THE COST OF CAPITAL: MISUNDERSTOOD, MISESTIMATED AND MISUSED!

Aswath Damodaran

What is the cost of capital?

☐ Most practitioners in finance either have had to estimate or seen others estimate a cost of capital? Which of the following best describes what the cost of capital?

a. It is the cost of raising funding (from both debt and equity) to run a business

b. It the hurdle rate to use in deciding whether to invest money in individual projects

c. It is a key determinant of whether a company should invest or return cash to its stockholders.

d. It is the discount rate that you use to estimate the value of the business.

e. It is one tool for estimating the right mix of debt and equity for a business.

f. It is all of the above.

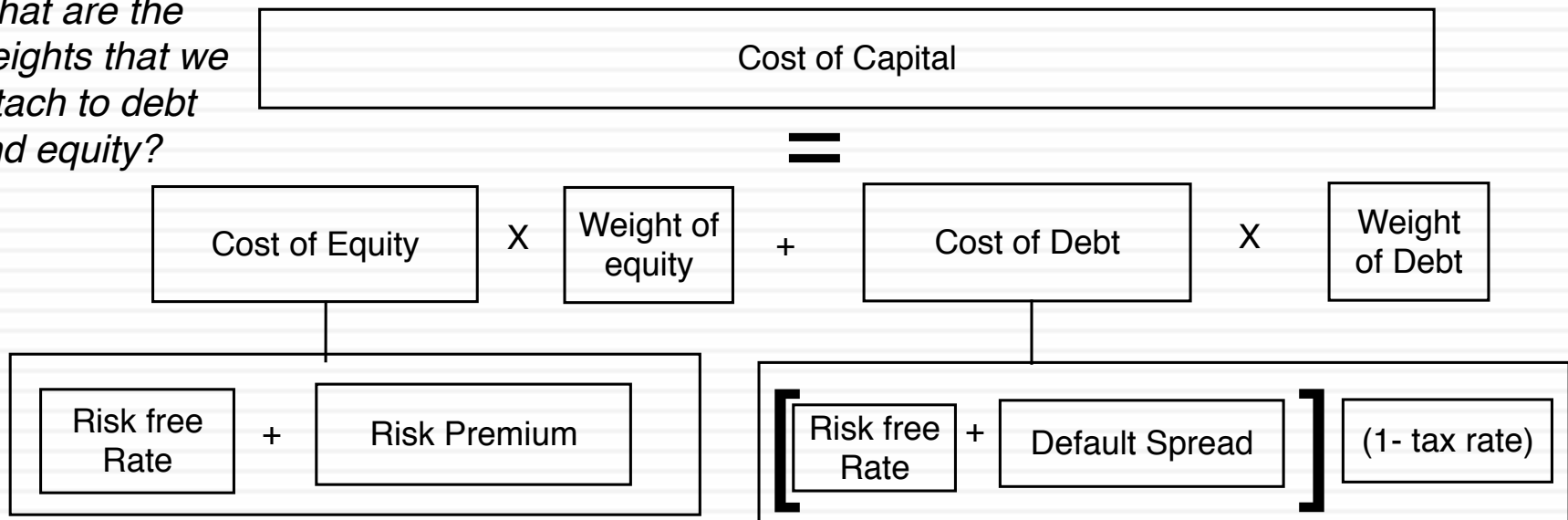# THE ULTIMATE MULTI-PURPOSE TOOL: AN OPPORTUNITY COST & OPTIMIZING TOOL

The Cost of Capital is everywhere in finance

- <u>In corporate finance</u>: In corporate finance, the cost of capital plays a central role in investment analysis, capital structure and dividend policy, helping to determine whether and where a business should invest, how much it should borrow and how much it should return to stockholders.

- <u>In valuation</u>: In valuation, the cost of capital operates as the primary mechanism for measuring and adjusting for risk in the expected cash flows.

The Mechanics of Computing the Cost of Capital

What are the weights that we attach to debt and equity?

Cost of Capital

=

Cost of Equity	X	Weight of equity	+	Cost of Debt	X	Weight of Debt

Risk free Rate	+	Risk Premium		[Risk free Rate	+	Default Spread]	(1- tax rate)

What should we use as the risk free rate?
What equity risks are rewarded?
Should we scale equity risk across companies?
How do we measure the risk premium per unit of risk?

How do we estimate the default spread?
What tax rate do we use?

In investment analysis: The cost of capital as a hurdle rate & opportunity cost

Accounting Test
Return on invested capital (ROIC) > Cost of Capital

Time Weighted CF Test
NPV of the Project > 0

Time Weighted % Return
IRR > Cost of Capital

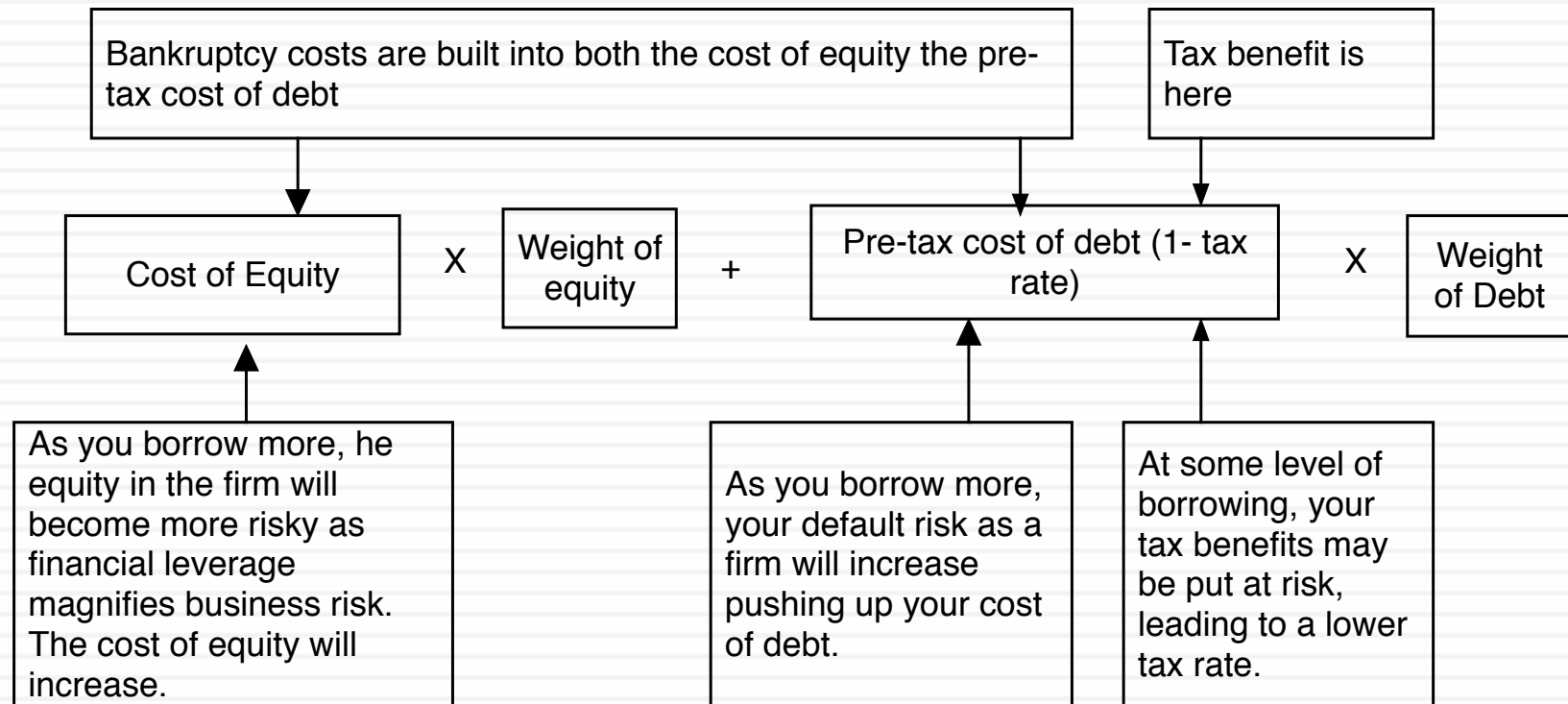| The cost of capital for an investment |
|---|
| *The Hurdle Rate* — Should reflect the risk of the investment, not the entity taking the investment. Should use a debt ratio that is reflective of the investment's cash flows. |

No risk subsidies
If you use the cost of capital of the company as your hurdle rate for all investments, risky investments (and businesses) will be subsidized by safe investments.(and businesses).

No debt subsidies
If you fund an investment disrprortionately with debt, you are using the company's debt capacity to subsidize the investment.

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In capital structure: The cost of capital as "optimizing" tool

Bankruptcy costs are built into both the cost of equity the pre-tax cost of debt	Tax benefit is here

Cost of Equity   X   Weight of equity   +   Pre-tax cost of debt (1- tax rate)   X   Weight of Debt

As you borrow more, he equity in the firm will become more risky as financial leverage magnifies business risk. The cost of equity will increase.

As you borrow more, your default risk as a firm will increase pushing up your cost of debt.

At some level of borrowing, your tax benefits may be put at risk, leading to a lower tax rate.
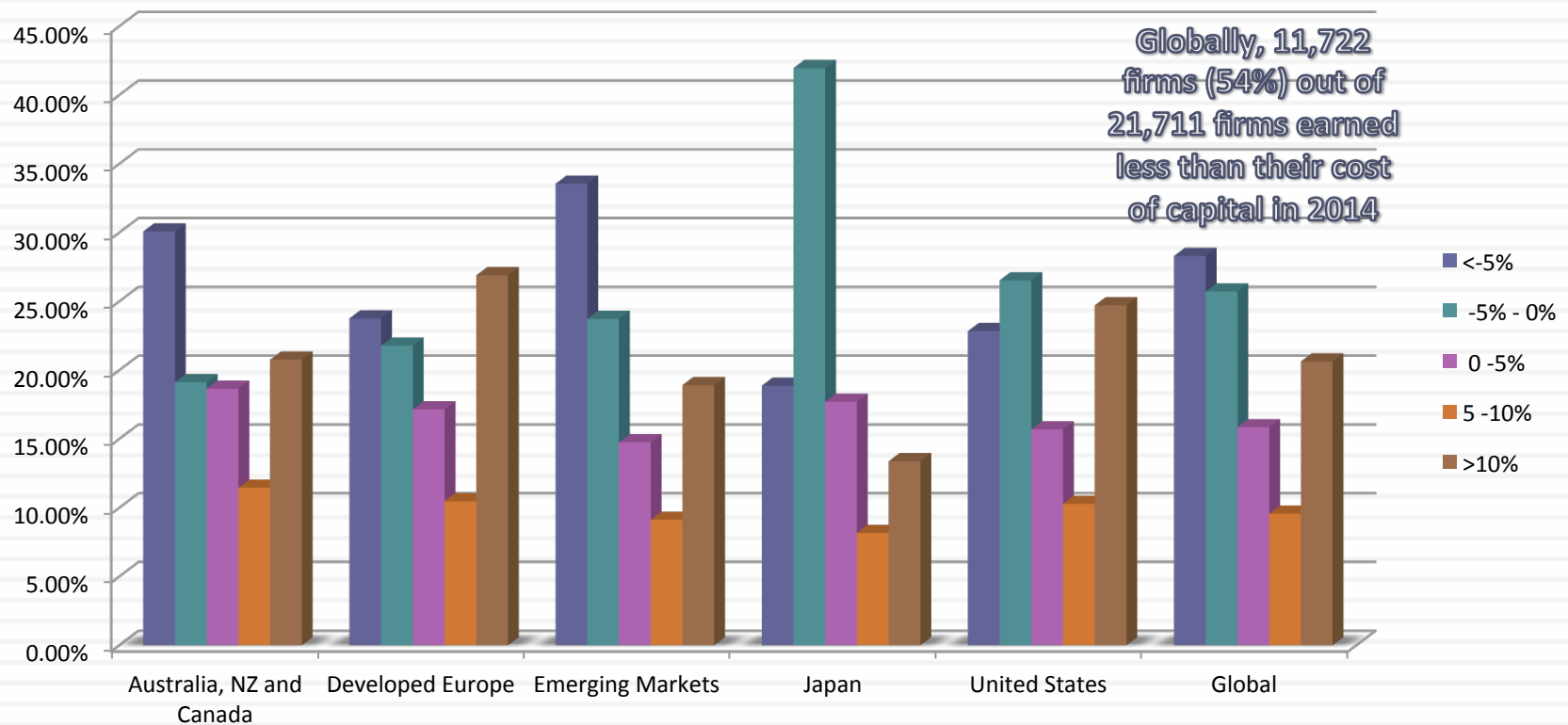
The trade off: As you use more debt, you replace more expensive equity with cheaper debt but you also increase the costs of equity and debt. The net effect will determine whether the cost of capital will increase, decrease or be unchanged as debt ratio changes.

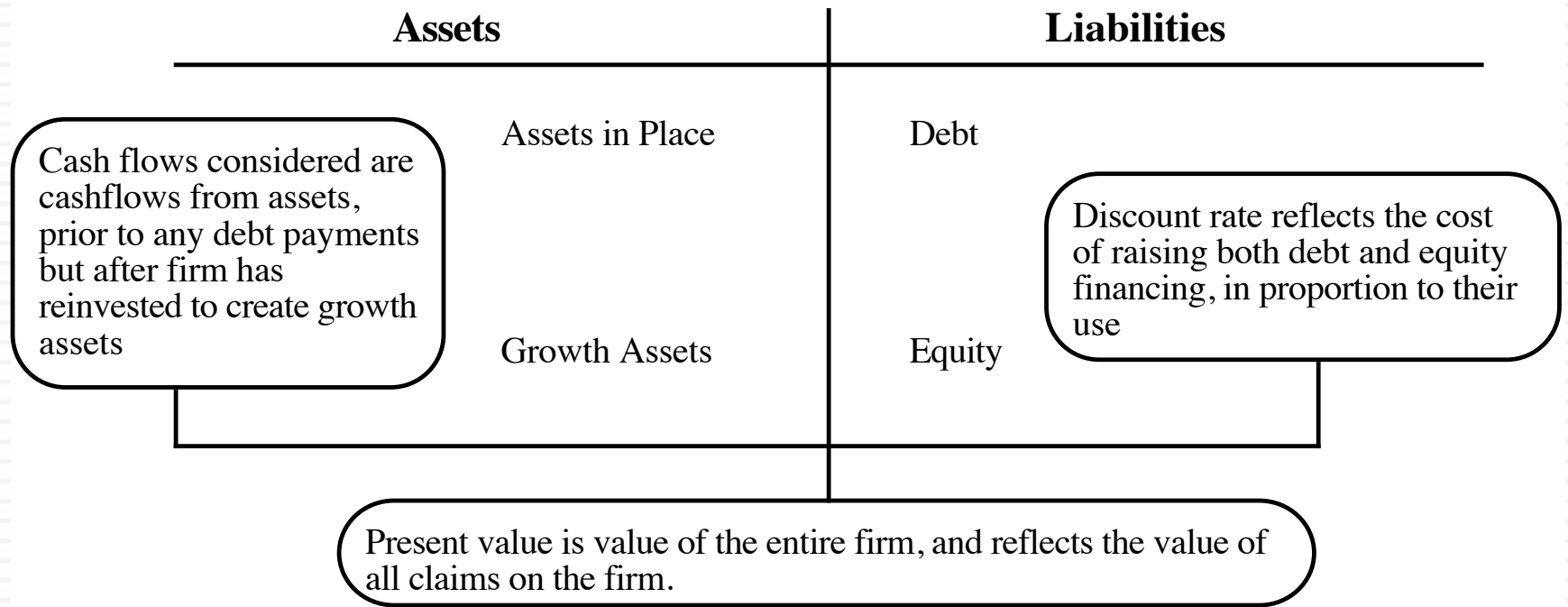*The optimal debt ratio is the one at which the cost of capital is minimized*

In dividend policy: It is the divining rod for returning cash

Excess Return (ROC minus Cost of Capital) for firms with market capitalization> $50 million: Global in 2014

Globally, 11,722 firms (54%) out of 21,711 firms earned less than their cost of capital in 2014

Legend:
- <-5%
- -5% - 0%
- 0 -5%
- 5 -10%
- >10%

Categories: Australia, NZ and Canada, Developed Europe, Emerging Markets, Japan, United States, Global

In valuation: It is the mechanism for adjusting for risk..

Figure 5.6: Firm Valuation

Assets		**Liabilities**
	Assets in Place	Debt
	Growth Assets	Equity

Cash flows considered are cashflows from assets, prior to any debt payments but after firm has reinvested to create growth assets

Discount rate reflects the cost of raising both debt and equity financing, in proportion to their use

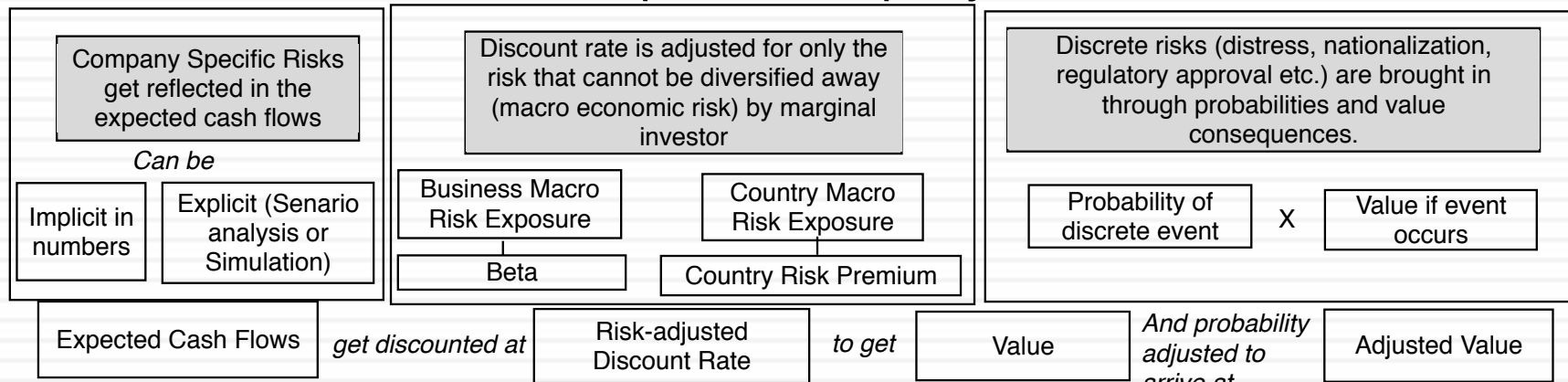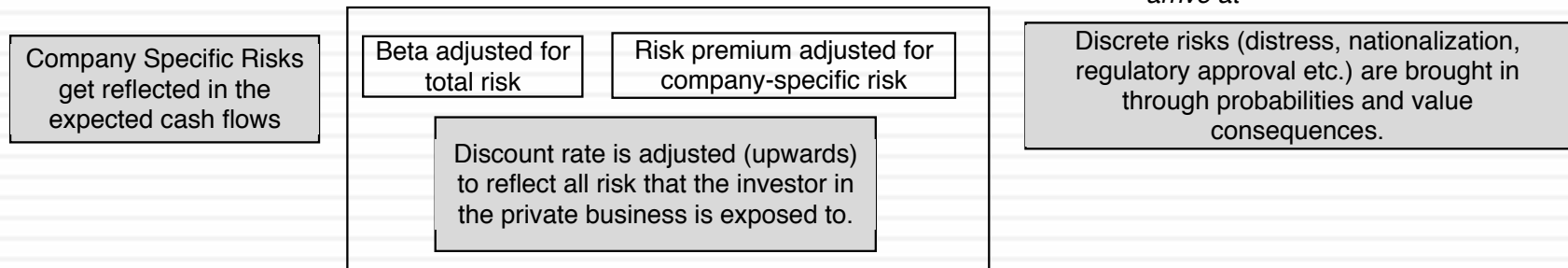Present value is value of the entire firm, and reflects the value of all claims on the firm.

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

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A Template for Risk Adjusting Value

For a public company

| Company Specific Risks get reflected in the expected cash flows | Discount rate is adjusted for only the risk that cannot be diversified away (macro economic risk) by marginal investor | Discrete risks (distress, nationalization, regulatory approval etc.) are brought in through probabilities and value consequences. |

Can be

| Implicit in numbers | Explicit (Senario analysis or Simulation) | Business Macro Risk Exposure | Country Macro Risk Exposure | Probability of discrete event | X | Value if event occurs |

| Beta | Country Risk Premium |

| Expected Cash Flows | *get discounted at* | Risk-adjusted Discount Rate | *to get* | Value | *And probability adjusted to arrive at* | Adjusted Value |

| Company Specific Risks get reflected in the expected cash flows | Beta adjusted for total risk | Risk premium adjusted for company-specific risk | Discrete risks (distress, nationalization, regulatory approval etc.) are brought in through probabilities and value consequences. |

Discount rate is adjusted (upwards) to reflect all risk that the investor in the private business is exposed to.

For a private business

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What the cost of capital is not..

1. **It is not the cost of equity**: There is a time and a place to use the cost of equity and a time a place for the cost of capital. You cannot use them interchangeably.

2. **It is not a return that you would like to make**: Both companies and investors mistake their "hopes" fore expectations. The fact that you would like to make 15% is nice but it is not your cost of capital.

3. **It is not a receptacle for all your hopes and fears**: Some analysts take the "risk adjusting" in the discount rate too far, adjusting it for any and all risks in the company and their "perception" of those risks.

4. **It is not a mechanism for reverse engineering a desired value**: A cost of capital is not that discount rate that yields a value you would like to see.

5. **It is not the most important input in your valuation**: The discount rate is an input into a discounted cash flow valuation but it is definitely not the most critical.

6. **It is not a constant** across time, companies or even in your company's valuation.

I. THE RISK FREE RATE

Feel the urge to normalize?

The Risk Free Rate

You have been asked to estimate the risk free rate for a Swiss multinational, which gets 10% of its revenues in Switzerland (in Swiss Francs), 30% of its revenues in the EU (in Euros), 40% of its revenues in the US (in US $) and 20% of its revenues in India (in Indian rupees). The risk free rates are 0.5% in Swiss Francs, 1% in Euros, 2.5% in US $ and 6% in Indian Rupees. What risk free rate will you use in your valuation?

a. The simple average of the risk free rates

b. The weighted average of the risk free rates

c. The Swiss franc rate, since it is a Swiss company

d. The lowest of the rates, since it has to be risk free

e. The highest of the rates, to be conservative

f. None of the above

The "Low" Risk Free Rate

☐ The US 10-year T.Bond rate today is about 2.1%. That rate is

a. Too low

b. Too high

c. Just right

☐ If you have low risk free rates, you will get high values for assets in a discounted cash flow valuation.

a. True

b. False

☐ Since you are estimating intrinsic value, you should therefore use a normal risk free rate.

a. True

b. False

What is the risk free rate?

- On a riskfree asset, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.

- For an investment to be riskfree, then, it has to have
  - No default risk
  - No reinvestment risk

- Following up, here are three broad implications:

  1. Time horizon matters: Thus, the riskfree rates in valuation will depend upon when the cash flow is expected to occur and will vary across time.

  2. Currency matters: The risk free rate will vary across currencies.

  3. Not all government securities are riskfree: Some governments face default risk and the rates on bonds issued by them will not be riskfree.
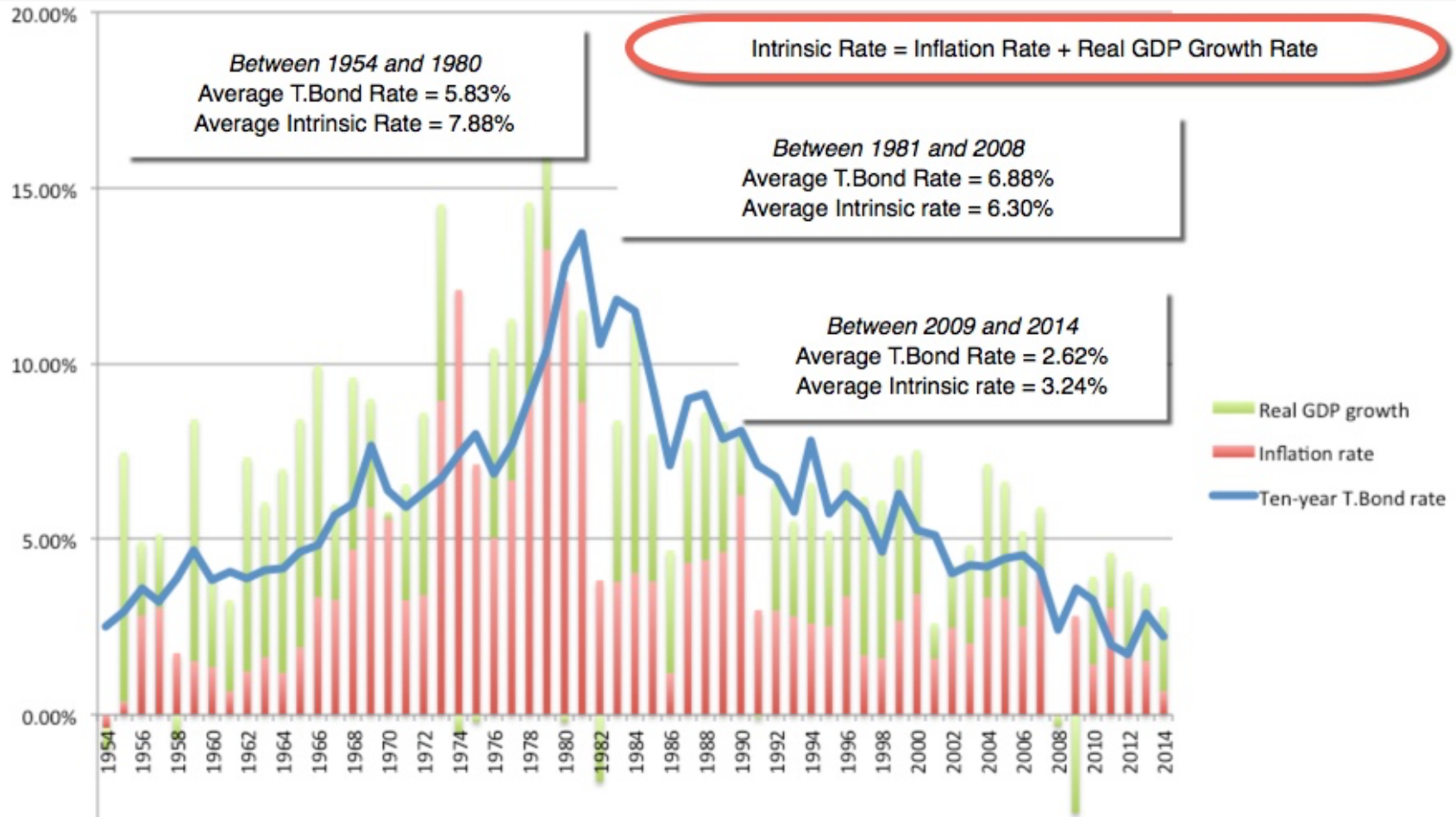
Risk free rate by currency

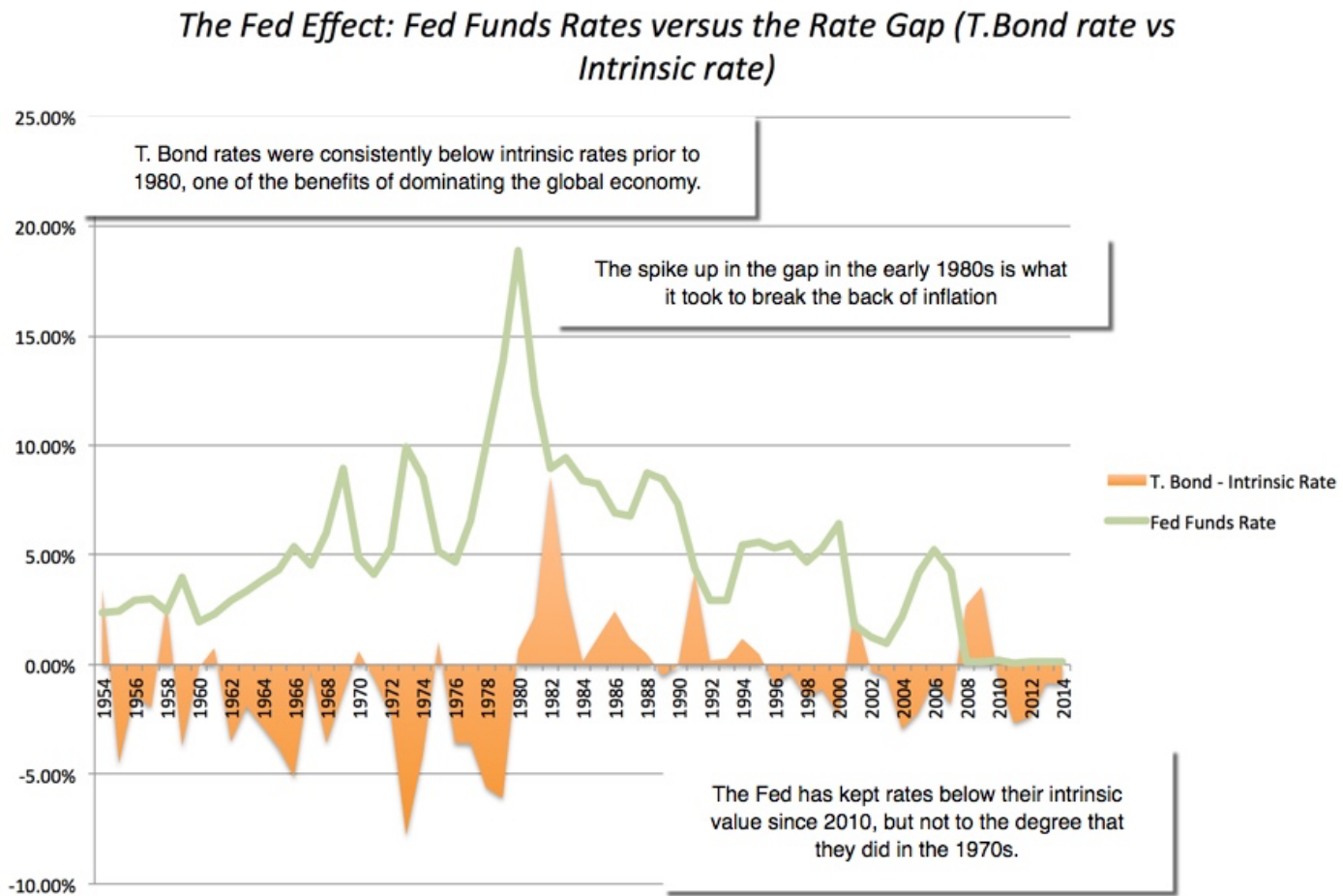## Riskfree Rates: January 2015
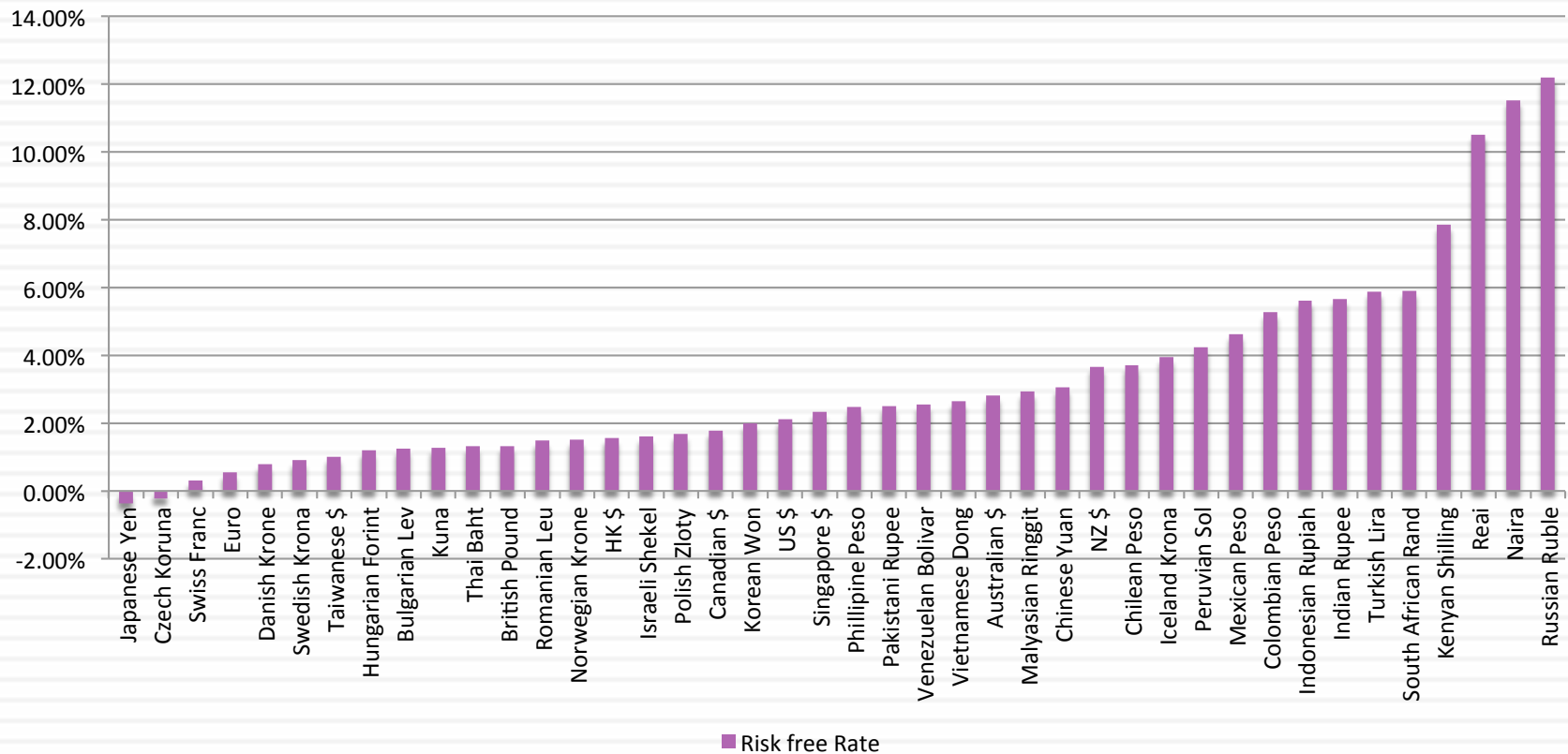
Risk free Rate

The risk free rate is "too low"!

☐ In January 2015, the 10-year treasury bond rate in the United States was 2.17%, a historic low. Assume that you were valuing a company in US dollars then, but were wary about the risk free rate being too low. Which of the following should you do?

   a. Replace the current 10-year bond rate with a more reasonable normalized riskfree rate (the average 10-year bond rate over the last 30 years has been about 5-6%)

   b. Use the current 10-year bond rate as your riskfree rate but make sure that your other assumptions (about growth and inflation) are consistent with the riskfree rate

   c. Something else…

Why is the risk free rate so low?

Between 1954 and 1980
Average T.Bond Rate = 5.83%
Average Intrinsic Rate = 7.88%

Intrinsic Rate = Inflation Rate + Real GDP Growth Rate

Between 1981 and 2008
Average T.Bond Rate = 6.88%
Average Intrinsic rate = 6.30%

Between 2009 and 2014
Average T.Bond Rate = 2.62%
Average Intrinsic rate = 3.24%

Real GDP growth
Inflation rate
Ten-year T.Bond rate

The Fed Effect: Smaller than you think!

The Fed Effect: Fed Funds Rates versus the Rate Gap (T.Bond rate vs Intrinsic rate)

T. Bond rates were consistently below intrinsic rates prior to 1980, one of the benefits of dominating the global economy.

The spike up in the gap in the early 1980s is what it took to break the back of inflation

The Fed has kept rates below their intrinsic value since 2010, but not to the degree that they did in the 1970s.

T. Bond - Intrinsic Rate

Fed Funds Rate

When the risk free rate changes, the rest of your inputs will as well!

Precipitating factor	Effect of precipitating factor on			
	Interest rates	Equity Risk Premium	Expected growth	Value
A crisis	Decrease (Flight to quality)	Increase (Fear Factor)	Decrease (Feedback to real economy)	Decrease
Bad economic news	Decrease	Increase	Decrease	Depends on whether rates drop more or less than expected growth.
Lower inflation or deflation	Decrease	Unclear	Decrease (in nominal terms)	Depends on which effect (interest rate or growth) dominates.
Central Bank action (Lower Fed rate or QE)	Decrease	Unclear	Decrease (since the central bank is signaling that growth is low now.	Increase, if the economy responds quickly and positively to interest rate drop.

Risk free Rate: There are choices but you have to be consistent..

Option	Inputs	Riskfree Rate	ERP	Cost of equity	Expected growth rate	Value
Normalize	Used 20-year averages for T.Bond rate and nominal GDP growth + Historical ERP (1928-2015)	4.14%	4.60%	8.74%	4.77%	**$2,519**
Intrinsic	Used inflation rate + real growth rate from last year as both risk free rate and nominal growth rate for the future. Estimated an intrinsic ERP from Baa default spread on 3/27/15.	3.08%	5.11%	8.19%	3.08%	**$1,957**
Leave alone	Used current T.Bond rate and implied ERP. Set nominal growth rate = current T.Bond rate.	2.00%	5.79%	7.79%	2.00%	**$1,727**
Leave alone for now & then normalize	Used leave alone inputs for next 5 years & normalized after year 5.	2.00%	5.79%	7.79%	2.00%	**$2,296**
		4.14%	4.60%	8.74%	4.77%	

The value of a business with expected cash flows to equity of $100 million next year

The Mismatch Effect

	Mismatches				
Normalize risk free rate, but leave all else alone	4.14%	5.79%	9.93%	2.00%	**$1,261**
Normalize ERP and growth rate, but leave risk free rate alone	2.00%	4.60%	6.60%	4.77%	**$5,464**

II. THE EQUITY RISK PREMIUM

Using history as a crutch?

The Equity Risk Premium

☐ If you use an equity risk premium in your valuations, how do you obtain this number?

a. I use a company-wide standard

b. I use historical risk premium

c. I use a service (D&P, Ibbotson)

d. I make up a number

e. None of the above

☐ If you use a historical risk premium, which of the following are you assuming?

a. That equity risk premiums revert back to historic norms

b. That the historical risk premium is reasonably precise.

c. That equity risk premiums don't change much over time.

What is the Equity Risk Premium?

- Intuitively, the equity risk premium measures what investors demand over and above the riskfree rate for investing in equities as a class. Think of it as the market price for taking on average equity risk.

- It should depend upon
  - The risk aversion of investors
  - The perceived risk of equity as an investment class

- Unless you believe that investor risk aversion and/or that the perceived risk of equity as a class does not change over time, the equity risk premium is a dynamic number (not a static one).

The Historical Risk Premium

□ The historical premium is the premium that stocks have historically earned over riskless securities.

□ While the users of historical risk premiums act as if it is a fact (rather than an estimate), it is sensitive to

  ▫ How far back you go in history…

  ▫ Whether you use T.bill rates or T.Bond rates

  ▫ Whether you use geometric or arithmetic averages.

□ For instance, looking at the US:

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2014	8.00%	6.25%	6.11%	4.60%
	2.17%	2.32%		
1965-2014	6.19%	4.12%	4.84%	3.14%
	2.42%	2.74%		
2005-2014	7.94%	4.06%	6.18%	2.73%
	6.05%	8.65%		

And why you should not trust it!

□ Pick your premium: Analysts can pick and choose the risk premium from the table that best reflects their biases and argue with legal justification that it is a historical risk premium.

□ Noisy estimates: Even with long time periods of history, the risk premium that you derive will have substantial standard error. For instance, if you go back to 1928 (about 80 years of history) and you assume a standard deviation of 20% in annual stock returns, you arrive at a standard error of greater than 2%:

Standard Error in Premium = 20%/√80 = 2.26%

□ Intuitively wrong: The historical risk premium will decrease after bad market years and increase after good ones. For instance, after the 2008 market crisis, the historical risk premium dropped from 4.4% to 3.88%.

Risk Premium for a Mature Market? Broadening the sample to 1900-2013

Country	Geometric Average ERP	Arithmetic Average ERP	Std Error
Australia	5.60%	7.50%	1.90%
Austria	2.50%	21.50%	14.40%
Belgium	2.30%	4.40%	2.00%
Canada	3.50%	5.10%	1.70%
Denmark	2.00%	3.60%	1.70%
Finland	5.10%	8.70%	2.80%
France	3.00%	5.30%	2.10%
Germany	5.00%	8.40%	2.70%
Ireland	2.60%	4.50%	1.80%
Italy	3.10%	6.50%	2.70%
Japan	5.10%	9.10%	3.00%
Netherlands	3.20%	5.60%	2.10%
New Zealand	3.90%	5.50%	1.70%
Norway	2.30%	5.30%	2.60%
South Africa	5.40%	7.10%	1.80%
Spain	1.90%	3.90%	1.90%
Sweden	3.00%	5.30%	2.00%
Switzerland	2.10%	3.60%	1.60%
U.K.	3.70%	5.00%	1.60%
U.S.	4.40%	6.50%	1.90%
Europe	3.10%	4.40%	1.50%
World-ex U.S.	2.80%	3.90%	1.40%
World	3.20%	4.50%	1.50%

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The simplest way of estimating an additional country risk premium: The country default spread

- **Default spread for country**: In this approach, the country equity risk premium is set equal to the default spread for the country, estimated in one of three ways:
  - The default spread on a dollar denominated bond issued by the country. (In January 2015, that spread was 1.55% for the Brazilian $ bond)
  - The sovereign CDS spread for the country. In January 2015, the ten year CDS spread for Brazil was 2.86%.
  - The default spread based on the local currency rating for the country. Brazil's sovereign local currency rating is Baa2 and the default spread for a Baa2 rated sovereign was about 1.90% in January 2015.
- Add the default spread to a "mature" market premium: This default spread is added on to the mature market premium to arrive at the total equity risk premium for Brazil, assuming a mature market premium of 5.75%.
  - Country Risk Premium for Brazil = 1.90%
  - Total ERP for Brazil = 5.75% + 1.90% = 7.65%

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A melded approach to estimating the additional country risk premium

- ☐ Country ratings measure default risk. While default risk premiums and equity risk premiums are highly correlated, one would expect equity spreads to be higher than debt spreads.

- ☐ Another is to multiply the bond default spread by the relative volatility of stock and bond prices in that market. Using this approach for Brazil in January 2015, you would get:
  - ☐ Country Equity risk premium = Default spread on country bond* $\sigma_{Country\ Equity}$ / $\sigma_{Country\ Bond}$
    - ▪ Standard Deviation in Bovespa (Equity) = 21%
    - ▪ Standard Deviation in Brazil government bond = 14%
    - ▪ Default spread on C-Bond = 1.90%
  - ☐ Brazil Country Risk Premium = 1.90% (21%/14%) = 2.85%
  - ☐ Brazil Total ERP = Mature Market Premium + CRP = 5.75% + 2.85% = 8.60%

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ERP : Jan 2015

Andorra	8.15%	2.40%	Italy	8.60%	2.85%
Austria	5.75%	0.00%	Jersey	6.35%	0.60%
Belgium	6.65%	0.90%	Liechtenstein	5.75%	0.00%
Cyprus	15.50%	9.75%	Luxembourg	5.75%	0.00%
Denmark	5.75%	0.00%	Malta	7.55%	1.80%
Finland	5.75%	0.00%	Netherlands	5.75%	0.00%
France	6.35%	0.60%	Norway	5.75%	-0.00%
Germany	5.75%	0.00%	Portugal	9.50%	3.75%
Greece	17.00%	11.25%	Spain	8.60%	2.85%
Guernsey	6.35%	0.60%	Sweden	5.75%	0.00%
Iceland	9.05%	3.30%	Switzerland	5.75%	0.00%
Ireland	8.15%	2.40%	Turkey	9.05%	3.30%
Isle of Man	6.35%	0.60%	UK	6.35%	0.60%
			W. Europe	**6.88%**	**1.13%**

Canada	5.75%	0.00%
US	5.75%	0.00%
North America	**5.75%**	**0.00%**

Argentina	17.00%	11.25%
Belize	19.25%	13.50%
Bolivia	11.15%	5.40%
Brazil	8.60%	2.85%
Chile	6.65%	0.90%
Colombia	8.60%	2.85%
Costa Rica	9.50%	3.75%
Ecuador	15.50%	9.75%
El Salvador	11.15%	5.40%
Guatemala	9.50%	3.75%
Honduras	15.50%	9.75%
Mexico	7.55%	1.80%
Nicaragua	15.50%	9.75%
Panama	8.60%	2.85%
Paraguay	10.25%	4.50%
Peru	7.55%	1.80%
Suriname	11.15%	5.40%
Uruguay	8.60%	2.85%
Venezuela	17.00%	11.25%
Latin America	**9.95%**	**4.20%**

Angola	10.25%	4.50%
Botswana	7.03%	1.28%
Burkina Faso	15.50%	9.75%
Cameroon	14.00%	8.25%
Cape Verde	14.00%	8.25%
Congo (DR)	15.50%	9.75%
Congo (Republic)	11.15%	5.40%
Côte d'Ivoire	12.50%	6.75%
Egypt	17.00%	11.25%
Ethiopia	12.50%	6.75%
Gabon	11.15%	5.40%
Ghana	14.00%	8.25%
Kenya	12.50%	6.75%
Morocco	9.50%	3.75%
Mozambique	12.50%	6.75%
Namibia	9.05%	3.30%
Nigeria	11.15%	5.40%
Rwanda	14.00%	8.25%
Senegal	12.50%	6.75%
South Africa	8.60%	2.85%
Tunisia	11.15%	5.40%
Uganda	12.50%	6.75%
Zambia	12.50%	6.75%
Africa	**11.73%**	**5.98%**

Albania	12.50%	6.75%	Montenegro	11.15%	5.40%
Armenia	10.25%	4.50%	Poland	7.03%	1.28%
Azerbaijan	9.05%	3.30%	Romania	9.05%	3.30%
Belarus	15.50%	9.75%	Russia	8.60%	2.85%
Bosnia	15.50%	.75%	Serbia	12.50%	6.75%
Bulgaria	8.60%	2.85%	Slovakia	7.03%	1.28%
Croatia	9.50%	3.75%	Slovenia	9.50%	3.75%
Czech Repub	6.80%	1.05%	Ukraine	20.75%	15.00%
Estonia	6.80%	1.05%	**E. Europe**	**9.08%**	**3.33%**
Georgia	11.15%	5.40%			
Hungary	9.50%	3.75%			
Kazakhstan	8.60%	2.85%			
Latvia	8.15%	2.40%			
Lithuania	8.15%	2.40%			
Macedonia	11.15%	5.40%			
Moldova	15.50%	9.75%			

Abu Dhabi	6.50%	0.75%
Bahrain	8.60%	2.85%
Israel	6.80%	1.05%
Jordan	12.50%	6.75%
Kuwait	6.50%	0.75%
Lebanon	14.00%	8.25%
Oman	6.80%	1.05%
Qatar	6.50%	0.75%
Ras Al Khaimah	7.03%	1.28%
Saudi Arabia	6.65%	0.90%
Sharjah	7.55%	1.80%
UAE	6.50%	0.75%
Middle East	**6.85%**	**1.10%**

Bangladesh	11.15%	5.40%
Cambodia	14.00%	8.25%
China	6.65%	0.90%
Fiji	12.50%	6.75%
Hong Kong	6.35%	0.60%
India	9.05%	3.30%
Indonesia	9.05%	3.30%
Japan	6.80%	1.05%
Korea	6.65%	0.90%
Macao	6.50%	0.75%
Malaysia	7.55%	1.80%
Mauritius	8.15%	2.40%
Mongolia	14.00%	8.25%
Pakistan	17.00%	11.25%
Papua New Guinea	12.50%	6.75%
Philippines	8.60%	2.85%
Singapore	5.75%	0.00%
Sri Lanka	12.50%	6.75%
Taiwan	6.65%	0.90%
Thailand	8.15%	2.40%
Vietnam	12.50%	6.75%
Asia	**7.26%**	**1.51%**

Australia	5.75%	0.00%
Cook Islands	12.50%	6.75%
New Zealand	5.75%	0.00%
Australia & NZ	**5.75%**	**0.00%**

Black #: Total ERP
Red #: Country risk premium
AVG: GDP weighted average

Estimating the ERP for a company

- <u>Location based CRP</u>: The standard approach in valuation is to attach a country risk premium to a company based upon its country of incorporation. Thus, if you are an Indian company, you are assumed to be exposed to the Indian country risk premium. A developed market company is assumed to be unexposed to emerging market risk.

- <u>Operation-based CRP</u>: There is a more reasonable modified version. The country risk premium for a company can be computed as a weighted average of the country risk premiums of the countries that it does business in, with the weights based upon revenues or operating income. If a company is exposed to risk in dozens of countries, you can take a weighted average of the risk premiums by region.
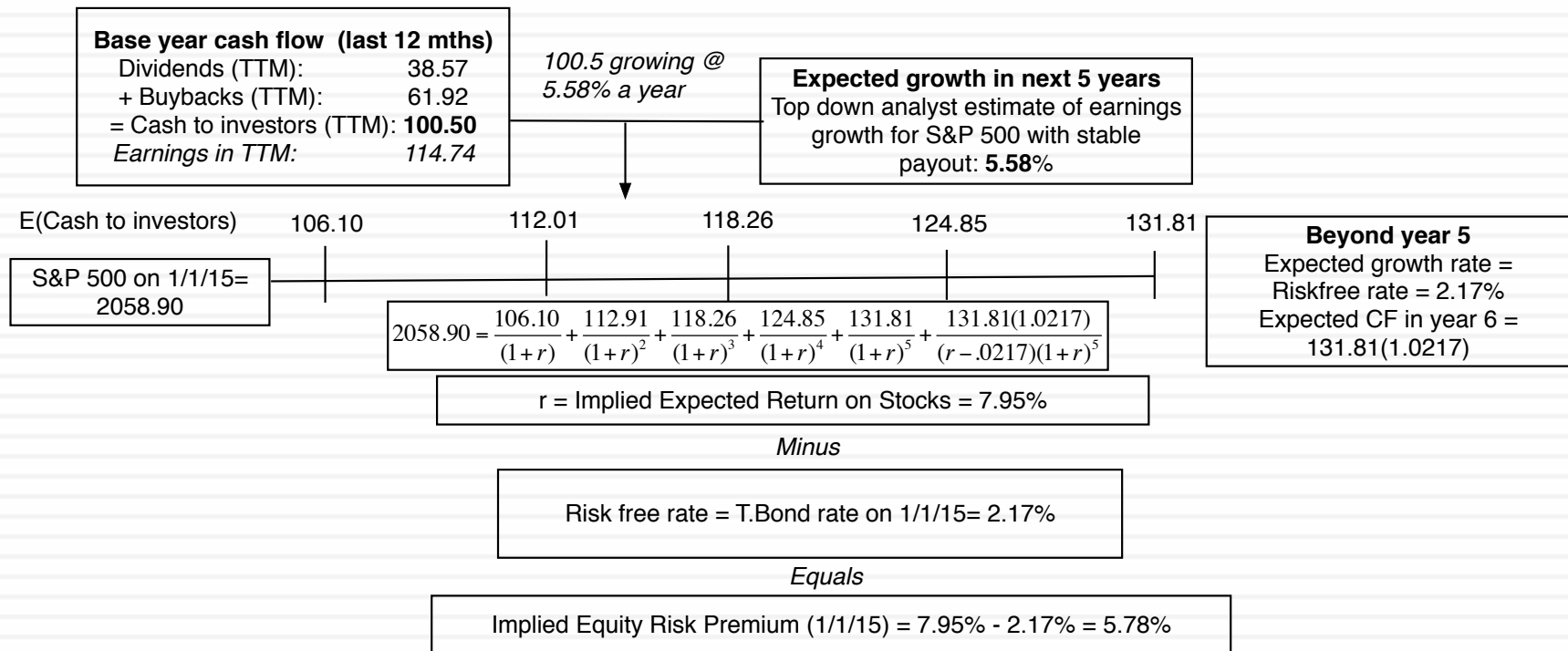
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ERP Computations for Coca Cola and Disney

Coca Cola: ERP in 2012

Region	Revenues	Total ERP	CRP
Western Europe	19%	6.67%	0.67%
Eastern Europe & Russia	5%	8.60%	2.60%
Asia	15%	7.63%	1.63%
Latin America	15%	9.42%	3.42%
Australia	4%	6.00%	0.00%
Africa	4%	9.82%	3.82%
North America	40%	6.00%	0.00%
Coca Cola	100%	7.14%	1.14%

Disney: ERP in November 2013

Region/ Country	Proportion of Disney's Revenues	ERP
US& Canada	82.01%	5.50%
Europe	11.64%	6.72%
Asia-Pacific	6.02%	7.27%
Latin America	0.33%	9.44%
Disney	**100.00%**	**5.76%**

A forward-looking ERP?

Base year cash flow (last 12 mths)
Dividends (TTM):   38.57
+ Buybacks (TTM):   61.92
= Cash to investors (TTM): **100.50**
Earnings in TTM: *114.74*

100.5 growing @ 5.58% a year

Expected growth in next 5 years
Top down analyst estimate of earnings growth for S&P 500 with stable payout: **5.58**%

E(Cash to investors)   106.10   112.01   118.26   124.85   131.81

S&P 500 on 1/1/15= 2058.90

Beyond year 5
Expected growth rate = Riskfree rate = 2.17%
Expected CF in year 6 = 131.81(1.0217)

$$2058.90 = \frac{106.10}{(1+r)} + \frac{112.91}{(1+r)^2} + \frac{118.26}{(1+r)^3} + \frac{124.85}{(1+r)^4} + \frac{131.81}{(1+r)^5} + \frac{131.81(1.0217)}{(r-.0217)(1+r)^5}$$

r = Implied Expected Return on Stocks = 7.95%

Minus

Risk free rate = T.Bond rate on 1/1/15= 2.17%

Equals

Implied Equity Risk Premium (1/1/15) = 7.95% - 2.17% = 5.78%

Implied Premiums in the US: 1960-2014

Implied Premium for US Equity Market: 1960-2014

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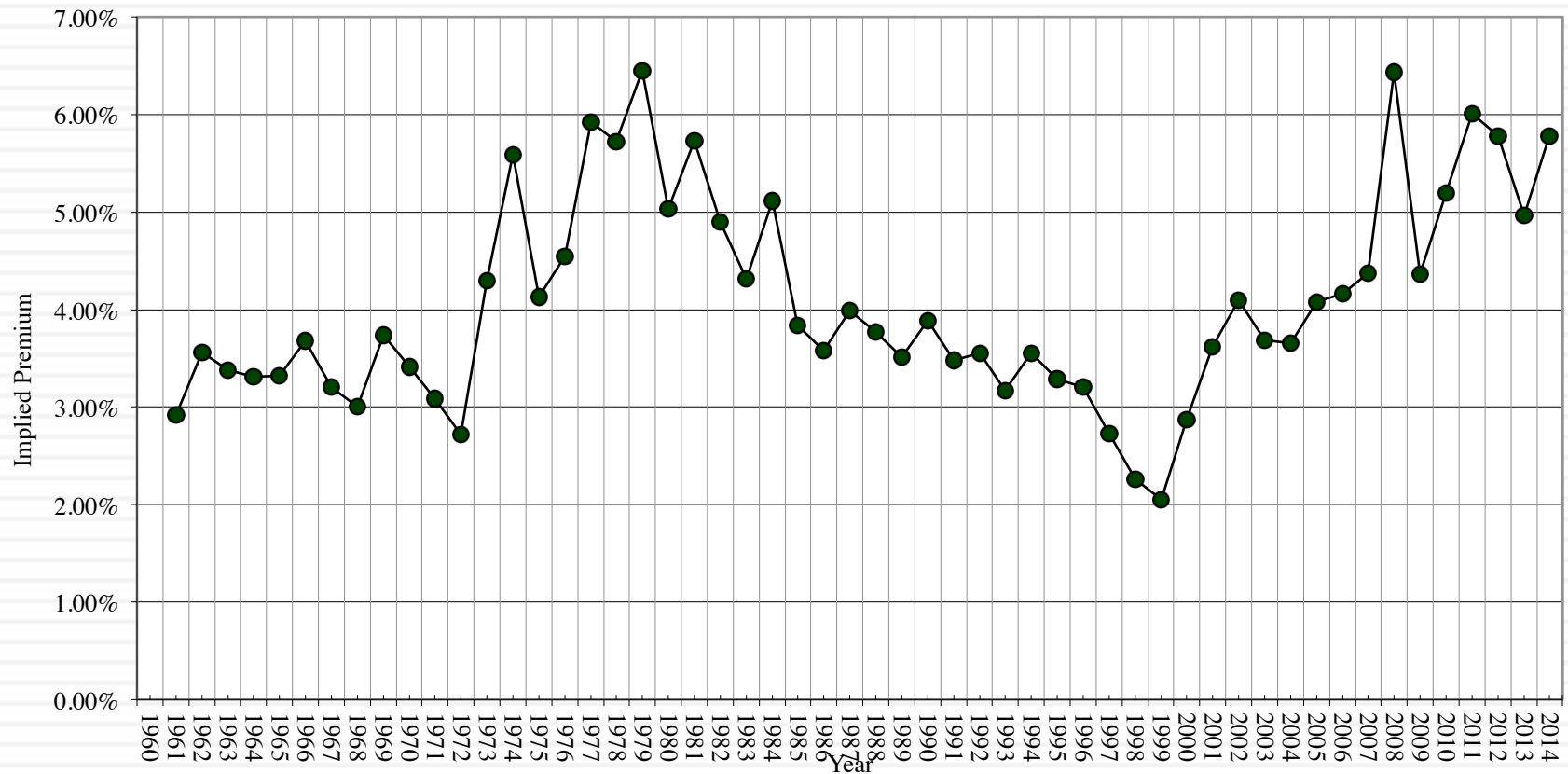
The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009

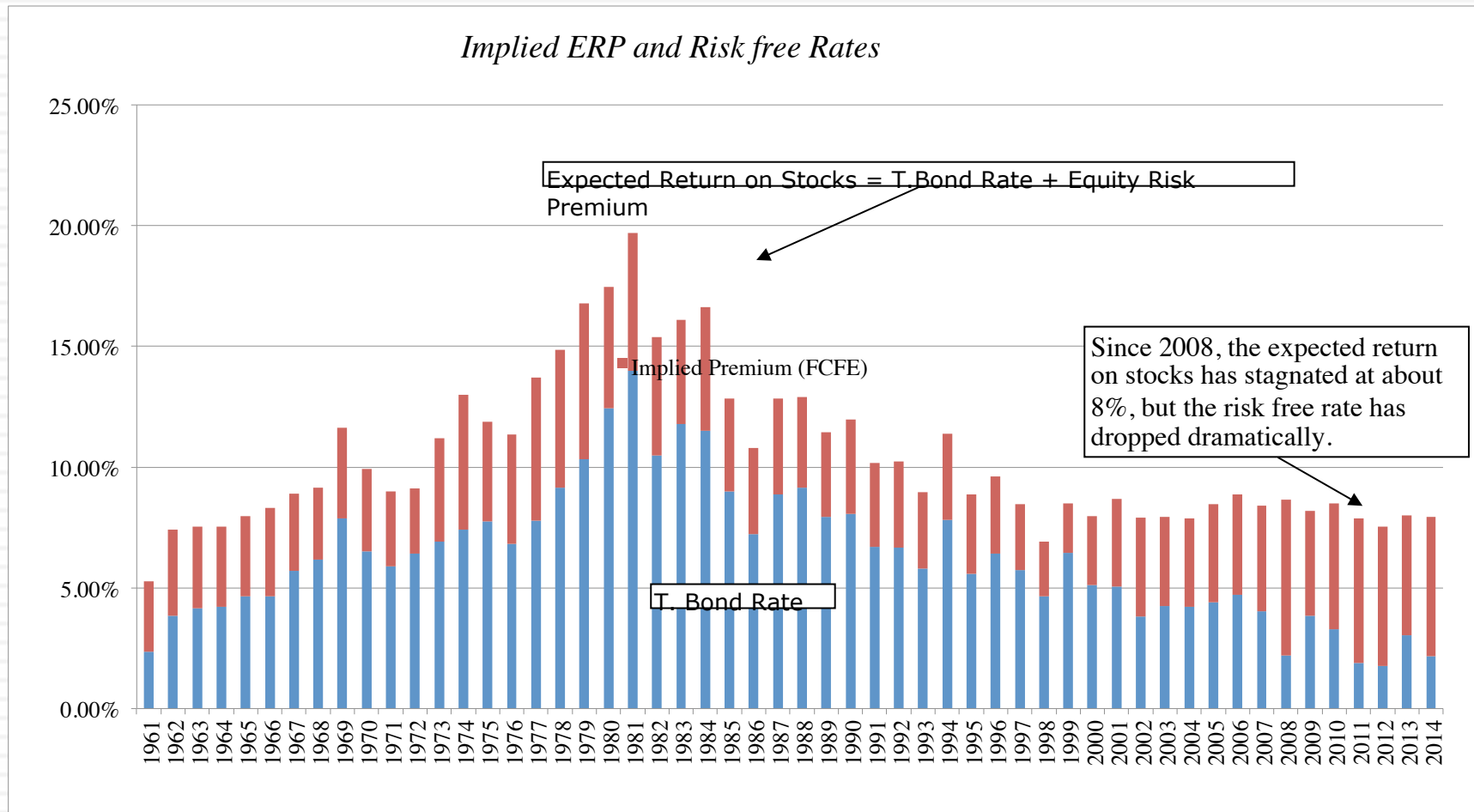Implied Equity Risk Premium - 9/12- 12/31/08

Aswath Damodaran
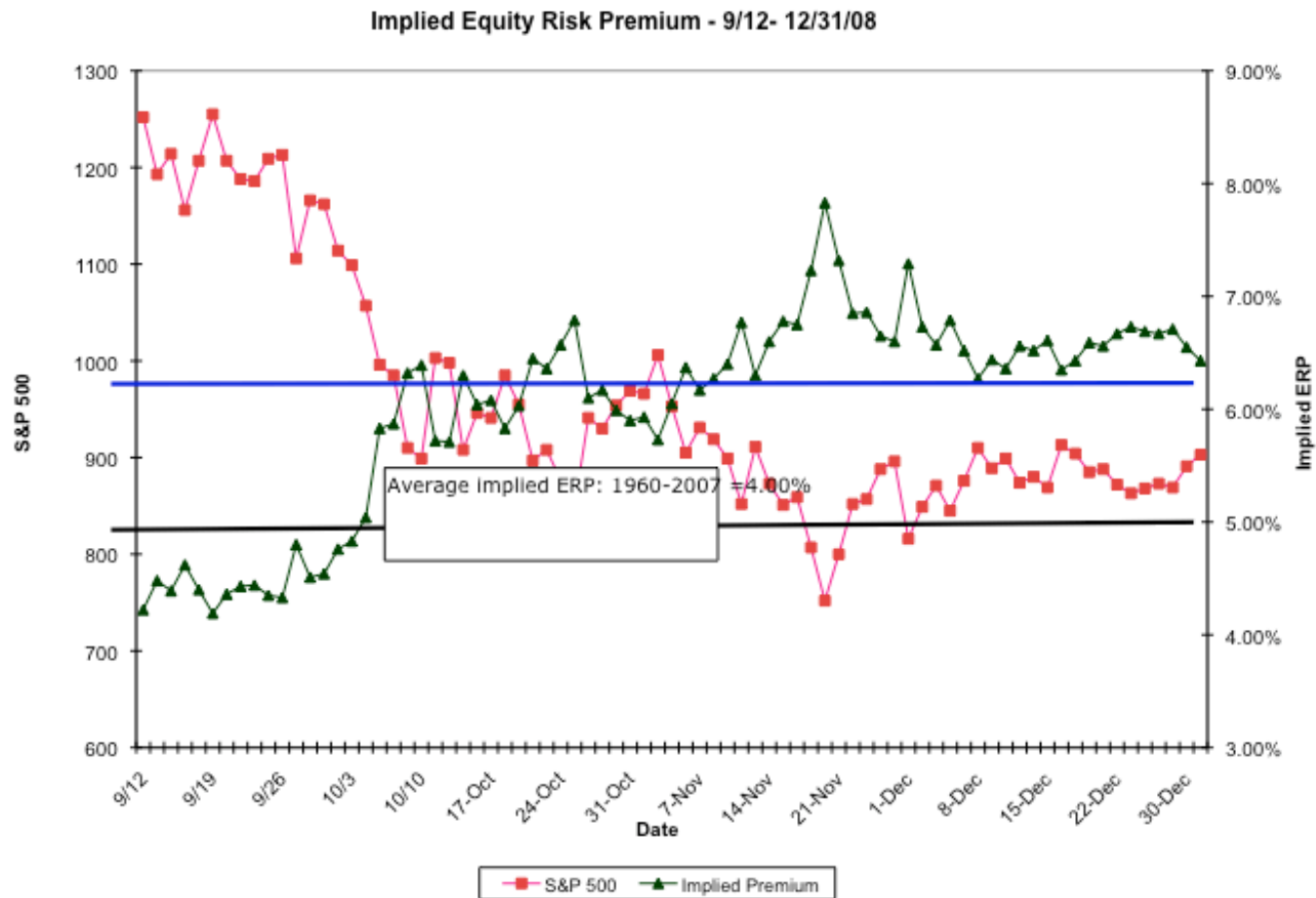
An Updated Equity Risk Premium: Dynamics and Determinant

☐ At this link, you will find the latest monthly ERP estimate that I have for the S&P 500.

☐ If I hold all else constant (same cash flows, same risk free rate) and lower the index value by 10%, what effect will it have on the ERP?

a. Increase

b. Decrease

☐ If I hold all else constant (same cash flows, same risk free rate) and lower the cash flow by 10%, what effect will it have on the ERP?

a. Increase

b. Decrease

☐ If I hold all else constant (same cash flows, same risk free rate) increase the risk free rate by 1%, what effect will it have on the ERP?

a. Increase

b. Decrease

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Implied Premium versus Risk Free Rate

Implied ERP and Risk free Rates

Expected Return on Stocks = T.Bond Rate + Equity Risk Premium

Implied Premium (FCFE)

T. Bond Rate

Since 2008, the expected return on stocks has stagnated at about 8%, but the risk free rate has dropped dramatically.
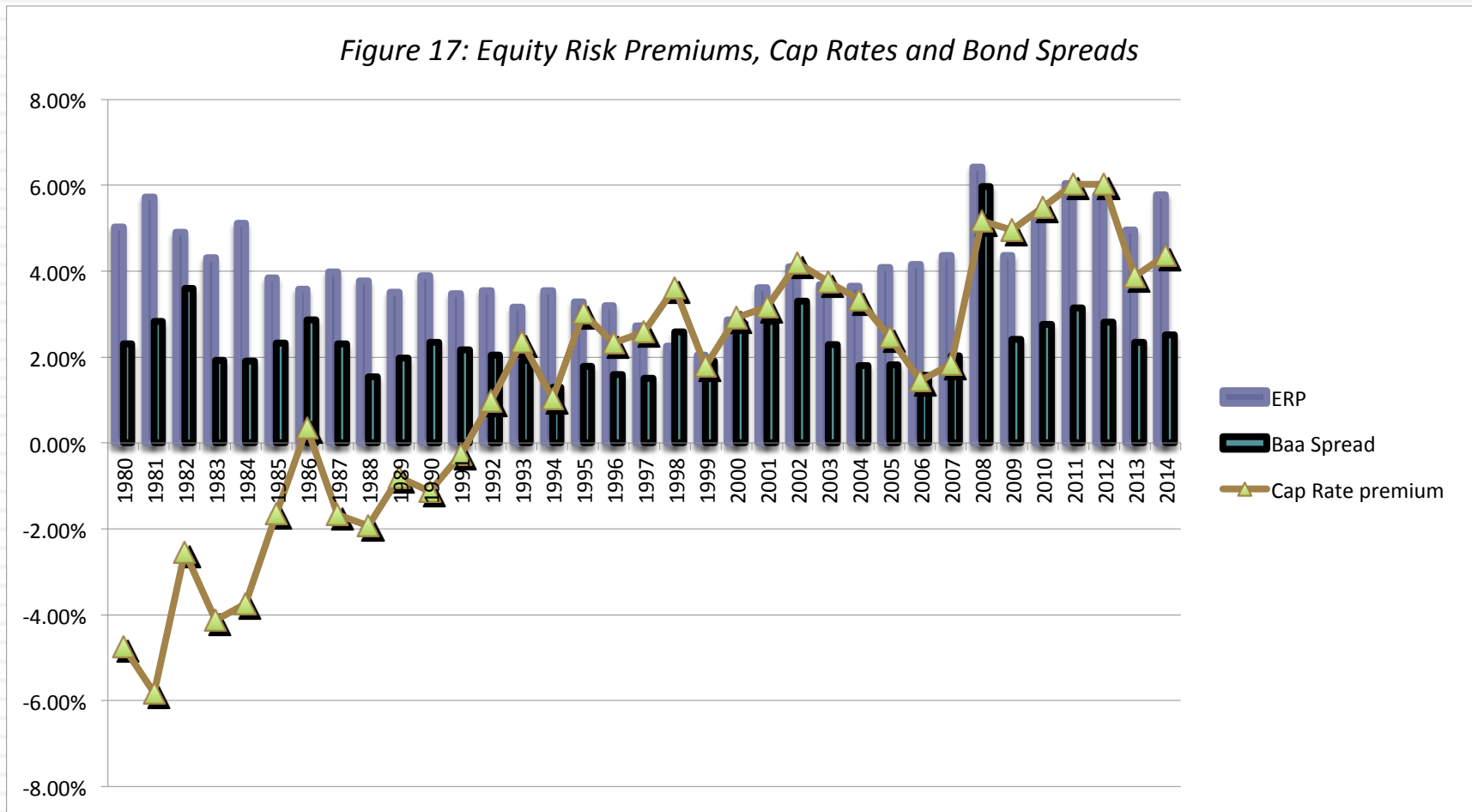
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Equity Risk Premiums and Bond Default Spreads

Figure 16: Equity Risk Premiums and Bond Default Spreads
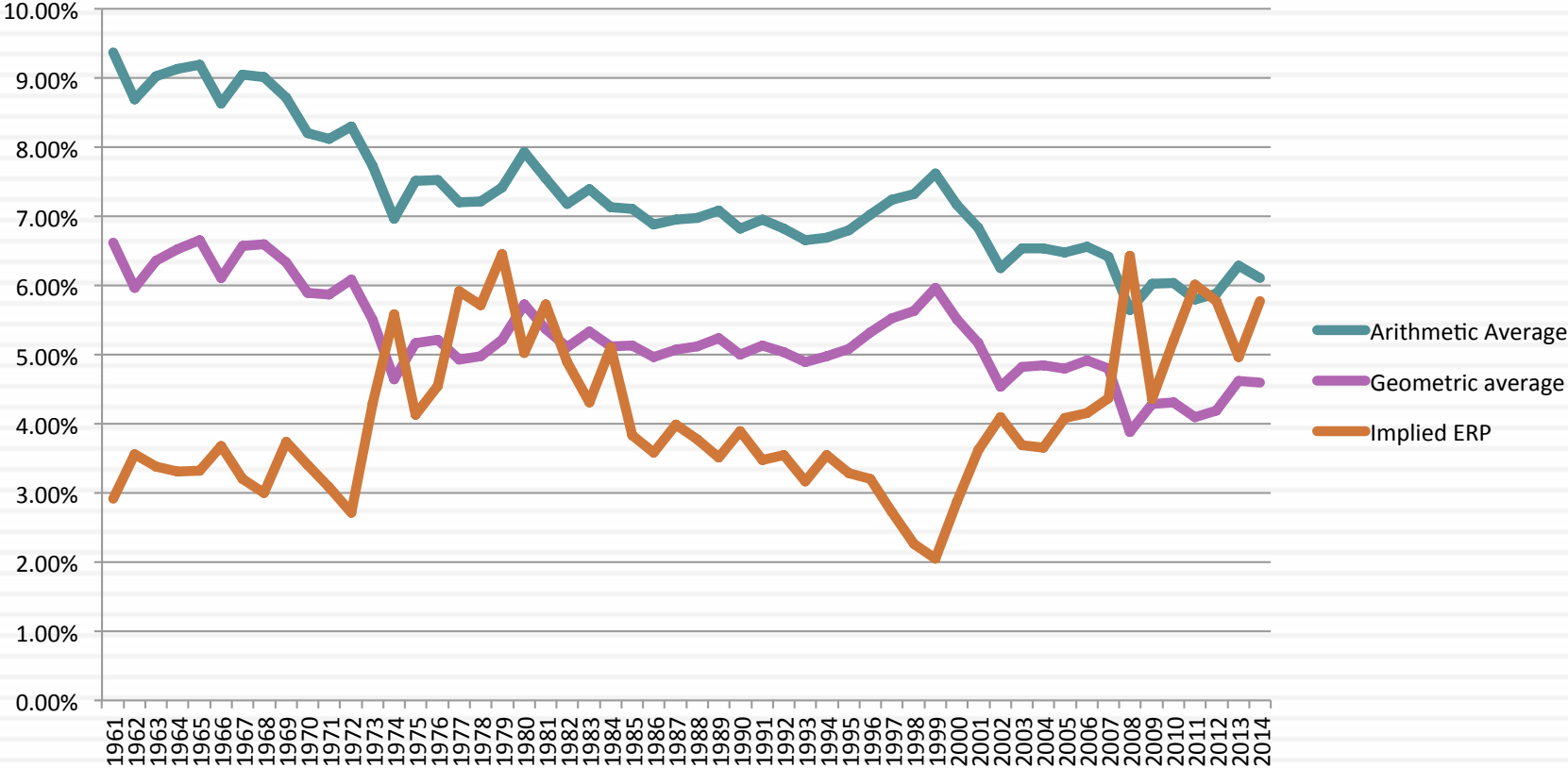
Aswath Damodaran
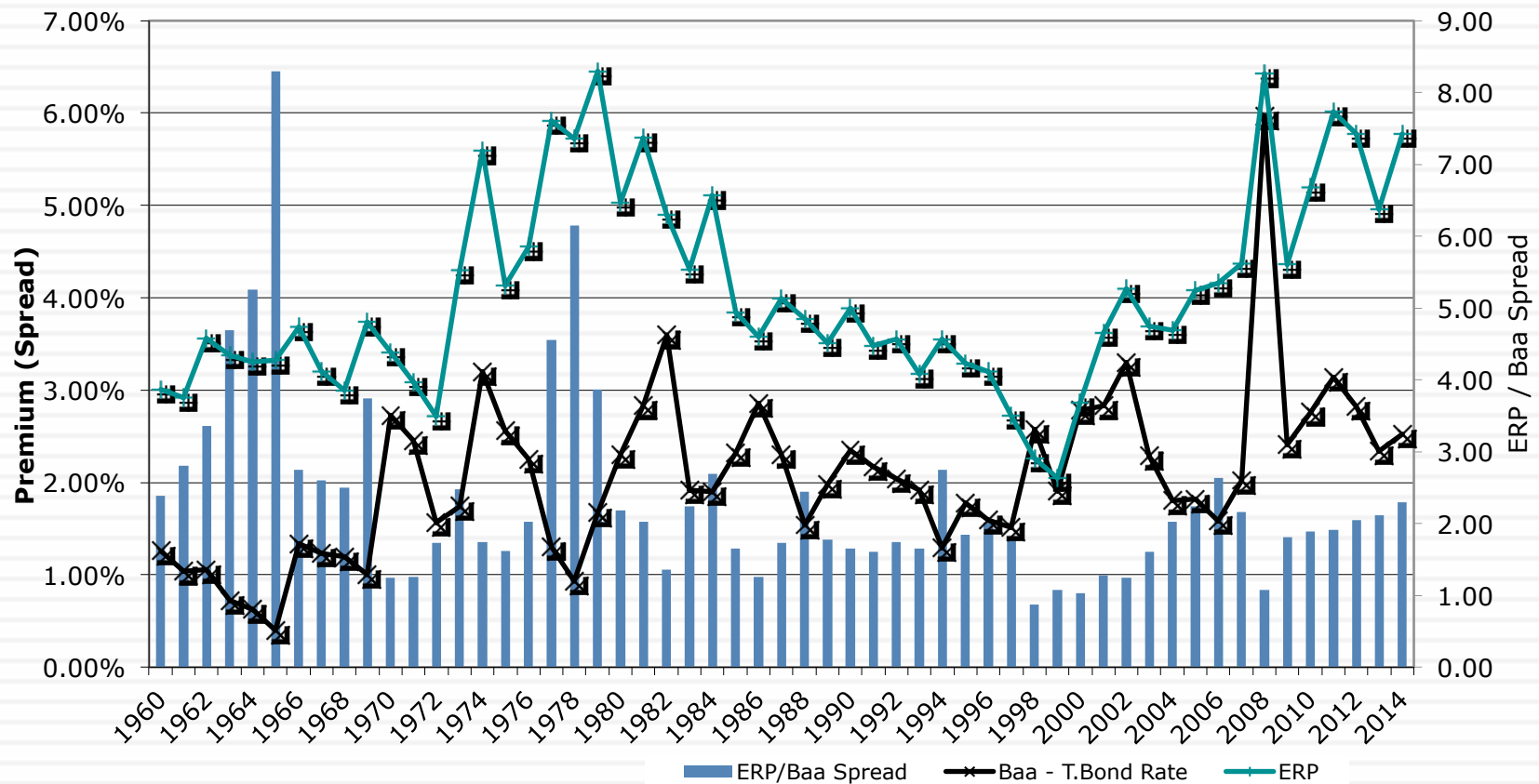
Equity Risk Premiums and Cap Rates (Real Estate)

Figure 17: Equity Risk Premiums, Cap Rates and Bond Spreads

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The Implied ERP over time.. Relative to a historical premium

Figure 10: Historical versus Implied Premium - 1961- 2014

Legend: Arithmetic Average, Geometric average, Implied ERP

Why implied premiums matter?

□ Many appraisers and analysts use historical risk premiums (and arithmetic averages at that) as risk premiums to compute cost of equity. If you use the arithmetic average premium (for stocks over T.Bills) for 1928-2014 of 8% to value stocks in January 2014, given the implied premium of 5.75%, what are they likely to find?

a. The values they obtain will be too low (most stocks will look overvalued)

b. The values they obtain will be too high (most stocks will look under valued)

c. There should be no systematic bias as long as they use the same premium to value all stocks.

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Which equity risk premium should you use?

If you assume this

Premium to use

Premiums revert back to historical norms and your time period yields these norms

Historical risk premium

Market is correct in the aggregate or that your valuation should be market neutral

Current implied equity risk premium

Marker makes mistakes even in the aggregate but is correct over time

Average implied equity risk premium over time.

Predictor	Correlation with implied premium next year	Correlation with actual risk premium – next 10 years
Current implied premium	0.712	0.424
Average implied premium: Last 5 years	0.646	0.360
Historical Premium	-0.394	-0.486
Default Spread based premium	0.059	0.174

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III. MEASURING RELATIVE RISK
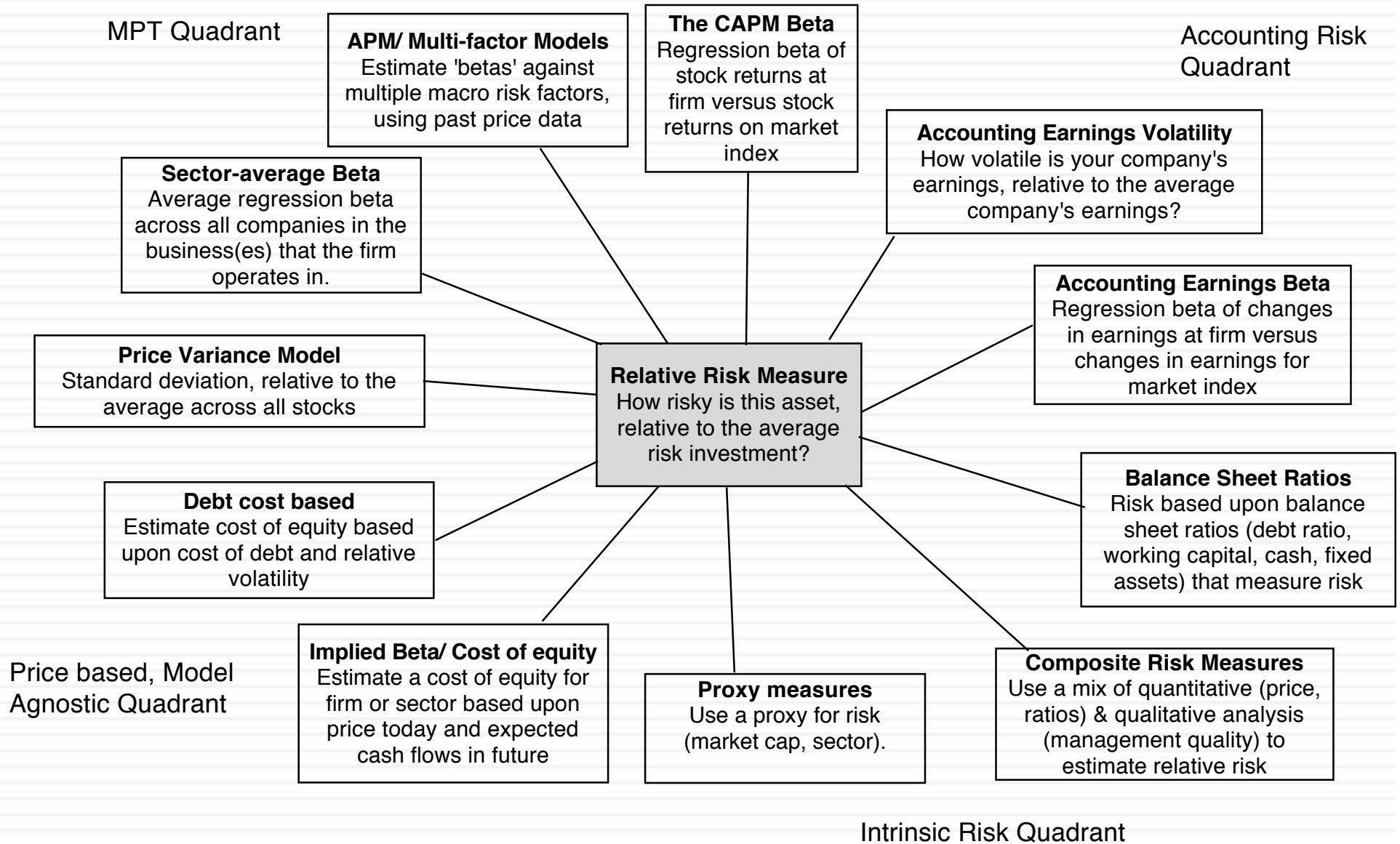
It should not be Greek to you!

MPT, Betas and Relative Risk Measures

□ Much of discount rate assessment is built on modern portfolio theory and its assumptions about how to measure risk. If you do not believe in MPT (and beta or betas), which of the following should you do?

a. Don't use discounted cash flow valuation

b. Don't adjust for risk in your discounted cash flow valuations (use a risk free rate or a constant return)

c. Come up with an alternative measure of relative risk that betters fits your thinking about risk.

Beta Mythology

□ Which of the following does beta measure?

a. The total risk in an investment

b. The portion of the risk in an investment that is due to micro reasons (management quality, brand name etc.)

c. The portion of the risk in an investment that is due to macro factors (interest rates, inflation).

□ If you don't like beta, which of the following reasons would you put first?

a. Investors are not all diversified.

b. It is a measure of price risk and does not fit into an intrinsic valuation.

c. If you use it, you are assuming that markets are efficient.

d. The beta estimate can be very noisy (lots of standard error)
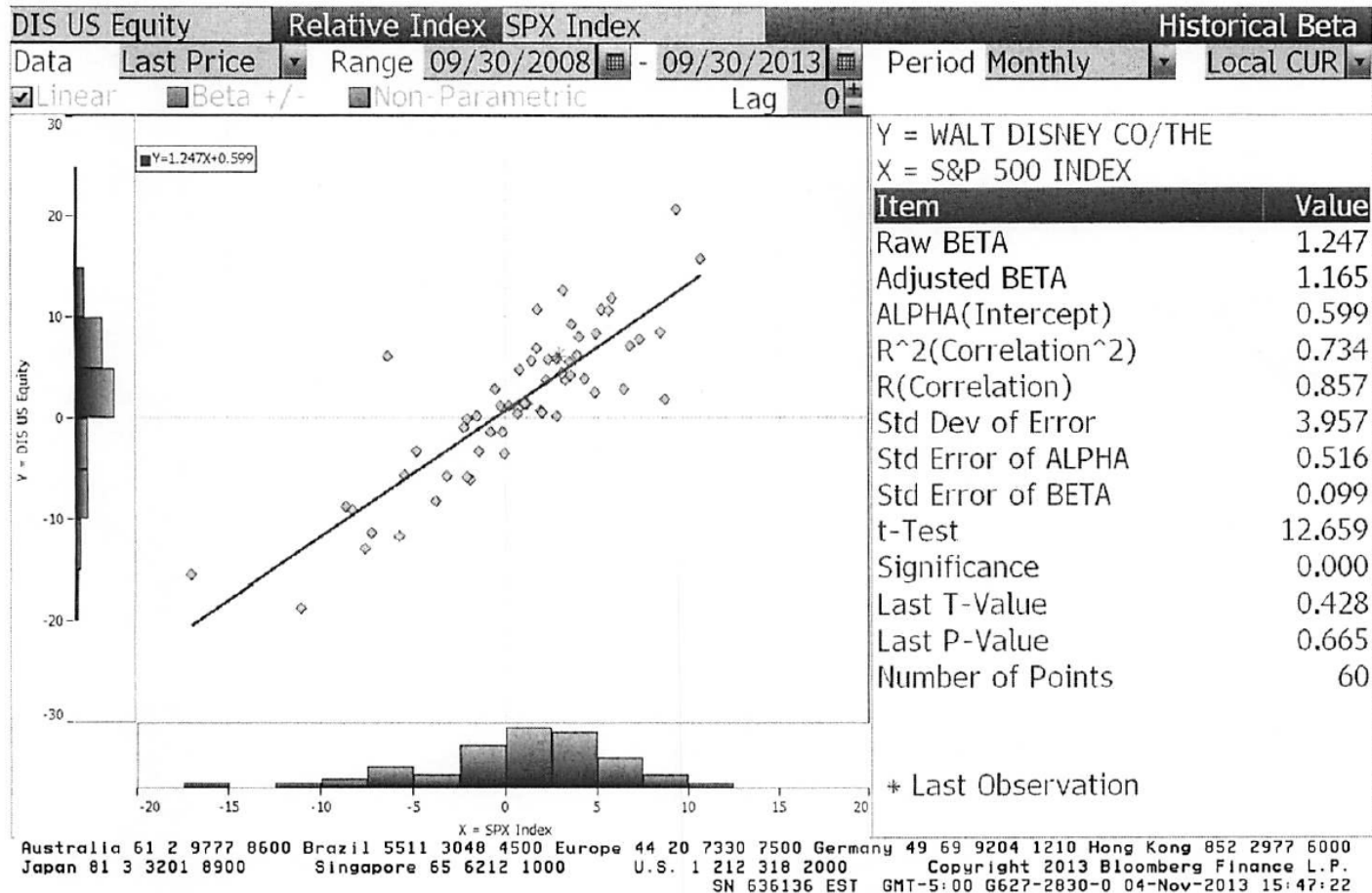
e. None of the above.

Measuring Relative Risk

MPT Quadrant

Accounting Risk Quadrant

Price based, Model Agnostic Quadrant

Intrinsic Risk Quadrant

APM/ Multi-factor Models
Estimate 'betas' against multiple macro risk factors, using past price data

The CAPM Beta
Regression beta of stock returns at firm versus stock returns on market index

Accounting Earnings Volatility
How volatile is your company's earnings, relative to the average company's earnings?

Sector-average Beta
Average regression beta across all companies in the business(es) that the firm operates in.

Accounting Earnings Beta
Regression beta of changes in earnings at firm versus changes in earnings for market index

Price Variance Model
Standard deviation, relative to the average across all stocks

Relative Risk Measure
How risky is this asset, relative to the average risk investment?

Balance Sheet Ratios
Risk based upon balance sheet ratios (debt ratio, working capital, cash, fixed assets) that measure risk

Debt cost based
Estimate cost of equity based upon cost of debt and relative volatility

Implied Beta/ Cost of equity
Estimate a cost of equity for firm or sector based upon price today and expected cash flows in future

Proxy measures
Use a proxy for risk (market cap, sector).

Composite Risk Measures
Use a mix of quantitative (price, ratios) & qualitative analysis (management quality) to estimate relative risk

The CAPM Beta
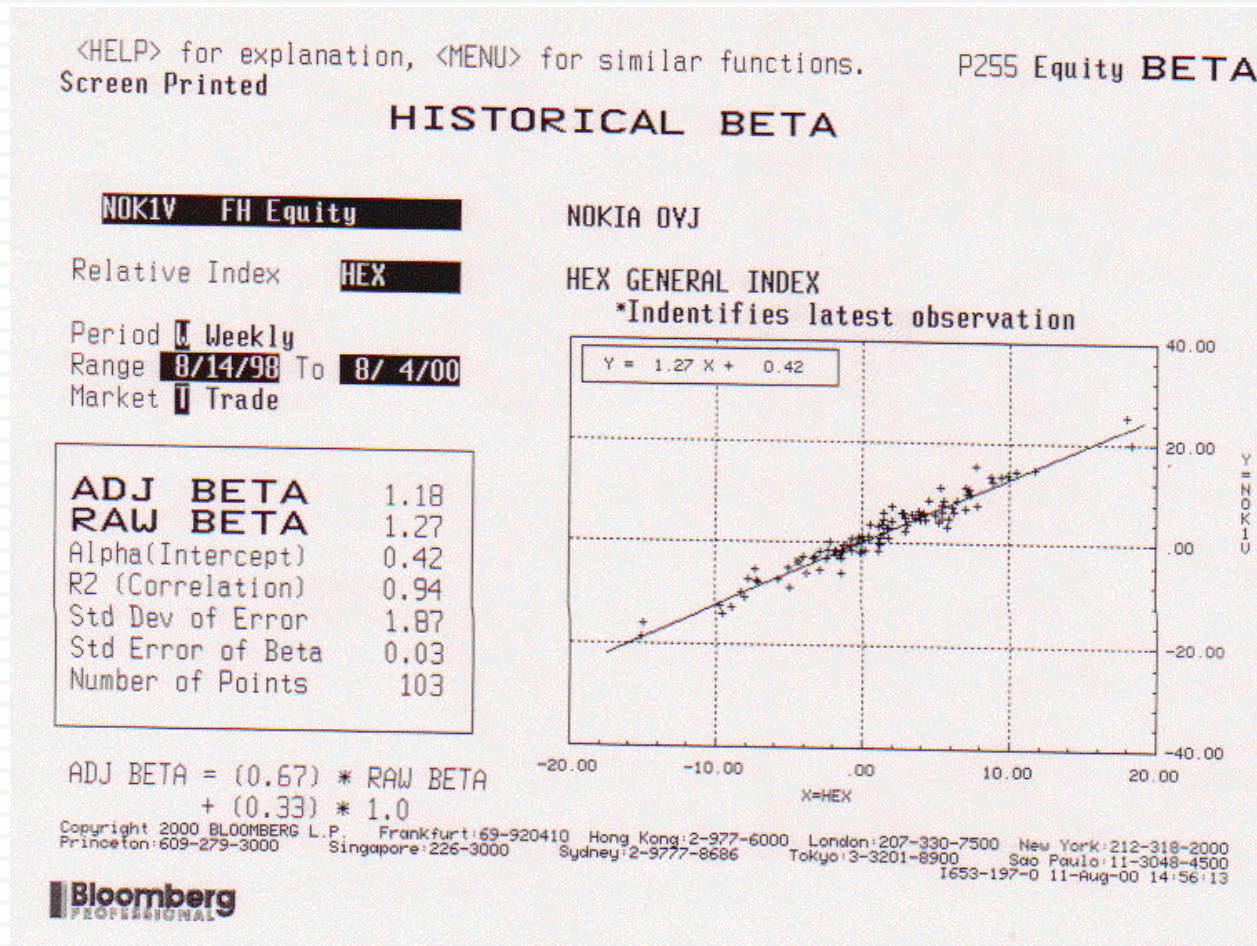
☐ The standard procedure for estimating betas is to regress stock returns (Rj) against market returns (Rm) -

Rj = a + b Rm

where a is the intercept and b is the slope of the regression.

☐ The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock.

☐ This beta has three problems:

▫ It has high standard error

▫ It reflects the firm's business mix over the period of the regression, not the current mix

▫ It reflects the firm's average financial leverage over the period rather than the current leverage.

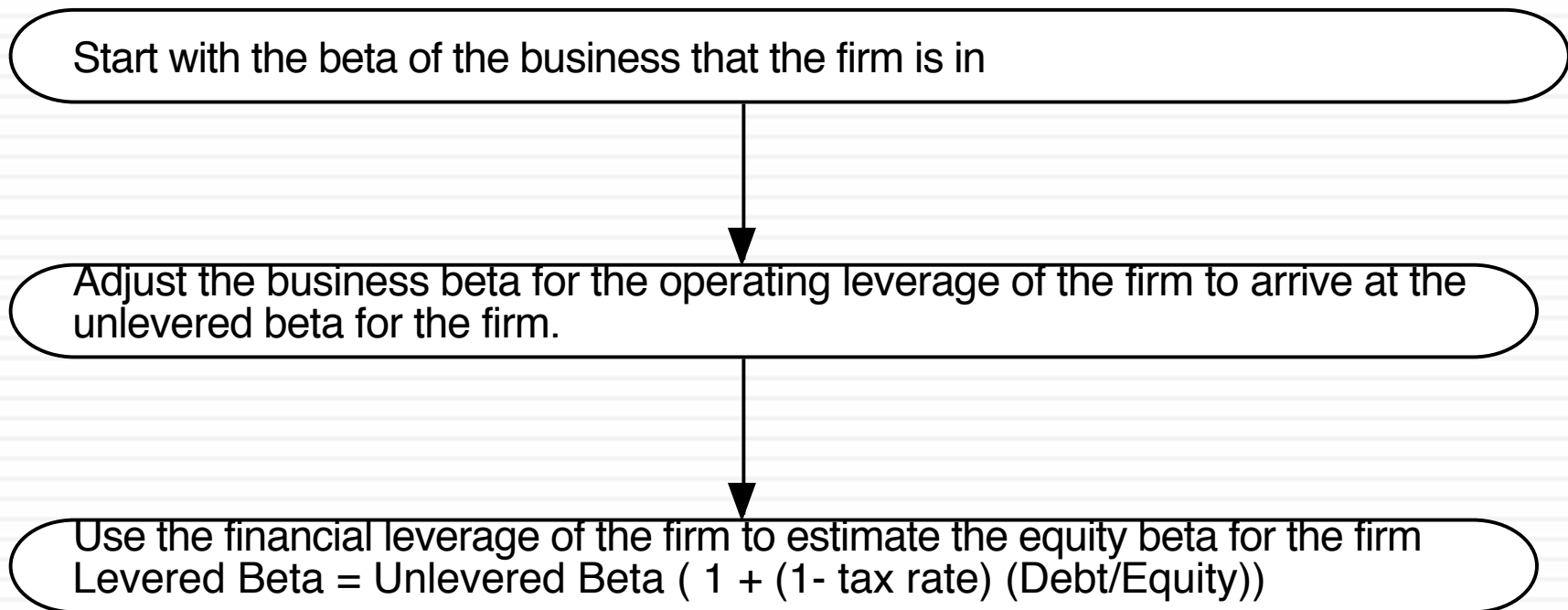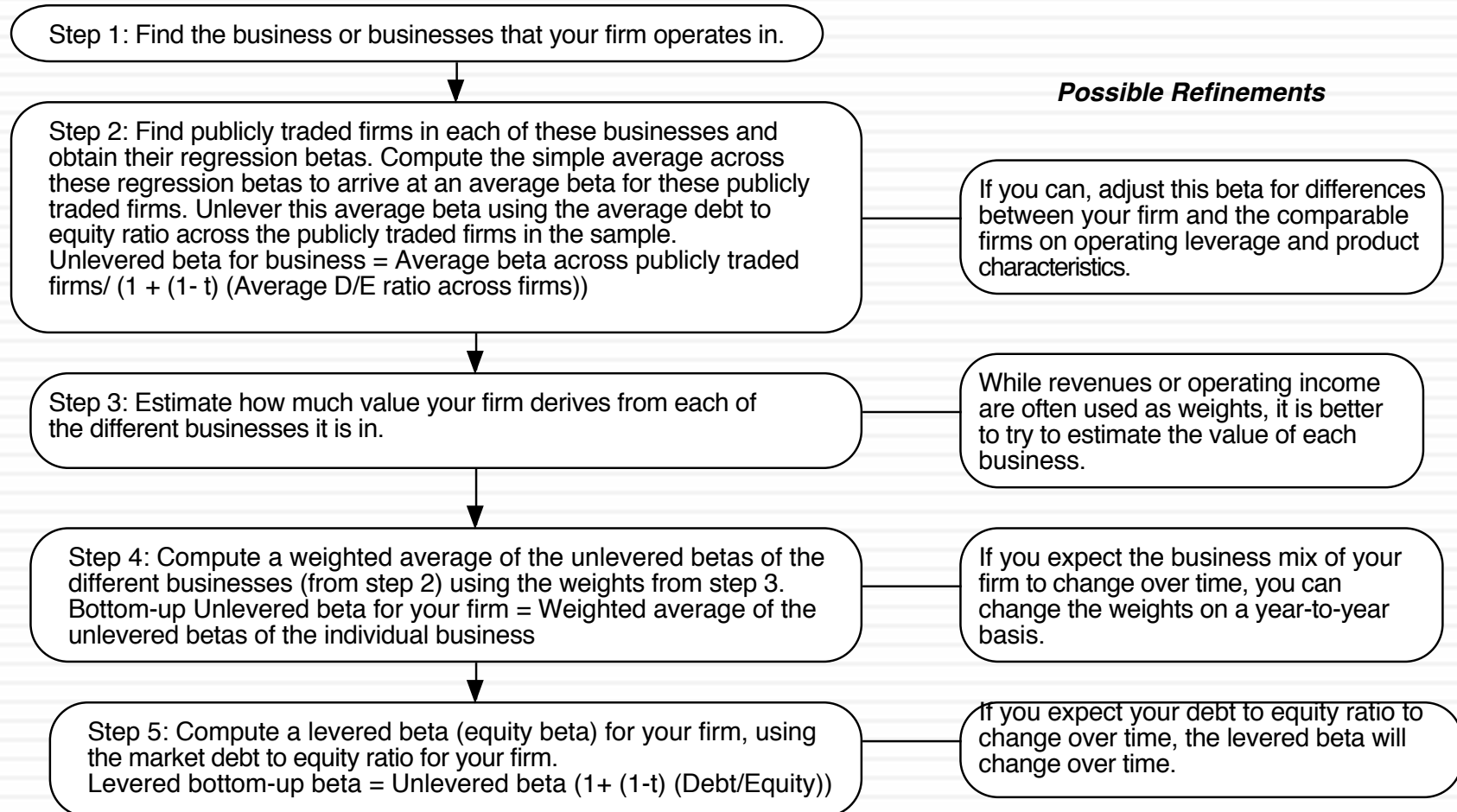# Beta Estimation: Using a Service (Bloomberg)

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Beta Estimation: The Index Effect

In a perfect world… we would estimate the beta of a firm by doing the following

Start with the beta of the business that the firm is in

Adjust the business beta for the operating leverage of the firm to arrive at the unlevered beta for the firm.

Use the financial leverage of the firm to estimate the equity beta for the firm
Levered Beta = Unlevered Beta (1 + (1- tax rate) (Debt/Equity))

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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.

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Why bottom-up betas?

□ The standard error in a bottom-up beta will be significantly lower than the standard error in a single regression beta. Roughly speaking, the standard error of a bottom-up beta estimate can be written as follows:

Std error of bottom-up beta =

$$\frac{\text{Average Std Error across Betas}}{\sqrt{\text{Number of firms in sample}}}$$

□ The bottom-up beta can be adjusted to reflect changes in the firm's business mix and financial leverage. Regression betas reflect the past.

□ You can estimate bottom-up betas even when you do not have historical stock prices. This is the case with initial public offerings, private businesses or divisions of companies.

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Unlevered Betas for businesses

$$\frac{\text{Unlevered Beta}}{(1 \ - \ \text{Cash/ Firm Value})}$$

Business	Comparable firms	Sample size	Median Beta	Median D/E	Median Tax rate	Company Unlevered Beta	Median Cash/ Firm Value	Business Unlevered Beta
Media Networks	US firms in broadcasting business	26	1.43	71.09%	40.00%	1.0024	2.80%	1.0313
Parks & Resorts	Global firms in amusement park business	20	0.87	46.76%	35.67%	0.6677	4.95%	0.7024
Studio Entertainment	US movie firms	10	1.24	27.06%	40.00%	1.0668	2.96%	1.0993
Consumer Products	Global firms in toys/games production & retail	44	0.74	29.53%	25.00%	0.6034	10.64%	0.6752
Interactive	Global computer gaming firms	33	1.03	3.26%	34.55%	1.0085	17.25%	1.2187

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Estimating Bottom Up Betas & Costs of Equity: Disney

Business	Revenues	EV/Sales	Value of Business	Proportion of Disney	Unlevered beta	Value	Proportion
Media Networks	$20,356	3.27	$66,580	49.27%	1.03	$66,579.81	49.27%
Parks & Resorts	$14,087	3.24	$45,683	33.81%	0.70	$45,682.80	33.81%
Studio Entertainment	$5,979	3.05	$18,234	13.49%	1.10	$18,234.27	13.49%
Consumer Products	$3,555	0.83	$2,952	2.18%	0.68	$2,951.50	2.18%
Interactive	$1,064	1.58	$1,684	1.25%	1.22	$1,683.72	1.25%
Disney Operations	$45,041		$135,132	100.00%	0.9239	$135,132.11	

Business	Unlevered beta	Value of business	D/E ratio	Levered beta	Cost of Equity
Media Networks	1.0313	$66,580	10.03%	1.0975	9.07%
Parks & Resorts	0.7024	$45,683	11.41%	0.7537	7.09%
Studio Entertainment	1.0993	$18,234	20.71%	1.2448	9.92%
Consumer Products	0.6752	$2,952	117.11%	1.1805	9.55%
Interactive	1.2187	$1,684	41.07%	1.5385	11.61%
Disney Operations	0.9239	$135,132	13.10%	1.0012	8.52%

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III. THE GARNISHING

Here a premium, there a premium..

Premiums in Discount Rates

☐ Do you use a small cap premium in estimating cost of equity for smaller companies?

a. Yes

b. No

☐ If you do use a small cap premium, why do you use it?

a. Because small cap stocks have historically earned higher returns than large cap stocks.

b. Because small companies are riskier than large cap companies.

c. Because small cap companies are less liquid than large cap companies.

d. Because it is the standard practice.

The Build up Approach

□ For many analysts, the risk free rate and equity risk premium are just the starting points to get to a cost of equity. The required return that you obtain is then augmented with premiums for "other" risks to arrive at a built up cost of equity.

□ The justifications offered for these premiums are varied but can be broadly classified into:

  ◘ Historical premium: The historical data justifies adding a premium (for small capitalization, illiquidity)

  ◘ Intuition: There are risks that are being missed that have to be built in

  ◘ Reasonableness: The discount rate that I am getting looks too low.

The Most Added Premium: The Small Cap Premium
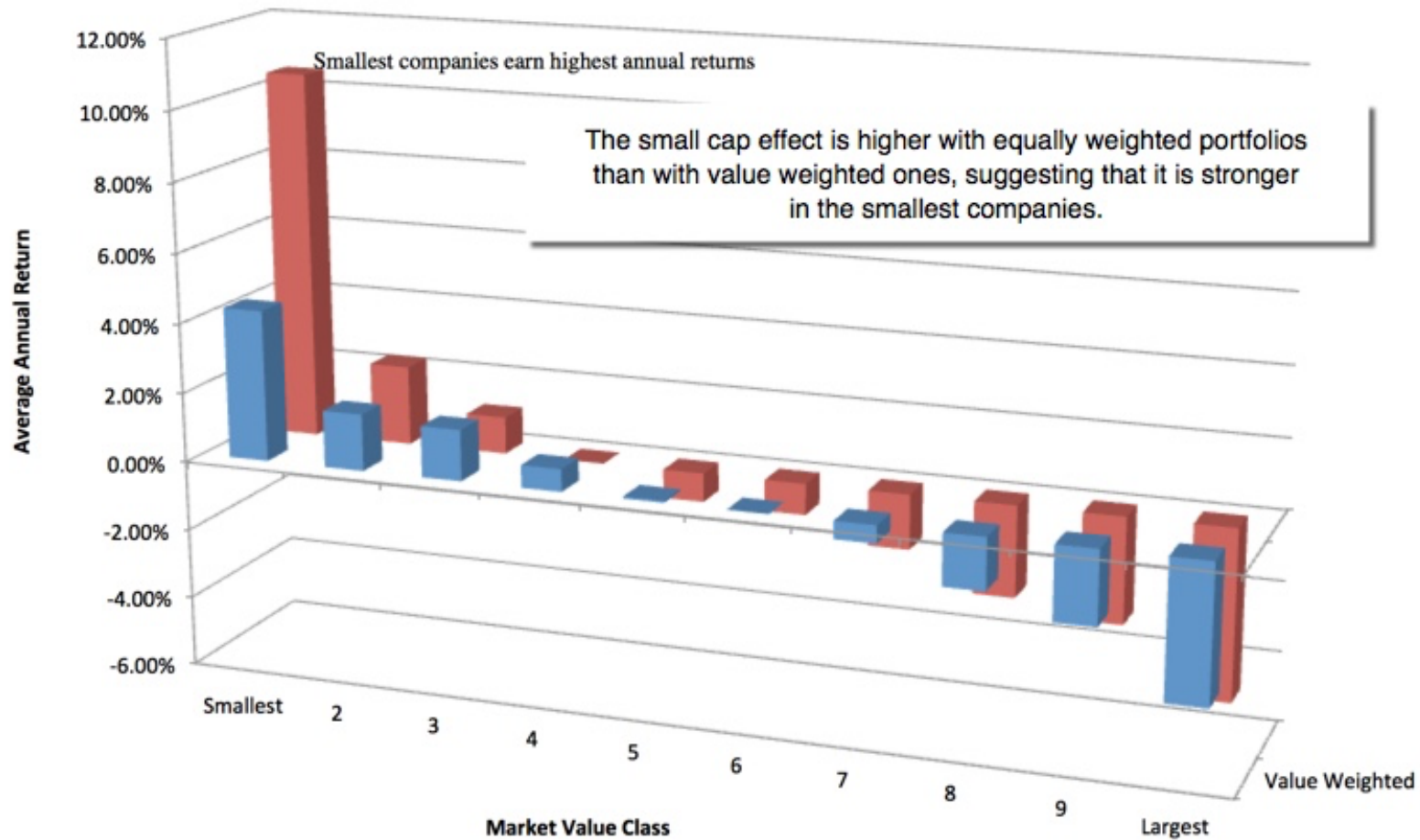
Historical premiums are noisy..

Decile	Average	Standard Error	Maximum	Minimum
Smallest	4.33%	1.96%	76.28%	-28.42%
2	1.63%	1.14%	41.25%	-17.96%
3	1.47%	0.77%	41.98%	-13.54%
4	0.64%	0.55%	15.56%	-7.33%
5	0.05%	0.53%	11.63%	-16.05%
6	-0.01%	0.51%	15.21%	-14.01%
7	-0.51%	0.55%	7.48%	-19.50%
8	-1.50%	0.81%	11.20%	-29.42%
9	-2.13%	1.02%	21.96%	-36.09%
Largest	-3.98%	1.56%	31.29%	-65.57%

Historical data can hide trends..

Small Firm Premium over time- 1927 -2014

Between 1926 and 1980, small cap stocks earned on average 7.18% more than the market each year.

Best year for small cap stocks

Between 1981 and 2014, small cap stocks earned on average 0.18% less than the market each year.

Small cap stocks did worse than large cap stocks

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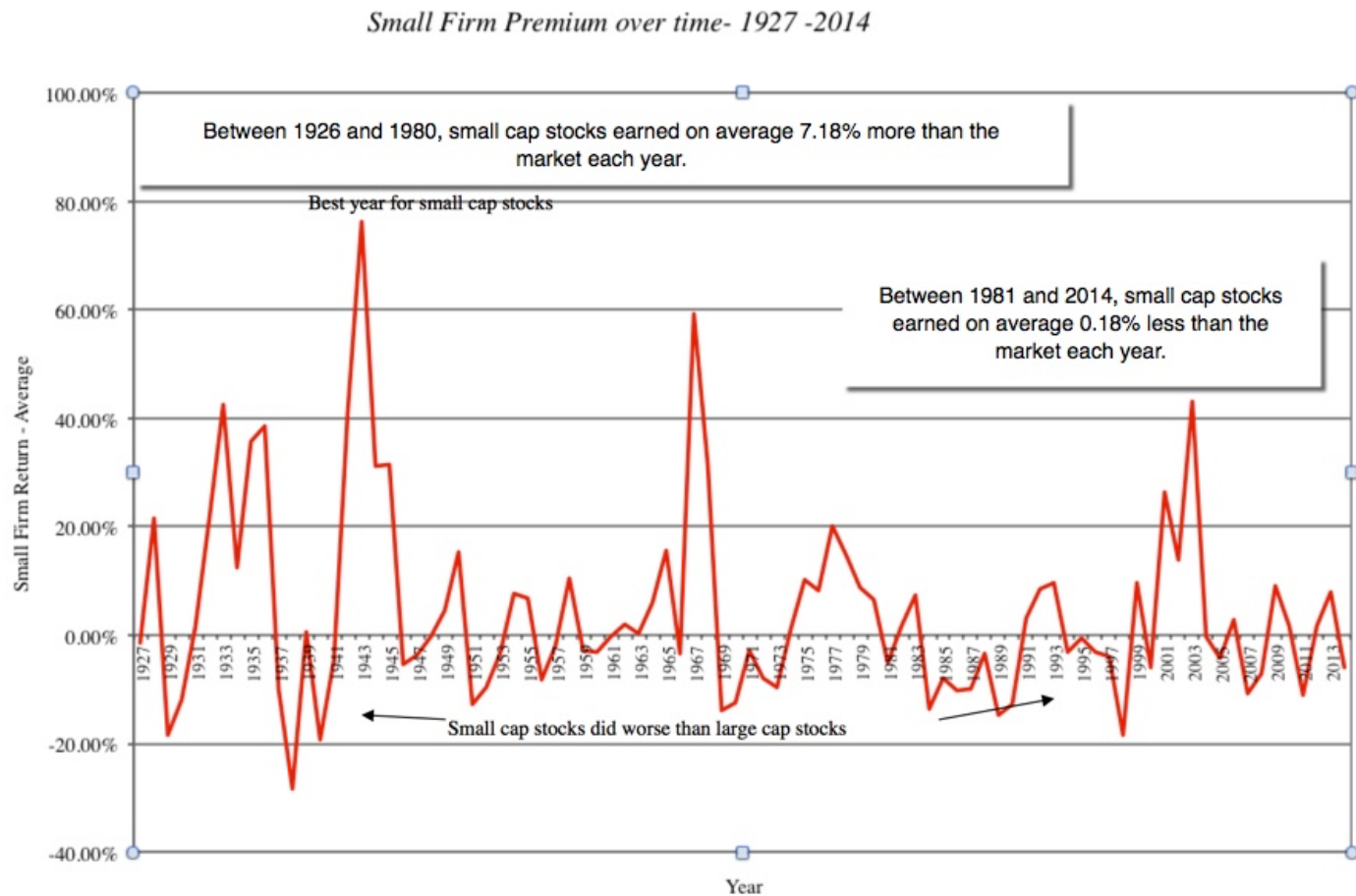
And the market does not seem to be pricing it in..

Base year cash flow (last 12 mths)
Dividends (TTM):   9.73
+ Buybacks (TTM):   16.40
= Cash to investors (TTM): **26.13**

*26.13 growing @
10.25% a year*

Expected growth in next 5 years
Top down analyst estimate of earnings
growth for S&P 600 with stable
payout: **10.25%**

E(Cash to investors)   28.81   31.77   35.02   38.61   42.57

S&P 600 on 1/1/15=
695.08

Beyond year 5
Expected growth rate =
Riskfree rate = 2.17%
Expected CF in year 6 =
42.57(1.0217)

$$695.08 = \frac{28.81}{(1+r)} + \frac{31.77}{(1+r)^2} + \frac{35.02}{(1+r)^3} + \frac{38.61}{(1+r)^4} + \frac{42.57}{(1+r)^5} + \frac{42.57(1.0217)}{(r-.0217)(1+r)^5}$$

r = Implied Expected Return on Stocks = 7,61%

Minus

Risk free rate = T.Bond rate on 1/1/15= 2.17%

Equals

Implied Equity Risk Premium (1/1/15) = 7.61% - 2.17% = 5.44%

The implied ERP for the S&P 500 was 5.78%. If there is a small cap premium, where is it?

The fig leaf of illiquidity

☐ Test 1: If illiquidity is what you are concerned about with the company you are valuing, why use market capitalization as a proxy for illiquidity?

☐ Test 2: Assuming that you believe that market capitalization is a reasonable proxy for illiquidity, why do you assume that illiquidity has the same impact at every company you value, for every buyer and across time periods?

☐ Test 3: Assuming that you size is a proxy for liquidity and that you can make the case that illiquidity does not vary across companies, why is it not changing in your company as it grows over time?

☐ Test 4: Assuming that you are okay with size being a proxy for illiquidity and are willing to argue that it is a constant across companies and time, why are you then applying an illiquidity discount to the value that you obtained in your DCF?

But, but.. My company is risky..

- Estimation versus Economic uncertainty
  - Estimation uncertainty reflects the possibility that you could have the "wrong model" or estimated inputs incorrectly within this model.
  - Economic uncertainty comes the fact that markets and economies can change over time and that even the best models will fail to capture these unexpected changes.
- Micro uncertainty versus Macro uncertainty
  - Micro uncertainty refers to uncertainty about the potential market for a firm's products, the competition it will face and the quality of its management team.
  - Macro uncertainty reflects the reality that your firm's fortunes can be affected by changes in the macro economic environment.
- Discrete versus continuous uncertainty
  - Discrete risk: Risks that lie dormant for periods but show up at points in time. (Examples: A drug working its way through the FDA pipeline may fail at some stage of the approval process or a company in Venezuela may be nationalized)
  - Continuous risk: Risks changes in interest rates or economic growth occur continuously and affect value as they happen.

Risk and Cost of Equity: The role of the marginal investor

- <u>Not all risk counts</u>: While the notion that the cost of equity should be higher for riskier investments and lower for safer investments is intuitive, what risk should be built into the cost of equity is the question.

- <u>Risk through whose eyes</u>? While risk is usually defined in terms of the variance of actual returns around an expected return, risk and return models in finance assume that the risk that should be rewarded (and thus built into the discount rate) in valuation should be the risk perceived by the marginal investor in the investment

- <u>The diversification effect</u>: Most risk and return models in finance also assume that the marginal investor is well diversified, and that the only risk that he or she perceives in an investment is risk that cannot be diversified away (i.e, market or non-diversifiable risk). In effect, it is primarily economic, macro, continuous risk that should be incorporated into the cost of equity.
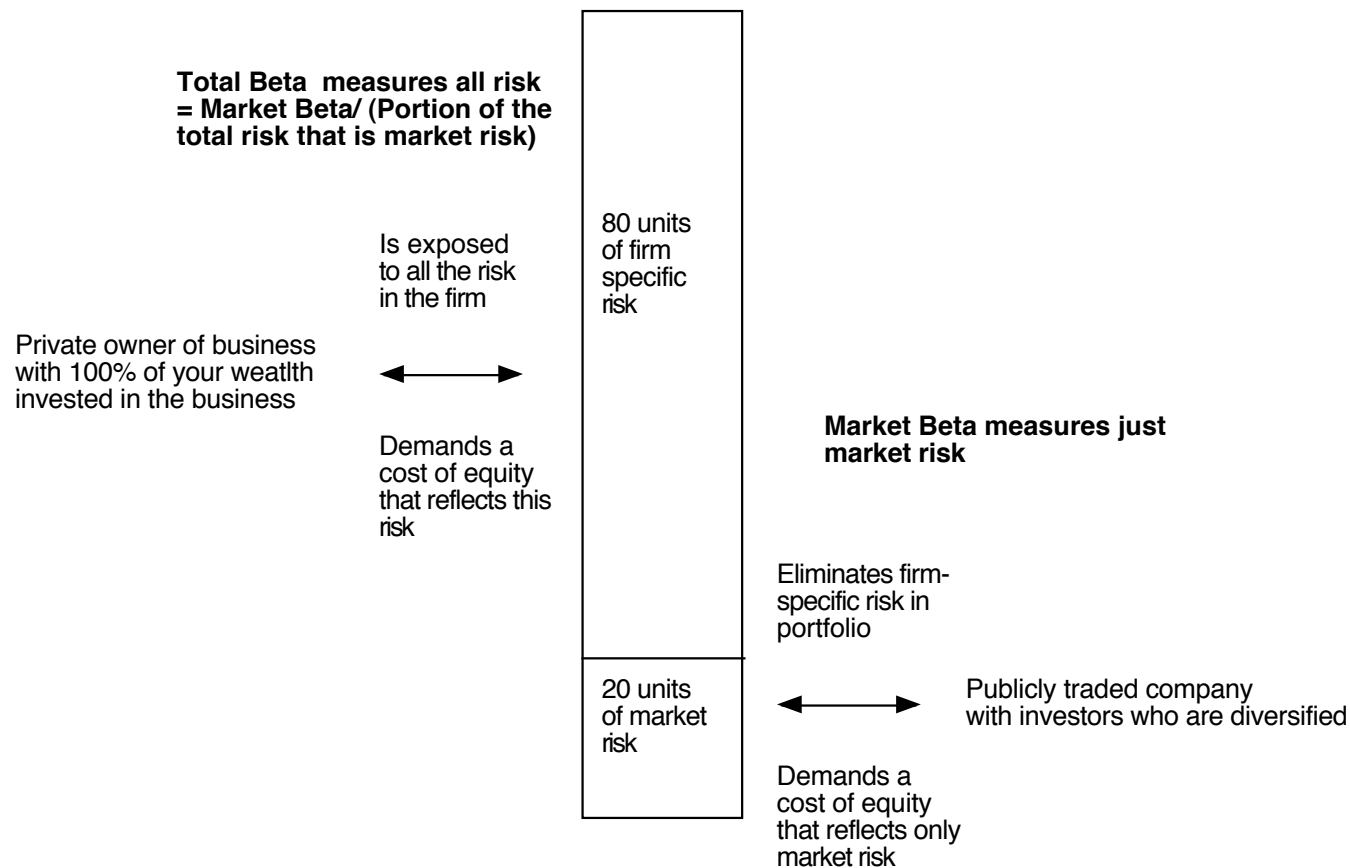
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The Cost of Equity (for diversified investors)

Cost of equity for Publicly traded US firms - January 2015

Distribution Statistics	
10th percentile	5.45%
25th percentile	7.05%
Median	8.33%
75th percentile	9.69%
90th percentile	13.43%

Chart data (Cost of equity range : Number of firms):
- <4% : 250.
- 4-5% : 213.
- 5-6% : 628.
- 6-7% : 852.
- 7-8% : 1,463.
- 8-9% : 1,865.
- 9-10% : 926.
- 10-11% : 474.
- 11-12% : 225.
- 12-13% : 141.
- 13-14% : 90.
- 14-15% : 70.
- >15% : 681.
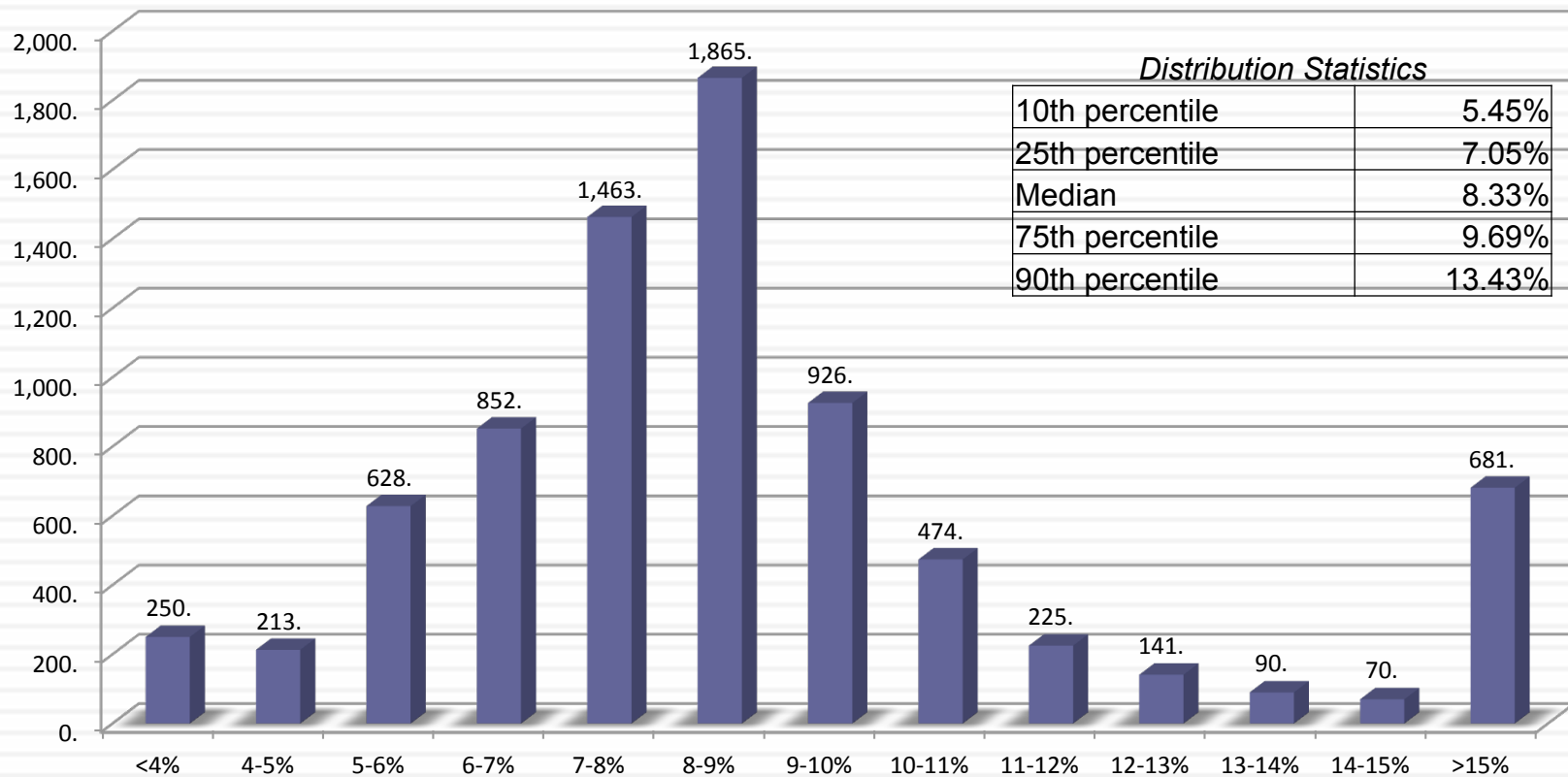
If the "buyer" is not diversified..

Private Owner versus Publicly Traded Company Perceptions of Risk in an Investment

Total Beta measures all risk = Market Beta/ (Portion of the total risk that is market risk)

80 units of firm specific risk

Is exposed to all the risk in the firm

Private owner of business with 100% of your weatlth invested in the business

Demands a cost of equity that reflects this risk

Market Beta measures just market risk

Eliminates firm-specific risk in portfolio

20 units of market risk

Publicly traded company with investors who are diversified

Demands a cost of equity that reflects only market risk

IV. DEBT AND ITS COST

Costs of debt and capital

□ Which of the following is the best way to estimate cost of debt?

a. Take the existing interest expense and divide by the book value of debt. (Book interest rate)

b. Look at the sector average cost of borrowing.

c. Find a traded bond (if you can find one) issued by the company and use the interest rate on the bond.

□ In computing your cost of capital, the debt ratio that you should use is

a. Book Debt/ (Book Debt + Book Equity)

b. Market Debt/ (Market Debt + Market Equity)

c. Book Debt/ (Book Debt + Market Equity)

d. A target debt ratio

□ In valuing a company, the cost of capital that you use has to be

a. Constant over time

b. Can change over time

What is debt?

- 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.

- As a consequence, debt should include
  - Any interest-bearing liability, whether short term or long term.
  - Any lease obligation, whether operating or capital.

The Cost of Debt

- The cost of debt is the rate at which you can borrow at currently, It will reflect not only your default risk but also the level of interest rates in the market.

- The two most widely used approaches to estimating cost of debt are:
  - Looking up the yield to maturity on a straight bond outstanding from the firm. The limitation of this approach is that very few firms have long term straight bonds that are liquid and widely traded
  - Looking up the rating for the firm and estimating a default spread based upon the rating. While this approach is more robust, different bonds from the same firm can have different ratings. You have to use a median rating for the firm

- When in trouble (either because you have no ratings or multiple ratings for a firm), estimate a synthetic rating for your firm and the cost of debt based upon that rating.

And the weights should be market value..

□ The weights used in the cost of capital computation should be market values.

□ There are three specious arguments used against market value

  ▫ Book value is more reliable than market value because it is not as volatile: While it is true that book value does not change as much as market value, this is more a reflection of weakness than strength

  ▫ Using book value rather than market value is a more conservative approach to estimating debt ratios: For most companies, using book values will yield a lower cost of capital than using market value weights.

  ▫ Since accounting returns are computed based upon book value, consistency requires the use of book value in computing cost of capital: While it may seem consistent to use book values for both accounting return and cost of capital calculations, it does not make economic sense.

  ▫ Even if your company is a private business, where no market values are available, you are better off using "industry average" debt ratios or iterated debt ratios instead of book value debt ratios.

As your company changes, so should your cost of capital

- The belief that you get one shot at estimating the cost of capital in a DCF valuation and that it cannot change over the course of your forecasts is misplaced.
- The cost of capital can and should change over time, as your company changes. Put differently, if you are forecasting that your company will grow over time to become a larger, more profitable, lower growth company, your inputs should change with your
  - Debt ratio rising to that of a mature company
  - Relative risk measure (Beta) converging on one
  - Cost of debt reflective of your profitability & size
- If your cost of capital changes, you have to compute the present value using a compounded cost of capital.

Disney's Cost of Capital: By Division

- Disney's cost of debt, based upon it's A rating in November 2013, wad 3.75% and its marginal tax rate was 36.1%.

  - After-tax cost of debt = 3.75% (1-.361) = 2.40%

- The cost of capital, by division, for Disney is below.

	Cost of equity	Cost of debt	Marginal tax rate	After-tax cost of debt	Debt ratio	Cost of capital
Media Networks	9.07%	3.75%	36.10%	2.40%	9.12%	8.46%
Parks & Resorts	7.09%	3.75%	36.10%	2.40%	10.24%	6.61%
Studio Entertainment	9.92%	3.75%	36.10%	2.40%	17.16%	8.63%
Consumer Products	9.55%	3.75%	36.10%	2.40%	53.94%	5.69%
Interactive	11.65%	3.75%	36.10%	2.40%	29.11%	8.96%
Disney Operations	8.52%	3.75%	36.10%	2.40%	11.58%	7.81%

Used risk free rate of 2.75% and Disney's weighted average ERP of 5.75% in estimating cost of equity

Aswath Damodaran

Investment Analysis

- ❑ Assume now that you are the CFO of Disney. You are considering an <u>investment in a new theme park</u>. What cost of capital would you use in evaluating the theme park?

- ❑ Would your answer be different if the theme park were in Rio De Janeiro and your analysis were in US dollars?

- ❑ What if the park is in Rio but your analysis is in $R?

- ◪ Now assume that you are planning to divest yourself of ESPN. What cost of capital would you use to value ESPN?

Aswath Damodaran

Acquisition Valuation

□ Now assume that Disney is planning to buy Twitter, a firm that by itself cannot service any debt and has a cost of equity of 12%. Disney is planning to borrow half the money for the deal at an after-tax cost of debt of 2.4%. What cost of capital would you use to value Twitter?

a. Disney's cost of capital (7.81%)

b. Disney's cost of equity (8.52%)

c. Twitter's cost of equity and capital (12%)

d. An equally weighted average of Twitter's cost of equity and Disney's cost of debt. (7.2%)

e. None of the above

f. Any of the above, depending on my agenda.
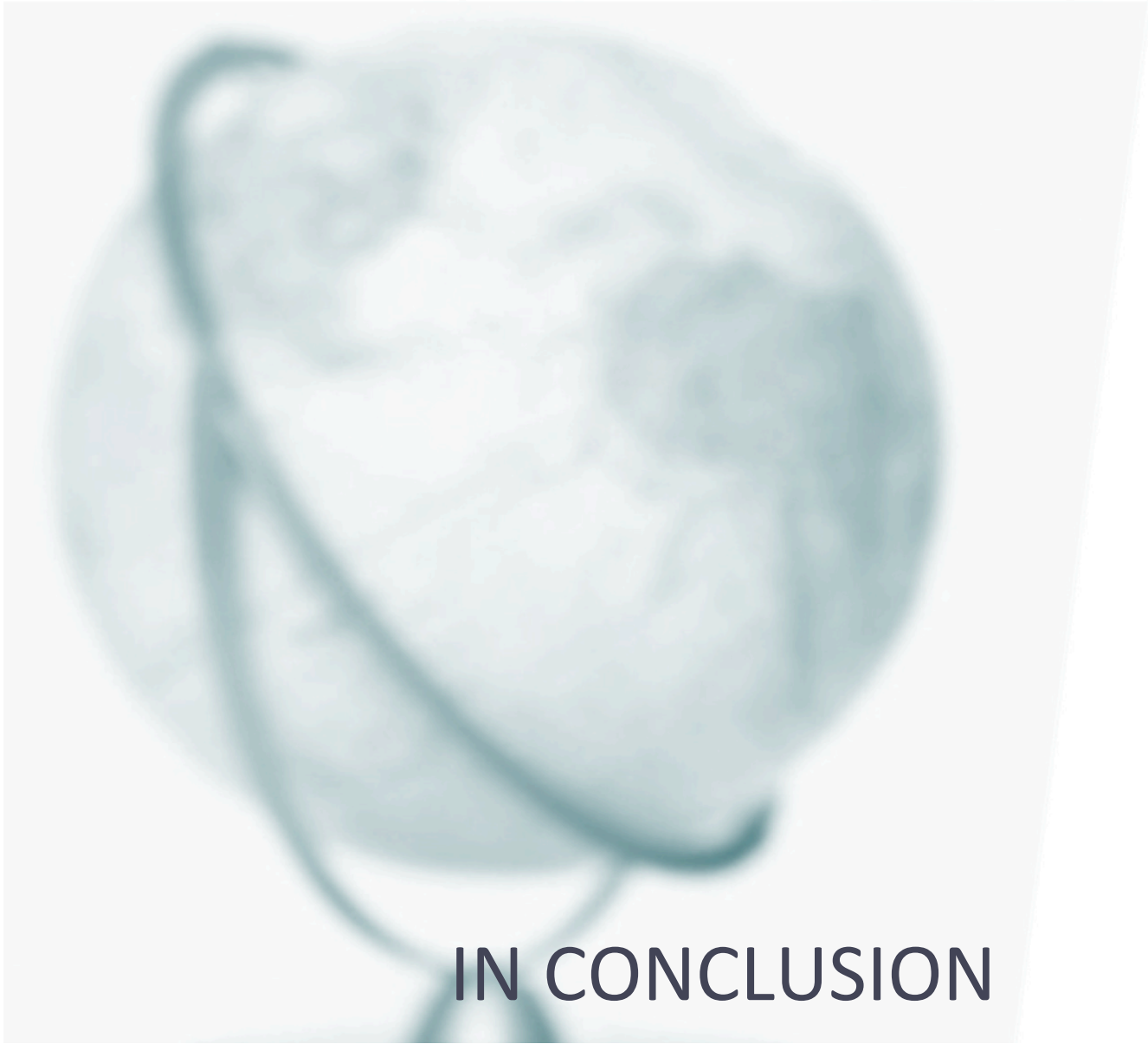
IN CONCLUSION

Less rules, more first principles

Lesson 1: It's important, but not that important..

- The cost of capital is a driver of value but it is not as much of a driver as you think.

- This is particularly true, with young growth companies and when there is a great deal of uncertainty about the future.

- As a general rule, we spend far too much time on the cost of capital and far too little on cash flows and growth rates.

Lesson 2: There are many ways of estimating cost of capital, but most of them are wrong or inconsistent

- It is true that there are competing risk and return models, that a wide variety of estimation practices exist for estimating inputs to these model and that there are multiple data sources for each input.

- That does not imply that you have license to mix and match models, practices and data sources to get whatever number you want.

- Many estimates of cost of capital are just plain wrong, because they are based on bad data, ignore basic statistical rules or just don't pass the common sense test.

- Other estimates of cost of capital are internally inconsistent, because they mix and match models and practices that were never meant to be mixed.

Lesson 3: Just because a practice is established does not make it right

- There is a valuation establishment and it likes writing rules that lay out the templates for established or acceptable practice.

- Those rules are then enforced by legal and regulatory systems that insist that everyone follow the rules.

- At some point, the strongest rationale for why we do what we do is that everyone does it and has always done it.

- In the legal and regulatory settings, this gets reinforced by the fact that it is easier to defend a bad practice of long standing than it is to argue for a better practice.

Lesson 4: Watch out for agenda-driven (or bias-driven) costs of capital

- Much as we would like to pose as objective analysts with no interest in tilting the value of a company of an asset one way or the other, once we are paid to do valuations, bias will follow.

- The strongest determinant of what practices you will use to get a cost of capital is that bias that you have to push the value up (or down).

  - If your bias is upwards (to make value higher), you will find every rationale you can for reducing your cost of capital.

  - If your bias is downwards (to make value lower), you will find every rationale you can for increasing your cost of capital.