THE COST OF CAPITAL: MISUNDERSTOOD, MISESTIMATED AND MISUSED!

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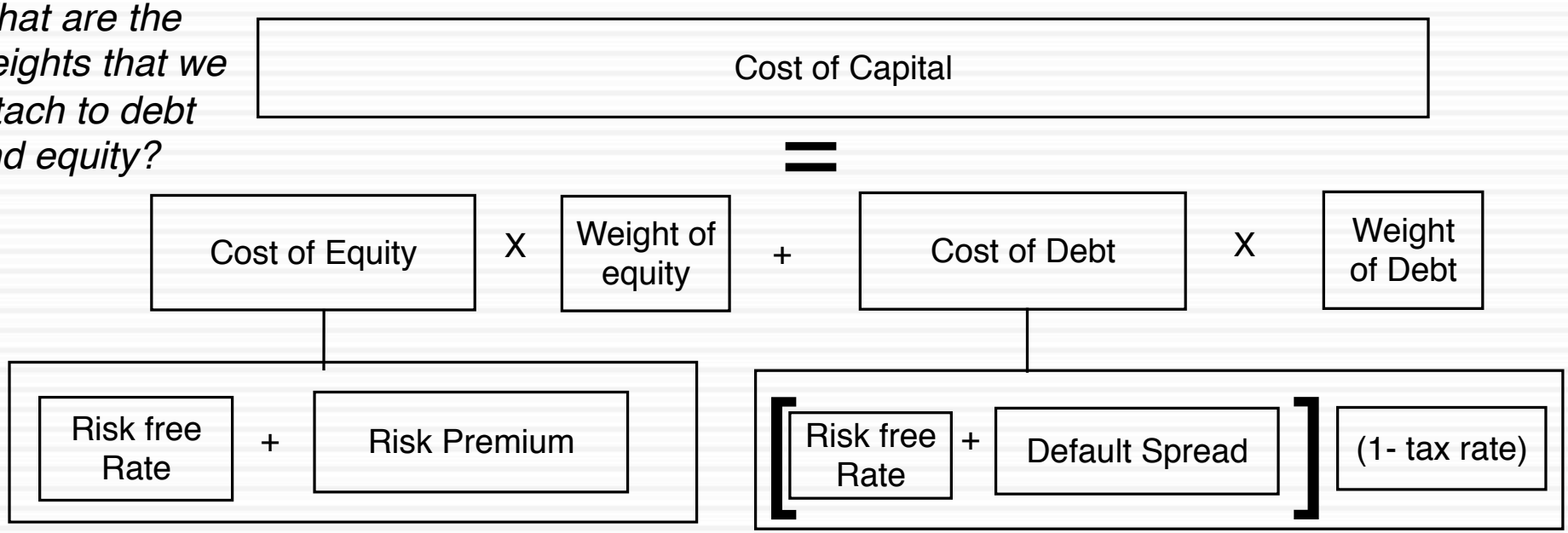
THE ULTIMATE MULTI-PURPOSE TOOL: AN OPPORTUNITY COST & OPTIMIZING TOOL

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

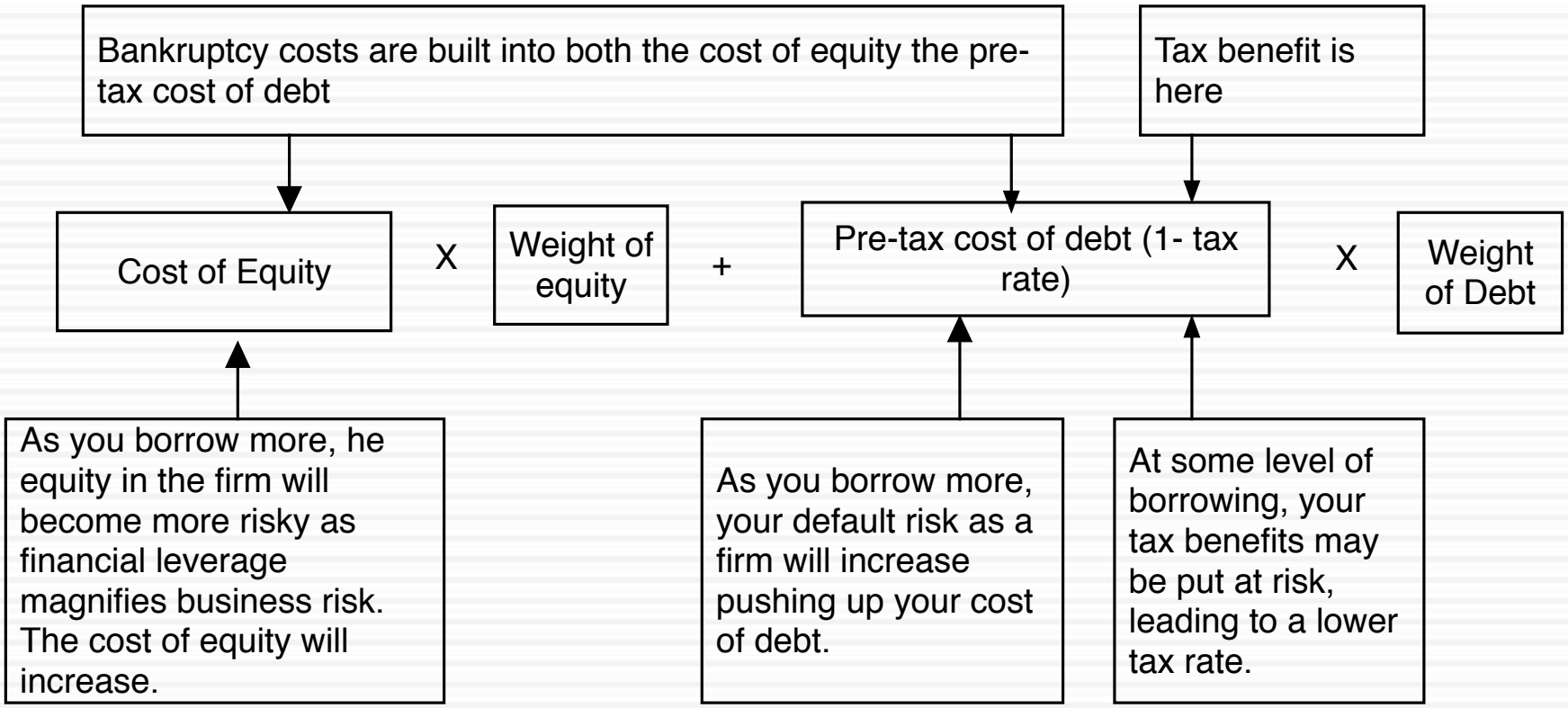
The Hurdle Rate

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

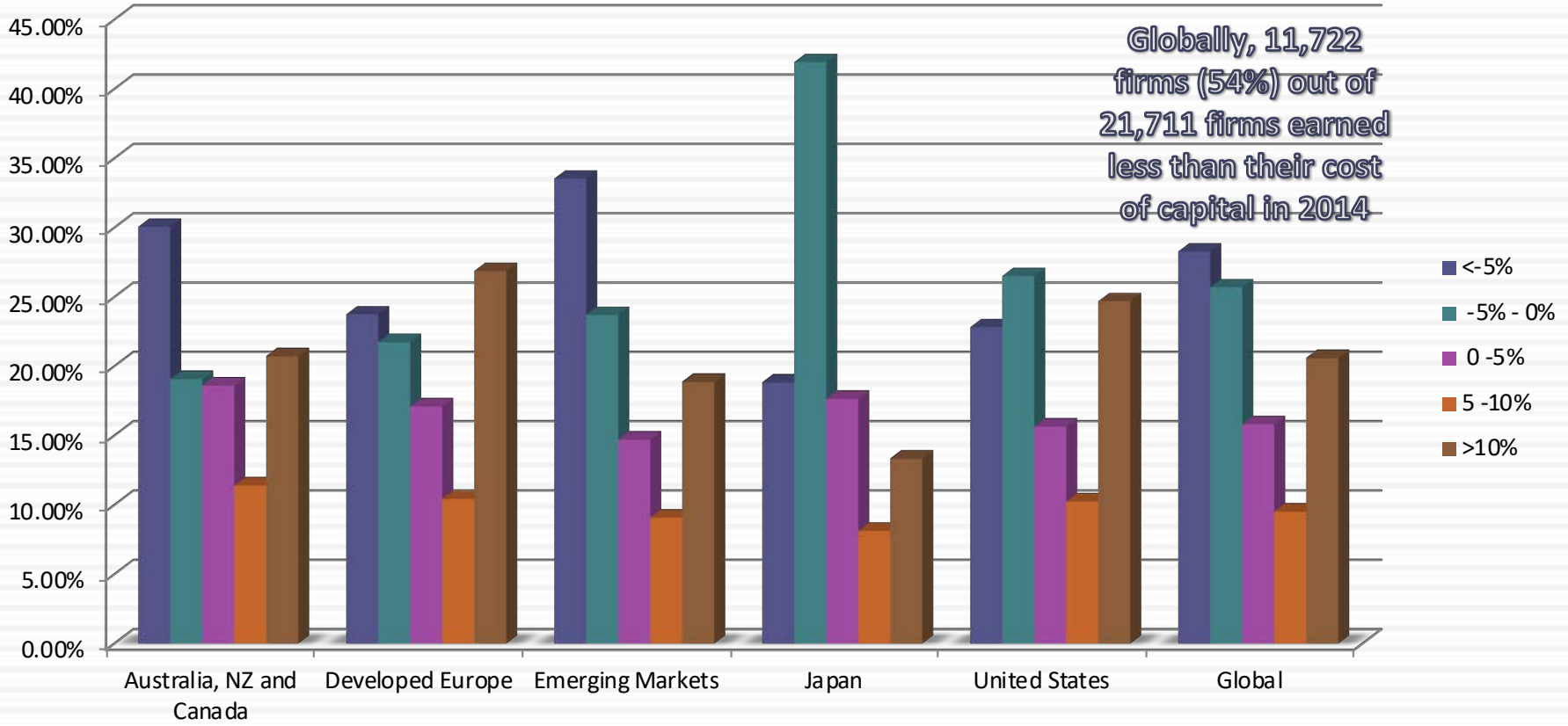


The trade off: As you use more debt, you replace more expensive equity with cheaper debt but you also increase the costs of equity and debt. The net effect will determine whether the cost of capital will increase, decrease or be unchanged as debt ratio changes.

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

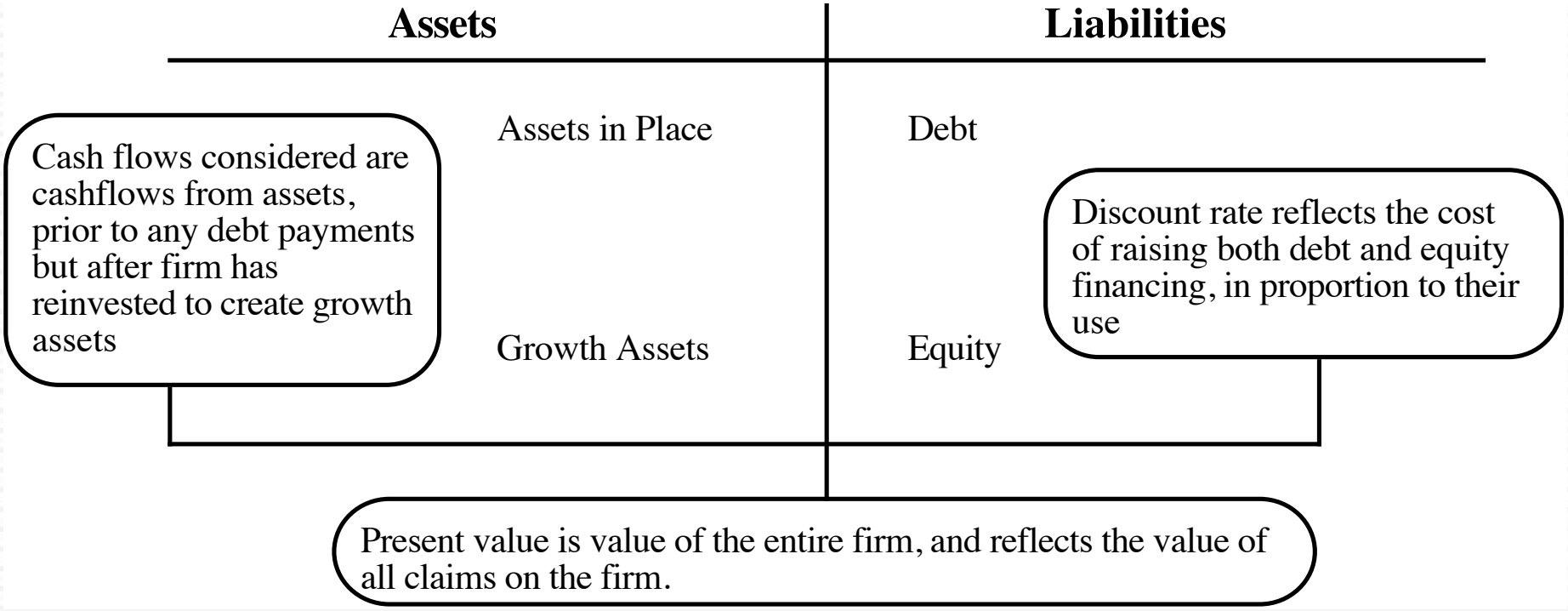
In dividend policy: It is the divining rod for returning cash

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



In valuation, it is the mechanism for adjusting for risk..

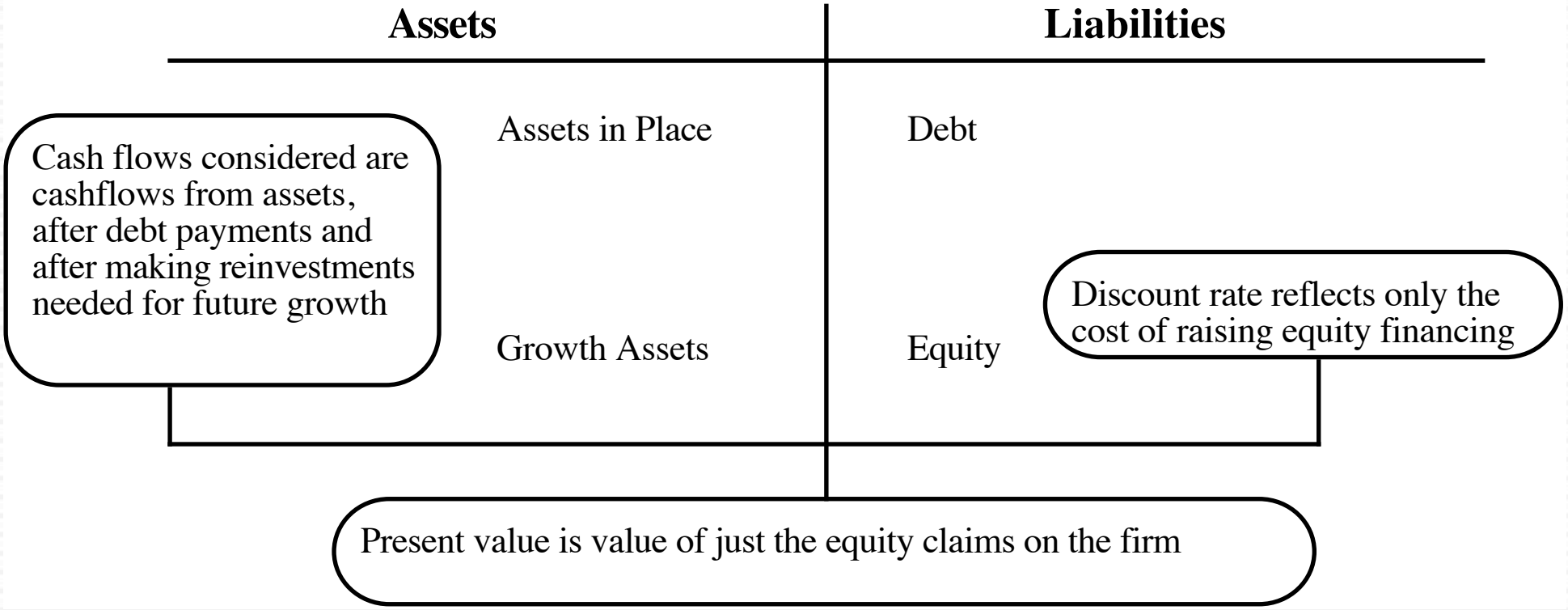
Figure 5.6: Firm Valuation



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

Though you can value with just an equity focus..

Figure 5.5: Equity Valuation



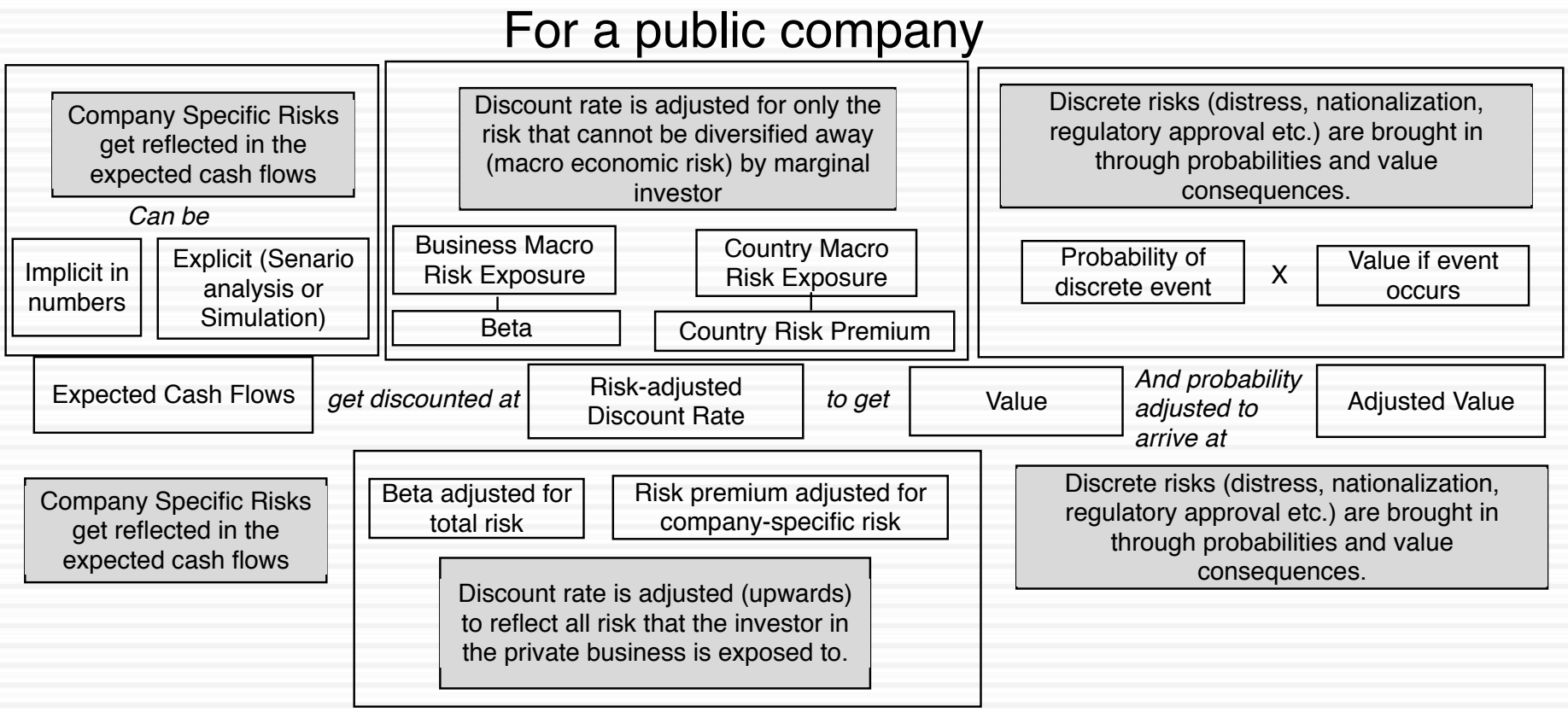
Both costs are sometimes disguised under a different names..

- In real estate, the cost of equity or capital is often called a "capitalization" or "cap" rate. It is used to capitalize the income on a real estate property to get to its value:

  Value of property (or business) = Income/ Cap Rate

- Since the cap rate is just a euphemism for discount rate, to understand what cap rate to use, you have to look at the numerator:
  - If the numerator is net income (after interest expenses and taxes), it is the cost of equity.
  - If the numerator is pre-tax net income (after interest expenses but before taxes), is a pre-tax cost of equity.
  - If the numerator is operating income after taxes (before interest expenses), it is the cost of capital.
  - If the numerator is operating income before taxes, it is the pre-tax cost of capital.

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

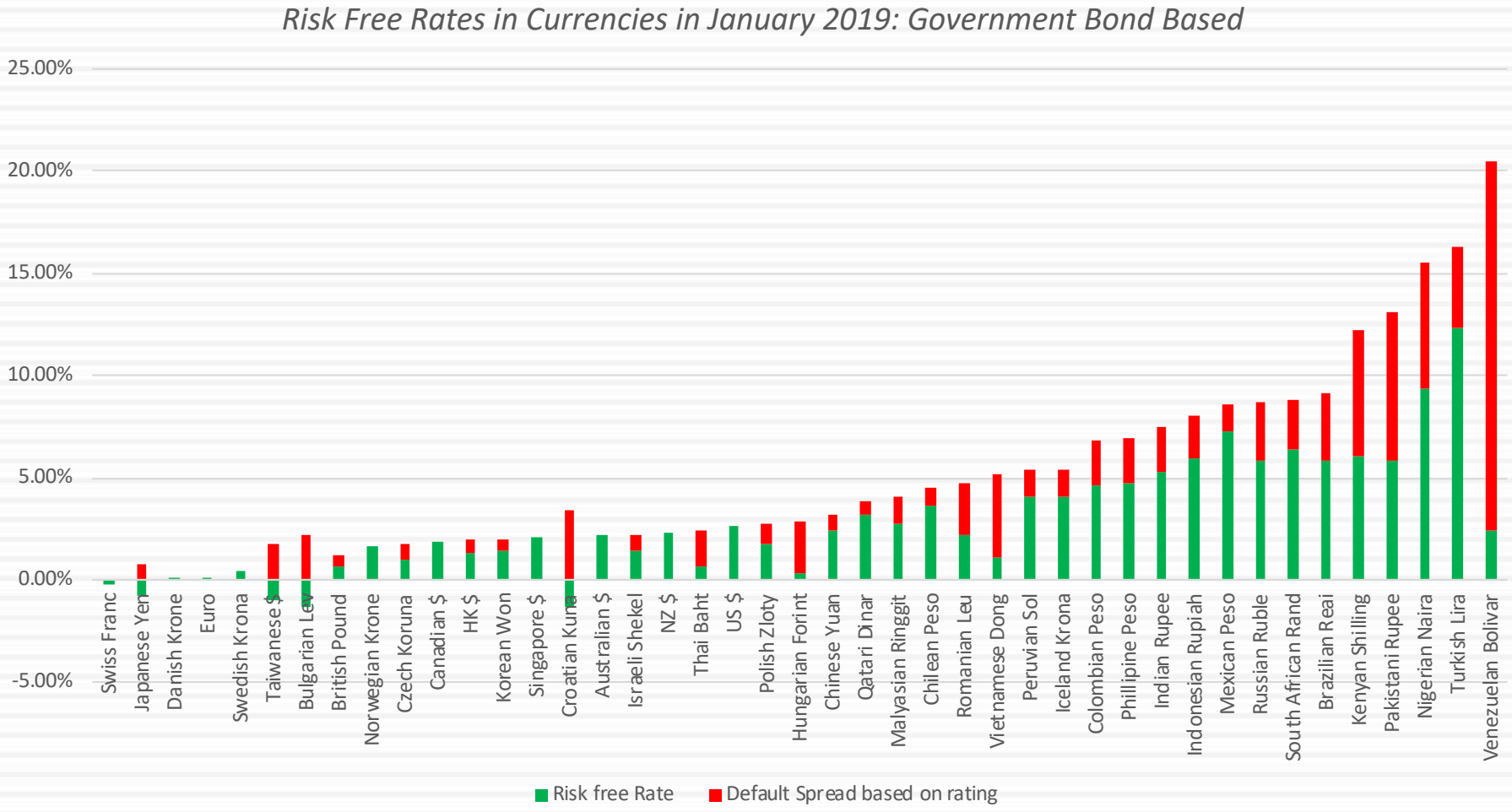
Feel the urge to normalize?

What is the risk free rate?

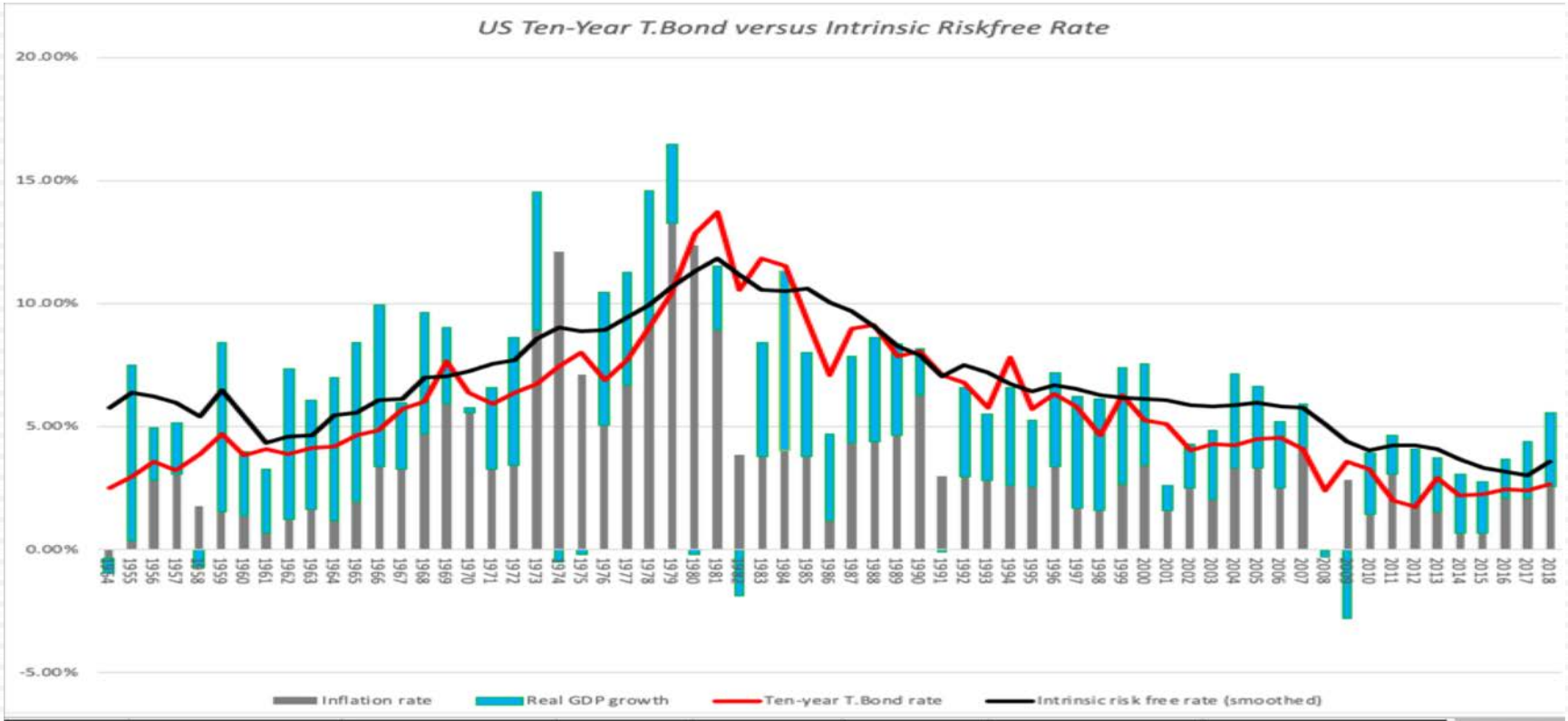
- On a riskfree asset, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.
- For an investment to be riskfree, then, it has to have
  - No default risk
  - No reinvestment risk
- Following up, here are three broad implications:

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.

Why do risk free rates vary across currencies? January 2019 Risk free rates



Why is the risk free rate so low?



Period	T.Bond rate	Inflation rate	Real GDP growth	Intrinsic Riskfree Rate	T.Bond - Intrinsic Rate	Smoothed Intrinsic Riskfree Rate	T.Bond Rate - Smoothed Intrinsic Rate
1954-2017	5.82%	3.57%	3.03%	6.60%	-0.77%	6.85%	-1.02%
1954-1980	5.83%	4.49%	3.50%	7.98%	-2.15%	7.10%	-1.27%
1981-2008	6.88%	3.26%	3.04%	6.30%	0.58%	7.59%	-0.71%
2009-2018	2.55%	1.86%	1.72%	3.58%	-1.03%	3.77%	-1.22%
End of 201	2.68%	2.54%	3.00%	5.54%	-2.86%	3.58%	-0.90%

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.

II. THE EQUITY RISK PREMIUM

Using history as a crutch?

What is the Equity Risk Premium?

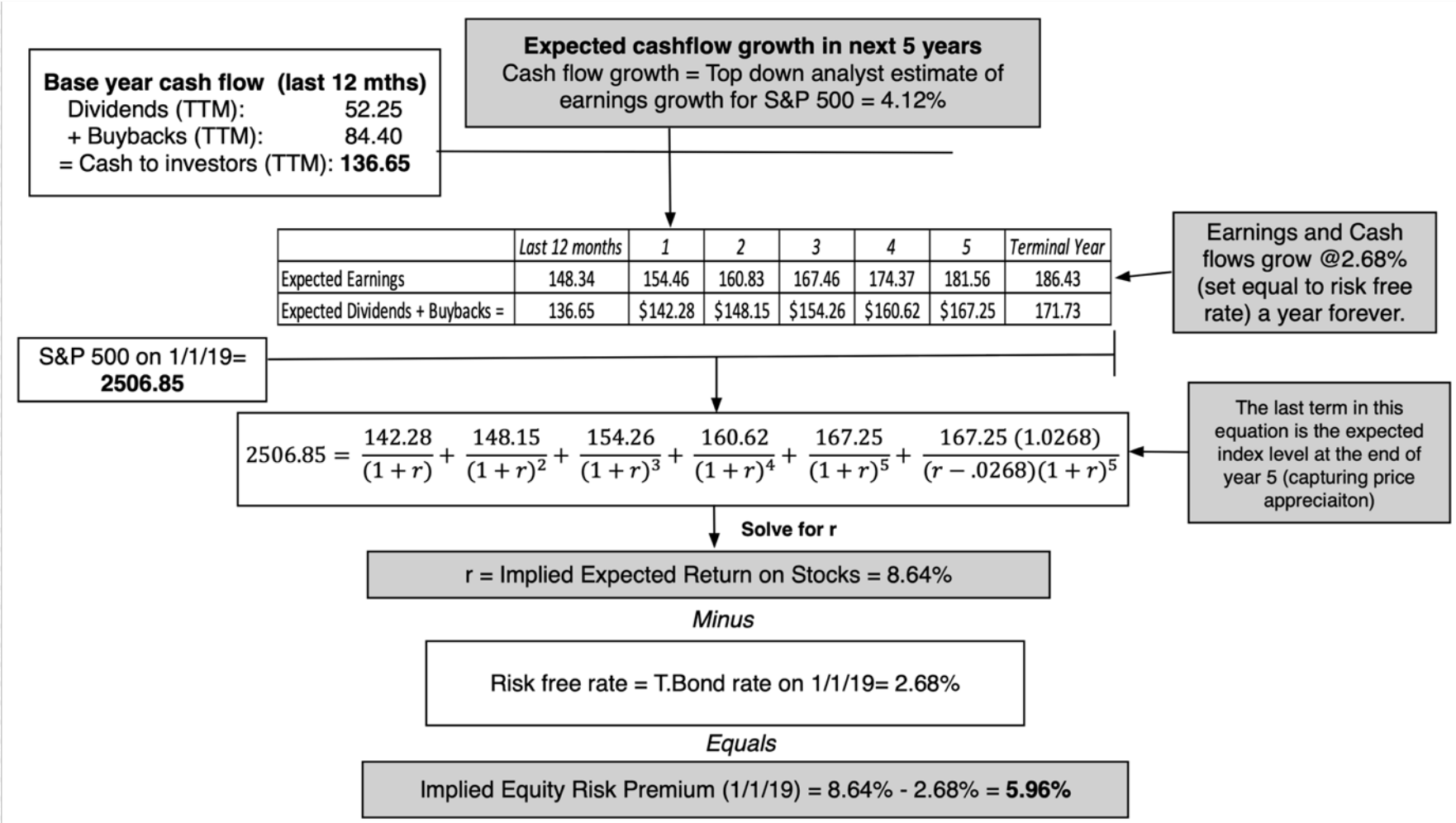
- Intuitively, the equity risk premium measures what investors demand over and above the riskfree rate for investing in equities as a class. Think of it as the market price for taking on average equity risk.
- It should depend upon
  - The risk aversion of investors
  - The perceived risk of equity as 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
1928-2018	7.93%	6.26%	6.11%	4.66%
Std Error	2.09%	2.22%		
1969-2018	6.34%	4.00%	5.01%	3.04%
Std Error	2.38%	2.71%		
2009-2018	13.00%	11.21%	12.48%	11.00%
Std Error	3.71%	5.50%		

A forward-looking ERP?

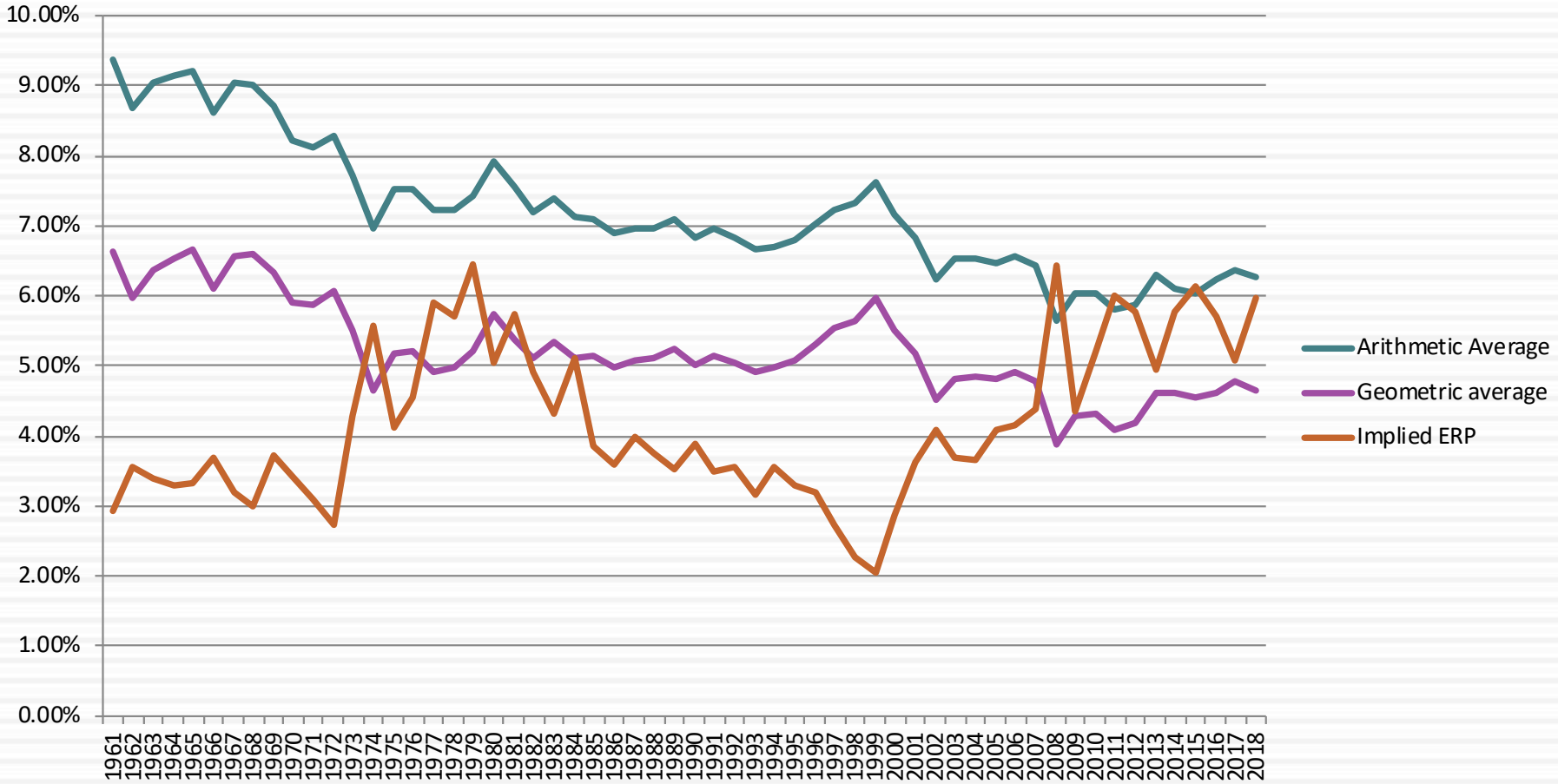


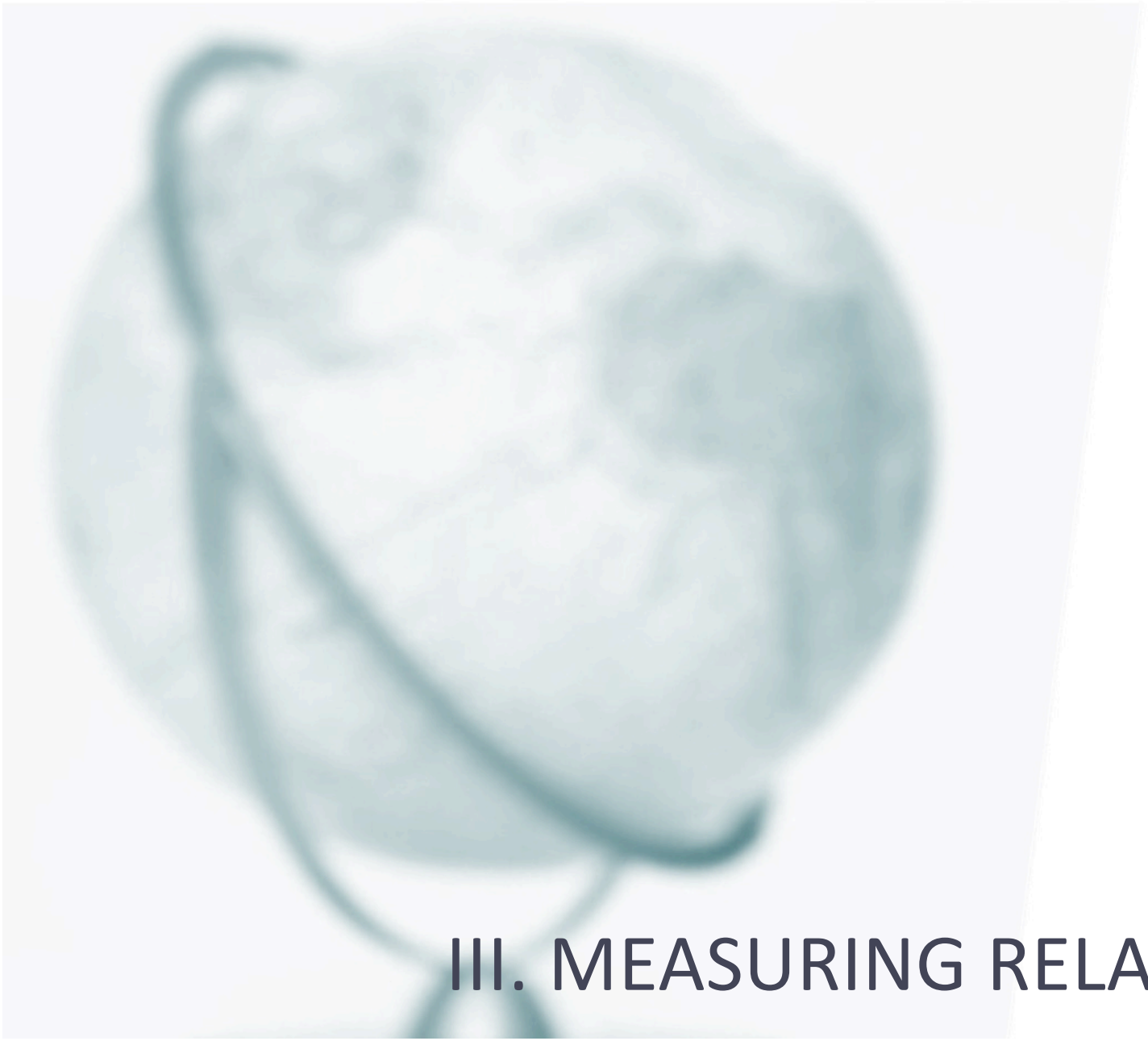
	Last 12 months	1	2	3	4	5	Terminal Year
Expected Earnings	148.34	154.46	160.83	167.46	174.37	181.56	186.43
Expected Dividends + Buybacks =	136.65	$142.28	$148.15	$154.26	$160.62	$167.25	171.73

$$2506.85 = \frac{142.28}{(1+r)} + \frac{148.15}{(1+r)^2} + \frac{154.26}{(1+r)^3} + \frac{160.62}{(1+r)^4} + \frac{167.25}{(1+r)^5} + \frac{167.25\ (1.0268)}{(r-.0268)(1+r)^5}$$

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

Figure 10: Historical versus Implied Premium - 1961- 2018

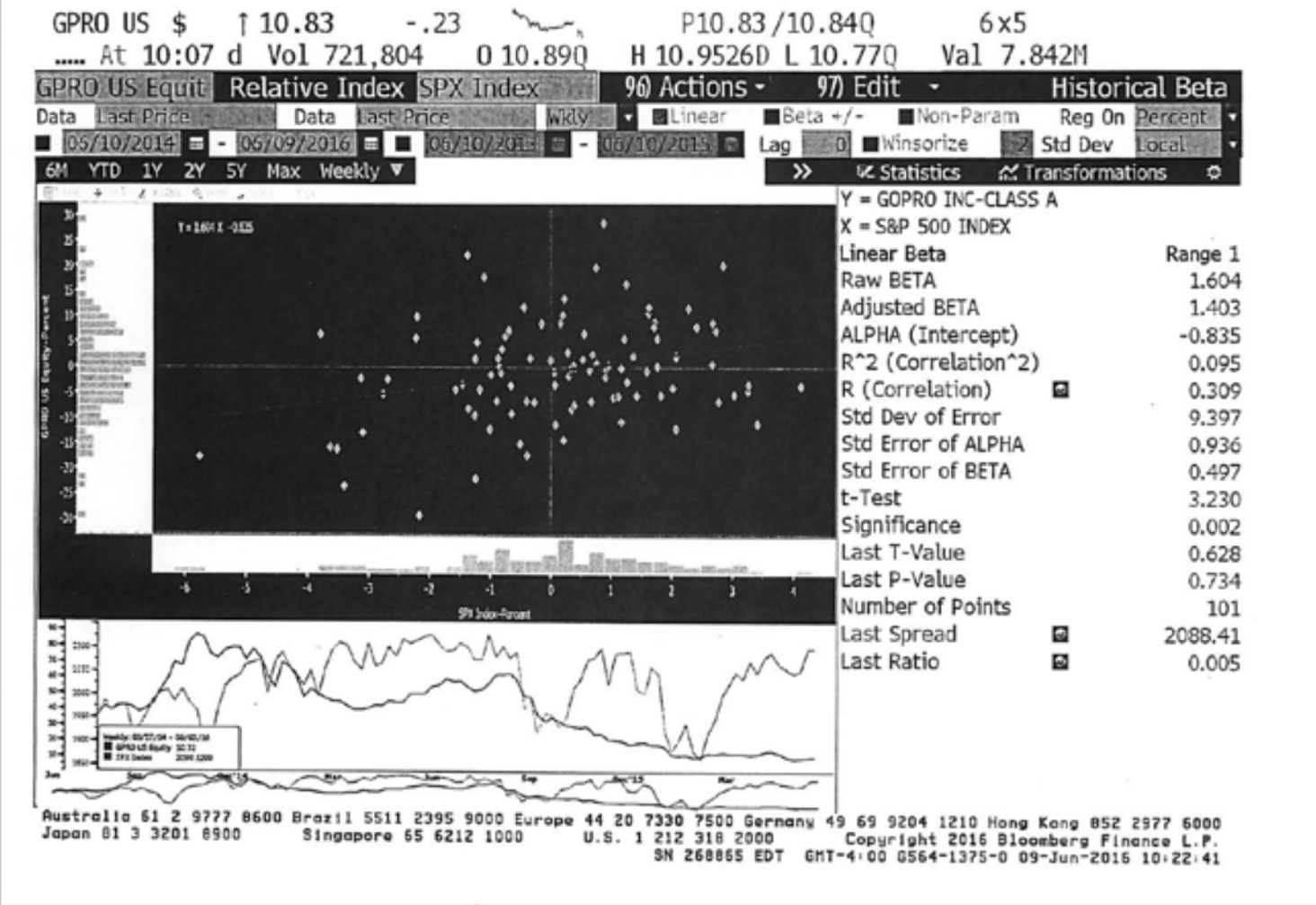




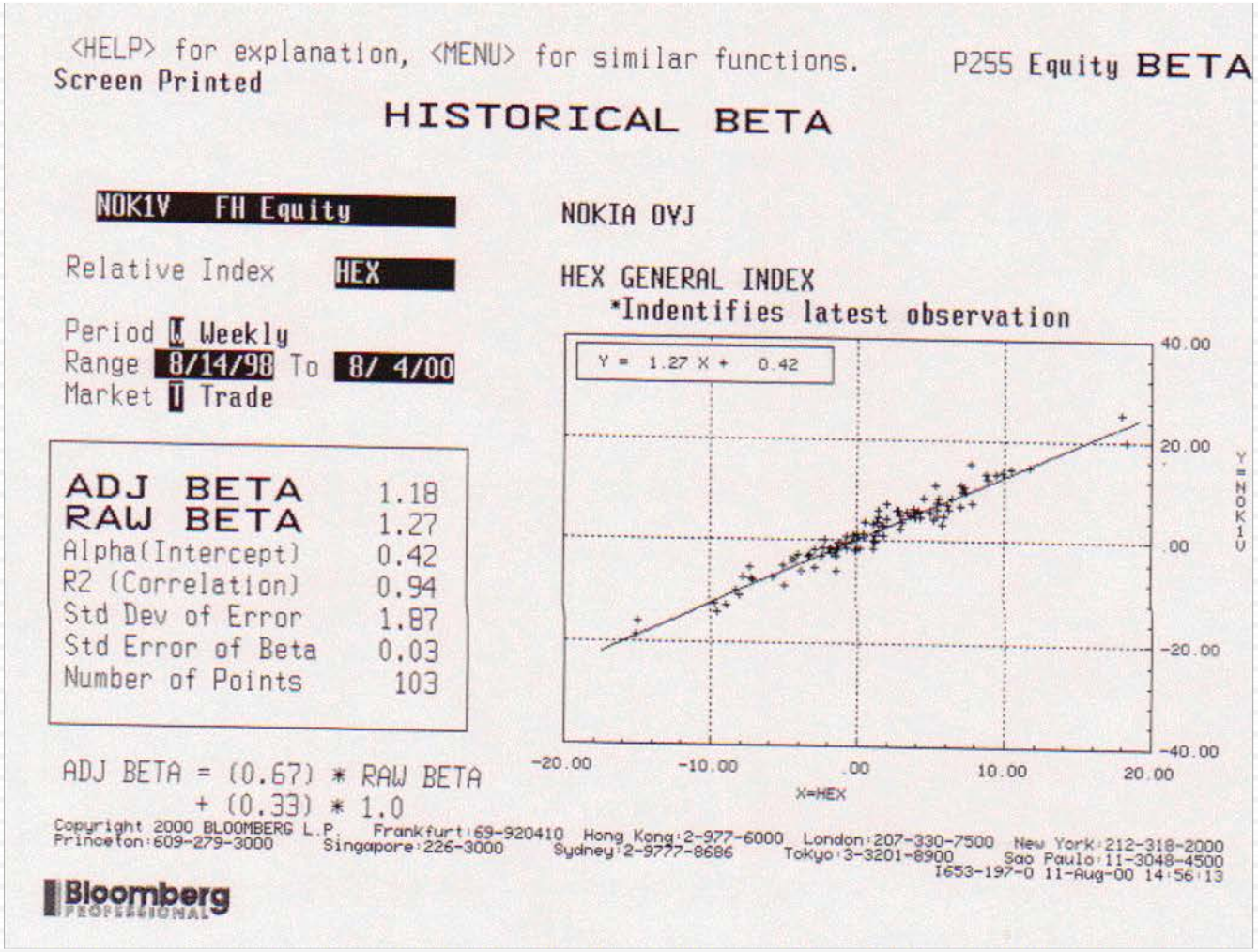
III. MEASURING RELATIVE RISK

It should not be Greek to you!

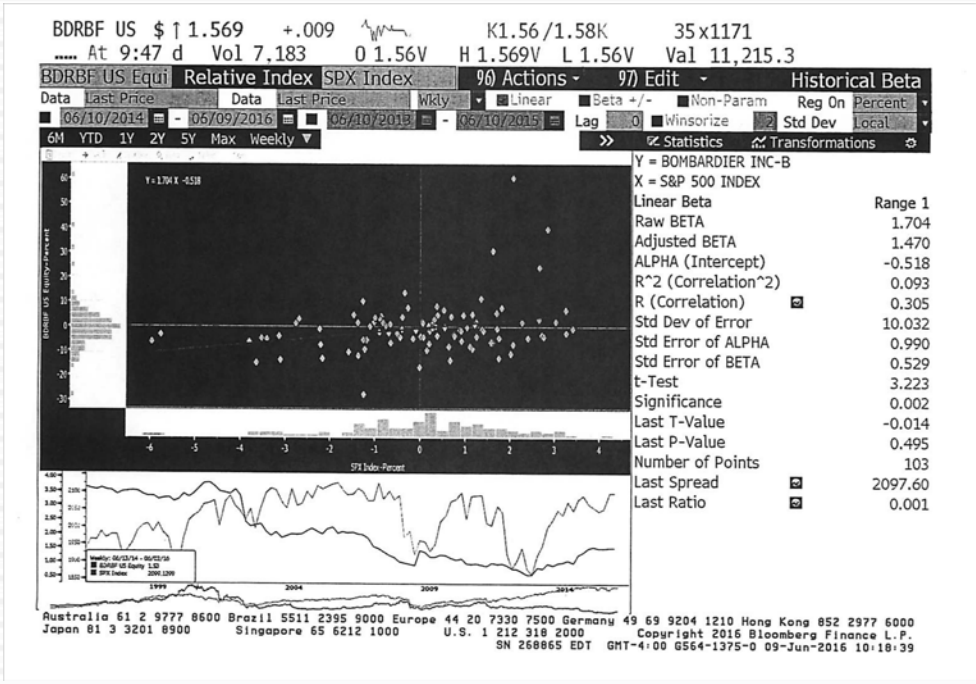
Unreliable, when it looks bad..

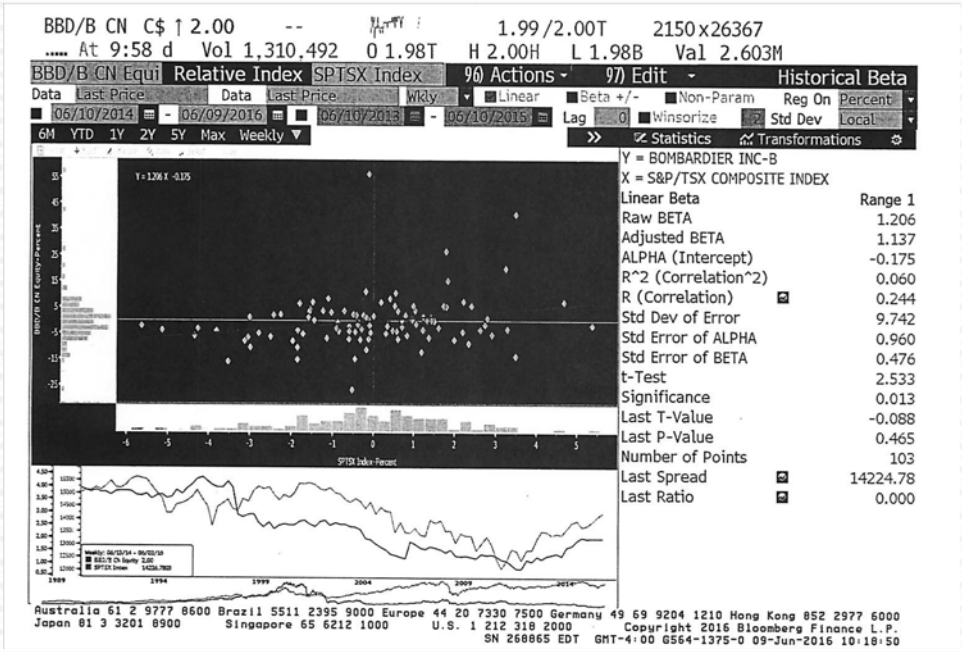


Or when it looks good..

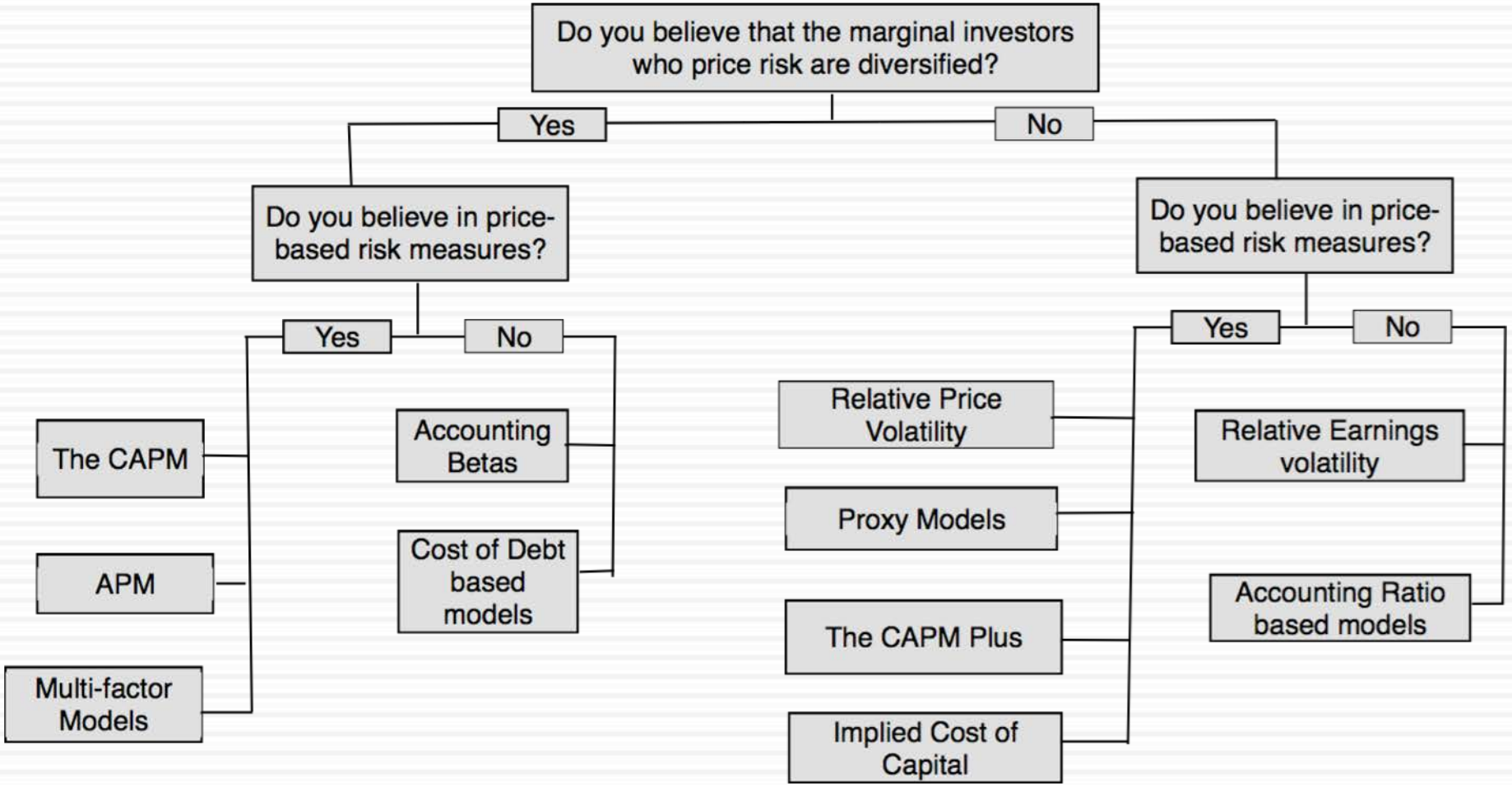


And subject to game playing





Measuring Relative Risk: You don't like betas or modern portfolio theory? No problem.



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.

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%

Bottom up Betas: Sampling Issues

- What are comparable firms, if you just want to extract betas?
  - A comparable firm, at least for measuring betas (exposure to macro risk), is one that does well when your company does well and badly when it does badly.
  - It follows then that a comparable firm does not have to be in the same sector as you do.
  - If you decide to add other criteria to get to comparable firms, you must have an a priori reason that you are willing to state (and defend) that those criteria are related to what you are trying to measure (exposure to macro risk)
- How big a sample?
  - The big advantage of "bottom up" betas is that you are averaging across many betas. It is thus the law of large numbers that you are benefiting from, not theory.
  - As long as your betas are not systematically biased up or down, the standard error of the average beta across a sample can be written as follows:

$$\text{Standard Error of Beta} = \frac{\text{Average Standard Error of Beta}}{\sqrt{\text{Number of firms in sample}}}$$

  - With 100 firms in your sample, your beta will ten times more precise than a single regression beta. Even with 10 firms, it will be about three times more precise.

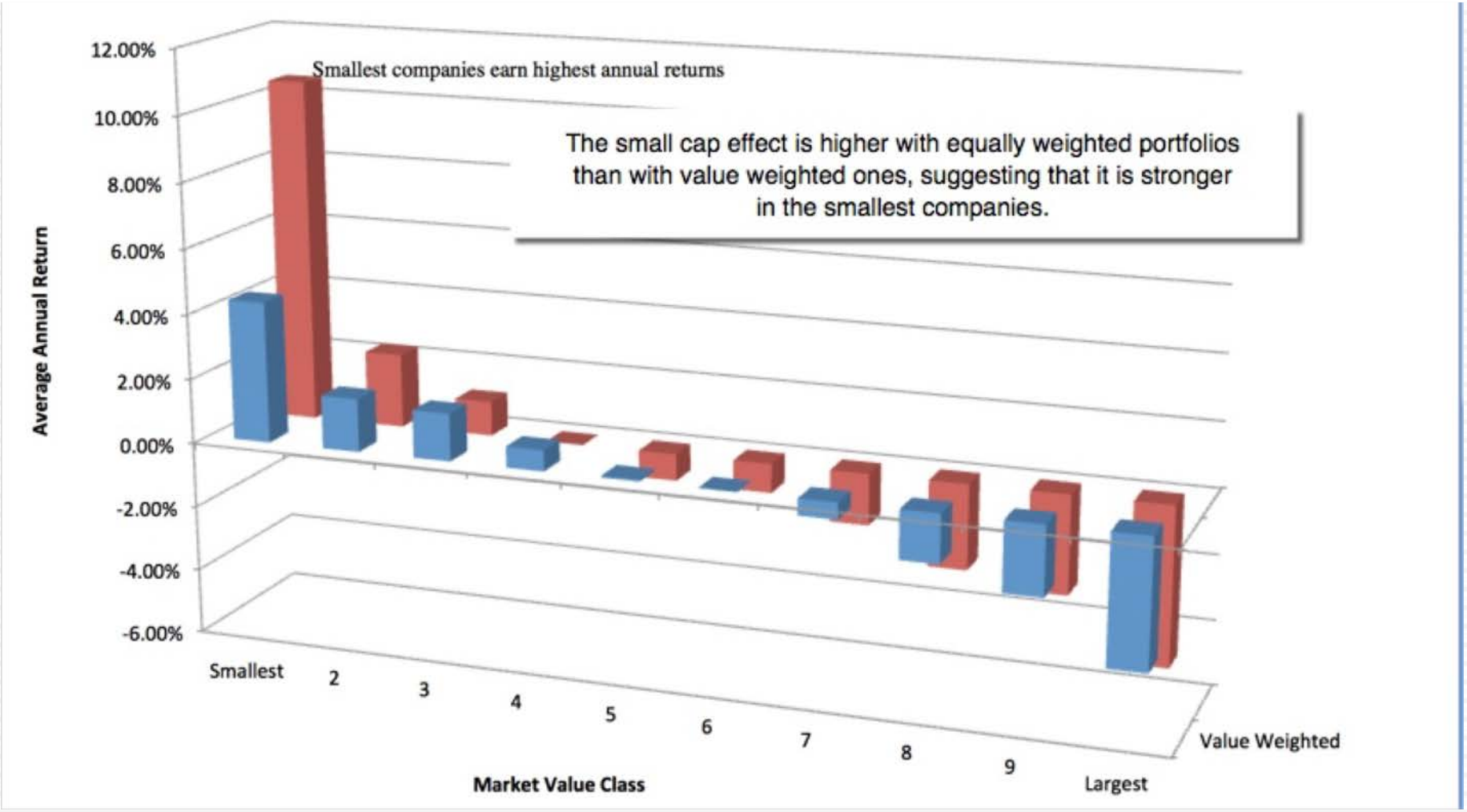
III. THE GARNISHING

Here a premium, there a premium..

The Build up Approach

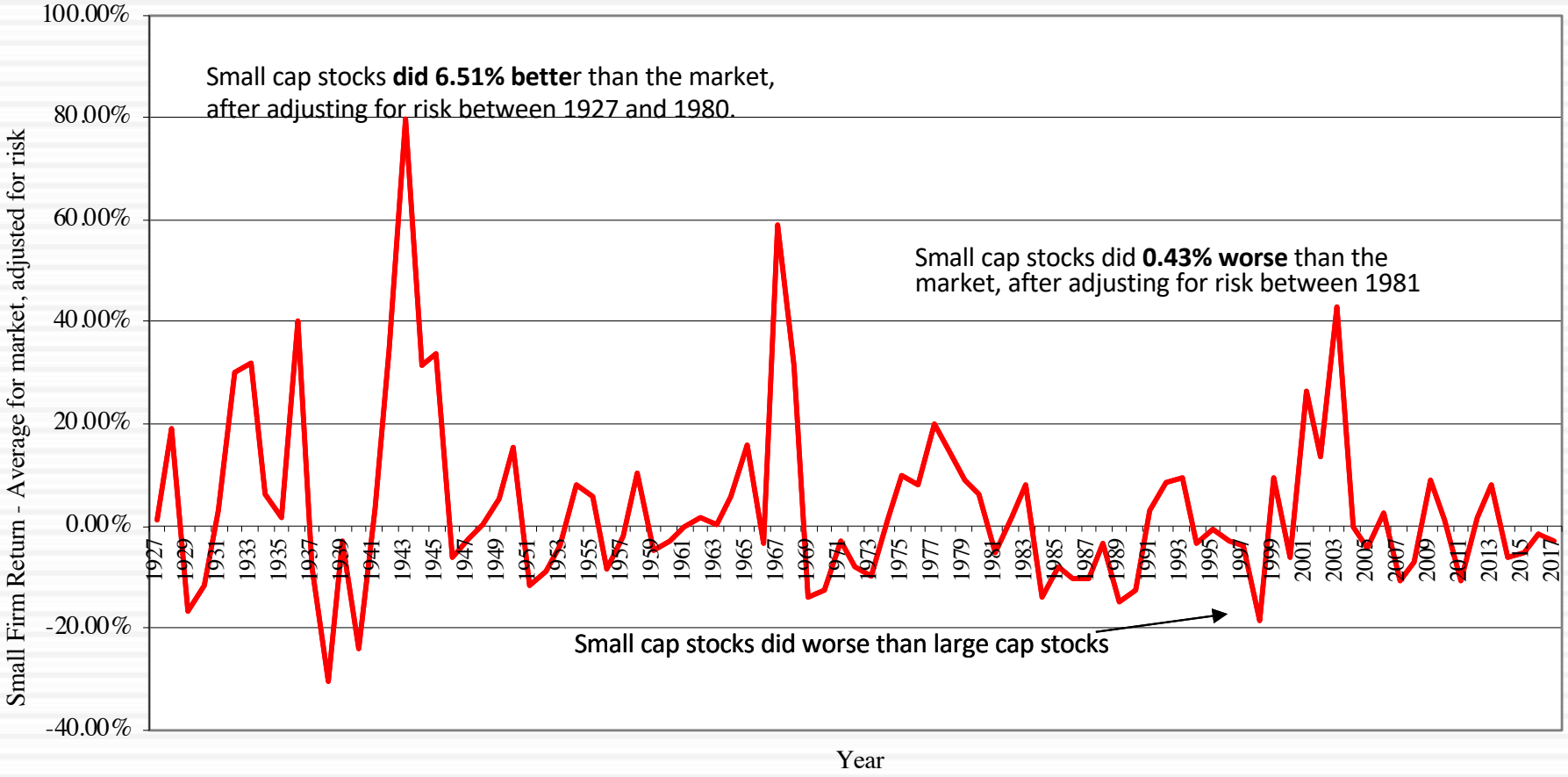
- For many analysts, the risk free rate and equity risk premium are just the starting points to get to a cost of equity. The required return that you obtain is then augmented with premiums for "other" risks to arrive at a built up cost of equity.
- The justifications offered for these premiums are varied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

Small Firm Premium over time- 1927 -2017



But, but.. My company is risky..

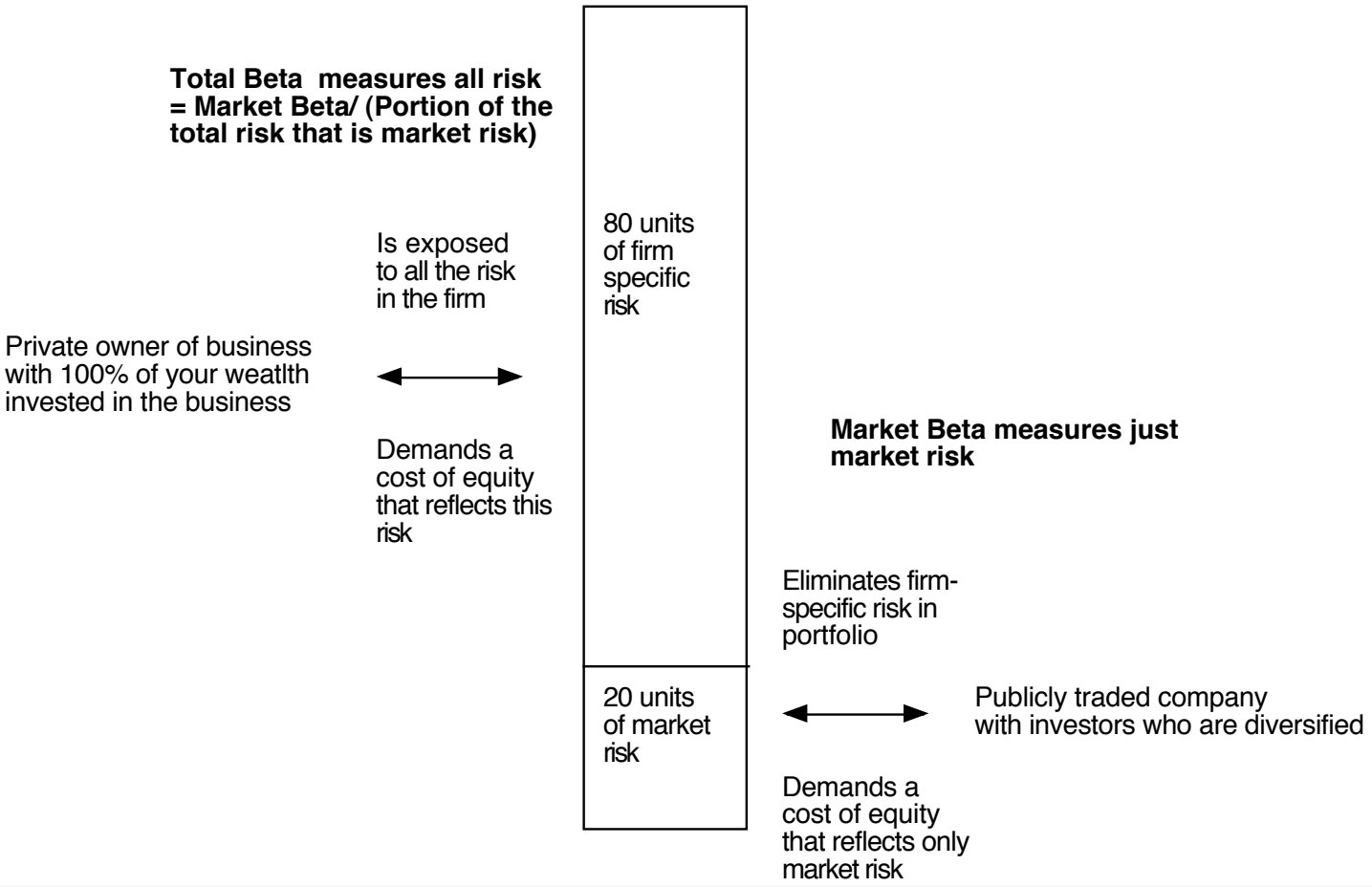
- Estimation versus Economic uncertainty
  - Estimation uncertainty reflects the possibility that you could have the "wrong model" or estimated inputs incorrectly within this model.
  - Economic uncertainty comes the fact that markets and economies can change over time and that even the best models will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

If the "buyer" is not diversified..

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



RISK ADJUSTED CASH FLOW

The two faces of discounted cash flow valuation

- The value of a risky asset can be estimated by discounting the expected cash flows on the asset over its life at a risk-adjusted discount rate:

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

where the asset has an n-year life, $E(CF_t)$ is the expected cash flow in period t and r is a discount rate that reflects the risk of the cash flows.

- Alternatively, we can replace the expected cash flows with the guaranteed cash flows we would have accepted as an alternative (certainty equivalents) and discount these at the riskfree rate:

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

where CE(CFt) is the certainty equivalent of $E(CF_t)$ and r_f is the riskfree rate.

What is a risk adjusted cash flow?

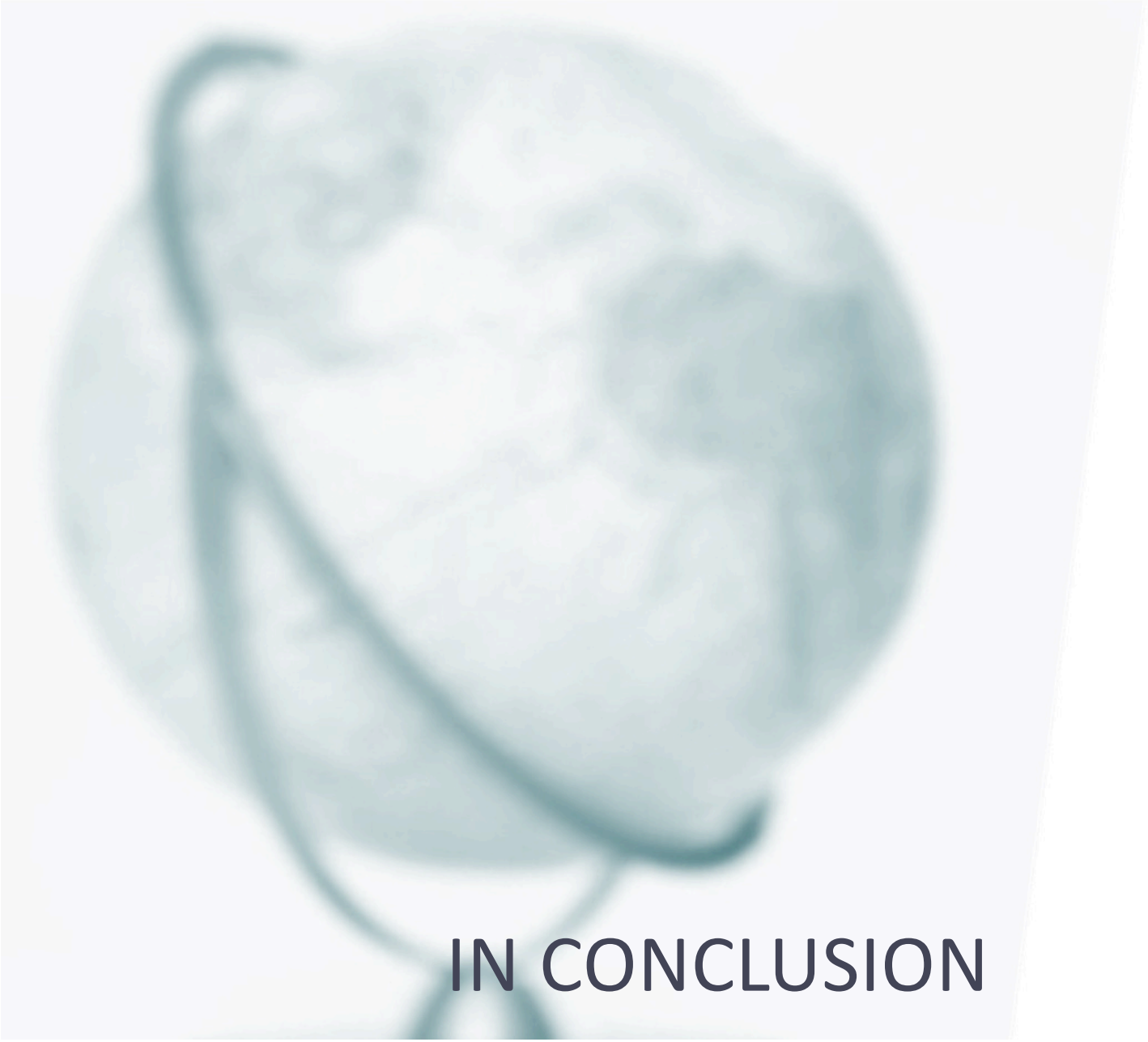
- Taking an expected value of cash flows across all scenarios is not a risk adjusted cash flow.
- As an illustration, think of being offered two choices:
  - An investment that will make $100 million, with 90% probability, and $10 million with 10% probability
  - A guaranteed cash flow of $90 million
  - Which one would you take?
- What guaranteed cashflow would you be willing to accept as an alternative to the risky investment?

Why risk adjusting cash flows in business valuation is so difficult

- For a finite life investment with a short life, you may be able to estimate certainty equivalents for the two or three years that you have cash flows for.
- With publicly traded companies, where the cash flows can last forever, you have to estimate certainly equivalent cashflows forever.
- Not only is that tedious, but to the extent that each year's expected cash flow is not independent of the prior one, you could very quickly be drawn into a hall of mirrors.

Two short cuts

1. Use intuitive short cuts: Warren Buffett has famously been quoted as saying that he uses the riskfree rate as the discount rate, but he did say that he discounts only the portion of earnings that he feels that he can count on.
2. Model certainty equivalents: If you want to create a model to estimate certainty equivalents over time, you have collect much of the same information and deal with the same questions you deal with in traditional risk and return models. In fact, with the same assumptions as the CAPM, you certainty equivalent adjustments will yield the following:
   - CE Factor for year n = $1/ \left(\frac{(1+E(R))}{(1+Rf)}\right)^n$
   - Thus, if you have an expected cash flow of $100 million in year 2, your cost of equity is 9% and the riskfree rate of 3%, the certainty equivalent would be = $1/ \left[\frac{(1.09)}{(1.03)}\right]^2 = 0.8929$.



IN CONCLUSION

Less rules, more first principles

Proposition 1: A hurdle rate is an opportunity cost, not a funding cost

- Most people, when asked what a cost of capital is, will respond with the answer that it is the cost of raising capital. In the context of its usage as a hurdle rate, that is not true.
- It is an opportunity cost, a rate of return that you (as a company or investor) can earn on other investments in the market of equivalent risk.

Application 1: The Beta for a Target Firm!

- When valuing a target firm in an acquisition, which of the following unlevered betas should you use to come up with your cost of equity?
  1. Beta of the acquiring firm
  2. Beta of the target firm
  3. Weighted average (by market value) of the betas of the two firms
  4. Simple average of the betas of the two firms

Application 2: The Debt Ratio to use

- In computing the cost of capital to use in valuing the target firm, which of the following debt choices should you make in your computation:
  1. The debt ratio and the cost of debt of acquiring firm
  2. The debt ratio and the cost of debt of the target firm
  3. The debt ratio used in the acquisition, with the cost of debt used for the acquisition
  4. The optimal debt ratio and cost of debt of the target firm
  5. The debt ratio for the combined firm after the acquisition, and the cost of debt after

Proposition 2: A company-wide hurdle rate can be misleading and dangerous

- In corporate finance, the hurdle rate becomes the number to beat, when you do investment analysis. Most companies claim to have a corporate hurdle rate, a number that all projects that are assessed within the company get measured against.
- If your company operates in only one business and one country, this may work, but to the extent that companies operate in many businesses across multiple countries, there can be no one hurdle rate. Even if you use only one currency in analysis, your cost of capital will be a function of which business a project is in, and what country it is aimed at.
- The consequences of not making these differential adjustments will be that your safe businesses will end up subsidizing your risky businesses, and over time, both will be hurt, in what I term the "curse of the lazy conglomerate".

Test: A Multi Business Company!

	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%

Disney has some major investments coming up in setting up a streaming competitor to Netflix. What cost of capital would you use in your assessment?

a. *Disney's cost of capital as a company*
b. *Disney's media networks cost of capital*
c. *Other*

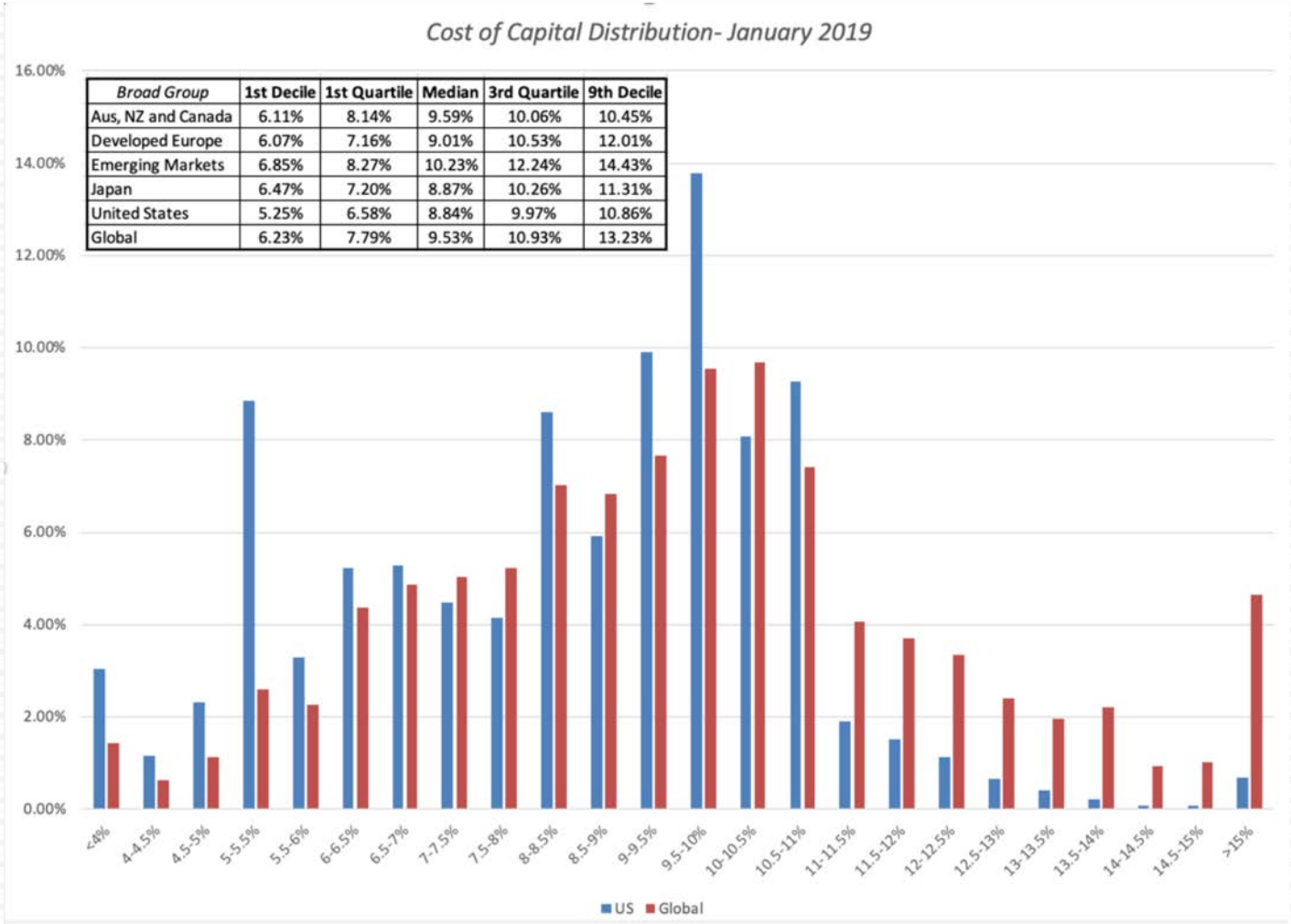
Proposition 3: Currency is a choice, but one that should not change outcomes

- If you follow the consistency rule on currency, incorporating inflation into both cash flows and discount rates, your analyses should be currency neutral.
- In other words, a project that looks like it is a bad project, when the analysis is done in US dollar terms, cannot become a good project, just because you decide to do the analysis in Indian rupees.
- If you do get divergent answers with different currencies, it is because there are inflation inconsistencies in your assessments of discount rates and cash flows.

Proposition 4: Your cost of capital cannot be insulated from the market

- There are many who remain wary of financial markets and their capacity to be irrational and volatile.
- Consequently, they try to generate hurdle rates that are unaffected by market movements, a futile and dangerous exercise, because we have to be price takers on at least some of the inputs into hurdle rates.
- Your cost of capital will change, and should change, as risk free rates and the prices of risk (equity risk premiums and default spreads) change.

Proposition 5: Gain perspective on cost of capital



Broad Group	1st Decile	1st Quartile	Median	3rd Quartile	9th Decile
Aus, NZ and Canada	6.11%	8.14%	9.59%	10.06%	10.45%
Developed Europe	6.07%	7.16%	9.01%	10.53%	12.01%
Emerging Markets	6.85%	8.27%	10.23%	12.24%	14.43%
Japan	6.47%	7.20%	8.87%	10.26%	11.31%
United States	5.25%	6.58%	8.84%	9.97%	10.86%
Global	6.23%	7.79%	9.53%	10.93%	13.23%