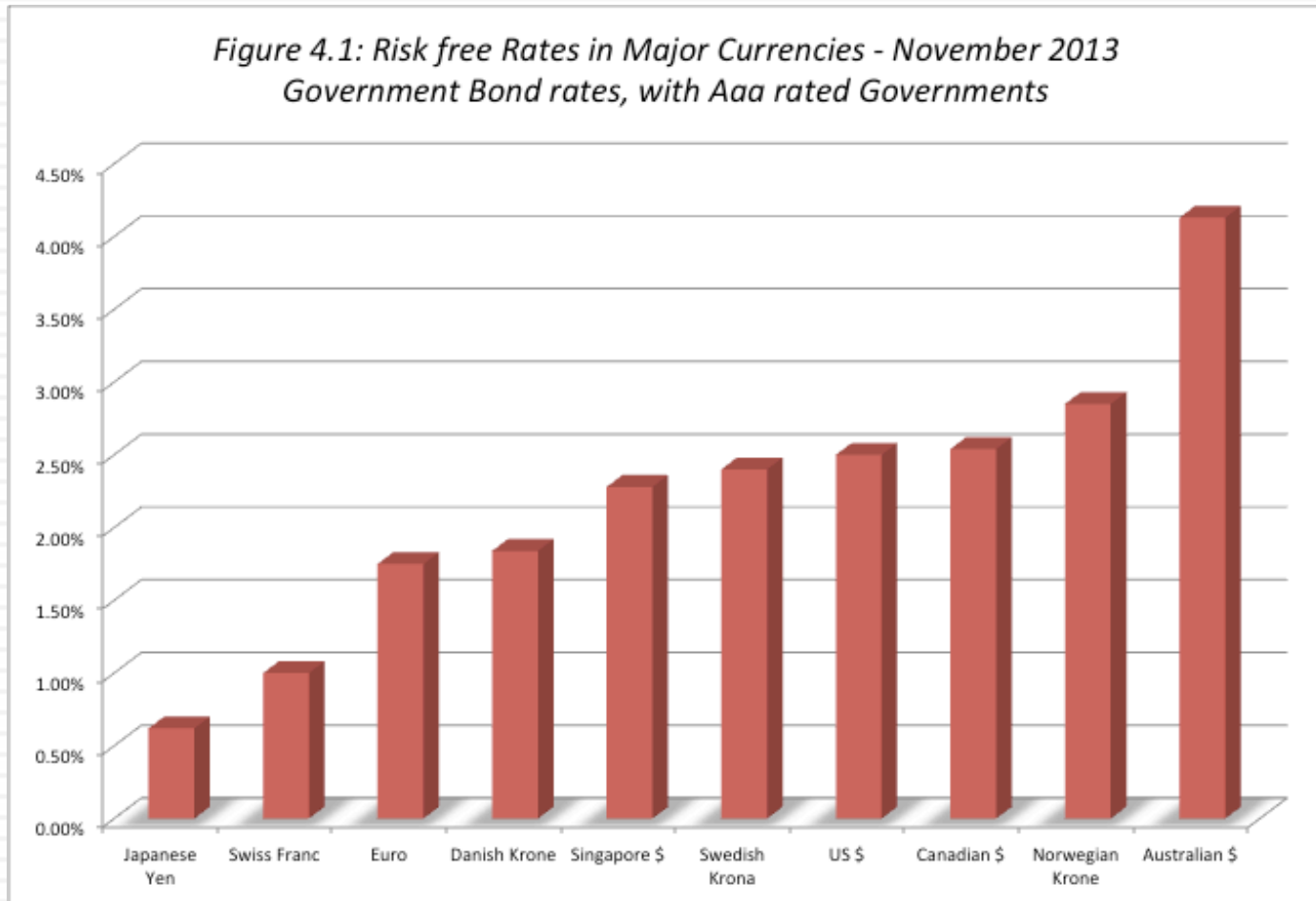


# When the government is default free: Risk free rates – in November 2013



# What if there is no default-free entity?

## Risk free rates in November 2013

- Adjust the local currency government borrowing rate for default risk to get a riskless local currency rate.
  - In November 2013, the Indian government rupee bond rate was 8.82%. the local currency rating from Moody's was Baa3 and the default spread for a Baa3 rated country bond was 2.25%.  
Riskfree rate in Rupees =  $8.82\% - 2.25\% = 6.57\%$
  - In November 2013, the Chinese Renmimbi government bond rate was 4.30% and the local currency rating was Aa3, with a default spread of 0.8%.  
Riskfree rate in Chinese Renmimbi =  $4.30\% - 0.8\% = 3.5\%$
- Do the analysis in an alternate currency, where getting the riskfree rate is easier. With Vale in 2013, we could chose to do the analysis in US dollars (rather than estimate a riskfree rate in R\$). The riskfree rate is then the US treasury bond rate.
- Do your analysis in real terms, in which case the riskfree rate has to be a real riskfree rate. The inflation-indexed treasury rate is a measure of a real riskfree rate.

# Three paths to estimating sovereign default spreads

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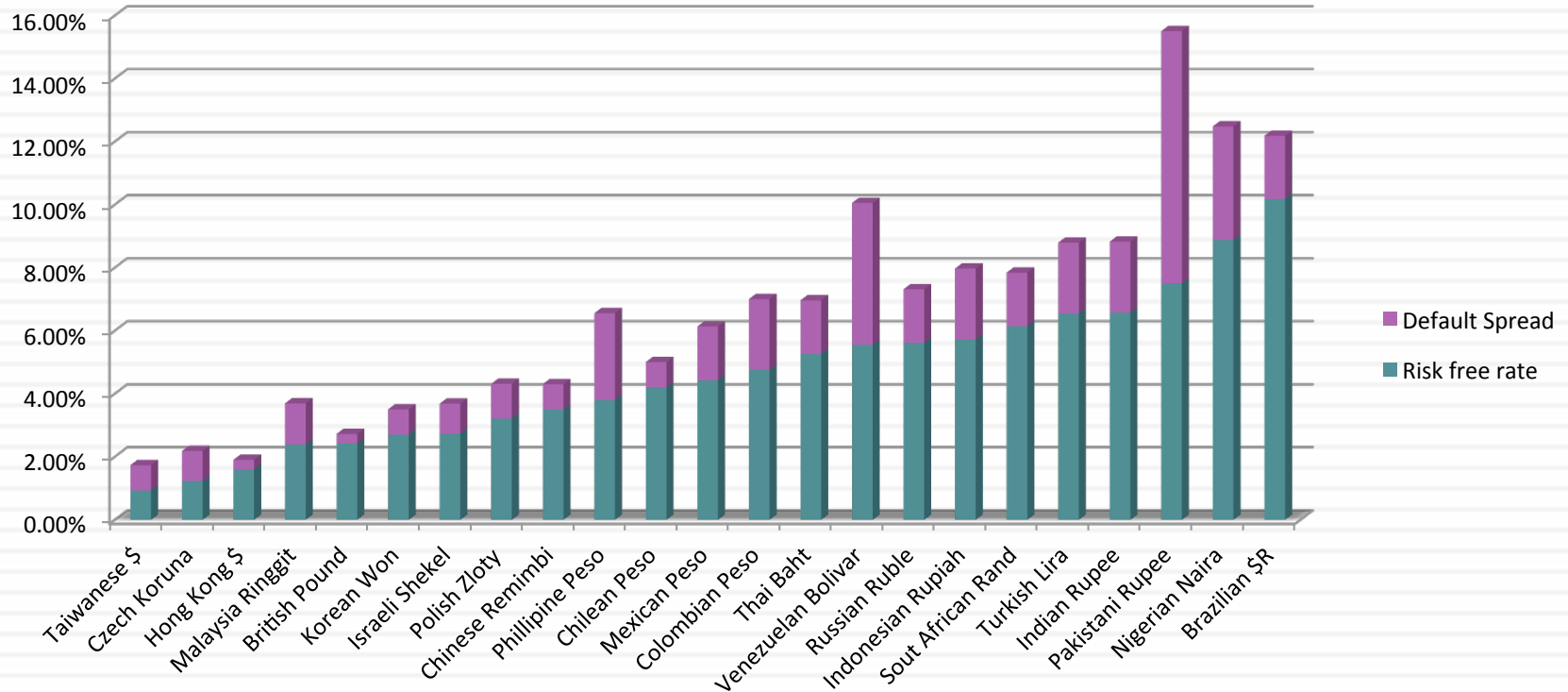
- Sovereign dollar or euro denominated bonds: The difference between the interest rate on a sovereign US \$ bond, issued by the country, and the US treasury bond rate can be used as the default spread. For example, in November 2013, the 10-year Brazil US \$ bond, denominated in US dollars had a yield of 4.25% and the US 10-year T.Bond rate traded at 2.75%.

$$\text{Default spread} = 4.25\% - 2.75\% = 1.50\%$$

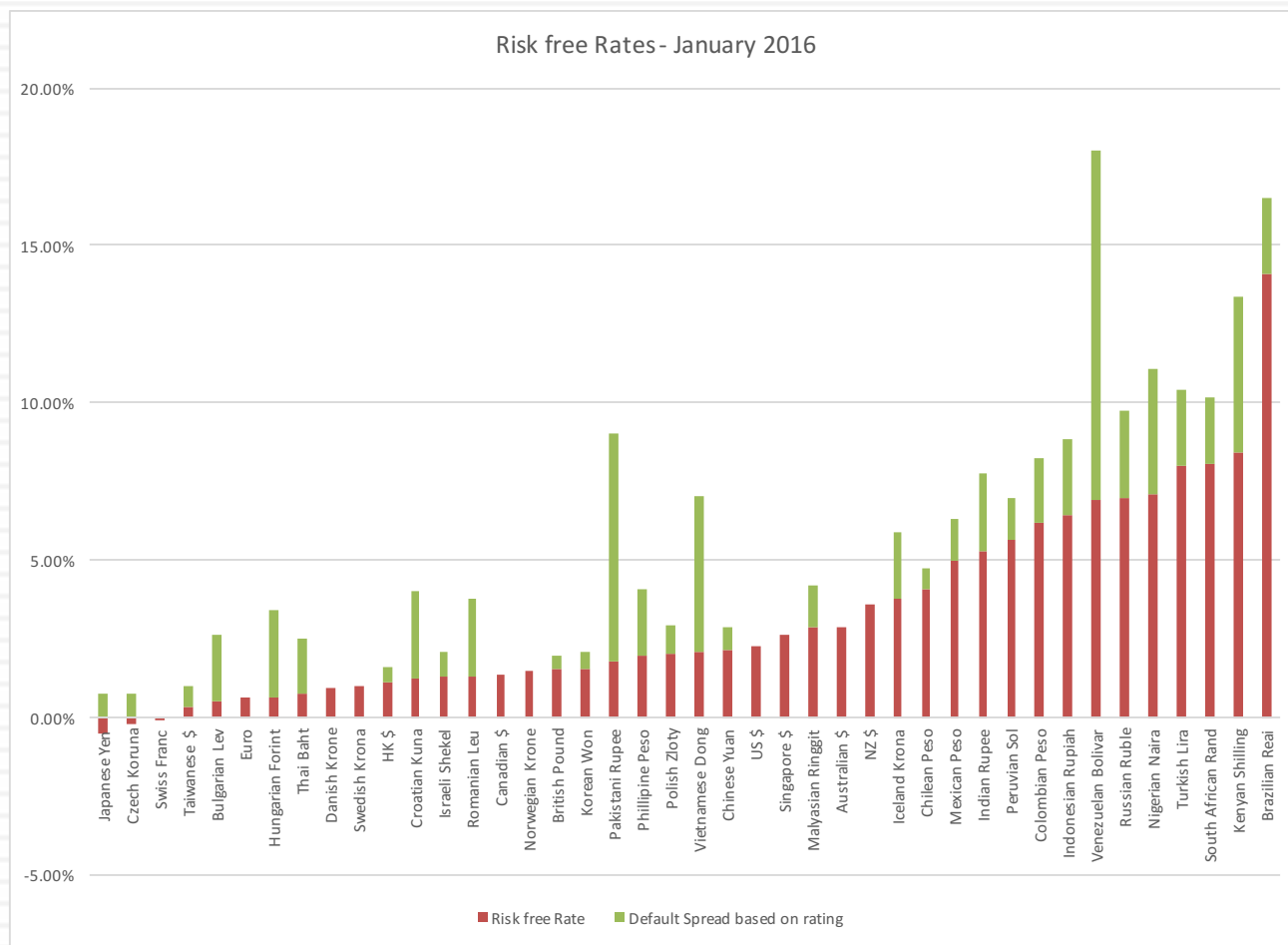
- CDS spreads: Obtain the default spreads for sovereigns in the CDS market. The CDS spread for Brazil in November 2013 was 2.50%.
- Average spread: If you know the sovereign rating for a country, you can estimate the default spread based on the rating. In November 2013, Brazil's rating was Baa2, yielding a default spread of 2%.

# Risk free rates in currencies: Sovereigns with default risk in November 2013

Figure 4.2: Risk free rates in Currencies where Governments not Aaa rated



# Risk free Rates in January 2016



# Measurement of the risk premium

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- The risk premium is the premium that investors demand for investing in an average risk investment, relative to the riskfree rate.
- As a general proposition, this premium should be
  - ▣ greater than zero
  - ▣ increase with the risk aversion of the investors in that market
  - ▣ increase with the riskiness of the “average” risk investment

# What is your risk premium?

- Assume that stocks are the only risky assets and that you are offered two investment options:
  - a riskless investment (say a Government Security), on which you can make 3%
  - a mutual fund of all stocks, on which the returns are uncertain
- How much of an expected return would you demand to shift your money from the riskless asset to the mutual fund?
  - a. Less than 3%
  - b. Between 3% - 5%
  - c. Between 5% - 7%
  - d. Between 7% -9%
  - e. Between 9%- 11%
  - f. More than 11%

# Risk Aversion and Risk Premiums

101

- If this were the entire market, the risk premium would be a weighted average of the risk premiums demanded by each and every investor.
- The weights will be determined by the wealth that each investor brings to the market. Thus, Warren Buffett's risk aversion counts more towards determining the "equilibrium" premium than yours' and mine.
- As investors become more risk averse, you would expect the "equilibrium" premium to increase.



# Risk Premiums do change..

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- Go back to the previous example. Assume now that you are making the same choice but that you are making it in the aftermath of a stock market crash (it has dropped 25% in the last month). Would you change your answer?
  - a. I would demand a larger premium
  - b. I would demand a smaller premium
  - c. I would demand the same premium

# Estimating Risk Premiums in Practice

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- Survey investors on their desired risk premiums and use the average premium from these surveys.
- Assume that the actual premium delivered over long time periods is equal to the expected premium - i.e., use historical data
- Estimate the implied premium in today's asset prices.

# The Survey Approach

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- Surveying all investors in a market place is impractical.
- However, you can survey a few individuals and use these results. In practice, this translates into surveys of the following:

<i>Group Surveyed</i>	<i>Survey done by</i>	<i>Estimated ERP</i>	<i>Notes</i>
Individual Investors	Securities Industries Association	8.3% (2004)	One year premium
Institutional Investors	Merrill Lynch	4.8% (2013)	Monrthly updates
CFOs	Campbell Harvey & Graham	4.48% (2012)	5-8% response rate
Analysts	Pablo Fernandez	5.0% (2011)	Lowest standard deviation
Academics	Pablo Fernandez	5.7% (2011)	Higher for emerging markets

- The limitations of this approach are:
  - There are no constraints on reasonability (the survey could produce negative risk premiums or risk premiums of 50%)
  - The survey results are more reflective of the past than the future.
  - They tend to be short term; even the longest surveys do not go beyond one year.

# The Historical Premium Approach

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- This is the default approach used by most to arrive at the premium to use in the model
- In most cases, this approach does the following
  - Defines a time period for the estimation (1928-Present, last 50 years...)
  - Calculates average returns on a stock index during the period
  - Calculates average returns on a riskless security over the period
  - Calculates the difference between the two averages and uses it as a premium looking forward.
- The limitations of this approach are:
  - it assumes that the risk aversion of investors has not changed in a systematic way across time. (The risk aversion may change from year to year, but it reverts back to historical averages)
  - it assumes that the riskiness of the “risky” portfolio (stock index) has not changed in a systematic way across time.

# ERP: A Historical Snapshot

	<i>Arithmetic Average</i>		<i>Geometric Average</i>	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2015	7.92%	6.18%	6.05%	4.54%
Std Error	<b>2.15%</b>	<b>2.29%</b>		
1966-2015	6.05%	3.89%	4.69%	2.90%
Std Error	<b>2.42%</b>	<b>2.74%</b>		
2006-2015	7.87%	3.88%	6.11%	2.53%
Std Error	<b>6.06%</b>	<b>8.66%</b>		

Historical  
premium for the  
US

- If you are going to use a historical risk premium, make it
  - ▣ Long term (because of the standard error)
  - ▣ Consistent with your risk free rate
  - ▣ A “compounded” average
- No matter which estimate you use, recognize that it is backward looking, is noisy and may reflect selection bias.

# What about historical premiums for other markets?

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- Historical data for markets outside the United States is available for much shorter time periods. The problem is even greater in emerging markets.
- The historical premiums that emerge from this data reflects this data problem and there is much greater error associated with the estimates of the premiums.

# One solution: Bond default spreads as CRP

## – November 2013

- In November 2013, the historical risk premium for the US was 4.20% (geometric average, stocks over T.Bonds, 1928-2012)

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2012	7.65%	5.88%	5.74%	4.20%
	2.20%	2.33%		

- Using the default spread on the sovereign bond or based upon the sovereign rating and adding that spread to the mature market premium (4.20% for the US) gives you a total ERP for a country.

Country	Rating	Default Spread (Country Risk Premium)	US ERP	Total ERP for country
India	Baa3	2.25%	4.20%	6.45%
China	Aa3	0.80%	4.20%	5.00%
Brazil	Baa2	2.00%	4.20%	6.20%

- If you prefer CDS spreads:

Country	Sovereign CDS Spread	US ERP	Total ERP for country
India	4.20%	4.20%	8.40%
China	1.20%	4.20%	5.40%
Brazil	2.59%	4.20%	6.79%

# Beyond the default spread? Equities are riskier than bonds

- While default risk spreads and equity risk premiums are highly correlated, one would expect equity spreads to be higher than debt spreads. One approach to scaling up the premium is to look at the relative volatility of equities to bonds and to scale up the default spread to reflect this:

$$\text{Country Risk Premium} = \text{Country Default Spread} * \left( \frac{\sigma_{\text{Equity}}}{\sigma_{\text{Country Bond}}} \right)$$

- Brazil: The annualized standard deviation in the Brazilian equity index over the previous year is 21 percent, whereas the annualized standard deviation in the Brazilian C-bond is 14 percent.

$$\text{Brazil's Total Risk Premium} = 4.20\% + 2.00\% \left( \frac{21\%}{14\%} \right) = 7.20\%$$

- Using the same approach for China and India:

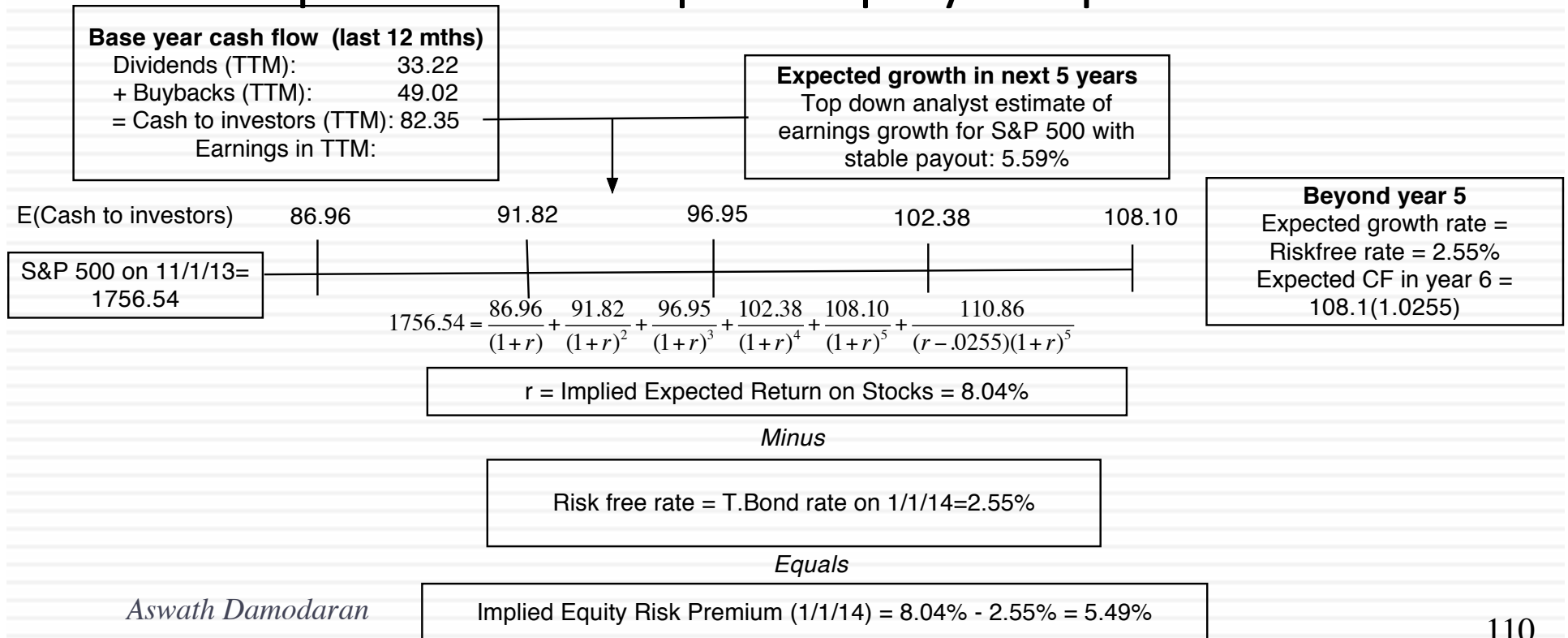
$$\text{Equity Risk Premium}_{\text{India}} = 4.20\% + 2.25\% \left( \frac{24\%}{17\%} \right) = 7.80\%$$

$$\text{Equity Risk Premium}_{\text{China}} = 4.20\% + 0.80\% \left( \frac{18\%}{10\%} \right) = 5.64\%$$



# Implied ERP in November 2013: Watch what I pay, not what I say..

- If you can observe what investors are willing to pay for stocks, you can back out an expected return from that price and an implied equity risk premium.



# The bottom line on Equity Risk Premiums in November 2013

- Mature Markets: In November 2013, the number that we chose to use as the equity risk premium for all mature markets was 5.5%. This was set equal to the implied premium at that point in time and it was much higher than the historical risk premium of 4.20% prevailing then (1928-2012 period).

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2012	7.65%	5.88%	5.74%	4.20%
	2.20%	2.33%		
1962-2012	5.93%	3.91%	4.60%	2.93%
	2.38%	2.66%		
2002-2012	7.06%	3.08%	5.38%	1.71%
	5.82%	8.11%		

- For emerging markets, we will use the melded default spread approach (where default spreads are scaled up to reflect additional equity risk) to come up with the additional risk premium that we will add to the mature market premium. Thus, markets in countries with lower sovereign ratings will have higher risk premiums that 5.5%.

$$\text{Emerging Market ERP} = 5.5\% + \text{Country Default Spread} * \left( \frac{\sigma_{\text{Equity}}}{\sigma_{\text{Country Bond}}} \right)$$

# A Composite way of estimating ERP for countries

Step 1: Estimate an equity risk premium for a mature market. If your preference is for a forward looking, updated number, you can estimate an implied equity risk premium for the US (assuming that you buy into the contention that it is a mature market)

- ▣ My estimate: In November 2013, my estimate for the implied premium in the US was 5.5%. That will also be my estimate for a mature market ERP.

Step 2: Come up with a generic and measurable definition of a mature market.

- ▣ My estimate: Any AAA rated country is mature.

Step 3: Estimate the additional risk premium that you will charge for markets that are not mature. You have two choices:

- ▣ The default spread for the country, estimated based either on sovereign ratings or the CDS market.
- ▣ A scaled up default spread, where you adjust the default spread upwards for the additional risk in equity markets.

ERP : Nov 2013

Andorra	7.45%	1.95%	Liechtenstein	5.50%	0.00%	Albania	12.25%	6.75%
Austria	5.50%	0.00%	Luxembourg	5.50%	0.00%	Armenia	10.23%	4.73%
Belgium	6.70%	1.20%	Malta	7.45%	1.95%	Azerbaijan	8.88%	3.38%
Cyprus	22.00%	16.50%	Netherlands	5.50%	0.00%	Belarus	15.63%	10.13%
Denmark	5.50%	0.00%	Norway	5.50%	0.00%	Bosnia	15.63%	10.13%
Finland	5.50%	0.00%	Portugal	10.90%	5.40%	Bulgaria	8.50%	3.00%
France	5.95%	0.45%	Spain	8.88%	3.38%	Croatia	9.63%	4.13%
Germany	5.50%	0.00%	Sweden	5.50%	0.00%	Czech Republic	6.93%	1.43%
Greece	15.63%	10.13%	Switzerland	5.50%	0.00%	Estonia	6.93%	1.43%
Iceland	8.88%	3.38%	Turkey	8.88%	3.38%	Georgia	10.90%	5.40%
Ireland	9.63%	4.13%	United Kingdom	5.95%	0.45%	Hungary	9.63%	4.13%
Italy	8.50%	3.00%	<b>Western Europe</b>	<b>6.72%</b>	<b>1.22%</b>	Kazakhstan	8.50%	3.00%
						Latvia	8.50%	3.00%

Canada	5.50%	0.00%
United States of America	5.50%	0.00%
<b>North America</b>	<b>5.50%</b>	<b>0.00%</b>

Argentina	15.63%	10.13%
Belize	19.75%	14.25%
Bolivia	10.90%	5.40%
Brazil	8.50%	3.00%
Chile	6.70%	1.20%
Colombia	8.88%	3.38%
Costa Rica	8.88%	3.38%
Ecuador	17.50%	12.00%
El Salvador	10.90%	5.40%
Guatemala	9.63%	4.13%
Honduras	13.75%	8.25%
Mexico	8.05%	2.55%
Nicaragua	15.63%	10.13%
Panama	8.50%	3.00%
Paraguay	10.90%	5.40%
Peru	8.50%	3.00%
Suriname	10.90%	5.40%
Uruguay	8.88%	3.38%
Venezuela	12.25%	6.75%
<b>Latin America</b>	<b>9.44%</b>	<b>3.94%</b>

Country	TRP	CRP
Angola	10.90%	5.40%
Benin	13.75%	8.25%
Botswana	7.15%	1.65%
Burkina Faso	13.75%	8.25%
Cameroon	13.75%	8.25%
Cape Verde	12.25%	6.75%
Egypt	17.50%	12.00%
Gabon	10.90%	5.40%
Ghana	12.25%	6.75%
Kenya	12.25%	6.75%
Morocco	9.63%	4.13%
Mozambique	12.25%	6.75%
Namibia	8.88%	3.38%
Nigeria	10.90%	5.40%
Rwanda	13.75%	8.25%
Senegal	12.25%	6.75%
South Africa	8.05%	2.55%
Tunisia	10.23%	4.73%
Uganda	12.25%	6.75%
Zambia	12.25%	6.75%
<b>Africa</b>	<b>11.22%</b>	<b>5.82%</b>

Lithuania	8.05%	2.55%
Macedonia	10.90%	5.40%
Moldova	15.63%	10.13%
Montenegro	10.90%	5.40%
Poland	7.15%	1.65%
Romania	8.88%	3.38%
Russia	8.05%	2.55%
Serbia	10.90%	5.40%
Slovakia	7.15%	1.65%
Slovenia	9.63%	4.13%
Ukraine	15.63%	10.13%
<b>E. Europe &amp; Russia</b>	<b>8.60%</b>	<b>3.10%</b>

Bahrain	8.05%	2.55%
Israel	6.93%	1.43%
Jordan	12.25%	6.75%
Kuwait	6.40%	0.90%
Lebanon	12.25%	6.75%
Oman	6.93%	1.43%
Qatar	6.40%	0.90%
Saudi Arabia	6.70%	1.20%
United Arab Emirates	6.40%	0.90%
<b>Middle East</b>	<b>6.88%</b>	<b>1.38%</b>

Bangladesh	10.90%	5.40%
Cambodia	13.75%	8.25%
China	6.94%	1.44%
Fiji	12.25%	6.75%
Hong Kong	5.95%	0.45%
India	9.10%	3.60%
Indonesia	8.88%	3.38%
Japan	6.70%	1.20%
Korea	6.70%	1.20%
Macao	6.70%	1.20%
Malaysia	7.45%	1.95%
Mauritius	8.05%	2.55%
Mongolia	12.25%	6.75%
Pakistan	17.50%	12.00%
Papua NG	12.25%	6.75%
Philippines	9.63%	4.13%
Singapore	5.50%	0.00%
Sri Lanka	12.25%	6.75%
Taiwan	6.70%	1.20%
Thailand	8.05%	2.55%
Vietnam	13.75%	8.25%
<b>Asia</b>	<b>7.27%</b>	<b>1.77%</b>

Australia	5.50%	0.00%
Cook Islands	12.25%	6.75%
New Zealand	5.50%	0.00%
<b>Australia &amp; NZ</b>	<b>5.50%</b>	<b>0.00%</b>

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

# Estimating ERP for Disney: November 2013

- Incorporation: The conventional practice on equity risk premiums is to estimate an ERP based upon where a company is incorporated. Thus, the cost of equity for Disney would be computed based on the US equity risk premium, because it is a US company, and the Brazilian ERP would be used for Vale, because it is a Brazilian company.
- Operations: The more sensible practice on equity risk premium is to estimate an ERP based upon where a company operates. For Disney in 2013:

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

# ERP for Companies: November 2013

In November 2013,  
the mature market  
premium used was  
5.5%

<i>Company</i>	<i>Region/ Country</i>	<i>Weight</i>	<i>ERP</i>	
Bookscape	United States	100%	5.50%	
	US & Canada	4.90%	5.50%	
	Brazil	16.90%	8.50%	
	Rest of Latin America	1.70%	10.09%	
Vale	China	37.00%	6.94%	
	Japan	10.30%	6.70%	
	Rest of Asia	8.50%	8.61%	
	Europe	17.20%	6.72%	
	Rest of World	3.50%	10.06%	
	Company	100.00%	7.38%	
	Tata Motors	India	23.90%	9.10%
		China	23.60%	6.94%
		UK	11.90%	5.95%
United States		10.00%	5.50%	
Mainland Europe		11.70%	6.85%	
Rest of World		18.90%	6.98%	
Company		100.00%	7.19%	
Baidu	China	100%	6.94%	
Deutsche Bank	Germany	35.93%	5.50%	
	North America	24.72%	5.50%	
	Rest of Europe	28.67%	7.02%	
	Asia-Pacific	10.68%	7.27%	
	South America	0.00%	9.44%	
	Company	100.00%	6.12%	

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

