**Equity Risk Premium**

When an investor invests in common stock or equity investment, he has to assume equity risks. For assuming equity risk, investors demand equity risk premium. Equity risk premium is the incremental or additional return that investors require for holding equity security rather than risk free asset. It is the difference between the required return on equity and current expected return on risk free asset. For example, suppose current risk free rate of return is 8% and the required return for equity investment is 15% , equity risk premium is (15-8)% = 7%.

Possibly confusingly, equity risk premium is also commonly used to refer to the realized excess return of stocks over risk free assets over a given period of time. For example one might refer the realized excess return of DGEN index over 10 year Treasury bond for the last 10 years as equity risk premium. The realized excess return could be very different from the equity risk premium. I would address this issue in detail elsewhere in my lecture.

One of the most common ways to determine required return on equity is using the CAPM equation as follows

Ri = Rf + βi ( Rm - Rf )

The equation says required return on equity is the current expected risk free rate Rf  plus Equity risk premium ( Rm - Rf ) multiplied by ith firm’s beta . The underlined portion (Rm - Rf ) in the equation shows the market equity risk premium. The equity risk premium can be adjusted upward or downward for specific firm’s systematic risk or beta.

Suppose current risk free rate as reflected by 10 year T-bond is 8% and the equity risk premium is 7% . For a average systematic company which has a beta of 1 , required return estimate is = 8% + 1\*7% = 15% . Now suppose AB bank has a beta of 1.3 , so required return on AB bank stock is = 8% + 1.3\*7% = 17.1%. As AB bank stock has above average systematic risk measured by beta of 1.3 which is higher than average systematic stocks beta of 1, so we have adjusted the **Equity Risk Premium Estimate** for AB bank by 1.3\*7% = 9.1% . Adding required equity risk premium estimate of 9.1% for AB bank to risk free rate of 8%, we find required return on AB bank stock is 17.1%.

In practice the magnitude of equity risk premium is very difficult to estimate and can be a reasons for different investment conclusions among the analysts.

Two board approaches are available to estimate the equity risk premium.

1. Historical Estimate
2. Forward Looking Estimates

**Historical Estimate**

A historical equity risk premium is calculated as mean value of the differences between the boards based equity market return and the government bond/bill return over some selected sample period. For example one might calculate equity risk premium as the average difference between the return on DGEN index and return on Bangladesh Government Treasury bond for the last 10 years. When reliable long term estimate of long term equity returns are available, historical estimates have been popular choice for estimation.

In using the historical approach to equity risk premium for the future, an analyst is implicitly assuming that the returns are stationary. That is the parameters or an economic or financial variable that describes that return generating process are constant over the past and into future.

The analyst’s major decisions regarding developing a historical equity risk premium estimate include the selection of

1. Equity index to represent the equity market return
2. The time period and time interval for computing the estimate
3. The type of mean calculated
4. The proxy for risk free rate

**Equity index to represent the equity market return**

Analysts try to select an equity index that represents the average returns earned by equity investors in the market being considered. For this, a broad based market value weighted index is usually selected. In Bangladesh, the premier bourse DSE until January 28th 2013, maintained three indices to represent the equity market performance: DSE General Index, DSE All share price index and DSE 20. All are market value weighted index. Analysts and practitioners usually select the DGEN to estimate the equity market return. As an illustration , look at table 1, over 132 month return series, average annual equity return in Bangladesh is 11.95% when DSE-20 is considered, when DGEN is considered , the average annual return over 132 months return series is 20% whereas it is 19.07% for the DSE All-share price index. Notice that difference for historical equity return among the different equity index selected has been there even different time period is considered. The bottom line is that selection of a certain equity index as proxy for equity return has bearing on the historical estimate of equity return.

**The period and time interval for computing the equity return**

Historical equity return estimate is very sensitive to the sample time period selected for which equity return will be calculated. When selecting the length of time period, a common choice is the longest reliable returns series available. It is also important that total economic cycle should be covered. For example, there may be equity market bubble in the return series which will inflate the historical average return and burst which shall deflate the historical average return. If a total cycle is covered in the time period, then on an average a reliable estimate of equity return can be calculated.

As an illustration, observe the table 1, DGEN historical return varies from 28.17% on 9 year historical yearly average to 8.82% on 3 year historical average returns. Similar discrepancies are observed for historical average return series for DSE-20 and DSE All share price index for different time periods selected.

Now notice one more thing, variance among the different time series average return is less when monthly return series is considered than yearly return series for All the Indices. This infers one conclusion that the more time interval return series data is considered, the lower the variances among them.

**Table: 1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Time Period for which equity return calculated** | **DSE-20** | **DGEN** | **DSE All share price Index** |
| Monthly annualized return over 132 months period | 11.95% | 20.00% | 19.07% |
| Monthly annualized return over 120 months period | 14.18% | 18.86% | 17.85% |
| Monthly annualized return over 108 months period | 15.25% | 20.98% | 19.75% |
| Monthly annualized return over 96 months period | 9.72% | 14.20% | 12.81% |
| Monthly annualized return over 84 months period | 19.90% | 21.34% | 22.07% |
| Monthly annualized return over 72 months period | 12.50% | 12.90% | 13.61% |
| Monthly annualized return over 60 months period | 13.73% | 16.58% | 16.97% |
| 12 year average return | 18.00% | 24.91% | 26.12% |
| 11 year average return | 18.00% | 24.57% | 25.87% |
| 10 year average return | 19.99% | 26.76% | 28.21% |
| 9 year average return | 20.38% | 28.17% | 29.78% |
| 8 year average return | 13.46% | 18.73% | 20.54% |
| 7 year average return | 19.03% | 23.54% | 28.52% |
| 6 year average return | 24.29% | 28.14% | 32.67% |
| 5 year average return | 13.80% | 16.27% | 13.54% |
| 4 year average return | 18.83% | 22.18% | 22.79% |
| 3 year average return | 21.03% | 8.82% | 9.62% |

**The type of mean- (Geometric/Arithmetic) calculated**

An important decision in calculating historical mean equity risk premium is the choice between an arithmetic mean and geometric mean. A geometric mean equity risk premium estimates equal to the compound annual excess return of equities over the risk free return. A arithmetic mean equity risk premium estimates equal to the sum of the annual return differences between risk free return and equity return divided by the no of observations. Mathematically speaking, an arithmetic mean is always higher than geometric mean (except for the situation where return in all periods are equal) . So a arithmetic mean equity risk premium is higher than geometric mean equity risks premium. In actual practice, both means have been used in equity risk premium estimations.

**Arguments in favor of Arithmetic mean returns:**

* Traditions finance model like CAPM, APT for required return estimations are single period model. The arithmetic mean return as the average one period return best represents the mean return in single period. From that perspective arithmetic mean equity risk premium is model consistent.
* With serially uncorrelated returns and a known underlying arithmetic mean, unbiased estimate of expected terminal value of an investment is found by compounding forward at arithmetic mean.

**Arguments in favor of Geometric mean returns:**

Geometric mean is the compound rate of growth that equates the initial investment to the ending investment over multiple periods. Present value model involves discounting of cash flow over multiple periods. Discounting is the reverse of compounding. Because geometric mean is a compound growth rate, it appears to be logical to use geometric mean in estimating required return over multi period valuation context.

**Risk Free Rate: Long term government bond or short term government bill**

An important decision that analysts face is whether Treasury bond or Treasury bill yield shall be used as proxy for risk free return. In a typical upward sloping yield curve, T-bond yield is higher than T-bill. As a result T-bill based equity risk premium is always higher than the T-bond based equity risks premium.

Table -2

|  |  |  |
| --- | --- | --- |
| **Historical Risk Premium (ERM) relative to T-bond and T-bill ( From 1900-2007)** | | |
|
| **Country** | **Mean ERM relative to T-bond** | **Mean ERM relative to T-bill** |
| **Australia** | **6.40%** | **7.20%** |
| **Belgium** | **2.70%** | **2.90%** |
| **Canada** | **4.20%** | **4.60%** |
| **Denmark** | **2.30%** | **3%** |
| **France** | **4.10%** | **6.80%** |
| **Germany** | **5.60%** | **4.10%** |
| **Ireland** | **3.50%** | **3.90%** |
| **Italy** | **4.40%** | **6.50%** |
| **Japan** | **5.70%** | **6.50%** |
| **Netherland** | **4.10%** | **4.60%** |
| **Norway** | **2.90%** | **3.30%** |
| **South Africa** | **5.70%** | **6.40%** |
| **Spain** | **2.70%** | **3.70%** |
| **Sweden** | **5.30%** | **5.80%** |
| **Switzerland** | **1.90%** | **3.70%** |
| **UK** | **4.10%** | **4.40%** |
| **US** | **4.50%** | **5.50%** |
| **World** | **4.00%** | **4.80%** |

Table-2 shows the historical equity risk premium for some of the developed country and the world from 1990 to 2007. In all cases a bond based equity risk premium is always lower than the bill based equity risk premium. Table-3 shows that historical equity risk premium based on 91 , 182 and 364 days Bangladesh Treasury bills and 5 and 10 years treasury bonds from the 2005-2012.

**Table-3**

|  |  |  |  |
| --- | --- | --- | --- |
| Equity Risk Premium in Bangladesh based on different maturity government Bills and bonds  ( Based on Monthly data form 2005-2012) | DGEN to represent Equity Index | DSE20 to represent Equity Index | DSE All Share Price Index to represent Equity Index |
| Equity Risk Premium based on 91 day bill | **11.05%** | **7.09%** | **14.21%** |
| Equity Risk Premium based on 182 day bill | **10.55%** | **6.59%** | **13.71%** |
| Equity Risk Premium based on 364 day bill | **10.01%** | **6.05%** | **13.17%** |
| Equity Risk Premium based on 5 year T-bond | **8.03%** | **4.07%** | **11.19%** |
| Equity Risk Premium based on 10 year T-bond | **6.96%** | **2.99%** | **10.12%** |

Closely observe when DGEN index is considered as proxy for equity market return, 91 day bill based ERM is higher than all the corresponding treasury security. Again 182 based ERM is higher than all other treasury security except 91 day based T-bill and so forth. The result is consistent when we consider DSE-20 or DSE All share price index. The bottom line is that like other market in table 2, a bill based equity risk premium is always higher than the bond based equity risk premium.

Now a relevant question is which rate should be used as risk free rate – T-bill or T-bond.

As traditional financial model like CAPM is one period model, so a one year or less Treasury bill based equity risk premium is model consistent. Plus Treasury bill is less sensitive to liquidity and inflation risks as compared to Treasury bond.

But industry practices tended to favor the use of a long term government bond in equity risk premium estimate. A practical principal is that analysts try to match the duration of risk free asset to the duration of the asset being valued. As valuation is being conducted in multiperiod context going forward, a long term T-bond is more plausible. Plus when analyst is using YTM of a long term T- bond, he is implicitly considering the current inflation expectation in this analysis. Regarding liquidity risk, when analyst uses on the run (recently issued) T-bond, liquidity risk is largely mitigated. A 10 year government bond yield is a common choice for industry practitioners as proxy for risk free rate of return.

**Adjusted Historical Estimates**

A historical equity risk premium estimate may contain some systematic bias which shall be adjusted. One such bias is **the survivorship bias** in the equity market data series. The bias arises when poorly performing companies or defunct companies are removed from the index so that only relatively good companies remain in the index. Survivorship bias tends to inflate the historical estimate of equity risk premium.

For example, in 2011, 68 poorly performing companies have been shifted from DSE main trading floor to OTC market. If that 68 poorly performing stocks return included in DGEN index return calculation, then actual return would been lower than it is now. In nutshell, Survivorship bias inflates the historical estimate of equity risk premium.

**Forward Looking Estimates of Equity Risk Premium**

Because Equity risk premium estimate is driven by the current expectations about the future economic and financial variables, so it is logical to estimate the equity risk premium directly based on current information and expectations about such economic and financial variables. Two such forward looking estimates are

1. Gordon growth model estimate
2. Macroeconomic model estimate by Ibbotson and Chen

**Gordon growth model estimate**

Perhaps the simplest form of forward looking encountered estimate of equity risk premium is based on a very simple

Present value model, which is constant growth dividend discount model or Gordon Growth model. For developed market like EU or US, the assumptions of the model are almost met. Broad based equity index are nearly associated with dividend yield. And constant dividend growth estimate can be inferred from the consensus analyst’s expectation and other economic expectations. According to this model.

Gordon Growth model equity risk premium is

= (Dividend yield on the index based on year end aggregate forecasted dividend and aggregate market value)

+ (consensus long term earnings growth rate)

- (current long term government bond yield

For example, As on September 2007, S&P Index one year dividend yield is estimated to be 2%, over the 10 year time horizon, earnings are expected to grow at 7% . And the 10 year government Treasury bond in US is now 5%. Gordon growth equity risk premium is now = 2% + 7%-5% = 4%. Look table -2 that historical estimate of equity risk premium 4.5% is close to forward looking estimate of 4%.

Now consider about Bangladesh, as on December 2011, dividend yield of DGEN index was 3.7%. Nominal GDP growth forecasts over the next 10 years is around 14% (nominal GDP growth of 14% equals real GDP growth of around 6.2-6.3%) . Now assume that nominal GDP growth tracks the nominal earning growth of listed company with DSE. Current yield on 10 year Bangladesh Treasury bill is around 11%.

Gordon growth equity risk premium for Bangladesh is = (3.7%+14%-11%) = 6.7%.

Look table -2 that historical estimate of equity risk premium 6.96% is close to forward looking estimate of 6.7%.

**Macroeconomic model estimate**

Financial performance of companies is affected by the macroeconomic performance of the economy. So using the relationship between the macroeconomic and financial variables into equity valuation, analyst can estimate the equity risk premium. The approach is from the perspective of the supply side analysis.

In supply side analysis of macroeconomic model estimate, equity risk premium can be analyzed by four components as described by the Ibbotson and Chen

Expected Inflation: EINF

Expected growth in real earning per share :EGREPS

Expected growth in P/E : EGPE

Expected income components: EINC

Equity risks premium = {[1+EINF)(1+EGREPS)(1+EGPE)-1]+EINC}- risk free return

**Expected Inflation: EINF**

In US, expected inflation can be forecasted from the US Treasury and Treasury inflation protected securities (TIPS) yield curve.

For example, implicit inflation forecast =  **-1**

**= -1**

**= 2.3%**

**Expected growth in real earning per share: EGREPS**

This should track approximately the real GDP growth rate of the economy. In Bangladesh, over the last one decade, real GDP has been growing at 6% plus rate, which can be a proxy for the expected growth in real earning per share estimate subject to upward and downward adjustment.

**Expected growth in P/E: EGPE**

The baseline value for this factor is zero reflecting the view of the efficient capital market. In a efficient market Price shows the fundamental value, so it is assumed that every earning is priced rightly. However, in reality, P/E of market may show overvaluation or undervaluation. A overvaluation P/E is subject to downward adjustment indicating negative growth in P/E and a undervaluation P/E is subject to upward adjustment indicating positive growth in P/E. During the stock market bubble in 2010 December, P/E of DSE was as high as 33 times whereas after the crash, market P/E went down to as low as 10.3 times. So upward/downward adjustment is required to reflect realistic view in forward looking estimate.

**Expected income components: EINC**

Expected income component shows the dividend yield of the market. In Bangladesh, dividend yield has been hovering around 3.2%-3.7%.

Now suppose expected inflation in BD now is 7% (2013-14 budget targets). Expected growth in real EPS is 7.2% (2013-14 budget targets of real GDP growth). Expected growth in P/E is zero and expected dividend yield is 3.5%. Current yield on 10 year Bangladesh Treasury bill is around 11%. So according to this model , BD equity risk premium is

= {[(1.07)(1.072)(1.00)-1]+.035}-.11 =

= 7.2%