

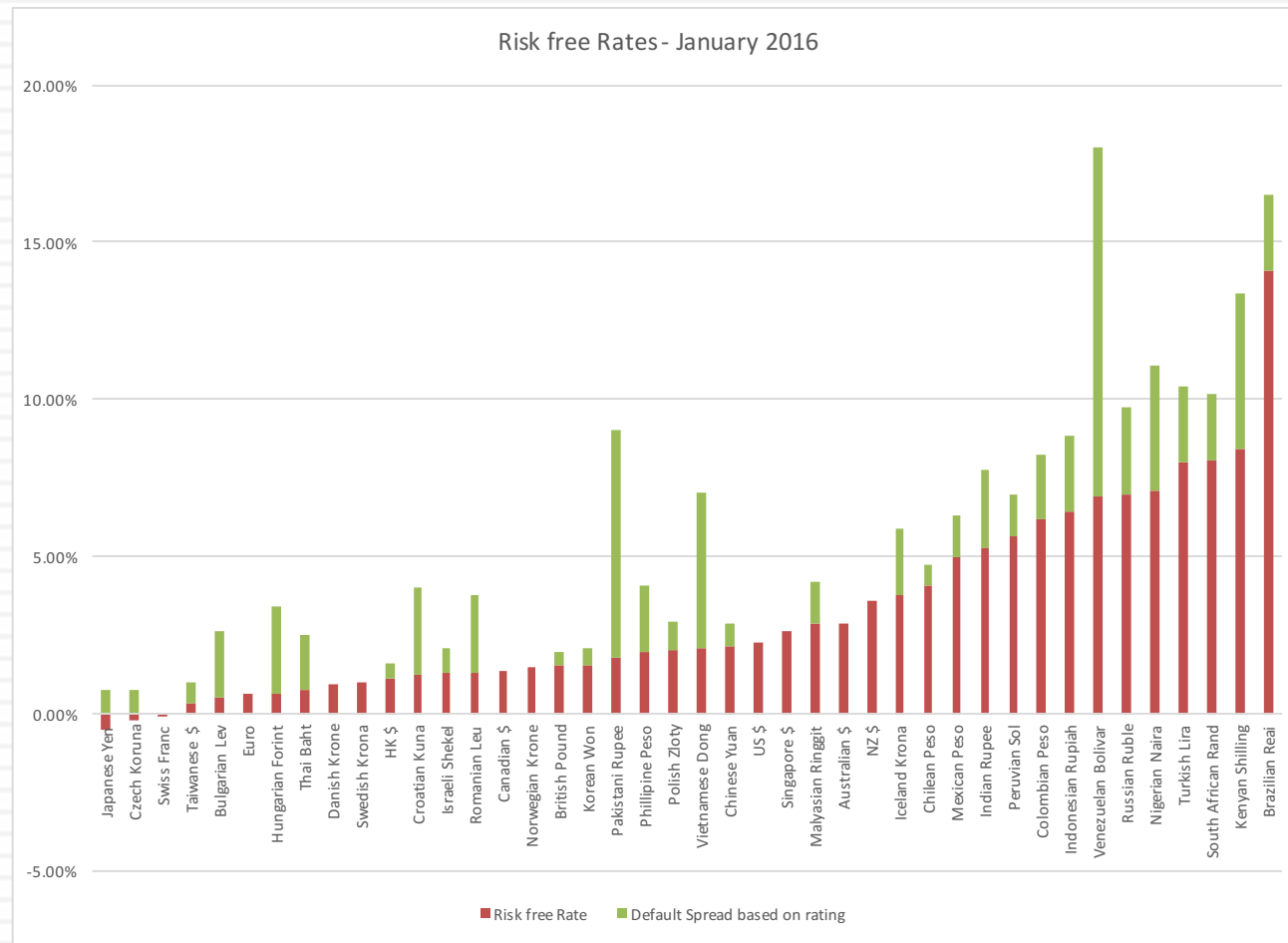
What if there is no default-free entity?

Risk free rates in November 2013

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- If the government is perceived to have default risk, the government bond rate will have a default spread component in it and not be riskfree. There are three choices we have, when this is the case.
 - 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 = $8.82\% - 2.25\% = 6.57\%$
 - 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.

Risk free rates by currency: January 2016



II. Equity Risk Premium

- 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%

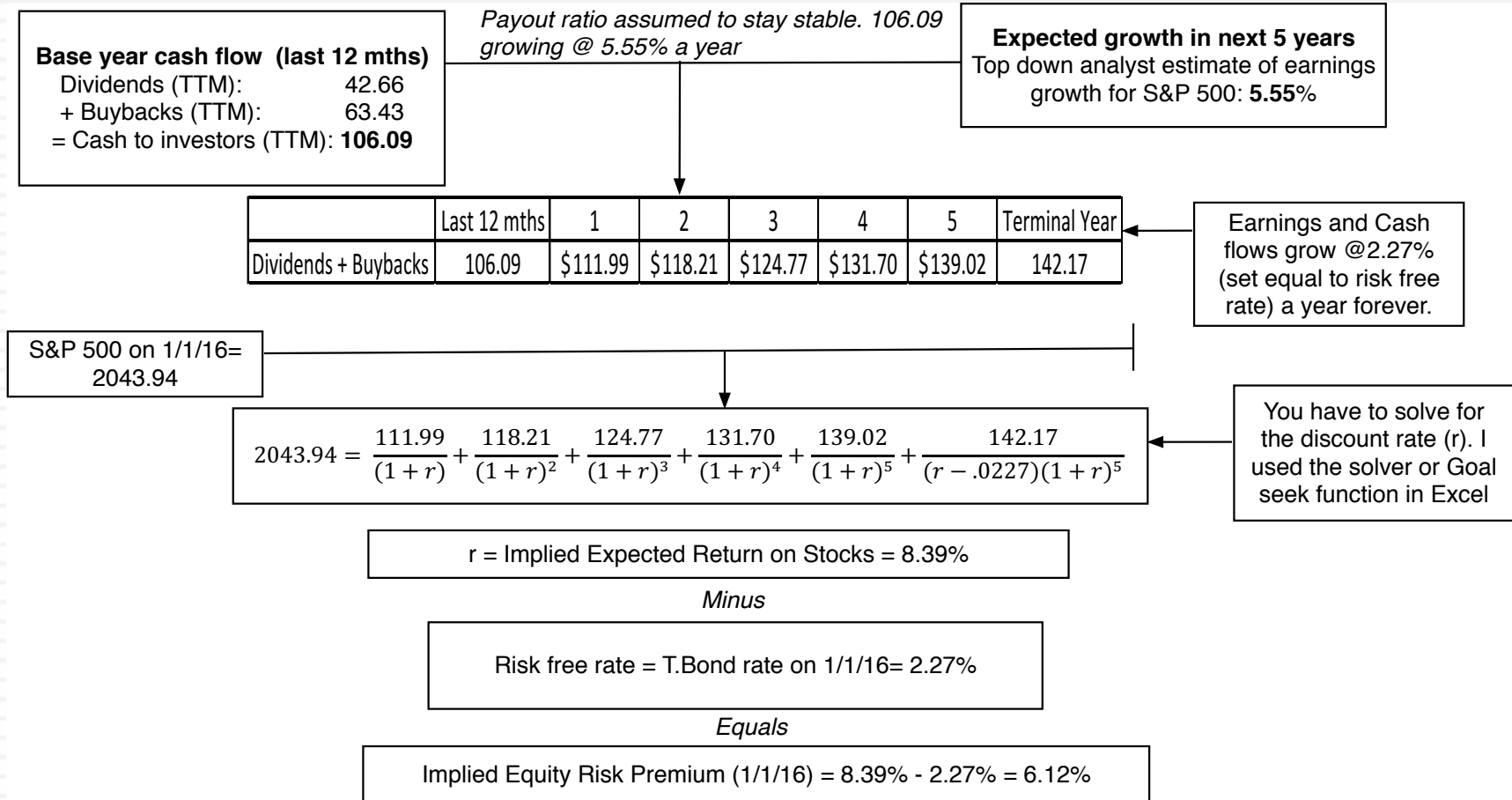
ERP: A Historical Snapshot

	<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	2.15%	2.29%		
1966-2015	6.05%	3.89%	4.69%	2.90%
Std Error	2.42%	2.74%		
2006-2015	7.87%	3.88%	6.11%	2.53%
Std Error	6.06%	8.66%		

Historical
premium for the
US

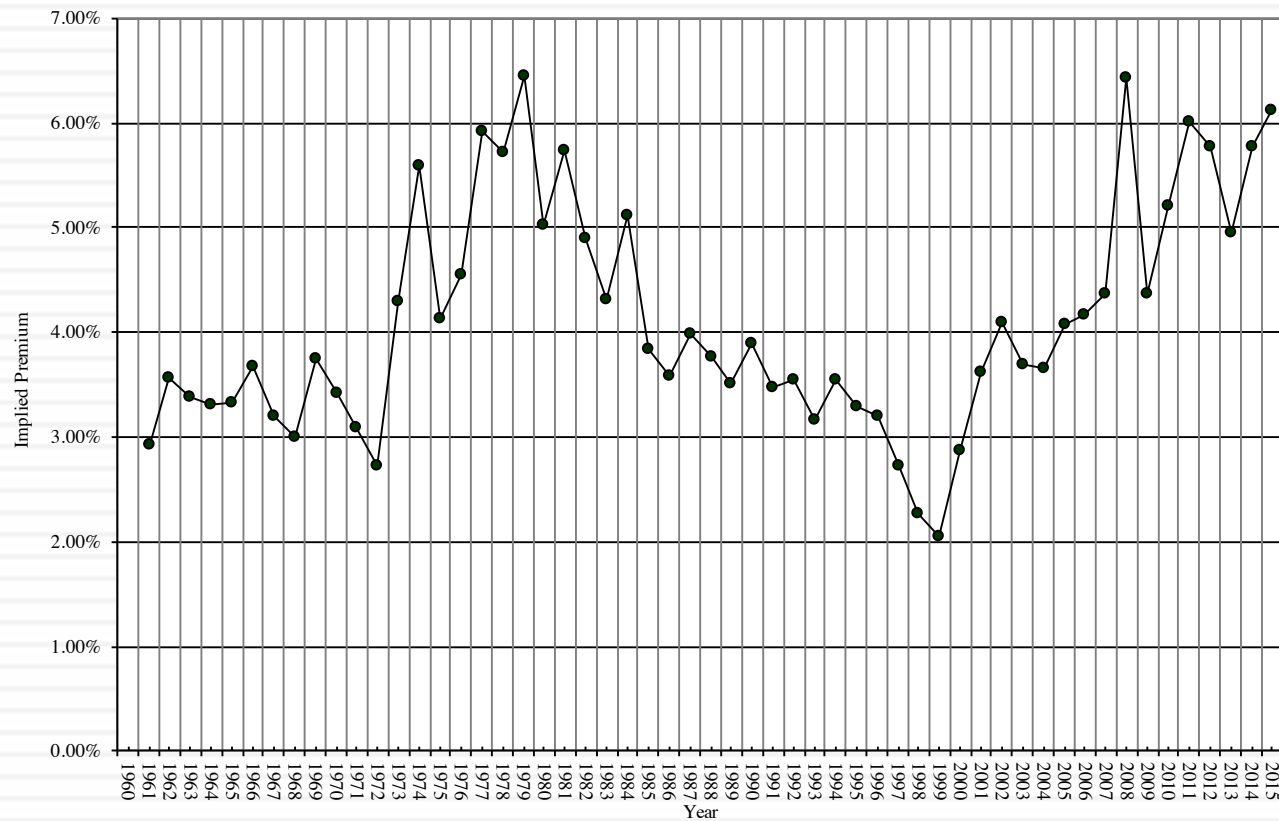
- If you are going to use a historical risk premium, make it
 - ▣ Long term (because of the standard error)
 - ▣ Consistent with your risk free rate
 - ▣ A “compounded” average
- No matter which estimate you use, recognize that it is backward looking, is noisy and may reflect selection bias.

An Implied ERP



Implied Premiums in the US: 1960-2015

Implied Premium for US Equity Market: 1960-2015



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, the historical data option is not useful, since most of these markets have too short a history to compute a risk premium. The implied premium can be computed, but some of the inputs (especially growth) are tough to get.

Country Risk: Look at a country's bond rating and default spreads as a start

- In this approach, the country equity risk premium is set equal to the default spread for the country, estimated in one of three ways. In November 2013, for Brazil, this would have yielded three numbers:
 - The default spread on a dollar denominated bond issued by the country. (In November 2013, that spread was 5.25% for the Brazilian \$ bond)
 - The sovereign CDS spread for the country. In November 2013, the ten year CDS spread for Brazil was 2.59%.
 - The default spread based on the local currency rating for the country. Brazil's sovereign local currency rating is Baa3 and the default spread for a Baa3 rated sovereign was about 2.00% in November 2013.
- Many analysts add this default spread to the US risk premium to come up with a risk premium for a country. This would yield a risk premium of 7.50% for Brazil, if we use 5.50% as the US risk premium (in November 2013) and the default spread based on the rating.

Beyond the default spread

- 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 November 2013, you would get:
 - Country Equity risk premium = Default spread on country bond* $\frac{\sigma_{\text{Country Equity}}}{\sigma_{\text{Country Bond}}}$
 - Standard Deviation in Bovespa (Equity) = 21%
 - Standard Deviation in Brazil government bond = 14%
 - Default spread on Brazilian \$ bond = 2.00%
 - Brazil Country Risk Premium = 2.00% (21%/14%) = 3.00%
 - Brazil Total ERP = Mature Market Premium + CRP = 5.5% + 3.00% = 8.50%

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%	Western Europe	6.72%	1.22%	Kazakhstan	8.50%	3.00%
						Latvia	8.50%	3.00%

Canada	5.50%	0.00%
United States of America	5.50%	0.00%
North America	5.50%	0.00%

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%
Latin America	9.44%	3.94%

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%
Africa	11.22%	5.82%

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%
E. Europe & Russia	8.60%	3.10%

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%
Middle East	6.88%	1.38%

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%
Asia	7.27%	1.77%

Australia	5.50%	0.00%
Cook Islands	12.25%	6.75%
New Zealand	5.50%	0.00%
Australia & NZ	5.50%	0.00%

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