Equity Risk Premium Article

Michael Annin, CFA and Dominic Falaschetti, CFA

This article appears in the January/February 1998 issue of Valuation Strategies.

Executive Summary

This article explores one of the most important elements in any discount rate calculation—the equity risk premium. While there are many topics in the area of finance upon which academics agree, a topic as basic as the equity risk premium still can produce some vigorous debate.

The assumptions that underlie the calculation of the equity risk premium have a material impact on the magnitude of the premium and, therefore, the ultimate discount rate. It is important for anyone performing business valuation to understand how and why any risk premium calculation is performed due to the impact it has on the overall valuation.

This article explores some of the more common equity risk premium methodologies currently in use by business valuation professionals. We attempt to address how the equity risk premium is calculated under each methodology and the assumptions that underlie each approach.

Introduction

What is the equity risk premium? The equity risk premium is defined as the reward that investors require to accept the uncertain outcomes associated with owning equity securities. The equity risk premium is measured as the extra return that equity holders expect to achieve over risk-free assets on average.

It is important to note that the equity risk premium as it is used in discount rates and cost of capital analysis is a forward looking concept. That is, the equity risk premium that is used in the discount rate should be reflective of what investors think the risk premium will be going forward.

There are two general ways to estimate the equity risk premium - one using historical data and one using estimates or market projections. Using historical data to develop an equity risk premium, one assumes that what has happened in the past is representative of what might be expected in the future. Using market projection, one assumes that it is possible to project the equity risk premium from surveys or some other projection model. Most equity risk premium models use historical data and assume that some period of the past provides the best indication of what the future will hold. To our knowledge, there is no functioning ERP model that uses future projections as its base. The remainder of this article examines the measurement of the ERP using historical data.

To determine an equity risk premium, one must define a stock market benchmark and a risk-free asset. For instance, the market can be defined as the S&P 500 or the New York Stock Exchange index or some other market benchmark. The risk-free asset can be defined as Treasury bonds or some other risk-free asset. The equity risk premium is simply the return on the market less the return on the risk-free asset.

The equity risk premium can be calculated over any time period. For the U.S., market data exists back at least as far as the late 1800s. Therefore it is possible to measure the historical equity risk premium roughly the past 100 years.

The time period, market benchmark, and risk-free asset assumptions drive the equity risk premium. Deciding on these three elements determines the magnitude of the equity risk premium.

Uses of the Equity Risk Premium

The equity risk premium is a key element in many cost of equity models. The build-up approach, capital asset pricing model, and Fama-French three factor model all require an equity risk premium to compute a cost of equity. The higher the equity risk premium the higher the cost of equity.

Build-Up Methodology

The build-up methodology starts with a risk-free rate and adds other elements of risk to that rate to come up with an appropriate cost of equity. If, for example, you are trying to determine the cost of equity for a small manufacturing facility using the build-up approach, the initial element is the risk-free rate. Other elements include the equity risk premium and size premium. Therefore the build-up approach would be the risk-free rate plus the equity risk premium plus the size premium.

Capital Asset Pricing Model

The capital asset pricing model (CAPM) is an extension of the build-up approach. CAPM is stated as follows:

$$K_s = R_f + (\beta_s \times ERP)$$

where,

K_s = cost of equity for company s;

R_f = risk-free rate;

β_s = beta of company s; and,

ERP = equity risk premium.

The CAPM states that the cost of equity is equal to the risk-free rate plus the equity risk premium multiplied by the company beta or measure of systematic risk. In many cases it is also appropriate to add a size premium to the CAPM.

Fama-French Three Factor Model

The Fama-French three factor model is a further extension of the CAPM. The regression equation to estimate the cost of capital using the Fama-French model can be written as follows:

$$R_i - R_f = \beta_i (R_m - R_f) + (s_i \times SMB) + (h_i \times HML)$$

where,

$R_i–R_f$ = risk premium for company i;

β_i, s_i, h_i = regression coefficients for company i;

$R_m–R_f$ = expected equity risk premium;

SMB = Size factor risk. Expected return of a portfolio of small stocks minus the expected return on portfolio of big stocks; and,

HML = Distress factor risk where distress is measured by book equity divided by market equity. Expected return of a portfolio of high book-to-market stocks minus the

expected return of a portfolio of low book-to-market stocks.

The equity risk premium is one of three components in the Fama-French three factor model. These three factors include a size factor, a distress factor and a market risk factor (the equity risk premium).

Why Do We Care About The Equity Risk Premium?

Why is there so much debate about the equity risk premium? The answer is that it can have a profound effect on the ultimate cost of equity derived. As we will outline later in this article, depending on the assumptions that you use, the equity risk premium that you calculate can range from below 4 percent to over 8 percent. What does this mean?

Using a standard CAPM model assuming a beta of 1.0, a risk-free rate of 6.5 percent, and an equity risk premium of 4.5 or 7.5 percent, the cost of equity varies from 11.0 percent to 14.5 percent. To people not involved in business valuation, this may seem like splitting hairs. However, 350 basis points usually has a dramatic impact on the ultimate value derived.

In a simplified example of a company that is expected to generate annuity like cash flows of $1 million per year, using a discount rate of 11.0 percent translates into a value of $9.1 million ($1 million / 11.0 percent). Using a discount rate of 14.5 percent translates into a value of $6.9 million. To most clients, differences of this magnitude are material.

The Ibbotson Associates Equity Risk Premium

Ibbotson Associates produces several publications that provide various cost of capital measures. One of these, the *Stocks, Bonds, Bills and Inflation (SBBI) Yearbook* provides one of the most commonly cited equity risk premium estimates in the field of valuation.

Calculation Methodology

The equity risk premium (ERP) is calculated by Ibbotson Associates using the returns on the S&P 500™ over the income return on the appropriate horizon Treasury security. *SBBI* provides equity risk premium calculations for short-, intermediate-, and long-term horizons. However, companies are entities that have no defined life span and are assumed to be going concerns for extended time periods. In determining a company's value, it is important to use a long-term discount rate because the life of the company is assumed to be infinite. This holds true even if the time horizon of the investor is for a short amount of time. The long horizon ERP is simply the arithmetic average total return for the S&P 500 less the average income return of long-term Treasury bonds measured from 1926 to present.

The History Behind the Seventy-one Year History

The Ibbotson Associates equity risk premium covers the time period from 1926 to present. The original data source for the time series comprising the equity risk premium is the Center for Research in Security Prices (CRSP) at the University of Chicago. The CRSP time series start in 1926. CRSP determined that the time period around 1926 was approximately the time period where quality financial data became available. Nineteen twenty-six was also chosen by CRSP because it includes one full business cycle of data before the market crash of 1929. This is the most basic reason why the Ibbotson Associates' ERP calculation window starts in 1926.

The period from 1926 to present is relevant because of the number of different economic scenarios represented by the time period. Some practitioners argue for a shorter historical time period, such as thirty years. This is based on the assumption that it is improbable that events of the more distant past will not be repeated in the future. However, as is discussed later in this article, even the most recent periods contain unique events.

The Income Return Versus the Total Return

The use of the income return, as opposed to the total return, for the appropriate horizon Treasury as a representation of the riskless rate is another area of discussion. Ibbotson uses the income return in calculating the ERP rather than the total return since it represents the *truly riskless* portion of the return. Yields have been rising generally over the period 1926-1996 causing negative capital appreciation on the long-term bond series. This negative return is due to the risk of unanticipated yield changes. Any anticipated changes in yields will already be priced by the market into the bond. Therefore, the total return on the bond series does not represent the riskless rate of return. It includes the effects of unanticipated interest rate changes. The income return better represents the riskless rate of return since an investor can hold a bond to maturity and be certain of obtaining the income return and return of principal with no capital loss.

The Appropriate Market Benchmark

The Ibbotson Associates' equity risk premium is based on the S&P 500 as its market proxy. The S&P 500 is chosen to represent the market because it is a broad based index, covering a large portion of the overall market in term of equity capitalization. It is also a widely cited proxy for the market as a whole.

Alternatively, other market indices with broader scope could be used in the calculation of the equity risk premium. Examples include the Center for Research in Security Prices (CRSP) database which covers the New York Stock Exchange (NYSE), the NYSE and American Stock Exchange (AMEX) combined, and the NYSE, AMEX and NASDQ markets combined. These data series again are available back to 1926, but the AMEX and NASDQ data is only available from 1962 and 1982 respectively. Regardless, the results from using these different market benchmarks do not vary significantly as they are all market capitalization weighted benchmarks. The majority of the return of these benchmarks is therefore determined by the largest companies. The equity risk premium measured from 1926-1996 range between 7.1 and 7.5 percent for the four market benchmarks cited here.

Arithmetic vs. Geometric Mean

One area regarding the equity risk premium that is not disputed in academic circles is whether the arithmetic or geometric mean equity risk premium should be used. The arithmetic mean should always be used in evaluating projected cash flows. Therefore, the arithmetic mean should always be used in calculating the value of business.

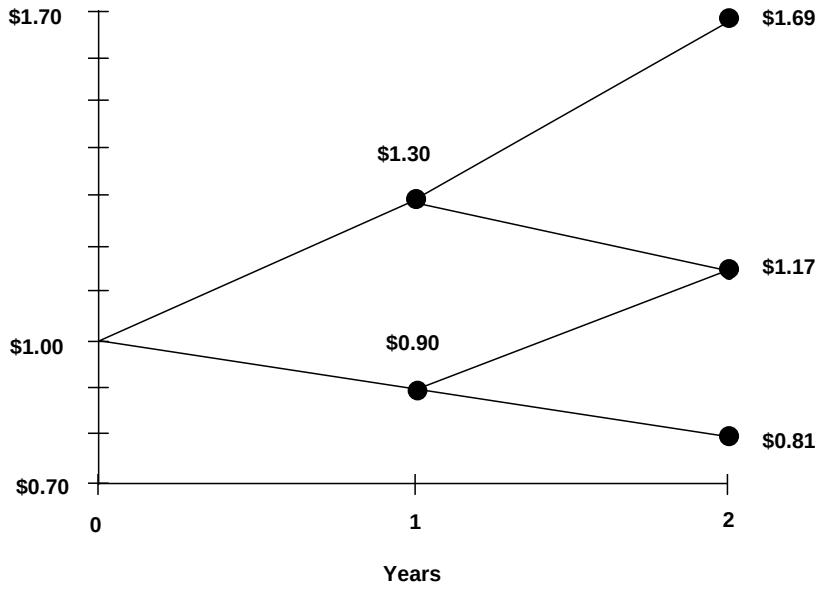
In SBBI, Ibbotson Associates provides both arithmetic and geometric means for different asset classes. The equity risk premium that is outlined in the publication is an arithmetic mean however. SBBI has a number of different audiences including business appraisers, investment analysts, and financial planners. Geometric means are presented because they can be useful in analyzing historical performance.

The argument for using the arithmetic average is quite straight-forward. In looking at projected cash flows, the equity risk premium that should be employed is the equity risk premium that is expected to actually be incurred over the future time periods. Using the geometric average

assumes that the equity risk premium will be the same for each and every future time period. That is, the market benchmark will achieve the same excess return over every future time period. We know that this is not the case. Exhibit 1 shows the equity risk premium for each year based on the arithmetic mean returns of the S&P 500 and the income return on long-term government bonds. There is considerable volatility in the year-by-year calculation of the equity risk premium. At times the equity risk premium is even negative.

The arithmetic average acknowledges the fact that market returns vary over time. Yet, the average equity risk premium realized will be the arithmetic average. However, the numbers will vary from period to period.

To illustrate the difference between the arithmetic and geometric mean, suppose the expected return on a stock is 10 percent per year with a standard deviation of 20 percent. Also assume that only two outcomes are possible each year— +30 percent and -10 percent (or rather, the mean plus or minus one standard deviation). The probability of occurrence for each outcome is equal. The growth of wealth over a two-year period is illustrated in below.



The most common outcome of $1.17 is given by the geometric mean of 8.2 percent. However, the expected value is predicted by compounding the arithmetic, not the geometric mean. The probability weighted average of all possible outcomes is:

(0.25 x 1.69) = 0.4225
(0.26 x 1.17) = 0.5850
(0.27 x 0.81) = 0.2025
1.2100

The rate that must be compounded to achieve the terminal value of $1.21 after two years is 10 percent, the arithmetic mean. The arithmetic mean equates the expected future value with the present value, therefore it is the appropriate discount rate.

The Equity Risk Premium Over Time

As seen in Exhibit 1, the equity risk premium varies considerably from year-to-year. The table below also indicates that the equity risk premium varies considerably by decade, from a high of 17.9 percent in the 1950s to a low of 2.3 percent in the 1930s. In the recent periods, the equity risk premium has been higher than its long-term average of 7.5 percent.

1926-1929	1930s	1940s	1950s	1960s	1970s	1980s	1990s	1987-1996
17.6	2.3	8.0	17.9	4.2	0.3	7.9	7.9	8.3

Exhibit 2 illustrates the resulting equity risk premium based on different starting dates through year-end 1996. Over longer periods, the results are fairly stable, centering around 7.5 percent. In contrast, the equity risk premium calculations over shorter periods can fluctuate considerably. When measured from 1966 through 1996, the lowest period, the resulting equity risk premium is only 4.3 percent. More recent calculations of the equity risk premium lie above 8 percent.

The Thirty Year Equity Risk Premium

Some practitioners argue for a shorter historical time period, such as thirty years, as a basis for the equity risk premium calculation. The logic for the use of a shorter period is that historical events and economic scenarios present before this time are unlikely to be repeated. Exhibit 3 shows the equity risk premium measured over all 30-year periods. It is clear that the equity risk premium measured over 30-year periods has been trending downwards. The thirty-year equity risk premium has remained close to 4 percent for several years. The thirty-year calculation starts to recover only in the most recent periods.

The key to understanding this result lies in the years 1973 and 1974. The oil embargo during the period had a tremendous effect on the market. The equity risk premium for these years alone was negative 21 and negative 34 percent respectively. If we look at the last thirty years excluding 1973 and 1974, this 28 year period results in an equity risk premium of 7.2 percent as opposed to 4.9 with these years included.

This example helps illustrate why a long time period is required to accurately estimate the equity risk premium. The shorter, thirty-year period places too much emphasis on the poor stock market

performance of the 1973-1974 period. As seen in the rolling twenty-year equity risk premium, Exhibit 4, the equity risk premium recovers significantly in more recent period once the years 1973 and 1974 drop out of the analysis. The rolling ten-year equity risk premium, Exhibit 5, even shows full ten-year periods containing 1973-1974 where the equity risk premium was negative. Again, the averages recover significantly when the years 1973-1974 drop out.

Is it likely that another oil embargo will occur having the same effect on the stock market as it did in the early 1970s? Are we likely to become engaged in another world war or fall into an economic period of depression? For the most part, we do not have the answers to these questions. Even recent periods could be characterized as *unique* in one way or another. Relatively recently there have been periods of recession and boom, low and high inflation, low and high interest rates, in addition to the stagflation period of the 1970s. By including market data measured over the entire set of economic scenarios available, the model can better anticipate similar events in the future. It would be inappropriate to overemphasize one period over another without the knowledge of what lies ahead.

The Rolling Thirty Year Average Equity Risk Premium

One equity risk premium methodology that is employed by some business appraisers utilizes a rolling average approach. This rolling average approach typically looks at a window of historical data and calculates a premium, then moves forward a year and calculates another premium. Once the entire time series is calculated, an average of the premiums is taken to come up with the equity risk premium.

The idea behind this approach is that if the most recent thirty year equity risk premium does not include enough history, we should then look at the average of equity risk premiums throughout

the entire historical time period. This approach is based on the assumption that a given time frame is the appropriate time frame over which the equity risk premium should be calculated.

For instance, if we assume that the relevant time frame over which the equity risk premium should be calculated is thirty years, the rolling approach would calculate a thirty year equity risk premium for all time periods from 1926 to present. There would be a premium for 1926 to 1955. There would be a premium for 1927 to 1956. These premiums would be calculated and averaged. The average is the ultimate equity risk premium.

There are some serious problems with this type of methodology. First of all, it assumes that there is an appropriate historical window over which the equity risk premium should be calculated. There is no basis for assuming that one period of time is better or worse than another period of time. The thirty year equity risk premium is typically justified because of changes in the market or the economy, not because it represents the appropriate amount of time that should be considered.

Another serious defect in this approach is that it over-weights certain time periods. As was stated above, calculating the rolling equity risk premium over a thirty year window would require compiling an equity risk premium for 1926 to 1955, for 1927 to 1956, etc. Under this methodology, the year of 1926 is only included in one window. The year of 1927 is only included in two windows. The year of 1928 is only included in three windows.

This deficiency also occurs at the most current end of the time period begin analyzed. If the final year in the analysis is 1996, it is only counted in one window. The year of 1995 would only be counted in two windows. In short, the years in the middle are included in more rolling periods of

the calculation. Therefore, these periods carry more weight in the ultimate equity risk premium determined under this approach.

Summary and Conclusion

The equity risk premium is and will probably be one of the more widely debated topics in the area of cost of capital and valuation. The ERP is wildly debated because of its impact on the ultimate value derived. It is also widely debated since it represents the expectation of what the future returns on equities will be on average.

In this article we have outlined various EPR methodologies. We have also outlined some of the strengths and weaknesses of these methodologies. Whether or not you agree with the Ibbotson Associates' ERP methodology, it is important to understand how and why it is calculated in this manner. The issues addressed and assumptions made underlying the Ibbotson Associates' ERP must also be addressed in any ERP calculation.