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# Estimating the Equity Risk Premium for Economies in the Asian Region

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**Abstract**

The Equity Risk Premium (ERP) is widely used in economic and financial analysis, yet it is difficult to find empirical estimates of the ERP that are generally accepted. The paucity of data in Asian economies exacerbates the problems of estimation. This study estimates the ERP for the larger market-orientated Asian economies and compares the estimates with those of the United States. Surprisingly, of the seven economies examined, the ERP of four cannot be statistically differentiated from that of the United States.

*JEL Classifications*: G11, G12, E42
*Keywords:* Equity risk premium, Asian economies, Estimation

## 1. Introduction

The economic growth of an economy is affected by the decisions of myriads of individuals to acquire investment assets. The returns on such assets are, by their nature, uncertain. Investors need to balance the expected return on their investments with the risks associated with those investments.

In a market economy the financial markets adjust asset prices (and therefore rates of return) so that the returns reflect the risk appetite of the members of that economy. There is no *a priori* assumption about the risk preferences of individuals, save that they regard risk as undesirable. Importantly there is no assumption that risk preferences of individuals remain constant over time, or are the same between various geographical areas. The concept of the Equity Risk Premium (ERP) provides an intuitive measure of the extent to which the members of an economy, in aggregate, need to be compensated for the riskiness of the productive assets of that economy. More specifically, the ERP represents the amount that investors require to induce them to hold a well diversified portfolio of risky assets rather than the risk-free asset. The usefulness of the ERP as an explanation of investor behaviour has led to its use in the fields of corporate finance, asset valuation, and portfolio management.

While the meaning and usefulness of the ERP is unambiguous, attempts to empirically estimate the ERP have been fraught with difficulties. Most empirical studies have been based on the economy of the United States, and to a less degree, other large Western economies. This paper investigates the magnitude of the ERP for the larger market-orientated economies of Asia and finds that there is often not enough evidence to conclude that these economies have a significantly different ERP to that of the United States of America.

The analysis proceeds as follows; firstly the origins of the formulation of the ERP are disused. The various methods by which the ERP can be measured, and the empirical estimates for selected Asian economies, are then presented. Finally, the estimates obtained are compared to those for the United States over the same time period.

## 2. The origins the Equity Risk Premium

The concept of ERP required the development of a model of asset pricing that was able to distinguish between the idiosyncratic and system risk of each asset. Markowitz (1952) was the first to lay the basis for this type of analysis. Over time Markowitz's method of exposition has been refined and formalised so that it is now a standard part of the theory of finance (Ross, Westerfield, & Jaffe, 2005; Joshi, 2003; Elton & Gruber, 1995; Brealey, Myers, & Allen, 2006). Markowitz's formulation of portfolio risk has been identified as the beginning of what is now known as “Modern Portfolio Theory” (Rubinstein, 2002).

If equilibrium prevails in the asset market, it is possible to determine the rate at which the future cash flows of any assets should be discounted, and the resulting amount will be the value (i.e. equilibrium price) of that asset. This extension to the Markowitz model is due to

four authors, each of whom developed the theory independently, namely Treynor (1961); Sharpe (1964); Lintner (1965); and Mossin (1966). This important result, known as the "Capital Asset Pricing Model" (CAPM), states that the expected return on any asset is given by the following relationship:

$$E(R_i) = R_F + \beta[E(R_M) - R_F]$$

where:

$E(R_i)$ is the expected return on the asset $i$

$R_F$ is the risk-free rate of interest

$E(R_M)$ is the expected return of the market portfolio, and

$\beta$ is a measure of the sensitivity of the asset returns to market returns, measured by the ratio of the covariance of the returns to the market portfolio and the returns to asset $i$ to the variance of the market returns.

The term in the square brackets is the ERP. The CAPM has been widely adopted by the financial sector. It is used in portfolio management as a means of rating portfolio managers (using a reward-to-variability ratio relative to the capital market line); in corporate finance (to find the required return on capital investments); in legal claims the courts have generally accepted discount rates for valuing future claims that are based on CAPM; and regulatory bodies routinely use CAPM to calculate the cost of capital for regulated industries and firms.

Empirical tests of the CAPM have however been troubling. The earliest tests (Lintner 1965, for example) found a positive and significant intercept term whereas CAPM predicted a linear function that passed through the origin, and a market risk premium that was significantly less than that which was observed. However, the statistical methods used in these tests were subject to criticism and much debate about the correct form of test has ensued. Roll (1977) raised a more important and fundamental objection to the empirical tests of CAPM. All empirical tests of CAPM test a joint hypothesis; that the market portfolio is mean-variance efficient and that the proxy for the market portfolio is accurate. The theoretical market portfolio consists of all assets available to an investor, and includes assets such as housing, human capital (e.g. education) and other non-market assets. Roll was able to demonstrate that even a highly diversified portfolio consisting of all the current market assets does not necessarily provide a good proxy for the theoretical market portfolio (Richard Roll & Ross, 1994). Kandel & Stambaugh (1995) show that even using generalized least squares it is not possible to estimate the model correctly if the extent to which the proxy for the market portfolio differs from the theoretical market portfolio is not known.

## 3. Estimation of the Equity Risk Premium

There are three methods that can be used to estimate the ERP in any economy; firstly, the ERP can be "reversed out" of the CAPM and the observed market valuation in the equity

market of an economy. Secondly, it is possible to survey investment professionals for a direct estimate of the value that they believe reflects their investment behaviour (Graham & Harvey, 2008). The third method is to use the actual returns on assets as an unbiased estimate for the expected returns on those assets. This is the approach that is most widely used, and it is the approach that is adopted in this paper.

Attempts to empirically estimate the ERP are fraught with difficulties. These difficulties have arisen despite the fact that much of the empirical research has been conducted in economies where data availability is plentiful; for example in the United States of America good quality data is available from the year 1871. Despite this apparent richness in the data, there is little agreement on the correct estimate of the ERP for the United States (Fernandez, 2009; Claus & Thomas, 1999). There have also been studies that estimate of the ERP for smaller economies; for example Australia (Brailsford, Handley, & Maheswaran, 2007), New Zealand (McCulloch & Leonova, 2005) and Portugal (Alpalhao & Alves, 2005). These studies too show little agreement as to the correct estimate of the ERP. Surprisingly, despite the importance of the ERP to the economic performance of economies, that there have been only a few published studies that have estimated the differences of the ERP between economies. The limited amount of data has often confined such studies to more advanced Western economies (Dimson, Marsh, & Staunton, 2003, 2006; Ang & Maddaloni, 2005) although developing economies have also been studied (Salomons & Grootveld, 2003; Damodaran, 2008; Sterken, Hullegie, & Salomons, 2004).

The problem of estimating the ERP is compounded in many economies in the Asian region where far less data is available, where markets may at times be less liquid, and policy interventions may be more visible. These factors make any attempt at estimation even more daunting. Practical matters can however not be delayed while additional data is collected and a workable solution is needed for problems and issues which require immediate analysis. This study investigates the possibility of estimating the ERP for the larger market-orientated economies in the Asian region with the data that is currently available, as well as estimating the extent to which such estimates are significantly different to that of the largest economy in the world, the United States.

## 4. Empirical estimates of the ERP for Asian economies

The population of the Asian economies is approximately 4 billion people (60% of the world population). There are 46 different states in Asia, and only the largest of these economies for which data of the return on equities and risk-free assets are considered. Even for these economies there are differences in the data available and quality; shorter time series, less depth and breadth for the individual markets, and the possibility of greater regulation. These factors all contribute to the difficulties in estimating the ERP. The available data for each of the Asian economies analysed, together with the corresponding data for the United States of America (which is used as a base case) are listed in Table 1.

Table 1. Risk-free rates, returns on stock market indices, estimates of the ERP, and results of t-tests for comparison with the United States.

| Country | Series | Start date of series | Mean - full period | Mean M7 1997 - M7 2008 | P(T<=t) compared to US |
|---|---|---|---|---|---|
| China,P.R. | Money market rate | M12 1993 | 3.97 | 3.56 | |
| | Return on Hang Seng Index | M12 1986 | 0.81 | 0.20 | |
| | ERP | | -3.64 | -3.36 | 0.82778 |
| Korea | Money market rate | M8 1976 | 11.23 | 5.78 | |
| | Return on KOSPI Index | M7 1997 | 0.53 | 0.53 | |
| | ERP | | -5.25 | -5.25 | 0.11015 |
| Malaysia | Interbank overnight money | M1 1971 | 4.79 | 3.69 | |
| | Return on KLSE Index | M12 1993 | -0.08 | 0.06 | |
| | ERP | | -4.31 | -3.63 | 0.9160 |
| Thailand | Money market rate | M1 1977 | 8.48 | 4.13 | |
| | Return on SET Index | M4 1975 | 0.48 | 0.02 | |
| | ERP | | -7.55 | -4.11 | 0.6036 |
| Indonesia | Call money rate | M5 1986 | 14.85 | 16.81 | |
| | Return on Jakarta Index | M7 1997 | 0.83 | 0.83 | |
| | ERP | | -15.98 | -15.98 | 0.0000 |
| Japan | Call money rate | M1 1970 | 4.23 | 0.16 | |
| | Return on Nikkei 225Index | M1 1984 | 0.08 | -0.33 | |
| | ERP | | -2.30 | -0.49 | 0.0000 |
| Pakistan | Call money rate | M1 1970 | 8.21 | 7.51 | |
| | Return on KSE Index | M7 1997 | 1.15 | 1.15 | |
| | ERP | | -6.36 | -6.36 | 0.0073 |
| | | | | | |
| United States | Federal funds rate | M1 1970 | 6.51 | 3.79 | |
| | Return on DJ Index | M1 1970 | 0.59 | 0.26 | |
| | ERP | | -5.92 | -3.54 | n.a. |

For each economy the mean for the full period of the available data series and the mean for the overlapping period for the following variables: proxy for the risk-free rate, the return on the domestic equity market and the Equity Risk Premium. The final column is the t-static for the differences in means between each economy and the USA.

The choice of a proxy for the risk free asset has been much debated in the literature. The desirable characteristics for the proxy asset are well established; it should have zero risk of default, be traded in liquid markets, and have a duration similar to that of the risky investment. For these reasons the 10 year Treasury bond is often used in empirical studies of the ERP in the United States. The use of the rate that prevails on the money market is a viable compromise for economies where a long-term treasury is not liquid or may not even exist; in such economies this is the best indicator of changes in the interest rate structure even though

it is at the very short end of the yield curve. In order to compare the ERP between counties the rate which most closely approaches the money market rate is used, even though there might have been more suitable return series for individual countries. The data for each country was collected from the International Financial Statistics (IFS) database which is provided the International Monetary Fund. The details of the series used, as well as the start date for the series, for each of the economies, are listed in Table 1.

It is traditional to use a broad based stock index to estimate the representative risky asset for an economy. This choice of the proxy for the representative risky asset has been criticised since such an index is subject to survivorship bias; stocks of failed companies which have disappeared from the index are not represented in later time periods. Never-the-less the correction of such a bias is mitigated in a comparison between countries if it can be assumed that the effect is similar across economies. The index used for each country is listed in Table 1 and the relevant data is collected either directly from the relevant stock exchange or from the data provided by Yahoo.com.

The stock index contains sufficient information to derive the return on the index over any interval of time. In the present study monthly intervals are used, and the return on each index can be approximated by taking the natural logarithm of the change of the index over the month. The arithmetic mean of the returns for each economy is calculated over the full period for which data is available for that index, as well as for the period over which data is available for all markets (July 1997 to July 2008). These figures are reported in Table 1.
Finally, in order to calculate the ERP, the return on the market index for each period is subtracted from the return on the proxy for the risk free asset. The mean for the full period for which data is available for each economy, as well as the mean for the common period is again shown in Table 1.

## 5. Analysis of results

The value of the ERP in any economy is determined by the attitude of the marginal investor towards the trade-off between risk and return. There is no reason to suppose that the ERP will be the same or different between different economies; further more it is possible to test this hypothesis given the data that was used in constructing the ERP in this study.

Selecting a common period (July 1997 to July 2008) for each economy allows the mean ERP of any two economies to be compared. This is the largest possible interval given the limitations of the available data. As so much work has already been undertaken on the ERP for the United States it is of some interest to ask if the ERP of the Asian economies in this study are statistically different from that of the United States.

Since the variance of the estimate of the ERP for each economy is different the appropriate test is a heteroscedastic Student's t-test. The results of the comparison for each economy to the US given in the last column of Table 1. Of the seven economies analysed, the ERP of

four cannot be said to be different to that of the US. The three economies that show statistically different ERP's are Indonesia, Japan and Pakistan. The very high rate of return available on the Indonesian and Pakistan money markets, and the "lost decade" in Japan may be raised as reasons why these two economies are not comparable to the US over the sample period.

The rather surprising implication of the analysis thus far is that the best estimate for the ERP for the remaining countries might in fact be that of the United States economy. This result has the important advantage that the much more is known about the ERP in the United States for which long and accurate time series of data are available. However before this result is taken is accepted are correct, further scrutiny is called for. Two main areas of concern might be raised; are the statistical tests appropriate and are what theoretical justification can there be for these results. Both these areas of concern are addressed below.

*5.1 Additional Statistical Considerations*

The sample period is comparatively short. There are only eleven years of monthly observations (132 observations in total). This period is the maximum period for which observations for all the economies studied is available; but the relatively small number of observations will lead to larger standard errors than would be the case with a larger number of observations. However the number of observations can be increased for some of the countries by examining the entire existing data series. Using the same definitions and proceeds as before, Table 2 shows the results of comparing the ERP for each economy to that of the USA over the longest possible period for which data is avialable.

Table 2. Results of t-tests for comparison of each country's ERP with the United States over the common period (M7 1997 – M7 2008) and the longest possible series for each country.

| **Country** | **P(T<=t) compared to US M7 1997 – M7 2008 Common period** | **Longest possible period for which data is available** | **P(T<=t) compared to US for longest possible period** |
|---|---|---|---|
| China,P.R. | 0.82778 | M12 1993 – M12 2008 | 0.74976 |
| Korea | 0.11015 | M7 1997 – M11 2008 | 0.10016 |
| Malaysia | 0.9160 | M12 1993 – M9 2008 | 0.23224 |
| Thailand | 0.6036 | M4 1975 – M12 2008 | 0.00228 |
| Indonesia | 0.0000 | M7 1997 – M10 2008 | 0.0000 |
| Japan | 0.0000 | M1 1984 – M11 2008 | 0.0000 |
| Pakistan | 0.0073 | M7 1997 – M7 2008 | 0.0073 |

For each economy the t-static for the differences in mean ERP between each economy and the USA. The first t-statistic is for the common period and the second for the maximum possible period, given the limitations of the available data collection.

The result of using all the available data is that the ERP for the Thai economy switches from being indistinguishable from that of the USA to being statistically different. This result implies either there have been structural adjustments over time, or that the time period is

indeed too short to reach robust conclusions.

In addition the start and end of the data window might introduce distortions into the statistical analysis if unusual events occurred during the relatively short time frame. One advantage of a long period of data collection is that unusual events are to some extend "diluted" by the relatively abundant normal conditions. In the present study the start date of the data window coincides with a period of strong economic growth in many counties followed by two recessions in the USA. One method of dealing with this problem would be to examine sub-periods within the data window to see if similar results are obtained; however given the already short data window this will exacerbate the problem of the variance of the standard errors and would not aid in the analysis of the problem at hand.

The t-statistic is a parametric test and thus relies on a set of assumptions about the nature of the underlying variables. The result of the statistical tests used thus far might be the consequence of the violation of the assumptions underlying the t-test rather than the fact that the data series are similar. The Wilcoxon signed-rank test and the Kolmogorov–Smirnov statistic are non-parametric tests of the distance between the empirical distribution functions of two samples (Stephens, 1974). Table 3 reports the results of the Kolmogorov–Smirnov statistic over the common data period as well as the t-statistic (for easier comparison).

Table 3. The Wilcoxon signed-rank test, the Kolmogorov–Smirnov statistic, and the Student's t-test for comparison of each country's ERP with the United States over the common period (M7 1997 – M7 2008).

| **Country compared to the USA for the period M7 1997 – M7 2008** | **P(T<=t) for the heteroscedastic Student's t-test** | **p-value for the Wilcoxon signed-rank test** | **p-value for the Kolmogorov-Smirnov test** |
|---|---|---|---|
| China,P.R. | 0.82778 | 0.35030 | 0.03747 |
| Korea | 0.11015 | 0.47610 | 0.00551 |
| Malaysia | 0.91600 | 0.44520 | 0.17490 |
| Thailand | 0.60360 | 0.23440 | 0.01241 |
| Indonesia | 0.00000 | 0.00000 | 0.00000 |
| Japan | 0.00000 | 0.00000 | 0.00000 |
| Pakistan | 0.00730 | 0.01057 | 0.00001 |

For each economy the t-static and the p–values for the Wilcoxon signed-rank test and the Kolmogorov-Smirnov test for the differences in mean ERP between each economy and the USA for the period M7 1997 to M& 2008.

The null hypothesis in the Wilcoxon signed-rank test is similar to that under the Student's t-test, but does not rely on parametric assumptions, while the null hypothesis in the Kolmogorov-Smirnov test is that both series of data were drawn from the same underlying distribution. The lower the p-value the less likely the result (assuming that the null hypothesis is correct). The non-parametric tests lead to mixed results; the Wilcoxon results support the parametric results obtained earlier (with Thailand once again not significantly different to the USA), while the Kolmogorov-Smirnov test results show that there is only evidence that the ERP in Malaysia and the USA are similar.

*5.2 Theoretical Justifications for Similarity of ERP's between Countries*

It might seem improbable that the ERP should be similar between two differ economies. If the economies were in some sense "closed" then local factors which affect the ERP are likely to be different in each economy, resulting in different ERP in each. Factors which influence the risk appetite in an economy, expectations of future economic activity, saving rates and inflation all affect the ERP and are mostly different between the countries studied. The risk appetite itself is a function of more than one local factor; the age distribution of the population being the most obvious.

Two recent rends would however mitigate against the arguments for a unique ERP for each economy. Firstly, the increasing extent to which economies have become integrated with one another, especially in financial markets. The Asian financial crisis of 1997 saw the contagion of the currency markets of emerging markets (Hunter, Kaufman, & Kreuger, 1999) while the present global financial crisis has brought many financial markets and economies into a form of synchronicity.

The second factor that would tend to equate the ERP between countries is the growth of portfolio investment and foreign direct investment across economic boundaries. Since prices, and therefore returns, are set at the margin and as the flows of portfolio investment are often substantial, the ERP might be heavily influenced by economic agents outside of the countries boarders.

## 6. Conclusion

Knowledge of the ERP is an important statistic for the efficient allocation and valuation of capital goods. The paucity of data in some economies has made estimates of this measure difficult, thus increasing the uncertainty in the estimates.

This study has demonstrated that in the period under examination there is no reason not to reinforce the estimate of the ERP in large market-orientated economies in Asia with estimates derived from the economy of the United States. At the very least significant deviations from the United States estimate should be carefully evaluated before the statistic is used in further analysis.

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