practitioners add an additional premium to the required returns (and costs of equity) of smaller market cap companies.

The CAPM and Market Capitalization

In one of very first studies to highlight the failure of the traditional capital asset pricing model to explain returns at small market cap companies, Banz (1981) looked at returns on stocks from 1936-1977 and concluded that investing in the smallest companies (the bottom 20% of NYSE firms in terms of capitalization) would have generated about 6% more, after adjusting for beta risk, than larger cap companies.[84] In the years since, there has been substantial research on both the origins and durability of the small cap premium, with mixed conclusions.

1. It exists globally, but it is more pronounced in developed markets: There is evidence of a small firm premium in markets outside the United States as well. Studies find small cap premiums of about 7% from 1955 to 1984 in the United Kingdom,[85] 8.8% in France and 3% in Germany,[86] and a premium of 5.1% for Japanese stocks between 1971 and 1988.[87] Dimson, Marsh and Staunton (2018), in their assessment of equity risk premiums in global markets, also compute small cap premiums in 23 markets over long time periods (which range from 116 years for some markets to less for others). Of the 23 markets, small cap stocks did not outperform the rest of the market in only Norway and the Netherlands; the small cap premium, over the long term, was higher in developed markets than in emerging markets. On average, across the markets, they estimate the small cap premium to be 0.32% a month (or about 3.78% a year), for 1900-2017.
2. There is a premium over a long history, but it is volatile and seems to have disappeared in recent decades: While the small cap premium has been persistent in US equity markets, it has also been volatile, with large cap stocks outperforming small

[84] Banz, R., 1981, *The Relationship between Return and Market Value of Common Stocks*, Journal of Financial Economics, v9.

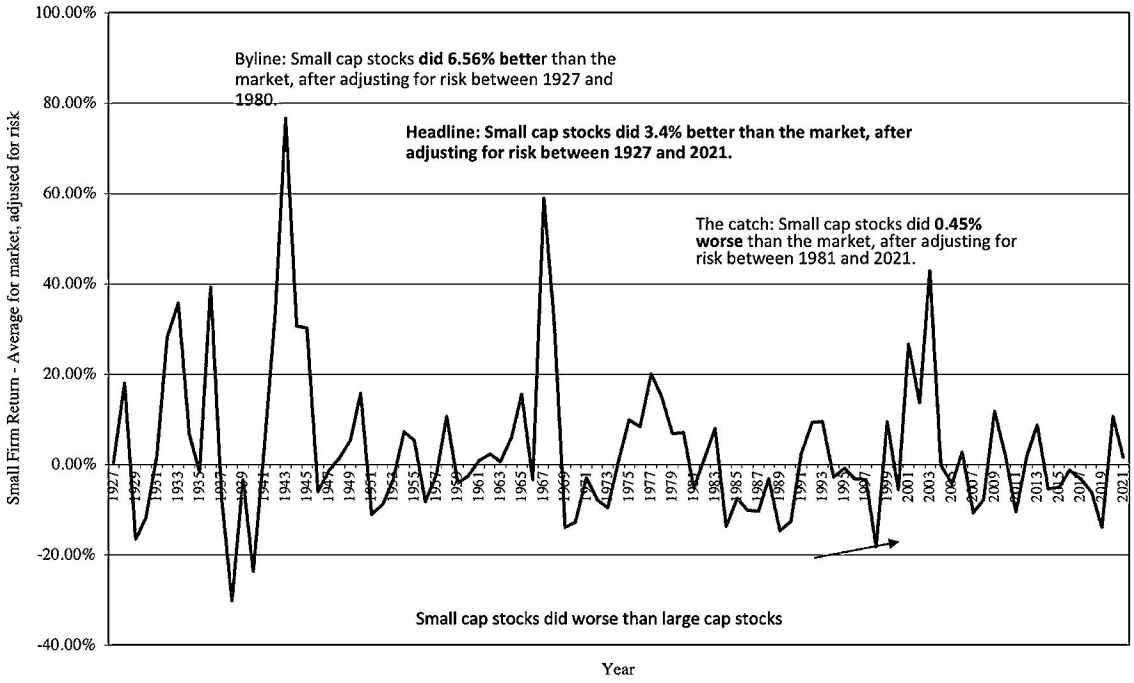
[85] Dimson, E. and P.R. Marsh, 1986, *Event Studies and the Size Effect: The Case of UK Press Recommendations*, Journal of Financial Economics, v17, 113-142.

[86] Bergstrom,G.L., R.D. Frashure and J.R. Chisholm, 1991, *The Gains from international small-company diversification* in Global Portfolios: Quantiative Strategies for Maximum Performance, Edited By R.Z. Aliber and B.R. Bruce, Business One Irwin, Homewood.

[87] Chan, L.K., Y. Hamao, and J. Lakonishok, 1991, *Fundamentals and Stock Returns in Japan*, Journal of Finance. v46. 1739-1789.

cap stocks for extended periods. In figure 4, we look at the difference in returns between small cap (defined as bottom 10% of firms in terms of market capitalization) and all US stocks between 1927 and 2021.[88]

Figure 4: Small Firm Premium over time- 1927 -2021



The average excess return earned by the smallest market cap stocks, between 1927 and 2021 was 3.4%, but the standard error in that estimate is 1.70%. However, the premium for small cap stocks over large cap stocks from 1981 to 2021 is -0.45%, though it enjoyed a brief resurgence between 2001 and 2005. The fading of the small cap premium over time can be seen when you look at the difference between the smallest cap stocks, by decile, and the largest cap stocks, by decile, by decade:

Table 7: Small Cap versus Large Cap Stocks- By Decade from 1930-2019

	Value Weighted		
	Largest Decile	*Smallest Decile*	*Difference*
1930-39	2.90%	15.21%	12.31%
1940-49	7.46%	30.82%	23.36%
1950-59	20.23%	22.39%	2.16%

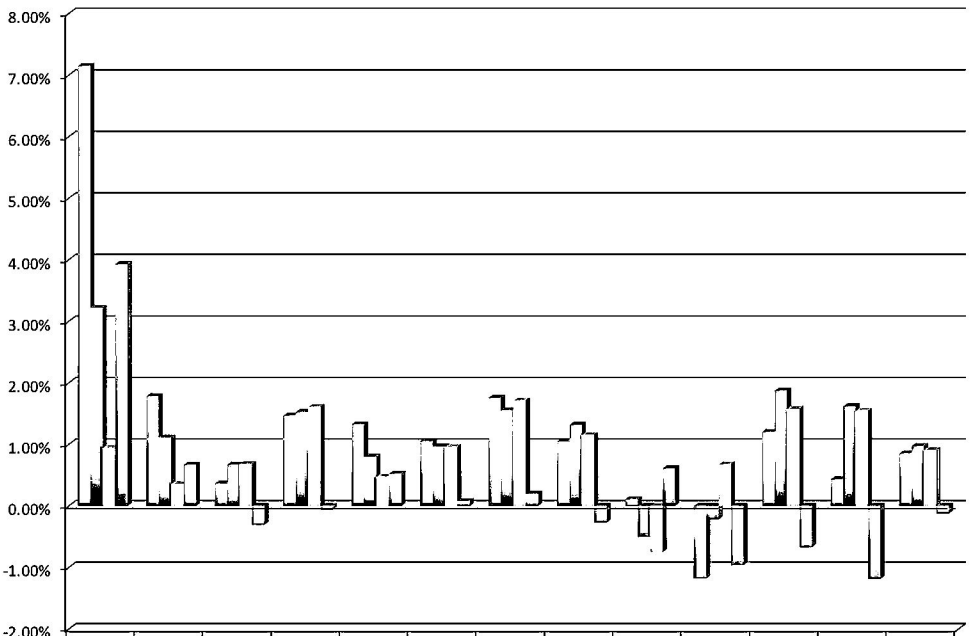
[88] The raw data for this table is obtained from Professor Ken French's website at Dartmouth. These premiums are based on value weighted portfolios. If equally weighted portfolios are used, the small cap premium is larger.

1960-69	9.52%	28.25%	18.73%
1970-79	4.32%	6.70%	2.38%
1980-89	16.09%	16.23%	0.13%
1990-99	21.18%	12.69%	-8.49%
2000-09	-0.53%	13.68%	14.22%
2010-19	13.36%	13.49%	0.13%

In the four decades since 1980, the small cap premium has been non-existent, raising questions about whether it still persists or whether it was an artifact of the twentieth century.

3. It is a January Premium: Much of the premium is generated in one month of the year: January. As Figure 5 shows, eliminating that month from our calculations would essentially dissipate the entire small stock premium. That would suggest that size itself is not the source of risk, since small firms in January remain small firms in the rest of the year, but that the small firm premium, if it exists, comes from some other risk that is more pronounced or prevalent in January than in the rest of the year.

Figure 5: Small Cap Premium by Month of Year - 1927-2021



	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Feb-Dec
Smallest (Lowest Decile)	7.15%	1.78%	0.37%	1.47%	1.33%	1.05%	1.76%	1.05%	0.11%	-1.18%	1.21%	0.43%	0.85%
Market	3.22%	1.11%	0.67%	1.53%	0.80%	0.97%	1.56%	1.32%	-0.50%	-0.22%	1.87%	1.62%	0.98%
Largest (Top Decile)	0.94%	0.36%	0.68%	1.61%	0.48%	0.96%	1.71%	1.15%	-0.75%	0.68%	1.58%	1.55%	0.91%
Small cap Premium	3.93%	0.67%	-0.31%	-0.06%	0.52%	0.08%	0.20%	-0.27%	0.61%	-0.96%	-0.67%	-1.19%	-0.12%

Source: Raw data from Ken French

4. It is stronger on an equally weighted basis than on a value weighted basis: The small cap premium is much stronger when computed on an equally weighted index, rather

than a value weighted one, suggesting that it is the smallest stocks that account for the bulk of the premium. Note also that it is the bottom decile of all US stocks that are counted as small cap stocks in this study, and that looking for the small cap premium within the S&P 500 or even the NYSE composite will yield slim pickings.

Finally, a series of studies have argued that market capitalization, by itself, is not the reason for excess returns but that it is a proxy for other ignored risks such as illiquidity and poor information. In summary, while the empirical evidence over a very long period supports the notion that small cap stocks have earned higher returns after adjusting for beta risk than large cap stocks, it is not as conclusive, nor as clean as it was initially thought to be. The argument that there is, in fact, no small cap premium and that we have observed over time is just an artifact of history should be given credence.

The Small Cap Premium

If you still accept the notion that there is a small cap premium, there are two ways in which you can respond to the empirical evidence that small market cap stocks seem to earn higher returns than expected, after adjusting for risk. One is to view this as a market inefficiency that can be exploited for profit: this, in effect, would require us to load up our portfolios with small market cap stocks that would then proceed to deliver higher than expected returns over long periods. The other is to take the excess returns as evidence that betas are inadequate measures of risk and view the additional returns are compensation for the missed risk.

If CAPM betas and other risk measures in conventional risk and return models understate the true risk of small cap stocks, what are the solutions? The first is to try and augment the model to reflect the missing risk, but this would require being explicit about this risk. For instance, there are models that include additional factors for illiquidity and imperfect information that claim to do better than the CAPM in predicting future returns. The second and simpler solution that is adopted by many practitioners is to add a premium to the expected return (from the CAPM) of small cap stocks. To arrive at this premium, analysts look at historical data on the returns on small cap stocks and the market, adjust for beta risk, and attribute the excess return to the small cap effect. As we noted earlier, using the data from 1926-2021, we would estimate a small cap premium of 3.4%.

Duff and Phelps present a richer set of estimates, where the premiums are computed for stocks in 25 different size classes (with size measured on eight different dimensions including market capitalization, book value and net income). Using the Fama/French data, we present excess returns for firms broken down by ten market value classes in Table 8, with the standard error for each estimate.

Table 8: Excess Returns by Market Value Class: US Stocks from 1927 – 2021

Excess Return = Return on Portfolio – Return on Market

Decile	Average	Standard Error	Maximum	Minimum
Smallest	3.40%	1.70%	76.55%	-30.22%
2	1.93%	1.21%	74.19%	-19.08%
3	1.12%	0.58%	23.17%	-17.74%
4	0.67%	0.50%	17.26%	-8.61%
5	0.00%	0.48%	9.66%	-16.21%
6	-0.03%	0.44%	11.70%	-13.85%
7	-0.57%	0.49%	7.40%	-21.39%
8	-1.10%	0.71%	9.12%	-30.61%
9	-1.98%	0.94%	22.63%	-41.08%
Largest	-3.44%	1.40%	31.22%	-66.73%

Raw data from Ken French

Note that the market capitalization effect shows up at both extremes – the smallest firms earn higher returns than expected whereas the largest firms earn lower returns than expected. The small firm premium is statistically significant only for the lowest and two highest size deciles. In fact, it is the large cap discount that is more pronounced (mathematically and statistically) than the small cap premium.

Perils of the approach

While the small cap premium may seem like a reasonable way of dealing with the failure of the CAPM to capture the risk in smaller companies, there are significant costs to using the approach.

a. Standard Error on estimates: One of the dangers we noted with using historical risk premiums is the high standard error in our estimates. This danger is magnified when we look at sub-sets of stocks, based on market capitalization or any other characteristic, and extrapolate past returns. The standard errors on the small cap premiums that are estimated are likely to be significant, as is evidenced in table 8.

b. Small versus Large Cap: At least in its simplest form, the small cap premium adjustment requires us to divide companies into small market companies and the rest of the market, with stocks falling on one side of the line having much higher required returns (and costs of equity) than stocks falling on the other side.
c. Understanding Risk: Even in its more refined format, where the required returns are calibrated to market cap, using small cap premiums allows analysts to evade basic questions about what it is that makes smaller cap companies riskier, and whether these factors may vary across companies.
d. Small cap companies become large cap companies over time: When valuing companies, we attach high growth rates to revenues, earnings, and value over time. Consequently, companies that are small market cap companies now grow to become large market cap companies over time. Consistency demands that we adjust the small cap premium as we go further into a forecast period.
e. Other risk premiums: Using a small cap premium opens the door to other premiums being used to augment expected returns. Thus, we could adjust expected returns upwards for stocks with price momentum and low price to book ratios, reflecting the excess returns that these characteristics seem to deliver, at least on paper. Doing so will deliver values that are closer to market prices, across assets, but undercuts the rationale for intrinsic valuation, i.e., finding market mistakes.

There is another reason why we are wary about adjusting costs of equity for a small cap effect. If, as is the practice now, you add a small cap premium of between 4% to 5% to the cost of equity of small companies, without attributing this premium to any specific risk factor, you are exposed to the risk of double counting risk. For instance, assume that the small cap premium that we have observed over the last few decades is attributable to the lower liquidity (and higher transactions costs) of trading small cap stocks. Adding that premium on to the discount rate will reduce the estimated values of small cap and private businesses. If you attach an illiquidity discount to this value, you are double counting the effect of illiquidity.

The small cap premium is firmly entrenched in practice, with analysts generally adding on 3% to 5% to the conventional cost of equity for small companies, with the definition of small shifting from analyst to analyst. Even if you believe that small cap

companies are more exposed to market risk than large cap ones, this is a sloppy and lazy way of dealing with that risk, since risk ultimately has to come from something fundamental (and size is not a fundamental factor). Thus, if you believe that small cap stocks are more prone to failure or distress, it behooves you to measure that risk directly and incorporate it into the cost of equity. If it is illiquidity that is at the heart of the small cap premium, then you should be measuring liquidity risk and incorporating it into the cost of equity and you certainly should not be double counting the risk by first incorporating a small cap premium into the discount rate and then applying an illiquidity discount to value.

As the small cap premium has faded in the market, advocates of its usage have started grasping at straws. Asness, Frazzini, Israel, Moskowitz and Pedersen (2018) argue that there is a small cap premium, if you control for "junk", i.e., that the small cap premium is restricted to high quality companies, with high and stable earnings.[89] Even if you accept the findings of this study at face value, it is not clear how this makes the case for adding a small cap premium to required returns and discount rates stronger. Specifically, it makes no intuitive sense to add the small cap premium and use higher discount rates for well run and profitable small companies, and dispense with the practice for troubled and unprofitable small cap companies.

The question of whether there is a small cap premium ultimately is not a theoretical one but a practical one. While those who incorporate a small cap premium justify the practice with the historical data, we will present a more forward-looking approach, where we use market pricing of small capitalization stocks to see if the market builds in a small cap premium, later in this paper.

Country Risk Premiums

As both companies and investors get used to the reality of a global economy, they have also been forced to confront the consequences of globalization for equity risk premiums and hurdle rates. Should an investor putting his money in Indian stocks demand a higher risk premium for investing in equities that one investing in German stocks? Should a US consumer product company investing in Brazil demand the same hurdle rates for its Brazilian investments as it does for its US investments? In effect, should we demand one

[89] Asness, C., A. Frazzini, R. Israel, T.J. Moskowitz and L.H. Pedersen, 2018, *Size matters, if you control for your junk*, Journal of Financial Economics, v129, 479-509.

global equity risk premium that we use for investments all over the world or should we use higher equity risk premiums in some markets than in others?

The arguments for no country risk premium

Is there more risk in investing in a Malaysian or Brazilian stock than there is in investing in the United States? The answer, to most, seems to be obviously affirmative, with the solution being that we should use higher equity risk premiums when investing in riskier emerging markets. There are, however, three distinct and different arguments offered against this practice.

1. Country risk is diversifiable

In the risk and return models that have developed from conventional portfolio theory, and in particular, the capital asset pricing model, the only risk that is relevant for purposes of estimating a cost of equity is the market risk or risk that cannot be diversified away. The key question in relation to country risk then becomes whether the additional risk in an emerging market is diversifiable or non-diversifiable risk. If, in fact, the additional risk of investing in Malaysia or Brazil can be diversified away, then there should be no additional risk premium charged. If it cannot, then it makes sense to think about estimating a country risk premium.

But diversified away by whom? Equity in a publicly traded Brazilian, or Malaysian, firm can be held by hundreds or even thousands of investors, some of whom may hold only domestic stocks in their portfolio, whereas others may have more global exposure. For purposes of analyzing country risk, we look at the marginal investor – the investor most likely to be trading on the equity. If that marginal investor is globally diversified, there is at least the potential for global diversification. If the marginal investor does not have a global portfolio, the likelihood of diversifying away country risk declines substantially. Stulz (1999) made a similar point using different terminology.[90] He differentiated between segmented markets, where risk premiums can be different in each market, because investors cannot or will not invest outside their domestic markets, and open markets, where investors can invest across markets. In a segmented market, the marginal investor will be

[90] Stulz, R.M., *Globalization, Corporate finance, and the Cost of Capital*, Journal of Applied Corporate Finance, v12. 8-25.

diversified only across investments in that market, whereas in an open market, the marginal investor has the opportunity (even if he or she does not take it) to invest across markets. It is unquestionable that investors today in most markets have more opportunities to diversify globally than they did three decades ago, with international mutual funds and exchange traded funds, and that many more of them take advantage of these opportunities. It is also true still that a significant home bias exists in most investors' portfolios, with most investors over investing in their home markets.

Even if the marginal investor is globally diversified, there is a second test that has to be met for country risk to be diversifiable. All or much of country risk should be country specific. In other words, there should be low correlation across markets. Only then will the risk be diversifiable in a globally diversified portfolio. If, on the other hand, the returns across countries have significant positive correlation, country risk has a market risk component, is not diversifiable and can command a premium. Whether returns across countries are positively correlated is an empirical question. Studies from the 1970s and 1980s suggested that the correlation was low, and this was an impetus for global diversification.[91] Partly because of the success of that sales pitch and partly because economies around the world have become increasingly intertwined over the last decade, more recent studies indicate that the correlation across markets has risen. The correlation across equity markets has been studied extensively over the last two decades and while there are differences, the overall conclusions are as follows:

1. The correlation across markets has increased over time, as both investors and firms have globalized. Yang, Tapon and Sun (2006) report correlations across eight, mostly developed markets between 1988 and 2002 and note that the correlation in the 1998-2002 time period was higher than the correlation between 1988 and 1992 in every single market; to illustrate, the correlation between the Hong Kong and US markets increased from 0.48 to 0.65 and the correlation between the UK and the US markets increased from 0.63 to 0.82.[92] In the global returns sourcebook, from Credit Suisse, referenced earlier for historical risk premiums for different markets, the authors

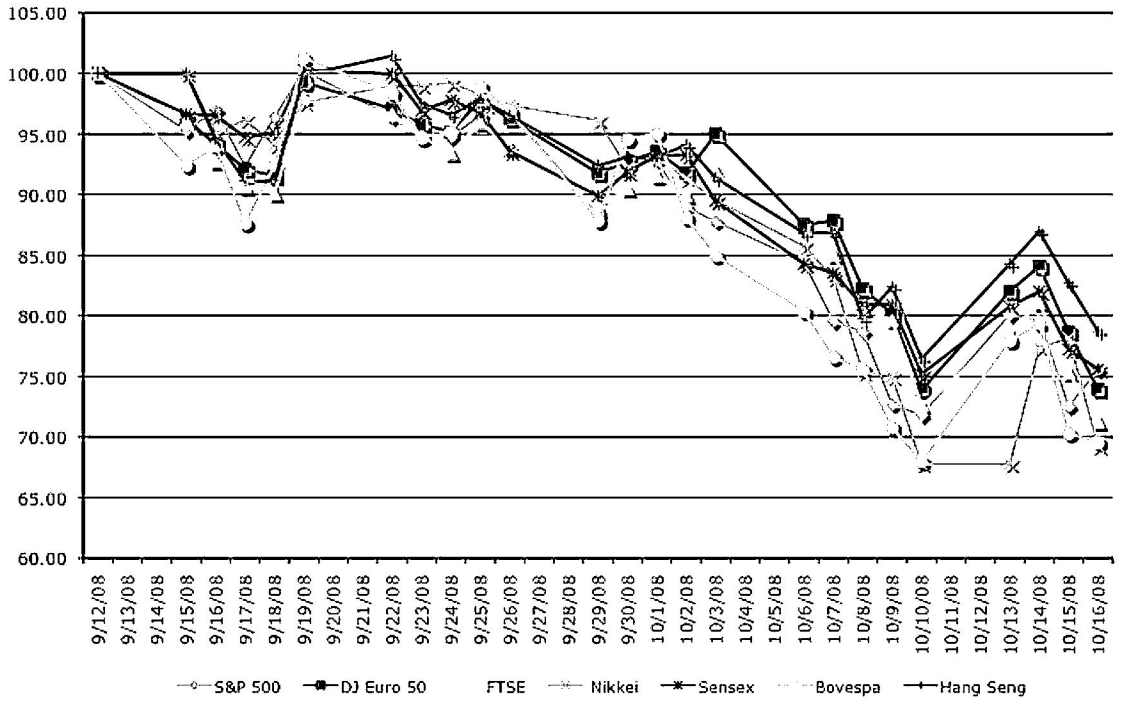
[91] Levy, H. and M. Sarnat, 1970, *International Diversification of Investment Portfolios*, American Economic Review 60(4), 668-75.

[92] Yang, Li , Tapon, Francis and Sun, Yiguo, 2006, *International correlations across stock markets and industries: trends and patterns 1988-2002*, Applied Financial Economics, v16: 16, 1171-1183

estimate the correlation between developed and emerging markets between 1980 and 2013, and note that it has increased from 0.57 in 1980 to 0.88 in 2013.

2. The correlation across equity markets increases during periods of extreme stress or high volatility.[93] This is borne out by the speed with which troubles in one market, say Russia, can spread to a market with little or no obvious relationship to it, say Brazil. The contagion effect, where troubles in one market spread into others is one reason to be skeptical with arguments that companies that are in multiple emerging markets are protected because of their diversification benefits. In fact, the market crisis in the last quarter of 2008 illustrated how closely bound markets have become, as can be seen in figure 6:

Figure 6: The globalization of risk



Between September 12, 2008 and October 16, 2008, markets across the globe moved up and down together, with emerging markets showing slightly more volatility. Looking at 2020, when markets were roiled by the COVID crisis, the same phenomena played out, as global markets moved together again, as can be seen in table 9:

[93] Ball, C. and W. Torous, 2000, *Stochastic correlation across international stock markets*, Journal of Empirical Finance. v7, 373-388.

Table 9: Correlations in Daily Returns across Equity Indices in 2020

	S&P 500	*S&P 600*	*S&P Euro 350*	*S&P Emerging Mkts*
S&P 500	1.0000			
S&P 600	0.8885	1.0000		
S&P Euro 350	0.7047	0.7379	1.0000	
S&P Em Mkt BMI	0.5991	0.5697	0.6261	1.0000

3. The downside correlation increases more than upside correlation: In a twist on the last point, Longin and Solnik (2001) report that it is not high volatility per se that increases correlation, but downside volatility. Put differently, the correlation between global equity markets is higher in bear markets than in bull markets.[94]
4. Globalization increases exposure to global political uncertainty, while reducing exposure to domestic political uncertainty: In the most direct test of whether we should be attaching different equity risk premiums to different countries due to systematic risk exposure, Brogaard, Dai, Ngo and Zhang (2014) looked at 36 countries from 1991-2010 and measured the exposure of companies in these countries to global political uncertainty and domestic political uncertainty.[95] They find that the costs of capital of companies in integrated markets are more highly influenced by global uncertainty (increasing as uncertainty increases) and those in segmented markets are more highly influenced by domestic uncertainty.[96]

2. A Global Capital Asset Pricing Model

The other argument against adjusting for country risk comes from theorists and practitioners who believe that the traditional capital asset pricing model can be adapted easily to a global market. In their view, all assets, no matter where they are traded, should

[94] Longin, F. and B. Solnik, 2001, *Extreme Correlation of International Equity Markets*, Journal of Finance, v56 , pg 649-675.

[95] Brogaard, J., L. Dai, P.T.H. Ngo, B. Zhuang, 2014, *The World Price of Political Uncertainty*, SSRN #2488820.

[96] The implied costs of capital for companies in the 36 countries were computed and related to global political uncertainty, measured using the US economic policy uncertainty index, and to domestic political uncertainty, measured using domestic national elections.

face the same global equity risk premium, with differences in risk captured by differences in betas. In effect, they are arguing that if Malaysian stocks are riskier than US stocks, they should have higher betas and expected returns.

While the argument is reasonable, it flounders in practice, partly because betas do not seem capable of carry the weight of measuring country risk.

1. If betas are estimated against local indices, as is usually the case, the average beta within each market (Brazil, Malaysia, US, or Germany) has to be one. Thus, it would be mathematically impossible for betas to capture country risk.
2. If betas are estimated against a global equity index, such as the Morgan Stanley Capital Index (MSCI), there is a possibility that betas could capture country risk but there is little evidence that they do in practice. Since the global equity indices are market weighted, it is the companies that are in developed markets that have higher betas, whereas the companies in small, very risky emerging markets report low betas. Table 10 reports the average beta estimated for the ten largest market cap companies in Brazil, India, the United States and Japan against the MSCI.[97]

Table 10: Betas against MSCI – Large Market Cap Companies

Country	*Average Beta (against local index)*	*Average Beta (against MSCI Global)*
India	0.97	0.83
Brazil	0.98	0.81
United States	0.96	1.05
Japan	0.94	1.03

The emerging market companies consistently have lower betas, when estimated against global equity indices, than developed market companies. Using these betas with a global equity risk premium will lead to lower costs of equity for emerging market companies than developed market companies. While there are creative fixes that practitioners have used to get around this problem, they seem to be based on little more

[97] The betas were estimated using two years of weekly returns from January 2006 to December 2007 against the most widely used local index (Sensex in India, Bovespa in Brazil, S&P 500 in the US and the Nikkei in Japan) and the MSCI Global Equity Index.

than the desire to end up with higher expected returns for emerging market companies.[98]

3. Country risk is better reflected in the cash flows

The essence of this argument is that country risk and its consequences are better reflected in the cash flows than in the discount rate. Proponents of this point of view argue that bringing in the likelihood of negative events (political chaos, nationalization, and economic meltdowns) into the expected cash flows effectively risk adjusts the cashflows, thus eliminating the need for adjusting the discount rate.

This argument is alluring but it is wrong. The expected cash flows, computed by taking into account the possibility of poor outcomes, is not risk adjusted. In fact, this is exactly how we should be calculating expected cash flows in any discounted cash flow analysis. Risk adjustment requires us to adjust the expected cash flow further for its risk, i.e. compute certainty equivalent cash flows in capital budgeting terms. To illustrate why, consider a simple example where a company is considering making the same type of investment in two countries. For simplicity, let us assume that the investment is expected to deliver $ 90, with certainty, in country 1 (a mature market); it is expected to generate $ 100 with 90% probability in country 2 (an emerging market) but there is a 10% chance that disaster will strike (and the cash flow will be $0). The expected cash flow is $90 on both investments, but only a risk neutral investor would be indifferent between the two. A risk averse investor would prefer the investment in the mature market over the emerging market investment, and would demand a premium for investing in the emerging market.

In effect, a full risk adjustment to the cash flows will require us to go through the same process that we have to use to adjust discount rates for risk. We will have to estimate a country risk premium and use that risk premium to compute certainty equivalent cash flows.[99]

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[98] There are some practitioners who multiply the local market betas for individual companies by a beta for that market against the US. Thus, if the beta for an Indian chemical company is 0.9 and the beta for the Indian market against the US is 1.5, the global beta for the Indian company will be 1.35 (0.9*1.5). The beta for the Indian market is obtained by regressing returns, in US dollars, for the Indian market against returns on a US index (say, the S&P 500).

[99] In the simple example above, this is how it would work. Assume that we compute a country risk premium of 3% for the emerging market to reflect the risk of disaster. The certainty equivalent cash flow on the investment in that country would be $90/1.03 = $87.38.

The arguments for a country risk premium

There are elements in each of the arguments in the previous section that are persuasive but none of them is persuasive enough.

- Investors have become more globally diversified over the last three decades and portions of country risk can therefore be diversified away in their portfolios. However, the significant home bias that remains in investor portfolios exposes investors disproportionately to home country risk, and the increase in correlation across markets has made a portion of country risk into non-diversifiable or market risk.
- As stocks are traded in multiple markets and in many currencies, it is becoming more feasible to estimate meaningful global betas, but it also is still true that these betas cannot carry the burden of capturing country risk in addition to all other macro risk exposures.
- Finally, there are certain types of country risk that are better embedded in the cash flows than in the risk premium or discount rates. In particular, risks that are discrete and isolated to individual countries should be incorporated into probabilities and expected cash flows; good examples would be risks associated with nationalization or related to acts of God (hurricanes, earthquakes etc.).

After you have diversified away the portion of country risk that you can, estimated a meaningful global beta and incorporated discrete risks into the expected cash flows, you will still be faced with residual country risk that has only one place to go: the equity risk premium.

There is evidence to support the proposition that you should incorporate additional country risk into equity risk premium estimates in riskier markets:

1. Historical equity risk premiums: Donadelli and Prosperi (2011) look at historical risk premiums in 32 different countries (13 developed and 19 emerging markets) and conclude that emerging market companies had both higher average returns and more volatility in these returns between 1988 and 2010 (see table 11).

Table 11: Historical Equity Risk Premiums (Monthly) by Region

Region	*Monthly ERP*	*Standard deviation*
Developed Markets	0.62%	4.91%

Asia	0.97%	7.56%
Latin America	2.07%	8.18%
Eastern Europe	2.40%	15.66%
Africa	1.41%	6.03%

While we remain cautious about using historical risk premiums over short time periods (and 22 years is short in terms of stock market history), the evidence is consistent with the argument that country risk should be incorporated into a larger equity risk premium.[100]

2. Survey premiums: Earlier in the paper, we referenced a paper by Fernandez et al (2021) that surveyed academics, analysts, and companies in 88 countries on equity risk premiums. The reported average premiums vary widely across markets and are higher for riskier emerging markets, as can be seen in table 12.

Table 12: Survey Estimates of Equity Risk Premium: By Region

			Equity Risk Premium used	
Country/Region	*# Countries*	*# Respondents*	*Average*	*Std Deviation*
Africa and Middle East	14	158	8.35%	1.80%
Asia	1	15	5.80%	2.40%
Australia & NZ	2	46	6.20%	1.50%
China	1	30	6.20%	1.60%
Eastern Europe & Russia	15	229	8.10%	1.44%
EU & Environs	23	1763	6.28%	1.75%
India	1	36	7.30%	1.00%
Japan	1	29	5.20%	3.00%
Latin America & Caribbean	16	305	9.28%	1.64%
North America	2	1794	5.55%	2.30%
Small Asia	11	134	7.47%	1.69%
UK	1	68	5.60%	1.20%
Global	**88**	**4607**	**7.58%**	**1.69%**

Again, while this does not conclusively prove that country risk commands a premium, it does indicate that those who do valuations in emerging market countries seem to act like it does. Ultimately, the question of whether country risk matters and should affect the equity risk premium is an empirical one, not a theoretical one, and for the moment, at least, the evidence

[100] Donadelli, M. and L. Prosperi, 2011, *The Equity Risk Premium: Empirical Evidence from Emerging Markets*, Working Paper, http://ssrn.com/abstract=1893378.

seems to suggest that you should incorporate country risk into your discount rates. This could change as we continue to move towards a global economy, with globally diversified investors and a global equity market, but we are not there yet.

Estimating a Country Risk Premium

If country risk is not diversifiable, either because the marginal investor is not globally diversified or because the risk is correlated across markets, we are then left with the task of measuring country risk and considering the consequences for equity risk premiums. In this section, we will consider three approaches that can be used to estimate country risk premiums, all of which build off the historical risk premiums estimated in the last section. To approach this estimation question, let us start with the basic proposition that the risk premium in any equity market can be written as:

Equity Risk Premium = Base Premium for Mature Equity Market + Country Risk Premium

The country premium could reflect the extra risk in a specific market. This boils down our estimation to estimating two numbers – an equity risk premium for a mature equity market and the additional risk premium, if any, for country risk. To estimate a mature market equity risk premium, we can look at one of two numbers. The first is the historical risk premium that we estimated for the United States, which yielded 5.13% as the geometric average premium for stocks over treasury bonds from 1928 to 2021. If we do this, we are arguing that the US equity market is a mature market, and that there is sufficient historical data in the United States to make a reasonable estimate of the risk premium. The other is the average historical risk premium across global equity markets, approximately 3.2%, that was estimated by Dimson et al (see earlier reference), as a counter to the survivor bias that they saw in using the US risk premium. Consistency would then require us to use this as the equity risk premium, in every other equity market that we deem mature; the equity risk premium in January 2022 would be 5.13% in Germany and Norway, for instance. For markets that are not mature, however, we need to measure country risk and convert the measure into a country risk premium, which will augment the mature market premium.

Measuring Country Risk

There are at least three measures of country risk that we can use. The first is the sovereign rating attached to a country by ratings agencies. The second is to subscribe to services that come up with broader measures of country risk that explicitly factor in the economic, political, and legal risks in individual countries. The third is go with a market-based measure such as the volatility in the country's currency or markets.

I. Sovereign Ratings

One of the simplest and most accessible measures of country risk is the rating assigned to a country's debt by a ratings agency (S&P, Moody's and Fitch, among others, all provide country ratings). These ratings measure default risk (rather than equity risk) but they are affected by many of the factors that drive equity risk – the stability of a country's currency, its budget and trade balances and political uncertainty, among other variables[101].

To get a measure of country ratings, consider six countries – Germany, Brazil, China, India, Russia and Greece. In January 2022, the Moody's ratings for the countries are summarized in table 13:

Table 13: Sovereign Ratings in January 2022 – Moody's

Country	*Foreign Currency Rating*	*Local Currency Rating*
Brazil	Ba2	Ba2
China	A1	A1
Germany	Aaa	Aaa
Greece	Ba3	Ba3
India	Baa3	Baa3
Russia	Baa3	Baa3

What do these ratings tell us? First, the local currency and foreign currency ratings are identical for all of the countries on the list. There are a few countries (not on this list) where the two ratings diverge, and when they do, the local currency ratings tend to be higher (or at worst equal to) the foreign currency ratings for most countries, because a country should be in a better position to pay off debt in the local currency than in a foreign currency. Second, at least based on Moody's assessments at the start of 2022, Germany is the safest

[101] The process by which country ratings are obtained in explained on the S&P web site at http://www.ratings.standardpoor.com/criteria/index.htm.

company in this group, followed by China, India, Russia, Brazil and Greece, in that order. Third, ratings do change over time. In fact, Brazil's rating moved from B1 in 2001 to Baa1 in 2015, reflecting both strong economic growth and a more robust political system, but it dropped back to Ba2 at the start of 2017, in the midst of political and economic problems. Greece, on the other hand, has seen a dramatic improvement in its rating in the last three years, with the rating changing from B3 in 2017 to Ba3 in 2021. To illustrate, in March 2022, Russia's sovereign rating dropped from Baa3 to B3 and then to C3, over the course of a few days, in response to its invasion of Ukraine, and the resulting global sanctions, in the prior weeks. Appendix 2 contains the current ratings – local currency and foreign currency – for the countries that are tracked by Moody's in January 2022.[102]

While ratings provide a convenient measure of country risk, there are costs associated with using them as the only measure. First, ratings agencies often lag markets when it comes to responding to changes in the underlying default risk. The ratings for India, according to Moody's, were unchanged from 2004 to 2007, though the Indian economy grew at double-digit rates over that period. Similarly, Greece's ratings did not plummet until the middle of 2011, though their financial problems were visible well before that time. Second, the ratings agency focus on default risk may obscure other risks that could still affect equity markets. For instance, rising commodity (and especially oil) prices pushed up the ratings for commodity supplying countries (like Russia), even though there was little improvement in the rest of the economy. In the same vein, you could argue that the risk in many oil-rich Middle Eastern countries will not be captured in the default risk measure. Finally, not all countries have ratings; much of sub-Saharan Africa, for instance, is unrated as are a host of markets on the front lines of warfare or tumult.

II. Country Risk Scores

Rather than focus on just default risk, as rating agencies do, some services have developed numerical country risk scores that take a more comprehensive view of risk. These risk scores are often estimated from the bottom-up by looking at economic

[102] In a disquieting reaction to the turmoil of the market crisis in the last quarter of 2008, Moody's promoted the notion that Aaa countries were not all created equal and slotted these countries into three groups – resistant Aaa (the stongest), resilient Aaa (weaker but will probably survive intact) and vulnerable Aaa (likely to face additional default risk.

fundamentals in each country. This, of course, requires significantly more information, and, as a consequence, most of these scores are available only to commercial subscribers.

The Political Risk Services (PRS) group, for instance, considers political, financial and economic risk indicators to come up with a composite measure of risk (ICRG) for each country that ranks from 0 to 100, with 0 being highest risk and 100 being the lowest risk.[103] Appendix 3 lists countries with their composite country risk measures from the PRS Group in January 2022.[104] Harvey (2005) examined the efficacy of these scores and found that they were correlated with costs of capital, but only for emerging market companies.

The Economist, the business newsmagazine, also operates a country risk assessment unit that measures risk from 0 to 100, with 0 being the least risk and 100 being the most risk. In September 2008, Table 14 the following countries were ranked as least and most risky by their measure:

[103] The PRS group considers three types of risk – political risk, which accounts for 50% of the index, financial risk, which accounts for 25%, and economic risk, which accounts for the balance. While this table is dated, updated numbers are available from PRS, to acquire. (http://www.prsgroup.com).

[104] Harvey, C.R., *Country Risk Components, the Cost of Capital, and Returns in Emerging Markets*, Working paper, Duke University. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=620710.

Table 14: Country Risk Scores – The Economist

Economist.com rankings

Country risk

Selected countries and territories, September 2008 (except where noted)

Least risky			Most risky		
Rank		Score*	Rank		Score
1	Switzerland †	12	120	Zimbabwe	86
2	Finland **	14	119	Iraq	80
	Norway **	14	118	Sudan	76
	Sweden ††	14	117	Myanmar	75
5	Canada **	17	116	Nicaragua	69
	Denmark †	17	115	Jamaica	68
	Netherlands §	17	114	Kenya	66
8	Germany ††	18	113	Cuba	64
9	Austria **	19	112	Cambodia	62
	France ††	19	111	Côte d'Ivoire	61
11	Belgium ††	20		Ecuador	61
12	Singapore	21		Pakistan	61
13	Japan **	23		Venezuela	61
14	Ireland #	24		Vietnam	61
	Britain	24	106	Syria	60
	United States †	24			

*Out of 100, with higher numbers indicating more risk. Scores are based on indicators from three categories: currency risk, sovereign debt risk and banking risk.

† May 2008; ** July 2008; †† June 2008; § August 2008; # February 2008

In fact, comparing the PRS and Economist measures of country risk provides some insight into the problems with using their risk measures. The first is that the measures may be internally consistent but are not easily comparable across different services. The Economist, for instance, assigns its lowest scores to the safest countries whereas PRS assigns the highest scores to these countries. The second is that, by their very nature, significant components of these measures have to be black boxes to prevent others from replicating them at no cost. Third, the measures are not linear, and the services do not claim that they are; a country with a risk score of 60 in the Economist measure is not twice as risky as a country with a risk score of 30.

III. Market-based Measures

To those analysts who feel that ratings agencies are either slow to respond to changes in country risk or take too narrow a view of risk, there is always the alternative of using market-based measures.

- Bond default spread: We can compute a default spread for a country if it has bonds that are denominated in currencies such as the US dollar, Euro or Yen, where there is a riskfree rate to compare it to. In January 2022, for instance, a 10-year US dollar denominated bond issued by the Brazilian government had a yield to maturity of 3.70%, giving it a default spread of 2.19% over the 10-year US treasury bond rate (1.51%), as of the same time.
- Credit Default Swap Spreads: In the last few years, credit default swaps (CDS) markets have developed, allowing us to obtain updated market measures of default risk in different entities. In particular, there are CDS spreads for countries (governments) that yield measures of default risk that are more updated and precise, at least in some cases, than bond default spreads.[105] Table 15 summarizes the CDS spreads for all countries where a CDS spread was available, in January 2022:

[105] The spreads are usually stated in US dollar or Euro terms.

Table 15: Credit Default Swap Spreads (in basis points)– January 2022

Country	CDS Spread	CDS Spread net of US	Country	CDS Spread	CDS Spread net of US	Country	CDS Spread	CDS Spread net of US
Abu Dhabi	0.77%	0.58%	Greece	1.69%	1.50%	Panama	1.26%	1.07%
Algeria	1.10%	0.91%	Guatamela	2.06%	1.87%	Peru	1.31%	1.12%
Angola	5.94%	5.75%	Hong Kong	0.41%	0.22%	Philippines	0.92%	0.73%
Argentina	23.32%	23.13%	Hungary	0.69%	0.50%	Poland	0.68%	0.49%
Australia	0.23%	0.04%	Iceland	0.73%	0.54%	Portugal	0.56%	0.37%
Austria	0.19%	0.00%	India	1.44%	1.25%	Qatar	0.74%	0.55%
Bahrain	3.40%	3.21%	Indonesia	1.36%	1.17%	Romania	1.24%	1.05%
Belgium	0.21%	0.02%	Iraq	5.63%	5.44%	Russia	1.70%	1.51%
Brazil	2.91%	2.72%	Ireland	0.27%	0.08%	Rwanda	3.36%	3.17%
Bulgaria	0.81%	0.62%	Israel	0.72%	0.53%	Saudi Arabia	0.88%	0.69%
Cameroon	3.56%	3.37%	Italy	1.41%	1.22%	Senegal	2.66%	2.47%
Canada	0.28%	0.09%	Japan	0.33%	0.14%	Serbia	1.37%	1.18%
Chile	1.25%	1.06%	Kazakhstan	0.99%	0.80%	Slovakia	0.63%	0.44%
China	0.74%	0.55%	Kenya	4.44%	4.25%	Slovenia	0.87%	0.68%
Colombia	2.77%	2.58%	Korea	0.35%	0.16%	South Africa	2.85%	2.66%
Costa Rica	3.92%	3.73%	Kuwait	0.86%	0.67%	Spain	0.60%	0.41%
Croatia	1.11%	0.92%	Latvia	0.74%	0.55%	Sri Lanka	19.69%	19.50%
Cyprus	0.74%	0.55%	Lebanon	NA	NA	Sweden	0.19%	0.00%
Czech Republic	0.47%	0.28%	Lithuania	0.79%	0.60%	Switzerland	0.11%	0.00%
Denmark	0.15%	0.00%	Malaysia	0.81%	0.62%	Thailand	0.52%	0.33%
Dubai	1.33%	1.14%	Mexico	1.58%	1.39%	Tunisia	8.82%	8.63%
Ecuador	7.57%	7.38%	Morocco	1.32%	1.13%	Turkey	5.51%	5.32%
Egypt	5.74%	5.55%	Netherlands	0.19%	0.00%	Ukraine	6.17%	5.98%
El Salvador	18.33%	18.14%	New Zealand	0.21%	0.02%	United Kingdom	0.18%	0.00%
Estonia	0.85%	0.66%	Nicaragua	4.36%	4.17%	United States	0.19%	0.00%
Ethiopia	20.40%	20.21%	Nigeria	5.53%	5.34%	Uruguay	1.46%	1.27%
Finland	0.20%	0.01%	Norway	0.19%	0.00%	Venezuela	NA	NA
France	0.34%	0.15%	Oman	3.19%	3.00%	Vietnam	1.56%	1.37%
Germany	0.18%	0.00%	Pakistan	3.67%	3.48%	Zambia	NA	NA

Source: Bloomberg; Spreads are for 10-year US $ CDS.

In January 2022, for instance, the CDS market yielded a spread of 2.91% for the Brazilian Government, higher than the 2.19% that we obtained from the 10-year dollar denominated Brazilian bond. However, the CDS market does have some counter-party risk exposure and market frictions, and there is no country with a zero CDS spread, indicating either that there is no entity with default risk or that the CDS spread is not a pure default spread. To counter that problem, we netted the US CDS spread of 0.19% from each country's CDS to get a modified measure of country default risk.[106] Using this approach for Brazil, for instance, yields a netted CDS spread of 2.72% (2.91% minus 0.19%) for the country.

[106] If we assume that there is default risk in the US, we would subtract the default spread associated with this risk from the 0.67% first, before netting the value against other CDS spreads. Thus, if the default spread for the US is 0.15%, we would subtract out only 0.52% (0.67% - 0.15%) from each country's CDS spread to get to a corrected default spread for that country.

- Market volatility: In portfolio theory, the standard deviation in returns is generally used as the proxy for risk. Extending that measure to emerging markets, there are some analysts who argue that the best measure of country risk is the volatility in local stock prices. Stock prices in emerging markets will be more volatile that stock prices in developed markets, and the volatility measure should be a good indicator of country risk. While the argument makes intuitive sense, the practical problem with using market volatility as a measure of risk is that it is as much a function of the underlying risk as it is a function of liquidity. Markets that are risky and illiquid often have low volatility, since without trading, prices don't move. Consequently, using volatility measures will understate the risk of emerging markets that are illiquid and overstate the risk of liquid markets.

Market-based numbers have the benefit of constant updating and reflect the points of view of investors at any point in time. However, they also are also afflicted with the problems that people associate with markets – volatility, mood shifts and at times, irrationality. They tend to move far more than the other two measures – sovereign ratings and country risk scores – sometimes for good reasons and sometimes for no reason at all.

Estimating Country Risk Premium (for Equities)

How do we link a country risk measure to a country risk premium? In this section, we will look at three approaches. The first approach uses default spreads, based upon country bonds or ratings, whereas the latter two use equity market volatility as an input in estimating country risk premiums.

1. Default Spreads

The simplest and most widely used proxy for the country risk premium is the default spread that investors charge for buying bonds issued by the country. This default spread can be estimated in one of three ways.

a. Current Default Spread on Sovereign Bond or CDS market: As we noted in the last section, the default spread comes from either looking at the yields on bonds issued by the country in a currency where there is a default free bond yield to which it can be compared

or spreads in the CDS market.[107] With the 10-year US dollar denominated Brazilian bond that we cited as an example in the last section, the default spread would have amounted to 2.19% in January 2022: the difference between the interest rate on the Brazilian bond and a treasury bond of the same maturity. The netted CDS market spread on the same day for the default spread was 2.72%. Bekaert, Harvey, Lundblad and Siegel (2014) break down the sovereign bond default spread into four components, including global economic conditions, country-specific economic factors, sovereign bond liquidity and political risk, and find that it is the political risk component that best explain money flows into and out of the country equity markets.[108]

b. Average (Normalized) spread on bond: While we can make the argument that the default spread in the dollar denominated is a reasonable measure of the default risk in Brazil, it is also a volatile measure. In figure 7, we have graphed the yields on the dollar denominated ten-year Brazilian Bond and the U.S. ten-year treasury bond and highlighted the default spread (as the difference between the two yields) from January 2000 to January 2022. In the same figure, we also show the 10-year CDS spreads, and those spreads have not only changed over time, but they move with bond default spreads.[109]

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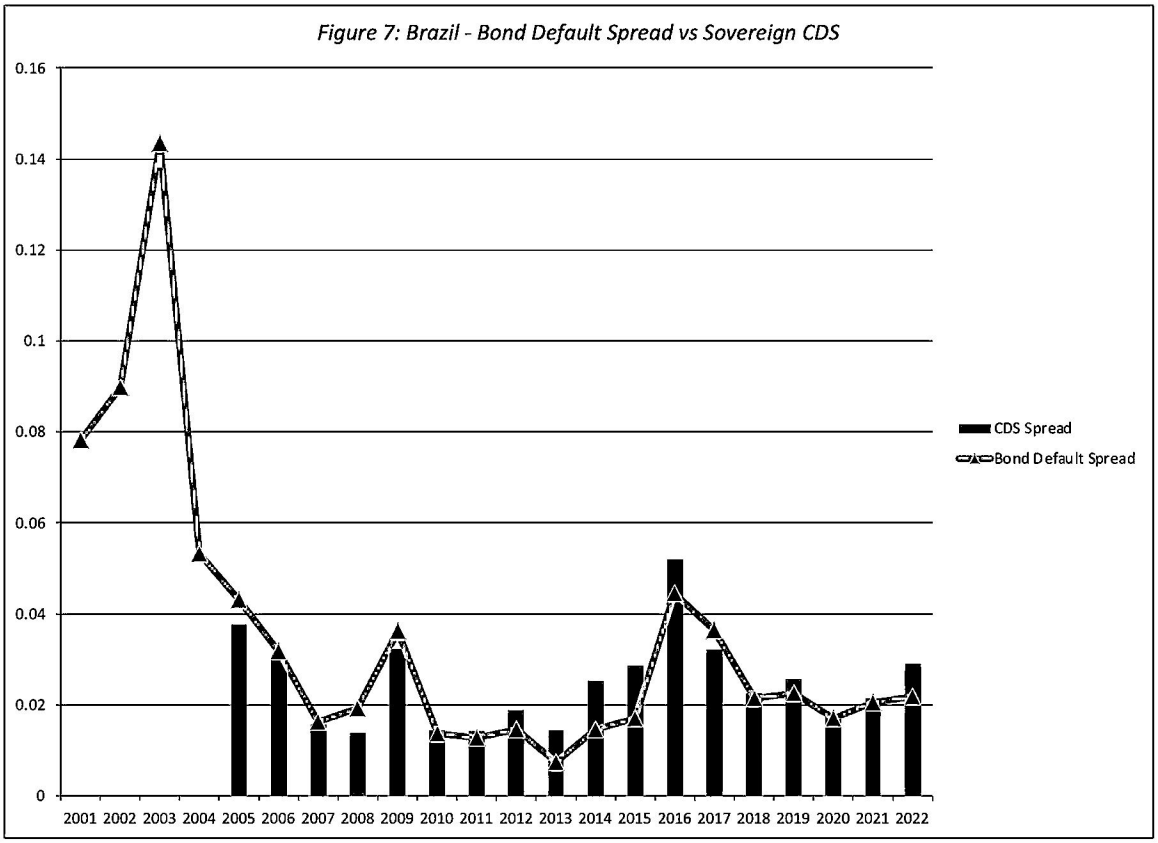
[107] You cannot compare interest rates across bonds in different currencies. The interest rate on a peso bond cannot be compared to the interest rate on a dollar denominated bond.

[108] Bekaert, G., C.R. Harvey, C.T. Lundblad and S. Siegel, 2014, *Political Risk Spreads*, Journal of International Business Studies, v45, 471-493.

[109] Data for the sovereign CDS market is available only from the last part of 2004.



Note that the bond default spread widened dramatically during 2002, mostly as a result of uncertainty in neighboring Argentina and concerns about the Brazilian presidential elections in that year.[110] After those elections, the spreads decreased just as quickly and continued on a downward trend through the middle of last year. Between 2004 and 2013, they stabilized, with a downward trend; they spiked during the market crisis in the last quarter of 2008 but then settled back into pre-crisis levels. From 2014 through 2016, the spreads widened in both markets as the country has been hit with a series of political and corporate scandals before declining again in 2017. Given this volatility, there are some who make the arguments we should consider the average spread over a period of time, rather than the default spread at the moment. If we accept this argument, the normalized default spread, using the average spreads over the last 5 years of data would be 2.07% for both the bond default spread and 2.33% for the sovereign CDS spread. Extending the normalization period to 10 years would yield 2.23% (bond default spread) or 2.69% (CDS spread). Using

[110] The polls throughout 2002 suggested that Lula Da Silva who was perceived by the market to be a leftist would beat the establishment candidate. Concerns about how he would govern roiled markets and any poll that showed him gaining would be followed by an increase in the default spread.

this approach makes sense only if the economic fundamentals of the country have not changed significantly (for the better or worse) during the period but will yield misleading values, if there have been structural shifts in the economy. In 2008, for instance, it would have made sense to use averages over time for a country like Nigeria, where oil price movements created volatility in spreads over time, but not for countries like China and India, which saw their economies expand and mature dramatically over the period or Venezuela, where government capriciousness made operating private businesses a hazardous activity (with a concurrent tripling in default spreads).

c. Imputed or Synthetic Spread: The two approaches outlined above for estimating the default spread can be used only if the country being analyzed has bonds denominated in US dollars, Euros or another currency that has a default free rate that is easily accessible. Most emerging market countries, though, do not have government bonds denominated in another currency and some do not have a sovereign rating. For the first group (that have sovereign rating but no foreign currency government bonds), there are two solutions. If we assume that countries with the similar default risk should have the same sovereign rating, we can use the typical default spread for other countries that have the same rating as the country we are analyzing, and dollar-denominated or Euro-denominated bonds outstanding. Thus, Indonesia, with a Baa2 rating, would be assigned the same default spread as Colombia, which also had a Baa2 rating in January 2022. For the second group, we are on even more tenuous grounds. Assuming that there is a country risk score from the Economist or PRS for the country, we could look for other countries that are rated and have similar scores and assign the default spreads that these countries face. For instance, we could assume that Uganda and Liberia, which fall within the same score grouping from PRS, have similar country risk; this would lead us to attach Uganda's rating of B2 to Liberia (which is not rated) and to use the same default spread (based on this rating) for both countries.

One problem that we had in obtaining the numbers for this table is that relatively few emerging markets have dollar or Euro denominated bonds outstanding. Consequently, there were some ratings classes where there was only one country with data and several ratings classes where there were none. To mitigate this problem, we used spreads from the CDS market, referenced in the earlier section. We were able to get default spreads for 77

countries, categorized by rating class, and we averaged the spreads across multiple countries in the same ratings class.[111] An alternative approach to estimating default spread is to assume that sovereign ratings are comparable to corporate ratings, i.e., a Ba1 rated country bond and a Ba1 rated corporate bond have equal default risk. In this case, we can use the default spreads on corporate bonds for different ratings classes. Table 16 summarizes the typical default spreads by sovereign rating class in January 2022, and compares it to the default spreads for similar corporate ratings.

Table 16: Default Spreads by Ratings Class – Sovereign vs. Corporate in January 2021

S&P Bond Rating	Moody's Sovereign Rating	Sovereign Default Spread	Corporate Default Spread
AAA	Aaa	0.00%	0.67%
AA+	Aa1	0.34%	0.75%
AA	Aa2	0.42%	0.82%
AA-	Aa3	0.51%	0.90%
A+	A1	0.60%	1.03%
A	A2	0.72%	1.14%
A-	A3	1.02%	1.29%
BBB+	Baa1	1.36%	1.42%
BBB	Baa2	1.62%	1.59%
BBB-	Baa3	1.87%	1.75%
BB+	Ba1	2.13%	1.93%
BB	Ba2	2.56%	2.15%
BB-	Ba3	3.06%	2.60%
B+	B1	3.83%	3.15%
B	B2	4.68%	3.78%
B-	B3	5.53%	4.62%
CCC+	Caa1	6.38%	7.05%
CCC	Caa2	7.66%	7.78%
CCC-	Caa3	8.51%	8.25%
CC+	Ca1	9.45%	8.50%
CC	Ca2	10.21%	8.80%
CC-	Ca3	11.20%	9.35%

[111] There were thirteen Baa2 rated countries, with ten-year CDS spreads, in January 2016. The average spread a these countries is 2.11%.

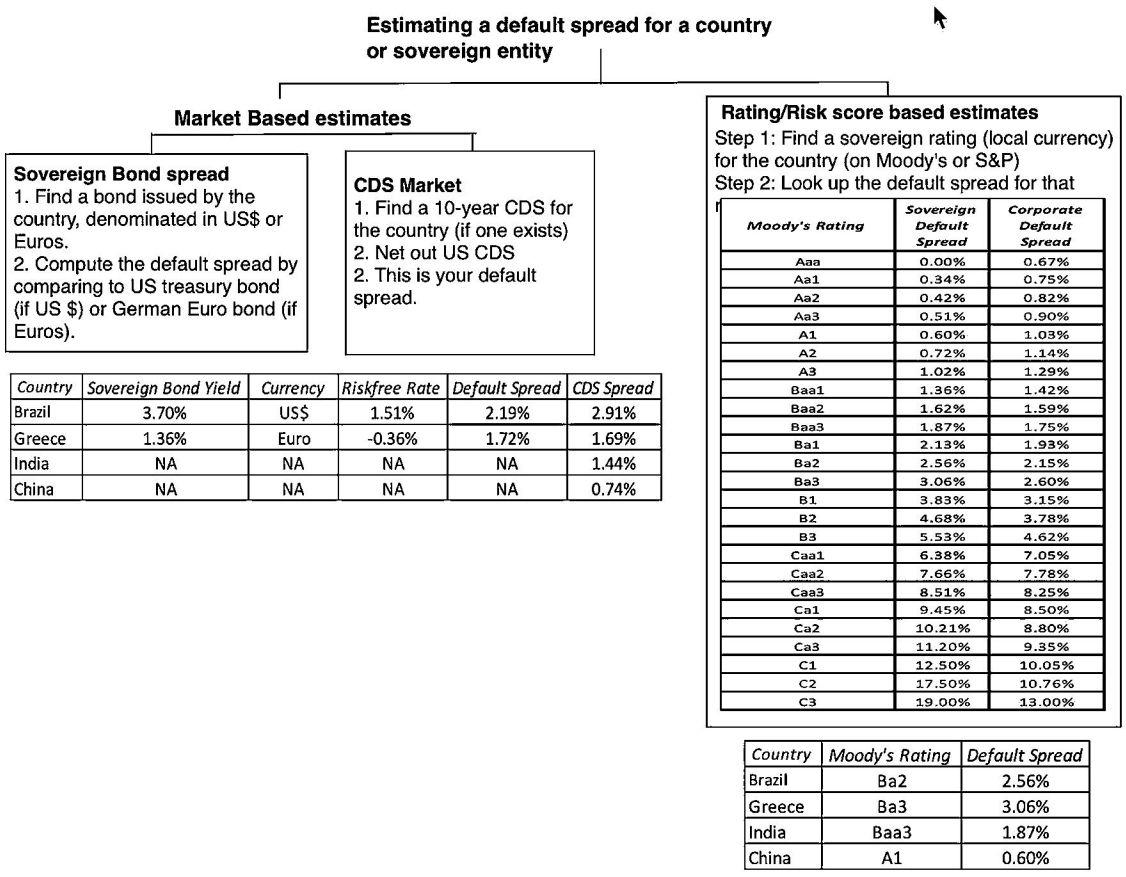
C+	C1	12.50%	10.05%
C	C2	17.50%	10.76%
C-	C3	19.00%	13.00%

Source: FRED (Federal Reserve, St. Louis) and Bloomberg

Note that the corporate bond spreads, at least in January 2022, were slightly larger than the sovereign spreads for the higher ratings classes and were lower at the higher ratings. Using this approach to estimate default spreads for Brazil, with its rating of Ba2 would result in a spread of 2.56% (2.15%), if we use sovereign spreads (corporate spreads).

Figure 8 depicts the alternative approaches to estimating default spreads for four countries, Brazil, China, India, and Russia, in early 2022:

Figure 8: Approaches for estimating Sovereign Default Spreads



Country	Sovereign Bond Yield	Currency	Riskfree Rate	Default Spread	CDS Spread
Brazil	3.70%	US$	1.51%	2.19%	2.91%
Greece	1.36%	Euro	-0.36%	1.72%	1.69%
India	NA	NA	NA	NA	1.44%
China	NA	NA	NA	NA	0.74%

Moody's Rating	Sovereign Default Spread	Corporate Default Spread
Aaa	0.00%	0.67%
Aa1	0.34%	0.75%
Aa2	0.42%	0.82%
Aa3	0.51%	0.90%
A1	0.60%	1.03%
A2	0.72%	1.14%
A3	1.02%	1.29%
Baa1	1.36%	1.42%
Baa2	1.62%	1.59%
Baa3	1.87%	1.75%
Ba1	2.13%	1.93%
Ba2	2.56%	2.15%
Ba3	3.06%	2.60%
B1	3.83%	3.15%
B2	4.68%	3.78%
B3	5.53%	4.62%
Caa1	6.38%	7.05%
Caa2	7.66%	7.78%
Caa3	8.51%	8.25%
Ca1	9.45%	8.50%
Ca2	10.21%	8.80%
Ca3	11.20%	9.35%
C1	12.50%	10.05%
C2	17.50%	10.76%
C3	19.00%	13.00%

Country	Moody's Rating	Default Spread
Brazil	Ba2	2.56%
Greece	Ba3	3.06%
India	Baa3	1.87%
China	A1	0.60%

With some countries, without US-dollar (or Euro) denominated sovereign bonds or CDS spreads, you don't have a choice since the only estimate of the default spread comes from the sovereign rating. With other countries, such as Brazil, you have multiple estimates of the default spreads: 2.05% from the dollar denominated bond, 2.15% from the CDS spread,

1.92% from the netted CDS spread and 2.65% from the sovereign rating look up table (table 16). When this occurs, you have to choose between the "updated but noisy" market numbers and the "stable but stagnant" rating-based spread.

Analysts who use default spreads as measures of country risk typically add them on to both the cost of equity and debt of every company traded in that country. Thus, the cost of equity for an Indian company, estimated in U.S. dollars, will be 1.87% higher than the cost of equity of an otherwise similar U.S. company, using the January 2022 measure of the default spread, based upon the rating. In some cases, analysts add the default spread to the U.S. risk premium and multiply it by the beta. This increases the cost of equity for high beta companies and lowers them for low beta firms.[112]

While many analysts use default spreads as proxies for country risk, the evidence for its use is still thin. Abuaf (2011) examines ADRs from ten emerging markets and relates the returns on these ADRs to returns on the S&P 500 (which yields a conventional beta) and to the CDS spreads for the countries of incorporation. He finds that ADR returns as well as multiples (such as PE ratios) are correlated with movement in the CDS spreads over time and argues for the addition of the CDS spread (or some multiple of it) to the costs of equity and capital to incorporate country risk.[113]

2. Relative Equity Market Standard Deviations

There are some analysts who believe that the equity risk premiums of markets should reflect the differences in equity risk, as measured by the volatilities of these markets. A conventional measure of equity risk is the standard deviation in stock prices; higher standard deviations are generally associated with more risk. If you scale the standard deviation of one market against another, you obtain a measure of relative risk. For instance, the relative standard deviation for country X (against the US) would be computed as follows:

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[112] In a companion paper, I argue for a separate measure of company exposure to country risk called lambda that is scaled around one (just like beta) that is multiplied by the country risk premium to estimate the cost of equity. See Damodaran, A., 2007, Measuring Company Risk Exposure to Country Risk, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=889388.

[113] Abuaf, N., 2011, *Valuing Emerging Market Equities – The Empirical Evidence*, Journal of Applied Finance, v21, 123-138.

$$\text{Relative Standard Deviation}_{\text{Country X}} = \frac{\text{Standard Deviation}_{\text{Country X}}}{\text{Standard Deviation}_{\text{US}}}$$

If we assume a linear relationship between equity risk premiums and equity market standard deviations, and we assume that the risk premium for the US can be computed (using historical data, for instance) the equity risk premium for country X follows:

$$\text{Equity risk premium}_{\text{Country X}} = \text{Risk Premum}_{\text{US}} * \text{Relative Standard Deviation}_{\text{Country X}}$$

Assume, for the moment, that you are using an equity risk premium for the United States of 4.24%. The annualized standard deviation in the S&P 500 in the 260 trading days leading into January 2022, using daily returns, was 13.18%, whereas the standard deviation in the Bovespa (the Brazilian equity index) over the same period was 21.18%.[114] Using these values, the estimate of a total risk premium for Brazil would be as follows.

$$\text{Equity Risk Premium}_{Brazil} = 4.24\% * \frac{21.18\%}{13.18\%} = 6.81\%$$

The country risk premium for Brazil can be isolated as follows:

$$\text{Country Risk Premium}_{Brazil} = 6.81\% - 4.24\% = 2.57\%$$

Table 17 lists country volatility numbers for some of the Latin American markets and the resulting total and country risk premiums for these markets, based on the assumption that the equity risk premium for the United States is 4.24%. Appendix 4 contains a more complete list of emerging markets, with equity risk premiums and country risk premiums estimated for each.

Table 17: Equity Market Volatilities and Risk Premiums (Daily Returns in 2022): Latin American Countries, relative to US

Country	*Std Deviation-Equities*	*Relative Volatility (to US)*	*ERP based on Relative Volatility*	*Country Risk Premium*
Argentina	31.67%	2.40	10.19%	5.95%
Brazil	21.18%	1.61	6.81%	2.57%
Chile	24.80%	1.88	7.98%	3.74%
Colombia	18.42%	1.40	5.93%	1.69%

[114] If the dependence on historical volatility is troubling, the options market can be used to get implied volatilities for both the US market (14.16%) and for the Bovespa (24.03%).

Costa Rica	5.15%	0.39	1.66%	-2.58%
Mexico	25.12%	1.91	8.08%	3.84%
Panama	4.46%	0.34	1.43%	-2.81%
Peru	25.51%	1.94	8.21%	3.97%
US	13.18%	1.00	4.24%	0.00%
Venezuela	41.63%	3.16	13.39%	9.15%

While this approach has intuitive appeal, there are problems with using standard deviations computed in markets with widely different market structures and liquidity. Since equity market volatility is affected by liquidity, with more liquid markets often showing higher volatility, this approach will understate premiums for illiquid markets and overstate the premiums for liquid markets. For instance, the standard deviations for Panama and Costa Rica are lower than the standard deviation in the S&P 500, leading to equity risk premiums for those countries that are lower than the US. The second problem is related to currencies since the standard deviations are usually measured in local currency terms; the standard deviation in the U.S. market is a dollar standard deviation, whereas the standard deviation in the Brazilian market is based on nominal Brazilian Real returns. This is a relatively simple problem to fix, though, since the standard deviations can be measured in the same currency – you could estimate the standard deviation in dollar returns for the Brazilian market.

3. Default Spreads + Relative Standard Deviations

In the first approach to computing equity risk premiums, we assumed that the default spreads (actual or implied) for the country were good measures of the additional risk we face when investing in equity in that country. In the second approach, we argued that the information in equity market volatility can be used to compute the country risk premium. In the third approach, we will meld the first two, and try to use the information in both the country default spread and the equity market volatility.

The country default spreads provide an important first step in measuring country equity risk, but still only measure the premium for default risk. Intuitively, we would expect the country equity risk premium to be larger than the country default risk spread. To address the issue of how much higher, we look at the volatility of the equity market in a country

relative to the volatility of the bond market used to estimate the spread. This yields the following estimate for the country equity risk premium.

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

To illustrate, consider again the case of Brazil. As noted earlier, the default spread for Brazil in January 2022, based upon its sovereign rating, was 2.56%. We computed annualized standard deviations, using 260 daily returns, in both the equity market and the government bond, in January 2022. The annualized standard deviation in the Brazilian dollar denominated ten-year bond was 14.27%, lower than the standard deviation in the Brazilian equity index of 21.18 %. The resulting country equity risk premium for Brazil is as follows:

$$\text{Brazil Country Risk Premium} = 2.56\% * \frac{21.18\%}{14.27\%} = 3.80\%$$

Unlike the equity standard deviation approach, this premium is in addition to a mature market equity risk premium. Thus, assuming a 4.24% mature market premium, we would compute a total equity risk premium for Brazil of 8.04%:

Brazil's Total Equity Risk Premium = 4.24% + 3.80% = 8.04%

Note that this country risk premium will increase if the country rating drops or if the relative volatility of the equity market increases.

Why should equity risk premiums have any relationship to country bond spreads? A simple explanation is that an investor who can make 2.56% risk premium on a dollar-denominated Brazilian government bond would not settle for an additional risk premium of 2.56% (in dollar terms) on Brazilian equity. Playing devil's advocate, however, a critic could argue that the interest rate on a country bond, from which default spreads are extracted, is not really an expected return since it is based upon the promised cash flows (coupon and principal) on the bond rather than the expected cash flows. In fact, if we wanted to estimate a risk premium for bonds, we would need to estimate the expected return based upon expected cash flows, allowing for the default risk. This would result in a lower default spread and equity risk premium. Both this approach and the last one use the standard deviation in equity of a market to make a judgment about country risk premium, but they measure it relative to different bases. This approach uses the country

bond as a base, whereas the previous one uses the standard deviation in the U.S. market. This approach assumes that investors are more likely to choose between Brazilian bonds and Brazilian equity, whereas the previous approach assumes that the choice is across equity markets.

There are three potential measurement problems with using this approach. The first is that the relative standard deviation of equity is a volatile number, both across countries and across time. The second is that computing the relative volatility requires us to estimate volatility in the government bond, which, in turn, presupposes that long-term government bonds not only exist but are also traded.[115] The third is that even if an emerging market meet the conditions of having a government bond that is traded, the trading is often so light that the standard deviation is too low (and the relative volatility value is too high). To illustrate the volatility in this number, note the range of values in the estimates of relative volatility at the start of 2021 in table 18.

Table 18: Relative Equity Market Volatility – Government Bonds and CDS

	$\sigma_{Equity} / \sigma_{Bond}$	$\sigma_{Equity} / \sigma_{CDS}$
Number of countries with data	28	47
Average	1.81	1.35
Median	1.48	1.03

Note that there were only 28 markets where volatility estimates on government bonds were available, and even in those markets, the relative volatility measure ranged from a high of 5.42 to a low of 0.45. In many the markets where volatility measures are available, the government bond is so thinly traded to make it an unreliable value. There is some promise in the sovereign CDS market, both because you have more countries where you have traded CDS, but also because it is a more volatile market. In fact, the relative volatility measure there has a median value barely above one, but the range in relative equity volatility values is even higher.

The problems associated with computing country-specific government bond or sovereign CDS volatility are increasingly overwhelming its intuitive appeal and it is worth

[115] One indication that the government bond is not heavily traded is an abnormally low standard deviation on the bond yield.

looking at two alternatives.[116] One is to revert to the first approach of using the default spreads as country risk premiums. The other is to compare the standard deviation of an emerging market equity index and that of an emerging market government bond index and to use this use this ratio as the scaling variable for all emerging market default spreads. While there will be some loss of information at the country level, the use of indices should allow for aggregation across multiple countries and perhaps give a more reliable and stable measure of relative risk in equity markets. To this end, we computed the standard deviations in the S&P BMI Emerging Market Index (for equity) and the Bank of America Merrill Lynch Emerging Market Public Sector Bond Index (for sovereign debt) as of January 1, 2022, and computed a relative equity market volatility of 1.16:

$$\text{Relative Equity Volatility}_{EM} = \frac{Standard\ Deviation\ of\ S\&P\ BMI\ Emerging\ Markets}{Standard\ Deviation\ of\ BAML\ Emerging\ Market\ Public\ Bonds}$$

$$= 19.11\%/\ 16.44\% = 1.16$$

Applying this multiple to each country's default spread, you can estimate a country risk premium for that country, which when added on to the base premium for a mature market should yield an equity risk premium for that country. In fact, with this multiple applied to Brazil's default spread of 2.56% in January 2022, you would have obtained a country risk premium of 2.97% for Brazil and a total equity risk premium of 7.21% (using 4.24% as the estimate for a mature market premium).

Country Risk Premium for Brazil = 2.56% *1.16 = 2.97%

Equity Risk Premium for Brazil = 4.24% + 2.97% = 7.21%

Choosing between the approaches

It is ironic that as investors and companies go global, our approaches for dealing with country risk remain unpolished. Each of the approaches described in this section come with perils and can yield very different values. Table 19 summarizes the estimates of country risk and total equity risk premiums, using the three approaches, with sub-variants, for Brazil in January 2022:

Table 19: Country and Total Equity Risk Premium: Brazil in January 2021

Approach	*ERP*	*CRP*

[116] Thanks are due to the Value Analysis team at Temasek, whose detailed and focused work on the imprecision of government bond volatility finally led to this break.

Rating-based Default Spread	6.80%	2.56%
$-Bond based Default Spread	6.43%	2.19%
CDS-based Default Spread	7.15%	2.91%
Relative Equity Market Volatility	6.81%	2.57%
Default Spread, scaled for equity risk with Brazil Govt Bond	8.04%	3.80%
Default Spread, scaled for equity risk with EM multiple	7.21%	2.97%

The default-spread based approaches yield similar equity risk premiums, but the approaches that scale standard deviations (to either equity or the government bond) yield much higher values. With all the approaches, just as companies mature and become less risky over time, countries can mature and become less risky as well and it is reasonable to assume that country risk premiums decrease over time, especially for risky and rapidly evolving markets. One way to adjust country risk premiums over time is to begin with the premium that emerges from the melded approach and to adjust this premium down towards either the country bond default spread or even a regional average. Thus, the equity risk premium will converge to the country bond default spread as we look at longer term expected returns. As an illustration, the country risk premium for Brazil would be 2.97% for the next year but decline over time to 2.56% (country default spread) or perhaps even lower, depending upon your assessment of how Brazil's economy will evolve over time.

Implied Equity Premiums

The problem with any historical premium approach, even with substantial modifications, is that it is backward looking. Given that our objective is to estimate an updated, forward-looking premium, it seems foolhardy to put your faith in mean reversion and past data. In this section, we will consider three approaches for estimating equity risk premiums that are more forward looking.

1. DCF Model Based Premiums

When investors price assets, they are implicitly telling you what they require as an expected return on that asset. Thus, if an asset has expected cash flows of $15 a year in perpetuity, and an investor pays $75 for that asset, he is announcing to the world that his required rate of return on that asset is 20% (15/75). In this section, we expand on this

intuition and argue that the current market prices for equity, in conjunction with expected cash flows, should yield an estimate on the equity risk premium.

A Stable Growth DDM Premium

It is easiest to illustrated implied equity premiums with a dividend discount model (DDM). In the DDM, the value of equity is the present value of expected dividends from the investment. In the special case where dividends are assumed to grow at a constant rate forever, we get the classic stable growth (Gordon) model:

$$\text{Value of equity} = \frac{\text{Expected Dividends Next Period}}{(\text{Required Return on Equity} - \text{Expected Growth Rate})}$$

This is essentially the present value of dividends growing at a constant rate. Three of the four inputs in this model can be obtained or estimated - the current level of the market (value), the expected dividends next period and the expected growth rate in earnings and dividends in the long term. The only "unknown" is then the required return on equity; when we solve for it, we get an implied expected return on stocks. Subtracting out the riskfree rate will yield an implied equity risk premium.

To illustrate, assume that the current level of the S&P 500 Index is 900, the expected dividend yield on the index is 2% and the expected growth rate in earnings and dividends in the long term is 7%. Solving for the required return on equity yields the following:

$$900 = (.02*900) /(r - .07)$$

Solving for r,

$$r = (18+63)/900 = 9\%$$

If the current riskfree rate is 6%, this will yield a premium of 3%.

In fact, if we accept the stable growth dividend discount model as the base model for valuing equities and assume that the expected growth rate in dividends should equate to the riskfree rate in the long term, the dividend yield on equities becomes a measure of the equity risk premium:

$$\text{Value of equity} = \frac{\text{Expected Dividends Next Period}}{(\text{Required Return on Equity} - \text{Expected Growth Rate})}$$

Dividends/ Value of Equity = Required Return on Equity – Expected Growth rate

Dividend Yield = Required Return on Equity – Riskfree rate
= Equity Risk Premium

Rozeff (1984) made this argument[117] and empirical support has been claimed for dividend yields as predictors of future returns in many studies since.[118] Note that this simple equation will break down if (a) companies do not pay out what they can afford to in dividends, i.e., they hold back cash or (b) if earnings are expected to grow at extraordinary rates for the short term.

There is another variant of this model that can be used, where we focus on earnings instead of dividends. To make this transition, though, we have to state the expected growth rate as a function of the payout ratio and return on equity (ROE) :[119]

Growth rate = (1 – Dividends/ Earnings) (Return on equity)
= (1 – Payout ratio) (ROE)

Substituting back into the stable growth model,

$$\text{Value of equity} = \frac{\text{Expected Earnings Next Period (Payout ratio)}}{\text{(Required Return on Equity - (1-Payout ratio) (ROE))}}$$

If we assume that the return on equity (ROE) is equal to the required return on equity (cost of equity), i.e., that the firm does not earn excess returns, this equation simplifies as follows:

$$\text{Value of equity} = \frac{\text{Expected Earnings Next Period}}{\text{Required Return on Equity}}$$

In this case, the required return on equity can be written as:

$$\text{Required return on equity} = \frac{\text{Expected Earnings Next Period}}{\text{Value of Equity}}$$

In effect, the inverse of the PE ratio (also referenced as the earnings yield) becomes the required return on equity, if firms are in stable growth and earning no excess returns. Subtracting out the riskfree rate should yield an implied premium:

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[117] Rozeff, M. S. 1984. *Dividend yields are equity risk premiums*, Journal of Portfolio Management, v11, 68-75.

[118] Fama, E. F., and K. R. French. 1988. *Dividend yields and expected stock returns*. Journal of Financial Economics, v22, 3-25.

[119] This equation for sustainable growth is discussed more fully in Damodaran, A., 2002, Investment Valuation, John Wiley and Sons.

Implied premium (EP approach) = Earnings Yield on index – Riskfree rate

In January 2022, the first of these approaches would have delivered a very low equity risk premium for the US market.

Dividend Yield = 1.24%

The second approach of netting the earnings yield against the risk free rate would have generated a more plausible number[120]:

Earnings Yield = 4.33%:

Implied premium = Earnings yield – 10-year US Treasury Bond rate

= 4.33% - 1.51% = 2.82%

Both approaches, though, draw on the dividend discount model and make strong assumptions about firms being in stable growth and/or long-term excess returns. In recent work, Shiller has adapted his widely used CAPE ratio to reflect an implied equity risk premium, by inverting the CAPE and netting out a real risk free rate from it.[121]

A Generalized Model: Implied Equity Risk Premium

To expand the model to fit more general specifications, we would make the following changes: Instead of looking at the actual dividends paid as the only cash flow to equity, we would consider potential dividends instead of actual dividends. In my earlier work (2002, 2006), the free cash flow to equity (FCFE), i.e, the cash flow left over after taxes, reinvestment needs and debt repayments, was offered as a measure of potential dividends.[122] Over the last decade, for instance, firms have paid out only about half their FCFE as dividends. If this poses too much of an estimation challenge, there is a simpler alternative. Firms that hold back cash build up large cash balances that they use over time to fund stock buybacks. Adding stock buybacks to aggregate dividends paid should give us a better measure of total cash flows to equity. The model can also be expanded to allow for a high growth phase, where aggregate earnings and dividends can grow at rates that are

[120] The earnings yield in January 2021 is estimated by dividing the aggregated earnings for the index by the index level.

[121] The CAPE is computed using average earnings over ten years and adjusting these earnings for inflation. To be honest, this modified version seems like a belated and incomplete attempt to fix the CAPE, as a market timing tool.

[122] Damodaran, A., 2002, *Investment Valuation*, John Wiley and Sons; Damodaran, A., 2006, *Damodaran on Valuation*, John Wiley and Sons.

very different (usually higher, but not always) than stable growth values. With these changes, the value of equity can be written as follows:

$$\text{Value of Equity} = \sum_{t=1}^{t=N} \frac{E(FCFE_t)}{(1+k_e)^t} + \frac{E(FCFE_{N+1})}{(k_e - g_N)(1+k_e)^N}$$

In this equation, there are N years of high growth, $E(FCFE_t)$ is the expected free cash flow to equity (potential dividend) in year t, k_e is the rate of return expected by equity investors and g_N is the stable growth rate (after year N). We can solve for the rate of return equity investors need, given the expected potential dividends and prices today. Subtracting out the riskfree rate should generate a more realistic equity risk premium.

In a variant of this approach, the implied equity risk premium can be computed from excess return or residual earnings models. In these models, the value of equity today can be written as the sum of capital invested in assets in place and the present value of future excess returns:[123]

$$\text{Value of Equity} = \text{Book Equity today} + \sum_{t=1}^{t=\infty} \frac{\text{Net Income}_t - k_e(\text{Book Equity}_{t-1})}{(1+k_e)^t}$$

If we can make estimates of the book equity and net income in future periods, we can then solve for the cost of equity and use that number to back into an implied equity risk premium. Claus and Thomas (2001) use this approach, in conjunction with analyst forecasts of earnings growth, to estimate implied equity risk premiums of about 3% for the market in 2000.[124] Easton (2007) provides a summary of possible limitations of models that attempt to extract costs of equity from accounting data including the unreliability of book value numbers and the use of optimistic estimates of growth from analysts.[125]

Implied Equity Risk Premium: S&P 500

Given its long history and wide following, the S&P 500 is a logical index to use to try out the implied equity risk premium measure. In this section, we will begin by

[123] For more on excess return models, see Damodaran, A, 2006, *Valuation Approaches and Metrics: A Survey of the Theory and Evidence*, Working Paper, www.damodaran.com.

[124] Claus, J. and J. Thomas, 2001,'*Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets*, Journal of Finance 56(5), 1629–1666.

[125] Easton, P., 2007, *Estimating the cost of equity using market prices and accounting data*, Foundations and Trends in Accounting, v2, 241-364.

estimating implied equity risk premiums at the start of the years 2008 to 2021, and follow up by looking at the volatility in that estimate over time.

Implied Equity Risk Premiums: Annual Estimates from 2008 to 2021 (Start of each year)

On December 31, 2007, the S&P 500 Index closed at 1468.36, and the dividend yield on the index was roughly 1.89%. In addition, the consensus estimate of growth in earnings for companies in the index was approximately 5% for the next 5 years.[126] Since this is not a growth rate that can be sustained forever, we employ a two-stage valuation model, where we allow growth to continue at 5% for 5 years, and then lower the growth rate to 4.02% (the riskfree rate) after that.[127] Table 20 summarizes the expected dividends for the next 5 years of high growth, and for the first year of stable growth thereafter:

Table 20: Estimated Dividends on the S&P 500 Index – January 1, 2008

Year	*Dividends on Index*
1	29.12
2	30.57
3	32.10
4	33.71
5	35.39
6	36.81

[a]Dividends in the first year = 1.89% of 1468.36 (1.05)

If we assume that these are reasonable estimates of the expected dividends and that the index is correctly priced, the value can be written as follows:

$$1468.36 = \frac{29.12}{(1+r)} + \frac{30.57}{(1+r)^2} + \frac{32.10}{(1+r)^3} + \frac{33.71}{(1+r)^4} + \frac{35.39}{(1+r)^5} + \frac{36.81}{(r-.0402)(1+r)^5}$$

Note that the last term in the equation is the terminal value of the index, based upon the stable growth rate of 4.02%, discounted back to the present. Solving for required return in this equation yields us a value of 6.04%. Subtracting out the ten-year treasury bond rate (the riskfree rate) yields an implied equity premium of 2.02%.

The focus on dividends may be understating the premium, since the companies in the index have bought back substantial amounts of their own stock over the last few years.

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[126] We used the average of the analyst estimates for individual firms (bottom-up). Alternatively, we could have used the top-down estimate for the S&P 500 earnings.

[127] The treasury bond rate is the sum of expected inflation and the expected real rate. If we assume that real growth is equal to the real interest rate, the long term stable growth rate should be equal to the treasury bond rate.

In 2007, for instance, firms collectively returned more than twice as much in the form of buybacks than they paid out in dividends. Since buybacks are volatile over time, and 2007 may represent a high-water mark for the phenomenon, we recomputed the expected cash flows, in table 21, for the next 6 years using the average total yield (dividends + buybacks) of 4.11%, instead of the actual dividends, and the growth rates estimated earlier (5% for the next 5 years, 4.02% thereafter):

Table 21: Cashflows on S&P 500 Index

Year	*Dividends+ Buybacks on Index*
1	63.37
2	66.54
3	69.86
4	73.36
5	77.02

Using these cash flows to compute the expected return on stocks, we derive the following:

$$1468.36 = \frac{63.37}{(1+r)} + \frac{66.54}{(1+r)^2} + \frac{69.86}{(1+r)^3} + \frac{73.36}{(1+r)^4} + \frac{77.02}{(1+r)^5} + \frac{77.02(1.0402)}{(r-.0402)(1+r)^5}$$

Solving for the required return and the implied premium with the higher cash flows:

Required Return on Equity = 8.39%

Implied Equity Risk Premium = Required Return on Equity - Riskfree Rate

= 8.48% - 4.02% = 4.46%

This value (4.46%) would have been our estimate of the equity risk premium on January 1, 2008.

During 2008, the S&P 500 lost just over a third of its value and ended the year at 903.25 and the treasury bond rate plummeted to close at 2.21% on December 31, 2008. Firms also pulled back on stock buybacks and financial service firms in particular cut dividends during the year. The inputs to the equity risk premium computation reflect these changes:

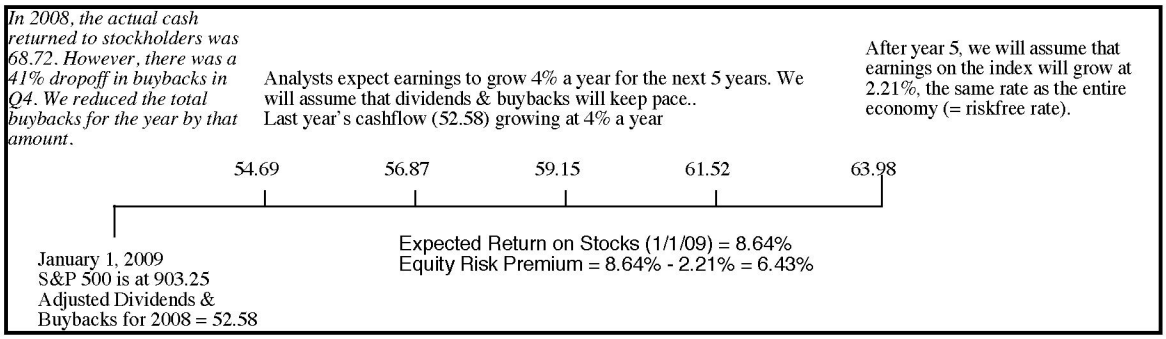
Level of the index = 903.25 (Down from 1468.36)

Treasury bond rate = 2.21% (Down from 4.02%)

Updated dividends and buybacks on the index = 52.58 (Down about 15%)

Expected growth rate = 4% for next 5 years (analyst estimates) and 2.21% thereafter (set equal to riskfree rate).

The computation is summarized below:



The resulting equation is below:

$$903.25 = \frac{54.69}{(1+r)} + \frac{56.87}{(1+r)^2} + \frac{59.15}{(1+r)^3} + \frac{61.52}{(1+r)^4} + \frac{63.98}{(1+r)^5} + \frac{63.98(1.0221)}{(r-.0221)(1+r)^5}$$

Solving for the required return and the implied premium with the higher cash flows:

Required Return on Equity = 8.64%

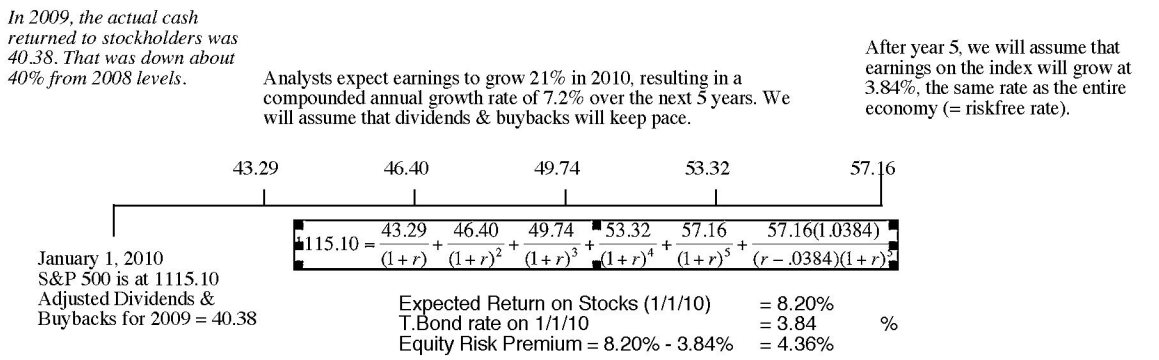
Implied Equity Risk Premium = Required Return on Equity - Riskfree Rate

= 8.64% - 2.21% = 6.43%

The implied premium rose more than 2%, from 4.37% to 6.43%, over the course of the year, indicating that investors perceived more risk in equities at the end of the year, than they did at the start and were demanding a higher premium to compensate.

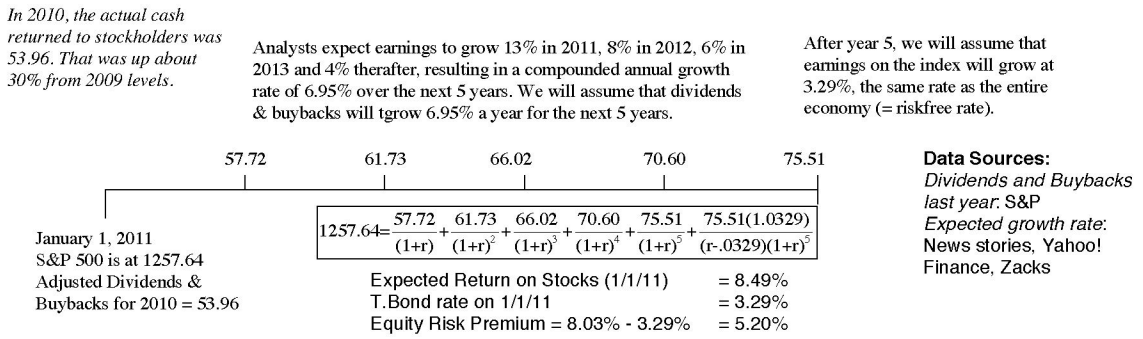
By January 2010, the fears of a banking crisis had subsided and the S&P 500 had recovered to 1115.10. However, a combination of dividend cuts and a decline in stock buybacks had combined to put the cash flows on the index down to 40.38 in 2009. That was partially offset by increasing optimism about an economic recovery and expected earnings growth for the next 5 years had bounced back to 7.2%.[128] The resulting equity risk premium is 4.36%:

[128] The expected earnings growth for just 2010 was 21%, primarily driven by earnings bouncing back to pre-crisis levels, followed by a more normal 4% earnings growth in the following years. The compounded average growth rate is $((1.21)(1.04)^4)^{1/5}-1 = .072$ or 7.2%.



In effect, equity risk premiums have reverted back to what they were before the 2008 crisis.

Updating the numbers to January 2011, the S&P 500 had climbed to 1257.64, but cash flows on the index, in the form of dividends and buybacks, made an even more impressive comeback, increasing to 53.96 from the depressed 2009 levels. The implied equity risk premium computation is summarized below:



The implied equity risk premium climbed to 5.20%, with the higher cash flows more than offsetting the rise in equity prices.

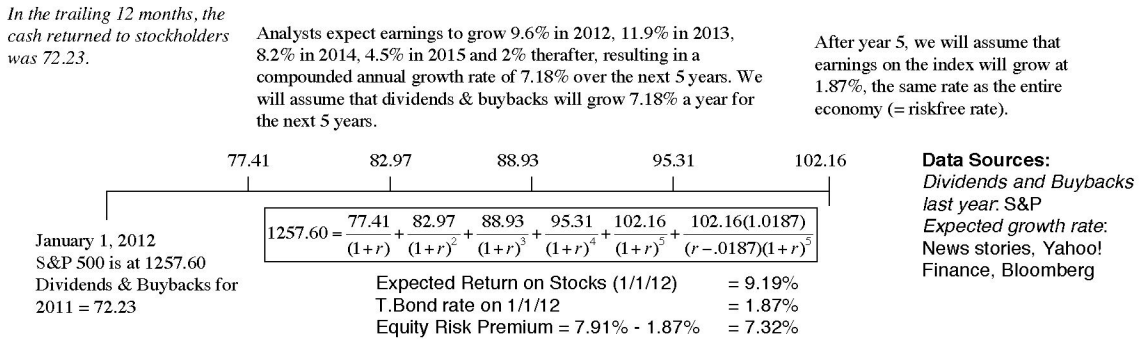
The S&P 500 ended 2011 at 1257.60, almost unchanged from the level at the start of the year. The other inputs into the implied equity risk premium equation changed significantly over the year:

a. The ten-year treasury bond rate dropped during the course of the year from 3.29% to 1.87%, as the European debt crisis caused a "flight to safety". The US did lose its AAA rating with Standard and Poor's during the course of the year, but we will continue to assume that the T.Bond rate is risk free.
b. Companies that had cut back dividends and scaled back stock buybacks in 2009, after the crisis, and only tentatively returned to the fray in 2010, returned to buying

back stocks at almost pre-crisis levels. The total dividends and buybacks for the trailing 12 months leading into January 2012 climbed to 72.23, a significant increase over the previous year.[129]

c. Analysts continued to be optimistic about earnings growth, in the face of signs of a pickup in the US economy, forecasting growth rate of 9.6% for 2012 (year 1), 11.9% in 2013, 8.2% in 2014, 4% in 2015 and 2.5% in 2016, leading to a compounded annual growth rate of 7.18% a year.

Incorporating these inputs into the implied equity risk premium computation, we get an expected return on stocks of 9.29% and an implied equity risk premium of 7.32%:



Since the index level did not change over the course of the year, the jump in the equity risk premium from 5.20% on January 1, 2011 to 7.32% on January 1, 2012, was precipitated by two factors. The first was the drop in the ten-year treasury bond rate to a historic low of 1.87% and the second was the surge in the cash returned to stockholders, primarily in buybacks. With the experiences of the last decade fresh in our minds, we considered the possibility that the cash returned during the trailing 12 months may reflect cash that had built up during the prior two years, when firms were in their defensive posture. If that were the case, it is likely that buybacks will decline to a more normalized value in future years. To estimate this value, we looked at the total cash yield on the S&P 500 from 2002 to 2011 and computed an average value of 4.69% over the decade in table 22.

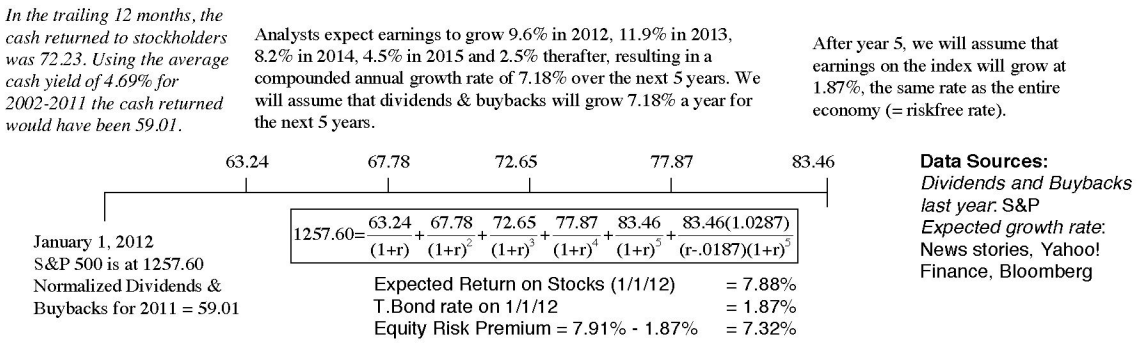
Table 22: Dividends and Buybacks on S&P 500 Index: 2002-2011

Year	Dividend Yield	Buybacks/Index	Yield

[129] These represented dividends and stock buybacks from October 1, 2010 to September 30, 2011, based upon the update from S&P on December 22, 2011. The data for the last quarter is not made available until late March of the following year.

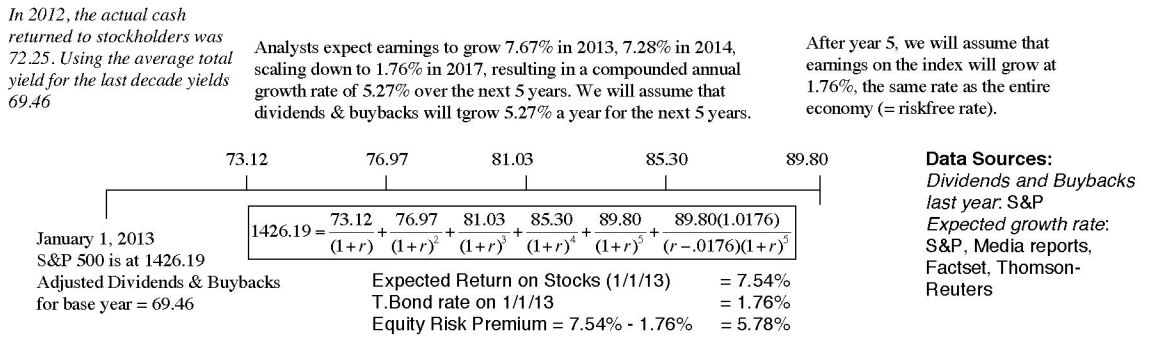
2002	1.81%	1.58%	3.39%
2003	1.61%	1.23%	2.84%
2004	1.57%	1.78%	3.35%
2005	1.79%	3.11%	4.90%
2006	1.77%	3.39%	5.16%
2007	1.92%	4.58%	6.49%
2008	3.15%	4.33%	7.47%
2009	1.97%	1.39%	3.36%
2010	1.80%	2.61%	4.42%
2011	2.00%	3.53%	5.54%
Average: Last 10 years =			4.69%

Assuming that the cash returned would revert to this yield provides us with a lower estimate of the cash flow (4.69% of 1257.60= 59.01) and an equity risk premium of 6.01%:



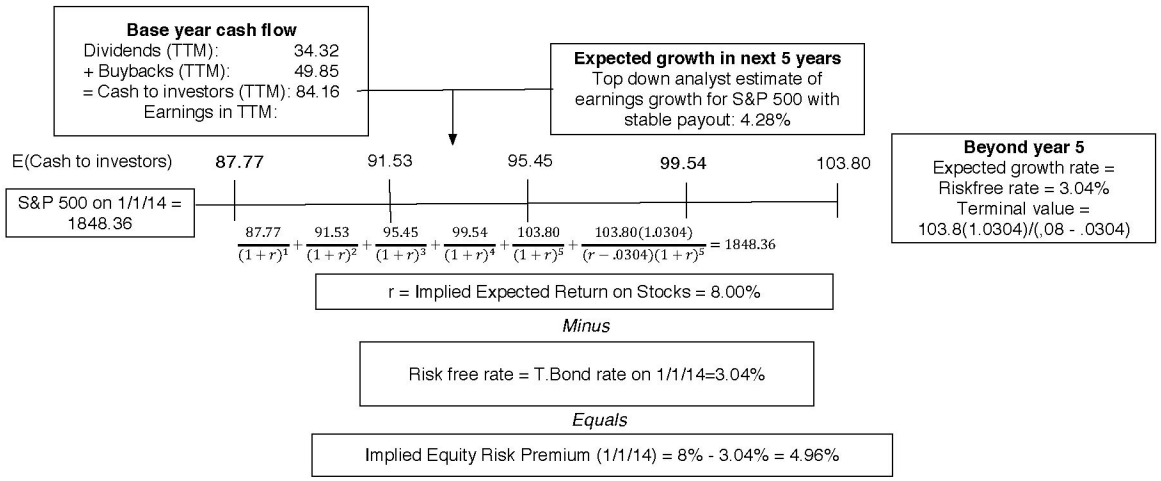
So, did the equity risk premium for the S&P 500 jump from 5.20% to 7.32%, as suggested by the raw cash yield, or from 5.20% to 6.01%, based upon the normalized yield? We would be more inclined to go with the latter, especially since the index remained unchanged over the year. Note, though, that if the cash returned by firms does not drop back in the next few quarters, we will revisit the assumption of normalization and the resulting lower equity risk premium.

By January 1, 2013, the S&P 500 climbed to 1426.19 and the treasury bond rate had dropped to 1.76%. The dividends and buybacks were almost identical to the prior year and the smoothed out cash returned (using the average yield over the prior 10 years) climbed to 69.46. Incorporating the lower growth expectations leading into 2013, the implied equity risk premium dropped to 5.78% on January 1, 2013:

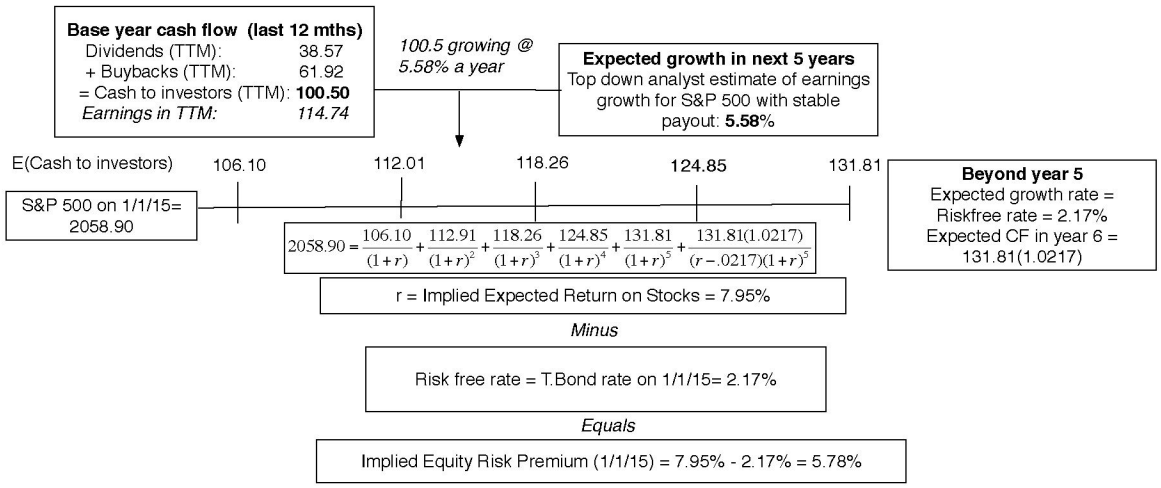


Note that the chasm between the trailing 12-month cash flow premium and the smoother cash yield premium that had opened up at the start of 2012 had narrowed. The trailing 12-month cash flow premium was 6%, just 0.22% higher than the 5.78% premium obtained with the smoothed out cash flow.

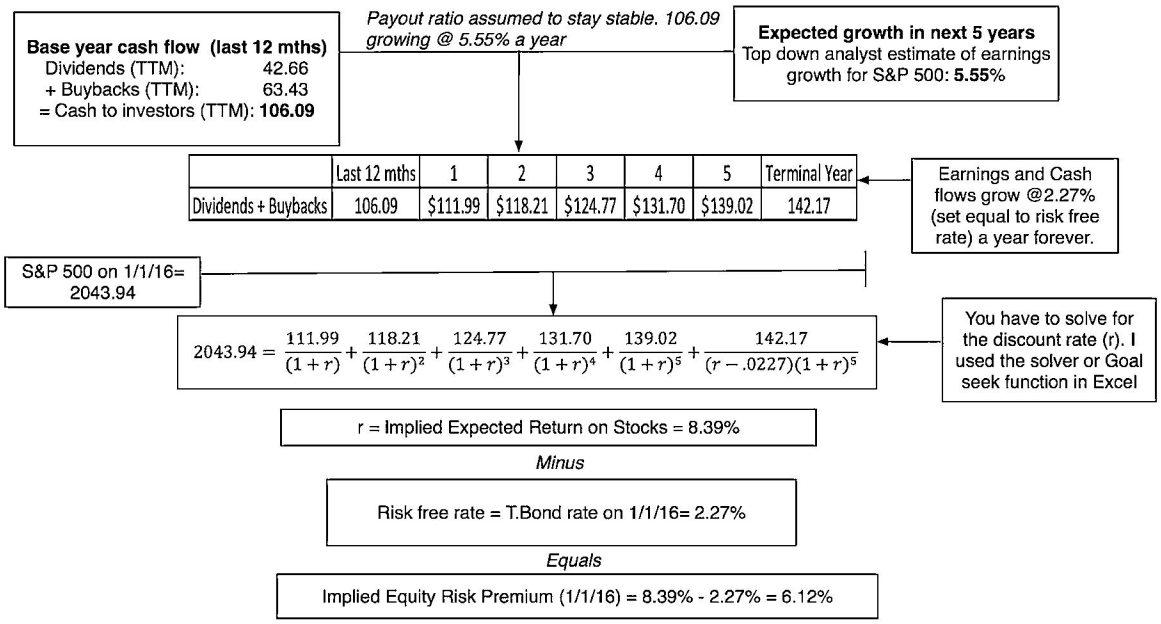
After a good year for stocks, the S&P 500 was at 1848.36 on January 1, 2014, up 29.6% over the prior year, and cash flows also jumped to 84.16 over the trailing 12 months (ending September 30, 2013), up 16.48% over the prior year. Incorporating an increase in the US ten-year treasury bond rate to 3.04%, the implied equity risk premium at the start of 2014 was 4.96%.



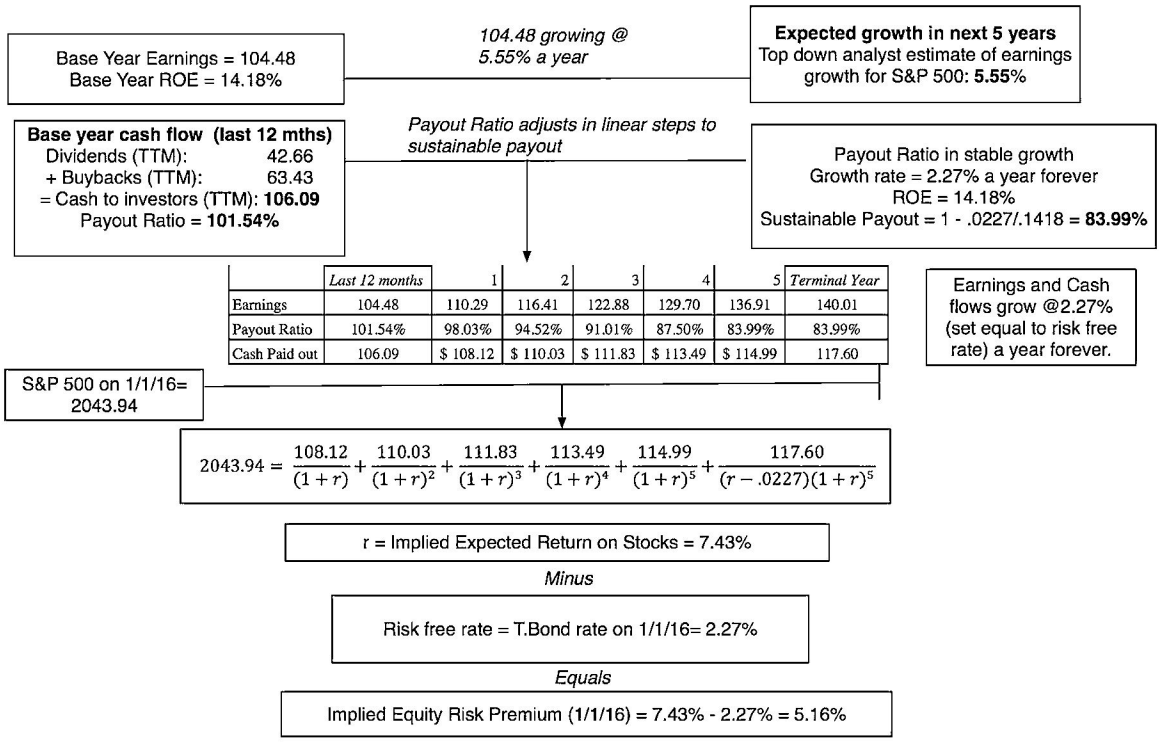
During 2014, stocks continued to rise, albeit at a less frenetic pace, and the US ten-year treasury bond rate dropped back again to 2.17%. Since buybacks and dividends grew at higher rate than prices, the net effect was an increase in the implied equity risk premium to 5.78% at the start of 2015:



At the start of 2016, we updated the implied equity risk premium after a year in which stocks were flat and the treasury bond rate moved up slightly to 2.27%. The resulting implied premium was 6.12%:



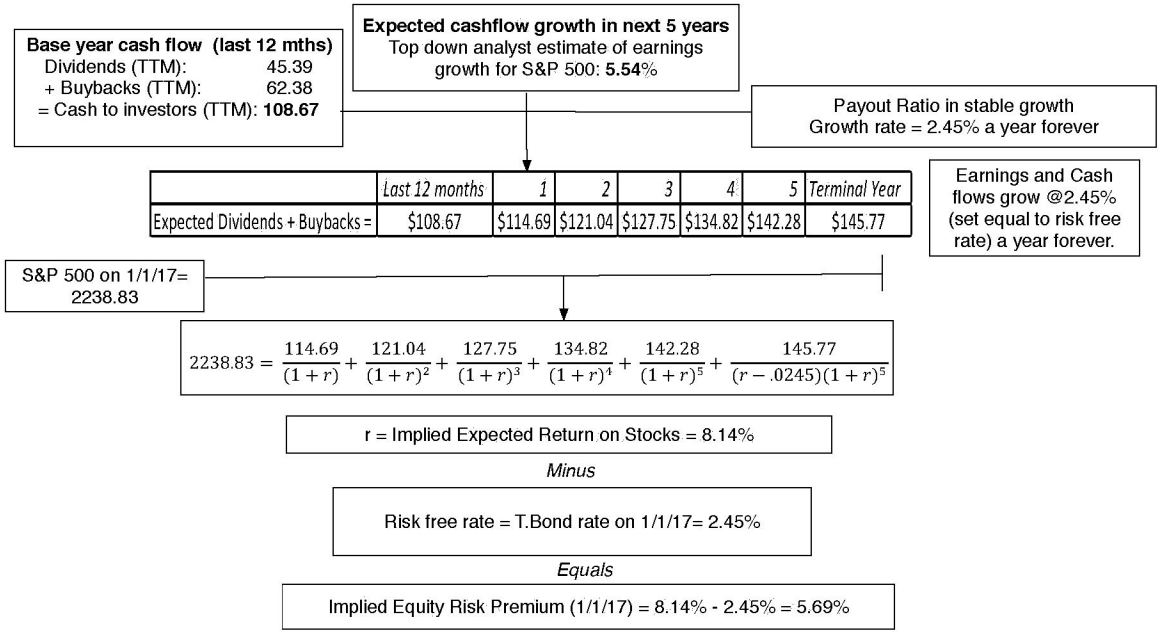
One troubling aspect of cash flows in the twelve months leading into January 1, 2016, was that the companies in the S&P 500 collectively returned 106.09 in cash flows, 101.54% of earnings during the period and inconsistent with the assumption that earnings would continue to grow over time. To correct for this, I recomputed the equity risk premium with the assumption that the cash payout would decrease over time to a sustainable level and came up with an equity risk premium of 5.16%.



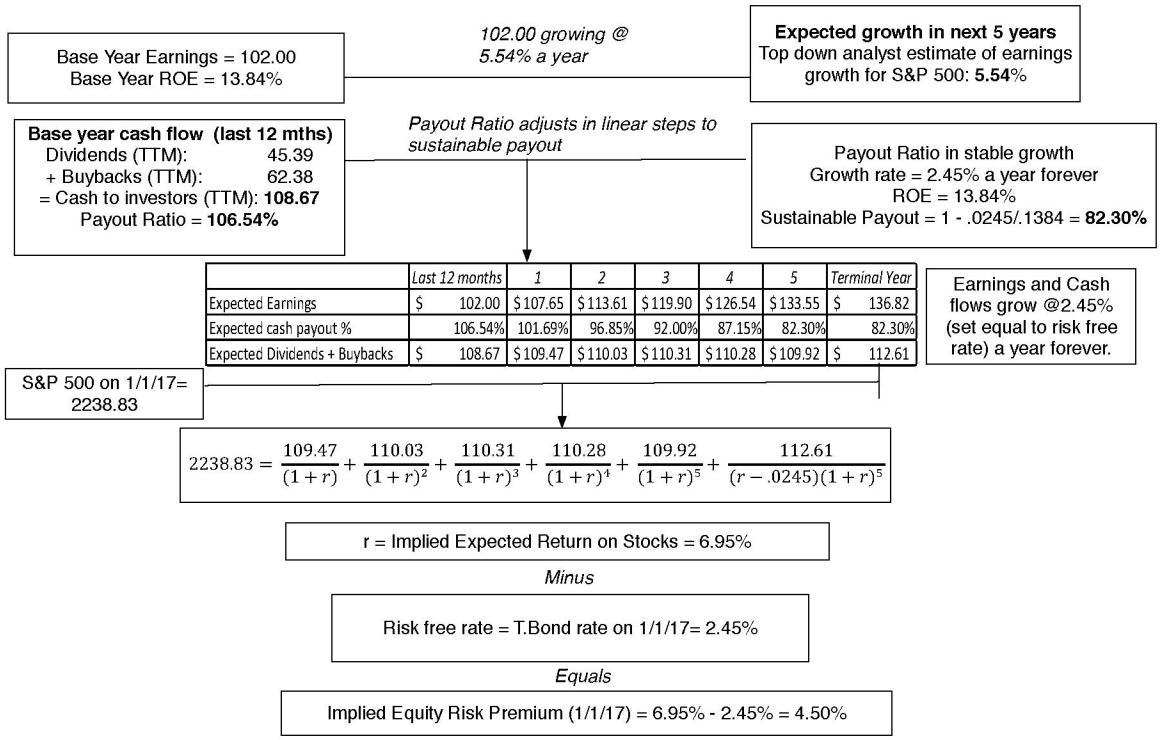
	Last 12 months	1	2	3	4	5	Terminal Year
Earnings	104.48	110.29	116.41	122.88	129.70	136.91	140.01
Payout Ratio	101.54%	98.03%	94.52%	91.01%	87.50%	83.99%	83.99%
Cash Paid out	106.09	$ 108.12	$ 110.03	$ 111.83	$ 113.49	$ 114.99	117.60

This recomputed premium, though, cannot be compared easily with my estimates of the risk premiums with earlier years (since I did not use the same payout adjustment assumption in earlier years) but it does indicate the reasons why there can be differences in estimated implied premiums across investors.

After stocks posted a strong year in 2016, we re-estimated the equity risk premium at the start of 2017 at 5.69%:

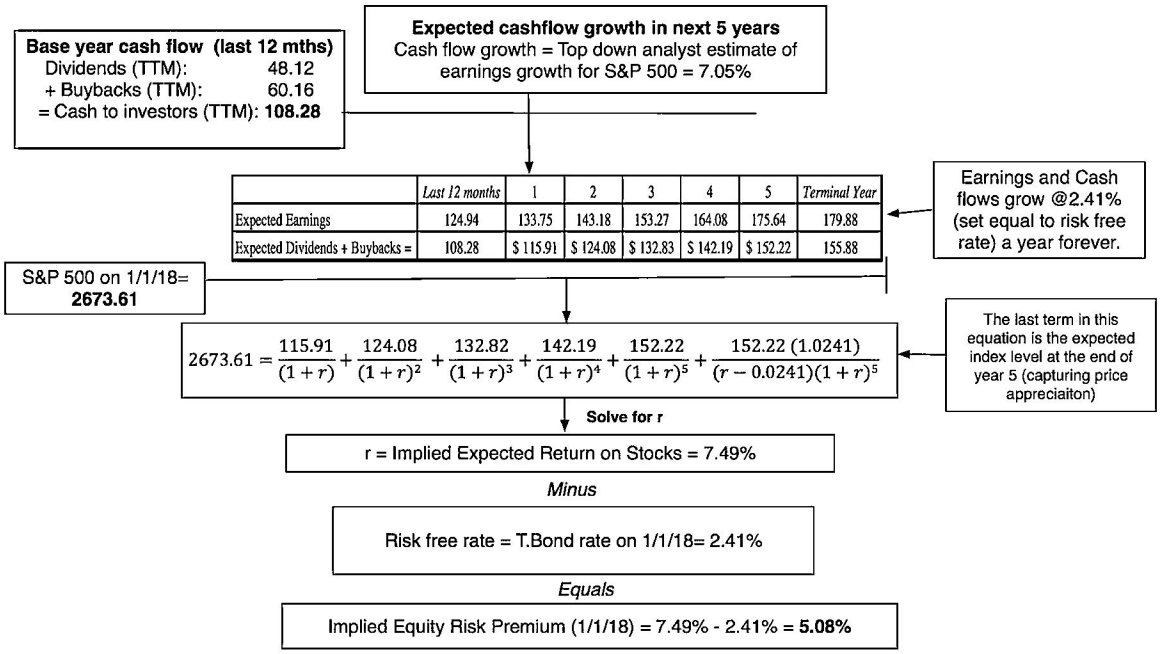


Since the cash flows in 2016 were higher than the earnings, just as in 2015, we followed the 2016 rulebook and computed the equity risk premium, allowing for dividend payout to adjust to sustainable levels by the end of the fifth year:



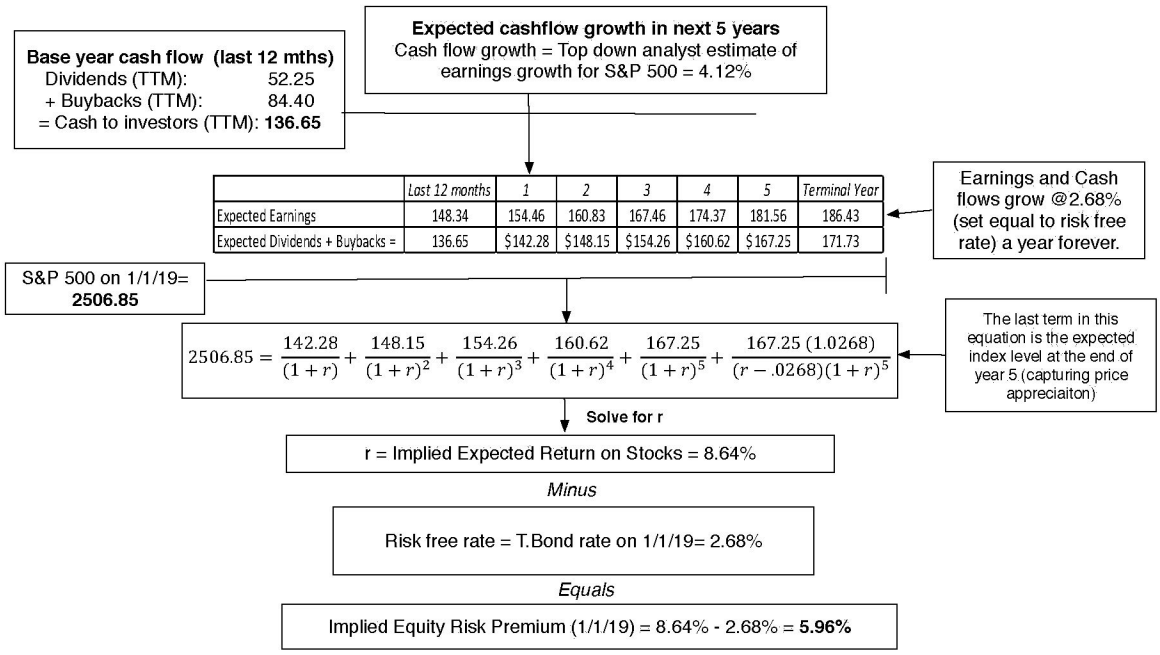
The adjusted premium is 4.50%, reflecting the expectation of lower cash flows in the future.

At the end of 2017, after a strong year for US equities, the S&P 500 stood at 2673.61, with earnings also up over the course of the year. The US corporate tax cut, passed at the end of 2017, was expected to add significantly to earnings growth, pushing up expected earnings growth to 7.05%.



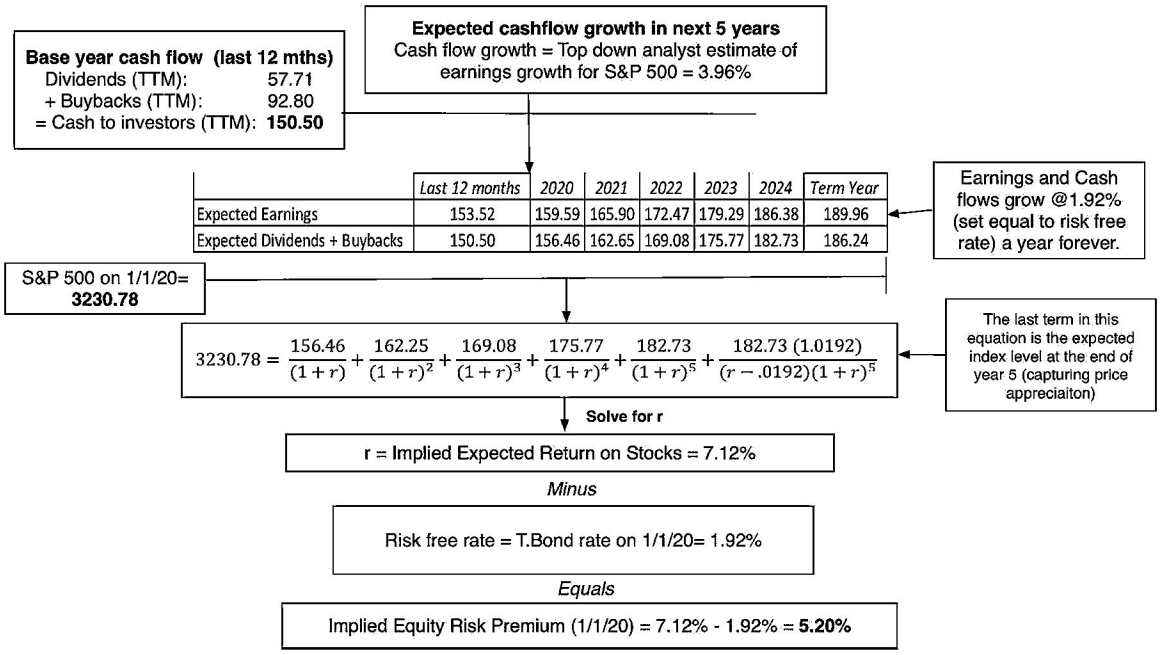
With these inputs, and a treasury bond rate of 2.41%, the implied equity risk premium for the S&P 500 stood at 5.08%. Since the cash payout ratio had dropped below 100% and was close to a 10-year average, we dispensed with the computation where payout ratios were adjusted over time.

After a lackluster year for stocks in 2018, with the index down 6.24%, we recomputed the equity risk premium to be 5.96% at the start of 2019:



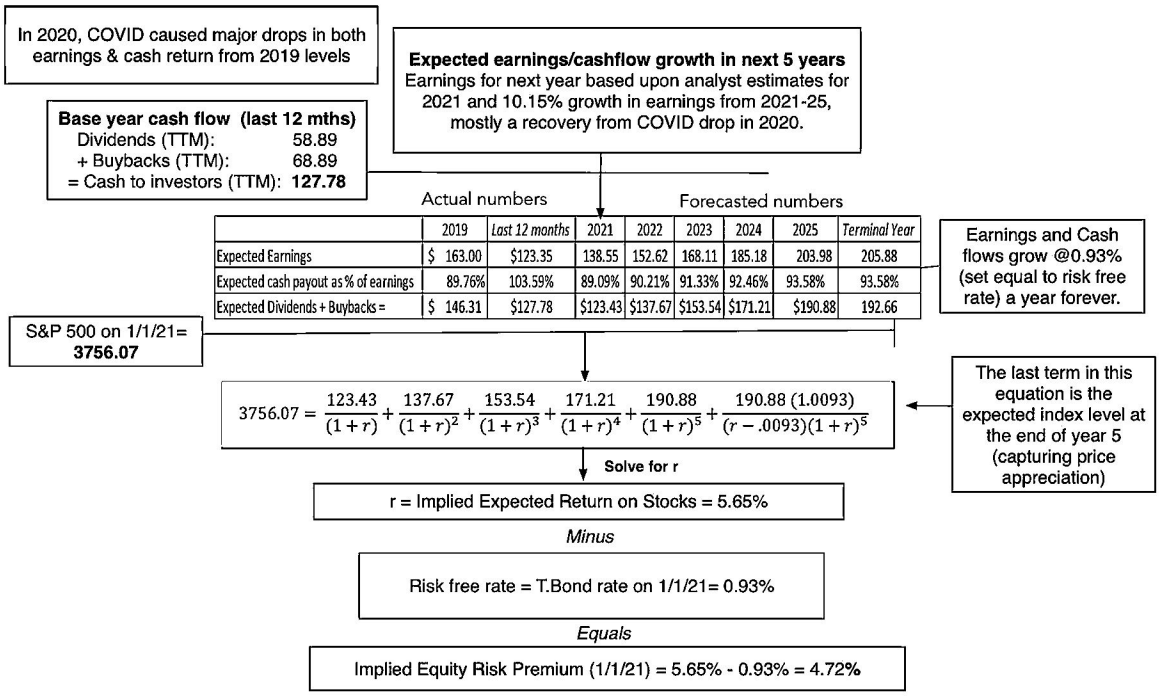
Note the surge in cash flows in 2018, with buybacks continuing the be dominant mode of cash return. While some of the increase in buybacks is temporary and a reaction to tax law changes at the start of the year, the combination of lower stock prices and higher cash flows yields an equity risk premium of 5.96%, almost a full percentage point higher than it was at the start of the prior year.

If markets give and markets take away, 2019 was a giving year for markets as stock prices surged almost 30%, earnings and cash flows stayed elevated and the Treasury Bond rate dropped in 2019. At the start of 2020, the implied equity risk premium was 5.20%, down from the number at the start of 2019, but still above historic norms:



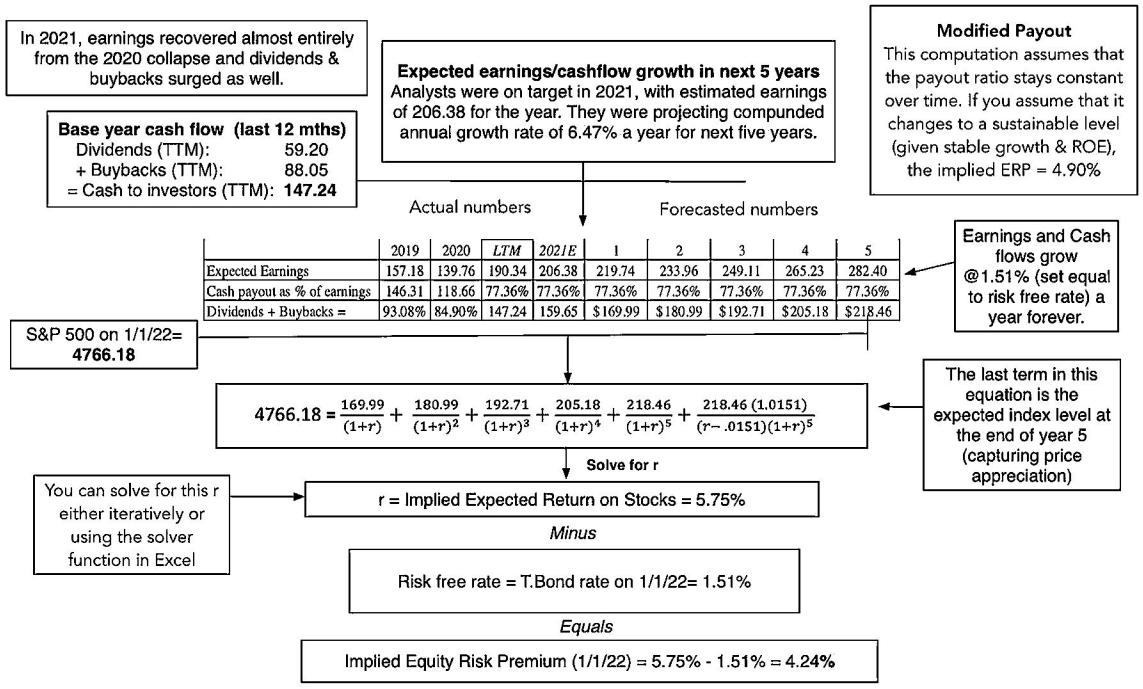
Note that the key reason for equity risk premiums stayed elevated was the low treasury bond rate, since the expected return on stocks, computed as the internal rate of return dropped to 7.12% by the end of 2019.

While 2020 started off as a peaceful year, the Corona virus through a scare into markets early in the year, causing a significant meltdown in February and March, before stocks surged back to end the year, up strongly. The equity risk premium at the start of 2021 is shown below:



Stock prices increased during 2020, even as earnings and cash flows were hit by economic shutdowns, and that combination resulted in a drop in the the expected rwrurn on stocks to 5.65%, a historical low. However, the risk free rate also dropped during the year to 0.93%, leaving the implied equity risk premium at 4.72%.

After another positive year for stocks, with the S&P 500 index up about 27% over the prior year, the implied equity risk premium coming into the start of 2022 is shown below:



Even as treasury bond rates rose during 2021, earnings estimates for the index also surged, partially offsetting that effect, leaving the implied equity risk premium at the start of 2022 at 4.24%.

A Term Structure for Equity Risk Premiums

When we estimate an implied equity risk premium, from the current level of the index and expected future cash flows, we are estimating a compounded average equity risk premium over the long term. Thus, the 4.24% estimate of the equity risk premium at the start of 2022 is the geometric average of the annualized equity risk premiums in future years and is analogous to the yield to maturity on a long term bond.

But is it possible that equity risk premiums have a term structure, just as interest rates do? Absolutely. In a creative attempt to measure the slope of the term structure of equity risk premiums, Binsberger, Brandt and Koijen (2012) use dividend strips, i.e., short term assets that pay dividends for finite time periods (and have no face value), to extract equity risk premiums for the short term as opposed to the long term. Using dividend strips on the S&P 500 to extract expected returns from 1996 to 2009, they find that equity risk premiums are higher for shorter term claims than for longer term claims, by approximately

2.75%.[130] Their findings are contested by Boguth, Carlson, Fisher and Simutin (2011), who note that small market pricing frictions are amplified when valuing synthetic dividend strips and that using more robust return measures results in no significant differences between short term and longer term equity risk premiums.[131] Schulz (2015) argues that the finding of a term structure in equity risk premiums may arise from a failure to consider differential tax treatment of dividends, as opposed to capital gains, and that incorporating those tax differences flattens out the equity risk premium term structure.[132]

While this debate will undoubtedly continue, the relevance to valuation and corporate finance practice is questionable. Even if you could compute period-specific equity risk premiums, the effect on value of using these premiums (instead of the compounded average premium) would be small in most valuations. To illustrate, your valuation of an asset, using an equity risk premium of 4.5% for the first 3 years and 4% thereafter[133], at the start of 2022, would be very similar to the value you would have obtained using 4.24% as your equity risk premium for all time periods. The only scenario where using year-specific premiums would make a material difference would be in the valuation of an asset or investment with primarily short-term cash flows, where using a higher short-term premium will yield a lower (and perhaps more realistic) value for the asset.

Time Series Behavior for S&P 500 Implied Premium

As the inputs to the implied equity risk premium, it is quite clear that the value for the premium will change not just from day to day but from one minute to the next. In particular, movements in the index will affect the equity risk premium, with higher (lower) index values, other things remaining equal, translating into lower (higher) implied equity

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[130] Binsbergen, J. H. van, Michael W. Brandt, and Ralph S. J. Koijen, 2012, *On the timing and pricing of dividends*, American Economic Review, v102, 1596-1618.

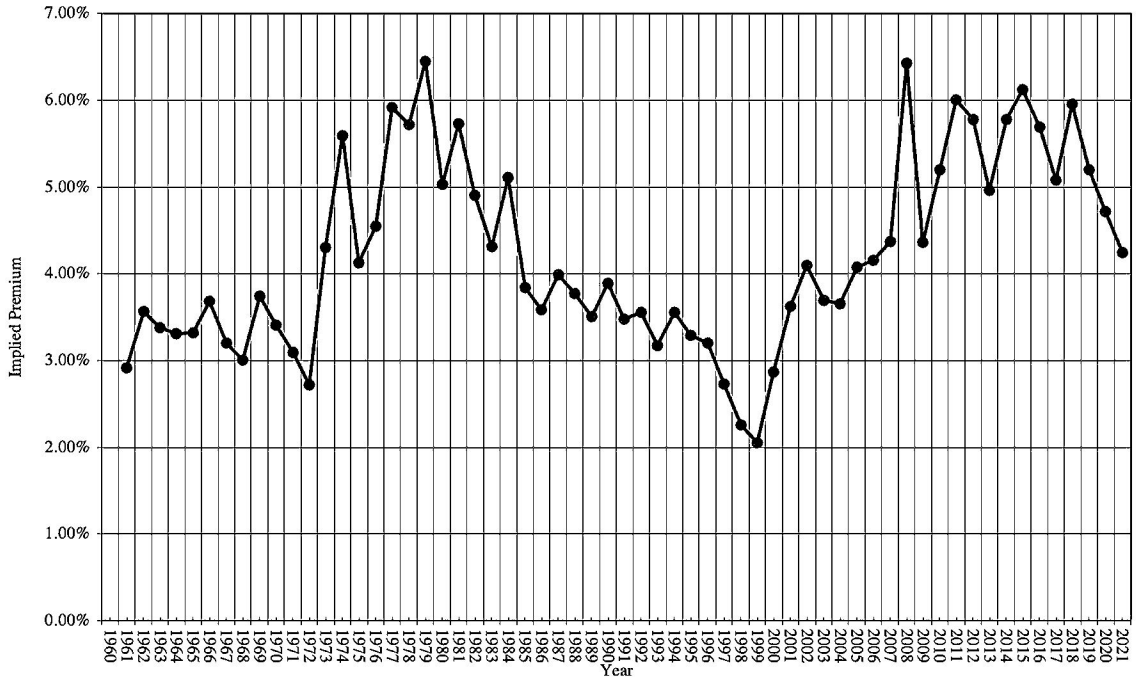
[131] Boguth, O., M. Carlson, A. Fisher and M. Simutin, 2011, *Dividend Strips and the Term Structure of Equity Risk Premia: A Case Study of Limits to Arbitrage*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1931105. In a response, Binsbergen, Brandt and Koijen argue that their results hold even if traded dividend strips (rather than synthetic strips) are used.

[132] Schulz, F., 2015, On the Timing and Pricing of Dividends, SSRN Working paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2705909

[133] The compounded average premium over time, using a 7% equity risk premium for the first 3 years and 5.88% thereafter, is roughly 6.01%.

risk premiums. In Figure 9, we chart the implied premiums in the S&P 500 from 1960 to 2021 (year ends):

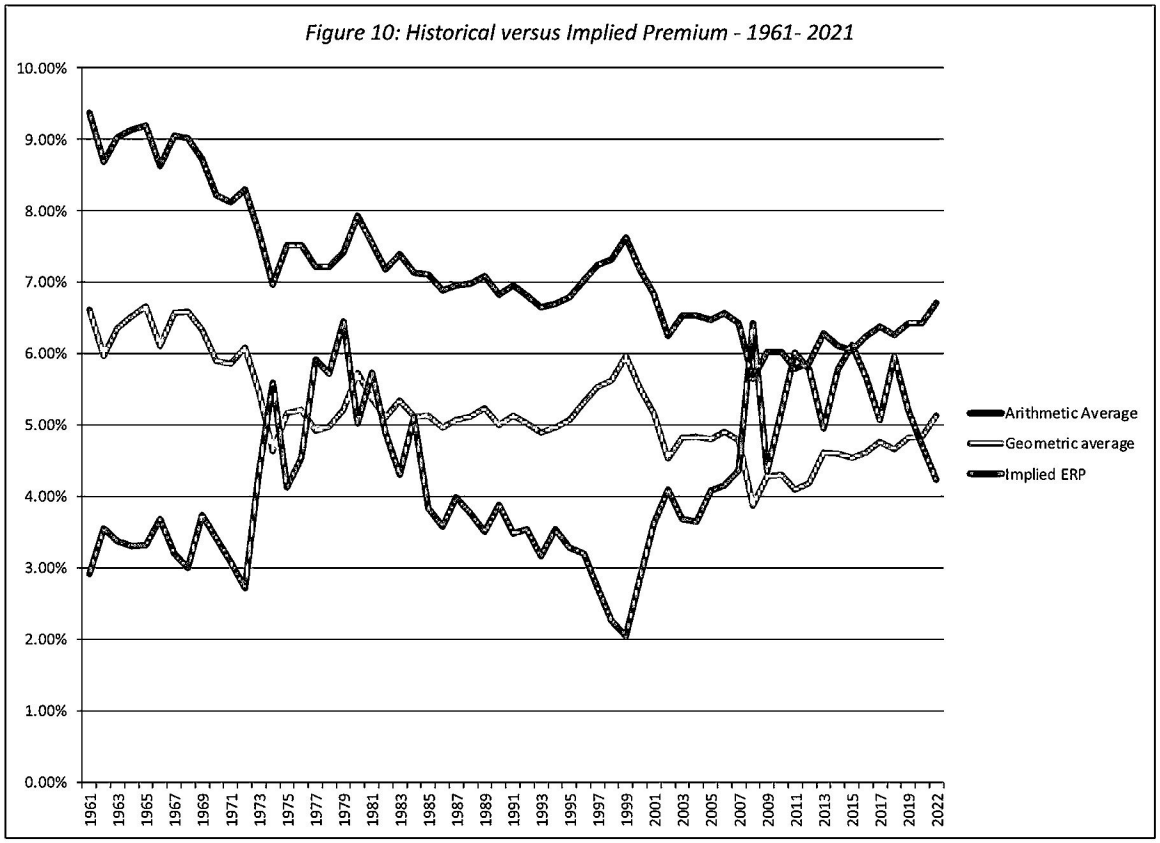
Figure 9: Implied Equity Risk Premium for US Equity Market: 1960-2021



In terms of mechanics, we used potential dividends (including buybacks) as cash flows, and a two-stage discounted cash flow model; the estimates for each year are in appendix 6.[134] Looking at these numbers, we would draw the following conclusions:

- The implied equity premium has deviated from the historical premium for the US equity market for most of the last few decades. To provide a contrast, we compare the implied equity risk premiums each year to the historical risk premiums for stocks over treasury bonds, using both geometric and arithmetic averages, each year from 1961 to 2021 in figure 10:

[134] We used analyst estimates of growth in earnings for the 5-year growth rate after 1980. Between 1960 and 1980, we used the historical growth rate (from the previous 5 years) as the projected growth, since analyst estimates were difficult to obtain. Prior to the late 1980s, the dividends and potential dividends were very similar, because stock buybacks were uncommon. In the last 20 years, the numbers have diverged.



The arithmetic average premium, which is used by many practitioners, has been significantly higher than the implied premium over much of the fifty-year period (with 2009 and 2011 being the only exceptions). The geometric premium does provide a more interesting mix of results, with implied premiums exceeding historical premiums in the mid-1970s and again since 2008.

- The implied equity premium did increase during the seventies, as inflation increased. This does have implications for risk premium estimation. Instead of assuming that the risk premium is a constant, and unaffected by the level of inflation and interest rates, which is what we do with historical risk premiums, would it be more realistic to increase the risk premium if expected inflation and interest rates go up? We will come back and address this question in the next section.
- There is a strong tendency towards mean reversion in implied equity premiums. Thus, the premium, which peaked at 6.5% in 1978, moved down towards 4% in the 1980s. By the same token, the premium of 2% that we observed at the end of the dot-com boom in the 1990s quickly reverted back to 4%, during the market correction from

2000-2003.[135] Given this tendency, it is possible that we can end up with a better estimate of the implied equity premium by looking at not just the current premium, but also at historical trend lines. We can use the average implied equity premium over a longer period, say ten to fifteen years. Note that we do not need as many years of data to make this estimate as we do with historical premiums, because the standard errors tend to be smaller.

Finally, the implied equity risk premium will move dramatically during crises, as investors reassess the price of risk. During the 2008 crisis, implied equity risk premiums rose more during the year than in any one of the prior 50 years, with much of the change happening in a fifteen-week time period towards the end of the year. While much of that increase dissipated in 2009, as equity risk premiums returned to pre-crisis levels, equity risk premiums have remained more volatile since 2008. In 2020, as the COVID crisis played out in markets, we saw the same type of volatility in the equity risk premiums. In the next section, we will take a closer look at the 2008 and 2020 crises.

Implied Equity Risk Premiums during a Market Crisis and Beyond

When we use historical risk premiums, we are, in effect, assuming that equity risk premiums do not change much over short periods and revert back over time to historical averages. This assumption was viewed as reasonable for mature equity markets like the United States, but it was put under a severe test during the market crisis that unfolded with the fall of Lehman Brothers on September 15, 2008, and the subsequent collapse of equity markets, first in the US, and then globally.

Since implied equity risk premiums reflect the current level of the index, the 75 trading days between September 15, 2008, and December 31, 2008, offer us an unprecedented opportunity to observe how much the price charged for risk can change over short periods. In figure 11, we depict the S&P 500 on one axis and the implied equity risk premium on the other. To estimate the latter, we used the level of the index and the treasury bond rate at the end of each day and used the total dollar dividends and buybacks over the

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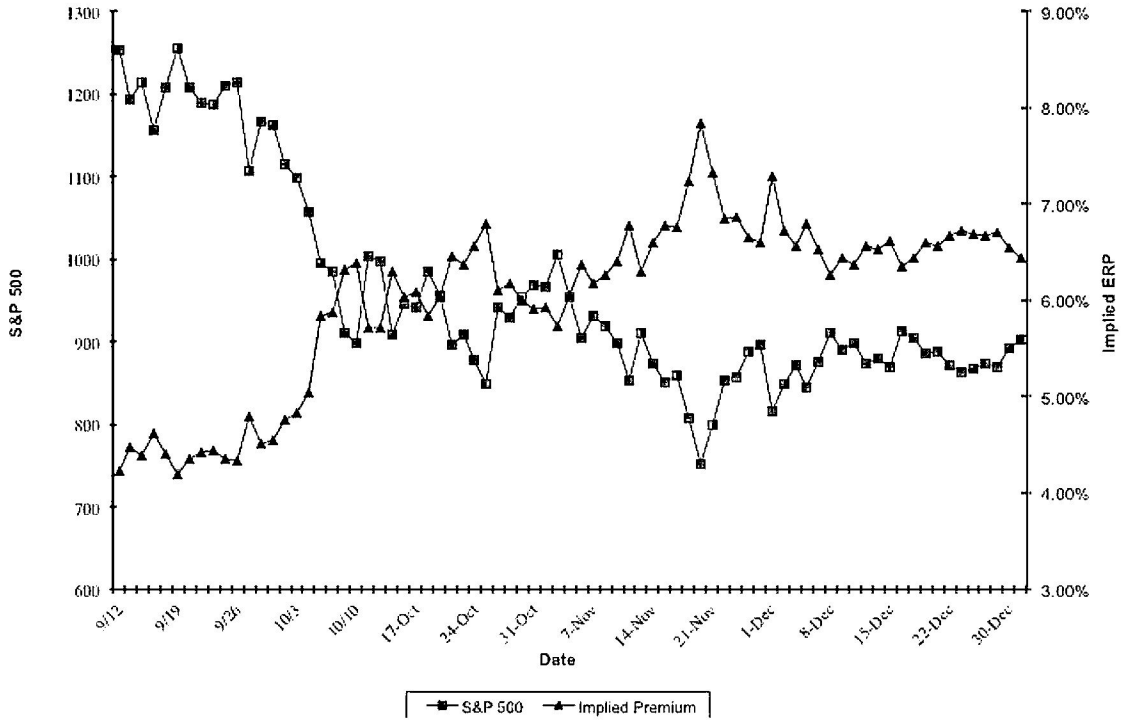
[135] Arnott, Robert D., and Ronald Ryan, 2001, *The Death of the Risk Premium: Consequences of the 1990s*, Journal of Portfolio Management, v27, 61-74. They make the same point about reduction in implied equity risk premiums that we do. According to their calculations, though, the implied equity risk premium in the late 1990s was negative.

trailing 12 months to compute the cash flows for the most recent year.[136] We also updated the expected growth in earnings for the next 5 years, but that number changed only slowly over the period. For example, the total dollar dividends and buybacks on the index for the trailing 12 months of 52.58 resulted in a dividend yield of 4.20% on September 12 (when the index closed at 1252) but jumped to 4.97% on October 6, when the index closed at 1057.[137]

Figure 11: Implied Equity Risk Premium - 9/12- 12/31/08



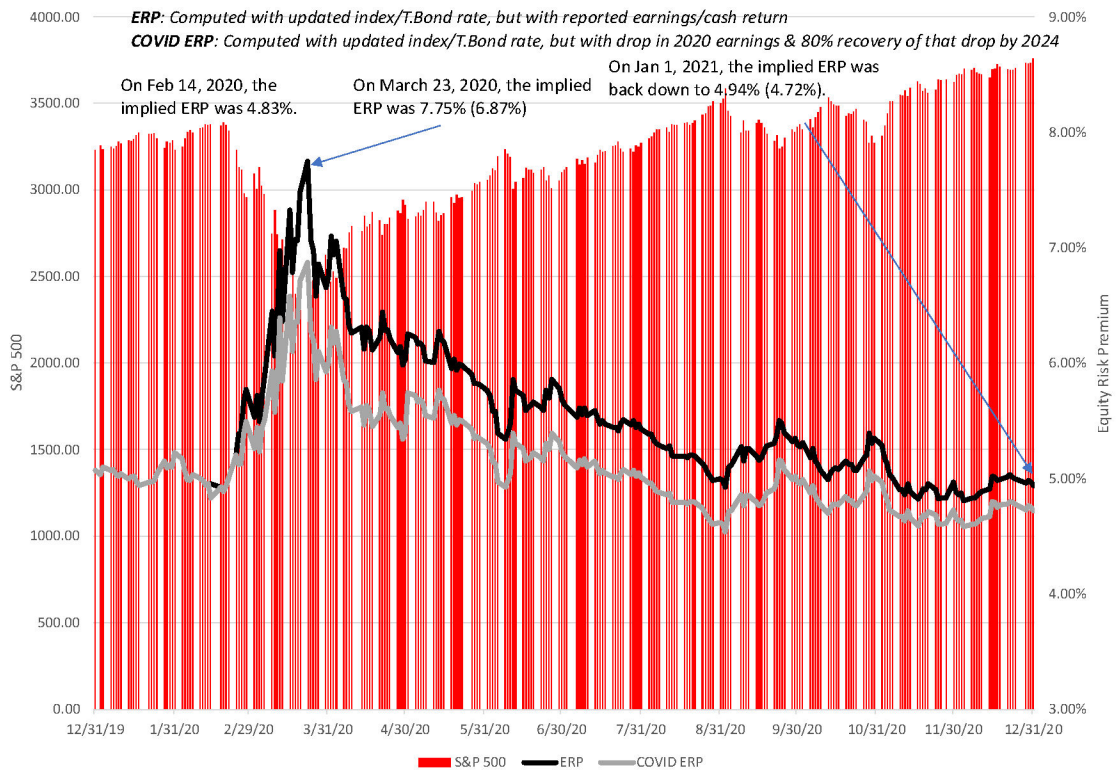
In a period of a month, the implied equity risk premium rose from 4.20% on September 12 to 6.39% at the close of trading of October 10 as the S&P moved from 1250 down to 903. Even more disconcertingly, there were wide swings in the equity risk premium within a day; in the last trading hour just on October 10, the implied equity risk premium ranged from a high of 6.6% to a low of 6.1%. Over the rest of the year, the equity risk premium

[136] This number, unlike the index and treasury bond rate, is not updated on a daily basis. We did try to modify the number as companies in the index announced dividend suspensions or buyback modifications.

[137] It is possible, and maybe even likely, that the banking crisis and resulting economic slowdown was leading some companies to reassess policies on buybacks. Alcoa, for instance, announced that it was terminating stock buybacks. However, other companies stepped up buybacks in response to lower stock prices. If the total cash return was dropping, as the market was, the implied equity risk premiums should be lower than the numbers that we have computed.

gyrated, hitting a high of 8% in late November, before settling into the year-end level of 6.43%. In 2020, as COVID caused a global economic shut down, you saw the same phenomenon play out, in figure 12:

Figure 12: Equity Risk Premium for S&P 500: December 31, 2019 to December 31, 2020



The volatility captured in figures 11 and 12 were not restricted to just the US equity markets. Global equity markets gyrated with and sometimes more than the US, default spreads widened considerably in corporate bond markets, commercial paper and LIBOR rates soared while the 3-month treasury bill rate dropped close to zero and the implied volatility in option markets soared. Not only did we discover how intertwined equity markets are around the globe but also how markets for all risky assets are tied together.

There are two ways in which we can view this volatility. One the one side, proponents of using historical averages (either of actual or implied premiums) will use the day-to-day volatility in market risk premiums to argue for the stability of historical averages. They are implicitly assuming that when the crisis passes, markets will return to the status quo. On the other hand, there will be many who point to the unprecedented jump in implied premiums over a few weeks and note the danger of sticking with a "fixed"

premium. They will argue that there are sometimes structural shifts in markets, i.e., big events that change market risk premiums for long periods, and that we should be therefore be modifying the risk premiums that we use in valuation as the market changes around us. In January 2009, in the context of equity risk premiums, the first group would have argued we should ignore history (both in terms of historical returns and implied equity risk premiums) and move to equity risk premiums of 6%+ for mature markets (and higher for emerging markets whereas the second would have made a case for sticking with a historical average, which would have been much lower than 6.43%.

The years since the crisis ended in 2008 have seen ups and downs in the implied premium, with clear evidence that the volatility in the equity risk premium has increased over the last few years. I believe that the very act of valuing companies requires taking a stand on the appropriate equity risk premium to use. For many years prior to September 2008, I used 4% as my mature market equity risk premium when valuing companies, and assumed that mean reversion to this number (the average implied premium over time) would occur quickly and deviations from the number would be small. Though mean reversion is a powerful force, I think that the banking and financial crisis of 2008 has created a new reality, i.e., that equity risk premiums can change quickly and by large amounts even in mature equity markets. Consequently, I have forsaken my practice of staying with a fixed equity risk premium for mature markets, and I now vary it year-to-year, and even on an intra-year basis, if conditions warrant. After the crisis, in the first half of 2009, I used equity risk premiums of 6% for mature markets in my valuations. As risk premiums came down in 2009, I moved back to using a 4.5% equity risk premium for mature markets in 2010. With the increase in implied premiums at the start of 2011, my valuations for the year were based upon an equity risk premium of 5% for mature markets and I increased that number to 6% for 2012. In 2016, I used an equity risk premium of 6.12%, reflecting the implied premium at the start of the year but adjusted the premium on a monthly basis, as investors navigated Brexit and the US presidential election. At the start of 2022, I was using 4.24% as my base premium for a mature market, but during the course of the year, I have revisited that number as the price of risk has soared. While some may view this shifting equity risk premium as a sign of weakness, I would frame it differently. When valuing individual companies, I want my valuations to reflect my assessments of the

company and not my assessments of the overall equity market. Using equity risk premiums that are very different from the implied premium will introduce a market view into individual company valuations.

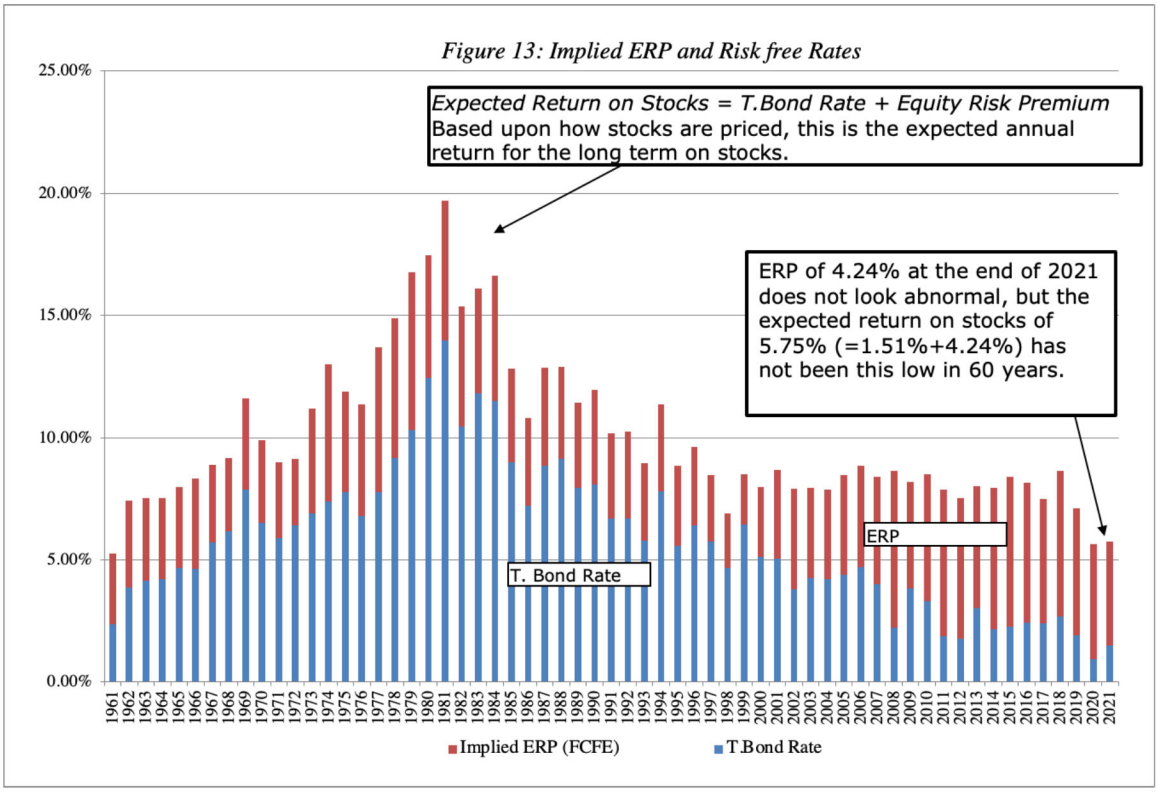
Determinants of Implied Premiums

One of the advantages of estimating implied equity risk premiums, by period, is that we can track year to year changes in that number and relate those changes to shifts in interest rates, the macro environment or even to company characteristics. By doing so, not only can we get a better understanding of what causes equity risk premiums to change over time, but we are also able to come up with better estimates of future premiums.

Implied ERP and Interest rates

In much of valuation and corporate finance practice, we assume that the equity risk premium that we compute and use is unrelated to the level of interest rates. In particular, the use of historical risk premiums, where the premium is based upon an average premium earned over shifting risk free rates, implicitly assumes that the level of the premium is unchanged as the risk free rate changes. Thus, we use the same equity risk premium of 5.13% (the historical average for 1928-2021) on a risk free rate of 1.51% at the start of 2022, as we would have, if the risk free rate had been 10%.

But is this a reasonable assumption? How much of the variation in the premium over time can be explained by changes in interest rates? Put differently, do equity risk premiums increase as the risk free rate increases or are they unaffected? To answer this question, we looked at the relationship between the implied equity risk premium and the treasury bond rate (risk free rate).



As can be seen in figure 13, the implied equity risk premiums were highest in the 1970s, when interest rates and inflation were also high. However, there is contradictory evidence between 2008 and 2021, when high equity risk premiums accompanied low riskfree rates.

To examine the relationship between equity risk premiums and risk free rates, we ran a regression of the implied equity risk premium against both the level of long-term rates (the treasury bond rate) and the slope of the yield curve (captured as the difference between the 10-year treasury bond rate and the 3-month T.Bill rate), from 1960 to 2021, with the t statistics reported in brackets below each coefficient:

$$\text{Implied ERP} = 4.24\% - 0.0151\ (\text{T.Bond Rate}) + 0.0409\ (\text{T.Bond} - \text{T.Bill}) \quad R^2 = 0.37\%$$
$$(11.53)\ (0.31) \qquad (0.33)$$

Looking across the time period (1960-2021), neither the level of rates nor the slope of the yield curve seems to have much impact on the implied equity risk premium in that year.. This regression does not provide support for the view that equity risk premiums should not be constant but should be linked to the level of interest rates. In earlier versions of the paper, this regression has yielded a mildly positive relationship between the implied ERP and the T.Bond rate, but the combination of low rates and high equity risk premiums since

2008 seems to have eliminated even that mild connection between the two, a result consistent with the regime change recorded by Campbell, Pfueger and Viceira, referenced in the earlier section.

The rising equity risk premiums, in conjunction with low risk free rates, can be viewed paradoxically as both an indicator of how much and how little power central banks have over asset pricing. To the extent that the lower US treasury bond rate is the result of the Fed's quantitative easing policies since the 2008 crisis, they underscore the effect that central banks can have on equity risk premiums. At the same time, the stickiness of the overall expected return on stocks, which has not gone down with the risk free rate, is a testimonial that central banking policy is not pushing up the prices of financial assets. To the extent that this failure to move expected returns is also happening in real businesses, in the form of sticky hurdle rates for investments, the Fed's hope of increasing real investment at businesses with lower interest rates did not come to fruition.

Implied ERP and Macroeconomic variables

While we considered the interaction between equity risk premiums and interest rates in the last section, the analysis can be expanded to include other macroeconomic variables including economic growth, inflation rates and exchange rates. Doing so may give us a way of estimating an "intrinsic' equity risk premium, based upon macroeconomic variables, that is less susceptible to market moods and perceptions.

To explore the relationship, we estimated the correlation, between the implied equity risk premiums that we estimated for the S&P 500 and three macroeconomic variables – real GDP growth for the US, inflation rates (CPI) and exchange rates (trade weighted dollar), using data from 1973 to 2021, in table 23 (t statistics in brackets):

Table 23: Correlation Matrix: ERP and Macroeconomic variables: 1961-2021

	Inflation rate	Real GDP growth	Weighted Dollar	ERP
Inflation rate	1.0000			
Real GDP growth	-0.0267 (0.20)	1.0000		
Weighted Dollar	0.0528 (0.72)	0.0823 (0.58)	1.0000	
ERP	0.2600** (2.07)	-0.3078** (2.49)	-0.1012 (0.69)	1.0000

T statistics in brackets ** Statistically significant at 0.01 level; * Statistically significant at 0.05 level

The implied equity risk premium is negatively correlated with GDP growth, increasing as GDP growth increases and is positively correlated with inflation. In more intuitive terms, since lower equity risk premiums translate into higher stock prices, real growth is good for stocks, and inflation is not.[138]

Following up on this analysis, we regressed equity risk premiums against the inflation rate and GDP growth, using data from 1961 to 2021:

$$\text{ERP} = 0.0431 + 0.0964^{*} \text{ CPI} - 0.153 * \text{Real GDP Growth} \qquad R^2 = 15.82\%$$
$$(14.94^{**}) \quad (2.09^{**}) \qquad (2.50^{**})$$

Based on this regression, every 1% increase in the inflation rate increases the equity risk premium by approximately 0.10%, whereas every 1% increase in the growth rate in real GDP decreases the implied equity risk premium by 0.15%.

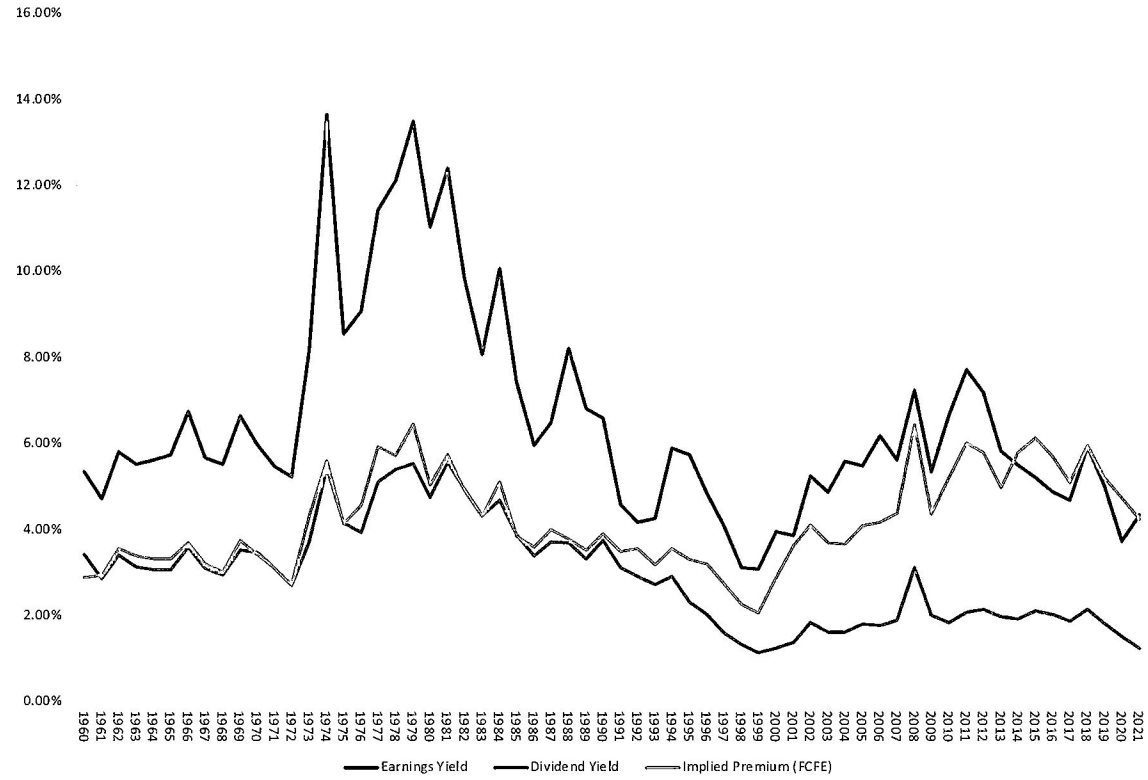
From a risk perspective, it is not the level of GDP growth that matters, but uncertainty about that level; you can have low and stable economic growth and high and unstable economic growth. Since 2008, the economies of both developed and emerging markets have become more unstable over time and upended long held beliefs about developed economies. It will be interesting to see if equity risk premiums become more sensitive to real economic growth in this environment.

Implied ERP, Earnings Yields and Dividend Yields

Earlier in the paper, we noted that the dividend yield and the earnings yield (net of the riskfree rate) can be used as proxies for the equity risk premium, if we make assumptions about future growth (stable growth, with the dividend yield) or expected excess returns (zero, with the earnings yield). In figure 14, we compare the implied equity risk premiums that we computed to the earnings and dividend yields for the S&P 500 from 1961 to 2021:

[138] The correlation was also computed for lagged and leading versions of these variables, with little material change to the relationship.

Figure 14: Earnings Yield, Dividend Yield and Implied ERP



Note that the dividend yield is a very close proxy for the implied equity risk premium until the late 1980s, when the two measures decoupled, a phenomenon that is best explained by the rise of stock buybacks as an alternative way of returning cash to stockholders.

The earnings yield, with the risk free rate netted out, has generally not been a good proxy for the implied equity risk premium and would have yielded negative values for the equity risk premium (since you have to subtract out the risk free rate from it) through much of the 1990s. However, it does move with the implied equity risk premium. The difference between the earnings to price measure and the implied ERP can be attributed to a combination of higher earnings growth and excess returns that investors expect companies to deliver in the future. Analysts and academic researchers who use the earnings to price ratio as a proxy for forward-looking costs of equity may therefore end up with significant measurement error in their analyses.

Implied ERP and Technical Indicators

Earlier in the paper, we noted that any market timing forecast can be recast as a view on the future direction of the equity risk premium. Thus, a view that the market is

under (over) priced and likely to go higher (lower is consistent with a belief that equity risk premiums will decline (increase) in the future. Many market timers do rely on technical indicators, such as moving averages and momentum measures, to make their judgment about market direction. To evaluate whether these approaches have a basis, you would need to look at how these measures are correlated with changes in equity risk premiums.

In a test of the efficacy of technical indicators, Neely, Rapach, Tu and Zhou (2011) compare the predictive power of macroeconomic/fundamental indications (including the interest rate, inflation, GDP growth and earnings/dividend yield numbers) with those of technical indicators (moving average, momentum and trading volume) and conclude that the latter better explain movements in stock returns.[139] They conclude that a composite prediction, that incorporates both macroeconomic and technical indicators, is superior to using just one set or the other of these variables. Note, however, that their study focused primarily on the predictability of stock returns over the next year and not on longer term equity risk premiums.

Extensions of Implied Equity Risk Premium

The process of backing out risk premiums from current prices and expected cash flows is a flexible one. It can be expanded into emerging markets to provide estimates of risk premiums that can replace the country risk premiums we developed in the last section. Within an equity market, it can be used to compute implied equity risk premiums for individual sectors or even classes of companies.

Other Equity Markets

The advantage of the implied premium approach is that it is market-driven and current, and does not require any historical data. Thus, it can be used to estimate implied equity premiums in any market, no matter how short its history, It is, however, bounded by whether the model used for the valuation is the right one and the availability and reliability of the inputs to that model. Earlier in this paper, we estimated country risk premiums for Brazil, using default spreads and equity market volatile. To provide a contrast, we

[139] Neely, C.J., D.E. Rapach, J. Tu and G. Zhou, 2011, *Forecasting the Equity Risk Premium: The Role of Technical Indicators*, Working Paper, http://ssrn.com/abstract=1787554.

estimated the implied equity risk premium for the Brazilian equity market in September 2009, from the following inputs.

- The index (Bovespa) was trading at 61,172 on September 30, 2009, and the dividend yield on the index over the previous 12 months was approximately 2.2%. While stock buybacks represented negligible cash flows, we did compute the FCFE for companies in the index, and the aggregate FCFE yield across the companies was 4.95%.
- Earnings in companies in the index are expected to grow 6% (in US dollar terms) over the next 5 years, and 3.45% (set equal to the treasury bond rate) thereafter.
- The riskfree rate is the US 10-year treasury bond rate of 3.45%.

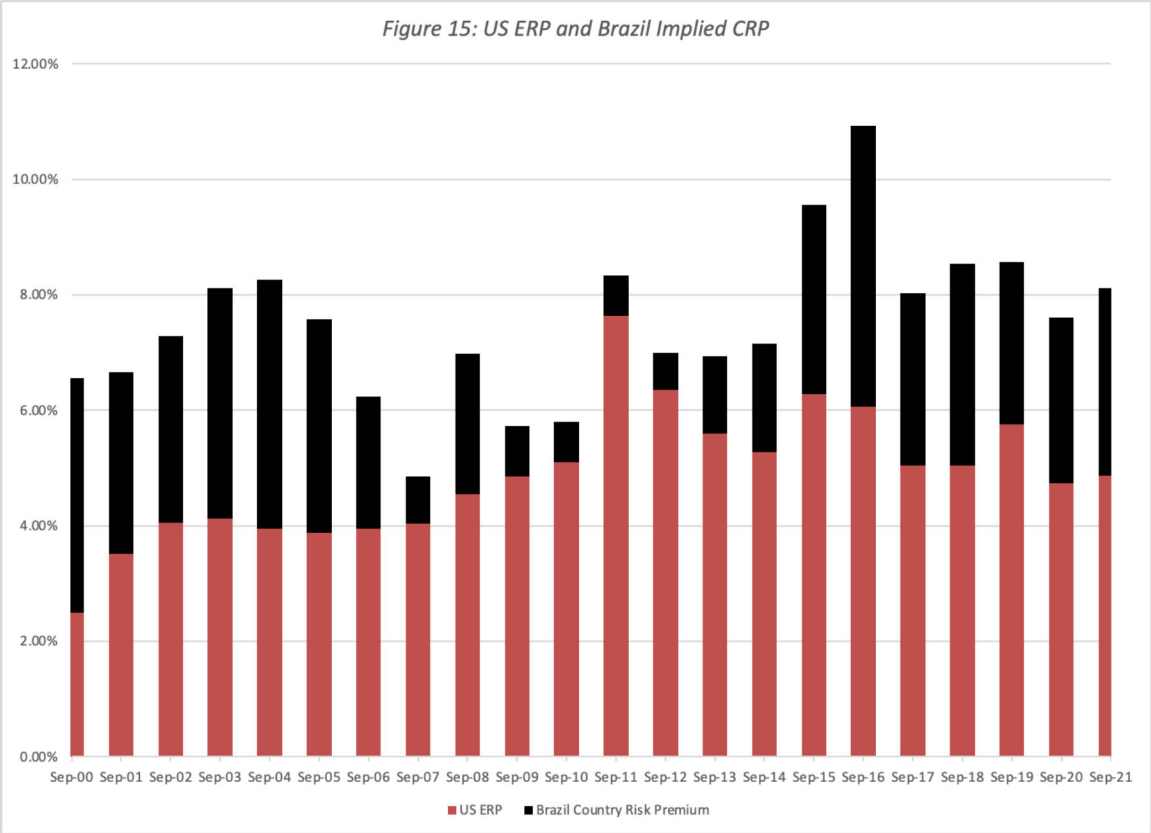
The time line of cash flows is shown below:

$$61,272 = \frac{3210}{(1+r)} + \frac{3,402}{(1+r)^2} + \frac{3,606}{(1+r)^3} + \frac{3,821}{(1+r)^4} + \frac{4,052}{(1+r)^5} + \frac{4,052(1.0345)}{(r-.0345)(1+r)^5}$$

These inputs yield a required return on equity of 9.17%, which when compared to the treasury bond rate of 3.45% on that day results in an implied equity premium of 5.72%. For simplicity, we have used nominal dollar expected growth rates[140] and treasury bond rates, but this analysis could have been done entirely in the local currency.

One of the advantages of using implied equity risk premiums is that that they are more sensitive to changing market conditions. The implied equity risk premium for Brazil in September 2007, when the Bovespa was trading at 73512, was 4.63%, lower than the premium in September 2009, which in turn was much lower than the premium prevailing in September 2015. In figure 15, we trace the changes in the implied equity risk premium in Brazil from September 2000 to September 2021 and compare them to the implied premium in US equities:

[140] The input that is most difficult to estimate for emerging markets is a long-term expected growth rate. For Brazilian stocks, I used the average consensus estimate of growth in earnings for the largest Brazilian companies which have ADRs listed on them. This estimate may be biased, as a consequence.



Implied equity risk premiums in Brazil declined steadily from 2003 to 2007, with the September 2007 numbers representing a historic low. They surged in September 2008, as the crisis unfolded, fell back in 2009 and 2010 but increased again in 2011. In fact, the Brazil portion of the implied equity risk premium fell to its lowest level in ten years in September 2010, a phenomenon that remained largely unchanged in 2011 and 2012. Political turmoil and corruptions scandals combined to push the premium back up again in the next few years, with a leveling off between September 2019 and September 2021.

Computing and comparing implied equity risk premiums across multiple equity markets allows us to pinpoint markets that stand out, either as over priced (because their implied premiums are too low, relative to other markets) or under priced (because their premiums at too high, relative to other markets). In September 2007, for instance, the implied equity risk premiums in India and China were roughly equal to or even lower than the implied premium for the United States, computed at the same time. Even an optimist on future growth these countries would be hard pressed to argue that equity markets in

these markets and the United States were of equivalent risk, which would lead us to conclude that these stocks were overvalued relative to US companies.

One final note is worth making. Over the last decade, the implied equity risk premiums in the largest emerging markets – India, China and Brazil- have all declined substantially, relative to developed markets. In table 24, we summarize implied equity risk premiums for developed and emerging markets from 2001 and 2022, at the start of each year, making simplistic assumptions about growth and stable growth valuation models:[141]

Table 24: Developed versus Emerging Market Equity Risk Premiums

Start of year	PBV (Developed)	PBV (Emerging)	ROE (Developed)	ROE (Emerging)	US T.Bond Rate	Growth Rate (Developed)	Growth Rate (Emerging)	Cost of Equity (Developed)	Cost of Equity (Emerging)	Differential
2004	2.00	1.19	10.81%	11.65%	4.25%	3.75%	4.75%	7.28%	10.55%	3.27%
2005	2.09	1.27	11.12%	11.93%	4.22%	3.72%	4.72%	7.26%	10.40%	3.14%
2006	2.03	1.44	11.32%	12.18%	4.39%	3.89%	4.89%	7.55%	9.95%	2.40%
2007	1.67	1.67	10.87%	12.88%	4.70%	4.20%	5.20%	8.19%	9.80%	1.60%
2008	0.87	0.83	9.42%	11.12%	4.02%	3.52%	4.52%	10.30%	12.47%	2.17%
2009	1.20	1.34	8.48%	11.02%	2.21%	1.71%	2.71%	7.35%	8.91%	1.56%
2010	1.39	1.43	9.14%	11.22%	3.84%	3.34%	4.34%	7.51%	9.15%	1.64%
2011	1.12	1.08	9.21%	10.04%	3.29%	2.79%	3.79%	8.52%	9.58%	1.05%
2012	1.17	1.18	9.10%	9.33%	1.88%	1.38%	2.38%	7.98%	8.27%	0.29%
2013	1.56	1.63	8.67%	10.48%	1.76%	1.26%	2.26%	6.01%	7.30%	1.29%
2014	1.95	1.50	9.27%	9.64%	3.04%	2.54%	3.54%	5.99%	7.61%	1.62%
2015	1.88	1.56	9.69%	9.75%	2.17%	1.67%	2.67%	5.94%	7.21%	1.27%
2016	1.99	1.59	9.24%	10.16%	2.27%	1.77%	2.77%	5.52%	7.42%	1.89%
2017	1.76	1.48	8.71%	9.53%	2.68%	2.18%	3.18%	5.89%	7.47%	1.58%
2018	1.98	1.66	11.23%	11.36%	2.68%	2.18%	3.18%	6.75%	8.11%	1.36%
2019	1.64	1.31	12.09%	11.35%	2.68%	2.18%	3.18%	8.22%	9.42%	1.19%
2020	2.26	1.64	10.41%	9.10%	1.92%	1.42%	2.42%	5.40%	6.49%	1.10%
2021	2.21	1.77	6.30%	7.31%	0.93%	0.43%	1.43%	3.09%	4.75%	1.67%
2022	2.31	1.67	13.22%	11.99%	1.51%	1.01%	2.01%	6.30%	7.99%	1.69%

The trend line from 2004 to 2012 is clear as the equity risk premiums, notwithstanding a minor widening in 2008, have converged in developed and emerging markets, suggesting that globalization has put "emerging market risk" into developed markets, while creating "developed markets stability factors" (more predictable government policies, stronger legal and corporate governance systems, lower inflation, and stronger currencies) in emerging markets. In the last four years, we did see a correction in emerging markets that pushed the premium back up, albeit to a level that was still lower than it was prior to 2010, with a jump in the post-2020 time period.

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[141] We start with the US treasury bond rate as the proxy for global nominal growth (in US dollar terms), and assume that the expected growth rate in developed markets is 0.5% lower than that number and the expected growth rate in emerging markets is 1% higher than that number. The equation used to compute the ERP is a simplistic one, based on the assumptions that the countries are in stable growth and that the return on equity in each country is a predictor of future return on equity:
PBV = (ROE – g)/ (Cost of equity –g)
Cost of equity = (ROE –g + PBV(g))/ PBV

Sector premiums

Using current prices and expected future cash flows to back out implied risk premiums is not restricted to market indices. We can employ the approach to estimate the implied equity risk premium for a specific sector at a point in time. In September 2008, for instance, there was a widely held perception that investors were attaching much higher equity risk premiums to commercial bank stocks, in the aftermath of the failures of Fannie Mae, Freddie Mac, Bear Stearns and Lehman. To test this proposition, we took a look at the S&P Commercial Bank index, which was trading at 318.26 on September 12, 2008, with an expected dividend yield of 5.83% for the next 12 months. Assuming that these dividends will grow at 4% a year for the next 5 years and 3.60% (the treasury bond rate) thereafter, well below the nominal growth rate in the overall economy, we arrived at the following equation:

$$318.26 = \frac{19.30}{(1+r)} + \frac{20.07}{(1+r)^2} + \frac{20.87}{(1+r)^3} + \frac{21.71}{(1+r)^4} + \frac{22.57}{(1+r)^5} + \frac{22.57(1.036)}{(r-.036)(1+r)^5}$$

Solving for the expected return yields a value of 9.74%, which when netted out against the riskfree rate at the time (3.60%) yields an implied premium for the sector:

Implied ERP for Banking in September 2008 = 9.74% - 3.60% = 6.14%

How would we use this number? One approach would be to compare it to the average implied premium in this sector over time, with the underlying assumption that the value will revert back to the historical average for the sector. The implied equity risk premium for commercial banking stocks was close to 4% between 2005 and 2007, which would lead to the conclusion that banking stocks were undervalued in September 2008. The other is to assume that the implied equity premium for a sector is reflective of perceptions of future risk in that sector; in September 2008, there can be no denying that financial service companies faced unique risks and the market was reflecting these risks in prices. As a postscript, the implied equity risk premium for financial service firms was 5.80% in January 2012, just below the market-implied premium at the time (6.01%), suggesting that some of the post-crisis fear about banking stocks had receded.

A note of caution has to be added to about sector-implied premiums. Since these risk premiums consolidate both sector risk and market risk, it would be inappropriate to multiply these premiums by conventional betas, which are measures of sector risk. Thus,

multiplying the implied equity risk premium for the technology sector (which will yield a high value) by a market beta for a technology company (which will also be high for the same reason) will result in double counting risk.[142] In fact, these implied sector equity risk premiums can be added to the risk free rate to get a cost of equity for a sector that is entirely market-driven and model agnostic. For those analysts and appraisers who remain leery of using betas, for good or bad reasons, the implied cost of equity provides an escape hatch.

Firm Characteristics

Earlier in this paper, we talked about the small firm premium and how it has been estimated using historical data, resulting in backward looking estimates with substantial standard error. We could use implied premiums to arrive at more forward-looking estimates, using the following steps:

Step 1: Compute the implied equity risk premium for the overall market, using a broad index such as the S&P 500. Earlier in this paper, we estimated this, as of January 2022, to be 4.72%.

Step 2: Compute the implied equity risk premium for an index containing primarily or only small cap firms, such as the S&P 600 Small Cap Index. On January 1, 2022, the index was trading at 1416.86, with aggregated dividends and buybacks amounting to 3.10% (in index terms) of the index in the trailing 12 months. Using analyst estimates of growth for the next five years of 3.10% a year, and allowing for an increase in cash payout, as the growth rate decreases over time to 1.51%, yields the following equation[143]:

$$1416.86 = \frac{49.73}{(1+r)} + \frac{55.85}{(1+r)^2} + \frac{62.30}{(1+r)^3} + \frac{69.10}{(1+r)^4} + \frac{76.26}{(1+r)^5} + \frac{76.26\ (1.0151)}{(r-.0151)(1+r)^5}$$

Solving for the expected return, we get:

Expected return on small cap stocks = 6.41%

Implied equity risk premium for small cap stocks = 6.41% -1.51% = 4.90%

Step 3: The forward-looking estimate of the small cap premium should be the difference between the implied premium for small cap stocks (in step 2) and the implied premium for

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[142] You could estimate betas for technology companies against a technology index (rather than the market index) and use these betas with the implied equity risk premium for technology companies.

[143] To estimate the stable growth payout, the return on equity for small cap firms was set equal to the return on equity for mature firms in the most recent 12 months and the payout ratio was computed using the growth rate in perpetuity (set equal to the risk free rate). The payout ratio was adjusted in linear increments over the next five years.

the market (in step 1). Since we did use the adjusted buyback for small cap stocks, we will compare the small cap premium to the 4.90% that we estimated for the S&P 500 using the same approach.

Small cap premium = 4.90% - 4.90% = 0%

With the numbers in January 2022, small caps are priced to generate an expected identical to the expected return on large caps, i.e., the small cap premium is zero. Barring a one-time perturbation caused by COVID in 2020, small cap stocks have consistently been priced to earn close to or less than the expected return on large cap stocks in the United States. In effect, the answer to the question of how large the small cap premium answer should be, which we tried to address with historical data earlier in the paper, the market's response is "What small cap premium?".

This approach to estimating premiums can be extended to other variables. For instance, one of the issues that has challenged analysts in valuation is how to incorporate the illiquidity of an asset into its estimated value. While the conventional approach is to attach an illiquidity discount, an alternative is to adjust the discount rate upwards for illiquid assets. If we compute the implied equity risk premiums for stocks categorized by illiquidity, we may be able to come up with an appropriate adjustment. For instance, you could estimate the implied equity risk premium for the stocks that rank in the lowest decile in terms of illiquidity, defined as turnover ratio.[144] Comparing this value to the implied premium for the S&P 500 should yield an implied illiquidity risk premium. Adding this premium to the cost of equity for relatively illiquid investments will then discount the value of these investments for illiquidity.

2. Default Spread Based Equity Risk Premiums

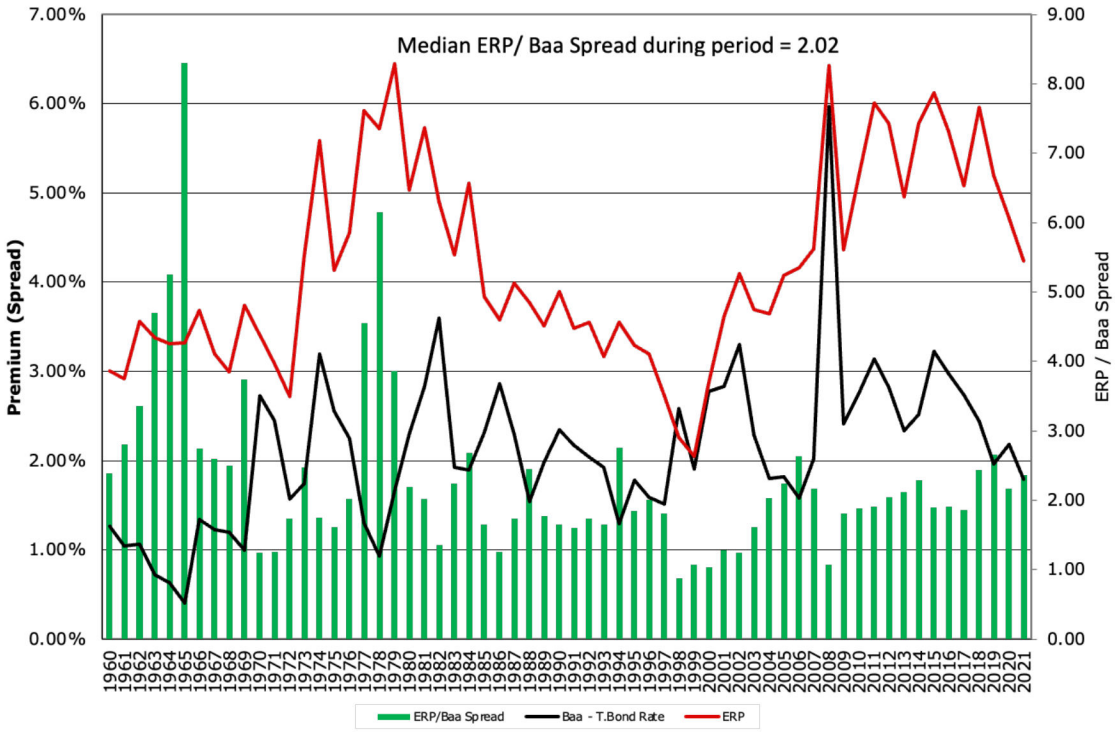
While we think of corporate bonds, stocks, and real estate as different asset classes, it can be argued that they are all risky assets and that they should therefore be priced consistently. Put another way, there should be a relationship across the risk premiums in these asset classes that reflect their fundamental risk differences. In the corporate bond market, the default spread, i.e., the spread between the interest rate on corporate bonds and the treasury bond rate, is used as the risk premium. In the equity market, as we have seen

[144] The turnover ratio is obtained by dividing $ trading volume in a stock by its market capitalization at that time.

through this paper, historical and implied equity premiums have tussled for supremacy as the measure of the equity risk premium. In the real estate market, no mention is made of an explicit risk premium, but real estate valuations draw heavily on the "capitalization rate", which is the discount rate applied to a real estate property's earnings to arrive at an estimate of value. The use of higher (lower) capitalization rates is the equivalent of demanding a higher (lower) risk premium.

Of these three premiums, the default spread is the less complex and the most widely accessible data item. If equity risk premiums could be stated in terms of the default spread on corporate bonds, the estimation of equity risk premiums would become immeasurably simpler. For instance, assume that the default spread on Baa rated corporate bonds, relative to the ten-year treasury bond, is 2.2% and that equity risk premiums are routinely twice as high as Baa bonds, the equity risk premium would be 4.4%. Is such a rule of thumb even feasible? To answer this question, we looked at implied equity risk premiums and Baa-rated corporate bond default spreads from 1960 to 2021 in Figure 16.

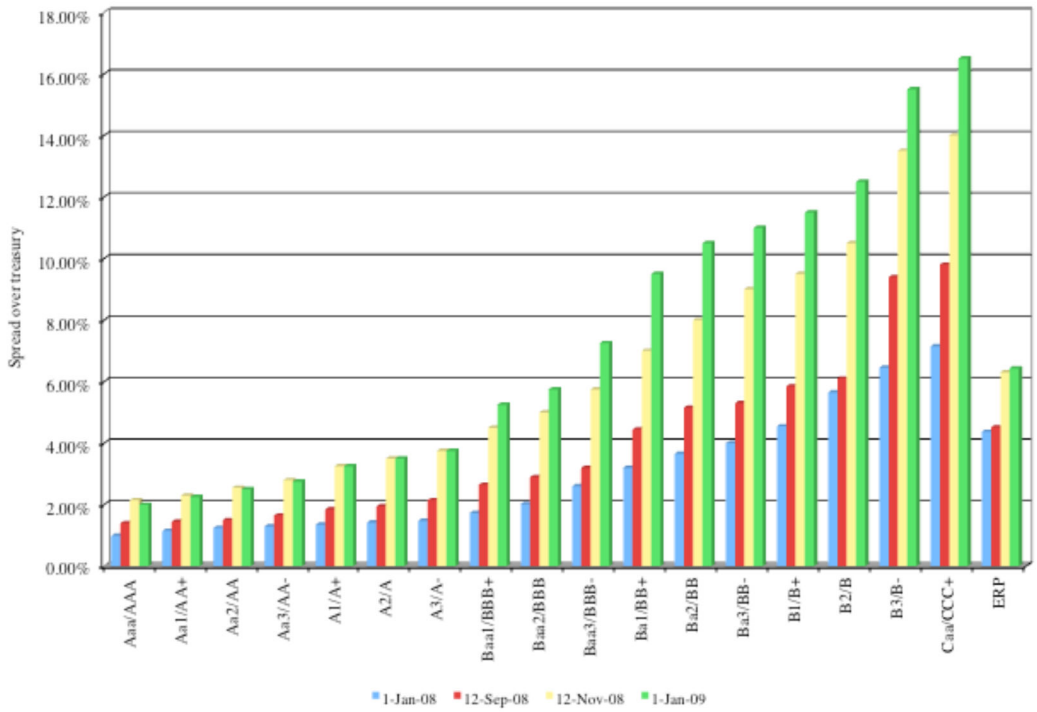
Figure 16: Equity Risk Premiums and Bond Default Spreads



In 2008, as the market went into crisis, both default spreads and equity risk premiums jumped, with the former increasing more on a proportionate basis. The ratio of 1.08 (ERP/ Baa Default Spread) at the end of 2008 was close to the lowest value in the entire series,

suggesting that either equity risk premiums were too low, or that default spreads were too high. At the end of 2021, both the equity risk premium and the default spread decreased, and the ratio moved back down to 2.37, a little higher than the median value of 2.02 for the entire time period. The connection between equity risk premiums and default spreads was most obvious during 2008, where changes in one often were accompanied by changes in the other. Figure 17 graphs out changes in default spreads and ERP over the tumultuous year:

Figure 17: Default Spreads on Ratings Classes



How could we use the historical relationship between equity risk premiums and default spreads to estimate a forward-looking equity risk premium? On January 1, 2022, the default spread on a Baa rated bond was about 2.18%. Applying the median ratio of 2.02, estimated from 1960-2021 numbers, to the Baa default spread results in the following estimate of the ERP:

Default Spread on Baa bonds (over treasury) on 1/1/2022 = 1.79%

Imputed Equity Risk Premium = Default Spread * Median ratio or ERP/Spread

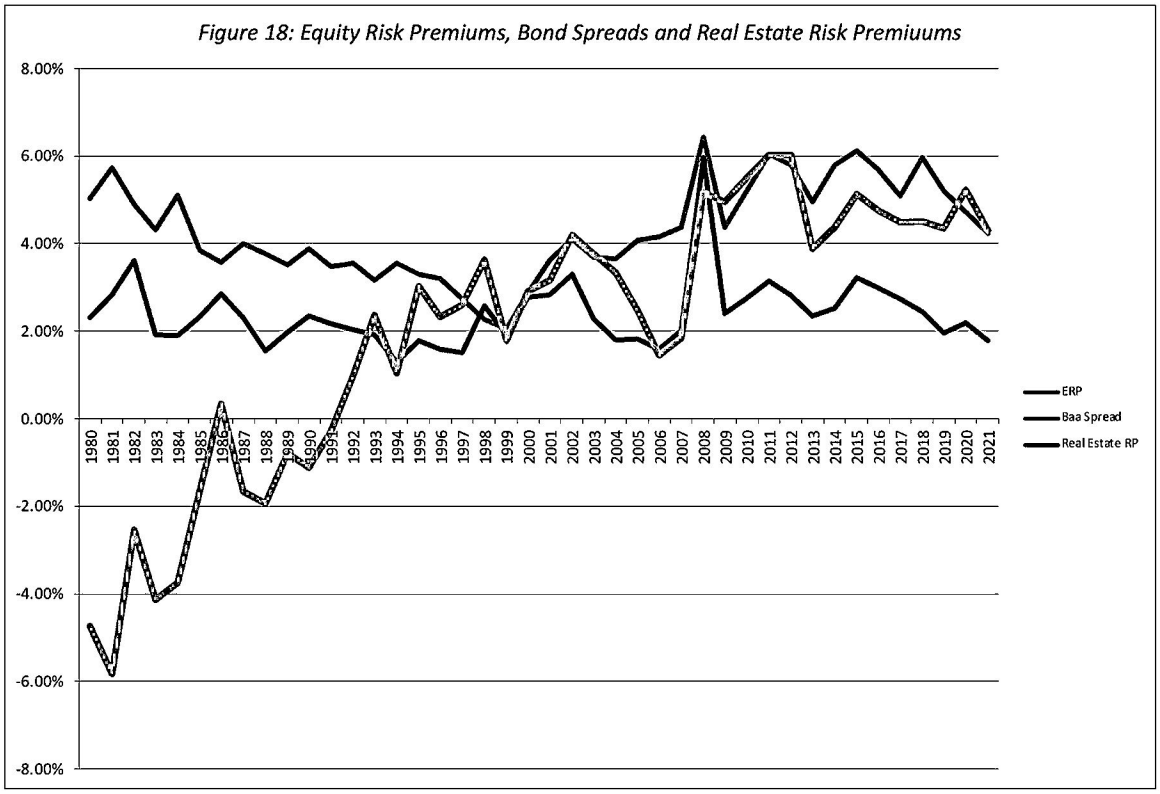
= 1.79%* 2.02 = 3.62 %

This is lower than the implied equity risk premium of 4.24% that we computed in January 2022. Note that there is significant variation in the ratio (of ERP to default spreads) over

time, with the ratio dropping below one at the peak of the dot.com boom (when equity risk premiums dropped to 2%) and rising to as high as 2.63 at the end of 2006; the standard error in the estimate is 0.20. Whenever the ratio has deviated significantly from the average, though, there is reversion back to that median over time.

The capitalization rate in real estate, as noted earlier, is widely used metric in the valuation of real estate properties. For instance, a capitalization rate of 8%, in conjunction with an office building that generates income of $ 10 million, would result in a property value of $ 125 million ($10/.08). The difference between the capitalization ratio and the treasury bond rate can be considered a real estate market risk premium, In Figure 18, we used the capitalization rate in real estate ventures and compared the risk premiums imputed for real estate with both bond default spreads and implied equity risk premiums between 1980 and 2021.

Figure 18: Equity Risk Premiums, Bond Spreads and Real Estate Risk Premiuums



The story in this graph is the convergence of the real estate and financial asset risk premiums. In the early 1980s, the real estate market seems to be operating in a different risk/return universe than financial assets, with the cap rates being less than the treasury bond rate. For instance, the cap rate in 1980 was 8.1%, well below the treasury bond rate of 12.8%, resulting in a negative risk premium for real estate. The risk premiums across

the three markets - real estate, equity and bonds - started moving closer to each other in the late 1980s and the trend accelerated in the 1990s. We would attribute at least some of this increased co-movement to the securitization of real estate in this period. In 2008, the three markets moved almost in lock step, as risk premiums in the markets rose and prices fell. The housing bubble of 2004-2008 is manifested in the drop in the real estate equity risk premium during those years, bottoming out at less than 2% at the 2006. The correction in housing prices since has pushed the premium back up. Both equity and bond premiums adjusted quickly to pre-crisis levels in 2009 and 2010, and real estate premiums followed, albeit at a slower pace. Between 2013 and 2021, the risk premiums in the three markets have moved in tandem, all rising over the period.

While the noise in the ratios (of ERP to default spreads and cap rates) is too high for us to develop a reliable rule of thumb, there is enough of a relationship here that we would suggest using this approach as a secondary one to test to see whether the equity risk premiums that we are using in practice make sense, given how risky assets are being priced in other markets. Thus, using an equity risk premium of 2%, when the Baa default spread is approximately at the same level strikes us as imprudent, given history. For macro strategists, there is a more activist way of using these premiums. When risk premiums in markets diverge, there is information in the relative pricing. Thus, the drop in equity risk premiums in the late 1990s, as default spreads stayed stable, would have signaled that the equity markets were overvalued (relative to bonds), just as the drop in default spreads between 2004 and 2007, while equity risk premiums were stagnant, would have suggested the opposite.

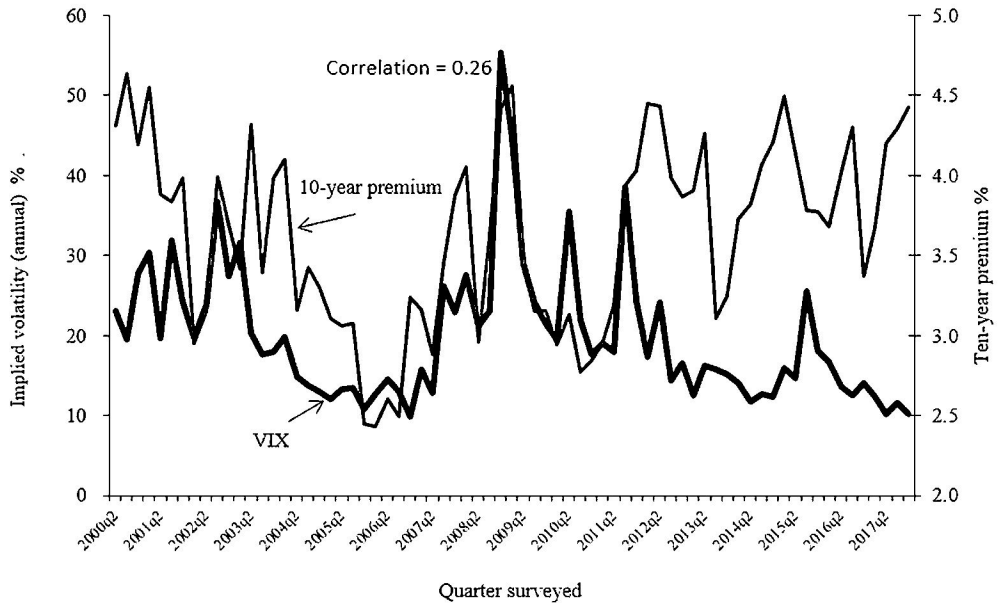
3. Option Pricing Model based Equity Risk Premium

There is one final approach to estimating equity risk premiums that draws on information in the option market. Option prices can be used to back out implied volatility in the equity market. To the extent that the equity risk premium is our way of pricing in the risk of future stock price volatility, there should be a relationship between the two.

The simplest measure of volatility from the options market is the volatility index (VIX), which is a measure of 30—day volatility constructed using the implied volatilities in traded S&P 500 index options. The CFO survey premium from Graham and Harvey that we referenced earlier in the paper found positive correlation between the premiums

demanded by CFOs and the VIX value (see figure 19 below), though the correlation has dropped over the last decade (from 0.64 to 0.26):

Figure 19: Volatility Index (VIX) and Survey Risk Premiums



Santa-Clara and Yan (2006) use options on the S&P 500 to estimate the ex-ante risk assessed by investors from 1996 and 2002 and back out an implied equity risk premium on that basis.[145] To estimate the ex-ante risk, they allow for both continuous and discontinuous (or jump) risk in stocks, and use the option prices to estimate the probabilities of both types of risk. They then assume that investors share a specific utility function (power utility) and back out a risk premium that would compensate for this risk. Based on their estimates, investors should have demanded an equity risk premium of 11.8% for their perceived risk and that the perceived risk was about 70% higher than the realized risk over this period. Ross (2015) uses the implied volatilities in calls and puts on the S&P 500 to extract not only equity risk premiums but to also estimate the probabilities of catastrophic events embedded in stock prices.[146]

The link between equity market volatility and the equity risk premium also became clearer during the market meltdown in the last quarter of 2008. Earlier in the paper, we noted the dramatic shifts in the equity risk premiums, especially in the last year, as the

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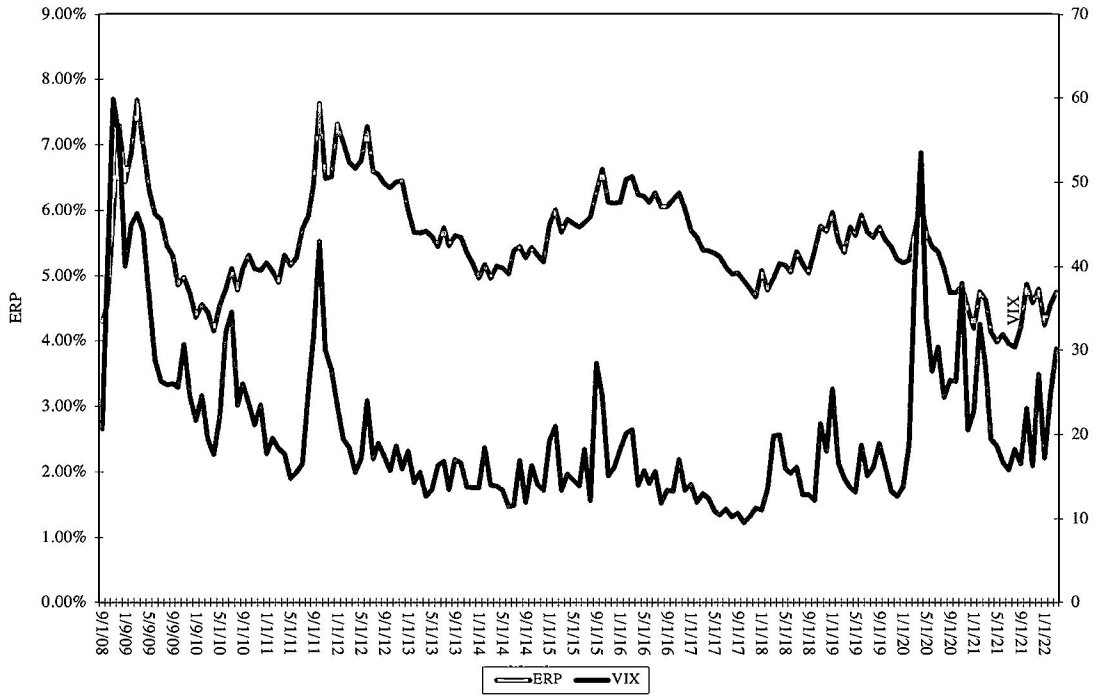
[145] Santa-Clara, P. and S. Yan, 2006, *Crashes, Volatility, and the Equity Premium: Lessons from S&P 500 Options*, Review of Economics and Statistics, v92, pg 435-451.

[146] Ross, S.M., 2015, *The Recovery Theorem*, Journal of Finance, v 70, 615-648.

financial crisis has unfolded. In Figure 20, we look at the implied equity risk premium at the start of each month from September 2008 to March 2022 and the volatility index (VIX), at the same point in time, for the S&P 500:

Figure 20: ERP versus VIX



Note that the surge in equity risk premiums between September 2008 and December 2008 coincided with a jump in the volatility index and that both numbers have declined in the years since the crisis. The drop in the VIX between September 2011 and March 2012 was not accompanied by a decrease in the implied equity risk premium, but equity risk premiums drifted down in the year after. While the VIX stayed low for much of 2014, equity risk premiums climbed through the course of the year. In the last few months of 2015, the VIX spiked again on global market crises and the equity risk premium also went up. In 2020, the VIX and the equity risk premium spiked in February and March, as markets melted down, but the spike subsided entirely in the equity risk premium and mostly in the VIX, by year end.

In a paper referenced earlier, Bollerslev, Tauchen and Zhou (2009) take a different tack and argue that it is not the implied volatility per se, but the variance risk, i.e., the difference between the implied variance (in option prices) and the actual variance, that

drives expected equity returns.[147] Thus, if the realized variance in a period is far higher (lower) than the implied variance, you should expect to see higher (lower) equity risk premiums demanded for subsequent periods. While they find evidence to back this proposition, they also note the relationship is strongest for short term returns (next quarter) and are weaker for longer-term returns. Bekaert and Hoerova (2013) decomposed the squared VIX into two components, a conditional variance of the stock market and an equity variance premium, and conclude that while the latter is a significant predictor of stock returns but the former is not.[148]

Choosing an Equity Risk Premium

We have looked at three different approaches to estimating risk premiums, the survey approach, where the answer seems to depend on who you ask and what you ask them, the historical premium approach, with wildly different results depending on how you slice and dice historical data and the implied premium approach, where the final number is a function of the model you use and the assumptions you make about the future. Ultimately, though, we have to choose a number to use in analysis and that number has consequences. In this section, we consider why the approaches give you different numbers and a pathway to use to devise which number is best for you.

Why do the approaches yield different values?

The different ways of estimating equity risk premium provide cover for analysts by providing justification for almost any number they choose to use in practice. No matter what the premium used by an analyst, whether it be 3% or 12%, there is back-up evidence offered that the premium is appropriate. While this may suffice as a legal defense, it does not pass muster on common sense grounds since not all risk premiums are equally justifiable. To provide a measure of how the numbers vary, the values that we have

[147] Bollerslev, T. G. Tauchen and H. Zhou, 2009, *Expected Stock Returns and Variance Risk Premia*, Review of Financial Studies, v22, 4463-4492.

[148] Bekaert, G. and M. Hoerova, 2013, *The VIX, Variance Premium and Stock Market Volatility*, SSRN Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2342200.

attached to the US equity risk premium, using different approaches, in January 2022 are summarized in table 25.

Table 25: Equity Risk Premium (ERP) for the United States – January 2022

Approach Used	*ERP*	*Additional information*
Survey: CFOs	4.42%	Campbell and Harvey survey of CFOs (2018); Average estimate. Median was 3.63%.
Survey: Global Fund Managers	4.60%	Merrill Lynch (January 2014) survey of global managers
Historical - US	5.13%	Geometric average - Stocks minus T.Bonds: 1928-2018
Historical – Multiple Equity Markets	3.20%	Average premium across 20 markets from 1900-2017: Dimson, Marsh and Staunton (2018)
Current Implied premium	4.24%	From S&P 500 – January 1, 2022
Average Implied premium (1960-2021)	4.21%	Average of implied equity risk premium
Average Implied premium (2012-2021)	5.35%	Average of implied equity risk premium
Default spread based premium	3.62%	Baa Default Spread on 1/1/22 * Median value of (ERP/ Default Spread)

The equity risk premiums, using the different approaches, yield a range, with the lowest value being 3.20% and the highest being 5.35%. Note that the range would have been larger if we used other measures of historical risk premiums: different time periods, arithmetic instead of geometric averages.

There are several reasons why the approaches yield different answers much of time and why they converge sometimes.

1. When stock prices enter an extended phase of upward (downward) movement, the historical risk premium will climb (drop) to reflect past returns. Implied premiums will tend to move in the opposite direction, since higher (lower) stock prices

generally translate into lower (higher) premiums. In 1999, for instance, after the technology induced stock price boom of the 1990s, the implied premium was 2% but the historical risk premium was almost 6%.

2. Survey premiums reflect historical data more than expectations. When stocks are going up, investors tend to become more optimistic about future returns and survey premiums reflect this optimism. In fact, the evidence that human beings overweight recent history (when making judgments) and overreact to information can lead to survey premiums overshooting historical premiums in both good and bad times. In good times, survey premiums are even higher than historical premiums, which, in turn, are higher than implied premiums; in bad times, the reverse occurs.
3. When the fundamentals of a market change, either because the economy becomes more volatile or investors get more risk averse, historical risk premiums will not change but implied premiums will. Shocks to the market are likely to cause the two numbers to deviate. After the attack on the World Trade Center in September 2001, for instance, implied equity risk premiums jumped almost 0.50% but historical premiums were unchanged (at least until the next update).

In summary, we should not be surprised to see large differences in equity risk premiums as we move from one approach to another, and even within an approach, as we change estimation parameters.

Which approach is the "best" approach?

If the approaches yield different numbers for the equity risk premium, and we have to choose one of these numbers, how do we decide which one is the "best" estimate? The answer to this question will depend upon several factors:

a. Predictive Power: In corporate finance and valuation, what we ultimately care about is the equity risk premium for the future. Consequently, the approach that has the best predictive power, i.e. yields forecasts of the risk premium that are closer to realized premiums, should be given more weight. So, which of the approaches does best on this count?

Campbell and Shiller (1988) suggested that the dividend yield, a simplistic measure of the implied equity risk premium, had significant predictive power for future

returns.[149] However, Goyal and Welch (2007) examined many of the measures suggested as predictors of the equity risk premium in the literature, including the dividend yield and the earnings to price ratio, and find them all wanting.[150] Using data from 1926 to 2005, they conclude that while the measures do reasonably well in sample, they perform poorly out of sample, suggesting that the relationships in the literature are either spurious or unstable. Campbell and Thompson (2008) disagree, noting that putting simple restrictions on the predictive regressions improve out of sample performance for many predictive variables.[151] Jagannathan and Liu (2019) also dissent, noting that using a latent model for dividends not only helps forecast future dividend growth, but that the learning from dividend dynamics can help predict future stock returns.[152]

To answer this question, we looked at the implied equity risk premiums from 1960 to 2021 and considered four predictors of this premium – the historical risk premium through the end of the prior year, the implied equity risk premium at the end of the prior year, the average implied equity risk premium over the previous five years and the premium implied by the Baa default spread. Since the survey data does not go back very far, we could not test the efficacy of the survey premium. Our results are summarized in table 26:

Table 26: Predictive Power of different estimates- 1960 – 2021

Predictor	*Correlation with implied premium next year*	*Correlation with actual return- next 5 years*	*Correlation with actual return – next 10 years*[153]
Earnings Yield	0.476**	0.194	0.420**
Dividend Yield	0.203	0.217	0.360**

[149] Campbell, J. Y. and R. J. Shiller. 1988, *The Dividend-Price Ratio And Expectations Of Future Dividends And Discount Factors*, Review of Financial Studies, v1(3), 195-228.

[150] Goyal, A. and I. Welch, 2007, *A Comprehensive Look at the Empirical Performance of Equity Premium Prediction*, Review of Financial Studies, v21, 1455-1508.

[151] Campbell, J.Y., and S.B. Thompson, 2008, *Predictive Excess Stock Returns Out of Sample: Can Anything Beat the Historical Average?* Review of Financial Studies, v21, 150-9-1531.

[152] Jagannathan, R. and B. Liu, 2019, *Dividend Dynamics, Learning and Expected Stock Returns*, Journal of Finance v74, pg 401-448.

[153] I computed the compounded average return on stocks in the following five (ten) years and netted out the compounded return earned on T.Bonds over the following five (ten) years. This was a switch from the simple arithmetic average of returns over the next 10 years that I was using until last year's survey.

Current implied premium	0.763**	0.471**	0.608**
Average implied premium: Last 5 years	0.718**	0.386**	0.537**
Historical Premium	-0.497**	-0.467**	-0.597**
Default Spread based premium	0.046	0.142	0.228

** Significant at 5% level

Over this period, the implied equity risk premium at the end of the prior period was the best predictor of the implied equity risk premium in the next period, whereas historical risk premiums did worst. If we extend our analysis to make forecasts of the actual return premium earned by stocks over bonds for the next five or ten years, the current implied premium remains the best predictor, though the earnings yield does well for ten-year returns. Historical risk premiums perform even worse as forecasts of actual risk premiums over the next 5 or 10 years; in fact, they operate as good contra indicators, with a high historical risk premium forecasting lowered actual returns in the future. If predictive power were the only test, historical premiums clearly fail the test.

b. Beliefs about markets: Implicit in the use of each approach are assumptions about market efficiency or lack thereof. If you believe that markets are efficient in the aggregate, or at least that you cannot forecast the direction of overall market movements, the current implied equity premium is the most logical choice, since it is estimated from the current level of the index. If you believe that markets, in the aggregate, can be significantly overvalued or undervalued, the historical risk premium or the average implied equity risk premium over long periods becomes a better choice. If you have absolutely no faith in markets, survey premiums will be the choice.

c. Purpose of the analysis: Notwithstanding your beliefs about market efficiency, the task for which you are using equity risk premiums may determine the right risk premium to use. In acquisition valuations and equity research, for instance, you are asked to assess the value of an individual company and not take a view on the level of the overall

market. This will require you to use the current implied equity risk premium, since using any other number will bring your market views into the valuation. To see why, assume that the current implied premium is 4% and you decide to use a historical premium of 6% in your company valuation. Odds are that you will find the company to be over valued, but a big reason for your conclusion is that you started off with the assumption that the market itself is over valued by about 25-30%.[154] To make yourself market neutral, you will have to stick with the current implied premium. In corporate finance, where the equity risk premium is used to come up with a cost of capital, which in turn determines the long-term investments of the company, it may be more prudent to build in a long-term average (historical or implied) premium.

In conclusion, there is no one approach to estimating equity risk premiums that will work for all analyses. If predictive power is critical or if market neutrality is a pre-requisite, the current implied equity risk premium is the best choice. For those more skeptical about markets, the choices are broader, with the average implied equity risk premium over a long time period having the strongest predictive power. Historical risk premiums are very poor predictors of both short-term movements in implied premiums or long-term returns on stocks.

As a final note, there are papers that report consensus premiums, often estimated by averaging across approaches. I remain skeptical about these estimates, since the approaches vary not only in terms of accuracy and predictive power but also in their philosophy. Averaging a historical risk premium with an implied premium may give an analyst a false sense of security but it really makes no sense since they represent different views of the world and push in different directions.

Five myths about equity risk premiums

There are widely held misconceptions about equity risk premiums that we would like to dispel in this section.

1. Estimation services "know" the risk premium: When Ibbotson and Sinquefield put together the first database of historical returns on stocks, bonds and bills in the 1970s,

[154] If the current implied premium is 4%, using a 6% premium on the market will reduce the value of the index by about 25-30%.

the data that they used was unique and not easily replicable, even for professional money managers. The niche they created, based on proprietary data, has led some to believe that Ibbotson Associates, and data services like them, have the capacity to read the historical data better than the rest of us, and therefore come up with better estimates. Now that the access to data has been democratized, and we face a much more even playing field, there is no reason to believe that any service has an advantage over any other, when it comes to historical premiums. Analysts should no longer be allowed to hide behind the defense that the equity risk premiums they use come from a reputable service and are thus beyond questioning.

2. There is no right risk premium: The flip side of the "services know it best" argument is that the data is so noisy that no one knows what the right risk premium is, and that any risk premium within a wide range is therefore defensible. As we have noted in this paper, it is indeed possible to arrive at outlandishly high or low premiums, but only if you use estimation approaches that do not hold up to scrutiny. The arithmetic average premium from 2012 to 2021 for stocks over treasury bonds is an equity risk premium estimate, but it is not a good one.
3. The equity risk premium does not change much over time: Equity risk premiums reflect both economic fundamentals and investor risk aversion and they do change over time, sometimes over very short intervals, as evidenced by what happened in the last quarter of 2008. Shocks to the system – a collapse of a large company or sovereign entity or a terrorist attack – can cause premiums to shoot up overnight. A failure to recognize this reality will lead to analyses that lag reality.
4. Using the same premium is more important than using the right premium: Within many investment banks, corporations and consulting firms, the view seems to be that getting all analysts to use the same number as the risk premium is more important than testing to see whether that number makes sense. Thus, if all equity research analysts use 5% as the equity risk premium, the argument is that they are all being consistent. There are two problems with this argument. The first is that using a premium that is too high or low will lead to systematic errors in valuation. For instance, using a 5% risk premium across the board, when the implied premium is 4%, will lead you to find that most stocks are overvalued. The second is that the impact of using too high a premium can

vary across stocks, with growth stocks being affected more negatively than mature companies. A portfolio manager who followed the recommendations of these analysts would then be over invested in mature companies and under invested in growth companies.

5. If you adjust the cash flows for risk, there is no need for a risk premium: While statement is technically correct, adjusting cash flows for risk has to go beyond reflecting the likelihood of negative scenarios in the expected cash flow. The risk adjustment to expected cash flows to make them certainty equivalent cash flows requires us to answer exactly the same questions that we deal with when adjusting discount rates for risk.

Summary

The risk premium is a fundamental and critical component in portfolio management, corporate finance and valuation. Given its importance, it is surprising that more attention has not been paid in practical terms to estimation issues. In this paper, we began by looking at the determinants of equity risk premiums including macroeconomic volatility, investor risk aversion and behavioral components. We then looked at the three basic approaches used to estimate equity risk premiums – the survey approach, where investors or managers are asked to provide estimates of the equity risk premium for the future, the historical return approach, where the premium is based upon how well equities have done in the past and the implied approach, where we use future cash flows or observed bond default spreads to estimate the current equity risk premium.

The premiums that we estimate can vary widely across approaches, and we considered two questions towards the end of the paper. The first is why the numbers vary across approaches and the second is how to choose the "right" number to use in analysis. For the latter question, we argued that the choice of a premium will depend upon the forecast period, whether you believe markets are efficient and whether you are required to be market neutral in your analysis.

Appendix 1: Historical Returns on Stocks, Bonds and Bills – United States

The historical returns on stocks include dividends each year and the historical returns on T.Bonds are computed for a constant-maturity 10-year treasury bond and include both price change and coupon each year.

	Annual Return			*Excess Return*		*Average Return*	
Year	*S&P 500*	*3-month T.Bill*	*10-year T. Bond*	*Stocks - Bills*	*Stocks - Bonds*	*Arithmetic Average: Stocks minus T.Bonds*	*Geometric Average: Stocks minus T. Bonds*
1928	43.81%	3.08%	0.84%	40.73%	42.98%	42.98%	42.98%
1929	-8.30%	3.16%	4.20%	-11.46%	-12.50%	15.24%	12.33%
1930	-25.12%	4.55%	4.54%	-29.67%	-29.66%	0.27%	-3.60%
1931	-43.84%	2.31%	-2.56%	-46.15%	-41.28%	-10.12%	-15.42%
1932	-8.64%	1.07%	8.79%	-9.71%	-17.43%	-11.58%	-15.81%
1933	49.98%	0.96%	1.86%	49.02%	48.13%	-1.63%	-7.36%
1934	-1.19%	0.32%	7.96%	-1.51%	-9.15%	-2.70%	-7.61%
1935	46.74%	0.18%	4.47%	46.57%	42.27%	2.92%	-2.49%
1936	31.94%	0.17%	5.02%	31.77%	26.93%	5.59%	0.40%
1937	-35.34%	0.30%	1.38%	-35.64%	-36.72%	1.36%	-4.22%
1938	29.28%	0.08%	4.21%	29.21%	25.07%	3.51%	-1.87%
1939	-1.10%	0.04%	4.41%	-1.14%	-5.51%	2.76%	-2.17%
1940	-10.67%	0.03%	5.40%	-10.70%	-16.08%	1.31%	-3.30%
1941	-12.77%	0.08%	-2.02%	-12.85%	-10.75%	0.45%	-3.88%
1942	19.17%	0.34%	2.29%	18.84%	16.88%	1.54%	-2.61%
1943	25.06%	0.38%	2.49%	24.68%	22.57%	2.86%	-1.18%
1944	19.03%	0.38%	2.58%	18.65%	16.45%	3.66%	-0.21%
1945	35.82%	0.38%	3.80%	35.44%	32.02%	5.23%	1.35%
1946	-8.43%	0.38%	3.13%	-8.81%	-11.56%	4.35%	0.63%
1947	5.20%	0.57%	0.92%	4.63%	4.28%	4.35%	0.81%
1948	5.70%	1.02%	1.95%	4.68%	3.75%	4.32%	0.95%
1949	18.30%	1.10%	4.66%	17.20%	13.64%	4.74%	1.49%
1950	30.81%	1.17%	0.43%	29.63%	30.38%	5.86%	2.63%
1951	23.68%	1.48%	-0.30%	22.20%	23.97%	6.61%	3.46%
1952	18.15%	1.67%	2.27%	16.48%	15.88%	6.98%	3.94%
1953	-1.21%	1.89%	4.14%	-3.10%	-5.35%	6.51%	3.57%
1954	52.56%	0.96%	3.29%	51.60%	49.27%	8.09%	4.98%
1955	32.60%	1.66%	-1.34%	30.94%	33.93%	9.01%	5.93%
1956	7.44%	2.56%	-2.26%	4.88%	9.70%	9.04%	6.07%
1957	-10.46%	3.23%	6.80%	-13.69%	-17.25%	8.16%	5.23%
1958	43.72%	1.78%	-2.10%	41.94%	45.82%	9.38%	6.39%

1959	12.06%	3.26%	-2.65%	8.80%	14.70%	9.54%	6.66%
1960	0.34%	3.05%	11.64%	-2.71%	-11.30%	8.91%	6.11%
1961	26.64%	2.27%	2.06%	24.37%	24.58%	9.37%	6.62%
1962	-8.81%	2.78%	5.69%	-11.59%	-14.51%	8.69%	5.97%
1963	22.61%	3.11%	1.68%	19.50%	20.93%	9.03%	6.36%
1964	16.42%	3.51%	3.73%	12.91%	12.69%	9.13%	6.53%
1965	12.40%	3.90%	0.72%	8.50%	11.68%	9.20%	6.66%
1966	-9.97%	4.84%	2.91%	-14.81%	-12.88%	8.63%	6.11%
1967	23.80%	4.33%	-1.58%	19.47%	25.38%	9.05%	6.57%
1968	10.81%	5.26%	3.27%	5.55%	7.54%	9.01%	6.60%
1969	-8.24%	6.56%	-5.01%	-14.80%	-3.23%	8.72%	6.33%
1970	3.56%	6.69%	16.75%	-3.12%	-13.19%	8.21%	5.90%
1971	14.22%	4.54%	9.79%	9.68%	4.43%	8.12%	5.87%
1972	18.76%	3.95%	2.82%	14.80%	15.94%	8.30%	6.08%
1973	-14.31%	6.73%	3.66%	-21.03%	-17.97%	7.73%	5.50%
1974	-25.90%	7.78%	1.99%	-33.68%	-27.89%	6.97%	4.64%
1975	37.00%	5.99%	3.61%	31.01%	33.39%	7.52%	5.17%
1976	23.83%	4.97%	15.98%	18.86%	7.85%	7.53%	5.22%
1977	-6.98%	5.13%	1.29%	-12.11%	-8.27%	7.21%	4.93%
1978	6.51%	6.93%	-0.78%	-0.42%	7.29%	7.21%	4.97%
1979	18.52%	9.94%	0.67%	8.58%	17.85%	7.42%	5.21%
1980	31.74%	11.22%	-2.99%	20.52%	34.72%	7.93%	5.73%
1981	-4.70%	14.30%	8.20%	-19.00%	-12.90%	7.55%	5.37%
1982	20.42%	11.01%	32.81%	9.41%	-12.40%	7.18%	5.10%
1983	22.34%	8.45%	3.20%	13.89%	19.14%	7.40%	5.34%
1984	6.15%	9.61%	13.73%	-3.47%	-7.59%	7.13%	5.12%
1985	31.24%	7.49%	25.71%	23.75%	5.52%	7.11%	5.13%
1986	18.49%	6.04%	24.28%	12.46%	-5.79%	6.89%	4.97%
1987	5.81%	5.72%	-4.96%	0.09%	10.77%	6.95%	5.07%
1988	16.54%	6.45%	8.22%	10.09%	8.31%	6.98%	5.12%
1989	31.48%	8.11%	17.69%	23.37%	13.78%	7.08%	5.24%
1990	-3.06%	7.55%	6.24%	-10.61%	-9.30%	6.82%	5.00%
1991	30.23%	5.61%	15.00%	24.62%	15.23%	6.96%	5.14%
1992	7.49%	3.41%	9.36%	4.09%	-1.87%	6.82%	5.03%
1993	9.97%	2.98%	14.21%	6.98%	-4.24%	6.65%	4.90%
1994	1.33%	3.99%	-8.04%	-2.66%	9.36%	6.69%	4.97%
1995	37.20%	5.52%	23.48%	31.68%	13.71%	6.80%	5.08%
1996	22.68%	5.02%	1.43%	17.66%	21.25%	7.01%	5.30%
1997	33.10%	5.05%	9.94%	28.05%	23.16%	7.24%	5.53%

1998	28.34%	4.73%	14.92%	23.61%	13.42%	7.32%	5.63%
1999	20.89%	4.51%	-8.25%	16.38%	29.14%	7.63%	5.96%
2000	-9.03%	5.76%	16.66%	-14.79%	-25.69%	7.17%	5.51%
2001	-11.85%	3.67%	5.57%	-15.52%	-17.42%	6.84%	5.17%
2002	-21.97%	1.66%	15.12%	-23.62%	-37.08%	6.25%	4.53%
2003	28.36%	1.03%	0.38%	27.33%	27.98%	6.54%	4.82%
2004	10.74%	1.23%	4.49%	9.52%	6.25%	6.53%	4.84%
2005	4.83%	3.01%	2.87%	1.82%	1.97%	6.48%	4.80%
2006	15.61%	4.68%	1.96%	10.94%	13.65%	6.57%	4.91%
2007	5.48%	4.64%	10.21%	0.84%	-4.73%	6.43%	4.79%
2008	-36.55%	1.59%	20.10%	-38.14%	-56.65%	5.65%	3.88%
2009	25.94%	0.14%	-11.12%	25.80%	37.05%	6.03%	4.29%
2010	14.82%	0.13%	8.46%	14.69%	6.36%	6.03%	4.31%
2011	2.10%	0.03%	16.04%	2.07%	-13.94%	5.80%	4.10%
2012	15.89%	0.05%	2.97%	15.84%	12.92%	5.88%	4.20%
2013	32.15%	0.07%	-9.10%	32.08%	41.25%	6.29%	4.62%
2014	13.52%	0.05%	10.75%	13.47%	2.78%	6.25%	4.60%
2015	1.36%	0.21%	1.28%	1.15%	0.08%	6.18%	4.54%
2016	11.77%	0.51%	0.69%	11.26%	11.08%	6.24%	4.62%
2017	21.61%	1.39%	2.80%	20.22%	18.80%	6.38%	4.77%
2018	-4.23%	2.37%	-0.02%	-6.17%	-4.21%	6.26%	4.66%
2019	31.22%	1.55%	9.64%	29.66%	21.58%	6.43%	4.83%
2020	18.01%	0.09%	11.33%	17.93%	6.69%	6.43%	4.84%
2021	28.47%	0.06%	-4.42%	28.41%	32.88%	6.71%	5.13%

Appendix 2: Moody's Sovereign Ratings by Country- January 2022 (FC = Foreign Currency, LC = Local Currency)

Country	FC	LC	Country	FC	LC	Country	FC	LC	Country	FC	LC
Abu Dhabi	Aa2	Aa2	Denmark	Aaa	Aaa	Latvia	A3	A3	Saudi Arabia	A1	A1
Albania	B1	B1	Dominican Republic	Ba3	Ba3	Lebanon	C	C	Senegal	Ba3	Ba3
Angola	B3	B3	Ecuador	Caa3	-	Liechtenstein	-	-	Serbia	Ba2	Ba2
Argentina	Ca	Ca	Egypt	B2	B2	Lithuania	A2	A2	Sharjah	Baa3	Baa3
Armenia	Ba3	Ba3	El Salvador	Caa1	-	Luxembourg	Aaa	Aaa	Singapore	Aaa	Aaa
Australia	Aaa	Aaa	Estonia	A1	A1	Macao SAR, China	Aa3	Aa3	Slovakia	A2	A2
Austria	Aa1	Aa1	eSwatini	B3	B3	Malaysia	A3	A3	Slovenia	A3	A3
Azerbaijan	Ba2	Ba2	Ethiopia	Caa2	Caa2	Maldives	Caa1	Caa1	Solomon Isla	Caa1	Caa1
Bahamas	Ba3	Ba3	Fiji	B1	B1	Mali	Caa1	Caa1	South Africa	Ba2	Ba2
Bahamas-Offshore Banks	-	-	Finland	Aa1	Aa1	Malta	A2	A2	Spain	Baa1	Baa1
Bahrain	B2	B2	France	Aa2	Aa2	Mauritius	Baa2	Baa2	Sri Lanka	Caa2	-
Bahrain-Offshore Banks [1]	-	-	Gabon	Caa1	Caa1	Mexico	Baa1	Baa1	Sint Maarten	Ba2	Ba2
Bangladesh	Ba3	Ba3	Georgia	Ba2	Ba2	Moldova	B3	B3	St. Vincent &	B3	B3
Barbados	Caa1	Caa1	Germany	Aaa	Aaa	Mongolia	B3	B3	Suriname	Caa3	Caa3
Belarus	B3	B3	Ghana	B3	B3	Montenegro	B1	-	Sweden	Aaa	Aaa
Belgium	Aa3	Aa3	Greece	Ba3	Ba3	Morocco	Ba1	Ba1	Switzerland	Aaa	Aaa
Belize	Caa3	Caa3	Guatemala	Ba1	Ba1	Mozambique	Caa2	Caa2	Taiwan, China	Aa3	Aa3
Benin	B1	B1	Guernsey (Channel Islands)	-	-	Namibia	Ba3	Ba3	Tajikistan	B3	B3
Bermuda	A2	A2	Honduras	B1	B1	Netherlands	Aaa	Aaa	Tanzania	B2	B2
Bolivia	B2	B2	Hong Kong SAR, China	Aa3	Aa3	New Zealand	Aaa	Aaa	Thailand	Baa1	Baa1
Bosnia and Herzegovina	B3	B3	Hungary	Baa2	Baa2	Nicaragua	B3	B3	Togo	B3	B3
Botswana	A3	A3	Iceland	A2	A2	Niger	B3	B3	Trinidad and	Ba2	Ba2
Brazil	Ba2	Ba2	India	Baa3	Baa3	Nigeria	B2	B2	Tunisia	Caa1	Caa1
Bulgaria	Baa1	Baa1	Indonesia	Baa2	Baa2	Norway	Aaa	Aaa	Turkey	B2	B2
Cambodia	B2	B2	Iraq	Caa1	Caa1	Oman	Ba3	Ba3	Uganda	B2	B2
Cameroon	B2	B2	Ireland	A2	A2	Pakistan	B3	B3	Ukraine	B3	B3
Canada	Aaa	Aaa	Isle of Man	Aa3	Aa3	Panama	Baa2	-	United Arab E	Aa2	Aa2
Cayman Islands	Aa3	Aa3	Israel	A1	A1	Panama-Offshore Banks	-	-	United Kingd	Aa3	Aa3
Cayman Islands-Offshore Banks	-	-	Italy	Baa3	Baa3	Papua New Guinea	B2	B2	United States	Aaa	Aaa
Chile	A1	A1	Jamaica	B2	B2	Paraguay	Ba1	Ba1	Uzbekistan	B1	B1
China	A1	A1	Japan	A1	A1	Peru	Baa1	Baa1	Uruguay	Baa2	Baa2
Colombia	Baa2	Baa2	Jersey (Channel Islands)	-	-	Philippines	Baa2	Baa2	Venezuela	C	C
Costa Rica	B2	B2	Jordan	B1	B1	Poland	A2	A2	Vietnam	Ba3	Ba3
Cote d'Ivoire	Ba3	Ba3	Kazakhstan	Baa2	Baa2	Portugal	Baa2	Baa2	Zambia	Ca	Ca
Croatia	Ba1	Ba1	Kenya	B2	B2	Qatar	Aa3	Aa3			
Cuba	Ca	Ca	Korea	Aa2	Aa2	Republic of the Congo	Caa2	Caa2			
Cyprus	Ba1	Ba1	Kuwait	A1	A1	Romania	Baa3	Baa3			
Czech Republic	Aa3	Aa3	Kyrgyz Republic	B2	B2	Russia	Baa3	Baa3			
Democratic Republic of the Congo	Caa1	Caa1	Laos	Caa2	Caa2	Rwanda	B2	B2			

Appendix 3: Country Risk Scores from the PRS Group – January 2022

Political Risk Services (PRS) is a risk estimation service that estimates country risk on multiple dimensions. The risk scores reported in this table are composite risk scores for each country, with lower numbers indicating higher risk.

Country	*PRS Score*	*Country*	*PRS Score*	*Country*	*PRS Score*	*Country*	*PRS Score*
Albania	69.3	El Salvador	68.3	Liberia	59.0	Serbia	69.5
Algeria	62.3	Estonia	73.3	Libya	66.3	Sierra Leone	57.0
Angola	62.8	Ethiopia	56.8	Lithuania	74.5	Singapore	85.5
Argentina	67.0	Finland	81.8	Luxembourg	86.3	Slovakia	73.3
Armenia	64.8	France	74.0	Madagascar	63.5	Slovenia	72.0
Australia	80.0	Gabon	65.3	Malawi	59.8	Somalia	51.5
Austria	78.0	Gambia	65.8	Malaysia	74.0	South Africa	69.5
Azerbaijan	72.0	Germany	82.5	Mali	59.3	Spain	73.0
Bahamas	72.0	Ghana	67.0	Malta	76.3	Sri Lanka	61.0
Bahrain	68.3	Greece	69.3	Mexico	70.0	Sudan	36.3
Bangladesh	66.8	Guatemala	71.5	Moldova	68.3	Suriname	55.0
Belarus	65.0	Guinea	57.5	Mongolia	66.3	Sweden	83.5
Belgium	77.5	Guinea-Bissau	62.8	Morocco	68.3	Switzerland	86.8
Bolivia	66.5	Guyana	66.3	Mozambique	50.5	Syria	45.5
Botswana	76.5	Haiti	56.3	Myanmar	53.0	Taiwan	86.0
Brazil	69.5	Honduras	68.0	Namibia	72.0	Tanzania	64.8
Brunei	79.0	Hong Kong	76.8	Netherlands	80.3	Thailand	65.5
Bulgaria	74.8	Hungary	74.0	New Zealand	79.5	Togo	63.8
Burkina Faso	61.3	Iceland	81.0	Nicaragua	66.8	Trinidad & Tobago	76.5
Cameroon	61.3	India	72.5	Niger	58.0	Tunisia	62.5
Canada	81.3	Indonesia	69.3	Nigeria	60.5	Turkey	58.3
Chile	73.8	Iran	63.8	Norway	88.0	Uganda	59.5
China, Peoples' Rep.	71.8	Iraq	65.3	Oman	71.8	Ukraine	66.5
Colombia	64.5	Ireland	82.3	Pakistan	57.3	United Arab Emirates	78.5
Congo, Dem. Republic	57.5	Israel	75.8	Panama	74.0	United Kingdom	76.0
Congo, Republic	66.5	Italy	76.5	Papua New Guinea	67.5	United States	72.3
Costa Rica	73.0	Jamaica	73.8	Paraguay	68.8	Uruguay	74.5
Cote d'Ivoire	60.5	Japan	80.3	Peru	70.8	Uzbekistan	75.5
Croatia	75.5	Jordan	64.8	Philippines	69.8	Venezuela	41.8
Cuba	55.3	Kazakhstan	72.8	Poland	74.5	Vietnam	71.0
Cyprus	71.3	Kenya	63.0	Portugal	77.3	Yemen, Republic	52.8
Czech Republic	77.8	Korea, D.P.R.	51.5	Qatar	78.0	Zambia	63.0
Denmark	85.5	Korea, Republic	80.8	Romania	70.5	Zimbabwe	61.0
Dominican Republic	73.0	Kuwait	72.8	Russia	73.5		
Ecuador	68.5	Latvia	73.5	Saudi Arabia	79.3		
Egypt	64.5	Lebanon	51.5	Senegal	61.8		

Appendix 4: Equity Market volatility, relative to S&P 500: Total Equity Risk Premiums and Country Risk Premiums (Daily returns from 1/21 – 1/22)

The standard deviation in stocks is computed using the primary index for each country, using 260 days of returns. The ERP for the US is 4.24%.

Country	*Std deviation in Equities*	*Relative Equity Volatility*	ERP	CRP
Argentina	31.72%	2.41	10.20%	5.96%
Bahrain	8.01%	0.61	2.58%	-1.66%
Bangladesh	15.04%	1.14	4.84%	0.60%
Bosnia	25.03%	1.90	8.05%	3.81%
Botswana	2.43%	0.18	0.78%	-3.46%
Brazil	19.95%	1.51	6.42%	2.18%
Bulgaria	15.12%	1.15	4.86%	0.62%
Chile	24.79%	1.88	7.97%	3.73%
China	19.74%	1.50	6.35%	2.11%
Colombia	17.88%	1.36	5.75%	1.51%
Costa Rica	5.65%	0.43	1.82%	-2.42%
Croatia	12.28%	0.93	3.95%	-0.29%
Cyprus	14.43%	1.09	4.64%	0.40%
Czech Republic	15.61%	1.18	5.02%	0.78%
Egypt	15.53%	1.18	5.00%	0.76%
Estonia	20.79%	1.58	6.69%	2.45%
Greece	20.44%	1.55	6.58%	2.34%
Hungary	25.51%	1.94	8.21%	3.97%
India	16.67%	1.26	5.36%	1.12%
Indonesia	12.56%	0.95	4.04%	-0.20%
Israel	13.95%	1.06	4.49%	0.25%
Italy	21.10%	1.60	6.79%	2.55%
Jamaica	15.31%	1.16	4.93%	0.69%
Jordan	10.03%	0.76	3.23%	-1.01%
Kazakhastan	14.79%	1.12	4.76%	0.52%
Kenya	15.26%	1.16	4.91%	0.67%
Kuwait	8.87%	0.67	2.85%	-1.39%
Laos	18.16%	1.38	5.84%	1.60%
Latvia	18.18%	1.38	5.85%	1.61%
Lebanon	22.59%	1.71	7.27%	3.03%

Lithuania	14.15%	1.07	4.55%	0.31%
Macedonia	13.98%	1.06	4.50%	0.26%
Malaysia	11.08%	0.84	3.56%	-0.68%
Malta	11.85%	0.90	3.81%	-0.43%
Mauritius	9.03%	0.69	2.90%	-1.34%
Mexico	14.24%	1.08	4.58%	0.34%
Mongolia	25.53%	1.94	8.21%	3.97%
Morocco	9.47%	0.72	3.05%	-1.19%
Namibia	23.11%	1.75	7.43%	3.19%
Nigeria	9.66%	0.73	3.11%	-1.13%
Oman	7.59%	0.58	2.44%	-1.80%
Pakistan	15.38%	1.17	4.95%	0.71%
Palestine	7.57%	0.57	2.44%	-1.80%
Panama	4.47%	0.34	1.44%	-2.80%
Peru	25.53%	1.94	8.21%	3.97%
Philippines	19.80%	1.50	6.37%	2.13%
Qatar	9.71%	0.74	3.12%	-1.12%
Romania	17.08%	1.30	5.49%	1.25%
Russia	32.39%	2.46	10.42%	6.18%
Saudi Arabia	12.43%	0.94	4.00%	-0.24%
Serbia	9.68%	0.73	3.11%	-1.13%
Singapore	12.13%	0.92	3.90%	-0.34%
Slovakia	12.08%	0.92	3.89%	-0.35%
Slovenia	16.15%	1.23	5.20%	0.96%
South Africa	18.53%	1.41	5.96%	1.72%
Sri Lanka	24.22%	1.84	7.79%	3.55%
Taiwan	17.14%	1.30	5.51%	1.27%
Tanzania	12.84%	0.97	4.13%	-0.11%
Thailand	12.00%	0.91	3.86%	-0.38%
Tunisia	5.51%	0.42	1.77%	-2.47%
Turkey	29.06%	2.20	9.35%	5.11%
UAE	14.57%	1.11	4.69%	0.45%
Ukraine	35.21%	2.67	11.33%	7.09%
US	13.18%	1.00	4.24%	0.00%
Venezuela	41.63%	3.16	13.39%	9.15%

Appendix 5: Equity Volatility versus Bond/CDS volatility- January 2022

Standard deviation in equity index (σ_{Equity}) and government bond price (σ_{Bond}) was computed, using the last 260 trading days, where available. To compute the σ_{CDS}, we first computed the standard deviation of the CDS in basis points over the the last 260 trading days and then divided by the level of the CDS to get a coefficient of variation.

Country	*Std deviation in Equities*	σ_{Bond}	$\sigma_{Equity}/\sigma_{Bond}$	σ *(CDS)*	*CDS*	CV(CDS)	$\sigma_{Equity}/\sigma_{CDS}$
Algeria	NA	NA	NA	0.23%	1.10%	20.91%	NA
Angola	NA	NA	NA	0.53%	5.94%	8.92%	NA
Argentina	31.72%	NA	NA	0.70%	23.32%	3.00%	10.57
Bahrain	8.01%	NA	NA	0.21%	3.40%	6.18%	1.30
Bangladesh	15.04%	NA	NA	NA	NA	NA	NA
Bosnia	25.03%	NA	NA	NA	NA	NA	NA
Botswana	2.43%	NA	NA	Na	NA	NA	NA
Brazil	19.95%	14.29%	1.40	0.23%	2.91%	7.90%	2.52
Bulgaria	15.12%	7.12%	2.12	0.36%	0.81%	44.44%	0.34
Chile	24.79%	24.46%	1.01	0.26%	1.25%	20.80%	1.19
China	19.74%	9.77%	2.02	0.20%	0.74%	27.03%	0.73
Colombia	17.88%	10.06%	1.78	0.24%	2.77%	8.66%	2.06
Costa Rica	5.65%	NA	NA	0.72%	3.92%	18.37%	0.31
Croatia	12.28%	11.33	0.01	0.38%	1.11%	34.23%	0.36
Cyprus	14.43%	5.64%	2.56	0.21%	0.74%	28.38%	0.51
Czech Republic	15.61%	8.64%	1.81	0.19%	0.47%	40.43%	0.39
Egypt	15.53%	NA	NA	0.67%	5.74%	11.67%	1.33
El Salvador	NA	NA	NA	0.45%	18.33%	2.45%	NA
Estonia	20.79%	NA	NA	0.37%	0.85%	43.53%	0.48
Ghana	NA	NA	NA	0.82%	12.54%	6.54%	NA
Greece	20.44%	11.81%	1.73	0.35%	1.69%	20.71%	0.99
Guatemela	NA	NA	NA	0.46%	2.30%	20.00%	NA
Hungary	25.51%	15.28%	1.67	0.15%	0.69%	21.74%	1.17
India	16.67%	10.51%	1.59	0.23%	1.44%	15.97%	1.04
Indonesia	12.56%	7.19%	1.75	0.43%	1.36%	31.62%	0.40
Iraq	NA	NA	NA	0.43%	5.63%	7.64%	NA

Israel	13.95%	5.86%	2.38	0.39%	0.72%	54.17%	0.26
Italy	21.10%	NA	NA	0.24%	1.41%	17.02%	1.24
Jamaica	15.31%	NA	NA	NA	NA	NA	NA
Jordan	10.03%	NA	NA	NA	NA	NA	NA
Kazakhastan	14.79%	NA	NA	0.49%	2.46%	19.92%	0.74
Kenya	15.26%	NA	NA	0.19%	4.44%	4.28%	3.57
Kuwait	8.87%	NA	NA	0.21%	0.86%	24.42%	0.36
Laos	18.16%	NA	NA	NA	NA	NA	NA
Latvia	18.18%	4.38%	4.15	0.25%	0.74%	33.78%	0.54
Lebanon	22.59%	NA	NA	NA	NA	NA	NA
Lithuania	14.15%	4.18%	3.39	0.19%	0.79%	24.05%	0.59
Macedonia	13.98%	NA	NA	NA	NA	NA	NA
Malaysia	11.08%	6.94%	1.60	0.28%	0.81%	34.57%	0.32
Malta	11.85%	NA	NA	NA	NA	NA	NA
Mauritius	9.03%	NA	NA	NA	NA	NA	NA
Mexico	14.24%	12.65%	1.13	0.29%	1.58%	18.35%	0.78
Mongolia	25.53%	NA	NA	0.78%	4.37%	17.85%	1.43
Morocco	9.47%	NA	NA	0.21%	1.32%	15.91%	0.60
Namibia	23.11%	NA	NA	0.38%	2.80%	13.57%	1.70
Nigeria	9.66%	18.35%	0.53	0.41%	5.53%	7.41%	1.30
Oman	7.59%	NA	NA	0.43%	3.19%	13.48%	0.56
Pakistan	15.38%	8.55%	1.80	0.48%	3.67%	13.08%	1.18
Palestine	7.57%	NA	NA	NA	NA	NA	NA
Panama	4.47%	NA	NA	0.24%	1.26%	19.05%	0.23
Peru	25.53%	15.60%	1.64	0.21%	1.31%	16.03%	1.59
Philippines	19.80%	7.14%	2.77	0.35%	0.92%	38.04%	0.52
Qatar	9.71%	NA	NA	0.33%	0.74%	44.59%	0.22
Romania	17.08%	8.65%	1.97	0.30%	1.24%	24.19%	0.71
Russia	32.39%	18.35%	1.77	0.35%	1.70%	20.59%	1.57
Rwanda	NA	NA	NA	0.25%	3.36%	7.44%	NA
Saudi Arabia	12.43%	5.52%	2.25	0.35%	0.88%	39.77%	0.31
Senegal	NA	NA	NA	0.35%	2.66%	13.16%	NA
Serbia	9.68%	NA	NA	0.22%	1.37%	16.06%	0.60

Singapore	12.13%	6.73%	1.80	NA	NA	NA	NA
Slovakia	12.08%	6.35	0.02	0.15%	0.63%	23.81%	0.51
Slovenia	16.15%	9.41%	1.72	0.25%	0.87%	28.74%	0.56
South Africa	18.53%	15.16%	1.22	0.35%	2.85%	12.28%	1.51
Sri Lanka	24.22%	NA	NA	0.37%	19.69%	1.88%	12.89
Taiwan	17.14%	NA	NA	NA	NA	NA	NA
Tanzania	12.84%	NA	NA	NA	NA	NA	NA
Thailand	12.00%	3.78%	3.17	0.25%	0.52%	48.08%	0.25
Tunisia	5.51%	NA	NA	0.45%	8.82%	5.10%	1.08
Turkey	29.06%	18.34%	1.58	0.45%	5.51%	8.17%	3.56
UAE	14.57%	NA	NA	NA	NA	NA	NA
Ukraine	35.21%	25.90%	1.36	0.50%	6.17%	8.10%	4.34
Uruguay	NA	NA	NA	0.33%	1.46%	22.60%	NA
Venezuela	41.63%	49.70%	0.84	NA	NA	NA	NA
Vietnam	25.33%	NA	NA	0.32%	1.56%	20.51%	1.23
Zambia	NA	NA	NA	NA	NA	NA	NA
Average			1.77				1.46
Median			1.74				0.73

Appendix 6: Year-end Implied Equity Risk Premiums: 1961-2021

These estimates of equity risk premium for the S&P 500 are forward looking and are computed based on the index level at the end of each year and the expected cash flows on the index for the future. The cash flows are computed as dividends plus stock buybacks in each year.

Year	*S&P 500*	*Earnings**	*Dividends**	*T.Bond Rate*	*Estimated Growth*	*Implied ERP*
1961	71.55	3.37	2.04	2.35%	2.41%	2.92%
1962	63.1	3.67	2.15	3.85%	4.05%	3.56%
1963	75.02	4.13	2.35	4.14%	4.96%	3.38%
1964	84.75	4.76	2.58	4.21%	5.13%	3.31%
1965	92.43	5.30	2.83	4.65%	5.46%	3.32%
1966	80.33	5.41	2.88	4.64%	4.19%	3.68%
1967	96.47	5.46	2.98	5.70%	5.25%	3.20%
1968	103.86	5.72	3.04	6.16%	5.32%	3.00%
1969	92.06	6.10	3.24	7.88%	7.55%	3.74%
1970	92.15	5.51	3.19	6.50%	4.78%	3.41%
1971	102.09	5.57	3.16	5.89%	4.57%	3.09%
1972	118.05	6.17	3.19	6.41%	5.21%	2.72%
1973	97.55	7.96	3.61	6.90%	8.30%	4.30%
1974	68.56	9.35	3.72	7.40%	6.42%	5.59%
1975	90.19	7.71	3.73	7.76%	5.99%	4.13%
1976	107.46	9.75	4.22	6.81%	8.19%	4.55%
1977	95.1	10.87	4.86	7.78%	9.52%	5.92%
1978	96.11	11.64	5.18	9.15%	8.48%	5.72%
1979	107.94	14.55	5.97	10.33%	11.70%	6.45%
1980	135.76	14.99	6.44	12.43%	11.01%	5.03%
1981	122.55	15.18	6.83	13.98%	11.42%	5.73%
1982	140.64	13.82	6.93	10.47%	7.96%	4.90%
1983	164.93	13.29	7.12	11.80%	9.09%	4.31%
1984	167.24	16.84	7.83	11.51%	11.02%	5.11%
1985	211.28	15.68	8.20	8.99%	7.89%	3.84%
1986	242.17	14.43	8.19	7.22%	5.54%	3.58%
1987	247.08	16.04	9.17	8.86%	9.66%	3.99%
1988	277.72	24.12	10.22	9.14%	9.76%	3.77%
1989	353.4	24.32	11.73	7.93%	9.58%	3.51%
1990	330.22	22.65	12.35	8.07%	7.39%	3.89%
1991	417.09	19.30	12.97	6.70%	6.34%	3.48%
1992	435.71	20.87	12.64	6.68%	4.67%	3.55%

1993	466.45	26.90	12.69	5.79%	4.73%	3.17%
1994	459.27	31.75	13.36	7.82%	7.23%	3.55%
1995	615.93	37.70	14.17	5.57%	5.65%	3.29%
1996	740.74	40.63	14.89	6.41%	6.13%	3.20%
1997	970.43	44.09	15.52	5.74%	5.45%	2.73%
1998	1229.23	44.27	16.20	4.65%	4.60%	2.26%
1999	1469.25	51.68	16.71	6.44%	5.75%	2.05%
2000	1320.28	56.13	16.27	5.11%	3.71%	2.87%
2001	1148.09	38.85	15.74	5.05%	3.56%	3.62%
2002	879.82	46.04	16.08	3.81%	3.57%	4.10%
2003	1111.91	54.69	17.88	4.25%	5.35%	3.69%
2004	1211.92	67.68	19.407	4.22%	4.90%	3.65%
2005	1248.29	76.45	22.38	4.39%	6.16%	4.08%
2006	1418.3	87.72	25.05	4.70%	5.93%	4.16%
2007	1468.36	82.54	27.73	4.02%	5.03%	4.37%
2008	903.25	65.39	28.05	2.21%	2.11%	6.43%
2009	1115.10	59.65	22.31	3.84%	0.28%	4.36%
2010	1257.64	83.66	23.12	3.29%	3.33%	5.20%
2011	1257.60	97.05	26.02	1.88%	2.75%	6.01%
2012	1426.19	102.47	30.44	1.76%	2.93%	5.78%
2013	1848.36	107.45	36.28	3.04%	5.01%	4.96%
2014	2058.90	113.01	39.44	2.17%	2.77%	5.78%
2015	2043.94	106.32	43.16	2.27%	2.96%	6.12%
2016	2238.83	108.86	45.03	2.45%	2.64%	5.69%
2017	2673.61	124.94	49.73	2.41%	3.22%	5.08%
2018	2506.85	148.34	53.61	2.68%	3.24%	5.96%
2019	3230.78	*162.35*	*58.80*	1.92%	2.57%	5.20%
2020	3756.07	139.76	56.70	0.93%	0.74%	4.72%
2021	4766.18	206.38	59.20	1.51%	1.71%	4.24%

[a] The earnings and dividend numbers for the S&P 500 represent the estimates that would have been available at the start of each of the years and thus may not match up to the actual numbers for the year. For instance, in January 2022, the estimated earnings for the S&P 500 index included actual earnings for three quarters of 2021 and the estimated earnings for the last quarter of 2020. The actual earnings for the last quarter would not have been available until April 2022.

Implied Equity Premiums

- Let's start with a general proposition. If you know the price paid for an asset and have estimates of the expected cash flows on the asset, you can estimate the IRR of these cash flows. If you paid the price, this is what you have priced the asset to earn (as an expected return).
- If you assume that stocks are correctly priced in the aggregate and you can estimate the expected cashflows from buying stocks, you can estimate the expected rate of return on stocks by finding that discount rate that makes the present value equal to the price paid. Subtracting out the riskfree rate should yield an implied equity risk premium.
- This implied equity premium is a forward looking number and can be updated as often as you want (every minute of every day, if you are so inclined).