CHAPTER 7

RISKLESS RATES AND RISK PREMIUMS

All models of risk and return in finance are built around a rate that investors can make on riskless investments and the risk premium or premiums that investors should charge for investing in the average risk investment. In the capital asset pricing model, where there is only one source of market risk captured in the market portfolio, this risk premium becomes the premium that investors would demand when investing in that portfolio. In multi-factor models, there are multiple risk premiums, each one measuring the premium demanded by investors for exposure to a specific risk factor. In this chapter, we examine how best to measure a riskless rate and to estimate a risk premium or premiums for use in these models.

As noted in chapter 4, risk is measured in terms of default risk for bonds and this default risk is captured in a default spread that firms have to pay over and above the riskless rate. We close this chapter by considering how best to estimate these default spreads and factors that may cause these spreads to change over time.

The Risk Free Rate

Most risk and return models in finance start off with an asset that is defined as risk free and use the expected return on that asset as the risk free rate. The expected returns on risky investments are then measured relative to the risk free rate, with the risk creating an expected risk premium that is added on to the risk free rate. But what makes an asset risk free? And what do we do when we cannot find such an asset? These are the questions that we will deal with in this section.

Requirements for an Asset to be Riskfree

In chapter 4, we considered some of the requirements for an asset to be riskfree. In particular, we argued that an asset is riskfree if we know the expected returns on it with certainty – i.e. the actual return is always equal to the expected return. Under what conditions will the actual returns on an investment be equal to the expected returns? In our view, there are two basic conditions that have to be met. The first is that there can be no default risk. Essentially, this rules out any security issued by a private firm, since even

the largest and safest firms have some measure of default risk. The only securities that have a chance of being risk free are government securities, not because governments are better run than corporations, but because they control the printing of currency. At least in nominal terms, they should be able to fulfill their promises. Even though this assumption is straightforward , it does not always hold up, especially when governments refuse to honor claims made by previous regimes and when they borrow in currencies other than their own.

There is a second condition that riskless securities need to fulfill that is often forgotten. For an investment to have an actual return equal to its expected return, there can be no reinvestment risk. To illustrate this point, assume that you are trying to estimate the expected return over a five-year period and that you want a risk free rate. A six-month treasury bill rate, while default free, will not be risk free, because there is the reinvestment risk of not knowing what the treasury bill rate will be in six months. Even a 5-year treasury bond is not risk free, since the coupons on the bond will be reinvested at rates that cannot be predicted today. The risk free rate for a five-year time horizon has to be the expected return on a default-free (government) five-year zero coupon bond. This clearly has painful implications for anyone doing corporate finance or valuation, where expected returns often have to be estimated for periods ranging from one to ten years. A purist's view of risk free rates would then require different risk free rates for each period and different expected returns.

As a practical compromise, however, it is worth noting that the present value effect of using year-specific risk free rates tends to be small for most well-behaved[1] term structures. In these cases, we could use a duration matching strategy, where the duration of the default-free security used as the risk free asset is matched up to the duration[2] of the cash flows in the analysis. If, however, there are very large differences, in either direction, between short term and long term rates, it does pay to stick with year-specific risk free rates in computing expected returns.

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[1] By well behaved term structures, I would include a normal upwardly sloping yield curve, where long term rates are at most 2-3% higher than short term rates.

[2] In investment analysis, where we look at projects, these durations are usually between 3 and 10 years. In valuation, the durations tend to be much longer, since firms are assumed to have infinite lives. The duration in these cases is often well in excess of ten years and increases with the expected growth potential of the firm.

The Practical Implications when a Default-free Entity exists

In most developed markets, where the government can be viewed as a default free entity, at least when it comes to borrowing in the local currency, the implications are simple. When doing investment analysis on longer term projects or valuation, the risk free rate should be the long term government bond rate. If the analysis is shorter term, the short term government security rate can be used as the risk free rate. The choice of a risk free rate also has implications for how risk premiums are estimated. If, as is often the case, historical risk premiums are used, where the excess return earned by stocks over and above a government security rate over a past period is used as the risk premium, the government security chosen has to be same one as that used for the risk free rate. Thus, the historical risk premium used in the US should be the excess return earned by stocks over treasury bonds, and not treasury bills, for purposes of long term analysis.

Cash Flows and Risk free Rates: The Consistency Principle

The risk free rate used to come up with expected returns should be measured consistently with how the cash flows are measured. Thus, if cash flows are estimated in nominal US dollar terms, the risk free rate will be the US treasury bond rate. This also implies that it is not where a project or firm is domiciled that determines the choice of a risk free rate, but the currency in which the cash flows on the project or firm are estimated. Thus, Nestle can be valued using cash flows estimated in Swiss Francs, discounted back at an expected return estimated using a Swiss long term government bond rate or it can be valued in British pounds, with both the cash flows and the risk free rate being the British pound rates. Given that the same project or firm can be valued in different currencies, will the final results always be consistent? If we assume purchasing power parity then differences in interest rates reflect differences in expected inflation rates. Both the cash flows and the discount rate are affected by expected inflation; thus, a low discount rate arising from a low risk free rate will be exactly offset by a decline in expected nominal growth rates for cash flows and the value will remain unchanged.

If the difference in interest rates across two currencies does not adequately reflect the difference in expected inflation in these currencies, the values obtained using the different currencies can be different. In particular, projects and assets will be valued more

highly when the currency used is the one with low interest rates relative to inflation. The risk, however, is that the interest rates will have to rise at some point to correct for this divergence, at which point the values will also converge.

Real versus Nominal Risk free Rates

Under conditions of high and unstable inflation, valuation is often done in real terms. Effectively, this means that cash flows are estimated using real growth rates and without allowing for the growth that comes from price inflation. To be consistent, the discount rates used in these cases have to be real discount rates. To get a real expected rate of return, we need to start with a real risk free rate. While government bills and bonds offer returns that are risk free in nominal terms, they are not risk free in real terms, since expected inflation can be volatile. The standard approach of subtracting an expected inflation rate from the nominal interest rate to arrive at a real risk free rate provides at best an estimate of the real risk free rate.

Until recently, there were few traded default-free securities that could be used to estimate real risk free rates; but the introduction of inflation-indexed treasuries has filled this void. An inflation-indexed treasury security does not offer a guaranteed nominal return to buyers, but instead provides a guaranteed real return. Thus, an inflation-indexed treasury that offers a 3% real return, will yield approximately 7% in nominal terms if inflation is 4% and only 5% in nominal terms if inflation is only 2%.

The only problem is that real valuations are seldom called for or done in the United States, which has stable and low expected inflation. The markets where we would most need to do real valuations, unfortunately, are markets without inflation-indexed default-free securities. The real risk free rates in these markets can be estimated by using one of two arguments.

- The first argument is that as long as capital can flow freely to those economies with the highest real returns, there can be no differences in real risk free rates across markets. Using this argument, the real risk free rate for the United States, estimated from the inflation-indexed treasury, can be used as the real risk free rate in any market.

- The second argument applies if there are frictions and constraints in capital flowing across markets. In that case, the expected real return on an economy, in the long term, should be equal to the expected real growth rate, again in the long term, of that economy, for equilibrium. Thus, the real risk free rate for a mature economy like Germany should be much lower than the real risk free rate for an economy with greater growth potential, such as Hungary.

Risk free Rates when there is no Default-free Entity

Our discussion, hitherto, has been predicated on the assumption that governments do not default, at least on local borrowing. There are many emerging market economies where this assumption might not be viewed as reasonable. Governments in these markets are perceived as capable of defaulting even on local borrowing. When this is coupled with the fact that many governments do not borrow long term locally, there are scenarios where obtaining a local risk free rate, especially for the long term, becomes difficult. Under these cases, there are compromises that give us reasonable estimates of the risk free rate.

- Look at the largest and safest firms in that market and use the rate that they pay on their long term borrowings in the local currency as a base. Given that these firms, in spite of their size and stability, still have default risk, you would use a rate that is marginally lower[3] than the corporate borrowing rate.
- If there are long term dollar-denominated forward contracts on the currency, you can use interest rate parity and the treasury bond rate (or riskless rate in any other base currency) to arrive at an estimate of the local borrowing rate.

$$\text{Forward Rate}^{t}_{FC,\$} = \left(\text{Spot Rate}_{FC,\$}\right)\frac{1 + \text{Interest Rate}_{FC}}{1 + \text{Interest Rate}_{\$}}^{t}$$

where,

Forward Rate$_{FC,\$}$ = Forward rate for foreign currency units/$

Spot Rate$_{FC,\$}$ = Spot rate for foreign currency units/$

Interest Rate$_{FC}$ = Interest rate in foreign currency

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[3] I would use 0.50% less than the corporate borrowing rate of these firms as my risk free rate. This is roughly an AA default spread in the US.

Interest Rate$_{\$}$ = Interest rate in US dollars

For instance, if the current spot rate is 38.10 Thai Baht per US dollar, the ten-year forward rate is 61.36 Baht per dollar and the current ten-year US treasury bond rate is 5%, the ten-year Thai risk free rate (in nominal Baht) can be estimated as follows.

$$61.36 = (38.1)\left[\frac{1 + \text{Interest Rate}_{\text{Thai Baht}}}{1 + 0.05}\right]^{10}$$

Solving for the Thai interest rate yields a ten-year risk free rate of 10.12%. The biggest limitation of this approach, however, is that forward rates are difficult to obtain for periods beyond a year[4] for many of the emerging markets, where we would be most interested in using them.

- You could adjust the local currency government borrowing rate by the estimated default spread on the bond to arrive at a riskless local currency rate. The default spread on the government bond can be estimated using the local currency ratings[5] that are available for many countries. For instance, assume that the Indian government bond rate is 12% and that the rating assigned to the Indian government is A. If the default spread for A rated bonds is 2%, the riskless Indian rupee rate would be 10%.

$$\text{Riskless Rupee rate} = \text{Indian Government Bond rate} - \text{Default Spread}$$
$$= 12\% - 2\% = 10\%$$

Equity Risk Premiums

The notion that risk matters and that riskier investments should have a higher expected return than safer investments to be considered good investments is intuitive. Thus, the expected return on any investment can be written as the sum of the riskfree rate and an extra return to compensate for the risk. The disagreement, in both theoretical and practical terms, remains on how to measure this risk and how to convert the risk measure into an expected return that compensates for risk. This section looks at the estimation of

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[4] In cases where only a one-year forward rate exists, an approximation for the long term rate can be obtained by first backing out the one-year local currency borrowing rate, taking the spread over the one-year treasury bill rate and then adding this spread on to the long term treasury bond rate. For instance, with a one-year forward rate of 39.95 on the Thai bond, we obtain a one-year Thai baht riskless rate of 9.04% (given a one-year T.Bill rate of 4%). Adding the spread of 5.04% to the ten-year treasury bond rate of 5% provides a ten-year Thai Baht rate of 10.04%.

an appropriate risk premium to use in risk and return models, in general, and in the capital asset pricing model, in particular.

Competing Views on Risk Premiums

In chapter 4, we considered several competing models of risk ranging from the capital asset pricing model to multi-factor models. Notwithstanding their different conclusions, 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 all 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 models of risk 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.

While all risk and return models agree on these fairly crucial distinctions, they part ways when it comes to how measure this market risk. Table 7.1 summarizes four models and the way each model attempts to measure risk.

Table 7.1: Comparing Risk and Return Models

	Assumptions	*Measure of Market Risk*
The CAPM	There are no transactions costs or private information. Therefore, the diversified portfolio includes all traded investments, held in proportion to their market value.	Beta measured against this market portfolio.
Arbitrage pricing model (APM)	Investments with the same exposure to market risk have to trade at the same price (no arbitrage).	Betas measured against multiple (unspecified) market risk factors.
Multi-Factor Model	Same no arbitrage assumption	Betas measured against multiple specified macro

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[5] Ratings agencies generally assign different ratings for local currency borrowings and dollar borrowing, with higher ratings for the former and lower ratings for the latter.

		economic factors.
Proxy Model	Over very long periods, higher returns on investments must be compensation for higher market risk.	Proxies for market risk, for example, include market capitalization and Price/BV ratios.

In the first three models, the expected return on any investment can be written as:

$$\text{Expected Return } = \text{ Riskfree Rate } + \sum_{j=1}^{j=k} \beta_j(\text{Risk Premium}_j)$$

where,

β_j = Beta of investment relative to factor j

Risk Premium$_j$ = Risk Premium for factor j

Note that in the special case of a single-factor model, such as the CAPM, each investment's expected return will be determined by its beta relative to the single factor.

Assuming that the riskfree rate is known, these models all require two inputs. The first is the beta or betas of the investment being analyzed and the second is the appropriate risk premium(s) for the factor or factors in the model. While we examine the issue of beta estimation in the next chapter, we will concentrate on the measurement of the risk premium in this section.

What we would like to measure

We would like to measure how much market risk (or non-diversifiable risk) there is in any investment through its beta or betas. As far as the risk premium is concerned, we would like to know what investors, on average, require as a premium over the riskfree rate for an investment with average risk, for each factor.

Without any loss of generality, let us consider the estimation of the beta and the risk premium in the capital asset pricing model. Here, the beta should measure the risk added on by the investment being analyzed to a portfolio, diversified not only within asset classes but across asset classes. The risk premium should measure what investors, on average, demand as extra return for investing in this portfolio relative to the riskfree asset.

What we do in practice…

In practice, however, we compromise on both counts. We estimate the beta of an asset relative to the local stock market index, rather than a portfolio that is diversified across asset classes. This beta estimate is often noisy and a historical measure of risk. We estimate the risk premium by looking at the historical premium earned by stocks over default-free securities over long time periods. These approaches might yield reasonable estimates in markets like the United States, with a large and diverisified stock market and a long history of returns on both stocks and government securities. We will argue, however, that they yield meaningless estimates for both the beta and the risk premium in other countries, where the equity markets represent a small proportion of the overall economy and the historical returns are available only for short periods.

The Historical Premium Approach: An Examination

The historical premium approach, which remains the standard approach when it comes to estimating risk premiums, is simple. The actual returns earned on stocks over a long time period is estimated and compared to the actual returns earned on a default-free asset (usually government security). The difference, on an annual basis, between the two returns is computed and represents the <u>historical risk premium</u>

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. For instance, the risk premium estimated in the US markets by different investment banks, consultants and corporations range from 4% at the lower end to 12% at the upper end. Given that we almost all use the same database of historical returns, provided by Ibbotson Associates[6], summarizing data from 1926, these differences may seem surprising. There are, however, three reasons for the divergence in risk premiums.

- <u>Time Period Used</u>: While there are many who use all the data going back to 1926, there are almost as many using data over shorter time periods, such as fifty, 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. This has to be offset against a cost associated with using shorter time periods, which is the greater noise in the risk premium estimate. In fact, given the annual standard deviation in stock prices[7] between 1928 and 2000 of 20%, the standard error[8] associated with the risk premium estimate can be estimated as follows for different estimation periods in Table 7.2.

Table 7.2: Standard Errors in Risk Premium Estimates

Estimation Period	Standard Error of Risk Premium Estimate
5 years	$\frac{20}{\sqrt{5}} = 8.94\%$
10 years	$\frac{20}{\sqrt{10}} = 6.32\%$
25 years	$\frac{20}{\sqrt{25}} = 4.00\%$
50 years	$\frac{20}{\sqrt{50}} = 2.83\%$

Note that to get reasonable standard errors, we need very long time periods of historical returns. Conversely, 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.

- Choice of Riskfree Security: The Ibbotson database reports returns on both treasury bills and treasury bonds and the risk premium for stocks can be estimated relative to each. Given that the yield curve in the United States has been upward sloping for most of the last seven decades, the risk premium is larger when estimated relative to shorter term government securities (such as treasury bills). The riskfree rate chosen in

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[6] See "Stocks, Bonds, Bills and Inflation", an annual edition that reports on the annual returns on stocks, treasury bonds and bills, as well as inflation rates from 1926 to the present. (http://www.ibbotson.com)

[7] For the historical data on stock returns, bond returns and bill returns, check under "updated data" in www.stern.nyu.edu/~adamodar.

[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.

computing the premium has to be consistent with the riskfree rate used to compute expected returns. Thus, if the treasury bill rate is used as the riskfree rate, the premium has to be the premium earned by stocks over that rate. If the treasury bond rate is used as the riskfree rate, the premium has to be estimated relative to that rate. For the most part, in corporate finance and valuation, the riskfree rate will be a long term default-free (government) bond rate and not a treasury bill rate. Thus, the risk premium used should be the premium earned by stocks over treasury bonds.

- Arithmetic and Geometric Averages: The final sticking point when it comes to estimating historical premiums 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 return[9]. Conventional wisdom argues for the use of the arithmetic average. In fact, if annual returns are uncorrelated over time and our objectives were to estimate the risk premium for the next year, the arithmetic average is the best unbiased estimate of the premium. In reality, however, there are strong arguments that can be made for the use of geometric averages. First, empirical studies seem to indicate that returns on stocks are negatively correlated[10] over 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 single period may be much longer than a year. In this context, the argument for geometric average premiums becomes even stronger.

In summary, the risk premium estimates vary across users because of differences in time periods used, the choice of treasury bills or bonds as the riskfree rate and the use of

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[9] 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:

$$\text{Geometric Average} = \left[\frac{\text{Value}_N}{\text{Value}_0} \right]^{1/N} - 1$$

[10] 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.

arithmetic as opposed to geometric averages. The effect of these choices is summarized in table 7.3 below, which uses returns from 1928 to 2000.

Table 7.3: Historical Risk Premia for the United States

	Stocks – Treasury Bills		*Stocks – Treasury Bonds*	
	Arithmetic	*Geometric*	*Arithmetic*	*Geometric*
1928 – 2000	8.41%	7.17%	6.53%	5.51%
1962 – 2000	6.41%	5.25%	5.30%	4.52%
1990 – 2000	11.42%	7.64%	12.67%	7.09%

Note that the premiums can range from 4.52% to 12.67%, depending upon the choices made. In fact, these differences are exacerbated by the fact that many risk premiums that are in use today were estimated using historical data three, four or even ten years ago.

There is a dataset on the web that summarizes historical returns on stocks, T.Bonds and T.Bills in the United States going back to 1926.

The Historical Risk Premium Approach: Some Caveats

Given how widely the historical risk premium approach is used, it is surprising how flawed it is and how little attention these flaws have attracted. Consider first the underlying assumption that investors' risk premiums have not changed over time and that the average risk investment (in the market portfolio) has remained stable over the period examined. We would be hard pressed to find anyone who would be willing to sustain this argument with fervor.

The obvious fix for this problem, which is to use a shorter and more recent time period, runs directly into a second problem, which is the large noise associated with risk premium estimates. While these standard errors may be tolerable for very long time periods, they clearly are unacceptably high when shorter periods are used.

Finally, even if there is a sufficiently long time period of history available and investors' risk aversion has not changed in a systematic way over that period, there is a another problem. Markets that exhibit this characteristic, and let us assume that the US

market is one such example, represent "survivor markets". In other words, assume that one had invested in the ten largest equity markets in the world in 1928, of which the United States was one. In the period extending from 1928 to 2000, investments in one of the other equity markets would have earned as large a premium as the US equity market and some of them (like Austria) would have resulted in investors earning little or even negative returns over the period. Thus, the survivor bias will result in historical premiums that are larger than expected premiums for markets like the United States, even assuming that investors are rational and factoring risk into prices.

Historical Risk Premiums: Other Markets

If it is difficult to estimate a reliable historical premium for the US market, it becomes doubly so when looking at markets with short and volatile histories. This is clearly true for emerging markets, but it is also true for the European equity markets. While the economies of Germany, Italy and France may be mature, their equity markets do not share the same characteristic. They tend to be dominated by a few large companies; many businesses remain private; and trading, until recently, tended to be thin except on a few stocks.

There are some practitioners who still use historical premiums for these markets. To capture some of the danger in this practice, I have summarized historical risk premiums[11] for major non-US markets below for 1970-1996 in Table 7.4.

Table 7.4: Historical Risk Premiums in non-US markets

		Equity		*Bonds*	*Risk Premium*
Country	*Beginning*	*Ending*	*Annual Return*	*Annual Return*	
Australia	100	898.36	8.47%	6.99%	1.48%
Canada	100	1020.7	8.98%	8.30%	0.68%
France	100	1894.26	11.51%	9.17%	2.34%
Germany	100	1800.74	11.30%	12.10%	-0.80%
Hong Kong	100	14993.06	20.39%	12.66%	7.73%
Italy	100	423.64	5.49%	7.84%	-2.35%
Japan	100	5169.43	15.73%	12.69%	3.04%
Mexico	100	2073.65	11.88%	10.71%	1.17%
Netherlands	100	4870.32	15.48%	10.83%	4.65%
Singapore	100	4875.91	15.48%	6.45%	9.03%

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[11] This data is also from Ibbotson Associcates and can be obtained from their web site: http://www.ibbotson.com.

Spain	100	844.8	8.22%	7.91%	0.31%
Switzerland	100	3046.09	13.49%	10.11%	3.38%
UK	100	2361.53	12.42%	7.81%	4.61%

Note that a couple of the countries have negative historical risk premiums and a few others have risk premiums under 1%. Before we attempt to come up with rationale for why this might be so, it is worth noting that the standard errors on each and every one of these estimates is larger than 5%, largely because the estimation period includes only 26 years.

If the standard errors on these estimates make them close to useless, consider how much more noise there is in estimates of historical risk premiums for the equity markets of emerging economies, which often have a reliable history of ten years or less and very large standard deviations in annual stock returns. Historical risk premiums for emerging markets may provide for interesting anecdotes, but they clearly should not be used in risk and return models.

A Modified Historical Risk Premium

While historical risk premiums for markets outside the United States cannot be used in risk models, we still need to estimate a risk premium for use in these markets. To approach this estimation question, let us start with the basic proposition that the risk premium in any equity market can be written as:

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

The country premium could reflect the extra risk in a specific market. This boils down our estimation to answering two questions:

- What should the base premium for a mature equity market be?
- Should there be a country premium, and if so, how do we estimate the premium?

To answer the first question, we will make the argument that the US equity market is a mature market and that there is sufficient historical data in the United States to make a reasonable estimate of the risk premium. In fact, reverting back to our discussion of historical premiums in the US market, we will use the geometric average premium earned by stocks over treasury bonds of 5.51% between 1928 and 2000. We chose the long time period to reduce standard error, the treasury bond to be consistent with our choice of a

riskfree rate and geometric averages to reflect our desire for a risk premium that we can use for longer term expected returns.

On the issue of country premiums, there are some who argue that country risk is diversifiable and that there should be no country risk premium. We will begin by looking at the basis for their argument and then consider the alternative view that there should be a country risk premium. We will present two approaches for estimating country risk premiums, one based upon country bond default spreads and one based upon equity market volatility.

Should there be a country risk premium?

Is there more risk in investing in a Malaysian or Brazilian stock than there is in investing in the United States? The answer, to most, seems to be obviously affirmative. That, however, does not answer the question of whether there should be an additional risk premium charged when investing in those markets.

Note that the only risk that is relevant for the purpose of estimating a cost of equity is market risk or risk that cannot be diversified away. The key question then becomes whether the risk in an emerging market is diversifiable or non-diversifiable risk. If, in fact, the additional risk of investing in Malaysia or Brazil can be diversified away, then there should be no additional risk premium charged. If it cannot, then it makes sense to think about estimating a country risk premium.

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

will be diversified only across investments in that market; whereas in an open market, the marginal investor has the opportunity (even if he or she does not take it) to invest across markets.

Even if the marginal investor is globally diversified, there is a second test that has to be met for country risk to not matter. All or much of country risk should be country specific. In other words, there should be low correlation across markets. Only then will the risk be diversifiable in a globally diversified portfolio. If, on the other hand, the returns across countries have significant positive correlation, country risk has a market risk component and is not diversifiable and can command a premium. Whether returns across countries are positively correlated is an empirical question. Studies from the 1970s and 1980s suggested that the correlation was low and this was an impetus for global diversification. Partly because of the success of that sales pitch and partly because economies around the world have become increasingly intertwined over the last decade, more recent studies indicate that the correlation across markets has risen. This is borne out by the speed at which troubles in one market, say Russia, can spread to a market with little or no obvious relationship, say Brazil.

So where do we stand? We believe that while the barriers to trading across markets have dropped, investors still have a home bias in their portfolios and that markets remain partially segmented. While globally diversified investors are playing an increasing role in the pricing of equities around the world, the resulting increase in correlation across markets has resulted in a portion of country risk being non-diversifiable or market risk. In the next section, we will consider how best to measure this country risk and build it into expected returns.

Measuring Country Risk Premiums

If country risk matters and leads to higher premiums for riskier countries, the obvious follow-up question becomes how we measure this additional premium. In this section, we will look at two approaches. The first builds on default spreads on country bonds issued by each country whereas the second uses equity market volatility as its basis.

1. Default Risk Spreads

      While there are several measures of country risk, one of the simplest and most easily accessible is the rating assigned to a country's debt by a ratings agency (S&P, Moody's and IBCA all rate countries). These ratings measure default risk (rather than equity risk), but they are affected by many of the factors that drive equity risk – the stability of a country's currency, its budget and trade balances and its political stability, for instance[12]. The other advantage of ratings is that they come with default spreads over the US treasury bond. For instance, table 7.5 summarizes the ratings and default spreads for Latin American countries on June 2000.

Table 7.5: Ratings and Default Spreads: Latin America

Country	*Rating[a]*	*Typical Spread[b]*	*Market Spread[c]*
Argentina	B1	450	433
Bolivia	B1	450	469
Brazil	B2	550	483
Colombia	Ba2	300	291
Ecuador	Caa2	750	727
Guatemala	Ba2	300	331
Honduras	B2	550	537
Mexico	Baa3	145	152
Paraguay	B2	550	581
Peru	Ba3	400	426
Uruguay	Baa3	145	174
Venezuela	B2	550	571

[a] Ratings are foreign currency ratings from Moody's.

[b] Typical spreads are estimated by looking at the default spreads on bonds issued by all countries with this rating and are over and above a riskless rate (U.S. treasury or German Euro rate).

[c] Market spread measures the spread difference between dollar-denominated bonds issued by this country and the U.S. treasury bond rate.

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

The market spreads measure the difference between dollar-denominated bonds issued by the country and the U.S. treasury bond rate. While this is a market rate and reflects current expectations, country bond spreads are extremely volatile and can shift significantly from day to day. To counter this volatility, we have estimate typical spreads by averaging the default spreads of all countries in the world with the specified rating over and above the appropriate riskless. These spreads tend to be less volatile and more reliable for long term analysis.

Analysts who use default spreads as measures of country risk typically add them on to both the cost of equity and debt of every company traded in that country. For instance, the cost of equity for a Brazilian company, estimated in U.S. dollars, will be 4.83% higher than the cost of equity of an otherwise similar U.S. company. If we assume that the risk premium for the United States and other mature equity markets is 5.51%, the cost of equity for an average Brazilian company can be estimated as follows (with a U.S. Treasury bond rate of 5% and a beta of 1.2).

Cost of equity = Riskfree rate + Beta *(U.S. Risk premium) + Default Spread

$$= 5\% + 1.2\,(5.51\%) + 4.83\% = 16..34\%$$

In some cases, analysts add the default spread to the U.S. risk premium and multiply it by the beta. This increases the cost of equity for high beta companies and lowers them for low beta firms.

While ratings provide a convenient measure of country risk, there are costs associated with using them as the only measure. First, ratings agencies often lag markets when it comes to responding to changes in the underlying default risk. Second, the fact that the ratings agency focus on default risk may obscure other risks that could still affect equity markets. What are the alternatives? There are numerical country risk scores that have been developed by some services as much more comprehensive measures of risk. The Economist, for instance, has a score that runs from 0 to 100, where 0 is no risk, and 100 is most risky, that it uses to rank emerging markets. Alternatively, country risk can be estimated from the bottom-up by looking at economic fundamentals in each country. This, of course, requires significantly more information than the other approaches. Finally, default spreads measure the risk associated with bonds issued by countries and

not the equity risk in these countries. Since equities in any market are likely to be more risky than bonds, you could argue that default spreads understate equity risk premiums.

The Danger of Double Counting Risk

When assessing country risk, there is a substantial risk that the same risk may be counted more than once in a valuation. For instance, there are analysts who use the dollar-denominated bonds issued by a country – the Brazilian C-Bond, for instance – as the riskfree rate when estimating cost of equity for Brazilian companies. The interest rate on this bond already incorporates the default spreads discussed in the section above. If the risk premium is also adjusted upwards to reflect country risk, there has been a double counting of the risk. This effect is made worse when betas are adjusted upwards and cash flows are adjusted downwards (a process called "haircutting") because of country risk.

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2. Relative Standard Deviations

There are some analysts who believe that the equity risk premiums of markets should reflect the differences in equity risk, as measured by the volatilities of these markets. A conventional measure of equity risk is the standard deviation in stock prices; higher standard deviations are generally associated with more risk. If you scale the standard deviation of one market against another, you obtain a measure of relative risk.

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

This relative standard deviation when multiplied by the premium used for U.S. stocks should yield a measure of the total risk premium for any market.

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

Assume, for the moment, that you are using a mature market premium for the United States of 5.51% and that the annual standard deviation of U.S. stocks is 20%. If the annual standard deviation of Indonesian stocks is 35%, the estimate of a total risk premium for Indonesia would be as follows.

$$\text{Equity Risk Premium}_{\text{Indonesia}} = 5.51\% * \frac{35\%}{20\%} = 9.64\%$$

The country risk premium can be isolated as follows:

$$\text{Country Risk Premium}_{\text{Indonesia}} = 9.64\% - 5.51\% = 4.13\%$$

While this approach has intuitive appeal, there are problems with using standard deviations computed in markets with widely different market structures and liquidity. There are very risky emerging markets that have low standard deviations for their equity markets because the markets are illiquid. This approach will understate the equity risk premiums in those markets. The second problem is related to currencies since the standard deviations are usually measured in local currency terms; the standard deviation in the U.S. market is a dollar standard deviation, whereas the standard deviation in the Indonesian market is a rupiah standard deviation. This is a relatively simple problem to fix, though, since the standard deviations can be measured in the same currency – you could estimate the standard deviation in dollar returns for the Indonesian market.

3. Default Spreads + Relative Standard Deviations

The country default spreads that come with country ratings provide an important first step, but still only measure the premium for default risk. Intuitively, we would expect the country equity risk premium to be larger than the country default risk spread. To address the issue of how much higher, we look at the volatility of the equity market in a country relative to the volatility of the bond market used to estimate the spread. This yields the following estimate for the country equity risk premium.

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

To illustrate, consider the case of Brazil. In March 2000, Brazil was rated B2 by Moody's, resulting in a default spread of 4.83%. The annualized standard deviation in the Brazilian equity index over the previous year was 30.64%, while the annualized standard deviation in the Brazilian dollar denominated C-bond was 15.28%. The resulting country equity risk premium for Brazil is as follows:

$$\text{Brazils Country Risk Premium} = 4.83\% \frac{30.64\%}{15.28\%} = 9.69\%$$

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

Why should equity risk premiums have any relationship to country bond spreads? A simple explanation is that an investor who can make 11% on a dollar-denominated

Brazilian government bond would not settle for an expected return of 10.5% (in dollar terms) on Brazilian equity. Playing devil's advocate, however, a critic could argue that the interest rate on a country bond, from which default spreads are extracted, is not really an expected return since it is based upon the promised cash flows (coupon and principal) on the bond rather than the expected cash flows. In fact, if we wanted to estimate a risk premium for bonds, we would need to estimate the expected return based upon expected cash flows, allowing for the default risk. This would result in a much lower default spread and equity risk premium.

Both this approach and the previous one use the standard deviation in equity of a market to make a judgment about country risk premium, but they measure it relative to different bases. This approach uses the country bond as a base, whereas the previous one uses the standard deviation in the U.S. market. This approach assumes that investors are more likely to choose between Brazilian bonds and Brazilian equity, whereas the previous one approach assumes that the choice is across equity markets.

Choosing between the approaches

The three approaches to estimating country risk premiums will generally give you different estimates, with the bond default spread and relative equity standard deviation approaches yielding lower country risk premiums than the melded approach that uses both the country bond default spread and the equity and bond standard deviations. We believe that the larger country risk premiums that emerge from the last approach are the most realistic for the immediate future, but that country risk premiums will decline over time. Just as companies mature and become less risky over time, countries can mature and become less risky as well.

One way to adjust country risk premiums over time is to begin with the premium that emerges from the melded approach and to adjust this premium down towards either the country bond default spread or the country premium estimated from equity standard deviations. Another way of presenting this argument is to note that the differences between standard deviations in equity and bond prices narrow over longer periods and the

resulting relative volatility will generally be smaller[13]. Thus, the equity risk premium will converge to the country bond spread as we look at longer term expected returns. As an illustration, the country risk premium for Brazil would be 9.69% for the next year but decline over time to either the 4.83% (country default spread) or 4.13% (relative standard deviation).

Estimating Asset Exposure to Country Risk Premiums

Once country risk premiums have been estimated, the final question that we have to address relates to the exposure of individual companies within that country to country risk. There are three alternative views of country risk.

- Assume that all companies in a country are equally exposed to country risk. Thus, for Brazil, where we have estimated a country risk premium of 9.69%, each company in the market will have an additional country risk premium of 9.69% added to its expected returns. For instance, the cost of equity for Aracruz Celulose, a paper and pulp manufacturer listed in Brazil, with a beta of 0.72, in US dollar terms would be (assuming a US treasury bond rate of 5% and a mature market (US) risk premium of 5.59%):

  Expected Cost of Equity = 5.00% + 0.72 (5.51%) + 9.69% = 18.66%

  Note that the riskfree rate that we use is the US treasury bond rate, and that the 5.51% is the equity risk premium for a mature equity market (estimated from historical data in the US market). To convert this dollar cost of equity into a cost of equity in the local currency, all that we need to do is to scale the estimate by relative inflation. To illustrate, if the BR inflation rate is 10% and the U.S. inflation rate is 3%, the cost of equity for Aracruz in BR terms can be written as:

  $$\text{Expected Cost of Equity}_{BR} = 1.1866 \left(\frac{1.10}{1.03} \right) - 1 = 0.2672 \text{ or } 26.72\%$$

  This will ensure consistency across estimates and valuations in different currencies. The biggest limitation of this approach is that it assumes that all firms in a country, no matter what their business or size, are equally exposed to country risk.

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[13] Jeremy Siegel reports on the standard deviation in equity markets in his book "Stocks for the very long run" and notes that they tend to decrease with time horizon.

- Assume that a company's exposure to country risk is proportional to its exposure to all other market risk, which is measured by the beta. For Aracruz, this would lead to a cost of equity estimate of:

    Expected Cost of Equity = 5.00% + 0.72 (5.51% + 9.69%) = 15.94%

    This approach does differentiate between firms, but it assumes that betas which measure exposure to market risk also measure exposure to country risk as well. Thus, low beta companies are less exposed to country risk than high beta companies.

- The most general, and our preferred approach, is to allow for each company to have an exposure to country risk that is different from its exposure to all other market risk. We will measure this exposure with   and estimate the cost of equity for any firm as follows:

Expected Return = R_f + Beta (Mature Equity Risk Premium) +   (County Risk Premium)

How can we best estimate   ? I consider this question in far more detail in the next chapter on beta estimation but I would argue that commodity companies which get most of their revenues in US dollars[14] by selling into a global market should be less exposed than manufacturing companies that service the local market. Using this rationale, Aracruz, which derives 80% or more of its revenues in the global paper market in US dollars, should be less exposed[15] than the typical Brazilian firm to country risk. Using a   of 0.25, for instance, we get a cost of equity in US dollar terms for Aracruz of:

    Expected Return = 5% + 0.72 (5.51%) + 0.25 (9.69%) =11.39%

Note that the third approach essentially converts our expected return model to a two factor model, with the second factor being country risk as measured by the parameter   and the country risk premium. This approach also seems to offer the most promise in analyzing companies with exposures in multiple countries like Coca Cola and Nestle. While these firms are ostensibly developed market companies, they have substantial exposure to risk in emerging markets and their costs of equity should reflect this

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[14] While I have categorized the revenues into dollar, the analysis can be generalized to look at revenues in other stable currencies and revenues in "risky currencies".

[15] $\text{Aracruz} = \dfrac{\% \text{ from local market}_{\text{Aracruz}}}{\% \text{ from local market}_{\text{average Brazilian firm}}} = \dfrac{0.20}{0.80} = 0.25$

exposure. We could estimate the country risk premiums for each country in which they operate and a relative to each country and use these to estimate a cost of equity for either company.

There is a data set on the website that contains the updated ratings for countries and the risk premiums associated with each.

An Alternative Approach: Implied Equity Premiums

There is an alternative to estimating risk premiums that does not require historical data or corrections for country risk, but does assume that the market overall is correctly priced. Consider, for instance, a very simple valuation model for stocks.

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

This is essentially the present value of dividends growing at a constant rate. Three of the four variables in this model can be obtained externally – the current level of the market (i.e., 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 for the next period 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:

$$900 = \frac{900(0.02)}{r - 0.07}$$

Solving for r,

$$r - 0.07 = 0.02$$

$$r = 0.09 = 9\%$$

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

This approach can be generalized to allow for high growth for a period and extended to cover cash flow based, rather than dividend based, models. To illustrate this, consider the S&P 500 Index, as of December 31, 1999. The index was at 1469, and the dividend yield on the index was roughly 1.68%. In addition, the consensus estimate[16] of growth in earnings for companies in the index was approximately 10% for the next 5 years. 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 10% for 5 years and then lower the growth rate to the treasury bond rate of 6.50% after the 5 year period.[17] The following table summarizes the expected cash flows for the next 5 years of high growth and the first year of stable growth thereafter.

Year	Cash Flow on Index
1	27.15
2	29.86
3	32.85
4	36.13
5	39.75
6	42.33

[a]Cash flow in the first year = 1.68% of 1469 (1.10)

If we assume that these are reasonable estimates of the cash flows and that the index is correctly priced, then

$$\text{Level of the index} = 1469 = \frac{27.15}{(1+r)} + \frac{29.86}{(1+r)^2} + \frac{32.85}{(1+r)^3} + \frac{36.13}{(1+r)^4} + \frac{39.75 + \dfrac{42.33}{r-0.065}}{(1+r)^5}$$

Note that the term with 42.33 in the last term of the equation is the terminal value of the index, based upon the stable growth rate of 6.5%, discounted back to the present. Solving for r in this equation yields us the required return on equity of 8.56%. The treasury bond rate on December 31, 1999, was approximately 6.5%, yielding an implied equity premium of 2.06%.

The advantage of this approach is that it is market-driven and current and it does not require any historical data. Thus, it can be used to estimate implied equity premiums

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[16] 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.

in any market. It is, however, bounded by whether the model used for the valuation is the right one and the availability and reliability of the inputs to that model. For instance, the equity risk premium for the Argentine market on September 30, 1998 was estimated from the following inputs. The index (Merval) was at 687.50 and the current dividend yield on the index was 5.60%. Earnings in companies in the index are expected to grow 11% (in US dollar terms) over the next 5 years and 6% thereafter. These inputs yield a required return on equity of 10.59%, which when compared to the treasury bond rate of 5.14% on that day results in an implied equity premium of 5.45%. For simplicity, we have used nominal dollar expected growth rates[18] and treasury bond rates, but this analysis could have been done entirely in the local currency.

The implied equity premiums change over time much more than historical risk premiums. In fact, the contrast between these premiums and the historical premiums is best illustrated by graphing out the implied premiums in the S&P 500 going back to 1960 in Figure 7.1.

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[17] 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 rate, the long term stable growth rate should be equal to the treasury bond rate.

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

Implied Premium for US Equity Market
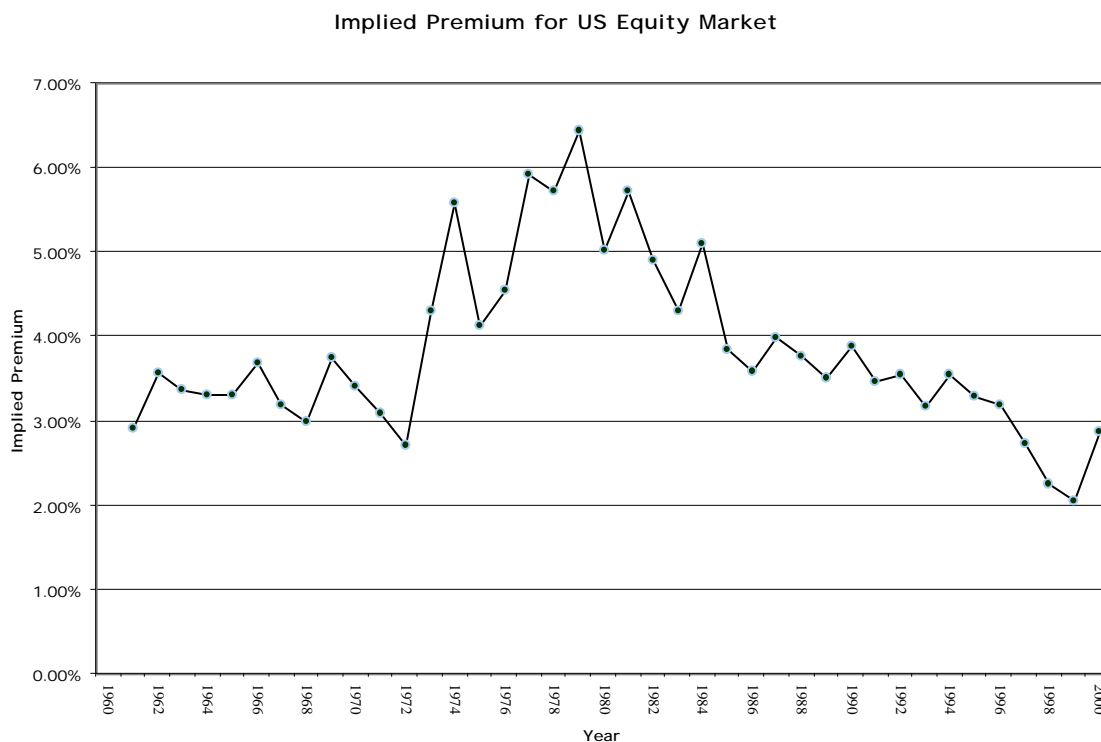
In terms of mechanics, we used smoothed historical growth rates in earnings and dividends as our projected growth rates and a two-stage dividend discount model. Looking at these numbers, we would draw the following conclusions.

- The implied equity premium has seldom been as high as the historical risk premium. Even in 1978, when the implied equity premium peaked, the estimate of 6.50% is well below what many practitioners use as the risk premium in their risk and return models. In fact, the average implied equity risk premium has been between about 4% over the last 40 years. We would argue that this is because of the survivor bias that pushes up historical risk premiums.

- The implied equity premium did increase during the seventies, as inflation increased. This does have interesting implications for risk premium estimation. Instead of assuming that the risk premium is a constant and unaffected by the level of inflation and interest rates, which is what we do with historical risk premiums, it may be more realistic to increase the risk premium as expected inflation and interest rates increase.

In fact, an interesting avenue of research would be to estimate the fundamentals that determine risk premiums.

- Finally, the risk premium has been on a downward trend since the early eighties and the risk premium at the end of 1999 was a historical low. Part of the decline can be attributed to a decline in inflation uncertainty and lower interest rates and part of it, arguably, may reflect other changes in investor risk aversion and characteristics over the period. There is, however, the very real possibility that the risk premium is low because investors had over priced equity. In fact, the market correction in 2000 pushed the implied equity risk premium up to 2.87% by the end of 2000.

As a final point, there is a strong tendency towards mean reversion in financial markets. Given this tendency, it is possible that we can end up with a far better estimate of the implied equity premium by looking at not just the current premium, but also at historical data. There are two ways in which we can do this.

- We can use the average implied equity premium over longer periods, say ten to fifteen years. Note that we do not need as many years of data here as we did with the traditional estimate because the standard errors tend to be smaller.

- A more rigorous approach would require relating implied equity risk premiums to fundamental macroeconomic data over the period. For instance, given that implied equity premiums tend to be higher during periods with higher inflation rates (and interest rates), we ran a regression of implied equity premiums against treasury bond rates and a term structure variable between 1960 and 2000:

Implied Equity Premium = 1.87% + 0.2903 (T.Bond Rate) - 0.1162 (T.Bond – T.Bill)

$$(5.94) \qquad\qquad (1.10)$$

The regression has significant explanatory power with an R-squared of 49% and the t statistics (in brackets under the coefficients) indicating the statistical significance of the independent variables used. Substituting the current treasury bond rate and bond-bill spread into this equation should yield an updated estimate[19] of the implied equity premium.

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[19] On June 30, 2001, for instance, I substituted in the treasury bond rate of 5% and a spread of 1.0% between the T.Bond and T.Bill rate into the regression equation to get:

0.0182 +0.2903 (0.05) - 0.1162(0.01) = 0.032 or 3.20%

histimpl.xls: This data set on the web shows the inputs used to calculate the premium in each year for the U.S. market.

implprem.xls: This spreadsheet allows you to estimate the implied equity premium in a market.

Default Spreads on Bonds

The interest rates on bonds are determined by the default risk that investors perceive in the issuer of the bonds. This default risk is often measured with a bond rating and the interest rate that corresponds to the rating is estimated by adding a default spread to the riskless rate. In chapter 4, we examined the process used by rating agencies to rate firms. In this chapter, we consider how to estimate default spreads for a given ratings class and why these spreads may vary over time.

Estimating Default Spreads

The simplest way to estimate default spreads for each ratings class is to find a sampling of bonds within that ratings class and obtain the current market interest rate on these bonds. Why do we need a sampling rather than just one bond? A bond can be mis-rated or the market can make mistakes with a single bond. Using a sample reduces or eliminates this problem. In obtaining this sample, you should try to focus on the most liquid bonds with as few special features attached to them as possible. Corporate bonds are often illiquid and the interest rates on such bonds may not reflect current market rates. The presence of special features on bonds such as convertibility or callability can affect the pricing of these bonds and consequently the interest rates estimated on them.

Once a sample of bonds within each ratings class has been identified, you need to estimate the interest rate on these bonds. There are two measures that are widely used. The first is the yield on the bond, which is the coupon rate divided by the market price. The second is the yield to maturity on the bond, which is the interest rate that makes the present value of the coupons and face value of the bond equal to the market price. In general, it is the yield to maturity that better measures the market interest rate on the bond.

Having obtained the interest rates on the bonds in the sample, you have two decisions to make. The first relates to weighting. You could compute a simple average of the interest rates of the bonds in the sample or a weighted average, with the weights based upon the trading volume – more liquid bonds will be weighted more than less liquid bonds. The second relates to the index treasury rate since the average interest rate for a ratings class is compared to this rate to arrive at a default spread. In general, the maturity of the treasury should match the average maturity of the corporate bonds chosen to estimate the average interest rate. Thus, the average interest rate for 5-year BBB rated corporate bonds should be compared to the average interest rate for 5-year treasuries to derive the spread for the BBB rated bonds.

While publications like Barron's have historically provided interest rates on at least higher rated bonds (BBB or higher), an increasing number of online services provide the same information today for all rated bonds. The following table is extracted from one such online service in early 2000 for 10-year bonds.

Table 7.6: Default Spreads by Ratings Class – January 2001 (T.Bond rate=5%)

| Rating	Spread	Interest Rate on Debt
AAA	0.75%	5.75%
AA	1.00%	6.00%
A+	1.50%	6.50%
A	1.80%	6.80%
A-	2.00%	7.00%
BBB	2.25%	7.25%
BB	3.50%	8.50%
B+	4.75%	9.75%
B	6.50%	11.50%
B-	8.00%	13.00%
CCC	10.00%	15.00%
CC	11.50%	16.50%
C	12.70%	17.70%
D	14.00%	19.00%

Source: bondsonline.com

Determinants of Default Spreads

Table 7.6 provides default spreads at a point in time, but default spreads not only vary across time but they can vary for bonds with the same rating but different maturities. In this section, we consider how default spreads vary across time and for bonds with varying maturities.

Default Spreads and Bond Maturity

From observation, the default spread for corporate bonds of a given ratings class seems to increase with the maturity of the bond. In Figure 7.2, we present the default spreads estimated for an AAA, BBB and CCC rated bond for maturities ranging from 1 to

Figure 7.2: Default Spreads by Maturity
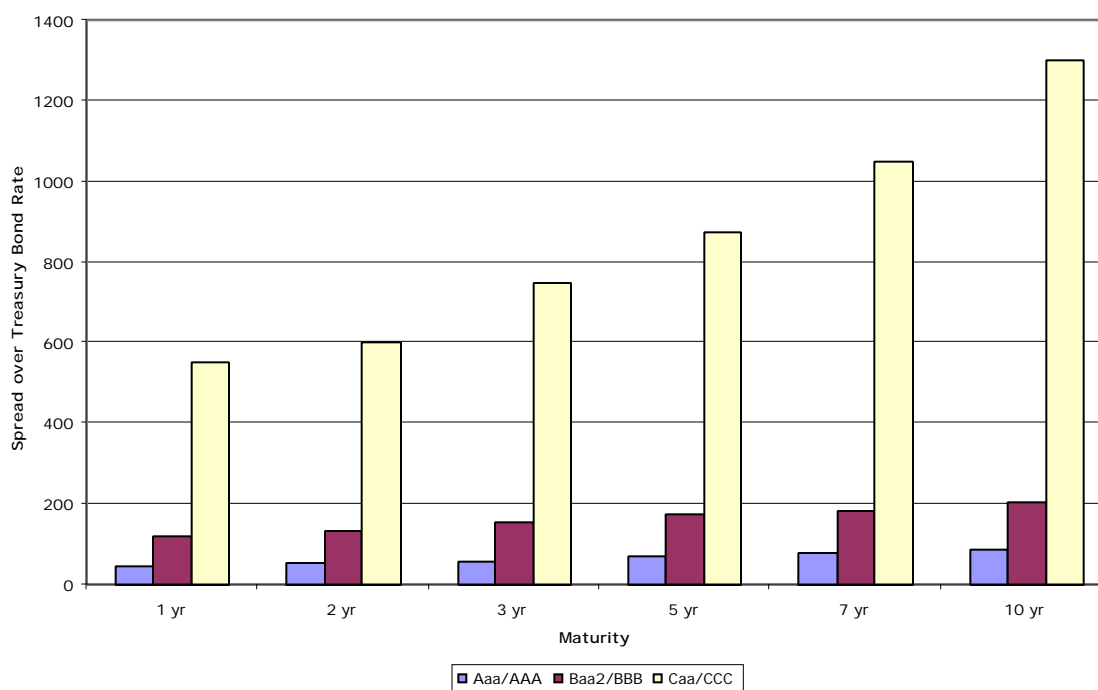

10 years in January 2001.

For every rating, the default spread seems to widen for the longer maturities and it widens more for the lower rated bonds. Why might this be? It is entirely possible that default risk is multiplied as we look at longer maturities. A bond investor buying a 10-year bond in a

CCC rated company may feel more exposed to default risk than a bondholder buying a higher rated bond.

Default Spreads over Time

The default spreads presented in Table 7.6, after a year of declining markets and a slowing economy, were significantly higher than the default spreads a year prior. This phenomenon is not new. Historically, default spreads for every ratings class have increased during recessions and decreased during economic booms. In Figure 7.3, we graph the spread between 10-year Moody's Baa rated bonds and the 10-year treasury bond rate each year from 1960 to 2000.

Figure 7.3: Default Spread - Baa versus Treasury Bond Rates from 1960 to 2000
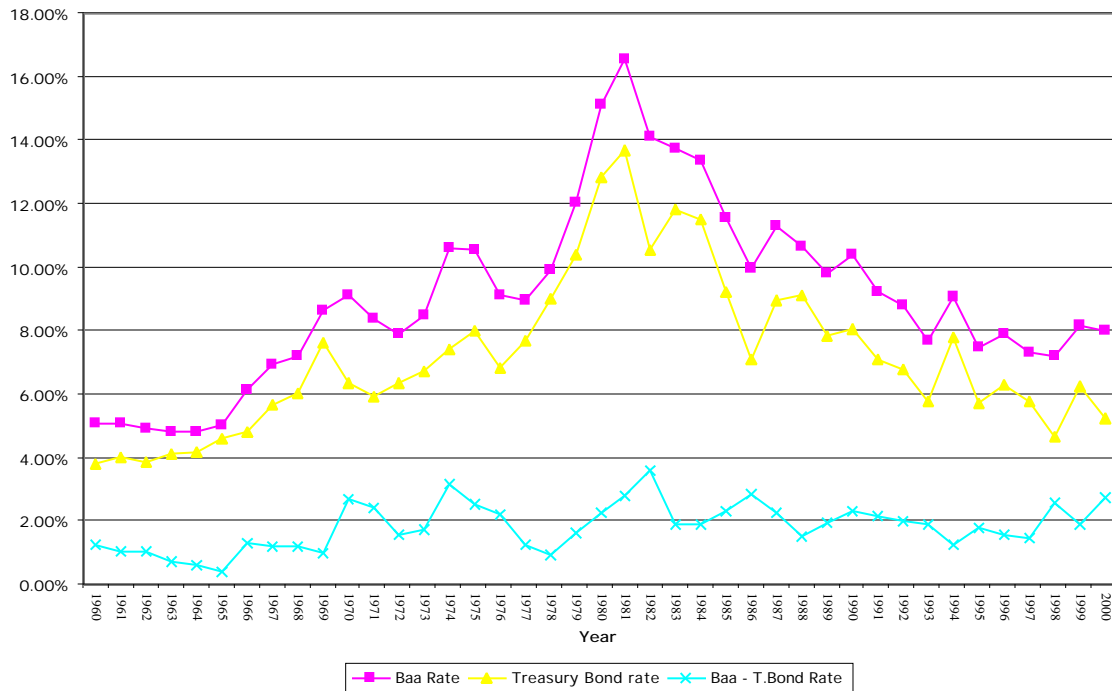
The default spreads did increase during periods of low economic growth; note the increase during 1973-74 and 1979-81, in particular. In fact, a regression of default spreads each year against real economic growth that year bears out this conclusion.

$$\text{Default Spread}_{\text{BBB-Treasury}} = 0.47 - 0.04 \text{ GNP Growth}_{\text{Real}}$$

After years of high real growth, default spreads tend to shrink.

The practical implication of this phenomenon is that default spreads for bonds have to be re-estimated at regular intervals, especially if the economy shifts from low to high growth or vice versa.

ratings.xls: There is a dataset on the web that summarizes default spreads by bond rating class for the most recent period.

Conclusion

The risk free rate is the starting point for all expected return models. For an asset to be risk free, it has to be free of both default and reinvestment risk. Using these criteria, the appropriate risk free rate to use to obtain expected returns should be a default-free (government) zero coupon rate that is matched up to when the cash flow or flows that are being discounted occur. In practice, however, it is usually appropriate to match up the duration of the risk free asset to the duration of the cash flows being analyzed. In corporate finance and valuation, this will lead us towards long term government bond rates as risk free rates. It is also important that the risk free rate be consistent with the cash flows being discounted. In particular, the currency in which the risk free rate is denominated and whether it is a real or nominal risk free rate should be determined by the currency in which the cash flows are estimated and whether the estimation is done in real or nominal terms.

The risk premium is a fundamental and critical component in portfolio management, corporate finance and valuation. Given its importance, it is surprising that more attention has not been paid in practical terms to estimation issues. In this paper, we considered the conventional approach to estimating risk premiums, which is to use historical returns on equity and government securities, and evaluated some of its weaknesses. We also examined how to extend this approach to emerging markets, where historical data tends to be both limited and volatile. The alternative to historical premiums is to estimate the equity premium implied by equity prices. This approach does require that we start with a valuation model for equities and estimate the expected growth and cash flows, collectively, on equity investments. It has the advantage of not requiring historical data and reflecting current market perceptions.

Problems and Questions

1. Assume that you are valuing an Indonesian firm in US dollars. What would you use as the riskless rate?

2. Explain why a 6-month treasury bill rate is not an appropriate riskless rate in discounting a five-year cash flow.

3. You have been asked to estimate a riskless rate in Indonesian Rupiah. The Indonesian government has rupiah denominated bonds outstanding with an interest rate of 17%. S&P has a rating of BB on these bonds, and the typical spread for a BB rated country is 5% over a riskless rate. Estimate the rupiah riskless rate.

4. You are valuing an Indian company in rupees. The current exchange rate is Rs 45 per dollar and you have been able to obtain a ten-year forward rate of Rs 70 per dollar. If the U.S. treasury bond rate is 5%, estimate the riskless rate in Indian rupees.

5. You are attempting to do a valuation of a Chilean company in real terms. While you have been unable to get a real riskless rate in Latin America, you know that inflation-index treasury bonds in the United States are yielding 3%. Could you use this as a real riskless rate? Why or why not? What are the alternatives?

6. Assume you have estimated the historical risk premium, based upon 50 years of data, to be 6%. If the annual standard deviation in stock prices is 30%, estimate the standard error in the risk premium estimate.

7. When you use a historical risk premium as your expected future risk premiums, what are the assumptions that you are making about investors and markets? Under what conditions would a historical risk premium give you too high a number (to use as an expected premium)?

8. You are trying to estimate a country equity risk premium for Poland. You find that S&P has assigned an A rating to Poland and that Poland has issued Euro-denominated bonds that yield 7.6% in the market currently. (Germany, an AAA rated country, has Euro-denominated bonds outstanding that yield 5.1%).
   a. Estimate the country risk premium, using the default spread on the country bond as the proxy.
   b. If you were told that the standard deviation in the Polish equity market was 25% and that the standard deviation in the Polish Euro bond was 15%, estimate the country risk premium.

9. The standard deviation in the Mexican Equity Index is 48% and the standard deviation in the S&P 500 is 20%. You use an equity risk premium of 5.5% for the United States.
   a. Estimate the country equity risk premium for Mexico using the equity standard deviations.

b. Now assume that you are told that Mexico is rated BBB by Standard and Poor's and that it has dollar denominated bonds outstanding that trade at a spread of about 3% above the treasury bond rate. If the standard deviation in these bonds is 24%, estimate the country risk premium for Mexico.

10. The S&P 500 is at 1400. The expected dividends and cash flows, next year, on the stocks in the index is expected to be 5% of the index. If the expected growth rate in dividends and cash flows over the long term is expected to be 6% and the riskless rate is 5.5%, estimate the implied equity risk premium.

11. The Bovespa (Brazilian equity index) is at 15000. The dividends on the index last year were 5% of the index value, and analysts expect them to grow 15% a year in real terms for the next 5 years. After the fifth year, the growth is expected to drop to 5% in real terms in perpetuity. If the real riskless rate is 6%, estimate the implied equity risk premium in this market.

12. As stock prices go up, implied equity risk premiums will go down. Is this statement always true?