THE COST OF CAPITAL: MISUNDERSTOOD, MISESTIMATED AND MISUSED!

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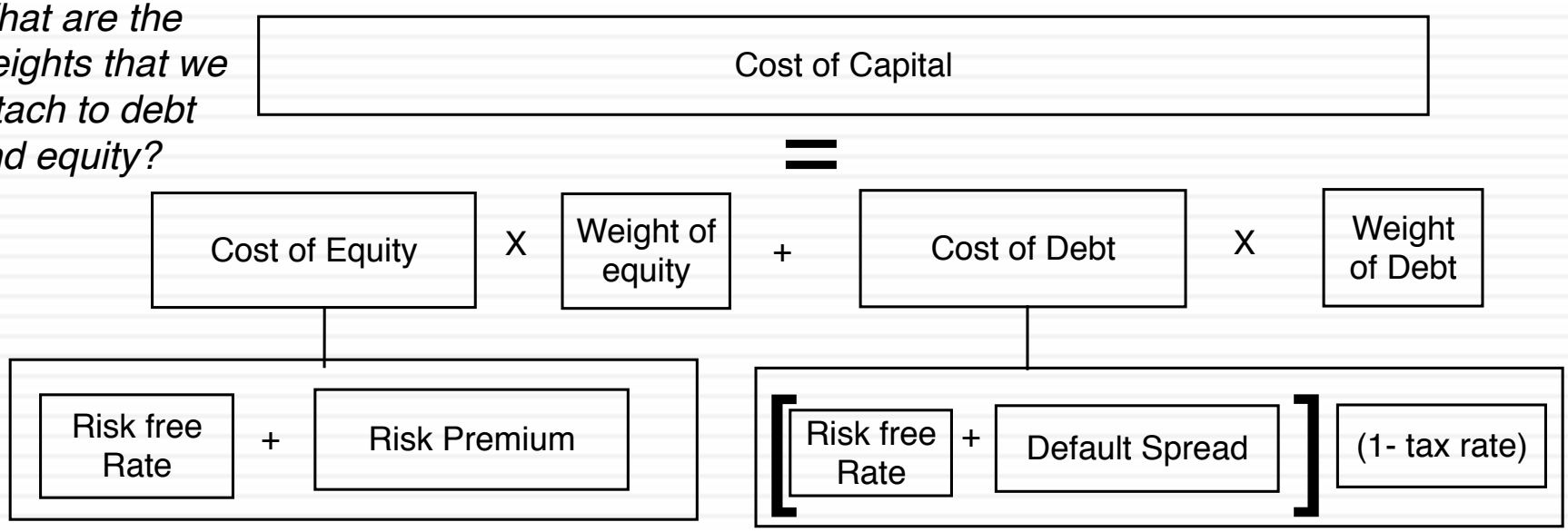
THE ULTIMATE MULTI-PURPOSE TOOL: AN OPPORTUNITY COST & OPTIMIZING TOOL

The Cost of Capital is everywhere in finance

- In corporate finance: 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.
- In valuation: 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?



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 Hurdle Rate

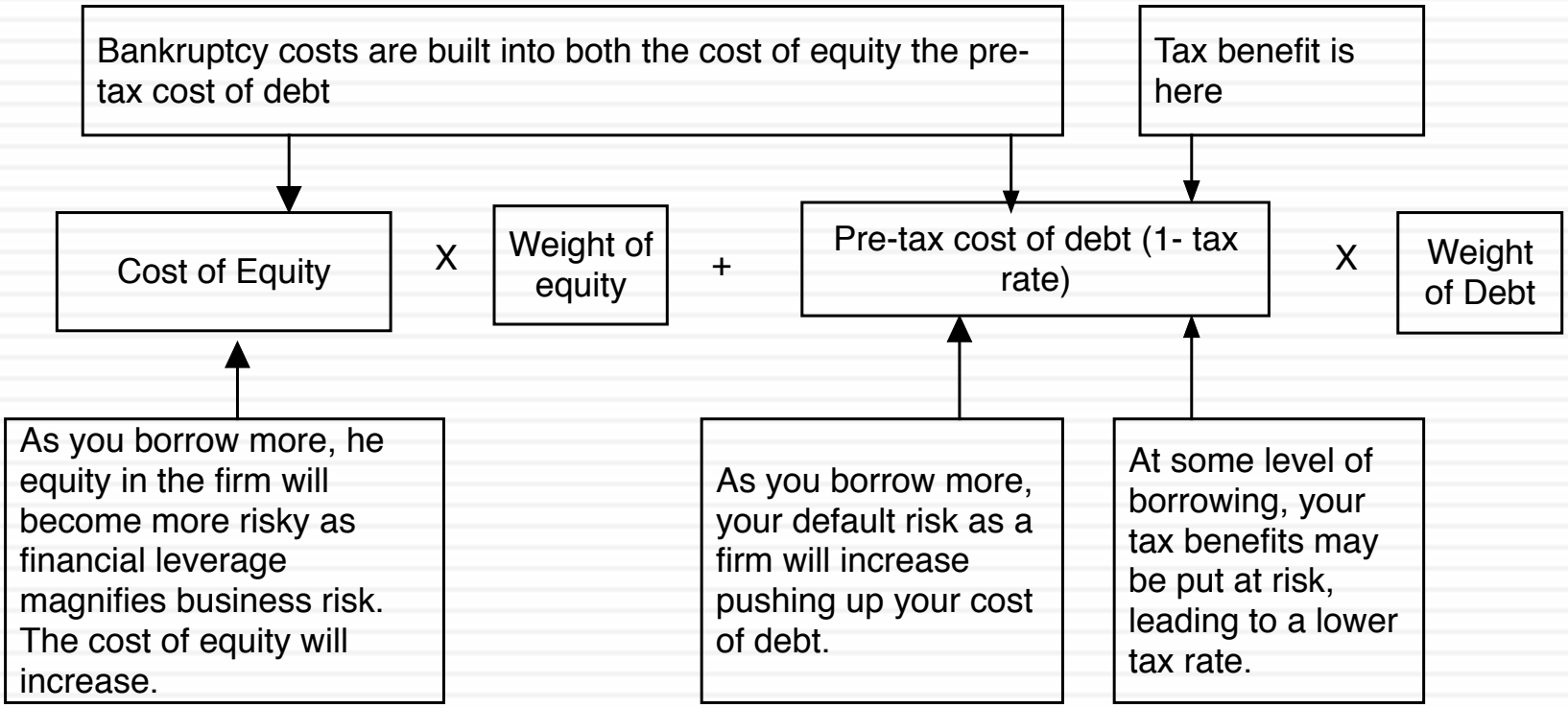
The cost of capital for an investment

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 disprportionately with debt, you are using the company's debt capacity to subsidize the investment.

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

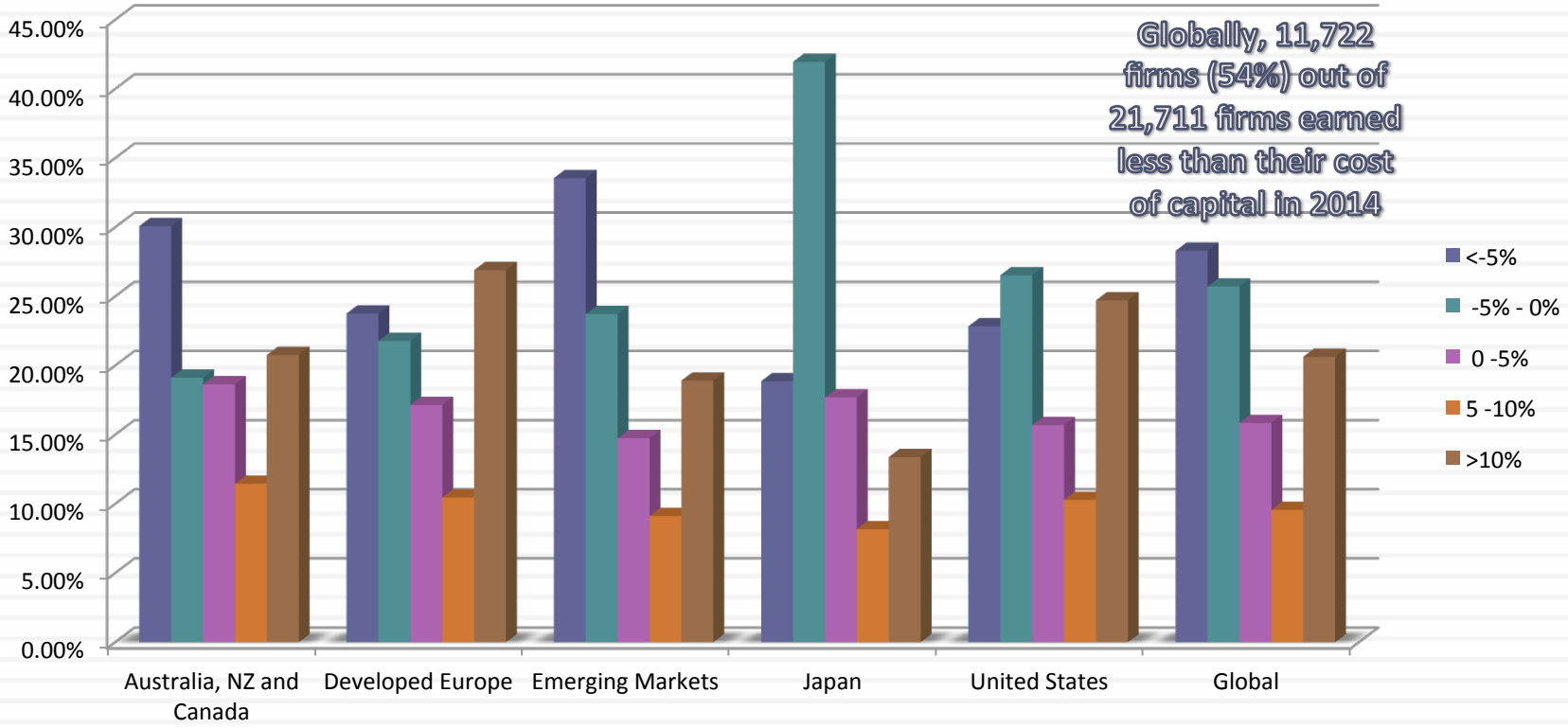


The trade off: As you use more debt, you replace more expensive equity with cheaper debt but you also increase the costs of equity and debt. The net effect will determine whether the cost of capital will increase, decrease or be unchanged as debt ratio changes.

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

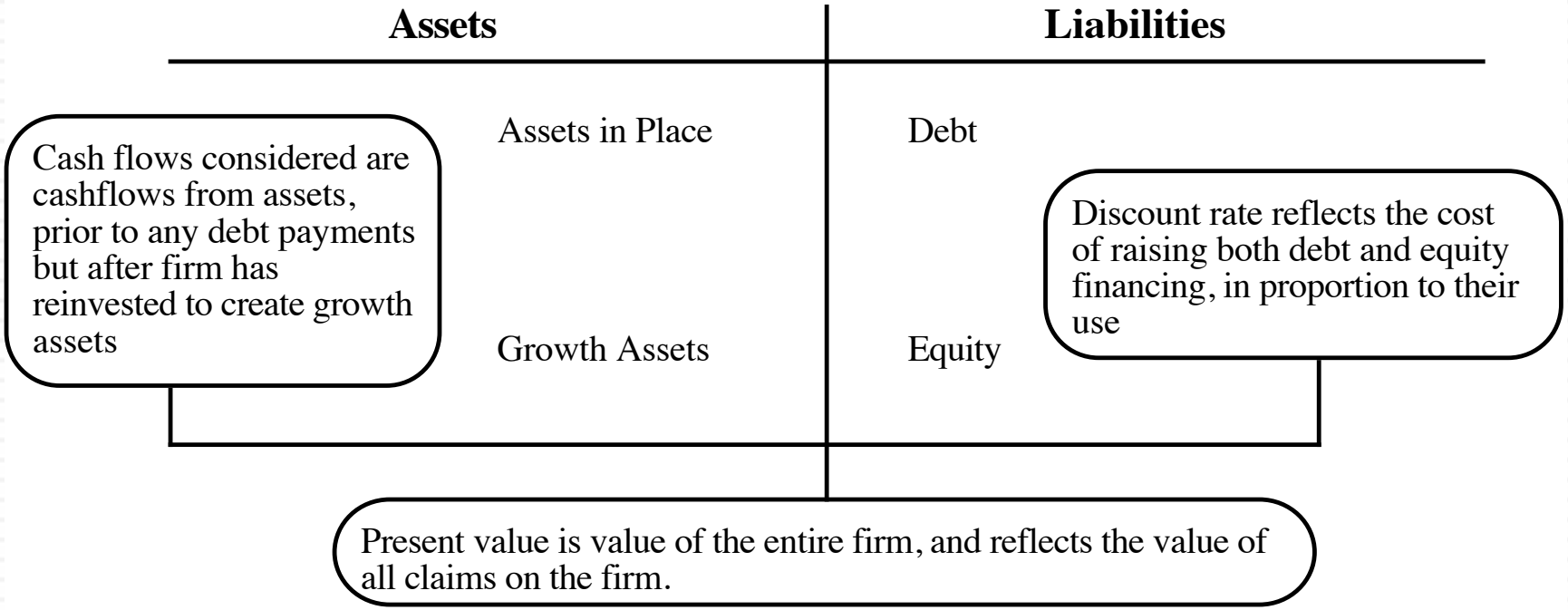
In dividend policy: It is the divining rod for dividend policy

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



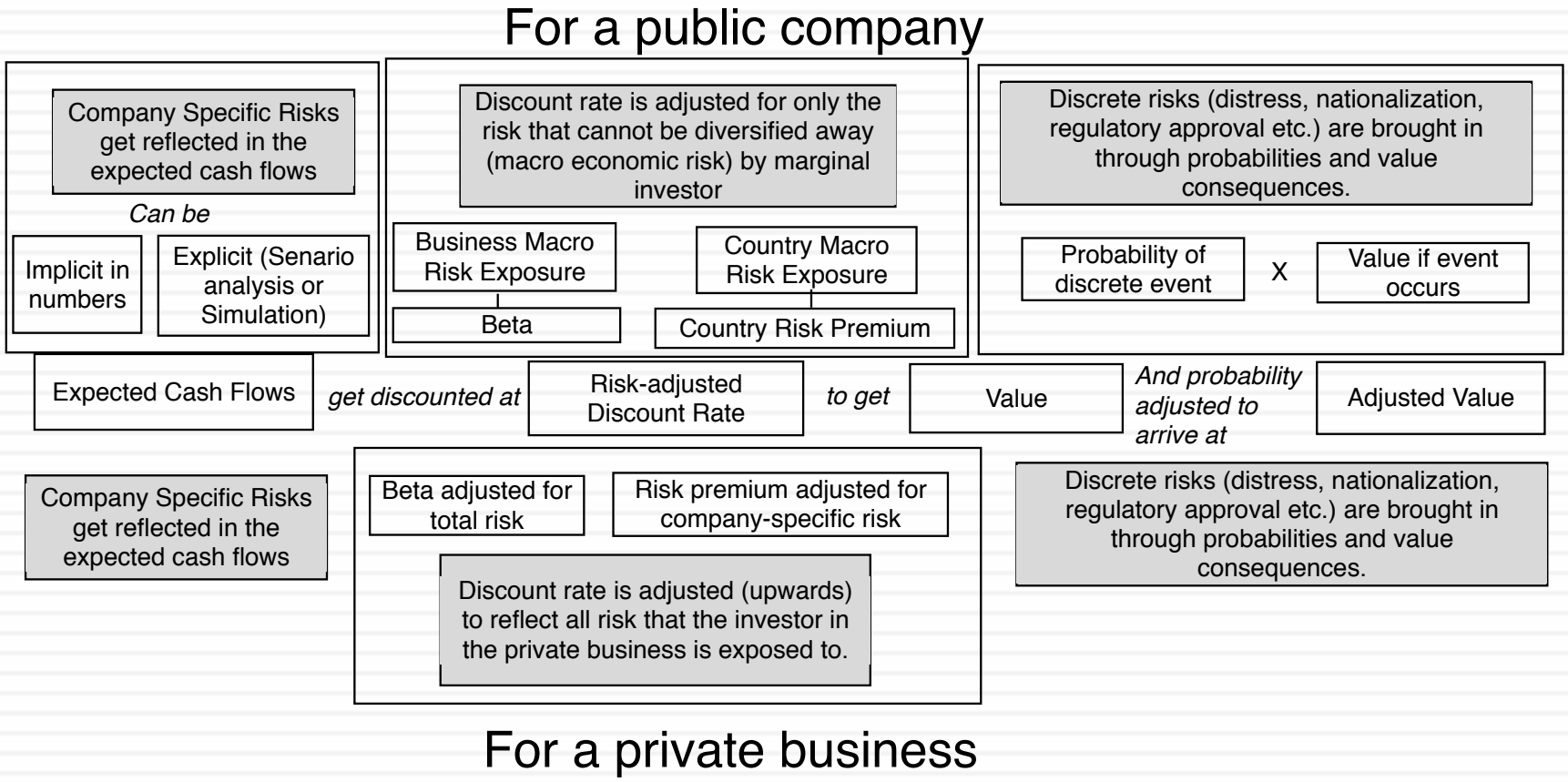
In valuation: It is the risk adjustment mechanism

Figure 5.6: Firm Valuation



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

A Template for Risk Adjusting Value



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

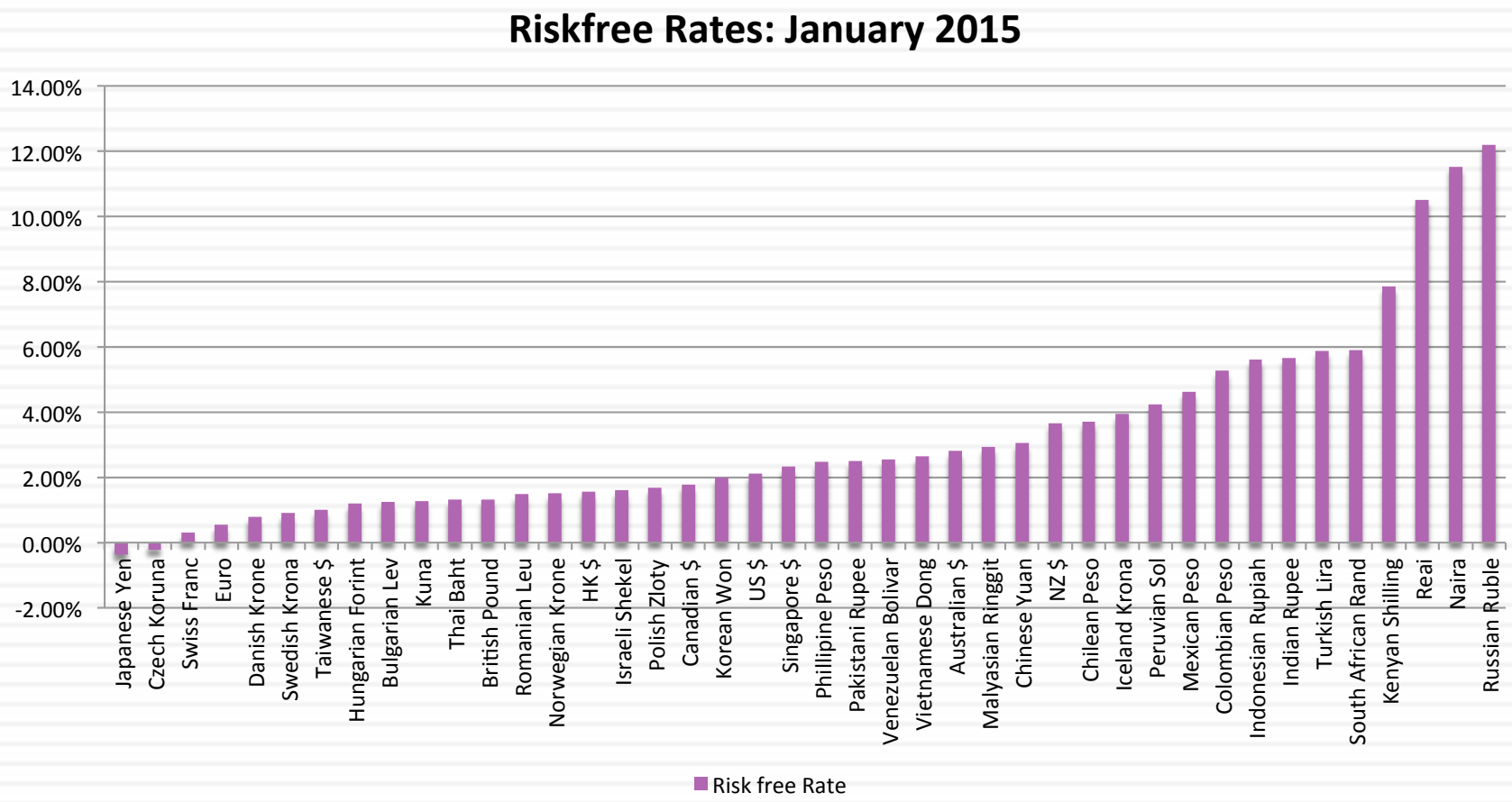
Feel the urge to normalize?

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.

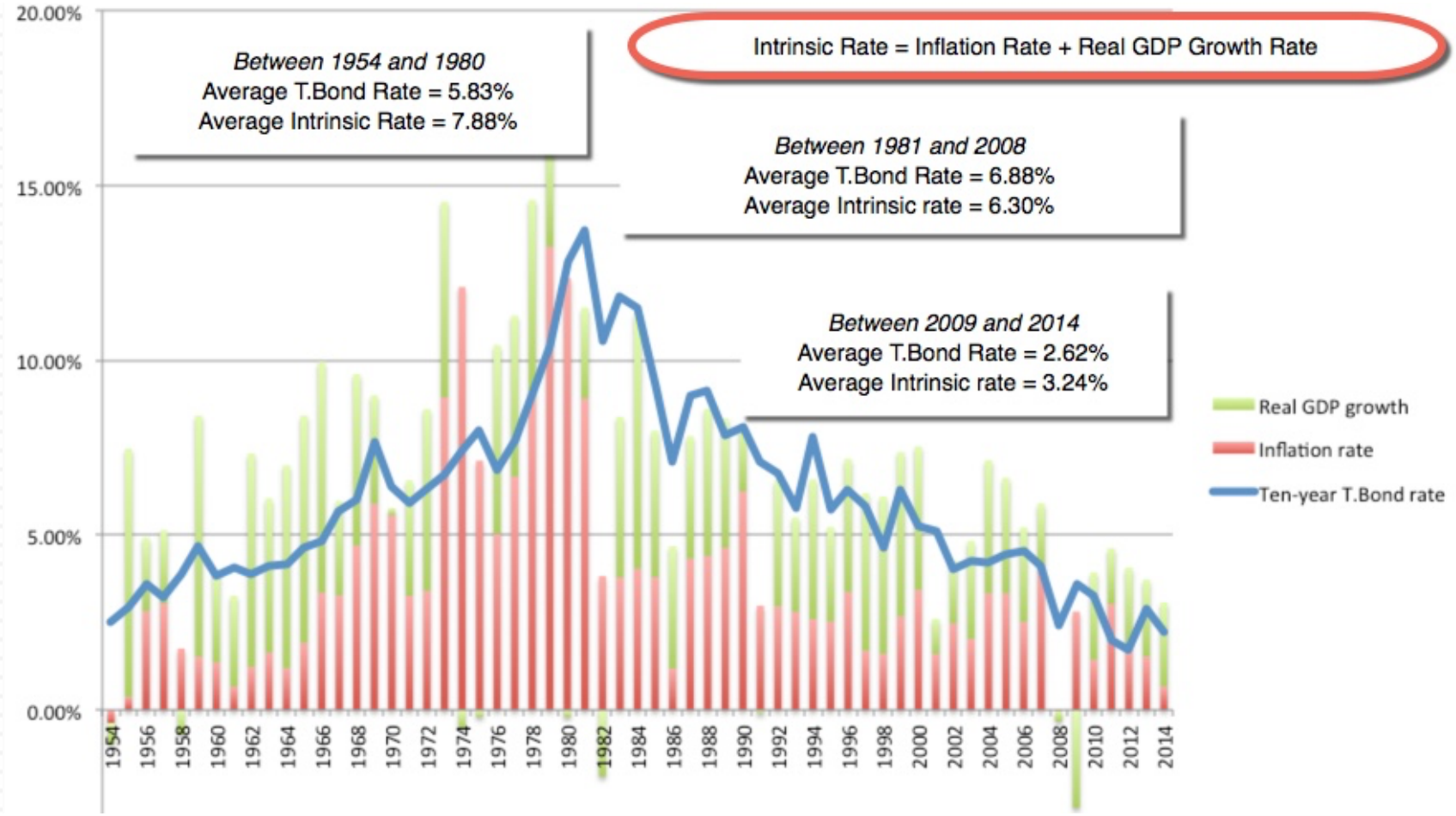
Risk free rate by currency



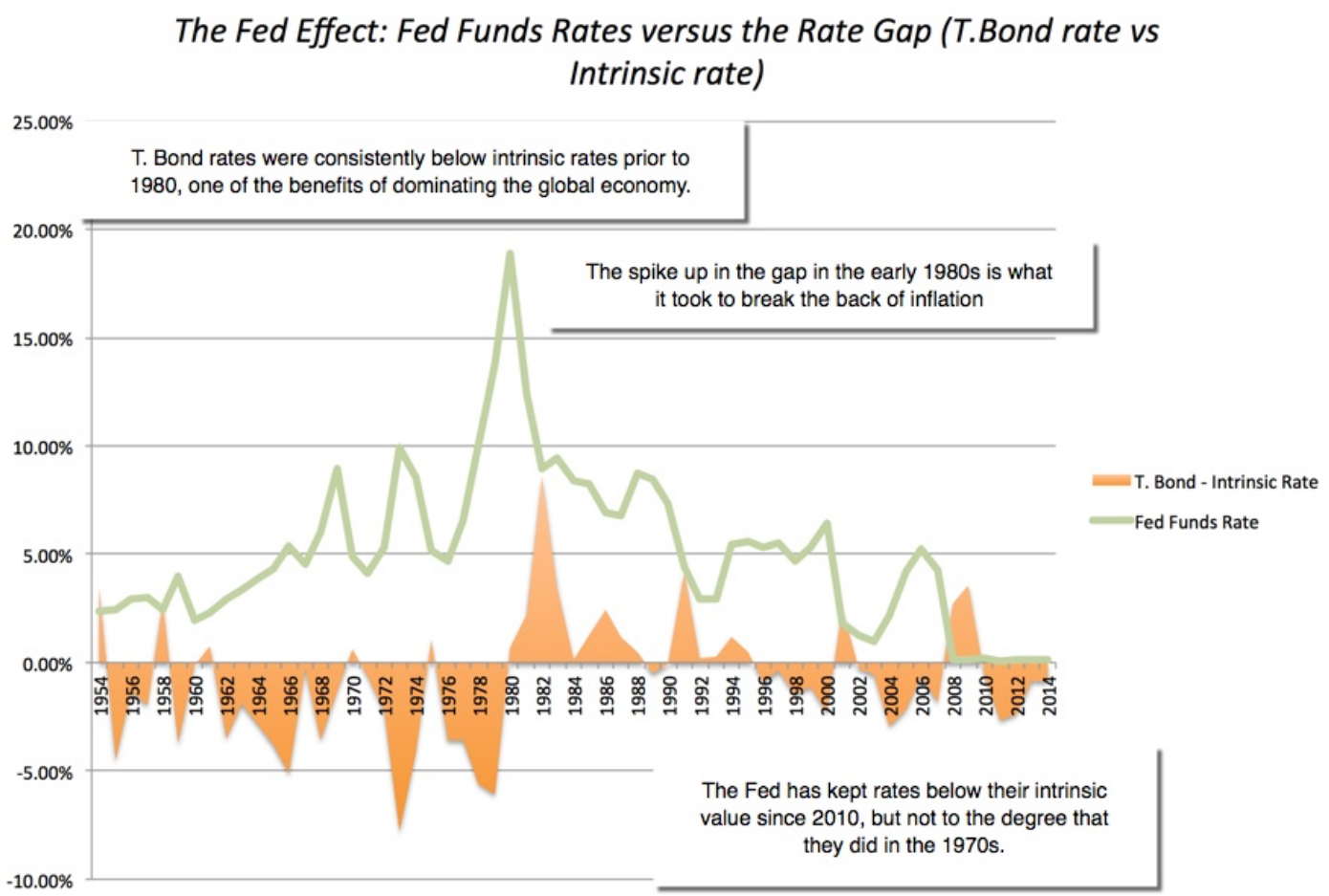
The risk free rate is “too low”!

- 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?



The Fed Effect: Smaller than you think!



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% 4.14%	5.79% 4.60%	7.79% 8.74%	2.00% 4.77%	**$2,296**

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?

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%		

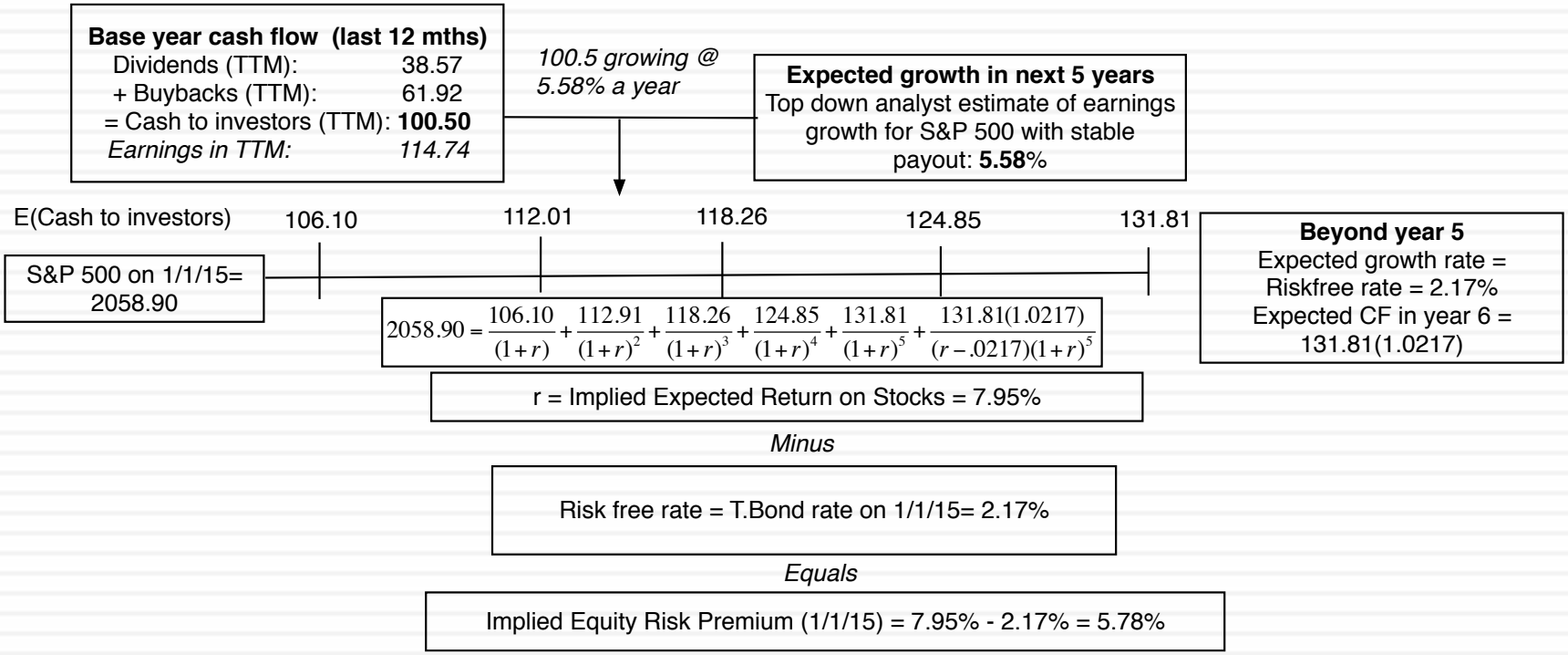
And why you should not trust it!

- 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%:

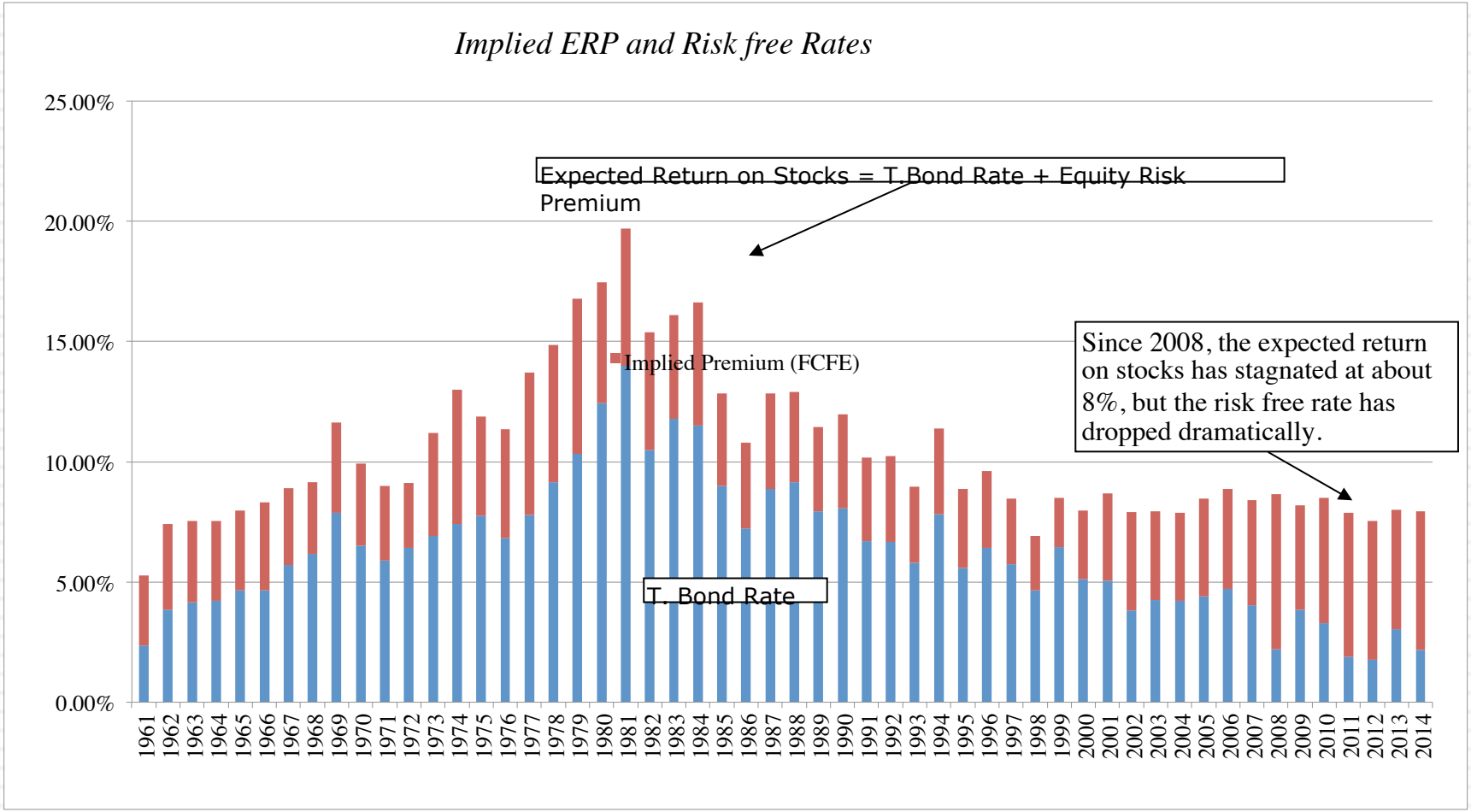
  $$\text{Standard Error in Premium} = 20\%/\sqrt{80} = 2.26\%$$

- 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%.

A forward-looking ERP?

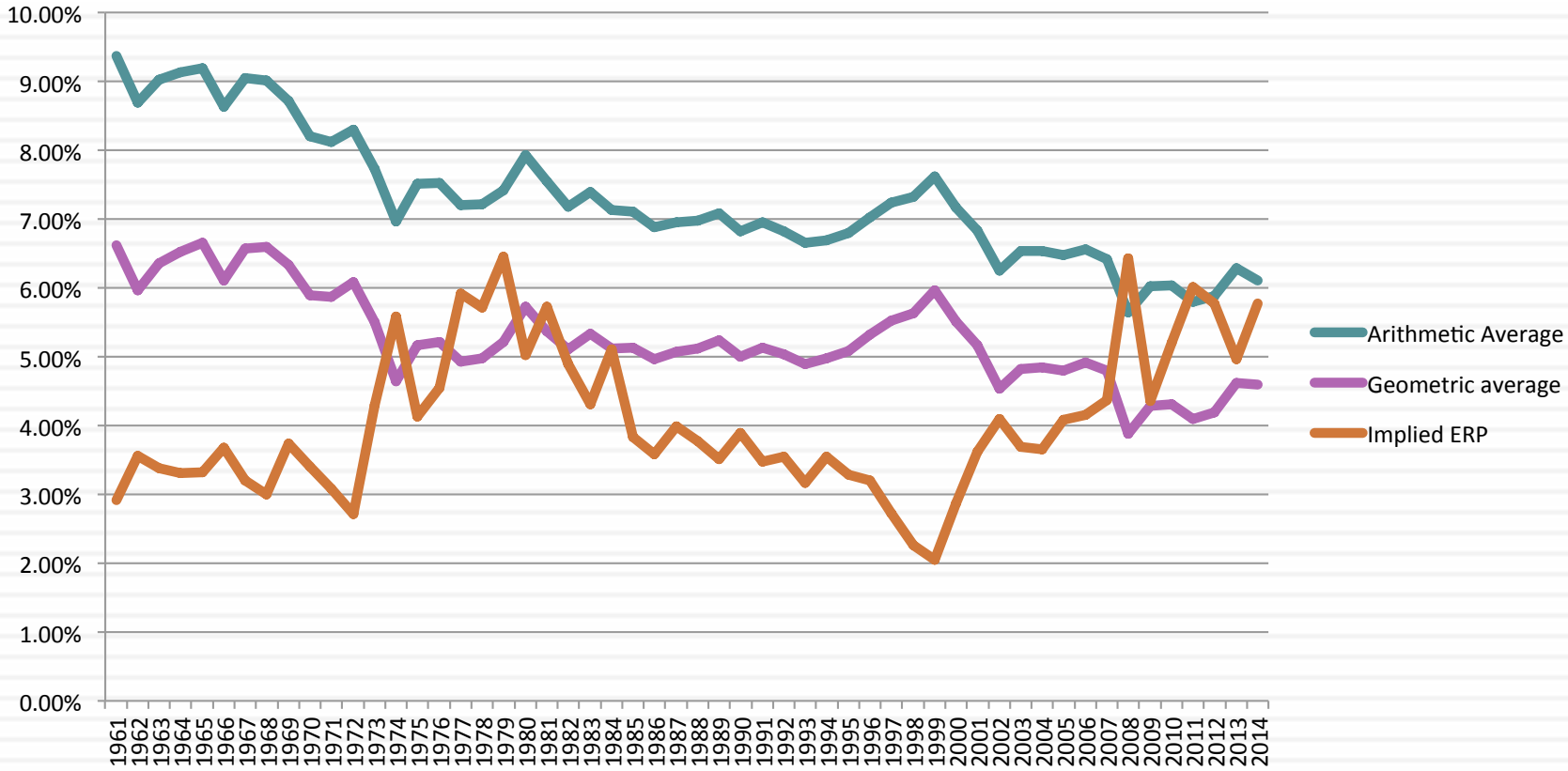


The ERP and Risk free Rates



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

Figure 10: Historical versus Implied Premium - 1961- 2014



Why implied premiums matter?

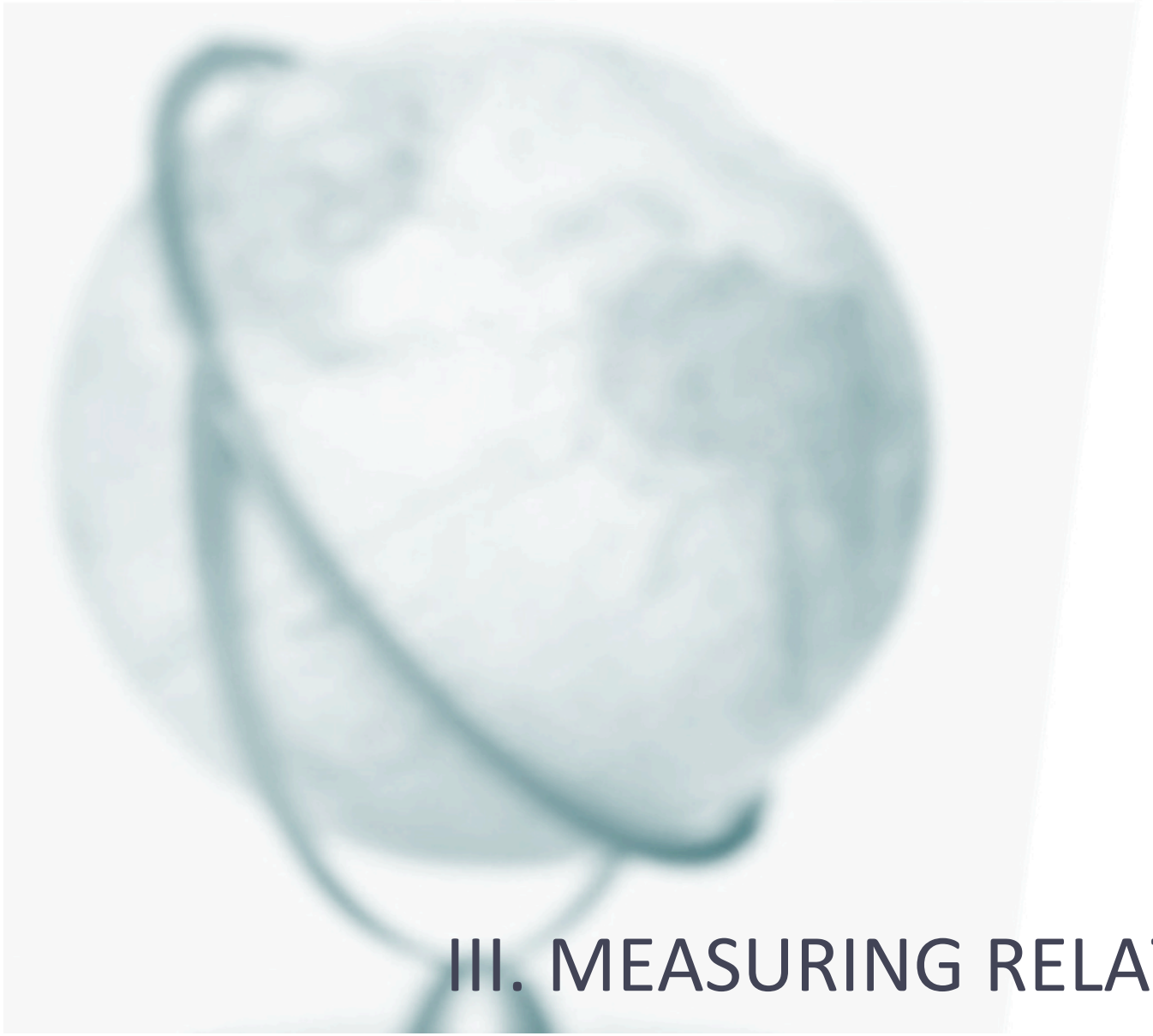
- Many appraisers and analysts use historical risk premiums (and arithmetic averages at that) as risk premiums to compute cost of equity. If you use the arithmetic average premium (for stocks over T.Bills) for 1928-2014 of 8% to value stocks in January 2014, given the implied premium of 5.75%, what are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

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.

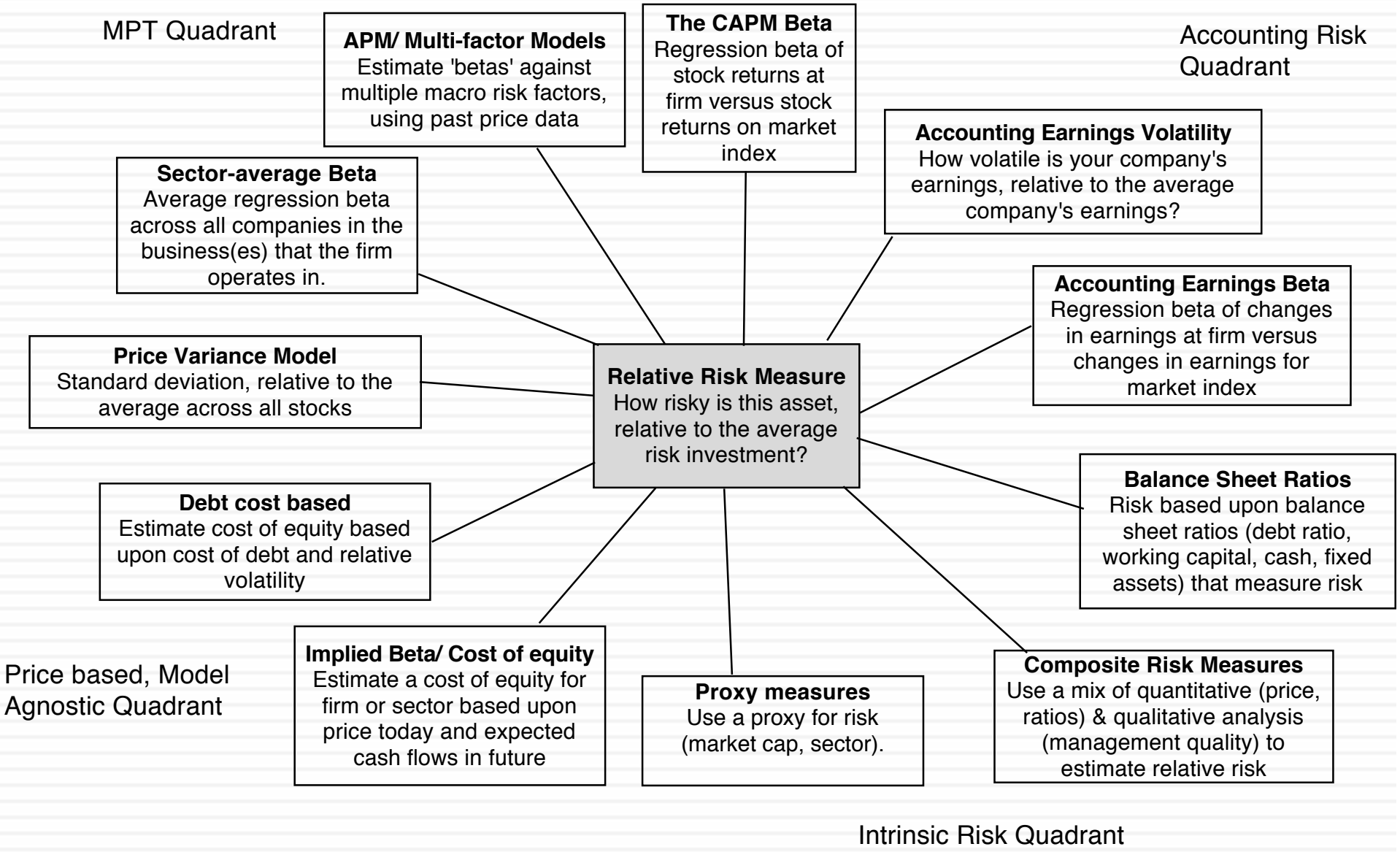
Predictor	*Correlation with implied premium next year*	*Correlation with actual risk premium – next 10 years*
Current implied premium	0.712	0.424
Average implied premium: Last 5 years	0.646	0.360
Historical Premium	-0.394	-0.486
Default Spread based premium	0.059	0.174



III. MEASURING RELATIVE RISK

It should not be Greek to you!

Measuring Relative Risk



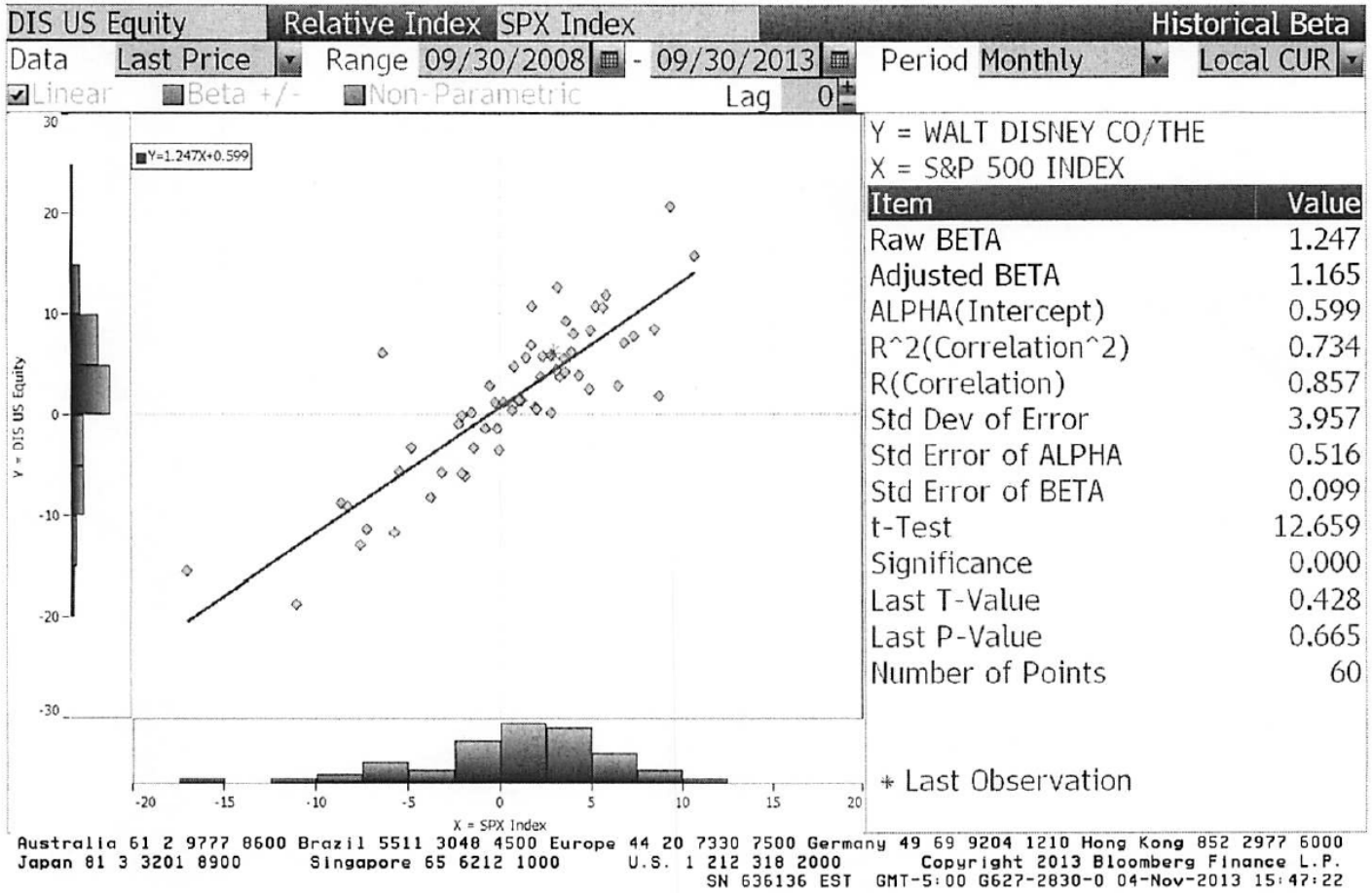
The CAPM Beta

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

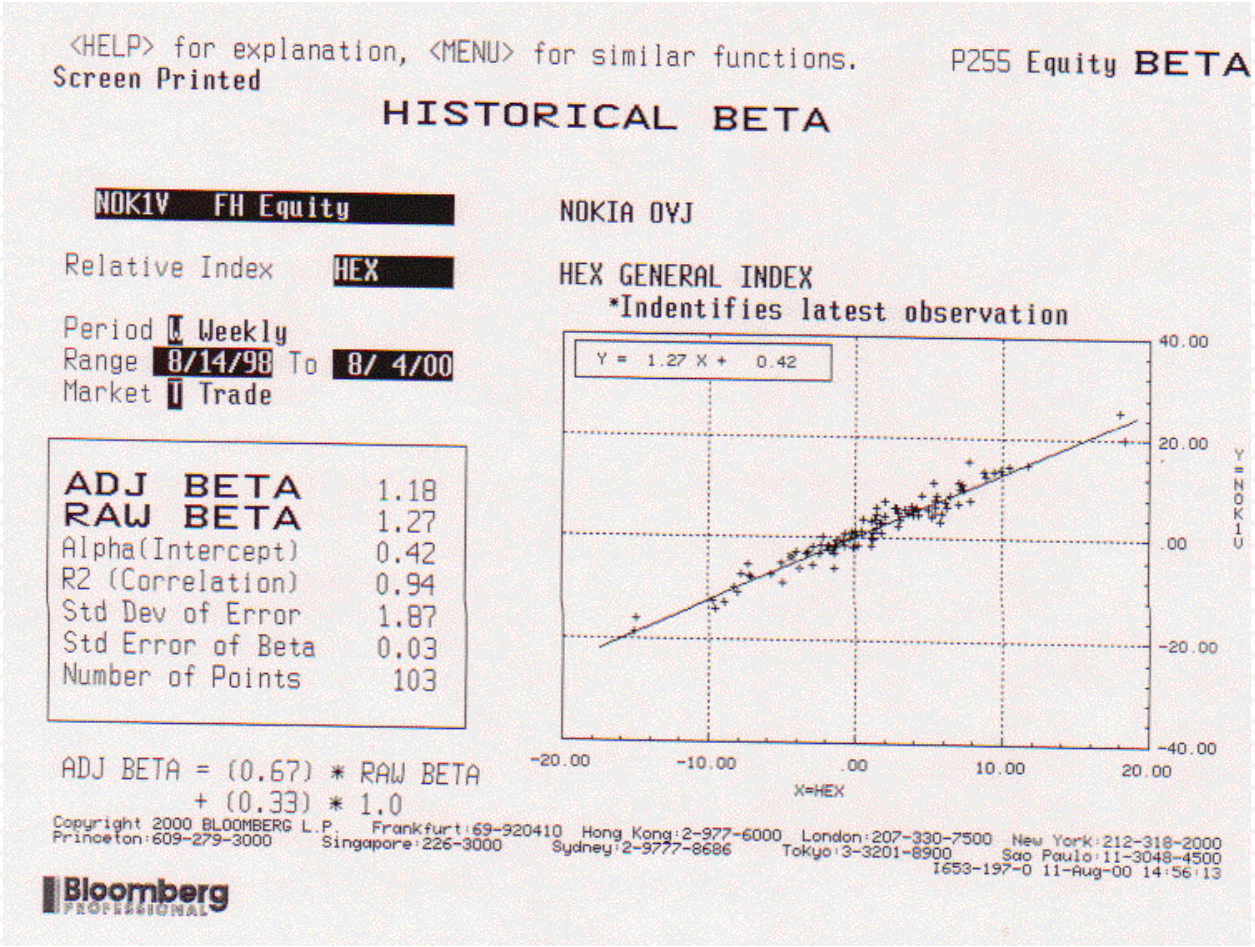
  Rj = a + b Rm

  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.

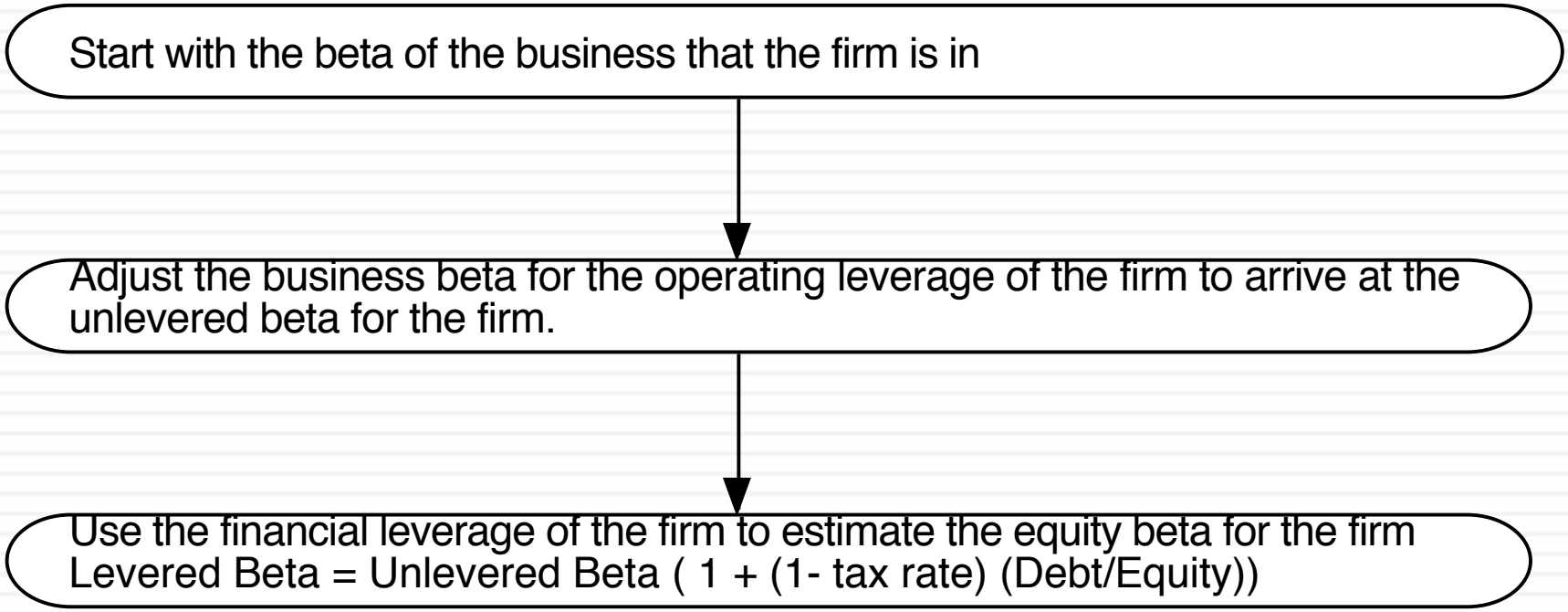
Beta Estimation: Using a Service (Bloomberg)



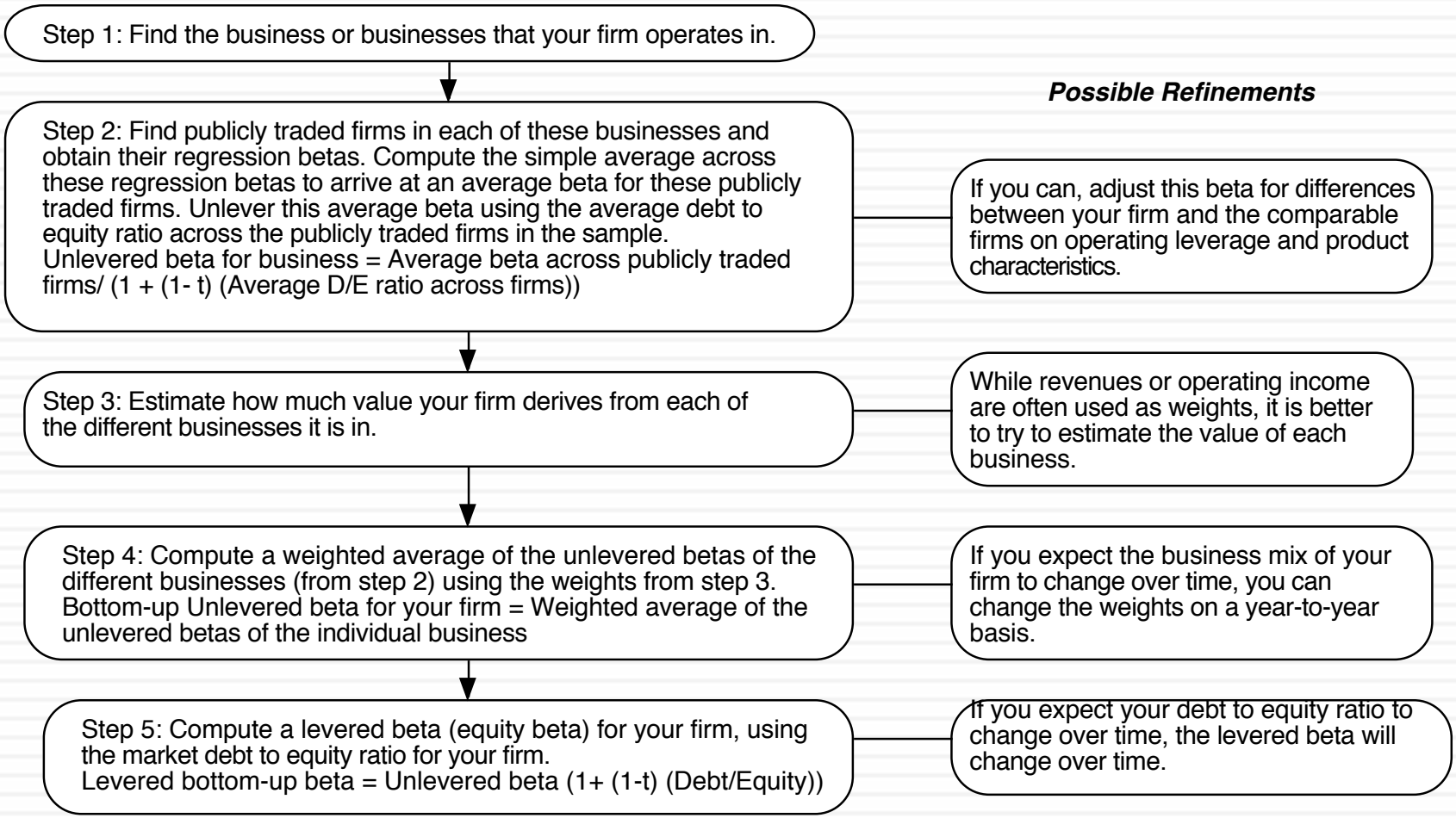
Beta Estimation: The Index Effect



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



Bottom-up Betas



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.

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%

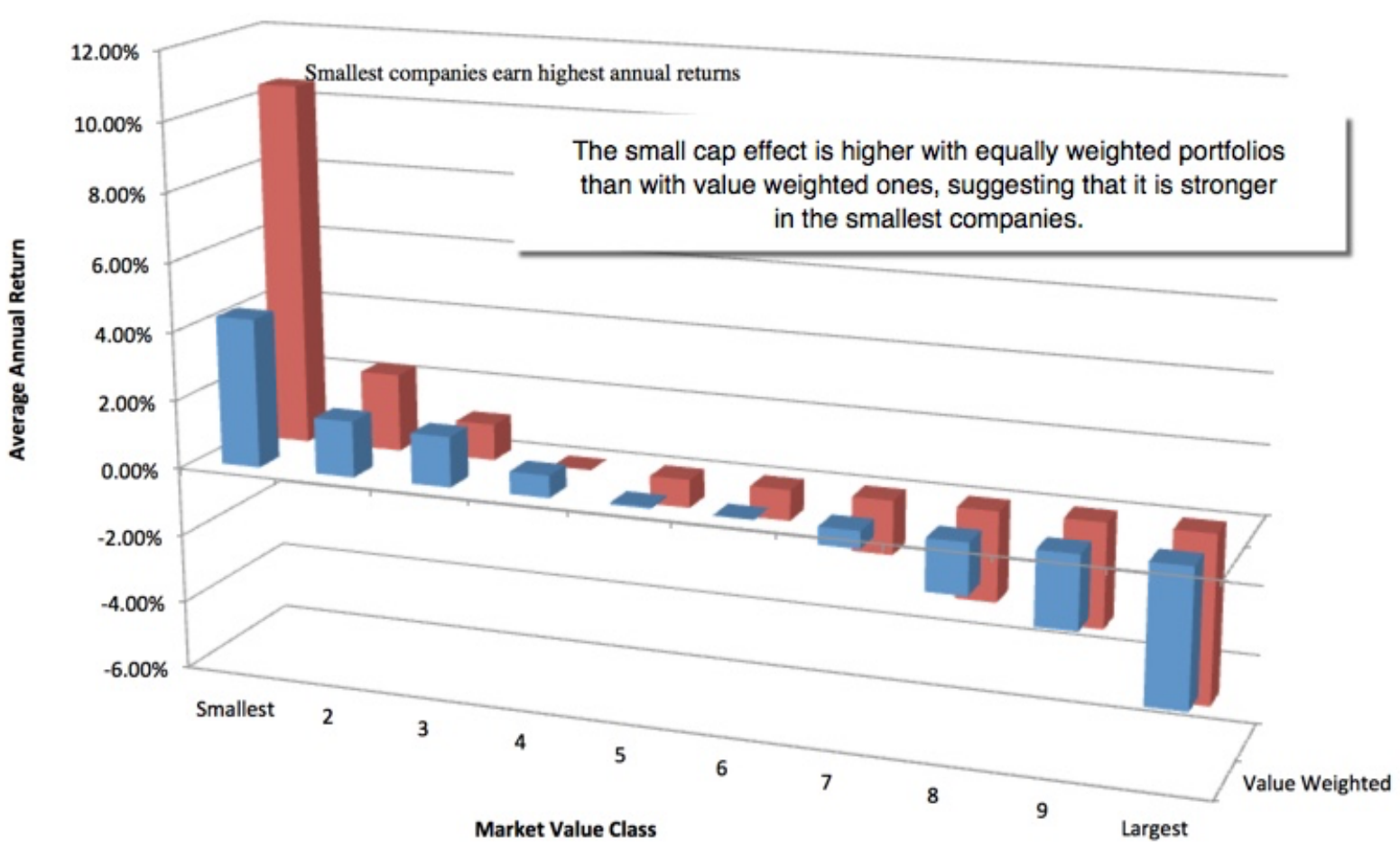
III. THE GARNISHING

Here a premium, there a premium..

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.

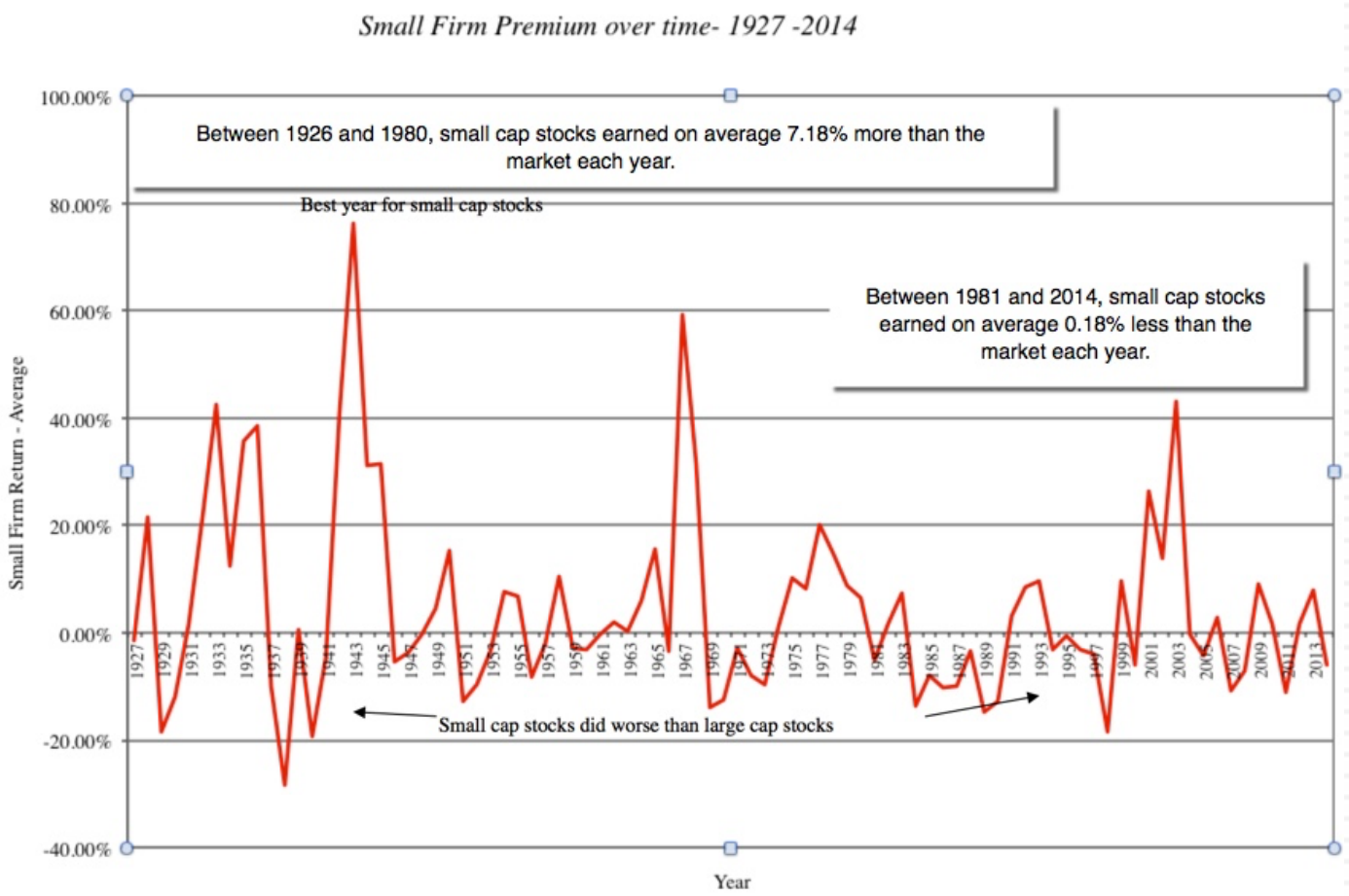
The Most Added Premium: The Small Cap Premium



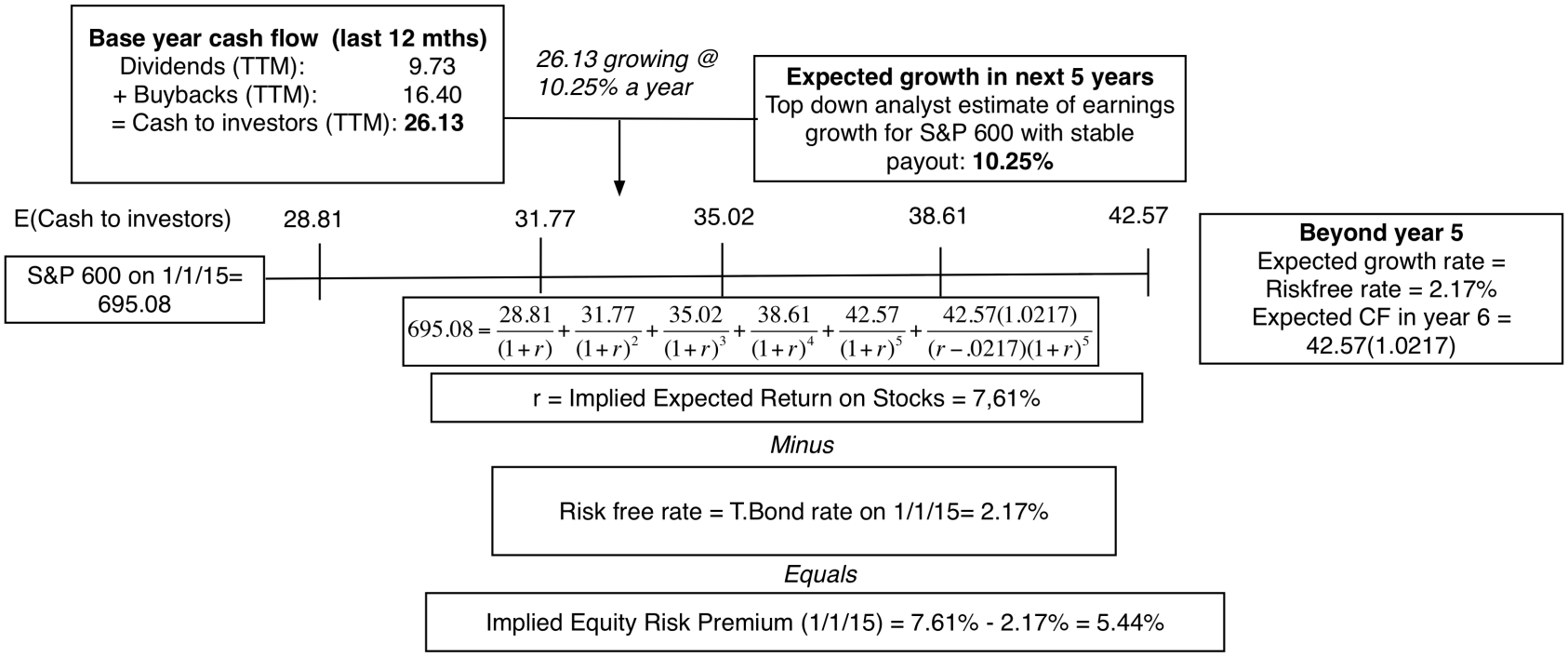
Historical premiums are noisy..

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..



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



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..

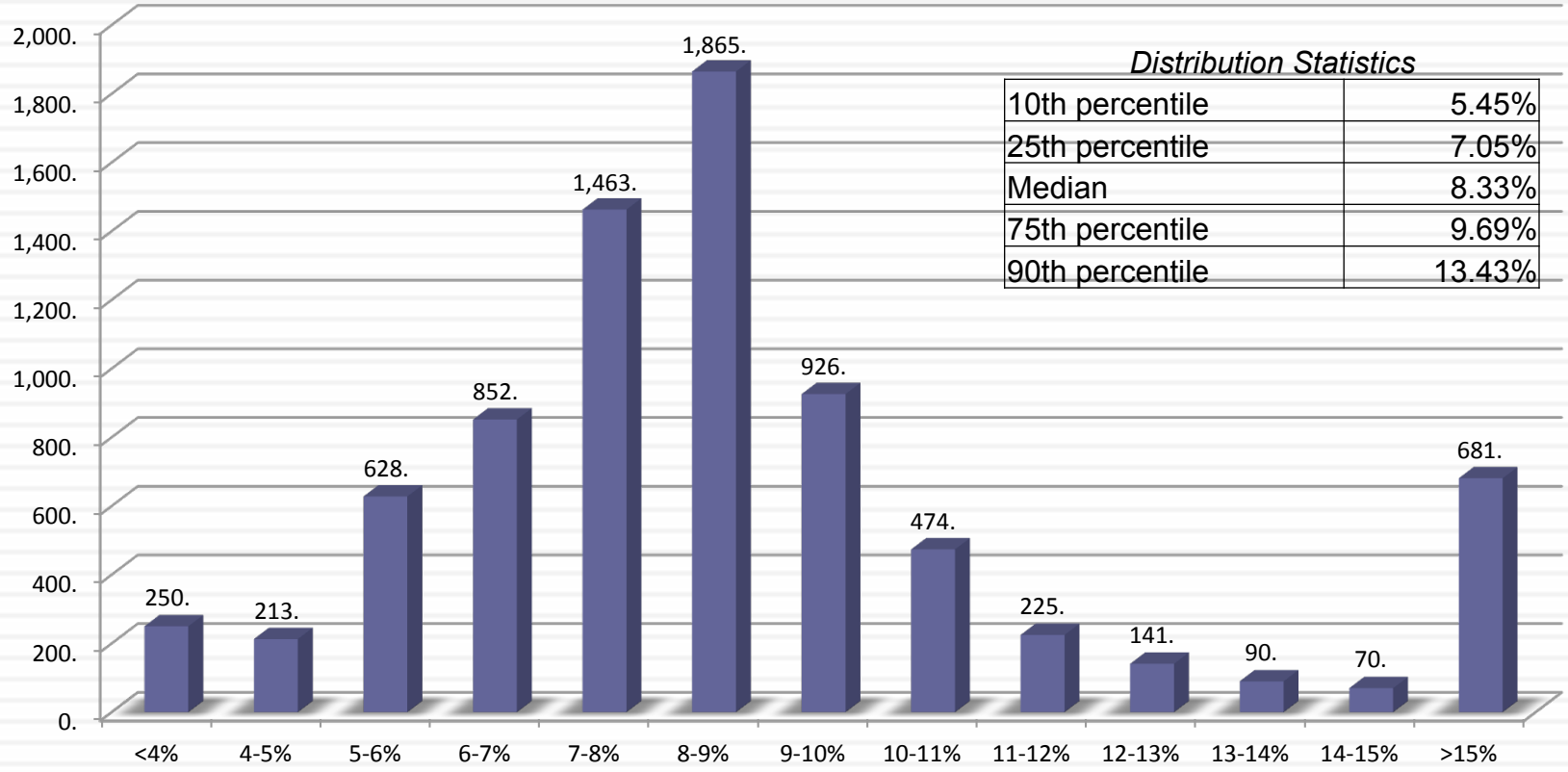
- Estimation versus Economic uncertainty
  - Estimation uncertainty reflects the possibility that you could have the "wrong model" or estimated inputs incorrectly within this model.
  - Economic uncertainty comes the fact that markets and economies can change over time and that even the best models will 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

- Not all risk counts: 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.
- Risk through whose eyes? 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
- The diversification effect: 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.

The Cost of Equity (for diversified investors)

Cost of equity for Publicly traded US firms - January 2015

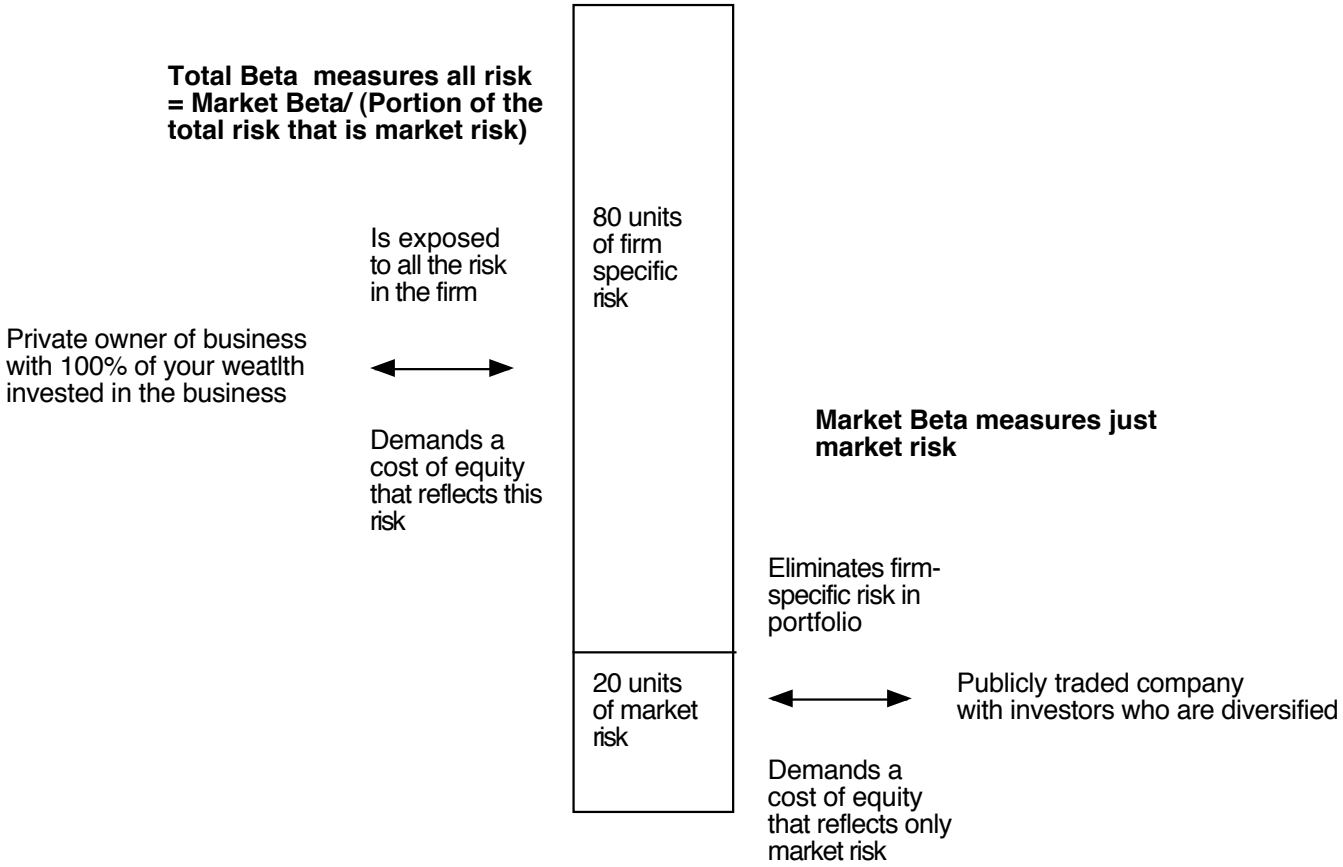


Distribution Statistics

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

If the "buyer" is not diversified..

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



IV. DEBT AND ITS COST

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

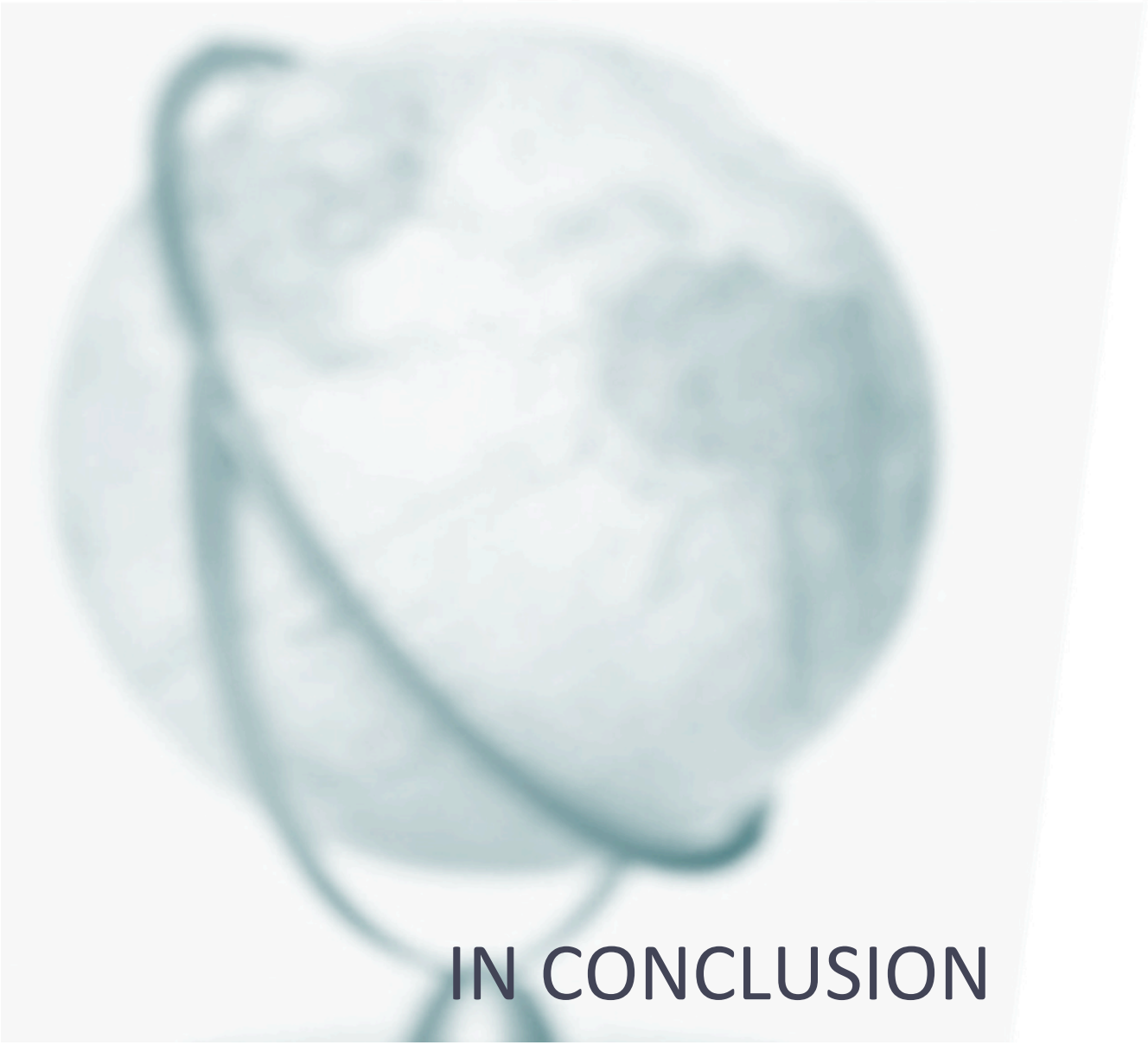
- The cost of debt is the rate at which you can borrow at currently, It will reflect not only your default risk but also the level of interest rates in the market.
- The two most widely used approaches to estimating cost of debt are:
  - Looking up the yield to maturity on a straight bond outstanding 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.



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.