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Risk factors

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Historical returns and financial market scenarios are no reliable indicators or guarantee of future performance. The price and value of investments mentioned and any income that might accrue could fall or rise or fluctuate. Past performance is not a guide to future performance. If an investment is denominated in a currency other than your base currency, changes in the rate of exchange may have an adverse effect on value, price, or income. You should consult with such advisor(s) as you consider necessary to assist you in making these determinations. Investments may have no public market or only a restricted secondary market. Where a secondary market exists, it is not possible to predict the price at which investments will trade in the market or whether such market will be liquid or illiquid.

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Emerging market investments usually result in higher risks such as political, economic, credit, exchange rate, market liquidity, legal, settlement, market, shareholder, and creditor risks. Emerging markets are located in countries that possess one or more of the following characteristics: a certain degree of political instability, relatively unpredictable financial markets and economic growth patterns, a financial market that is still at the development stage or a weak economy. Some of the main risks are political risks, economic risks, credit risks, currency risks and market risks. Investments in foreign currencies are subject to exchange rate fluctuations.

Foreign currency prices can fluctuate considerably, particularly due to macroeconomic and market trends. Thus, such involve e.g., the risk that the foreign currency might lose value against the investor's reference currency.

Equity securities are subject to a volatility risk that depends on a variety of factors, including but not limited to the company's financial health, the general economic situation and interest rate levels. Any pay out of profit (e.g., in the form of a dividend) is dependent on the

company and its business performance. Equity securities are also subject to an issuer risk in that a total loss is possible, for example if the issuer goes bankrupt.

Private equity is private equity capital investment in companies that are not traded publicly (i.e., are not listed on a stock exchange). Private equity investments are generally illiquid and are seen as a long-term investment. Private equity investments, including the investment opportunity described herein, may include the following additional risks: (i) loss of all or a substantial portion of the investor's investment, (ii) investment managers may have incentives to make investments that are riskier or more speculative due to performance based compensation, (iii) lack of liquidity as there may be no secondary market, (iv) volatility of returns, (v) restrictions on transfer, (vi) potential lack of diversification, (vii) high fees and expenses, (viii) little or no requirement to provide periodic pricing and (ix) complex tax structures and delays in distributing important tax information to investors.

Political developments concerning environmental regulations may have a significant adverse impact on the investments. Heightened exposure to less regulated sectors and to businesses such as renewable resources that are not yet well established could cause temporary volatility.

ESG-related risks in a portfolio context need to become an integral part of the investment process because they can impact growth, profitability, or the cost of capital in the long term. ESG insights need to be combined with traditional fundamental analysis in order to obtain a comprehensive picture of a company and implement better-informed investment decisions.

Sustainable investments involve several risks that are fundamentally dependent on the investments in different asset classes, regions, and currencies. For example, investments in equities bear market (price) risk and specific company risk, investments in fixed-income bear credit, interest rate, and inflation risks. Similar market risks apply to investment funds and to alternative investments. Some investments may be subject to foreign exchange currency risk, liquidity risk or/and emerging market risk. Sustainable investments bear the risk of suffering a partial or a total loss.

Risks associated with investments in cryptocurrencies and tokens (such as NFTs) include high volatility (e.g., due to low market capitalization, speculation and continually changing legal/regulatory frameworks) and various other risks (e.g., loss of access due to technical reasons or fraud etc.). Such investments may not be suitable for all investors. Before deciding to invest in Cryptocurrencies or tokens you are advised to carefully consider technical and

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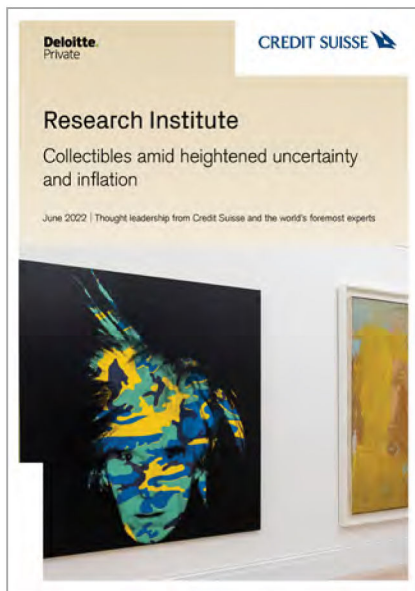
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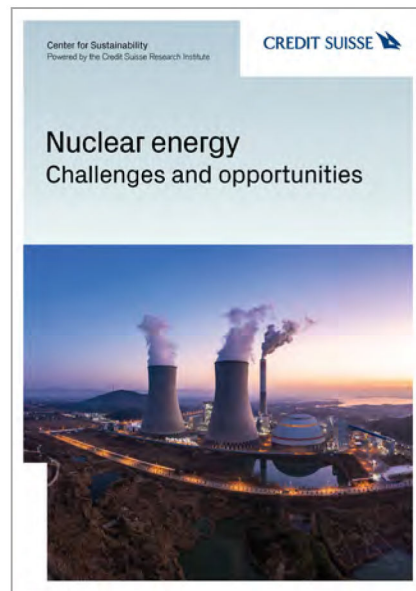
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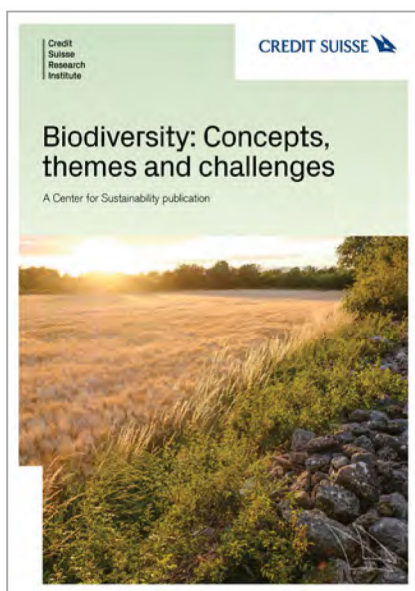
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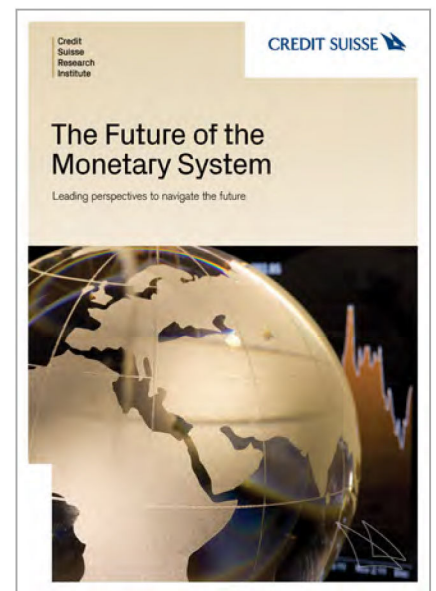
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	RETURN ASSUMPTION	RETURN ASSUMPTION	RETURN ASSUMPTION	RETURN ASSUMPTION		
U.S. Large-Cap	8.2%	7.0%	8.4%	7.2%	15.4%	13.0%
U.S. Mid-Cap	9.5%	8.1%	9.3%	7.9%	16.8%	11.3%
U.S. Small-Cap	11.2%	9.2%	10.5%	8.5%	19.7%	14.1%
Int Developed Large-Cap	8.7%	7.3%	9.1%	7.7%	16.8%	5.9%
Int Developed Small-Cap	11.2%	9.6%	10.9%	9.0%	18.1%	7.6%
Emerging Markets	12.8%	10.3%	12.7%	10.3%	22.1%	3.4%
Global Equity	8.7%	7.5%	9.5%	8.3%	15.1%	9.3%
Thematic Equity	13.8%	11.2%	10.3%	10.3%	22.5%	9.3%
Intermediate-Term Municipal	3.7%	3.6%	3.3%	3.3%	3.9%	2.2%
Short-Term Municipal	2.5%	2.5%	2.4%	2.4%	1.2%	0.9%
Intermediate-Term Core	4.7%	4.6%	4.7%	4.5%	5.3%	1.5%
Short-Term Core	3.7%	3.7%	3.7%	3.6%	2.6%	1.0%
MBS/ABS	4.0%	3.9%	4.0%	3.8%	6.0%	1.2%
Municipal High Yield	6.0%	5.8%	6.1%	5.8%	6.5%	4.4%
High Yield	7.2%	6.8%	7.0%	6.7%	8.4%	4.5%
Bank Loans	6.5%	6.3%	6.6%	6.4%	6.1%	3.7%
Preferred Stocks	5.9%	4.7%	5.9%	4.7%	15.2%	4.5%
Convertible Bonds	3.0%	2.3%	3.0%	2.3%	12.1%	10.6%
Non-US Developed Debt	2.1%	1.7%	2.2%	1.8%	9.3%	-1.7%
Emerging Markets Debt	5.7%	5.2%	5.2%	4.8%	9.6%	0.3%
TIPS	2.7%	2.6%	2.7%	2.6%	5.4%	1.7%

For illustrative purposes only and subject to change based on market environment. Data as of 12.31.2022. Geometric return is the compounding rate of wealth invested solely in a single asset class. Arithmetic averages convey the typical single-year rate of return from investing in an asset class; this quantity is used when combining asset class returns into a portfolio return for a given year. Geometric returns are lower than the corresponding arithmetic returns by an amount known as risk drag: the more volatile the asset, the higher its risk drag. Returns are listed in local currency. Asset classes are proxied by their indexes. It is not possible to invest directly in an index. Please see Notes on back page.

Capital Market & Yield Assumptions Cont.

ASSET CLASS	10-YR ARITHMETIC	10-YR GEOMETRIC	20-YR ARITHMETIC	20-YR GEOMETRIC	STANDARD DEVIATION	HISTORICAL RETURN (10-YR)
	RETURN ASSUMPTION	RETURN ASSUMPTION	RETURN ASSUMPTION	RETURN ASSUMPTION		
Energy Infrastructure	7.8%	5.3%	8.7%	6.1%	22.4%	0.7%
Public Real Estate	9.3%	7.9%	9.6%	8.2%	17.0%	8.3%
Commodities	4.7%	3.6%	4.7%	3.6%	14.8%	-0.8%
Market Neutral	4.1%	3.9%	5.2%	5.2%	6.0%	4.7%
Hedged Equity	5.1%	4.7%	6.2%	6.2%	8.9%	5.2%
Private Credit	9.7%	9.4%	9.5%	9.2%	7.2%	9.7%
Private Real Estate	8.4%	8.0%	8.6%	8.3%	8.5%	10.3%
Private Equity – Secondaries	12.5%	11.2%	11.7%	10.4%	15.7%	14.4%
Private Equity	14.6%	12.7%	13.7%	11.8%	19.7%	18.7%
Cash	3.4%	3.4%	3.4%	3.4%	1.2%	0.6%

For illustrative purposes only and subject to change based on market environment. Data as of 12.31.2022. Geometric return is the compounding rate of wealth invested solely in a single asset class. Arithmetic averages convey the typical single-year rate of return from investing in an asset class; this quantity is used when combining asset class returns into a portfolio return for a given year. Geometric returns are lower than the corresponding arithmetic returns by an amount known as risk drag; the more volatile the asset, the higher its risk drag. Returns are listed in local currency. Asset classes are proxied by their indexes. It is not possible to invest directly in an index. Please see Notes on back page.

Capital Market & Yield Assumptions Cont.

ASSET CLASS	REPRESENTATIVE BENCHMARK
U.S. Large-Cap	S&P 500 Index
U.S. Mid-Cap	Russell Mid-Cap Index
U.S. Small-Cap	Russell 2000 Index
Int Developed Large-Cap	MSCI EAFE Index
Int Developed Small-Cap	MSCI EAFE Small-Cap Index
Emerging Markets	MSCI Emerging Markets Index
Global All-Cap	MSCI ACWI Index
Thematic Equity	Russell 2000 Growth Index
Intermediate Term Municipal Bonds	Barclays Intermediate Municipal 5-10 Year Index
Short-Term Municipal Bonds	Barclays Municipal 1-3 Year Index
Investment Grade Core	Barclays U.S. Aggregate Index
Investment Grade Short-Term	Barclays U.S. Government/Credit 1-3 Year Index
MBS/ABS	Barclays US MBS Index
Municipal High Yield Bonds	Barclays High Yield Municipal Index
High Yield Bonds	Barclays U.S. Corporate High Yield Index
Bank Loans	S&P/LSTA Leveraged Loan 100AY Index
Preferred Stock	S&P Preferred Stock Index
Convertible Bonds	Barclays Convertibles Index
Non-U.S. Developed	Barclays Global Aggregate Index
Emerging Market Bonds	50% JPMorgan EMBI Global Core/50% JPMorgan GBI-EM Index
TIPS	Barclays U.S. Treasury TIPS Index
Energy Infrastructure	Alerian MLP Index
Public Real Estate	FTSE NAREIT All Equity REITs Index
Commodities	Bloomberg Commodity Index
Infrastructure	S&P Global Infrastructure Index
Market Neutral	Credit Suisse Liquid Alternative Index
Long/Short Equity	Credit Suisse Long/Short Equity Index
Private Equity - Secondaries	PitchBook Secondary Private Equity Index
Private Equity	PitchBook PE All US Index
Private Real Estate	NCREIF Fund ODCE Index
Private Credit	Cresset Private Credit Index
Cash	ICE BofA 0-3 Month US Treasury Bill Index

Investments cannot be made in an index.

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Fixed income assumptions are a combination of expected real yield, expected roll return, historical premium/discount over Treasuries, and historical defaults and recoveries.

Private Investments & Alternative assumptions such as Hedged Equity are built using an initial public market equivalent assumption plus a beta/leverage adjustment and an illiquidity premium.

Geometric return is the compounding rate of wealth invested solely in a single asset class. Arithmetic averages convey the typical single-year rate of return from investing in an asset class; this quantity is used when combining asset class returns into a portfolio return for a given year. Geometric returns are lower than the corresponding arithmetic returns by an amount known as risk drag: the more volatile the asset, the higher its risk drag. Returns are listed in local currency. Asset classes are proxied by their indexes.

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A New “Risky” World Order: Unstable Risk Premiums
Implications for Practice

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A New Unstable World Order: Risk Premiums

Implication for Practice

Investors have to be offered risk premiums to invest in risky assets. These risk premiums take different forms in different asset markets: equity risk premiums (ERP) in stock markets, default spreads in bond markets and real asset premiums in other asset markets. These premiums have their roots in fundamentals and will vary as a function of uncertainty about the economy, the risk aversion of investors, information uncertainty and fear of catastrophe, among other factors. In practice, analysts in developed markets have generally looked backwards to estimate risk premiums, using historical data to arrive at their estimates. Implicitly, they assume that historical averages are not only precise but also that risk premiums are stable and revert back quickly to historical norms. In this paper, we present evidence that risk premiums in equity, bond and real asset markets are not only imprecise, but also unstable and linked across markets. We present estimation approaches that are more in line with dynamic, shifting risk premiums. We argue that the resulting estimates can help use make more informed asset allocation and asset valuation judgments in portfolio management and better investment, financing and dividend decisions in corporate finance.

Risk averse investors have to be offered inducements to invest in risky assets, and these inducements take the form of risk premiums, i.e., additional returns offered over and above the riskfree rate. If we categorize investing broadly into investing in financial or real assets, risk premiums take the form of equity risk premiums for stocks, default spreads for bonds and asset premiums for investing in real estate or other real assets.

We begin this chapter by looking at the role that risk premiums play in investing and valuation and how they affect corporate finance decisions. We then examine the standard estimation processes used to estimate equity risk premiums and default spreads and point out the implicit assumptions underlying these practices. In particular, the risk premium is assumed to be stable over time, to revert back quickly to historical averages and to be unrelated across markets. We then look at the evidence on risk premiums to show that risk premiums not only change over long periods but that they can shift dramatically over short periods and across asset classes.

In the final part of the chapter, we examine the implications of unstable and dynamic risk premiums, by first looking at how estimation practices in valuation and corporate finance have to change and then by evaluating the potential shifts in investing behavior and corporate financial choices that will result from volatile risk premiums.

Why do risk premiums matter?

Financial investments in businesses can be categorized broadly into debt (entitling investors to a fixed and first claim on the cash flows) and equities (which generate a residual claim on the same cash flows). Risk premiums play a role in both types of investments but take different forms. In the case of equity investments, the equity risk premium is the additional return demanded by investors for holding the average risk equity investment, over and above the riskfree rate. In the case of debt or bonds, the risk premium is the default spread that is added on to the riskfree rate to get to the market interest rate on the bond. In this section, we will take a look at each of these risk premiums.

Definitions and Description

To understand equity risk premiums and default spreads and the role they play in both investing and corporate finance, we can start by framing a financial balance sheet for an ongoing business in figure 1:

Figure 1: A Financial Balance Sheet

Assets		Liabilities	
Existing Investments Generate cashflows today Includes long lived (fixed) and short-lived (working capital) assets	Assets in Place	Debt	Fixed Claim on cash flows Little or No role in management <i>Fixed Maturity</i> <i>Tax Deductible</i>
Expected Value that will be created by future investments	Growth Assets	Equity	Residual Claim on cash flows Significant Role in management <i>Perpetual Lives</i>

Note that the value of the business comes from both investments already made as well as from expectations of future growth, and that the financing has to come from either debt or equity. Investors looking at whether to invest in a business need to have a sense of how much to demand as a required return on their equity or debt investments in the firm. On the other side of the equation, to run the business soundly, managers have to be able to measure what it costs the firm to raise funds from either debt or equity. As we will see in the section below, equity risk premiums and default spreads are integral to decision making for both investors and managers in the firm.

Equity Risk Premiums: A Price for Equity Risk

The equity risk premium reflects fundamental judgments we make about how much risk we see in an economy/market and what price we attach for the average risk equity investment. In the process, it affects the expected return on every risky investment and the value that we estimate for that investment.

How do we get from the equity risk premium, which is the price we charge for the average risk equity investment, to the risk premiums for individual equities? Simple. We scale the risk of individual investments to the average risk investment. In the most widely used risk and return models in finance, this relative risk measure is the beta (or betas), which is scaled around the average risk investment. Thus, a beta of 1.5 can be read to

mean that the investment in question is one and half times more risky than the average risk investment and should thus command one and half times the risk premium.

While there are several competing risk and return models in finance, they all share some common views about risk. First, they all define risk in terms of variance in actual returns around an expected return; thus, an investment is riskless when actual returns are always equal to the expected return. Second, they argue that risk has to be measured from the perspective of the marginal investor in an asset, and that this marginal investor is well diversified. Therefore, the argument goes, it is only the risk that an investment adds on to a diversified portfolio that should be measured and compensated. In fact, it is this view of risk that leads us to break the risk in any investment into two components. There is a firm-specific component that measures risk that relates only to that investment or to a few investments like it, and a market component that contains risk that affects a large subset or all investments. It is the latter risk that is not diversifiable and should be rewarded.

All risk and return models agree on this fairly crucial distinction, but they part ways when it comes to how to measure the relative risk in an investment. In the capital asset pricing model (CAPM), the market risk is measured with a single beta, which when multiplied by the equity risk premium yields the total risk premium for a risky asset. In the competing models, such as the arbitrage pricing and multi-factor models, betas are estimated against individual market risk factors, and each factor has its own price (risk premium). All of the models require three inputs. The first is the riskfree rate, a concept that we explored in chapter 2. The second is the beta (in the CAPM) or betas (in the APM or multi-factor models) of the investment being analyzed, and the third is the appropriate risk premium for the portfolio of all risky assets (in the CAPM) and the factor risk premiums for the market risk factors in the APM and multi-factor models. Using a larger equity risk premium will increase the expected returns for all risky investments, and by extension, reduce their value. Consequently, the choice of an equity risk premium may have much larger consequences for value than firm-specific inputs such as cashflows, growth and firm-specific risk measures (such as betas).

Default Spreads: A Price for Default Risk

A bond or loan represents a string of promised payments, usually taking the form of interest payments, during the life of the bond, and principal repayments, either over the course of the loan (term loan) or at the end of the loan period (balloon payment). If the entity issuing the bond is default free, we would discount the promised payments back at the riskfree rate to arrive at the value of the bond. However, if we perceive the issuing entity to have default risk, we will increase the interest rate on the loan to cover the possibility that we will not get the promised payments.

Just as equity risk premium represents the price charged by investors per unit of equity risk, the default spread represents the price charged by lenders for perceived default or credit risk in a loan. The interest rate on a bond with default risk can therefore be written as:

$$\text{Interest rate on bond} = \text{Riskfree Rate} + \text{Default Spread}$$

As the default risk in the issuer increases, the default spread charged should also go up, which will increase the interest rate on the bond or loan. As with the equity risk premium, we have to confront estimation questions on how best to measure the default risk in an investment and how to convert that default risk measure into a default spread.

It is useful also to highlight the differences between equity and debt risk and see how these differences play out in the estimation of the risk premiums. When you invest in equities, you do so because you want not to control how the business is run but to claim a share of the upside. Since you have only a residual claim on the cash flows, the question of default is not central and risk is measured in terms of the actual returns you can make on the investment, relative to expectations. When you lend to a firm (in the form of a loan or by buying bonds), your payments are contractually set and your upside is limited. With a fixed rate loan or bond, the best you can hope for is that the promised cash flows are delivered to you. However, your downside is accentuated, since any financial troubles at the firm can put not only your promised cash flows but your principal at risk. The risk in debt is therefore not only more focused on default and downside side, but is less affected by distinctions between risk that is market wide and risk that is firm specific.

Implications for Investors

Many investors go through their investment lives, never thinking about equity risk premiums and default spreads explicitly. However, their implicit views on risk premiums affect every stage of the investment process, from allocating across asset classes to picking investments within each asset class to evaluating portfolio performance.

Asset Allocation

The first step in creating an investment portfolio is determining how much of that portfolio should go into different asset classes, defined broadly as equities, fixed income and real asset investments. While this allocation decision is often a function of investor age and risk preferences, views on risk premiums clearly have an impact. Thus, if investors perceive the expected equity risk premium to be high and the default spread on corporate bonds to be low, they will choose to invest a disproportionately large (given their risk preferences) portion of their portfolios in stocks. Similarly, if the expected risk premium for investing in real estate is high, relative to the expected risk premiums in financial assets (stocks and bonds), a larger portion of the portfolio will be allocated to real estate.

There are two points that should be noted here. The first is that allocation decisions are made based upon expectations of future risk premiums and it is entirely possible that these expectations are unrealistic or irrational. Thus, a bull market in stocks, may lead some individuals to extrapolate the high stock returns from the past into future years and invest too much (given their risk preferences and liquidity needs) in stocks. The second is that while most investors may never use the term “risk premiums” in the context of decision-making, claims that “stocks are cheap” or that “real estate is expensive” are equivalent to saying that equity risk premiums are high and real estate risk premiums are low.

Asset Valuation

To establish the relationship between risk premiums and asset prices, let us start with a basic and logical proposition. If you want to generate a higher return on an investment, you should pay less up front for that investment. Put another way, the higher

the price you pay initially for an asset, the lower the expected returns on that asset. By extension, risk premiums and asset prices should be inversely related.

To illustrate why the equity risk premium affects stock prices, consider an alternate (though unrealistic) world where investors are risk neutral. In this world, the value of a stock would be the present value of expected cash flows, discounted back at a risk free rate. The expected cash flows would capture the cash flows under all possible scenarios (good and bad) and there would be no risk adjustment needed. In the real world, investors are risk averse and will pay a lower price for risky cash flows than for riskless cash flows, with the same expected value. How much lower? That is where equity risk premiums come into play. In effect, the equity risk premium is the premium that investors demand for the average risk investment, and by extension, the discount that they apply to expected cash flows with average risk. When equity risk premiums rise, investors are charging a higher price for risk and will therefore pay lower prices for the same set of risky expected cash flows. In pragmatic terms, you should expect to see stock prices go down (up) when equity risk premiums go up (down).

Since the cash flows on most bonds are set at issuance, the only variable that will cause bond prices to change over time is changes in the default spread. These changes can occur for two reasons. The first is that the company's fundamentals may change over time, causing perceived credit risk to go up or down. Thus, a small, money losing company that makes a transition to being a large money making company should face a less default risk after the transition. Alternatively, a hitherto safe (or low default risk) firm may double or triple its borrowing, increasing the likelihood of default risk in the future. The second is that the price charged by the market for credit risk can change over time, for reasons that we will enumerate in the next section. Consequently, the default spread for a firm may increase or decrease as the market price changes, even though the firm's fundamentals might not have shifted. Again, the implication is straightforward: bond prices should increase (decrease) as default spreads increase (decrease).

Performance Evaluation

The final and perhaps most painful step in portfolio management is evaluating performance, and risk premiums can play two different roles. The actual returns earned

on investments can be compared to the returns you expected to make at the time the investment was made. Thus, if your equity risk premium was 6% at the time of the investment and the risk free rate was 4%, you expected to generate a return on 13% on an stock with a beta of 1.5.

$$\begin{aligned}\text{Expected Return}_{\text{Ex-ante}} &= \text{Riskfree Rate} + \text{Beta (Equity Risk Premium)} \\ &= 4\% + 1.5 (6\%) = 13\%\end{aligned}$$

If the stock actually generated a return on 16%, you outperformed expectations by 3%.

One limitation of the computation is that it is a joint test of both your views on the market and your security selection skills, since the difference between the actual and the expected return can be due to overall market performance (the equity market may have done much better or worse than expected) and/or to the individual stock performance. It is for this reason that an alternate measure of expected return is computed, using the actual return on the market over the period. Thus, if the market was up 20% over the period, the expected return on an investment with a beta of 1.5 can be computed as follows:

$$\begin{aligned}\text{Expected Return}_{\text{Ex-post}} &= \text{Riskfree Rate} + \text{Beta (Return on Market – Riskfree Rate)} \\ &= 4\% + 1.5 (20\% - 4\%) = 28\%\end{aligned}$$

This expected return is a conditional expected return, since it is conditioned on what the market did during the period. Comparing the actual return of 16% earned on this investment to the conditional expected return of 28% leads to the conclusion that this stock was not a good investment during, generating 12% less than what it should have, given its risk and given market performance during the period.

This distinction between the equity risk premium that you expect to make going into an investment (the ex-ante premium) and the actual equity risk premium you make (ex-post) is a key one for the following reason. The ex-ante premium should always be a positive number: it would make no sense for investors to invest in equities, if they expect to generate a return lower than the riskfree rate. The ex-post premium can be negative, and often is; that is the source of equity risk and why we demand a risk premium in the first place.

Implications for Corporate Finance

We began the section with a financial balance sheet for a business, arguing that there are only two ways to fund a business, debt and equity, and that a firm needs to know what the cost of each source is, for decision-making. The discussion that we had in the last section about how investors use risk premiums to estimate expected returns provides a logical launching point for this estimation. After all, if investors in the equity of a firm require a return of 13%, the cost of equity for that firm should be the same number. Similarly, if banks determine, based upon a default spread, that the appropriate interest rate for a firm's debt is 9%, it is the cost of debt for that firm, at least on a pre-tax basis. Figure 2 summarizes the link between the costs of financing and risk premiums:

Figure 2: Costs of Financing and Risk Premiums

	Financing Choice	Cost of Financing
Debt	Borrowed money	Riskfree Rate + Default Spread for debt (based upon perceived default risk in firm and market price for that default risk)
Equity	Owner's funds	Riskfree Rate + Beta * Equity Risk Premium (based upon firm's beta and premium investors charge for average risk equity investment.)

Using this framework, we can now consider the implications of risk premiums for investment, financing and dividend decisions in a firm.

Investment Decisions

If a key ingredient of business success is ensuring that the investments that the firm makes in new assets or projects generate returns that exceed a hurdle rate or expected return that reflects investment risk, the importance of risk premiums becomes obvious. As risk premiums rise, holding all else constant, the costs of financing will also go up. As the cost of financing increases, fewer investments will generate returns greater than these costs and the firm will invest less in projects and new assets.

To illustrate, assume that you have an all equity-funded firm and that it has a beta of 1.5. Furthermore, assume that the riskfree rate is 4% and that the equity risk premium is also 4%. The cost of equity for this firm is 10%:

$$\text{Cost of equity} = 4\% + 1.5 (4\%) = 10\%$$

Faced with this cost of equity, the firm will find that an investment in its existing line of business that generates a return of 12% will add value.¹ Now assume that the equity risk premium surges to 6%, leading to an increase in the cost of equity to 13%:

$$\text{Cost of equity} = 4\% + 1.5 (6\%) = 13\%$$

The investment that generates a return of 12% will no longer be an acceptable investment and will destroy value, if taken.

Thus, changes in risk premiums can have economy-wide effects on real investment and consequently on real growth. Lower risk premiums should lead to more real investment and higher real growth, whereas higher risk premiums should be associated with cutbacks in real investment and anemic real economic growth.

Financing Decisions

In figure 2, we noted the link between the costs of financing and risk premiums; the cost of equity is a function of the equity risk premium whereas the cost of debt is determined by the default spread. The overall cost of financing, i.e., the cost of capital is a weighted average of these the costs of debt and equity, with the weights reflecting how much of each source of financing is used by the firm. Consequently, each firm has to make a determination of what mix of debt and equity it will use to finance its assets, and that choice can be affected by movements in risk premiums in two ways:

- a. If firms or decision makers perceive the risk premium in one source of financing to be low, relative to the other, they will use more of the cheaper source of financing. Thus, if the managers in a firm believe that the equity risk premium today is much lower than it should be, but that default spreads are at fair values, they will fund operations disproportionately with equity. Conversely, if equity risk premiums are viewed as too high, debt will become the preferred choice.
- b. Equity risk premiums and default spreads change over time, and not always in tandem. There have been time periods, as we will see later in this chapter, where equity risk premiums have fallen but where default spreads have remained

¹ We are assuming that the firm is in a single business and that all investments in that business share the same risk characteristics. If this were not true, the beta that would be used would be the one appropriate for the project and not the beta of the firm.

stagnant or risk. During these periods, we would expect to see a general increase in equity funding across firms, just as we would expect to see a decrease in equity funding in periods where default spreads have fallen while equity risk premiums remained unchanged.

In summary, the choice between debt and equity can be impacted by the relative prices for debt risk versus equity risk.

Dividend Decisions

At regular intervals, every business has to assess what to do with cash flows generated by existing investments, since there are three potential uses. The first is to reinvest that cash back into the operations of the business, with the intent of creating future growth. The second is to return cash to investors; this takes the form of dividends and buybacks for equity investors and interest and principal payments for lenders. The third is to hold on to the cash, either for precautionary motives (to cover unexpected needs in future periods) or future investments.

The dividend decision is thus impacted by the investment decision. To the extent that higher risk premiums increase the cost of financing and reduce the number of good investments, they can lead to more cash being available to either return to investors or to withhold for future needs. In making that judgment, the equity risk premium comes into play again in the following sense. The cash withheld by the firm belongs to its equity investors, whose expected return is based upon equity risk premiums. As these premiums rise, investors will also hold firms to a higher standard when it comes to how cash is utilized. At the limit, if cash is invested in riskless assets, investors will rest easy and equity risk premiums are irrelevant. As the cash gets directed to higher risk and presumably higher return investments, though, the higher equity risk premiums will determine whether these investments will add or destroy value.

To illustrate, consider the scenario of the firm with a beta of 1.5 that we used to illustrate the investment decision. Furthermore, assume that the equity risk premium has increased from 4% to 6% and that the firm finds that the investment in operating assets no longer makes sense and decides to hold the cash. If that cash is invested in low-risk

(but not no risk) investments, with a beta of 0.25, the return that it would need to make to break even would be:

$$\text{Expected Return}_{\text{Low Risk investment}} = 4\% + 0.25 (6\%) = 5.5\%$$

If the cash generates only a 5% return on the low risk investment, investors would rather see the cash paid out as dividends than invested in the firm.

Other Implications

It may be tempting for those not in the midst of valuation or corporate finance analysis to pay little heed to the debate about risk premiums, but it would be a mistake to do so, since its effects are far reaching.

- a. The amounts set aside by both corporations and governments to meet future pension fund and health care obligations are determined by their expectations of returns from investing in equity markets, i.e., their views on the equity risk premium and from investing in corporate bonds, i.e., their assessments of default spreads. Assuming that the equity risk premium is 6% will lead to far less being set aside each year to cover future obligations than assuming a premium of 4%. If the actual premium delivered by equity markets is only 2%, the fund's assets will be insufficient to meet its liabilities, leading to fund shortfalls which have to be met by raising taxes (for governments) or reducing profits (for corporations). Pension benefits can be put at risk, if plan administrators use unrealistically high equity risk premiums, and set aside too little each year.
- b. Regulated monopolies, such as utility companies, are often restricted in terms of the prices that they charge for their products and services. The regulatory commissions that determine "reasonable" prices base them on the assumption that these companies have to earn a fair rate of return for their equity investors. To come up with this fair rate of return, they need estimates of equity risk premiums; using higher equity risk premiums will translate into higher prices for the customers in these companies.²

² The Society of Utility and Regulatory Financial Analysts (SURFA) has annual meetings of analysts involved primarily in this debate. Not surprisingly, they spend a good chunk of their time discussing equity risk premiums, with analysts working for the utility firms arguing for higher equity risk premiums and analysts working for the state or regulatory authorities wanting to use lower risk premiums.

- c. Judgments about how much you should save for your retirement or health care and where you should invest your savings are clearly affected by how much return you think you can make on your investments. Being over optimistic about equity risk premiums will lead you to save too little to meet future needs and to over investment in risky asset classes.

Thus, the debate about equity risk premiums has implications for almost every aspect of our lives.

What determines risk premiums?

Before we consider different approaches for estimating risk premiums, we should examine the factors that determine their magnitude. After all, risk premiums should reflect not only the risk that investors see in investments but also the price they put on that risk. In this section, we will consider the determinants of both equity risk premiums and default spreads.

Risk Aversion

The first and most critical factor, obviously, is the risk aversion of investors in the markets. As investors become more risk averse, equity risk premiums and default spreads will climb, and as risk aversion declines, risk premiums will fall. While risk aversion will vary across investors, it is the collective risk aversion of investors that determines risk premium, and changes in that collective risk aversion will manifest themselves as changes in the risk premiums. While there are numerous variables that influence risk aversion, we will focus on the variables most likely to change over time.

- a. Investor Age: There is substantial evidence that individuals become more risk averse as they get older. The logical follow up to this is that markets with older investors, in the aggregate, should have higher risk premiums than markets with younger investors, for any given level of risk. Bakshi and Chen (1994), for instance, examine equity risk premiums in the United States and note an increase in risk premiums as investors age.³

³ Bakshi, G. S., and Z. Chen, 1994, *Baby Boom, Population Aging, and Capital Markets*, The Journal of Business, LXVII, 165-202.

- b. Preference for current consumption: We would expect the risk premium to increase as investor preferences for current over future consumption increase. Put another way, risk premiums should be lower, other things remaining equal, in markets where individuals are net savers than in markets where individuals are net consumers. Consequently, risk premiums should increase as savings rates decrease in an economy.

Relating risk aversion to expected risk premiums is not as easy as it looks. While the direction of the relationship is fairly simple to establish – higher risk aversion should translate into higher risk premiums- getting beyond that requires us to be more precise in our judgments about investor utility functions, specifying how investor utility relates to wealth (and variance in that wealth). In fact, there has been a significant angst among financial economists that most conventional utility models do not do a good job of explaining observed equity risk premiums.⁴

Economic Risk

The risk of investing in both equities and bonds comes from more general concerns about the health and predictability of the overall economy. Put in more intuitive terms, risk premiums should be lower in an economy with predictable inflation, interest rates and economic growth than in one where these variables are volatile. Lettau, Ludvigson and Wachter (2007) link the changing equity risk premiums in the United States to shifting volatility in the real economy.⁵ In particular, they attribute that the lower equity risk premiums of the 1990s (and higher equity values) to reduced volatility in real economic variables including employment, consumption and GDP growth. One of the graphs that they use to illustrate the correlation looks at the relationship between the volatility in GDP growth and the dividend/ price ratio (which is the loose estimate that they use for equity risk premiums), and it is reproduced in figure 3.

⁴ Using conventional utility functions, we can derive numerical estimates of equity risk premiums but these estimates all seem too low, relative to the actual risk premiums delivered by equity markets over the last century. Thus, a debate has ensued about whether equity risk premiums are too high and what may explain the deviation. A similar discussion has occurred about actual default spreads being too high, relative to the actual history of defaults.

⁵ Lettau, M., S.C. Ludvigson and J.A. Wachter, 2008. *The Declining Equity Risk Premium: What role does macroeconomic risk play?* Review of Financial Studies, v21, 1653-1687.

Figure 3: Volatility in GDP growth and Equity Risk Premiums (US)

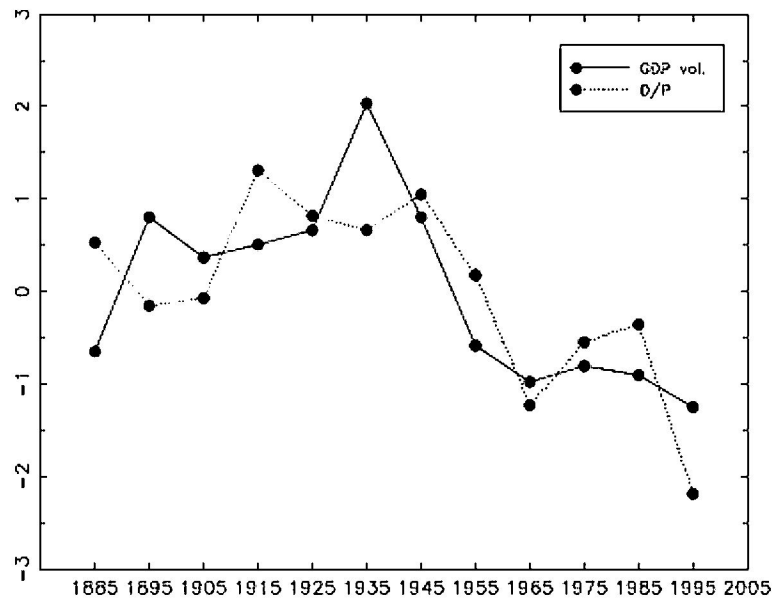
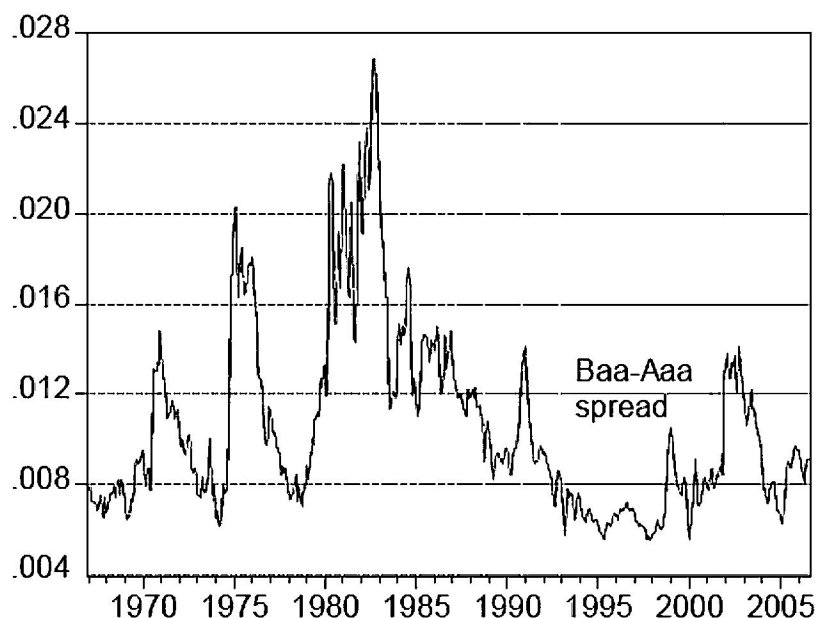


Figure 3
GDP volatility and the D/P ratio—Prewar evidence
 This figure plots the standard deviations of GDP growth and the mean D/P ratio by decade starting in 1880 until 2000. Both series are demeaned and divided by their standard deviation. The GDP data are from Ray Fair's website (<http://fairmodel.econ.yale.edu/RAYFAIR/PDF/2002DTBL.HTM>) based on Balke and Gordon (1989). The dividend yield data is from Robert Shiller's website (http://aida.econ.yale.edu/~shiller/data/ie_data.htm).

Note how closely the dividend yield has tracked the volatility in the real economy over this very long time period.

The relationship between default spreads and the health of the real economy is even stronger, with default spreads widening during recessions and periods of economic uncertainty. Figure 4 graphs the difference between the spread on a ten-year Baa bond and a ten-year Aaa rate over time, with recessions listed in the shaded areas:

Figure 4: Baa Spread and Economic Growth



Note that the spread on the lower rated bond increases during each recessionary period and decreases in economic boom times.

A related strand of research examines the relationship between risk premiums and inflation, with mixed results. Studies that look at the relationship between the level of inflation and equity risk premiums find little or no correlation. In contrast, Brandt and Wang (2003) argue that news about inflation dominates news about real economic growth and consumption in determining risk aversion and risk premiums.⁶ They present evidence that equity risk premiums tend to increase if inflation is higher than anticipated and decrease when it is lower than expected. Reconciling the findings, it seems reasonable to conclude that it is not so much the level of inflation that determines equity risk premiums but uncertainty about that level. Figure 4 also provides some evidence that default spreads widen during periods of high inflation; the spreads in the United States were during the high inflation period from 1979 to 1983.

⁶ Brandt, M.W., K.Q. Wang (2003). *Time-varying risk aversion and unexpected inflation*, Journal of Monetary Economics, v50, pp. 1457-1498.

Information

When you invest in equities, the risk in the underlying economy is manifested in volatility in the earnings and cash flows reported by individual firms in that economy. Information about these changes is transmitted to markets in multiple ways, and it is clear that there have been significant changes in both the quantity and quality of information available to investors over the last two decades. During the market boom in the late 1990s, there were some who argued that the lower risk premiums that we observed in that period were reflective of the fact that equity and bond investors had access to more information about their investments, leading to higher confidence and lower risk premiums in 2000. After the accounting scandals that followed the market collapse, there were others who attributed the increase in the risk premium to deterioration in the quality of information as well as information overload. In effect, they were arguing that easy access to large amounts of information of varying reliability was making investors less certain about the future.

As these contrary arguments suggest, the relationship between information and equity risk premiums is complex. More precise information should lead to lower risk premiums, other things remaining equal. However, precision here has to be defined in terms of what the information tells us about future earnings, cash flows and potential default. Consequently, it is possible that providing more information about last period's earnings may create more uncertainty about future earnings, especially since investors often disagree about how best to interpret these numbers.

Empirically, is there a relationship between earnings quality and observed equity risk premiums? The evidence is mostly anecdotal, but there are several studies that point to the deteriorating quality of earnings in the United States, with the blame distributed widely. First, the growth of technology and service firms has exposed inconsistencies in accounting definitions of earnings and capital expenditures – the treatment of R&D as an operating expense is a prime example. Second, audit firms have been accused of conflicts of interest leading to the abandonment of their oversight responsibility. Finally, the earnings game, where analysts forecast what firms will earn and firms then try to beat these forecasts has led to the stretching (and breaking) of accounting rules and standards.

If earnings have become less informative in the aggregate, it stands to reason that investors will demand large risk premiums to compensate for the added uncertainty.

Information differences may be one reason why investors demand larger risk premiums in some emerging markets than in others. After all, markets vary widely in terms of transparency and information disclosure requirements. Markets like Russia, where firms provide little (and often flawed) information about operations and corporate governance, should have higher risk premiums than markets like India, where information on firms is not only more reliable but also much more easily accessible to investors.

Liquidity

In addition to the risk from the underlying real economy and imprecise information from firms, investors also have to consider the additional risk created by illiquidity. If investors have to accept large discounts on estimated value or pay high transactions costs to liquidate investment positions, they will be pay less for investments today (and thus demand large risk premiums).

The notion that market for publicly traded stocks is wide and deep has led to the argument that the net effect of illiquidity on aggregate equity risk premiums should be small. However, there are two reasons to be skeptical about this argument. The first is that not all stocks are widely traded and illiquidity can vary widely across stocks; the cost of trading a widely held, large market cap stock is very small but the cost of trading an over-the-counter stock will be much higher. The second is that the cost of illiquidity in the aggregate can vary over time, and even small variations can have significant effects on equity risk premiums. In particular, the cost of illiquidity seems to increase when economies slow down and during periods of crisis, thus exaggerating the effects of both phenomena on the equity risk premium. While much of the empirical work on liquidity has been done on cross sectional variation across stocks (and the implications for expected returns), there have been attempts to extend the research to look at overall market risk premiums. Gibson and Mougeot (2002) look at U.S. stock returns from 1973 to 1997 and conclude that liquidity accounts for a significant component of the overall

equity risk premium, and that its effect varies over time.⁷ Baekart, Harvey and Lundblad (2006) present evidence that the differences in equity returns (and risk premiums) across emerging markets can be partially explained by differences in liquidity across the markets.⁸

The corporate bond market, like the equity market, is a liquid one, with bouts of illiquidity that coincide with economic crises. During the banking crisis of 2008, for instance, trading in the corporate bond market came to a standstill and default spreads widened significantly. The sovereign bond market has also been susceptible to illiquidity, especially with bonds issued by emerging economies, with a concomitant increase in interest rates (and default spreads).

Catastrophic Risk

When investing in either equities or bonds, there is always the potential for catastrophic risk, i.e. events that occur infrequently but can cause dramatic drops in wealth. Examples would include the great depression from 1929-30 in the United States and the collapse of Japanese equities in the last 1980s. In cases like these, many investors exposed to the market declines saw the values of their investments drop so much that it was unlikely that they would be made whole again in their lifetimes.⁹ While the possibility of catastrophic events occurring may be low, they cannot be ruled out and the equity risk premium has to reflect that risk.

The banking and financial crisis of 2008, where financial and real estate markets plunged in the last quarter of the year, has provided added ammunition to this school. As we will see later in the paper, risk premiums in all markets (equity, bond and real estate) climbed sharply during the weeks of the market crisis.

The fear of catastrophic risk may also explain a phenomenon that has puzzled researchers in both equity and bond markets: that equity risk premiums and default

⁷ Gibson R., Mougeot N., 2004, *The Pricing of Systematic Liquidity Risk: Empirical Evidence from the US Stock Market*. Journal of Banking and Finance, v28: 157–78.

⁸ Bekaert G., Harvey C. R., Lundblad C., 2006, *Liquidity and Expected Returns: Lessons from Emerging Markets*, The Review of Financial Studies.

⁹ An investor in the US equity markets who invested just prior to the crash of 1929 would not have seen index levels return to pre-crash levels until the 1940s. An investor in the Nikkei in 1987, when the index was at 40000, would still be facing a deficit of 50% (even after counting dividends) in 2008,

spreads seem too high, relative to theory (risk premiums derived from utility models) and evidence (actual default risk). To the extent that catastrophes are rare, we could look at very long periods of history where none have occurred, but that cannot be taken as evidence that they will not occur in the future or that investors were not worried about their occurrence during the historical period. In hindsight, therefore, the actual risk premiums charged for equities and bonds may seem too high, relative to the actual risk faced.

The behavioral/ irrational component

Investors do not always behave rationally, and there are some who have argued that risk premiums are determined, at least partially, by quirks in human behavior. While there are several strands to this analysis, we will focus on two:

- a. The Money Illusion: As equity prices declined significantly and inflation rates increased in the late 1970s, Modigliani and Cohn (1979) argued that low equity values of that period were the consequence of investors being inconsistent about their dealings with inflation. They argued that investors were guilty of using historical growth rates in earnings, which reflected past inflation, to forecast future earnings, but current interest rates, which reflected expectations of future inflation, to estimate discount rates.¹⁰ When inflation increases, this will lead to a mismatch, with high discount rates and low cash flows resulting in asset valuations that are too low (and risk premiums that are too high). In the Modigliani-Cohn model, equity risk premiums will rise in periods when inflation is higher than expected and drop in periods when inflation is lower than expected. Campbell and Voulteenaho (2004) update the Modigliani-Cohn results by relating changes in the dividend to price ratio to changes in the inflation rate over time and find strong support for the hypothesis.¹¹
- b. Narrow Framing: In conventional portfolio theory, we assume that investors assess the risk of an investment in the context of the risk it adds to their overall

¹⁰ Modigliani, Franco and Cohn, Richard. 1979, *Inflation, Rational Valuation, and the Market*, Financial Analysts Journal, v37(3), pp. 24-44.

¹¹ Campbell, J.Y. and T. Vuolteenaho, 2004, *Inflation Illusion and Stock Prices*, American Economic Review, v94, 19-23.

portfolio, and demand a premium for this risk. Behavioral economists argue that investors offered new gambles often evaluate those gambles in isolation, separately from other risks that they face in their portfolio, leading them to overestimate the risk of the gamble. In the context of the equity risk premium, Benartzi and Thaler (1995) use this “narrow framing” argument to argue that investors overestimate the risk in equity, and Barberis, Huang and Santos (2001) build on this theme.¹²

The bottom line: As fundamentals change, risk premiums should change

If we accept the proposition that risk premiums are determined by fundamental variables, there are two clear implications that emerge:

- Changes in the underlying variables should cause risk premiums to change over time. Thus, if investors risk aversion changes or perceptions about economic growth/stability vary over time, we should expect to see risk premiums change as well.
- Note that many of the underlying variables not only affect both equity risk premiums and default spreads but also push them in the same direction. Thus, as the fear of catastrophic risk increases, both equity risk premiums and default spreads should both go up.

Put another way, assuming that risk premiums have not changed over long periods or that they will not change in the future is tantamount to assuming that none of the fundamentals listed above – risk aversion, macro economic volatility, the fear of catastrophe and information processes – will change either. That is not only a tall order but, as we will see later in the chapter, incompatible with the evidence.

Estimation and Usage

In both corporate finance and valuation practice, equity risk premiums and default spreads represent fundamental inputs, numbers without which we cannot estimate required returns, discount rates and value. In this section, we will examine the estimation practices used by analysts and the implicit assumptions that underlie these practices.

¹² Benartzi, S. and R. Thaler, 1995, *Myopic Loss Aversion and the Equity Premium Puzzle*, Quarterly Journal of Economics.

Equity Risk Premiums

While our task is to estimate equity risk premiums in the future, much of the data that we use to make these estimates is from the past. Most analysts, investors and managers, when asked to estimate risk premiums, look at historical data. In fact, the most widely used approach to estimating equity risk premiums is the historical premium approach, where the actual returns earned on stocks over a long time period is estimated, and compared to the actual returns earned on a default-free (usually government security). The difference, on an annual basis, between the two returns is computed and represents the historical risk premium. In this section, we will take a closer look at the approach.

Historical Premiums: Estimation Choices

While users of risk and return models may have developed a consensus that historical premium is, in fact, the best estimate of the risk premium looking forward, there are surprisingly large differences in the actual premiums we observe being used in practice, with the numbers ranging from 3% at the lower end to 12% at the upper end. Given that we are almost all looking at the same historical data, these differences may seem surprising. There are, however, three reasons for the divergence in risk premiums: different time periods for estimation, differences in riskfree rates and market indices and differences in the way in which returns are averaged over time.

1. Time Period: Even if we agree that historical risk premiums are the best estimates of future equity risk premiums, we can still disagree about how far back in time we should go to estimate this premium. Ibbotson Associates, which is the most widely used estimation service, has stock return data and risk free rates going back to 1926,¹³ and there are other less widely used databases that go further back in time to 1871 or even to 1792.¹⁴ While there are many analysts who use all the data going back to the inception date, there are almost as many analysts using data over shorter time periods, such as fifty,

¹³ Ibbotson Associates, Stocks, Bonds, Bills and Inflation, 2009 Edition.

¹⁴ Siegel, in his book, Stocks for the Long Run, estimates the equity risk premium from 1802-1870 to be 2.2% and from 1871 to 1925 to be 2.9%. (Siegel, Jeremy J., Stocks for the Long Run, Second Edition, McGraw Hill, 1998). Goetzmann and Ibbotson estimate the premium from 1792 to 1925 to be 3.76% on an arithmetic average basis and 2.83% on a geometric average basis. Goetzmann, W.N. and R. G. Ibbotson, 2005, History and the Equity Risk Premium, Working Paper, Yale University.

twenty or even ten years to come up with historical risk premiums. The rationale presented by those who use shorter periods is that the risk aversion of the average investor is likely to change over time, and that using a shorter and more recent time period provides a more updated estimate.

2. Riskfree Security and Market Index: The second estimation question we face relates to the riskfree rate. We can compare the expected return on stocks to either short-term government securities (treasury bills) or long term government securities (treasury bonds) and the risk premium for stocks can be estimated relative to either. Given that short term rates in the United States have been lower than long term rates for most of the last eight decades, the risk premium is larger when estimated relative to short term government securities (such as treasury bills) than when estimated against treasury bonds. Some practitioners and a surprising number of academics (and textbooks) use the treasury bill rate as the riskfree rate, with the alluring logic that there is no price risk in a treasury bill, whereas the price of a treasury bond can be affected by changes in interest rates over time. That argument does make sense, but only if we are interested in a single period equity risk premium (say, for next year). If your time horizon is longer (say 5 or 10 years), it is the treasury bond that provides the more predictable returns.¹⁵ Investing in a 6-month treasury bill may yield a guaranteed return for the next six months, but rolling over this investment for the next five years will create reinvestment risk. In contrast, investing in a ten-year treasury bond, or better still, a ten-year zero coupon bond will generate a guaranteed return for the next ten years.¹⁶

3. Averaging Approach: The final sticking point when it comes to estimation relates to how the average returns on stocks, treasury bonds and bills are computed. The arithmetic average return measures the simple mean of the series of annual returns, whereas the geometric average looks at the compounded return¹⁷. Many estimation services and

¹⁵ For more on risk free rates, see Damodaran, A., 2008, *What is the riskfree rate*, Working Paper, SSRN.

¹⁶ There is a third choice that is sometimes employed, where the short term government security (treasury bills) is used as the riskfree rate and a “term structure spread” is added to this to get a normalized long term rate.

¹⁷ The compounded return is computed by taking the value of the investment at the start of the period ($Value_0$) and the value at the end ($Value_N$), and then computing the following:

$$\text{Geometric Average} = \left(\frac{Value_N}{Value_0} \right)^{1/N} - 1$$

academics argue for the arithmetic average as the best estimate of the equity risk premium. In fact, if annual returns are uncorrelated over time, and our objective was to estimate the risk premium for the next year, the arithmetic average is the best and most unbiased estimate of the premium. There are, however, strong arguments that can be made for the use of geometric averages. First, empirical studies seem to indicate that returns on stocks are negatively correlated¹⁸ over long periods of time. Consequently, the arithmetic average return is likely to over state the premium. Second, while asset pricing models may be single period models, the use of these models to get expected returns over long periods (such as five or ten years) suggests that the estimation period may be much longer than a year. In this context, the argument for geometric average premiums becomes stronger. Indro and Lee (1997) compare arithmetic and geometric premiums, find them both wanting, and argue for a weighted average, with the weight on the geometric premium increasing with the time horizon.¹⁹

In closing, the averaging approach used clearly matters. Arithmetic averages will be yield higher risk premiums than geometric averages, but using these arithmetic average premiums to obtain discount rates, which are then compounded over time, seems internally inconsistent. In corporate finance and valuation, at least, the argument for using geometric average premiums as estimates is strong.

Historical Premiums: Estimates for the United States

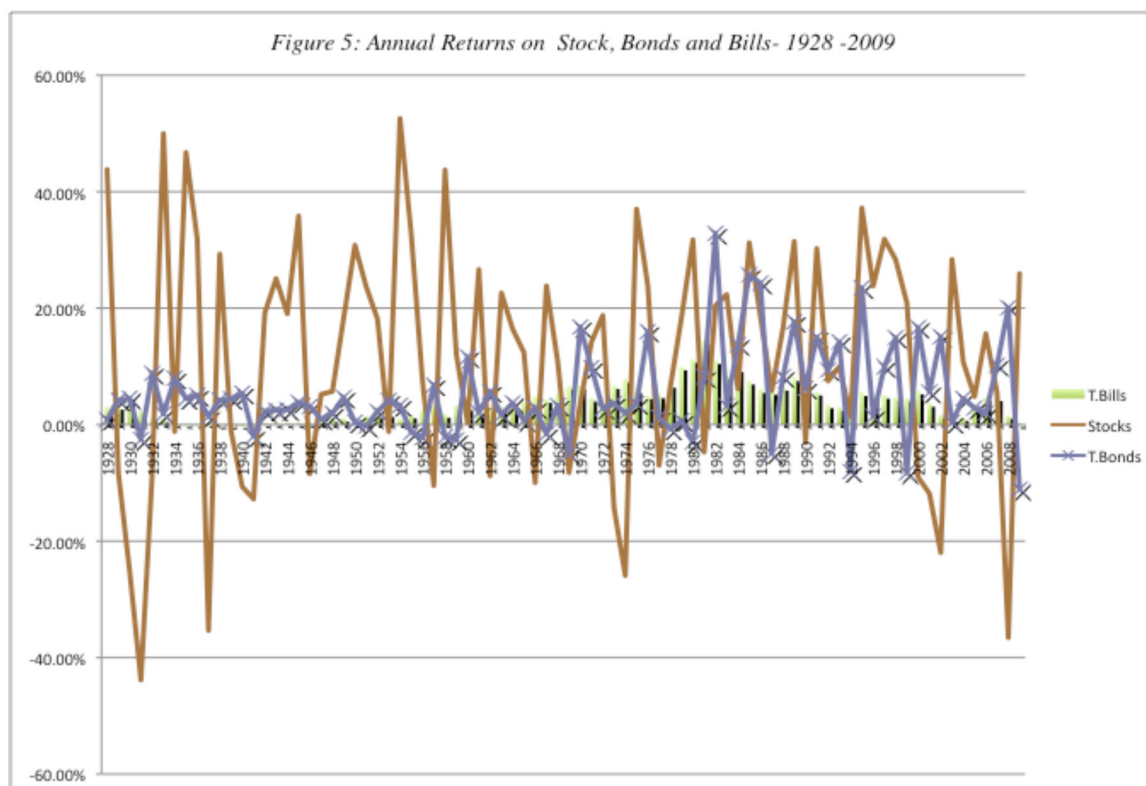
The questions of how far back in time to go, what riskfree rate to use and how to average returns (arithmetic or geometric) may seem trivial until you see the effect that the choices you make have on your equity risk premium. Rather than rely on the summary values that are provided by data services, we will use raw return data on stocks, treasury

Thus, if you start with \$ 100 and end up with \$ 1000 at the end of the tenth year, the geometric average premium = $(1000/100)^{(1/10)} - 1 = 0.2589$ or 25.89%.

¹⁸ In other words, good years are more likely to be followed by poor years, and vice versa. The evidence on negative serial correlation in stock returns over time is extensive, and can be found in Fama and French (1988). While they find that the one-year correlations are low, the five-year serial correlations are strongly negative for all size classes. Fama, E.F. and K.R. French, 1992, *The Cross-Section of Expected Returns*, Journal of Finance, Vol 47, 427-466.

¹⁹ Indro, D.C. and W. Y. Lee, 1997, *Biases in Arithmetic and Geometric Averages as Estimates of Long-run Expected Returns and Risk Premium*, Financial Management, v26, 81-90.

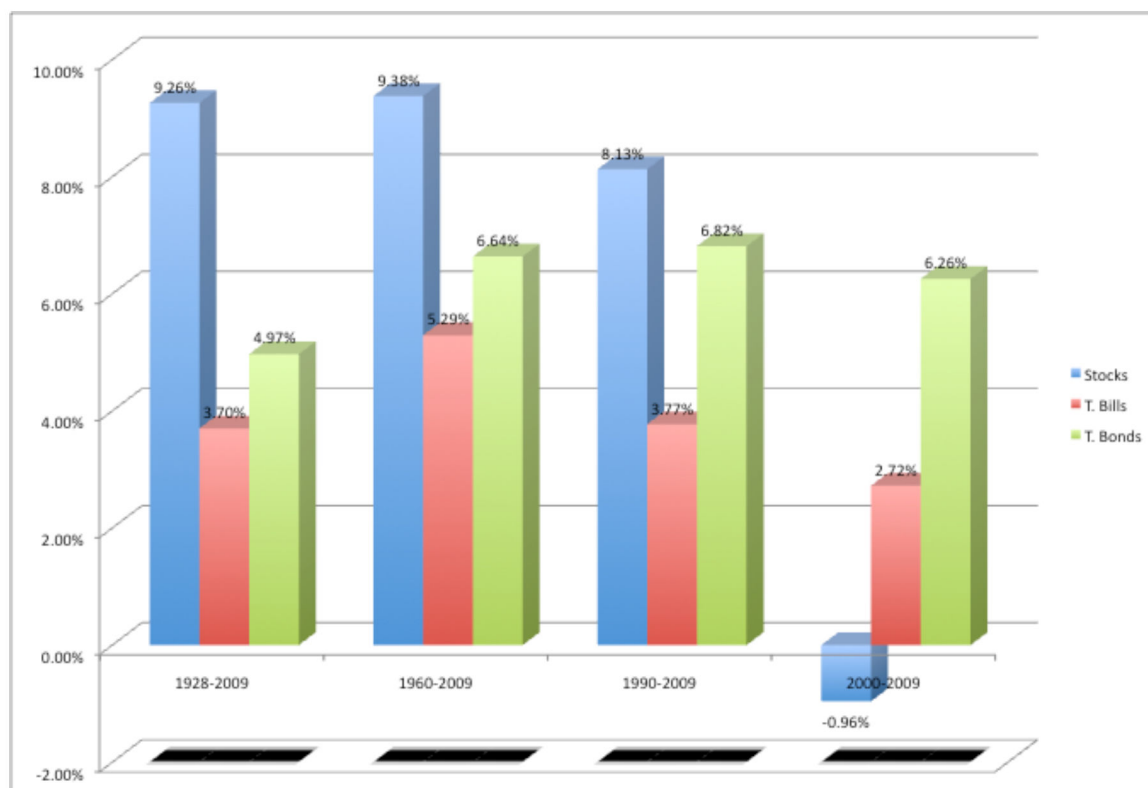
bills and treasury bonds from 1928 to 2009 to make this assessment.²⁰ In figure 5, we begin with a chart of the annual returns on stock, treasury bills and bonds for each year:



It is difficult to make much of this data other than to state the obvious, which is that stock returns are volatile, which is at the core of the demand for an equity risk premium in the first place. In figure 6, we present the geometric average returns for stocks, 6-month Treasury bill and ten-year Treasury bond returns for different time periods:

²⁰ The raw data for treasury rates is obtained from the Federal Reserve data archive at the Fed site in St. Louis, with the 6-month treasury bill rate uses for treasury bill returns and the 10-year treasury bond rate used to compute the returns on a constant maturity 10-year treasury bond. The stock returns represent the returns on the S&P 500. Appendix 1 provides the returns by year on stocks, bonds and bills.

Figure 6: Geometric Average Annual Returns on Stocks, Bills and Bonds



While U.S. equities have delivered much higher returns than treasuries over this period, they have also been more volatile, as evidenced both by the higher standard deviation in returns and by the extremes in the distribution. Using this table, we can take a first shot at estimating a risk premium between 1928 and 2009 by taking the difference between the average returns on stocks and the average return on treasuries, yielding a risk premium of 5.56% for stocks over T.Bills ($9.26\% - 3.70\%$) and 4.29% for stocks over T.Bonds ($9.26\% - 4.97\%$). Note, though, that these represent geometric average, long-term premiums for stocks over treasuries. Using the numbers for other time periods yields very different estimates of risk premiums. In fact, using only the 2000-09 time periods yields negative values for risk premiums, since stock returns have lagged treasury bill and bond returns over the period.

Global Estimates

If it is difficult to estimate a reliable historical premium for the US market, it becomes doubly so when looking at markets with short, volatile and transitional histories.

This is clearly true for emerging markets, where equity markets have often been in existence for only short time periods (Eastern Europe, China) or have seen substantial changes over the last few years (Latin America, India). It also true for many West European equity markets. While the economies of Germany, Italy and France can be categorized as mature, their equity markets did not share the same characteristics until recently. They tended to be dominated by a few large companies, many businesses remained private, and trading was thin except on a few stocks.

Dimson, Marsh, Staunton and Wilmot (2010) have filled the breach by providing historical returns for markets outside the United States. Table 1 summarizes the arithmetic average equity risk premiums over the government ten-year rate for 19 markets:²¹

Table 1: Global Equity Risk Premiums – Updated through 2009

<i>Country</i>	<i>2000-2009</i>	<i>1960-2009</i>	<i>1900-2009</i>
Australia	1.00%	3.50%	6.00%
Belgium	-5.70%	1.00%	2.60%
Canada	-2.00%	1.50%	3.70%
Denmark	-0.10%	0.90%	1.80%
Finland	-10.2%	4.10%	4.60%
France	-6.50%	-0.90%	3.30%
Germany	-6.90%	0.40%	5.40%
Ireland	-8.20%	3.50%	2.60%
Italy	-7.20%	-1.50%	3.80%
Japan	-7.80%	-0.80%	5.10%
Netherlands	-8.60%	3.30%	3.50%
New Zealand	-0.90%	2.80%	2.40%
Norway	1.90%	2.00%	2.00%
South Africa	3.30%	6.60%	5.40%
Spain	0.50%	3.70%	2.40%
Sweden	-3.90%	4.40%	3.60%
Switzerland	-3.40%	2.80%	2.10%
UK	-3.10%	3.30%	3.90%
US	-7.40%	2.30%	4.20%
World	-6.60%	0.90%	3.70%
World ex US	-5.20 %	0.60%	3.80%

²¹ *Credit Suisse Global Investment Returns Yearbook*, 2010, Credit Suisse, London. The raw data on returns is not provided in the yearbook and thus the geometric average premiums and other statistics were not updated.

Europe	-5.70%	1.30%	3.90%
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Note the havoc wreaked by the market collapse in 2008 is visible across most of these markets, with ten-year premiums becoming negative in many of the markets and the longer terms premiums declining from 2005 levels. Equity risk premiums, over the last 50 years, have been less than 1% globally, a sobering fact.

Default Spreads

Unlike the equity risk premium, where the consensus has coagulated around the historical risk premium, there is much less uniformity in how analysts estimate default spreads and by extension, the costs of debt. In fact, there are three general approaches that are used. The first is to use the interest rate on a traded bond, issued by the firm, as the cost of debt; this approach only works if the firm has bonds outstanding. The second is to trust a rating agency (S&P, Moody's or Fitch) to evaluate the default risk in the form of a bond rating, and to use the rating as the basis for estimating a default spread; this approach requires that the company have a bond rating. The third is the most general approach, where the cost of debt is obtained by looking at what the firm pays on its existing debt; this book interest rate becomes the cost of debt.

a. Traded bonds or CDS: Many large, publicly traded companies, especially in the United States, raise debt by issuing bonds to investors. Since these bonds can be bought and sold by investors, the market prices of the bonds reflect investor views about a "fair interest rate" to charge the issuing company. This is the rationale that is used by analysts who then use this interest rate as the cost of debt. While the logic of the approach is impeccable, there are several reasons why the estimates from this approach can be wrong:

- While some corporate bonds are liquid and have updated market prices, the bonds issued by many other companies are traded infrequently or not at all, which raises the possibility that the reported prices (and interest rates) do not reflect current market views about the company.
- The interest rate on a corporate bond is a reflection of the default risk of the bond, not the company issuing the bond. While this distinction may seem like nit picking, a risky company can issue a safe bond, by backing the bond

explicitly with its safest assets. If the default spread from the bond is used to estimate the cost of all of this firm's debt, the cost will be understated.

- The interest rate on a corporate bond will be a function not only of the default risk of the issuing company but also of any other features (good or bad) that are attached to the bond. Thus, the interest rate on a convertible bond is not a good measure of the cost of debt for the issuing company, since the option to convert the bond into stock will raise the price of the bond and lower the interest rate.

If the cost of debt is an updated measure of what it would cost a firm to borrow long term today, the traded corporate bond will have to be a general obligation (backed by the collective assets of the business and not just the safest assets), long-term bond, with no special features and significant liquidity.

An alternative approach to estimating default spreads is to look at prices in the Credit default swap (CDS) market. As we noted in the last chapter, the CDS market allows investors to trade on default risk, either buying or selling protection against default by entities (corporations and sovereigns). The resulting prices can be viewed as a market measure of the default spread for the company. Table 2 reviews the default spreads and cost of debt estimates for a five large US corporations using both the bond market and CDS spreads:

Table 2: Default Spreads and Costs of Debt^a

<i>Company</i>	<i>Coupon rate</i>	<i>Price (as% of par)</i>	<i>Yield to Maturity</i>	<i>CDS Spread</i>	<i>Riskfree rate</i>	<i>Cost of debt</i>
Altria	9.70%	132.29%	4.87%	1.99%	2.65%	4.64%
Cablevision	8.00%	106.79%	7.02%	1.69%	2.65%	4.34%
Kraft	5.38%	111.04%	3.96%	0.83%	2.65%	3.48%
Baxter Intl	4.25%	109.32%	3.11%	0.51%	2.65%	3.16%
Eaton	8.10%	133.20%	4.48%	0.87%	2.65%	3.52%

^a Corporate bonds expiring in approximately 10 years were used to compute the yield to maturity. The CDS spread used is for the 10-year maturity and the riskfree rate is the ten year US treasury bond rate.

Note that the estimates of the cost of debt are very similar for four of the companies, using the two approaches. Thus Altria's cost of debt is 4.84%, based on the yield to maturity on the traded bond, and 4.64%, using the CDS spread. For

Cablevision, the interest rate on the traded bond is much higher than the rate based on the CDS spread.

- b. Rating based spread: Almost all companies that issue bonds and some companies that do not are rated for default risk by one of the ratings agencies – S&P, Moody's and Fitch. These default risk measures rate firms from safest (AAA, Aaa) to firms in default (D) and are based upon a mixture of public information (from the financial statements) and private information (provided by the firm). If we assume that bond ratings are viable measures of default risk, we can use the ratings to estimate default spreads. To do so, we would first have find traded bonds in each ratings class, obtain current prices and interest rates on these bonds, and use the average interest rate to back out a default spread.²² Thus, if the ten-year treasury bond rate is 3% and the average interest rate on ten-year bond issued by BBB corporations is 4.75%, the default spread for a BBB rated bond would be 1.75%. Table 3 lists the default spreads by ratings class on August 27, 2010:

Table 3: Bond Ratings and Default Spreads

<i>Moody's/S&P Rating</i>	<i>1 year</i>	<i>5 year</i>	<i>10 year</i>
Aaa/AAA	0.20%	0.25%	0.45%
Aa1/AA+	0.25%	0.30%	0.50%
Aa2/AA	0.30%	0.40%	0.55%
Aa3/AA-	0.35%	0.45%	0.60%
A1/A+	0.40%	0.55%	0.75%
A2/A	0.60%	0.65%	0.85%
A3/A-	1.00%	0.75%	1.05%
Baa1/BBB+	1.15%	1.30%	1.50%
Baa2/BBB	1.50%	1.45%	1.75%
Baa3/BBB-	2.15%	2.50%	2.25%
Ba1/BB+	3.75%	4.25%	3.50%
Ba2/BB	4.75%	5.25%	4.50%
Ba3/BB-	5.50%	5.50%	4.75%
B1/B+	6.00%	6.25%	5.00%
B2/B	6.25%	7.25%	5.75%
B3/B-	6.75%	7.50%	6.25%
Caa/CCC+	7.50%	8.50%	7.75%

²² There are services that make these default spread estimates, using data from traded bonds. One online source is bondsonline.com.

Table 4 summarizes default spreads for the five companies that we looked at in table 2, using the S&P rating for each company as the basis for the estimate:

Table 4: Corporate Bond Default Spreads- July 2010^b

<i>Company</i>	<i>S&P Rating</i>	<i>Default Spread</i>	<i>Riskfree Rate</i>	<i>Cost of debt</i>
Altria	BBB	1.75%	2.65%	4.40%
Cablevision	B+	5.00%	2.65%	7.65%
Kraft	BBB-	2.25%	2.65%	4.90%
Baxter Intl	A+	0.75%	2.65%	3.40%
Eaton	A-	1.05%	2.65%	3.70%

^b The default spreads associated with each ratings class are obtained from bondsonline.com, an online database of default spreads, on August 27, 2010

Comparing the estimates of cost of debt in this table to those estimated in table 2, we find that the values are close to the yields to maturity for all of the companies. In the case of Cablevision, the fact that the estimate is closer to that obtained from the market yield to maturity would lead us to be skeptical of the much lower numbers from the CDS market.

- c. Historical borrowing cost: The use of a traded bond and/or a bond rating to obtain the cost of debt is feasible only if the company in question has accessed the bond market. Even in the United States, where firms are most likely to use corporate bonds to raise debt, more than 80% of all publicly traded firms are unrated and depend upon bank loans for debt. For these firms, analysts fall back on a simple, accounting-based alternative. They use the stated interest rates on the debt that the bank has outstanding and use either a weighted average or a simple average to arrive at a cost of debt. Thus, if a firm has two loans on its books, the first a five-year bank loan of \$ 10 million with an interest rate of 6% and the other a mortgage loan of \$ 15 million with an interest rate of 7.5%, the cost of debt will be either 7% (weighted average) or 6.75% (a simple average). In fact, if the debt is complex and comes from different sources, the cost of debt is computed as a book interest rate, computed by dividing the total interest expenses by the total book value of debt:

$$\text{Book interest rate} = \frac{\text{Interest Expenses}}{\text{Book Value of Debt}}$$

A variant of this ratio looks at only long-term interest expenses and long-term debt to compute a long term book interest rate. In table 5, we summarize the book interest rates estimated for the companies that we estimated the market-based costs of debt in table 4.

Table 5: Book Interest Rates^c

<i>Company</i>	<i>Interest expenses</i>	<i>Book Value of Debt</i>	<i>Book interest rate</i>
Altria	1189	11960	9.94%
Cablevision	753	11377	6.62%
Kraft	1260	18990	6.64%
Baxter Intl	145	4151	3.49%
Eaton	320	3467	9.23%

^cThe interest expenses from the most recent fiscal year (2009) were divided by the book value of interest bearing debt at the end of the year to estimate the book interest rate.

The cost of debt, based upon book interest rates is close for Baxter and Cablevision to our prior estimates but very different for the other companies, because they reflect past borrowing and not current conditions.

Implicit Assumptions

The conventional approaches to estimating equity risk premiums and default spreads make assumptions about the behavior and estimation of risk premiums that are often left unstated. In this section, we will list four of these assumptions, as a precursor to evaluating whether the data backs up the assumptions:

- a. Long data series = Precise estimates: Implicit in the use of historical data is the assumption that using a long data series to estimate risk premiums will result in precise values. Thus, those who use historical risk premiums, justify the use of these premiums by noting that these premiums are estimated over a long period therefore must be “precise”; what constitutes a “long period” varies across users, with some using 80 years or more of data and others using 25 years or less.
- b. Stable Risk Premiums: It is often taken as an article of faith that risk premiums do not change much over time in mature markets. Only in emerging markets, we are told, are big shifts in risk premiums common. As a consequence, the equity risk premium and default spread, once computed, are assumed to not change in the near or far future. Thus, if the equity risk premium today is 5%, it is assumed to

remain 5% essentially forever, and the estimated default spread of 2.25% is used to compute the cost of debt not only for next year, but for every year thereafter.

- c. Mean Reversion: Even if we accept the proposition that using a long time period will yield a precise estimate of the risk premium and that the risk premiums does not change over time, we still need to assume that the risk premium in the future will revert back to historical averages. This reversion back to the mean is not only a key assumption behind the use of historical equity risk premiums but is also behind the use of the book interest rate as the cost of debt. In effect, analysts are assuming that the rate at which a company has historically borrowed money is the rate at which they will continue to borrow money in the future.
- d. Insulated Markets: In computing risk premiums, it is generally assumed that investors within each market set risk premiums in that market, with little or no input from investors in other markets. Thus, no attempt is made to relate the equity risk premium used in a cost of capital computation to the default spread used in the same computation or the equity risk premium used in one market (say the United States) to the equity risk premium used in another (such as Brazil).

While none of these assumptions seem unreasonable, it is entirely possible that they one or more of them are not sustained by the data. If that is the case, we will have to revisit the standard approaches used to estimate these numbers.

The Evidence

The assumptions underlying current practice – that you get precise estimates by using long periods of historical data, that there is mean reversion, that risk premiums are stable and that risk premiums across markets are not related – can all be put to the test. In this section, we will attempt to do so.

Long data series = Imprecise Estimates

The notion that historical risk premiums are stable and easily obtained, at least for markets like the United States, can be easily countered. Using the geometric average returns on stocks, bonds and bills from 1928 to 2009, we estimated equity risk premiums of 5.56% for stocks over treasury bills and 4.29% for stocks over treasury bonds. How much will the premium change if we make different choices on historical time periods,

riskfree rates and averaging approaches? To answer this question, we estimated the arithmetic and geometric risk premiums for stocks over both treasury bills and bonds over different time periods in table 6:

Table 6: Historical Equity Risk Premiums (ERP) –Estimation Period, Riskfree Rate and Averaging Approach

	<i>ERP: Stocks minus T.Bills</i>		<i>ERP: Stocks minus T.Bonds</i>	
	<i>Arithmetic</i>	<i>Geometric</i>	<i>Arithmetic</i>	<i>Geometric</i>
1928-2009	7.53%	5.56%	6.03%	4.29%
1960-2009	5.48%	4.09%	3.78%	2.74%
2000-2009	-1.59%	-3.68%	-5.47%	-7.22%

Note that even with only three slices of history considered, the premiums range from - 7.22% to 7.53%, depending upon the choices made on risk free rate (T.Bill or T.Bond) and averaging approach (arithmetic or geometric). In other words, the notion that using long time periods of data will lead to an agreement on the right equity risk premium to use is misguided.

There is another basic statistical reality that also intrudes on the precision argument. In any data series, the averages computed come with estimation error, usually captured in a standard error, which, in turn, is a function of two variables – the standard deviation across the observations and the number of observations:

$$\text{Standard error of estimate} = \frac{\text{Standard deviation in sample data}}{\sqrt{\text{Number of observations in sample}}}$$

While this may seem like an abstraction, recognize that the equity risk premiums in table 6 were estimated using annual returns on stocks, treasury bonds and bills over the given time periods. Given the annual standard deviation in stock prices²³ between 1926 and 2008 of 20%, the standard error²⁴ associated with the risk premium estimate can be estimated in table 7 follows for different estimation periods:

²³ For the historical data on stock returns, bond returns and bill returns check under "updated data" in www.damodaran.com.

²⁴ The standard deviation in annual stock returns between 1928 and 2009 is 20.33%; the standard deviation in the risk premium (stock return – bond return) is a little higher at 21.8%. These estimates of the standard error are probably understated, because they are based upon the assumption that annual returns are uncorrelated over time. There is substantial empirical evidence that returns are correlated over time, which would make this standard error estimate much larger.

Table 7: Standard Errors in Historical Risk Premiums

<i>Estimation Period</i>	<i>Standard Error of Risk Premium Estimate</i>
5 years	$20\% / \sqrt{5} = 8.94\%$
10 years	$20\% / \sqrt{10} = 6.32\%$
25 years	$20\% / \sqrt{25} = 4.00\%$
50 years	$20\% / \sqrt{50} = 2.83\%$
80 years	$20\% / \sqrt{80} = 2.23\%$

Even using the longest time period (1928-2010), we face a substantial standard error of 2.23%. Note that the standard errors from ten-year and twenty-year estimates are likely to be almost as large or larger than the actual risk premium estimated. This cost of using shorter time periods seems, in our view, to overwhelm any advantages associated with getting a more updated premium.

Why is the standard error in risk premiums so high? Stock returns are volatile and that volatility feeds into the standard errors of any estimates that use these returns. While 80 or 100 years of data seems to clearly meet the “long term” requirement for most analysts, perhaps because it exceeds the typical life span of a human being, the estimates that are derived from this data are not “precise”.

Unstable Risk Premiums

When we use historical data to estimate equity risk premiums, we tend to get risk premiums that do not change much from year to year, simply because the estimates share much of the same data. Thus, the equity risk premium from 1928-2006 of 4.91% is not very different from the 4.79% we obtain using data from 1928 to 2007, because the estimates have 78 years of data in common. To get a measure of whether risk premiums change over short periods and how much they change, we need a different approach to estimating equity risk premiums that is forward looking and less weighed down by past data. In this section, we will develop this alternate approach and use it to examine the volatility of equity risk premiums over time.

Implied Equity Risk Premium

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% ($15/75$). It is easiest to illustrate 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,

$$r = (.02 + .07) / .02 = 9\%$$

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

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.²⁵ 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

²⁵ Damodaran, A., 2002, *Investment Valuation*, John Wiley and Sons; Damodaran, A., 2006, *Damodaran on Valuation*, John Wiley and Sons.

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 earnings and dividends can grow at rates that are very different (usually higher, but not always) than stable growth values. With these changes, the value of equity can be written as follows:

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

In this equation, there are N years of high growth, $E(\text{FCFE}_t)$ 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.

Long Term Movements in Risk Premiums

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 estimating implied equity risk premiums at the start of 2008, 2009 and 2010, and follow up by looking at the volatility in that estimate over the last 50 years.

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.²⁶ 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.²⁷ Table 8 summarizes the expected dividends for the next 5 years of high growth, and for the first year of stable growth thereafter:

Table 8: Estimated Dividends on the S&P 500 Index – January 1, 2008

<i>Year</i>	<i>Dividends on Index</i>
1	29.12
2	30.57

²⁶ 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.

²⁷ 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.

3	32.10
4	33.71
5	34.39
6	36.81

^aDividends 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:

$$1468.36 = \frac{29.12}{(1+r)} + \frac{30.57}{(1+r)^2} + \frac{32.10}{(1+r)^3} + \frac{33.71}{(1+r)^4} + \frac{34.39}{(1+r)^5} + \frac{36.81(1.0402)}{(r - .0402)(1+r)^5}$$

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. Table 9 summarizes dividends and stock buybacks on the index, going back to 2001.

Table 9: Dividends and Stock Buybacks on S&P 500 Index: 2001-2007

<i>Year</i>	<i>Dividend Yield</i>	<i>Stock Buyback Yield</i>	<i>Total Yield</i>
2001	1.37%	1.25%	2.62%
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%	3.38%	5.15%
2007	1.89%	4.00%	5.89%
Average total yield between 2001-2007 =			4.02%

In 2007, for instance, firms collectively returned more than twice as much cash 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 10, for the next 6 years using the average total yield (dividends + buybacks) of 4.02%, instead of the actual dividends, and the growth rates estimated earlier (5% for the next 5 years, 4.02% thereafter):

Table 10: Cashflows on S&P 500 Index

Year	Dividends+ Buybacks on Index
1	61.98
2	65.08
3	68.33
4	71.75
5	75.34
6	78.36

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

$$1468.36 = \frac{61.98}{(1+r)} + \frac{65.08}{(1+r)^2} + \frac{68.33}{(1+r)^3} + \frac{71.75}{(1+r)^4} + \frac{75.34}{(1+r)^5} + \frac{75.34(1.0402)}{(r - .0402)(1+r)^5}$$

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

$$= 8.39\% - 4.02\% = 4.37\%$$

This value (4.37%) 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:

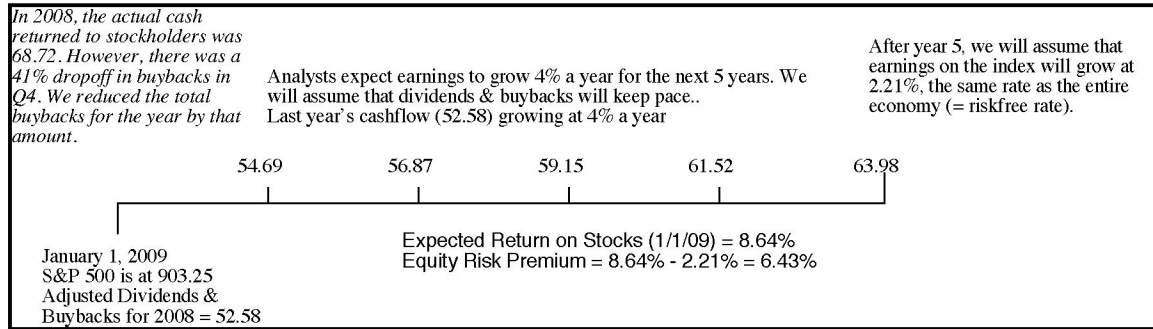
Level of the index = 903.25 (Down from 1468.36)

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

Updated dividends and buybacks on the index in 2008 = 52.58 (Down about 15% from 2007 levels)

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%.²⁸ The resulting equity risk premium is 4.36%:

²⁸ 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 2009, the actual cash returned to stockholders was 40.38. That was down about 40% from 2008 levels.

Analysts expect earnings to grow 21% in 2010, resulting in a compounded annual growth rate of 7.2% over the next 5 years. We will assume that dividends & buybacks will keep pace.

After year 5, we will assume that earnings on the index will grow at 3.84%, the same rate as the entire economy (= riskfree rate).

$$1115.10 = \frac{43.29}{(1+r)} + \frac{46.40}{(1+r)^2} + \frac{49.74}{(1+r)^3} + \frac{53.32}{(1+r)^4} + \frac{57.16}{(1+r)^5} + \frac{57.16(1.0384)}{(r - .0384)(1+r)^5}$$

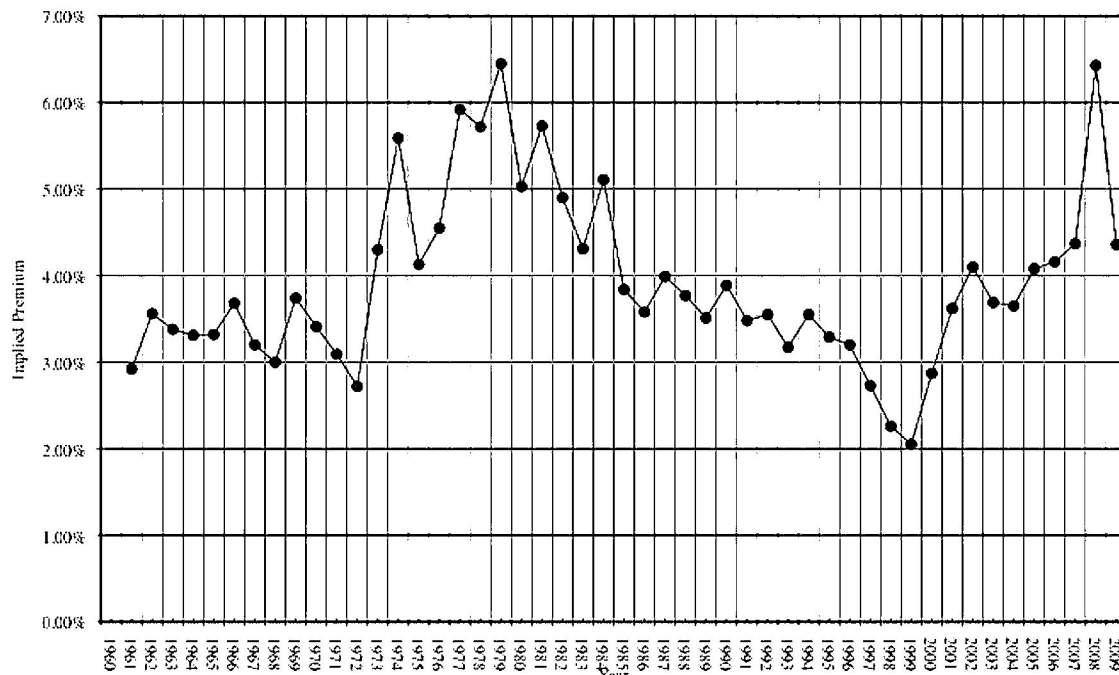
January 1, 2010
S&P 500 is at 1115.10
Adjusted Dividends & Buybacks for 2009 = 40.38

Expected Return on Stocks (1/1/10) = 8.20%
T.Bond rate on 1/1/10 = 3.84 %
Equity Risk Premium = 8.20% - 3.84% = 4.36%

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

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 risk premiums. In Figure 7, we chart the implied premiums in the S&P 500 from 1960 to 2009:

Figure 7: Implied Premium for US Equity Market

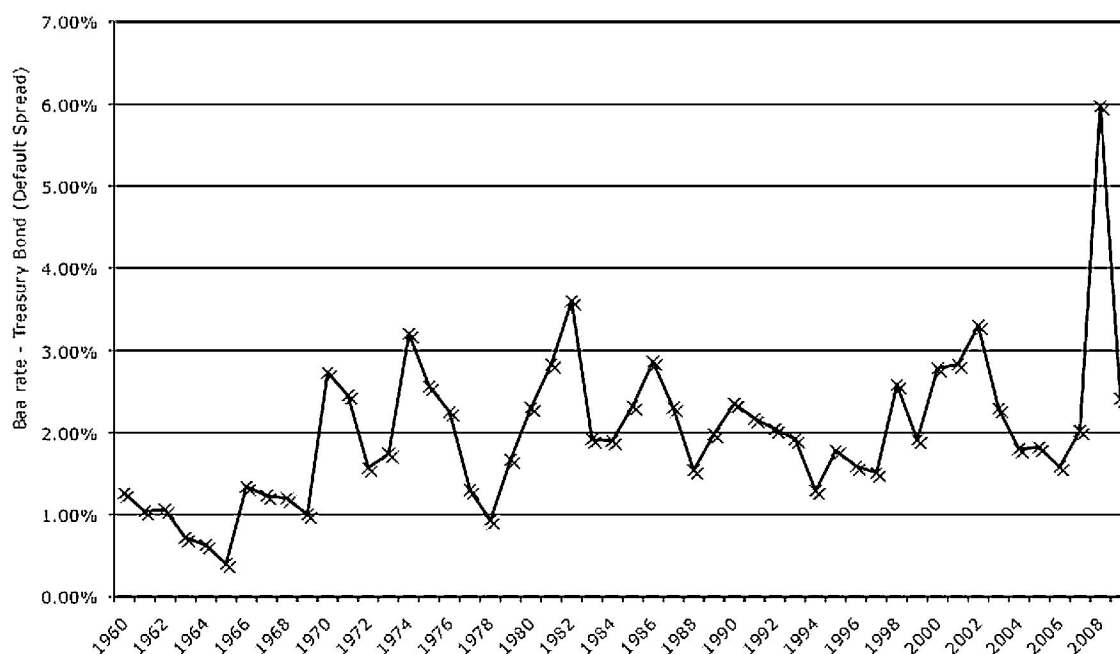


In terms of mechanics, we used potential dividends (including buybacks) as cash flows, and a two-stage discounted cash flow model.²⁹ Looking at figure 7, it is clear that equity risk premiums change significantly over long time periods. The stability of the sixties was followed by a surge in the equity risk premium in the seventies, in response to higher inflation and economic uncertainty. After peaking at 6.5% in 1978, equity risk premiums drifted down, for the most part, for the next two decades, culminating in a premium of 2% at the end of 1999, at the peak of the tech boom. During the last decade, equity risk premiums have increased again, with a sharp spike in 2008, reflecting the banking crisis in the last quarter of the year.

Do default spreads exhibit similar movements over long periods? To answer this question, we isolated bonds in one rating class (Baa) and estimated the default spread relative to a ten-year treasury bond each year from 1960 to 2009. The year-to-year shifts are captured in figure 8:

²⁹ 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.

Figure 8: Default Spread on Baa Rated Bond – 1960 to 2009



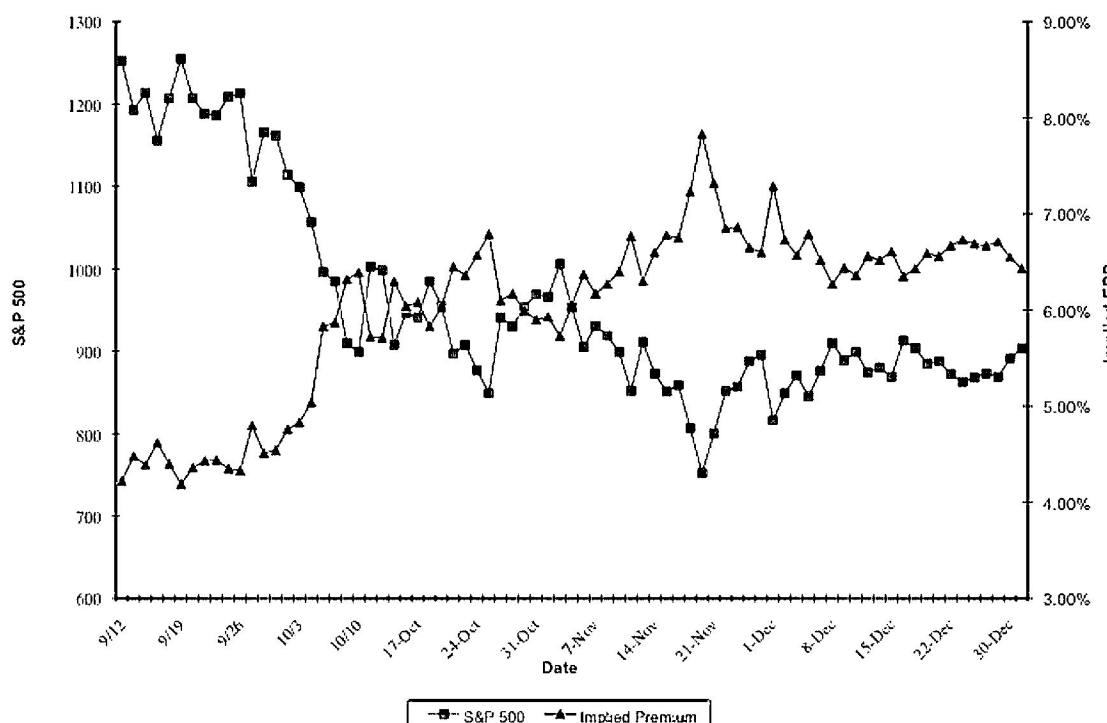
As with equity risk premiums, there are movements over long time periods in default spreads. In fact, the periods and direction of drift coincide with those observed for equity risk premiums, with default spreads widening in the 1970s and narrowing in the 1990s, a point that we return to later in the chapter. Note also the dramatic jump in default spreads in 2008, followed by the steep fall off in 2009, mirrors the movements in equity risk premiums in those two years.

Changes over short time periods

While many analysts concede the possibility that risk premiums change over long time periods, they have generally operated on the assumption that risk premiums do not change much over short time periods, at least in mature markets. This assumption was viewed as reasonable for equity markets like the United States, but was put under a severe test during the market crisis that unfolded with the fall of Lehman Brothers on September 15, 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 9, 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 trailing 12 months to compute the cash flows for the most recent year.³⁰ 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 1057.³¹

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

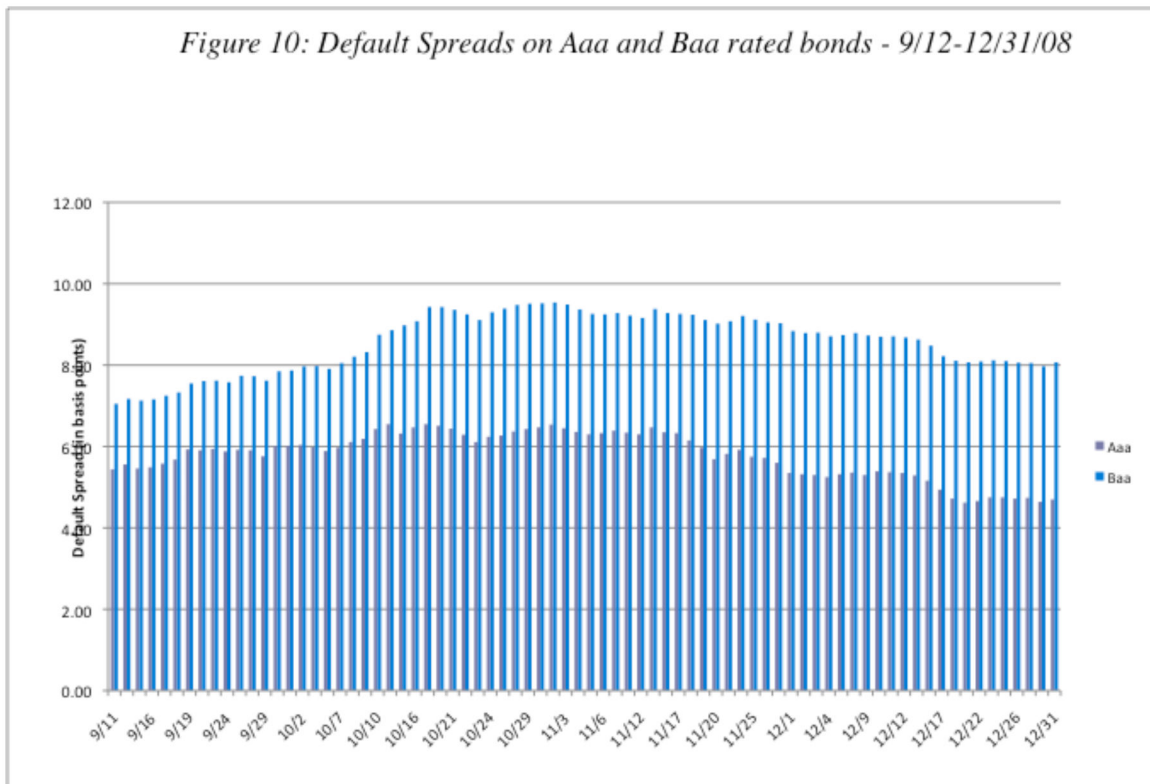


³⁰ This number, unlike the index and treasury bond rate, is not updated on a daily basis. We did try to modify the number as companies in the index announced dividend suspensions or buyback modifications.

³¹ 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.

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 gyrated, hitting a high of 8% in late November, before settling into the year-end level of 6.43%.

Looking at the default spreads on Aaa and Baa rated bonds over the same fifteen-week period, from 9/12/08 to 12/31/08, in figure 10, we observe volatility similar to that observed for equity risk premiums:



The default spreads for bonds in both ratings classes also increased over the period, reflecting investor fears about the future and a higher price for risk. However, the increases in spreads were less attenuated than the increase in equity risk premiums and the Baa rated bonds saw their spreads widen more than the Aaa rated bonds.

In summary, the last quarter of 2008 should operate as a reminder that assuming that risk premiums do not change over short periods can be dangerous, even in developed markets and even more so in emerging markets. While there are some who may view periods like this one as aberration, this is precisely the “risk” that we worry about when we invest in risky assets and why we should allow for the possibility of a reoccurrence. In particular, the effects of the crisis were magnified in riskier asset classes, as evidenced by the surge in equity risk premiums related to Aaa rated bond spreads.

Mean Reversion is not guaranteed

Analysts who use historical risk premiums, even when confronted with evidence of high volatility in the estimates, justify their usage by arguing that even if risk premiums are variable, they revert back to historical averages (mean reversion). As a consequence, they believe that intrinsic valuation, which is inherently long term, is better based upon the historical average rather than the current estimate.

The “mean reversion” argument has resonance because there is clear empirical evidence that numbers have a tendency to revert back to historical norms. Companies with high profit margins see these numbers drift down towards industry averages, low interest rates over time seem to revert back to more “normal” values and economies that go into recessions usually come back during recoveries. So, why should risk premiums be exceptions to the general rule? We do believe that mean reversion is a strong force with risk premiums, but we have three concerns with using this as a justification for using historical averages.

- a. Reversion to the mean, but to which one? Even if we accept the consensus view that risk premiums move back to historical norms, it is not clear that there will be consensus of what that norm is. In table 6, for instance, we reported historical equity risk premiums for the United States, but the estimate varies widely depending upon the time period used, the choice of a riskfree security and whether we use arithmetic or geometric averages. In effect, assuming mean reversion still leaves us with estimation decisions that can yield very different values for the risk premium.

- b. Reversion over what time period? Again, let us start with the presumption that there is mean reversion. The question of how quickly numbers revert back to the average can have a significant effect on whether the values we obtain from using historical risk premiums are viable. Assume, for instance, that the current equity risk premium is 7% and that the historical average is 4%. If mean reversion happens quickly, say over 6 months, using a 4% risk premium to value a stock will yield a reasonable estimate of intrinsic value (at least for any investor with a time horizon longer than 6 months). If risk aversion happens slowly, say over 5 years, using the 4% risk premium will generate “too high” an estimate of value for every stock.

This point is best illustrated by returning to figure 7, where we graphed implied equity risk premiums over time. A believer in mean reversion could look at this chart and argue that equity risk premiums seem to revert back to about 4-4.5% over long time periods. Thus, the premium, which peaked at 6.5% in 1978, moved down towards the average 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 reverted back to the average, during the market correction from 2000-2003.³² However, the reversions occurred over many years and drifts away from the mean have sometimes lasted as long as a decade.

- c. Structural breaks: Risk premiums tend to revert back to averages, until they do not. The biggest danger with assuming that numbers will revert back to historical averages is that they sometimes do not. In an earlier section, we outlined the fundamental variables that determine risk premiums – investor risk aversion, the volatility of the underlying economy, fear of catastrophic shocks, information uncertainty and illiquidity. If these fundamental variables do not change much over time or revert back to historical norms, there will be mean reversion in risk premiums. However, if there are permanent changes in any of these fundamentals,

³² Arnott, Robert D., and Ronald Ryan, 2001, *The Death of the Risk Premium: Consequences of the 1990s*, Journal of Portfolio Management, Spring 2001. 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.

we would expect risk premiums in the future to be different from historical averages.

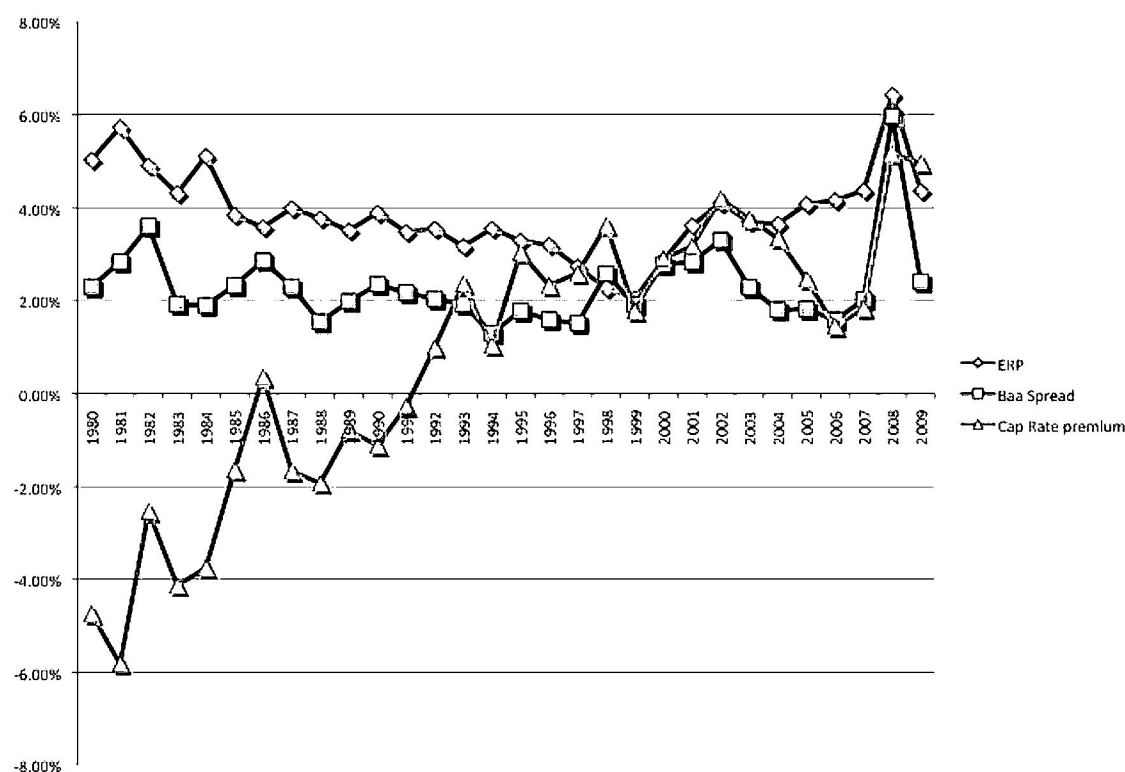
In conclusion, assuming that risk premiums revert back to historical averages is not a bad strategy for very long term investors in most time periods, but that assumption still leaves these investors with the requirements that they make “good” estimates of the average and check to see if the underlying fundamentals have shifted. For short and even medium term investors, assuming mean reversion can lead to misleading estimates of value and bad investment decisions.

Linked Markets

While we think of corporate bonds, stocks and real estate as different asset classes, they are all risky assets and that they should therefore be priced consistently by investors who can choose to invest in any or all of them. 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 is used as the risk premium. In the equity market, as we have seen 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 least complex and the most widely accessible data item and the implied equity risk premium can be computed in each time period. We were able to obtain annual values for the capitalization rate from 1980 to 2009. Figure 11 summarizes equity risk premiums, default spreads and capitalization rates each year from 1980 to 2009:

Figure 11: Equity Risk Premium, Default Spreads and Real Estate Capitalization Rates



Equity risk premiums and default spreads have moved closely over time, though there have short periods where the two have deviated; in the 1990s, equity risk premiums declined while default spreads stayed stable, whereas the opposite occurred in the early part of the last decade. Real estate capitalization rates seem unrelated to either of the other two risk premiums for much of the 1980s, reflecting the fact that investors in the real estate market were more insulated and therefore less inclined to compare or demand risk premiums compatible with the premiums earned in financial markets. With the advent of real estate securitization (mortgage backed securities and variants) in the 1990s, we see convergence in the three premiums. Thus, it behooves investors in any one of these markets to keep track of risk premiums in the other markets to get a sense of when risk premiums in a market are getting out of line (too high or low, relative to other markets) and to alter allocation and investment decisions accordingly.

As globalization becomes a reality for both corporations and investors, we are also seeing a harmonization of risk premiums for both equity and debt across different geographical markets. Thus, when equity risk premiums drop in United States, they also

seem to drop in India and Brazil. Macro investors (which include hedge funds and global portfolio managers), who can and do invest in different markets (asset classes and geographically), are comparing the risk premiums they can earn in different markets and redirecting their money to the markets where the payoff from taking risk is greatest. In summary, risky asset markets are more linked together than ever before and risk premiums across markets often do move in tandem.

Implications for Practice

If you find any of the evidence presented in the last section on the imprecision of historical averages, the instability of risk premiums, the potential failure of mean reversion and the linkages across risky asset classes, to be persuasive, it follows that the conventional practices of estimating and using risk premiums have to be reassessed. In this section, we will address how best to deal with the estimation questions in both investing and corporate finance.

Investing

As we noted in an earlier section, assessments of risk premiums underlie a great deal of investing from asset allocation to security selection. Put differently, a mistaken view on risk premiums can lead investors to invest too much in some risky asset classes and too little in others and to misvalue investments within each asset class. In this section, we will argue that to prevent these errors, investors should be dynamic in estimating risk premiums within each asset class, check risk premiums across asset classes and be judicious in assuming mean reversion.

Asset Allocation

One determinant of asset allocation can be market timing; you will over allocate assets to markets that you view as under valued and less to markets that are over valued. This judgment is often made using variables or data from within each market. Thus, stocks are viewed as under valued, if the PE ratio for the market drops below a pre-specified floor, say ten, and overvalued if the PE ratio increases above a ceiling. The problem with these measures is that they do not consider investment opportunities outside

this asset class. Risk premiums, estimated using updated and forward looking data, can help in determining what asset classes and geographical areas to invest in.

a. Individual asset classes: Investors are constantly called upon to assess whether asset prices within each asset class are too high or low and look for simple metrics that they can use to make this judgment. For instance, stocks are considered cheap when the current price earnings ratio is lower than historical averages. An alternative is to look at current risk premiums (equity, debt or real estate) to normalized values. Thus, if the current equity risk premium is 5% and the normalized value is 4%, stocks are under valued. There are three ways in which we can compute the normalized premium:

- *Use the historical premium:* In its simplest form, this would require comparing the current implied equity risk premium (4.78% in August 2010) to the historical average (4.29%) computed from actual returns in table 5. We would then conclude that stocks are under valued.

- *Use the historical implied premium:* Rather than trust historical returns and the resulting “noisy” averages, we could compute the average of the implied premiums that we computed from 1960-2009. Using the fifty years of data, the average that we arrive at is 3.92%. This estimate is far more precise than the one obtained from historical returns, because implied premiums are more stable than actual returns.

- *Use fundamentals:* If risk premiums are a function of fundamentals, we should be able to estimate risk premiums as a function of macro economic variables that reflect these fundamentals. Using data from 1960 to 2009, we regressed equity risk premiums against 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 6-month T.Bill rate), with the t statistics reported in brackets below each coefficient:

$$\text{Implied ERP} = 2.86\% + 0.167 \text{ (T.Bond Rate)} - 0.040 \text{ (T.Bond - T.Bill)} \quad R^2 = 15.4\%$$

(3.25)
(0.36)

There is a strong positive relationship between the T.Bond rate and implied equity risk premiums: every 1% increase in the treasury bond rate increases the equity risk premium by 0.177%. The relationship between implied premiums and the slope of the yield curve is negative but much weaker: a more upward sloping yield curve has generally been associated with lower equity risk premiums. To estimate the normalized premium on

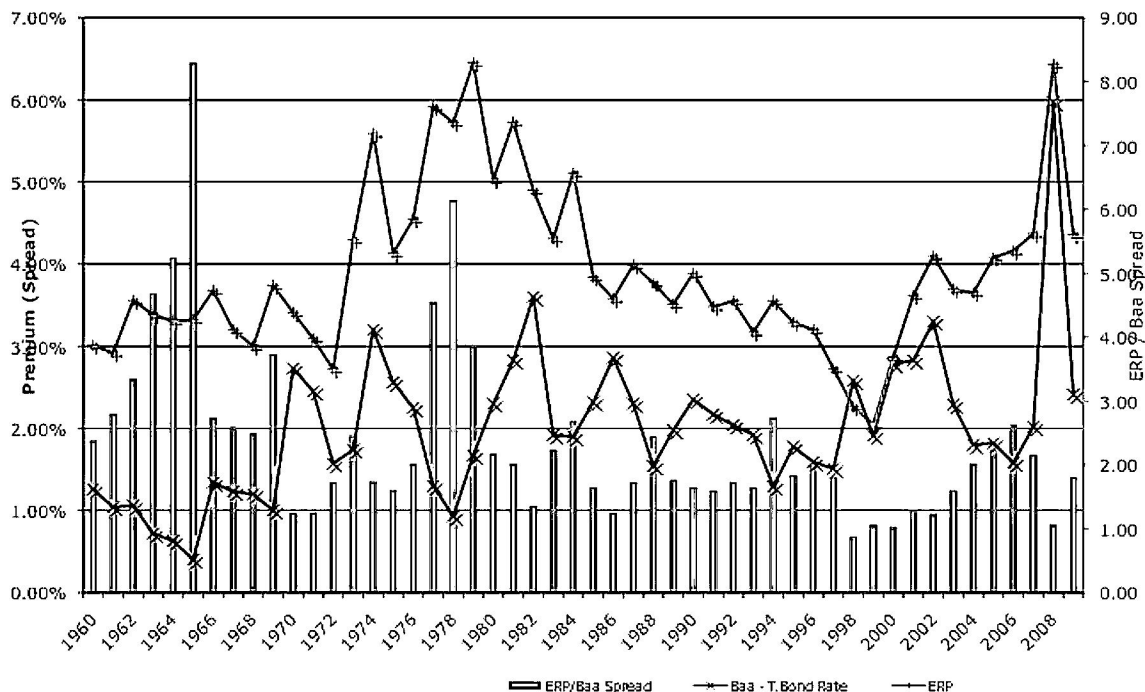
August 14, 2010, for instance, when the 10-year treasury bond rate was 2.65% and the 6-month treasury bill rate was at 1.00%, the implied equity risk premium would have been computed as follows:

$$\text{Implied ERP} = 2.86\% + 0.167 (2.65\%) - 0.040 (2.65\% - 1.00\%) = 3.24\%$$

This would have been below the observed implied equity risk premium of about 4.78% and the average implied equity risk premium of 3.92% between 1960 and 2009.

b. Across Asset classes: In the last section, we considered ways in which we can estimate forward-looking and dynamic risk premiums in different asset classes. In figures 9 and 10, we looked at the risk premiums for equity markets (implied ERP) and corporate bond markets (default spreads) and extended the analysis to cover real estate (real estate cap rates) in figure 11. While the risk premiums in the markets have moved together for the most part (especially in the bond and equity markets), there have been periods of disconnect, where the premium in one market has increased or stagnated while the premium in the other has declined. Figure 12 brings together the equity risk premium and default spread on a Baa rated bond and computes a ratio of the two (Equity Risk Premium/Default Spread).

Figure 12: Equity Risk Premium versus Default Spread – 1960 to 2009



How can we use the risk premium ratio? The average ratio of the equity risk premium to the Baa default spread from 1960 to 2009 is 2.38, and the median is approximately 2.02 for the entire time period. When the ratio rises above this median value, stocks offer a much better payoff for risk taking than corporate bonds, and the reverse is true if the ratio is lower. At the end of 1999, for instance, the equity risk premium and the Baa default spread were about 2%, yielding a ratio of the two of roughly one. This was at the peak of the technology boom of the 1990s and was followed by an extended bear market for equities and a bull market for corporate bonds. Conversely, the equity risk premium was almost three times the Baa default spread in 2006, setting the stage for the collapse in the high yield bond market in the next year. 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 default spreads were too high. During 2009, both risk premiums decreased, but default spreads dropped far more than the equity risk premium and the ratio moved back to 1.81, a little lower than the median value of 2.02 (and the average of 2.37) for the entire time period. On January 1, 2010, the default spread on a Baa rated bond had dropped back to 2.41%. Applying the median ratio of 2.02, estimated from 1960-2009 numbers, to the Baa default spread of 2.41% in January 2010 results in the following estimate of the ERP:

Default Spread on Baa bonds (over treasury) on 9/30-/09 = 2.41%

Imputed Equity Risk Premium = Default Spread * Median ratio or ERP/Spread
 $= 2.41\% * 2.02 = 4.87\%$

This is higher than the implied equity risk premium of 4.36% in January 2010, suggesting that stocks were mildly overvalued, relative to corporate bonds at that point in time.

c. Geographical/Global Allocation: As investors globalize their portfolios, they also have to decide where to invest their money. Thus, having determined that 40% of your portfolio should be in emerging markets, they have to follow up by then deciding whether to invest in Chinese, Brazilian or Russian equities. Here again, computing risk premiums can help, if they are based upon current equity prices and expected cash flows. The process that we used to estimate the implied equity risk premium can be expanded to compute implied equity premiums in different equity markets. Once computed, these

premiums can be scaled to the risk in each market (measured qualitatively or quantitatively) to get a sense of the payoff to risk taking. To illustrate this process, assumed that you would like to invest 10% of your portfolio in Latin American and are trying to decide which market to invest your money in. Table 11 summarizes implied equity risk premiums in seven Latin American markets, with two measures of risk for each of the markets – the default spread on dollar denominated bonds issued by the country and the standard deviation in equity prices within each of the markets over the previous 2 years (using weekly returns):

Table 11: Implied Equity Risk Premiums in August 2010 – Latin America

<i>Country</i>	<i>Standard deviation in equity</i>	<i>Implied equity risk premium</i>	<i>Return/Risk ratio</i>
Argentina	37%	9.83%	0.27
Brazil	25%	6.94%	0.28
Chile	26%	6.76%	0.26
Colombia	26%	7.30%	0.28
Peru	30%	7.52%	0.25
Venezuela	42%	10.03%	0.24
Mexico	28%	7.06%	0.25

Using the data in the table, it looks like Brazil and Colombia offers the best risk/return trade off among the markets and Venezuela offers the worst. That would lead us to allocate more of the portfolio to Brazilian and Colombian stocks and less to Venezuelan companies.

Asset Selection

Once allocation judgments are made, investors have to turn their attention to picking individual assets within each class – stocks for equity, bonds for fixed income and properties for real estate. To make these selections, they will have to assign values to individual assets and compare these values to the traded prices. Here again, risk premiums can play a role, especially if investors try to estimate intrinsic values for individual assets. In the context of stocks, the equity risk premium is an input into discounted cash flow models for valuing companies; with bonds, the default spread is a key component of the interest rate, which determines the bond price.

If risk premiums are indeed time varying, volatile and dynamic, what risk premiums should we use when valuing individual companies? On 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 markets will return to the status quo. On the other hand, there will be others who will point to the same volatility and note the danger of sticking with a “fixed” premium. In our view, individual asset valuations should be based upon the current risk premiums, rather than historical averages, for the following reasons:

- a. Separate market views from asset views: When we value individual companies, our valuations should be focused on our views of the company – its management, competitive advantages and products. If we value equity in individual companies, using historical risk premiums or any premium different from the current implied premium, our valuations become joint reflections of our views on the company and our views on the market. To illustrate, assume that the current implied equity risk premium is 4.5% and that we choose to use 6% as the equity risk premium (because it is the historical average). The higher risk premium, other things remaining equal, will lead to a higher discount rate and a lower value. If we then conclude that the stock is over valued (because the current price is higher than the value), that conclusion may be entirely driven by our choice of the equity risk premium and not at all by our views on the company. Note that the “market neutrality” implicit in the use of the current risk premium is not just a desirable feature but also a requirement for most analysts doing valuation. When you are an equity research analyst or an analyst valuing a company for an acquisition or an accountant appraising “fair value” of assets, your mission is to make a judgment on the company or assets in question and not to bring in your views on the overall market.
- b. Consistency across valuations: When there are multiple analysts valuing companies, it becomes even more critical that we make updated assessments of risk premiums and then require all analysts to use the “same” premium. If we do not and some analysts use higher risk premiums in their valuations than others,

the valuations and recommendations they make cannot be directly compared, in part because each analyst is bringing a different market view into his or her valuation.

Thus, using a current implied equity risk premium is not an acceptance that the overall market is correctly priced but a tactical device for separating market assessments from asset valuations. Views on the risk premium, i.e., that the premium will go up or down towards a normalized value (historical average, for instance), should be reserved for the asset allocation step. Once the allocation judgment has been made, we should switch to current implied premiums to keep the two steps from overlapping.

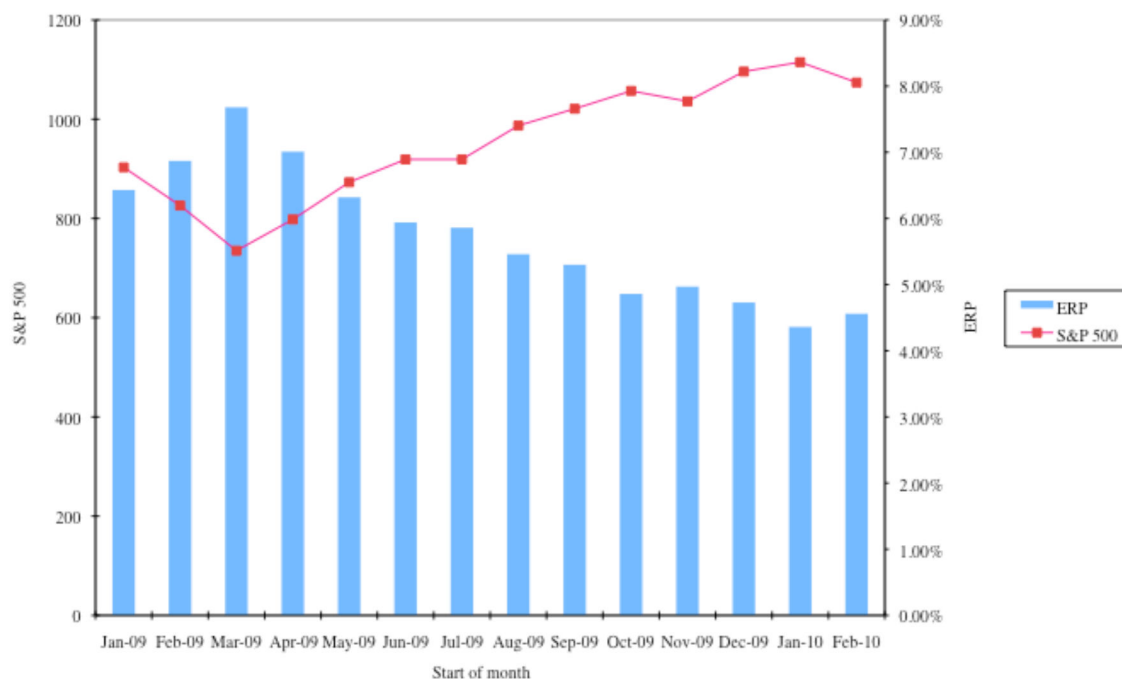
Most investors and analysts do not use intrinsic valuation to value individual assets. Instead, they value stocks, bonds and other assets on a relative basis, by comparing the pricing of an individual company to other companies in the peer group. With equities, the multiple, to earnings, book value or revenue, at which a company trades is used in the comparison. When we use relative valuation, we are implicitly assuming being “market neutral”, insofar as we are assuming that stocks are priced correctly, on average, across a sector. This may, in fact, be one reason why portfolio managers and analysts prefer relative valuation to intrinsic valuation, since the latter is often based on risk premiums that bear no resemblance to current levels.

Is using the current implied equity risk premium an unalloyed good? Not necessarily and there are some who will have misgivings about the practice and for good reasons:

1. It requires credible and updated risk premiums: If we accept the proposition that valuations are best done using current implied equity risk premiums, these premiums have to be estimated as precisely as possible and updated frequently. In figure 13, we report on the monthly equity risk premiums for the S&P 500 from January 2009 through July 2010:³³

³³ The monthly updates of equity risk premiums for the United States, based upon the S&P 500, are available on my website at <http://www.damodaran.com>.

Figure 13: ERP and S&P 500: January 2009 - February 2010



Note that the equity risk premium continued to climb in the first three months of 2009, reaching a high of 7.68% on March 1, 2009 but has dropped significantly since then. At the start of August 2010, the implied equity risk premium for the US stood at 4.78%.

2. Intrinsic valuations will become more volatile: Using updated risk premiums to value individual assets and companies will inevitably add more volatility to estimates of intrinsic value, especially in periods when market assessments of risk premiums are changing. Holding expected cash flows constant, the value of a company, estimated using equity risk premiums and default spreads from early September 2008, would have been very different from the value estimated in January 2009, with updated values for the risk premiums. While this seems reasonable to us, given the market shifts in risk pricing, the notion that intrinsic value is a stable number is deeply help by some analysts and variability in the number makes them uncomfortable.

Investors also need to be aware of what the estimated value, based upon an implied equity risk premium, is telling them: When a company or asset is valued using an updated risk premium, the estimated value conveys a very different meaning than an estimate

based upon a historical or normalized risk premium. Specifically, the value of a stock using an implied equity risk premium should be read as follows: this is the value that we would assign the company right now, given how the market is pricing risk in equity and bond markets. In contrast, the value of a stock using a “desired” or “historical” risk premium has the following connotation: this is the value that we would attach to this company, given what I think the market “should” be pricing risk at in equity and bond markets.

For those who are dead set against the use of the implied equity risk premiums in valuations, there is a compromise solution. The equity risk premiums and default spreads used in valuation do not have to be locked in for perpetuity. Risk premiums can and do change over time. We can start with the current values for the equity risk premium and default spreads in valuation and allow both numbers to adjust over time to what we believe are more normal values. In my discounted cash flow valuations in early 2009, for instance, I used the equity risk premium of 6% at that time as the starting estimate, but that number was assumed to drift down to 4.5% (my normalized, long term estimate) in the future.

Corporate Finance

In corporate finance, assessments of equity risk premiums and default spreads determine the costs attached by firms to equity and debt, and thus, to all capital. This cost of capital will then affect whether, how much and in what assets these firms invest. Furthermore, the mix of debt and equity used by a firm to fund its operations will be determined by how large the equity risk premium is, relative to default spreads. In this section, we examine the risk premium practices that make the most sense in corporate finance, given the evidence that premiums are imprecise, volatile and connected across markets.

Investment Analysis

When making investments, firms have to make sure that they generate returns that exceed the cost of capital on these investments. In assessing cost of capital, though, risk premiums come into play, with higher risk premiums for equity and/or debt pushing up the “hurdle rate”. It is no surprise, then, that the question of what risk premiums to use

becomes a central question in corporate finance and the right answer will depend upon the nature of the investments being considered.

- ➔ For firms whose investments are of short duration, we believe that the current estimates of equity risk premiums and default spreads should be used. Thus, these firms would have registered significant increases in the cost of capital between September 2008 and January 2009, as risk premiums increased. Carrying this through to its logical limits, investments that might have been classified as good investments in September 2008 (because they earned more than the cost of capital) could very well have switched to become bad investments in September.
- ➔ For firms with long term investments, where cash flows extend over many years, using current risk premiums can not only lead to whiplash, as risk premiums change, but also to a skewed investment process, where too many investments are taken in periods where risk premiums are too low and too few investments in periods where risk premiums are too high. Here, a better solution would be to compute “normalized” risk premiums. Thus, a “normalized” risk premium would provide more continuity and consistency to the process. While a historical risk premium may seem like a logical choice for a “normalized” premium, our earlier points about its imprecision (high standard error) and backward-looking nature stand. We would suggest one of the two alternatives we recommended earlier in the context of asset allocation: a historical average “implied” premium or a fundamental-adjusted implied premium.

In summary, if the objective in investment analysis is to allocate limited capital efficiently, while generating returns that exceed the hurdle rate over time, the appropriate risk premiums used in the computation of the costs of equity and capital should be based upon normalized risk premiums.

The Financing Decision

In the financing decision, we are comparing the costs of raising funds from debt and equity. Since these costs are determined by default spreads and the equity risk premium respectively, the relative value (of equity risk premium to default spread) can determine the debt to equity mix for a firm. Intuitively, if equity risk premiums are low,

relative to default spreads, you should see an increase in the use of equity, whereas the reverse will push firms to use more debt.

The big question again becomes whether the financing mix should be based upon current values for the risk premium (current default spreads and equity risk premium) or normalized values. To address this question, we will define the target debt ratio for the firm as its long-term or core debt ratio; this is the ratio that firms will use in their cost of capital computation and aspire to move towards in the long term. In keeping with our discussion of risk premiums to use in investment analysis, the target debt ratio should be based upon normalized values for default spreads and equity risk premiums.

In the short term, though, firms are opportunistic and often deviate from the target and one reason seems to be market timing. Put simply, when firms consider that their equity is over priced, they are likely to increase their use of equity, whereas debt becomes more attractive when the cost of debt looks “low”. Put in risk premium terms, this would involve comparing current risk premiums to normalized values for both debt and equity and altering the debt ratio to take advantage of the relative pricing. Thus, looking at figure 12, firms would have increased their use of equity in 1999, when the ratio of implied equity risk premium to default spreads dropped to a historical low, and their use of debt in 2006, when the ratio hit a historical high. In effect, firms will move away from their target debt ratios in the short term, based upon whether they believe that equity or debt offers better terms.

The Dividend Decision

Risk premiums affect both how much a firm returns to stockholders and the form of the return, i.e., whether they buy back stocks or pay dividends. The effect on the amount of cash returned to stockholders is indirect and occurs because risk premiums affect hurdle rates, and through them, the investment policy. If risk premiums for debt and equity are low, the hurdle rates (costs of equity and capital) use in investment analysis will also be low, and more investments will pass scrutiny, i.e., earn returns higher than the hurdle rates. Consequently, there will be less cash to return to stockholders. We would therefore expect the aggregate amount returned to stockholders

to decrease during periods of low risk premiums and increase during periods of high risk premiums.

Equity risk premiums can also affect whether firms pay dividends or buy back stocks. Since higher equity risk premiums translate into lower stock prices, and firms are more inclined to buy back stock when they believe stock prices are too low, we would expect to see more stock buybacks, relative to dividends, when risk premiums are high, and more dividends relative to stock buybacks, when risk premiums are low. In effect, firms are comparing current equity risk premiums to normalized risk premiums and concluding that stocks are more likely to be under (over) valued, when current premiums are high (low) relative to normalized risk premiums.

Summary

In the last two sections, we have laid out recommendations on the use of risk premiums that range from the use of current premiums, in the context of asset valuation, to normalized premiums for investment analysis, to a combination, when assessing capital structure. Table 12 summarizes our recommendations on risk premiums for investment analysis and capital structure:

Table 12: The “Right” Risk Premiums to use

	Right Risk Premium to Use
<i>Investments/Portfolio Management</i>	
Asset Allocation	Compare <u>current implied risk premiums</u> across different markets (equity, bond, real estate, global) and to historical values (to compute <u>normalized values</u>). Allocate more of your assets to those markets where you get the best trade off in terms of returns for risk taken.
Asset Valuation	Use <u>current</u> implied risk premiums and default spreads to value stocks and bonds.
<i>Corporate Finance</i>	
Investment Analysis	Use <u>normalized</u> equity risk premiums and default spreads to compute the cost of equity/capital, especially for long - term investments. For short term investments, stick with

	<u>current</u> equity risk premiums and default spreads.
Financing Policy	Use <u>normalized</u> equity risk premiums and default spreads to determine “target” debt ratios for long term. Exploit <u>current</u> equity risk premiums and default spreads to alter debt ratios for short term.
Dividend Policy	Set long term dividend policy to reflect <u>normalized</u> equity risk premiums and default spreads. Use stock buybacks and special dividends to take advantage of deviations of current from normalized values.

In both corporate finance and portfolio management, we need assessments of both current and normalized values for risk premiums in different markets.

Conclusion

Investors demand risk premiums as compensation for investing in risky assets and estimates of these risk premiums are central inputs in both investment and valuation. In portfolio management, assessment of risk premiums in different asset markets can affect asset allocation judgments and individual asset valuations. In corporate finance, risk premiums can affect whether, where and how much firms invest, the mix of debt and equity used to fund investments and how much cash gets returned to stockholders in the form of dividends and stock buybacks.

In practice, analysts have for the most part estimated equity risk premiums by looking at historical data and default spreads based upon interest rates paid on existing debt. Implicitly, they are assuming that risk premiums are stable and revert back to historical averages. In this paper, we presented evidence that risk premiums are unstable, do not quickly revert back to historical averages and are linked across different markets. As an alternative to historical risk premiums, we estimated “forward looking” premiums in risky markets and used these premiums to allocate wealth across asset classes and to value individual companies. We also argue that using these premiums will lead to better investment, financing and dividend decisions in corporate finance.

*Equity Risk Premiums (ERP): Determinants,
Estimation, and Implications – The 2022 Edition
Updated: March 23, 2022*

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Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2022 Edition

The equity risk premium is the price of risk in equity markets, and it is not just a key input in estimating costs of equity and capital in both corporate finance and valuation, but it is also a key metric in assessing the overall market. Given its importance, it is surprising how haphazard the estimation of equity risk premiums remains in practice. We begin this paper by looking at the economic determinants of equity risk premiums, including investor risk aversion, information uncertainty and perceptions of macroeconomic risk. In the standard approach to estimating the equity risk premium, historical returns are used, with the difference in annual returns on stocks versus bonds, over a long period, comprising the expected risk premium. We note the limitations of this approach, even in markets like the United States, which have long periods of historical data available, and its complete failure in emerging markets, where the historical data tends to be limited and volatile. We look at two other approaches to estimating equity risk premiums – the survey approach, where investors and managers are asked to assess the risk premium and the implied approach, where a forward-looking estimate of the premium is estimated using either current equity prices or risk premiums in non-equity markets. In the next section, we look at the relationship between the equity risk premium and risk premiums in the bond market (default spreads) and in real estate (cap rates) and how that relationship can be mined to generate expected equity risk premiums. We close the paper by examining why different approaches yield different values for the equity risk premium, and how to choose the “right” number to use in analysis.

(This is the thirteenth update of this paper. The first update was in the midst of the financial crisis in 2008 and there have been annual updates at the start of each year from 2009 through 2022)

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The notion that risk matters, and that riskier investments should have higher expected returns than safer investments, to be considered good investments, is intuitive and central to risk and return models in finance. Thus, the expected return on any investment can be written as the sum of the riskfree rate and a risk premium to compensate for the risk. The disagreement, in both theoretical and practical terms, remains on how to measure the risk in an investment, and how to convert the risk measure into an expected return that compensates for risk. A central number in this debate is the premium that investors demand for investing in the ‘average risk’ equity investment (or for investing in equities as a class), i.e., the equity risk premium.

In this paper, we begin by examining competing risk and return models in finance and the role played by equity risk premiums in each of them. We argue that equity risk premiums are central components in every one of these models and consider what the determinants of these premiums might be. We follow up by looking at three approaches for estimating the equity risk premium in practice. The first is to survey investors or managers with the intent of finding out what they require as a premium for investing in equity as a class, relative to the riskfree rate. The second is to look at the premiums earned historically by investing in stocks, as opposed to riskfree investments. The third is to back out an equity risk premium from market prices today. We consider the pluses and minuses of each approach and how to choose between the very different numbers that may emerge from these approaches.

Equity Risk Premiums: Importance and Determinants

Since the equity risk premium is a key component of every valuation, let’s begin by looking at not only why it matters in the first place but also the factors that influence its level at any point in time and why that level changes over time. In this section, we look at the role played by equity risk premiums in corporate financial analysis, valuation, and portfolio management, and then consider the determinants of equity risk premiums.

Why does the equity risk premium matter?

The equity risk premium reflects fundamental judgments we make about how much risk we see in an economy/market and what price we attach to that risk. In the process, it

affects the expected return on every risky investment and the value that we estimate for that investment. Consequently, it makes a difference in both how we allocate wealth across different asset classes and which specific assets or securities we invest in within each asset class.

A Price for Risk

To illustrate why the equity risk premium is the price attached to risk, consider an alternate (though unrealistic) world where investors are risk neutral. In this world, the value of an asset would be the present value of expected cash flows, discounted back at a risk free rate. The expected cash flows would capture the cash flows under all possible scenarios (good and bad) and there would be no risk adjustment needed. In the real world, investors are risk averse and will pay a lower price for risky cash flows than for riskless cash flows, with the same expected value. How much lower? That is where equity risk premiums come into play. In effect, the equity risk premium is the premium that investors demand for the average risk investment, and by extension, the discount that they apply to expected cash flows with average risk. When equity risk premiums rise, investors are charging a higher price for risk and will therefore pay lower prices for the same set of risky expected cash flows.

Expected Returns and Discount Rates

Building on the theme that the equity risk premium is the price for taking risk, it is a key component into the expected return that we demand for a risky investment. This expected return, is a determinant of both the cost of equity and the cost of capital, essential inputs into corporate financial analysis and valuation.

While there are several competing risk and return models in finance, they all share some common assumptions about risk. First, they all define risk in terms of variance in actual returns around an expected return; thus, an investment is riskless when actual returns are always equal to the expected return. Second, they argue that risk has to be measured from the perspective of the marginal investor in an asset, and that this marginal investor is well diversified. Therefore, the argument goes, it is only the risk that an investment adds on to a diversified portfolio that should be measured and compensated. In fact, it is this view of risk that leads us to break the risk in any investment into two components. There

is a firm-specific component that measures risk that relates only to that investment or to a few investments like it, and a market component that contains risk that affects a large subset or all investments. It is the latter risk that is not diversifiable and should be rewarded.

All risk and return models agree on this crucial distinction, but they part ways when it comes to how to measure this market risk. In the capital asset pricing model (CAPM), the market risk is measured with a beta, which when multiplied by the equity risk premium yields the total risk premium for a risky asset. In the competing models, such as the arbitrage pricing and multi-factor models, betas are estimated against individual market risk factors, and each factor has its own price (risk premium). Table 1 summarizes four models, and the role that equity risk premiums play in each one:

Table 1: Equity Risk Premiums in Risk and Return Models

	<i>Model</i>	<i>Equity Risk Premium</i>
	Expected Return = Riskfree Rate + $\text{Beta}_{\text{Asset}}$ (Equity Risk Premium)	Risk Premium for investing in the market portfolio, which includes all risky assets, relative to the riskless rate.
Arbitrage pricing model (APM)	Expected Return = Riskfree Rate + $\sum_{j=1}^{j=k} \beta_j (\text{Risk Premium}_j)$	Risk Premiums for individual (unspecified) market risk factors.
Multi-Factor Model	Expected Return = Riskfree Rate + $\sum_{j=1}^{j=k} \beta_j (\text{Risk Premium}_j)$	Risk Premiums for individual (specified) market risk factors
Proxy Models	Expected Return = $a + b (\text{Proxy } 1) + c (\text{Proxy } 2)$ (where the proxies are firm characteristics such as market capitalization, price to book ratios or return momentum)	No explicit risk premium computation, but coefficients on proxies reflect risk preferences.

All of the models other than proxy models require three inputs. The first is the riskfree rate, simple to estimate in currencies where a default free entity exists, but more complicated in markets where there are no default free entities. The second is the beta (in the CAPM) or betas (in the APM or multi-factor models) of the investment being analyzed, and the third is the appropriate risk premium for the portfolio of all risky assets (in the CAPM) and the factor risk premiums for the market risk factors in the APM and multi-

factor models. While I examine the issues of riskfree rate and beta estimation in companion pieces, I will concentrate on the measurement of the risk premium in this paper.

Note that the equity risk premium in all of these models is a market-wide number, in the sense that it is not company-specific or asset-specific but affects expected returns on all risky investments. Using a larger equity risk premium will increase the expected returns for all risky investments, and by extension, reduce their value. Consequently, the choice of an equity risk premium may have much larger consequences for value than firm-specific inputs such as cash flows, growth, and even firm-specific risk measures (such as betas).

Investment and Policy Implications

It may be tempting for those not immersed in valuation or corporate financial analysis to pay little heed to the debate about equity risk premium, but it would be a mistake to do so, since its effects are far reaching.

- The amounts set aside by both corporations and governments to meet future pension fund and health care obligations are determined by their expectations of returns from investing in equity markets, i.e., their views on the equity risk premium. Assuming that the equity risk premium is 6% will lead to far less being set aside each year to cover future obligations than assuming a premium of 4%. If the actual premium delivered by equity markets is only 2%, the fund's assets will be insufficient to meet its liabilities, leading to fund shortfalls which have to be met by raising taxes (for governments) or reducing profits (for corporations) In some cases, the pension benefits can be put at risk, if plan administrators use unrealistically high equity risk premiums, and set aside too little each year.
- Business investments in new assets and capacity is determined by whether the businesses think they can generate higher returns on those investments than the cost that they attach to the capital in that investment. If equity risk premiums increase, the cost of equity and capital will have to increase with them, leading to less overall investment in the economy and lower economic growth.
- Regulated monopolies, such as utility companies, are often restricted in terms of the prices that they charge for their products and services. The regulatory commissions that determine "reasonable" prices base them on the assumption that these companies have to earn a fair rate of return for their equity investors. To come up with this fair rate of

return, they need estimates of equity risk premiums; using higher equity risk premiums will translate into higher prices for the customers in these companies.¹

- Judgments about how much you should save for your retirement or health care and where you should invest your savings are clearly affected by how much return you think you can make on your investments. Being over optimistic about equity risk premiums will lead you to save too little to meet future needs and to over investment in risky asset classes.

Thus, the debate about equity risk premiums has implications for almost every aspect of our lives.

Market Timing and Risk Premiums

Anyone who invests has a view on equity risk premiums, though few investors are explicit about their views. In particular, if you believe that equity markets are efficient, you are arguing that the equity risk premiums built into market prices today are correct. If you believe that stock markets are overvalued or in a bubble, you are asserting that the equity risk premiums built into prices today are too low, relative to what they should be (based on the risk in equities and investor risk aversion). Conversely, investors who believe that stocks are collectively underpriced or cheap are also making a case that the equity risk premium in the market today is much higher than what you should be making (again based on the risk in equities and investor risk aversion). Thus, every debate about the overall equity market can be translated into a debate about equity risk premiums.

Put differently, asset allocation decisions that investors make are explicitly or implicitly affected by investor views on risk premiums and how they vary across asset classes and geographically. Thus, if you believe that equity risk premiums are low, relative to the risk premiums in corporate bond markets (which take the form of default spreads on bonds), you will allocate more of your overall portfolio to bonds. Your allocation of equities across geographical markets are driven by your perceptions of equity risk premiums in those markets, with more of your portfolio going into markets where the

¹ The Society of Utility and Regulatory Financial Analysts (SURFA) has annual meetings of analysts involved primarily in this debate. Not surprisingly, they spend a good chunk of their time discussing equity risk premiums, with analysts working for the utility firms arguing for higher equity risk premiums and analysts working for the state or regulatory authorities wanting to use lower risk premiums.

equity risk premium is higher than it should be (given the risk of those markets). Finally, if you determine that the risk premiums in financial assets (stocks and bonds) are too low, relative to what you can earn in real estate or other real assets, you will redirect more of your portfolio into the latter.

By making risk premiums the focus of asset allocation decisions, you give focus to those decisions. While it is very difficult to compare PE ratios for stocks to interest rates on bonds and housing price indicators, you can compare equity risk premiums to default spreads to real estate capitalization rates to make judgments about where you get the best trade off on risk and return. In fact, we will make these comparisons later in this paper.

What are the determinants of equity risk premiums?

Before we consider different approaches for estimating equity risk premiums, we should examine the factors that determine equity risk premiums. After all, equity risk premiums should reflect not only the risk that investors see in equity investments but also the price they attach to that risk.

Risk Aversion and Consumption Preferences

The first and most critical factor, obviously, is the risk aversion of investors in the markets. As investors become more risk averse, equity risk premiums will climb, and as risk aversion declines, equity risk premiums will fall. While risk aversion will vary across investors, it is the collective risk aversion of investors that determines equity risk premium, and changes in that collective risk aversion will manifest themselves as changes in the equity risk premium. While there are numerous variables that influence risk aversion, we will focus on the variables most likely to change over time.

- a. Investor Age: There is substantial evidence that individuals become more risk averse as they get older. The logical follow up to this proposition is that markets with older investors, in the aggregate, should have higher risk premiums than markets with younger investors, for any given level of risk. Bakshi and Chen (1994), for instance, examined risk premiums in the United States and noted an increase in risk premiums as investors aged.² Liu and Spiegel computed the ratio of the middle-age cohort (40-49

² Bakshi, G. S., and Z. Chen, 1994, *Baby Boom, Population Aging, and Capital Markets*, The Journal of Business, LXVII, 165-202.

years) to the old-age cohort (60-69) and found that PE ratios are closely and positively related to the Middle-age/Old-age ratio for the US equity market from 1954 to 2010; since the equity risk premium is inversely related to the PE, this would suggest that investor age does play a role in determining equity risk premiums.³

- b. Preference for current consumption: We would expect the equity risk premium to increase as investor preferences for current over future consumption increase. Put another way, equity risk premiums should be lower, other things remaining equal, in markets where individuals are net savers than in markets where individuals are net consumers. Consequently, equity risk premiums should increase as savings rates decrease in an economy. Rieger, Wang and Hens (2012) compare equity risk premiums and time discount factors across 27 countries and find that premiums are higher in countries where investors are more short term.⁴

Relating risk aversion to expected equity risk premiums is not straightforward. While the direction of the relationship is simple to establish – higher risk aversion should translate into higher equity risk premiums- getting beyond that requires us to be more precise in our judgments about investor utility functions, specifying how investor utility relates to wealth (and variance in that wealth). As we will see later in this paper, there has been a significant angst among financial economists that most conventional utility models do not do a good job of explaining observed equity risk premiums.

Economic Risk

The risk in equities as a class comes from more general concerns about the health and predictability of the overall economy. Put in more intuitive terms, the equity risk premium should be lower in an economy with predictable inflation, interest rates and economic growth than in one where these variables are volatile. Lettau, Ludvigson and Wachter (2008) link the changing equity risk premiums in the United States to shifting volatility in the real economy.⁵ They attribute the lower equity risk premiums of the 1990s

³ Liu, Z. and M.M. Siegel, 2011, *Boomer Retirement: Headwinds for US Equity Markets?* FRBSF Economic Letters, v26.

⁴ Rieger, M.O., M. Wang and T. Hens, 2012, International Evidence on the Equity Risk Premium Puzzle and Time Discounting, SSRN Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2120442

⁵ Lettau, M., S.C. Ludvigson and J.A. Wachter, 2008. *The Declining Equity Risk Premium: What role does macroeconomic risk play?* Review of Financial Studies, v21, 1653-1687.

(and higher equity values) to reduced volatility in real economic variables including employment, consumption and GDP growth. One of the graphs that they use to illustrate the correlation looks at the relationship between the volatility in GDP growth and the dividend/ price ratio (which is the loose estimate that they use for equity risk premiums), and it is reproduced in figure 1.

Figure 1: Volatility in GDP growth and Equity Risk Premiums (US)

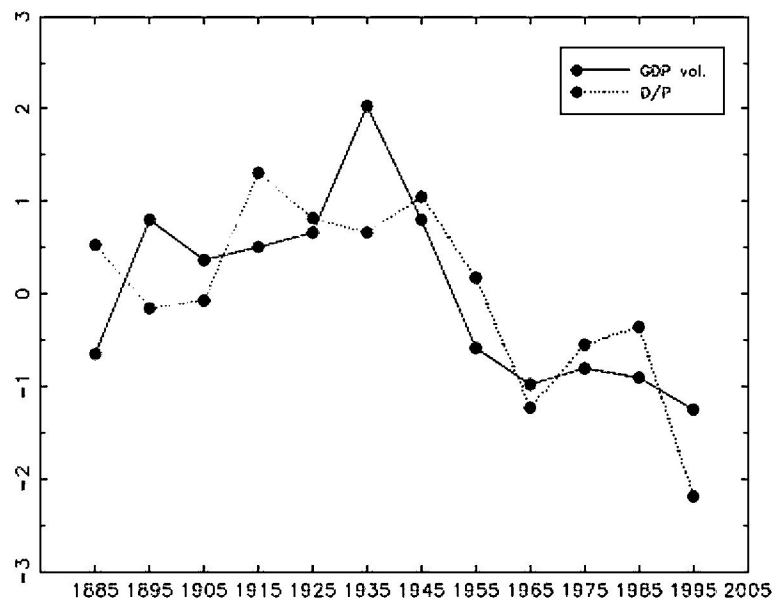


Figure 3
GDP volatility and the D/P ratio—Prewar evidence
 This figure plots the standard deviations of GDP growth and the mean D/P ratio by decade starting in 1880 until 2000. Both series are demeaned and divided by their standard deviation. The GDP data are from Ray Fair's website (<http://fairmodel.econ.yale.edu/RAYFAIR/PDF/2002DTBL.HTM>) based on Balke and Gordon (1989). The dividend yield data is from Robert Shiller's website (http://aida.econ.yale.edu/~shiller/data/ie_data.htm).

Note how closely the dividend yield has tracked the volatility in the real economy over this very long period. Segal and Shaliastovich (2021) also tie equity risk premiums to macroeconomic uncertainty, arguing that as uncertainty rises, investors and businesses conserve capital for the future, and invest less in current risky investments.⁶ Nezafat and Slavik (2021) develop a production-based asset pricing model, where firms and financial constrained and negative liquidity and cyclical shocks force retrenchment and liquidation,

⁶ Segal, G. and I. Shaliastovich, 2021, Uncertainty, Risk and Capital Growth, SSRN Working Paper, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4015970.

and use it to generate equity risk premiums and risk free rates similar to those observed in the data.⁷

Gollier (2001) noted that the linear absolute risk tolerance often assumed in standard models breaks down when there is income inequality, and that the resulting concave absolute risk tolerance should lead to higher equity risk premiums.⁸ Hatchondo (2008) attempted to quantify the impact on income inequality on equity risk premiums. In his model, which is narrowly structured, the equity risk premium is higher in an economy with unequal income than in an egalitarian setting, but only by a modest amount (less than 0.50%).⁹

Inflation and Interest Rates

A related strand of research examines the relationship between equity risk premium and inflation, with mixed results. Studies that look at the relationship between the level of inflation and equity risk premiums find little or no correlation. In contrast, Brandt and Wang (2003) argue that news about inflation dominates news about real economic growth and consumption in determining risk aversion and risk premiums.¹⁰ They present evidence that equity risk premiums tend to increase if inflation is higher than anticipated and decrease when it is lower than expected. Another area of research is on the Fisher equation, which decomposes the riskfree rate into expected inflation and a real interest rate, argues that when inflation is stochastic, there should be a third component in the risk free rate: an inflation risk premium, reflecting uncertainty about future inflation.¹¹ Reconciling the findings, it seems reasonable to conclude that it is not so much the level of inflation that determines equity risk premiums but uncertainty about that level, and that some of the inflation uncertainty premium may be captured in the risk free rate, rather than in the equity risk premiums.

⁷ Nezafat, M. and C. Slavik, 2021, Asset Prices and Business Cycles with Liquidity Risk, SSRN Working Paper, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3963053.

⁸ Gollier, C., 2001. *Wealth Inequality and Asset Pricing*, Review of Economic Studies, v68, 181–203.

⁹ Hatchondo, J.C., 2008, *A Quantitative Study of the Role of Income Inequality on Asset Prices*, Economic Quarterly, v94, 73–96.

¹⁰ Brandt, M.W. and K.Q. Wang. 2003. *Time-varying risk aversion and unexpected inflation*, Journal of Monetary Economics, v50, pp. 1457-1498.

¹¹ Benninga, S., and A. Protopapadakis, 1983, *Real and Nominal Interest Rates under Uncertainty: The Fisher Problem and the Term Structure*, Journal of Political Economy, vol. 91, pp. 856–67.

Since the 2008 crisis, with its aftermath of low government bond rates and a simmering economic crisis, equity risk premiums in the United States have behaved differently than they have historically. Connolly and Dubofsky (2015) find that equity risk premiums have increased (decreased) as US treasury bond rates decrease (increase) and have moved inversely with inflation (with higher inflation leading to lower equity risk premiums), both behaviors at odds with the relationship in the pre-2008 period, suggesting a structural break in 2008.¹² Campbell, Pflueger and Viceira (2019) also confirm a shift in the relationship between stocks and bonds, but trace the change back earlier to 2001 and link it to the change in the link between inflation and real output from negative in the pre-2001 time period to positive, post 2001.¹³

Information

When you invest in equities, the risk in the underlying economy is manifested in volatility in the earnings and cash flows reported by individual firms in that economy. Information about these changes is transmitted to markets in multiple ways, and it is clear that there have been significant changes in both the quantity and quality of information available to investors over the last two decades. During the market boom in the late 1990s, there were some who argued that the lower equity risk premiums that we observed in that period were reflective of the fact that investors had access to more information about their investments, leading to higher confidence and lower risk premiums in 2000. After the accounting scandals that followed the market collapse, there were others who attributed the increase in the equity risk premium to deterioration in the quality of information as well as information overload. In effect, they were arguing that easy access to large amounts of information of varying reliability was making investors less certain about the future.

As these contrary arguments suggest, the relationship between information and equity risk premiums is complex. More precise information should lead to lower equity risk premiums, other things remaining equal. However, precision here has to be defined in terms of what the information tells us about future earnings and cash flows. Consequently,

¹² Connolly, R. and D. Dubofsky, 2015, *Risk Perceptions, Inflation and Financial Asset Returns: A Tale of Two Connections*, Working Paper, SSRN #2527213.

¹³ Campbell J.Y., C. Pflueger and L.M. Viceira L.M. *Macroeconomic Drivers of Bond and Equity Risks*, Journal of Political Economy. Forthcoming.

it is possible that providing more information about last period's earnings may create more uncertainty about future earnings, especially since investors often disagree about how best to interpret these numbers. Yee (2006) defines earnings quality in terms of volatility of future earnings and argues that equity risk premiums should increase (decrease) as earnings quality decreases (increases).¹⁴

Empirically, is there a relationship between earnings quality and observed equity risk premiums? The evidence is mostly anecdotal, but there are several studies that point to the deteriorating quality of earnings in the United States, with the blame distributed widely. First, the growth of technology and service firms has exposed inconsistencies in accounting definitions of earnings and capital expenditures – the treatment of R&D as an operating expense is a prime example. Second, audit firms have been accused of conflicts of interest leading to the abandonment of their oversight responsibility. Finally, the earnings game, where analysts forecast what firms will earn and firms then try to beat these forecasts has led to the stretching (and breaking) of accounting rules and standards. If earnings have become less informative in the aggregate, it stands to reason that equity investors will demand large equity risk premiums to compensate for the added uncertainty.

Information differences may be one reason why investors demand larger risk premiums in some emerging markets than in others. After all, markets vary widely in terms of transparency and information disclosure requirements. Markets like Russia, where firms provide little (and often flawed) information about operations and corporate governance, should have higher risk premiums than markets like India, where information on firms is not only more reliable but also much more easily accessible to investors. Lau, Ng and Zhang (2011) look at time series variation in risk premiums in 41 countries and conclude that countries with more information disclosure, measured using a variety of proxies, have less volatile risk premiums and that the importance of information is heightened during crises (illustrated using the 1997 Asian financial crisis and the 2008 Global banking crisis).¹⁵

¹⁴ Yee, K. K., 2006, *Earnings Quality and the Equity Risk Premium: A Benchmark Model*, Contemporary Accounting Research, 23: 833–877.

¹⁵ Lau, S.T., L. Ng and B. Zhang, 2011, *Information Environment and Equity Risk Premium Volatility around the World*, Management Science, Forthcoming.

Liquidity and Fund Flows

In addition to the risk from the underlying real economy and imprecise information from firms, equity investors also have to consider the additional risk created by illiquidity. If investors have to accept large discounts on estimated value or pay high transactions costs to liquidate equity positions, they will be pay less for equities today (and thus demand a large risk premium).

The notion that the market for publicly traded stocks is wide and deep has led to the argument that the net effect of illiquidity on aggregate equity risk premiums should be small. However, there are two reasons to be skeptical about this argument. The first is that not all stocks are widely traded, and illiquidity can vary widely across stocks; the cost of trading a widely held, large market cap stock is very small but the cost of trading an over-the-counter stock will be much higher. The second is that the cost of illiquidity in the aggregate can vary over time, and even small variations can have significant effects on equity risk premiums. In particular, the cost of illiquidity seems to increase when economies slow down and during periods of crisis, thus exaggerating the effects of both phenomena on the equity risk premium.

While much of the empirical work on liquidity has been done on cross sectional variation across stocks (and the implications for expected returns), there have been attempts to extend the research to look at overall market risk premiums. Gibson and Mougeot (2004) look at U.S. stock returns from 1973 to 1997 and conclude that liquidity accounts for a significant component of the overall equity risk premium, and that its effect varies over time.¹⁶ Baekart, Harvey and Lundblad (2006) present evidence that the differences in equity returns (and risk premiums) across emerging markets can be partially explained by differences in liquidity across the markets.¹⁷

Another way of framing the liquidity issue is in terms of funds flows, where the equity risk premium is determined by funds flows into and out of equities. Thus, if more funds are flowing into an equity market, either from other asset classes or other

¹⁶ Gibson R., Mougeot N., 2004, *The Pricing of Systematic Liquidity Risk: Empirical Evidence from the US Stock Market*. Journal of Banking and Finance, v28: 157–78.

¹⁷ Bekaert G., Harvey C. R., Lundblad C., 2006, *Liquidity and Expected Returns: Lessons from Emerging Markets*, The Review of Financial Studies.

geographies, other things remaining equal, the equity risk premium should decrease, whereas funds flowing out of an equity market will lead to higher equity risk premiums.

Catastrophic Risk

When investing in equities, there is always the potential for catastrophic risk, i.e. events that occur infrequently but can cause dramatic drops in wealth. Examples in equity markets would include the great depression from 1929-30 in the United States and the collapse of Japanese equities in the last 1980s. In cases like these, many investors exposed to the market declines saw the values of their investments drop so much that it was unlikely that they would be made whole again in their lifetimes.¹⁸ While the possibility of catastrophic events occurring may be low, they cannot be ruled out and the equity risk premium has to reflect that risk.

Rietz (1988) uses the possibility of catastrophic events to justify higher equity risk premiums and Barro (2006) extends this argument. In the latter's paper, the catastrophic risk is modeled as both a drop in economic output (an economic depression) and partial default by the government on its borrowing.¹⁹ Gabaix (2009) extends the Barro-Rietz model to allow for time varying losses in disasters.²⁰ Barro, Nakamura, Steinsson and Ursua (2009) use panel data on 24 countries over more than 100 years to examine the empirical effects of disasters.²¹ They find that the average length of a disaster is six years and that half of the short run impact is reversed in the long term. Investigating the asset pricing implications, they conclude that the consequences for equity risk premiums will depend upon investor utility functions, with some utility functions (power utility, for instance) yielding low premiums and others generating much higher equity risk premiums. Barro and Ursua (2008) look back to 1870 and identify 87 crises through 2007, with an average impact on stock prices of about 22%, and estimate that investors would need to

¹⁸ An investor in the US equity markets who invested just prior to the crash of 1929 would not have seen index levels return to pre-crash levels until the 1940s. An investor in the Nikkei in 1987, when the index was at 40000, would still be facing a deficit of 50% (even after counting dividends) in 2008,

¹⁹ Rietz, T. A., 1988, *The equity premium~: A solution*, Journal of Monetary Economics, v22, 117-131; Barro R J., 2006, *Rare Disasters and Asset Markets in the Twentieth Century*, Quarterly Journal of Economics, August, 823-866.

²⁰ Gabaix, Xavier, 2012, *Variable Rare Disasters: An Exactly Solved Framework for Ten Puzzles in Macro-Finance*, The Quarterly Journal of Economics, v127, 645-700.

²¹ Barro, R.J. , E. Nakamura, J. Steinsson and J. Ursua, 2009, *Crises and Recoveries in an Empirical Model of Consumption Disasters*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1594554.

generate an equity risk premium of 7% to compensate for risk taken.²² Wachter (2012) builds a consumption model, where consumption follows a normal distribution with low volatility most of the time, with a time-varying probability of disasters that explains high equity risk premiums.²³ Barro and Jin(2017) estimate a model with rare events and long run risks, using long term consumption data for 42 countries, and argue that much of the movement in equity risk premiums comes from shifts in the assessed likelihood of rare events.²⁴

There have been attempts to measure the likelihood of catastrophic risk and incorporate them into models that predict equity risk premiums. In a series of papers with different co-authors, Bollerslev uses the variance risk premium, i.e., the difference between the implied variance in stock market options and realized variance, as a proxy for expectations of catastrophic risk, and documents a positive correlation with equity risk premiums.²⁵ Kelly (2012) looks at extreme stock market movements as a measure of expected future jump (catastrophic) risk and finds a positive link between jump risk and equity risk premiums.²⁶ Guo, Liu, Wang, Zhou and Zuo (2014) refine this analysis by decomposing jumps into bad (negative) and good (positive) ones and find that it is the risk of downside jumps that determines equity risk premiums.²⁷ Maheu, McCurdy and Zhao (2013) used a time-varying jump-arrival process and a two-component GARCH model on US stock market data from 1926 to 2011, and estimated that each additional jump per year increased the equity risk premium by 0.1062% and that there were, on average, 34 jumps a year, leading to a jump equity risk premium of 3.61%.²⁸

²² Barro, R.J. and J. Ursua, 2008, Macroeconomic Crises since 1870, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1124864.

²³ Wachter, J.A., 2013, *Can time-varying risk of rare disasters explain aggregate stock market volatility?* Journal of Finance, v68, 987-1035. See also Tsai, J. and J. Wachter, 2015, *Disaster Risk and its Implications for Asset Pricing*, Annual Review of Financial Economics, Vol. 7, pp. 219-252, 2015.

²⁴ Barro, R.J. and T. Jin, 2017, *Rare Events and Long Term Risks*, Working Paper, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2933697

²⁵ Bollerslev, T. M., T. H. Law, and G. Tauchen, 2008, *Risk, Jumps, and Diversification*, Journal of Econometrics, 144, 234-256; Bollerslev, T. M., G. Tauchen, and H. Zhou, 2009, *Expected Stock Returns and Variance Risk Premia*, Review of Financial Studies, 101-3, 552-573; Bollerslev, T.M., and V. Todorov, 2011, *Tails, Fears, and Risk Premia*, Journal of Finance, 66-6, 2165-2211.

²⁶ Kelly, B., 2012, *Tail Risk and Asset Prices*, Working Paper, University of Chicago.

²⁷ Guo, H., Z. Liu, K. Wang, H. Zhou and H. Zuo, 2014, *Good Jumps, Bad Jumps and Conditional Equity Risk Premium*, Working Paper, SSRN #2516074.

²⁸ Maheu, J.M., T.H. McCurdy and X. Wang, 2013, *Do Jumps Contribute to the Dynamics of the Equity Premium*, Journal of Financial Economics, v110, 457-477.

The banking and financial crisis of 2008, where financial and real estate markets plunged in the last quarter of the year, has provided added ammunition to this school. As we will see later in the paper, risk premiums in all markets (equity, bond and real estate) climbed sharply during the weeks of the market crisis. In fact, the series of macro crises in the last four years that have affected markets all over the world has led some to hypothesize that the globalization may have increased the frequency and probability of disasters and by extension, equity risk premiums, in all markets.

Government Policy and Politics

The prevailing wisdom, at least until 2008, was that while government policy affected equity risk premiums in emerging markets, it was not a major factor in determining equity risk premiums in developed markets. The banking crisis of 2008 and the government responses to it have changed some minds, as both the US government and European governments have made policy changes that at times have calmed markets and at other times roiled them, potentially affecting equity risk premiums.

Pastor and Veronesi (2012) argue that uncertainty about government policy can translate into higher equity risk premiums.²⁹ The model they develop has several testable implications. First, government policy changes will be more likely just after economic downturns, thus adding policy uncertainty to general economic uncertainty and pushing equity risk premiums upwards. Second, you should expect to see stock prices fall, on average, across all policy changes, with the magnitude of the negative returns increasing for policy changes create more uncertainty. Third, policy changes will increase stock market volatility and the correlation across stocks.

Lam and Zhang (2014) try to capture the potential policy shocks from either an unstable government (government stability) or an incompetent bureaucracy (bureaucracy quality) in 49 countries from 1995 to 2006, using two measures of policy uncertainty drawn from the international country risk guide (ICG). They do find that equity risk premiums are higher in countries with more policy risk from either factor, with more bureaucratic

²⁹ Pástor, L. and P. Veronesi, 2012. *Uncertainty about Government policy and Stock Prices*. *Journal of Finance* 67: 1219-1264.

risk increasing the premium by approximately 8%.³⁰ In a related finding, Miller (2020) looks at 57 countries undergoing shifts to democratic from more autocratic systems and documents an increase in equity risk premiums during periods of democratization, a result he attributes to the wealthiest portions of society being adversely impacted by the shift to more democratic regimes.³¹

Monetary Policy

Do central banks affect equity risk premiums? While the conventional channel for the influence has always been through macroeconomic variables, i.e., the effects that monetary policy has on inflation and real growth, and through these variables, equity risk premiums, increased activism on the part of central banks since the 2008 crisis has started on a debate on whether central banking policy can affect equity risk premiums. This has significant policy implications, since the notion that lower interest rates will give rise to higher prices for financial assets and more investment by businesses is built on the predication that equity risk premiums don't change when rates are lowered.

One argument for a feedback effect is that when central banks act aggressively to lower interest rates, using the mechanisms that they control, they send signals to investors and businesses about future growth and perhaps even about future risk in investing. In particular, as central bank alter the rates that they control to zero and below, markets may push up equity risk premiums and default spreads in bond markets, neutralizing or even countering whatever positive benefits might have been expected to flow from lower rates. In support of a Fed effect on equity risk, there have been recent papers that have examined returns on equities in the days leading up to Federal Open Market Committee (FOMC) meeting and found that these returns tend to be more positive than those earned in the rest of the year. Laaritis (2019) argues that the higher returns are compensation for the increased macroeconomic risk exposure faced by equity investors in the days leading up to FOMC meetings.³²

³⁰ Lam, S.S. and W. Zhang, 2014, *Does Policy Uncertainty matter for International Equity Markets?* Working Paper, SSRN #2297133.

³¹ Miller, M., 2020, *Democratization, Inequality, and Risk Premia*, Working Paper, The Wharton School.

³² Laaritis, T., 2019, *Pre-Announcement Risk*, SSRN Working Paper, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3443886.

Peng and Zervou (2015) argue that monetary policy rules can have substantial effects on equity risk premiums and that an inflation-targeting policy will create more volatility in equity risk premiums and a higher equity risk premium than alternate rules that generate more stability.³³ The 2008 crisis and the low interest rates that followed in most of the developing markets has rekindled the debate about how much central banks can affect equity risk premiums with interest rate policy. As we will see later in this paper, there is evidence that equity risk premiums have risen since 2008 but much of that rise can be attributed to lower interest rates rather than higher required returns on stocks.

The behavioral/ irrational component

Investors do not always behave rationally, and there are some who argue that equity risk premiums are determined, at least partially, by quirks in human behavior. While there are several strands to this analysis, we will focus on three:

- a. The Money Illusion: As equity prices declined significantly and inflation rates increased in the late 1970s, Modigliani and Cohn (1979) argued that low equity values of that period were the consequence of investors being inconsistent about their dealings with inflation. They argued that investors were guilty of using historical growth rates in earnings, which reflected past inflation, to forecast future earnings, but current interest rates, which reflected expectations of future inflation, to estimate discount rates.³⁴ When inflation increases, this will lead to a mismatch, with high discount rates and low cash flows resulting in asset valuations that are too low (and risk premiums that are too high). In the Modigliani-Cohn model, equity risk premiums will rise in periods when inflation is higher than expected and drop in periods when inflation is lower than expected. Campbell and Voulteenaho (2004) update the Modigliani-Cohn results by relating changes in the dividend to price ratio to changes in the inflation rate over time and find strong support for the hypothesis.³⁵

³³ Peng, Y. and A. S. Zervou, 2015, Monetary Policy Rules and the Equity Risk Premium, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2498684.

³⁴ Modigliani, Franco and Cohn, Richard. 1979, *Inflation, Rational Valuation, and the Market*, Financial Analysts Journal, v37(3), pp. 24-44.

³⁵ Campbell, J.Y. and T. Vuolteenaho, 2004, *Inflation Illusion and Stock Prices*, American Economic Review, v94, 19-23.

- b. Narrow Framing: In conventional portfolio theory, we assume that investors assess the risk of an investment in the context of the risk it adds to their overall portfolio, and demand a premium for this risk. Behavioral economists argue that investors offered new gambles often evaluate those gambles in isolation, separately from other risks that they face in their portfolio, leading them to over estimate the risk of the gamble. In the context of the equity risk premium, Benartzi and Thaler (1995) use this “narrow framing” argument to argue that investors over estimate the risk in equity, and Barberis, Huang and Santos (2001) build on this theme.³⁶

The Equity Risk Premium Puzzle

While many researchers have focused on individual determinants of equity risk premiums, there is a related question that has drawn almost as much attention. Are the equity risk premiums that we have observed in practice compatible with the theory? Mehra and Prescott (1985) fired the opening shot in this debate by arguing that the observed historical risk premiums (which they estimated at about 6% at the time of their analysis) were too high, and that investors would need implausibly high risk-aversion coefficients to demand these premiums.³⁷ In the years since, there have been many attempts to provide explanations for this puzzle:

1. Statistical artifact: The historical risk premium obtained by looking at U.S. data is biased upwards because of a survivor bias (induced by picking one of the most successful equity markets of the twentieth century). The true premium, it is argued, is much lower. This view is backed up by a study of large equity markets over the twentieth century, which concluded that the historical risk premium is closer to 4% than the 6% cited by Mehra and Prescott.³⁸ However, even the lower risk premium would still be too high, if we assumed reasonable risk aversion coefficients.
2. Disaster Insurance: A variation on the statistical artifact theme, albeit with a theoretical twist, is that the observed volatility in an equity market does not fully

³⁶ Benartzi, S. and R. Thaler, 1995, *Myopic Loss Aversion and the Equity Premium Puzzle*, Quarterly Journal of Economics; Barberis, N., M. Huang, and T. Santos, 2001, *Prospect Theory and Asset Prices*, Quarterly Journal of Economics, v 116(1), 1-53.

³⁷ Mehra, Rajnish, and Edward C. Prescott, 1985, *The Equity Premium: A Puzzle*, Journal of Monetary Economics, v15, 145–61. Using a constant relative risk aversion utility function and plausible risk aversion coefficients, they demonstrate the equity risk premiums should be much lower (less than 1%).

³⁸ Dimson, E., P. Marsh and M. Staunton, 2002, *Triumph of the Optimists*, Princeton University Press.

capture the potential volatility, which could include rare but disastrous events that reduce consumption and wealth substantially. Reitz, referenced earlier, argues that investments that have dividends that are proportional to consumption (as stocks do) should earn much higher returns than riskless investments to compensate for the possibility of a disastrous drop in consumption. Prescott and Mehra (1988) counter that the required drops in consumption would have to be of such a large magnitude to explain observed premiums that this solution is not viable.³⁹ Berkman, Jacobsen and Lee (2011) use data from 447 international political crises between 1918 and 2006 to create a crisis index and note that increases in the index increase equity risk premiums, with disproportionately large impacts on the industries most exposed to the crisis.⁴⁰

3. Taxes: One possible explanation for the high equity returns in the period after the Second World War is the declining marginal tax rate during that period. McGrattan and Prescott (2001), for instance, provide a hypothetical illustration where a drop in the tax rate on dividends from 50% to 0% over 40 years would cause equity prices to rise about 1.8% more than the growth rate in GDP; adding the dividend yield to this expected price appreciation generates returns similar to the observed equity risk premium.⁴¹ In reality, though, the drop in marginal tax rates was much smaller and cannot explain the surge in equity risk premiums.
4. Alternative Preference Structures: There are some who argue that the equity risk premium puzzle stems from its dependence upon conventional expected utility theory to derive premiums. In particular, the constant relative risk aversion (CRRA) function used by Mehra and Prescott in their paper implies that if an investor is risk averse to variation in consumption across different states of nature at a point in time, he or she will also be equally risk averse to consumption variation across time. Epstein and Zin consider a class of utility functions that separate risk aversion (to consumption variation at a point in time) from risk aversion to consumption

³⁹ Mehra, R. and E.C. Prescott, 1988, *The Equity Risk Premium: A Solution?* Journal of Monetary Economics, v22, 133-136.

⁴⁰ Berkman, H., B. Jacobsen and J. Lee, 2011, *Time-varying Disaster Risk and Stock Returns*, Journal of Financial Economics, v101, 313-332

⁴¹ McGrattan, E.R., and E.C. Prescott. 2001, *Taxes, Regulations, and Asset Prices*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=292522.

variation across time. They argue that individuals are much more risk averse when it comes to the latter and claim that this phenomenon explain the larger equity risk premiums.⁴² Put in more intuitive terms, individuals will choose a lower and more stable level of wealth and consumption that they can sustain over the long term over a higher level of wealth and consumption that varies widely from period to period. Constantinides (1990) adds to this argument by noting that individuals become used to maintaining past consumption levels and that even small changes in consumption can cause big changes in marginal utility. The returns on stocks are correlated with consumption, decreasing in periods when people have fewer goods to consume (recessions, for instance); the additional risk explains the higher observed equity risk premiums.⁴³

5. Myopic Loss Aversion: Myopic loss aversion refers to the finding in behavioral finance that the loss aversion already embedded in individuals becomes more pronounced as the frequency of their monitoring increases. Thus, investors who receive constant updates on equity values actually perceive more risk in equities, leading to higher risk premiums. The paper that we cited earlier by Benartzi and Thaler yields estimates of the risk premium very close to historical levels using a one-year time horizon for investors with plausible loss aversion characteristics (of about 2, which is backed up by the experimental research).
6. Over reaction: Choi and Mertens (2019) attribute high equity risk premiums to the propensity of markets to over react to recent stock price performance in setting expectations, pushing up (down) expected returns of stocks after recent good (bad) stock market performance. In their setting, the equity risk premium has to be set higher to compensate for this overreaction, since it makes stocks a bad hedge against consumption shocks.⁴⁴

In conclusion, it is not quite clear what to make of the equity risk premium puzzle. It is true that historical risk premiums are higher than could be justified using conventional utility

⁴² Epstein, L.G., and S.E. Zin. 1991. *Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: An Empirical Analysis*, *Journal of Political Economy*, v99, 263–286.

⁴³ Constantinides, G.M. 1990. *Habit Formation: A Resolution of the Equity Premium Puzzle*, *Journal of Political Economy*, v98, no. 3 (June):519–543.

⁴⁴ Choi, J.J. and T.M. Mertens, 2019, *Extrapolative Expectations and the Equity Premium*, Working Paper.