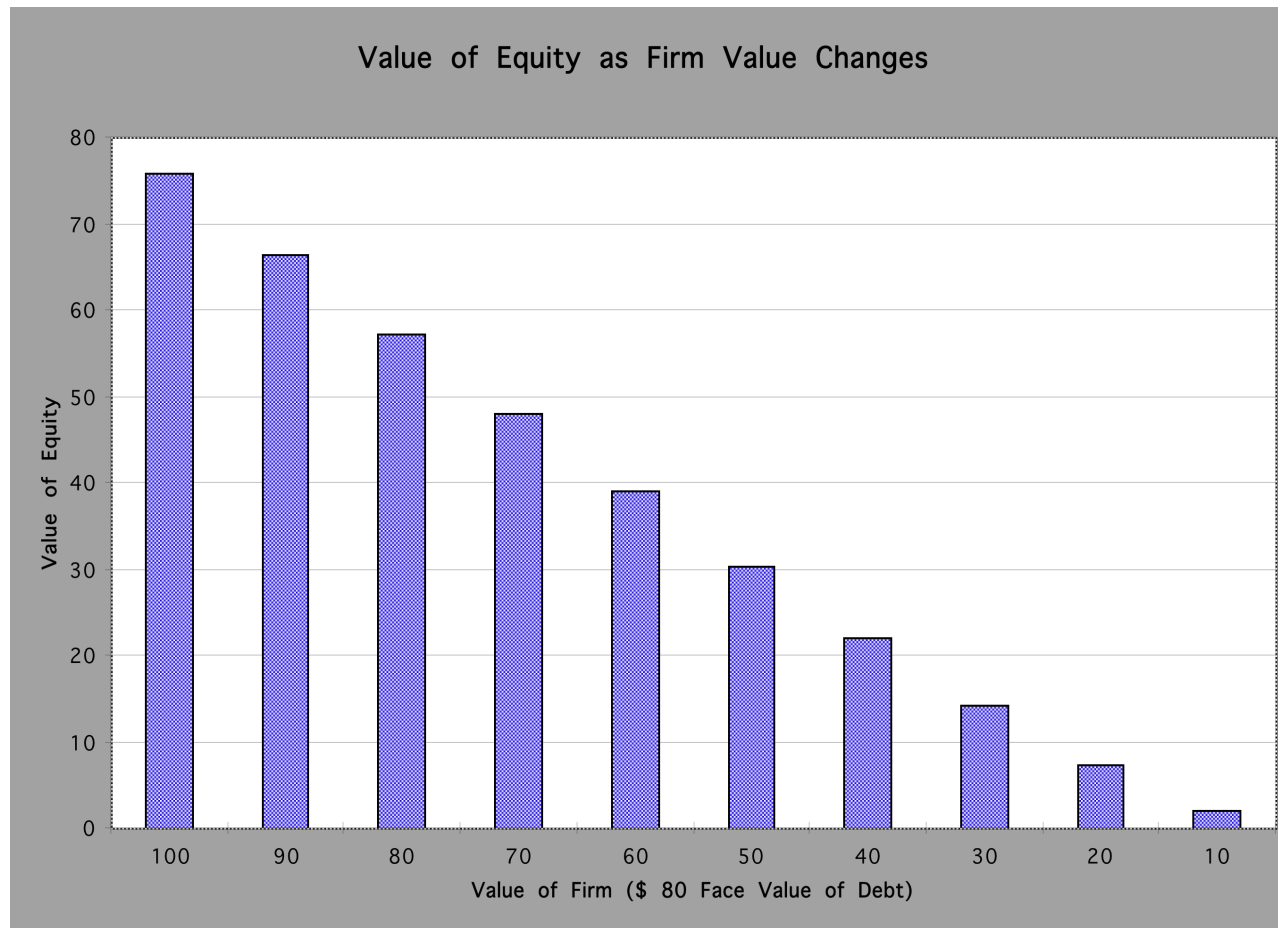- What should the interest rate on debt be?

Valuing Equity as a Call Option

- ■ Inputs to option pricing model
  - 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%
- ■ Based upon these inputs, 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%

The Effect of Catastrophic Drops in Value

■ 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. Consider the new inputs into the equity valuation:

- Value of the underlying asset = S = Value of the firm = $ 50 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%

■ 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 (Equity)= 50 (0.8534) - 80 exp$^{(-0.10)(10)}$ (0.4155) = $30.44 million
- Value of the debt= $50 - $30.44 = $19.56 million

Equity value persists ..

Value of Equity as Firm Value Changes

Back to Lemmings...

WHAT LEMMINGS BELIEVE