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# [Equity Premium Puzzle: Asian Countries Review]

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# ABSTRACT

This paper concentrates on one of the most famous puzzles in asset pricing, the equity premium puzzle, which was first identified by Mehra and Prescott (1985). The purpose of the paper is to test the existence of the equity premium puzzle in Asian countries, including China-Hong Kong, China-Mainland, China-Taiwan, India, Indonesia, Japan, Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka and Thailand. By using the paper of Campbell (1998) as a guideline for methodology, the results indicate that the equity premium puzzle is not a robust phenomenon in Asian countries. Also, the equity premium puzzle exists in all developed markets. This is, however, certainly not the case in all emerging markets.

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# 1 Introduction

The Capital Asset Pricing Model (CAPM), an asset-pricing model based on equilibrium with agents having mean-variance preference, gives us basic intuition about the trade-off between risk and return. Usually, the riskiness of an asset is compensated by a higher return, which can be illustrated by the CAPM. Mehra and Prescott (1985) showed that the average annual return on the stock market over the last 110 years has been an estimated 8.06%, while the average annual return on short-term debt was only 1.14% over the same period. This difference between stock market return and short-term debt return is called the equity premium and took a value of 6.92% an average over the last 110 year. This high difference is relatively interesting, because from a logical point of view it would mean that investors receive a higher compensation for buying shares than for lending money (issuing short-term debts). Consequently, this would imply that stocks are much riskier than issuing short-term debts. However, is this true: are stocks much riskier than short-term debt to justify a six percentages differential in their rates of return?

Mehra and Prescott (1985) were among the first that identified the equity premium puzzle, they showed that the equity premium puzzle was often associated with a high level of risk aversion. Over the last two decades, as one of the most famous puzzles in asset pricing, the equity premium puzzle has been intensively investigated by many economists and researchers. Consequently, there have been several explanations and theories developed concerning the equity premium puzzle, for instance, market segmentation (Mankiw and Zeldes, 1991), myopic loss aversion (Benartzi and Thaler, 1995), survival bias (Brown and Goetzmann, 1995), habit formation of investors (Campbell and Cochrane, 1999) and disappointment aversion (Ang, Bekaert and Liu, 2005).

The purpose of this paper is to test the existence of the equity premium puzzle in Asian countries; however it is not our goal to find an explanation for the existence or absence of this equity premium. Even though there is a substantial amount of existing literature concerning the equity premium puzzle, only few papers investigate this phenomenon in Asian countries. Most papers include only developed markets in their research. Most of these developed markets are located in Western countries, such as the USA and European countries. Therefore Asian countries have received so far only little attention.

There are many differences between Asian countries and Western countries, but the most prominent ones are in cultural background, market structure and stock market. Compared to the US and the European stock market, many stock markets in Asian countries were founded rather recently and soon started to expand rapidly in their respective national (and international) areas, except for Hong Kong, Japan and Singapore. Thus, the stock market is immature and less developed in Asia (Fernald and Rogers, 2002). Moreover, the stock market in Asia is much more influenced by government, whereas the regulation system is far from complete (Wu, 2007). Furthermore, individual investors in Asia are less professional than those in Western countries (Claus and Thomas, 2001). Asian individual investors view buying stock as speculation rather than investment and lack knowledge of the financial market. Last but not least, it is necessary to take into account that stock markets in Asian countries are more volatile than those in U.S. or European countries. Given these differences, having an empirical test of the equity premium puzzle in Asian countries appears to be meaningful.

In this paper, I investigate 13 countries and districts to test the existence of the equity premium. The countries to be closely examined are: China-Hong Kong, China-Mainland, China-Taiwan, India, Indonesia, Japan, Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka and Thailand.

The paper is divided in five different sections, where section 1 gives a brief introduction of the equity premium puzzle and also points out differences between Asian and Western countries in the stock market. The second section concentrates on the literature review of the equity premium puzzle. It consists of several parts, including general mode modification, explanation for the equity premium puzzle from the traditional economics aspect and the behavioural economics aspect and empirical study of equity premium puzzle. The methodology, which is mostly based on the paper of Campbell (1998), will be discussed in Section 3. Next, section 4 focuses on data sources and descriptive analysis of the data. The Empirical results on whether there is equity premium puzzle in Asian countries will be discussed in section 5. The final section is the conclusion and discussion part, which summarizes the entire paper, identifies the limitations of study and makes suggestion for further research.

# 2 Literature Review

The equity premium puzzle was firstly identified by Mehra and Prescot in 1985. They investigated U.S. data from the period of 1889-1978 and concluded that the average real annual yield on the stock market was seven percents and that the average yield on short-term debt was less one percent. Mehra and Prescott (1985) further demonstrated that the equity risk premium does not link up with the implication of a standard rational model. After that, there is a number of fruitful literature works regarding the rationalization of the equity premium puzzle.

## *2.1 Explanations for the equity premium puzzle – traditional economic aspect*

Constantinides (1990) introduced that the equity premium puzzle could be resolved by habit persistence. He proved that “the equity premium puzzle is resolved in a rational expectations model, once we relax the time separability of preferences and allow for adjacent complementarily in consumption, a property known as habit persistence.” Investors tend to be more sensitive to short-term consumption fluctuation and thus then require a higher premium given the degree of risk aversion because of the time non-separability of consumption and positive subsistence rate of consumption. Constantinides’s findings were further developed by Campbell and Cochrane (1999). In their habit formation mode, utility function with both consumption growth process and a slow-moving external habit is “independently and identically distributed”. Moreover, Campbell and Cochrane (1999) claimed that investor require higher premium due to stocks’ bad performance during recession periods, rather than the price fluctuation itself which may reduce investors’ wealth. They used this model to explain a wide variety of dynamic asset pricing phenomena.

Another explanation comes from Mankiw and Zeldes (1991). They pointed out that only one quarter of U.S. families own stock and used 17 years of data from the Panel Study of Income Dynamics to examine consumption differences between stockholders and non-stockholders. Consequently, Mankiw and Zeldes (1991) proved that aggregate consumption of stockholders substantially differs from that of and non-stockholders, despite the limitations of substantial measurement error, a relatively short time series and the availability of only food consumption. Moreover, Mankiw and Zeldes (1991) also pointed out that stockholder consumption is more volatile and highly correlated with excess return than non-stock consumption. The differences between stockholders and non-stockholders give an explanation of the size of equity premium. These findings became the keystone for further research in resolving the equity premium puzzle.

Brown, Goetzmann and Ross (1995) assessed that the available data for the empirical analysis may suffer from a so-called survival bias, making estimates of the equity risk premium too high. This bias was the result of simply missing data, since most stocks which survived during those time periods were recorded, whereas stocks which had low earnings and were abolished were missing. For instance, it is possible that a longer period of time would include severe crises, implicating discontinuous data series. The effect of survival bias turned out to be substantial but largely insufficient to explain the equity premium puzzle.

### *2.2 Explanations for equity premium puzzle – behavioural economic aspect*

Benatzi and Thaler (1995) attempted to rationalize the equity premium puzzle under behavioural explanation. The solution to the puzzle is myopic loss aversion, proposed by Benatzi and Thaler (1995). The myopic loss aversion combines loss aversion with frequent evaluations. Based on the prospect theory, developed by Kahneman and Tversky (1979), loss aversion refers to the larger sensitivity that individual investors have to losses than to gains, making people demand higher premium to compensate the larger return variability. On the other hand, investor’s decision-making is largely influenced by how frequent check the performance of purchased stocks. Benatzi and Thaler (1995) performed several tests to determine whether myopic loss aversion explains the equity premium puzzle. The results turned out that investors are myopic loss aversion and short-sighted. Investors ask for higher return when investing. Furthermore, Benatzi and Thaler (1995) based their research not only on individual investors but also on institutional investors, such as pension fund and endowments. They showed that institutional investors present more myopic loss aversion than individual investors, mostly because of agency problem.

Another explanation from behavioural finance view is disappointment aversion. Ang, Bekaert and Liu (2005) relied on the axiomatic Disappointment Aversion framework of Gul (1991). According to Ang, Bekaert and Liu (2005), “Gul’s preferences are a one-parameter extension of the expected utility framework and have the characteristic that good outcomes, i.e., outcomes above the certainty equivalent, are downweighted relative to bad outcomes.” They pointed out that investors do not invest into stock market even though there is a large premium, because their expectation is less likely to be met. Nevertheless, Investors turn to another investment which has lower expected return in absolute terms but higher possibility to fulfil expectation.

Last but not least, ambiguity aversion also contributes to rationalize the equity premium puzzle. Olsen and Troughton (2000) provided evidence to explain the equity premium puzzle caused by ambiguity aversion. When investor knows less about the profit distribution, the investor is more ambiguity averse. They used questionnaire from professional investment managers to gather data. The findings indicated that even professional investment managers are ambiguity averse. As a consequence, investors need higher return to compensate ambiguity of stock market. Moreover, Erbas and Mirakhor (2007) conducted an empirical study in order to find out whether equity premiums may reflect ambiguity aversion. They used Word Bank institutional quality indexes and other proxies for the degree of ambiguity in the sample countries. In the end, they found out that indeed equity premiums reflect ambiguity aversion. The outcome was statistically significant, which proposes that ambiguity aversion may be a possible explanation for the equity premium puzzle.

### 2.3 Empirical study of equity premium puzzle

Campbell (1998) investigated the equity premium puzzle in 11 western countries, including Australia, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom, and the United States. He reported that the average real returns of stocks are almost 5%, whereas short-term debt has seldom delivered average returns above 3%. Also, he showed that the correlations between real consumption rate and stock returns are variable in different countries. Finally, Campbell (1988) concluded that the equity premium puzzle is a robust phenomenon in these countries, mainly because the coefficients of risk aversion, much greater than 10 (the upper boundary set by Mehra and Prescott (1985)), are very large. Nevertheless, the data used in this study has several flaws, especially the fact that measure of quarterly consumption dose not exclude durable goods, except for the data for the U.S.. Consequently, the assumptions of the model might be violated leading to low validity of the findings.

Applying the Mehra and Prescott model, Hibbard (2000) examined the existence of the equity premium puzzle in New Zealand. He used quarterly financial security returns and consumption data from 1965-1997. Moreover, Hibbard (2000) excluded durable goods consumption by using non-durables plus services consumption. However, the data is still limited. Since Treasury bill data are not available in New Zealand prior 1978, in this paper, Hibbard (2000) used government bond as risk-free rate, while Mehra and Prescott (1985) employed yields on 90 day Treasury bill. The results of this paper indicated that calibration of Consumption Based Asset Pricing Model is unable to explain the high equity premium in New Zealand, which means New Zealand the equity premium puzzle existed in New Zealand during the researched period.

There are empirical studies of the equity premium puzzle in emerging countries, such as Brazil. Cysne (2005) used quarterly data from 1992:1-2004:2 to test the existence of the equity premium puzzle in Brazil. In the paper, based on the model of Mehra and Prescott (1985), Cysne (2005) applied two different methods which are approximations under lognormality and calibration. Moreover, the model used by Mehra and Prescott (1985), either with additive or recursive preferences, is not able to rationalize the equity premium observed in the Brazilian data. Namely, the results indicated that the equity premium puzzle existed in Brazil. However, Cysne's conclusion differed from those obtained by Sampaio and by Bonomo and Domingues. In order to understand different conclusions, Cysne (2005) used the parameter values reported by these authors and tried to reproduce their conclusion under the assumption of lognormality of the consumption growth and of the returns on stocks. Consequently, the coefficients of risk aversion are 1175 and 561.75, which are outside the usually allowable range, implying the existence of the equity premium puzzle in Brazil. The result contrasted with those obtained by Sampaio and by Bonomo and Domingues, suggesting that the lognormal approximation may be a poor approximation in this case.

The equity premium puzzle has been studied to a much less extent in Asian countries than in the western countries. However, I did find some results for the Korean and China market. Namely, Park and Kim (2009) pointed out that assert markets in Korea are much different from those in the U.S. The differences result from a short history of assert market data, no representative risk-free rate proxy and small equity premium in Korea market. However, Park and Kim (2009), based on Generalized Method of Moments and Hansen-Jagannathan bounds, showed that the equity premium puzzle exists in Korea despite the small equity premium, suggesting that the volatility of consumption and the correlation between consumption and asset returns matters more than the absolute magnitude of equity premium.

Xiao and Wang (2004) concluded that there is no equity premium puzzle in China by adopting generalized method of moments (GMM). They used sample period data from July 1993 to December 2003. In the end, Xiao and Wang (2004) found that the degree of risk aversion is significantly lower than the bound set by Mehra and Prescott (1985). Nevertheless, there are also some scholars confirming the existence of the equity premium puzzle in China. Liu and Wang (2005) employed A-share return of Shanghai Stock Exchange as equity return and adopt one-year deposit rate as proxy of risk-free rate, from 1992 to 2001. In this paper, Liu and Wang (2005) got the coefficient of risk aversion of 52, indicating the existence of the equity premium puzzle in China.

# 3 Methodology

## *3.1 The stochastic discount factor*

By using the paper of Campbell (1998) as a guideline for methodology, we can find that the investor's two-period consumption problem may help to recognize the equity premium puzzle. Assume the investor (denoted by k) with a concave utility function can trade some asset *i* without limitation (no market frictions) and the asset held is expected to generate a gross return of ($1+R_{i,t+1}$) from period t to period t+1. The consumption of the investor k at period t is $C_{kt}$which has time-separable utility $U(C_{kt})$. Moreover, $\delta$ is the discount factor of future consumption, which means that the investor values the future consumption less than the current consumption. The investor aims to maximize the two period utilities subject to the budget constraints. Hence after the first order condition, we can get the Euler equation

$$U'(C_{kt}) = \delta E_t\left[\left(1 + R_{i,t+1}\right)U'\left(C_{k,t+1}\right)\right] \tag{1}$$

where $U'(C_{kt})$ stands for the loss of current marginal utility by consuming a dollar less at the time t, while the right hand side represents the expected marginal utility benefit from investing and selling the dollar in asset i at period t and t+1 respectively. We can rewrite this equilibrium by dividing (1) by $U'(C_{kt})$ to get the stochastic discount factor as:

$$1 = E_t\left[\left(1 + R_{i,t+1}\right) M_{k,t+1}\right] \tag{2}$$

in which $M_{k,t+1} = \delta U'(C_{k,t+1})/U'(C_t)$ is called the stochastic discount factor or the pricing kernel. It is also the marginal rate of substitution, which gives the rate at which an agent is willing to substitute current consumption for future consumption.

Now we can extent this representative agent (investor) problem to a more general case. In fact, although different investors may have different utilities and so on, many stochastic discount factors can be developed. We assume investors can trade with no transaction costs and the absence of arbitrage in markets can ensure the existence of positive stochastic discount factor. Therefore we can safely drop subscript k from equation (2),

$$1 = E_t\left[\left(1 + R_{i,t+1}\right) M_{t+1}\right] \tag{3}$$

Moreover, idiosyncratic variation can be eliminated through trading with one another, therefore the stochastic discount factor $M_{t+1}$ will be unique in complete markets. This will impact our model which can be made clear when describing the expectation of the multiplication as the multiplication of expectations plus covariance in equation. This is represented in the following equation (4):

$$E_t\left[\left(1 + R_{i,t+1}\right) M_{k,t+1}\right] = E_t\left[\left(1 + R_{i,t+1}\right)\right]E_t\left[\, M_{k,t+1}\right] + Cov_t\left[R_{i,t+1}, M_{t+1}\right] \tag{4}$$

By substitution into (3) and rearranging,

$$1 + E_t\left[R_{i,t+1}\right] = \frac{1 - Cov_t\left[R_{i,t+1}, M_{t+1}\right]}{E_t\left[\, M_{t+1}\right]} \tag{5}$$

One would expect a low covariance with the stochastic discount factor if an asset is accompanied with high simple return. Moreover, this asset is expected to deliver low returns as the investor’s marginality utility increases till a high point. As a consequence, when the asset does not generate enough returns when it is needed, so basically when investor wealth/liquidity preferences are not met, the investor will demand a larger risky premium for holding the asset.

Because the simple riskless return is not correlated with stochastic discount factor, (thus$Cov_t\left[R_{f,t+1}, M_{t+1}\right] = 0$) equation (5) for the riskless return can be written as:

$$1 + R_{f,t+1} = \frac{1}{E_t\left[\, M_{t+1}\right]} \tag{6}$$

Substituting into (5) and rewriting gives

$$1 + E_t[R_{i,t+1}] = (1 + R_{f,t+1})(1 - Cov_t[R_{i,t+1}, M_{t+1}]) \tag{7}$$

Following Hansen (1983), it is assumed that the joint conditional distribution as well as the stochastic discount factor are both lognormal and homoskedastic. A lognormal distributed variable X can be defined with the following property:

$$\log E_t X = E_t \log X + \frac{1}{2} Var_t \log X \tag{8}$$

in which $Var_t \log X = E_t[(\log X - E_t \log X)^2]$ Moreover, if X is conditionally homoskedastic, it can be further developed to Var( $\log X - E_t \log X$ ). Based on these assumptions and by taking logs of (3) one can find the following equation:

$$0 = E_t r_{i,t+1} + E_t m_{t+1} + \frac{1}{2}[\sigma_i^2 + \sigma_m^2 + 2\sigma_{im}] \tag{9}$$

where $m_t = \log M_t$ , $r_{it} = \log(1 + R_{it})$ , $\sigma_i^2$ is the unconditional variance of log return $Var(r_{i,t+1} - E_t r_{i,t+1})$ , $\sigma_m^2$ stands for the unconditional variance of innovation to the stochastic discount factor $Var(m_{t+1} - E_t m_{t+1})$ , and $\sigma_{im}$ stands for the unconditional covariance $Cov(r_{i,t+1} - E_t r_{i,t+1}, m_{t+1} - E_t m_{t+1})$

The time-series and cross-sectional implication can both be seen from the equation (9). From an asset with riskless return $r_{f,t+1}$, return innovation variance $\sigma_f^2$ and covariance $\sigma_{fm}$ will both be zero, thus

$$r_{f,t+1} = -E_t m_{t+1} - \frac{\sigma_m^2}{2} \tag{10}$$

Which also can be derived from the log counterpart of (6); and the expected excess return on risky assets over riskless rate can be expressed after subtracting equation (10) from (9).

$$E_t[r_{i,t+1}, r_{f,t+1}] + \frac{\sigma_i^2}{2} = -\sigma_{im} \tag{11}$$

Which is the log counterpart of (7), and the right hand side means that the log risk premium is determined by the negative of the covariance of asset with stochastic discount factor.

Based on the reason $\rho_{im} \geq -1$ , $-\sigma_{im} \leq \sigma_i \sigma_m$ substituting into (11),

$$\sigma_m \geq \frac{E_t[r_{i,t+1}, r_{f,t+1}] + \sigma_i^2/2}{\sigma_i} \quad (12)$$

The right hand side can be defined as the excess log return on an asset divided by standard deviation of asset return – a logarithmic Sharpe ratio for the asset. This equation basically states that the standard deviation of the log stochastic discount factor is greater than the right hand side.

### *3.2 Consumption-Based Asset Pricing with Power Utility*

Following Mehra and Prescott (1985) and other studies on equity premium puzzle, I assume an investor who maximizes a time-separable power utility function defined over aggregate consumption $\mathrm{C_t}$,

$$U(C_t) = \frac{C_t^{1-\gamma} - 1}{1-\gamma} \quad (13)$$

Which is scale-invariant with constant return distribution ($\gamma$ is the coefficient of risk aversion), so when investors have different wealth level but same power utility function, they can be aggregated into a single representative investor with the same utility function.

Power Utility implies that marginal power utility $U'(C_t) = C_t^{-\gamma}$, and that stochastic discount factor $M_{t+1} = \delta(C_{t+1}/C_t)^{-\gamma}$. Similar to the conditionally lognormal stochastic discount factor, aggregate consumption will have the same property. To apply such assumption to expositional convenience, log stochastic discount factor is $m_{t+1} = \log\delta - \gamma\Delta c_{t+1}$, in which $c_t = \log(C_t)$, so equation (9) arrives at the following:

$$0 = E_t r_{i,t+1} + \log\delta + \gamma E_t \Delta c_{t+1} + \frac{1}{2}[\sigma_i^2 + \gamma^2\sigma_c^2 - 2\gamma\sigma_{ic}] \quad (14)$$

Where $\sigma_c^2$ and $\sigma_{ic}$ state the unconditional variance of log consumption innovations and unconditional covariance of innovations respectively. Equation (10) becomes:

$$r_{f,t+1} = -\log\delta + \gamma E_t \Delta c_{t+1} - \frac{\gamma^2\sigma_c^2}{2} \quad (15)$$

which tells that the riskless real rate is linear in expected consumption with slope coefficient equal to coefficient of relative risk aversion. The conditional variance of consumption growth has negative effect, and it is understood as a precautionary saving effect. Equation (11) arrives at:

$$E_t\left[r_{i,t+1} - r_{f,t+1}\right] + \frac{\sigma_i^2}{2} = \gamma\sigma_{ic} \quad (16)$$

I use equation (16) to test whether there is the equity premium puzzle in each country. Based on this equation, the equity premium is determined by the coefficient of relative risk aversion and the covariance of consumption growth with stock and short-term debt returns. Generally speaking, there is the equity premium puzzle if the coefficients of risk aversion are greater than 10. This value would appear to be at the higher end of acceptable values of relative risk aversion, and is not considered plausible by Mehra and Prescott (1985).

# 4 Data and descriptive statistics

### *4.1 Data resource*

The stock return index comes from Morgan Stanley Capital International (MSCI). Macroeconomic data on risk-free interest rate, consumer price index, private consumption and population are obtained from the International Financial Statistics (IFS) of the IMF (International Monetary Fund) and DataStream. All data are denominated in local currency. Both the frequency and the time span of the dataset are constrained by data availability. I work with data from the following 13 countries and districts: China-Hong Kong, China-Mainland, China-Taiwan, India, Indonesia, Japan, Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka and Thailand. Since only annual data is available, I use yearly samples of developed countries and districts (Hong Kong, Japan and Singapore) for the period from 1971 to 1977, whereas the observation from the emerging countries dates from 1988 and from 1993. Quarterly data are only available in Korea, Hong Kong, Japan and Singapore.

For the sake of simplicity and due to the limited availability of data, I did not use dividend yield to calculate the gross return of stock market. Therefore the gross return for each period is computed as $R_t = \ln (P_t / P_{t-1})$, where $P_t$ is the return index at the end of year $t$.

Excess returns are the real stock return minus the real risk-free interest rate. I used the Treasury-bill rate as the risk-free rate. The data of Treasury-bill rate is in general available in most of the examined countries. However, some countries did not have any data about treasury-bill rates, therefore I used in these cases the money-market rate as a proxy. For countries where both data on treasury-bill rate and money-market rate were not accessible, I used the deposit rate as a substituted variable; this is the case for China-mainland.

Real per capita consumption is computed by multiplying the private consumption by 100, after which it is divided by the consumer price index and the number of population. Real consumption growth is the log difference in current and one-period lagged per capita consumption. Nominal data are converted to real terms using the local Consumer Price Index.

### *4.2 Descriptive analysis of the data*

**Table 1**

**Stock and bill return**

| Country | Sample period | $\overline{r_e}$ | $\sigma(r_e)$ | $\overline{r_f}$ | $\sigma(r_f)$ |
|---|---|---|---|---|---|
| **Japan** | 1971-2009 | 3.416 | 25.999 | -0.177 | 3.038 |
| **Singapore** | 1973-2008 | 1.536 | 34.740 | -0.414 | 4.047 |
| **Hong Kong** | 1977-2009 | 9.309 | 32.912 | 0.956 | 3.463 |
| **Indonesia** | 1988-2009 | 8.907 | 51.408 | 2.844 | 4.743 |
| **Korea** | 1988-2009 | 4.268 | 35.847 | 3.779 | 3.014 |
| **Malaysia** | 1988-2009 | 6.487 | 32.665 | 1.439 | 1.357 |
| **Philippines** | 1988-2009 | 2.882 | 39.480 | 3.357 | 3.109 |
| **Taiwan** | 1988-2009 | 4.735 | 41.983 | 2.566 | 2.241 |
| **Thailand** | 1988-2009 | 4.345 | 45.923 | 2.171 | 0.028 |
| **China-Mainland** | 1993-2009 | 0.091 | 44.387 | 3.376 | 4.709 |
| **India** | 1993-2009 | 6.530 | 38.874 | 1.458 | 3.859 |
| **Pakistan** | 1993-2009 | 3.581 | 53.530 | 0.973 | 3.658 |
| **Sri Lanka** | 1993-2009 | 1.820 | 46.615 | 3.218 | 3.598 |
| | | | | | |
| **Singapore** | 1975.3-2009.4 | 6.472 | 26.998 | 0.444 | 1.529 |
| **Japan** | 1980.3-2009.4 | 2.876 | 21.959 | 1.217 | 1.247 |
| **Hong Kong** | 1981.2-2009.4 | 7.851 | 31.529 | 1.771 | 2.231 |
| **Korea** | 1996.1-2009.4 | 5.719 | 38.607 | 3.355 | 2.017 |

Table 1 shows the annualized mean and annualized standard deviation of the real stock return and the real risk-free rate for each country. For quarterly numbers, means are multiplied by 400 and standard deviations are multiplied by 200 for annualizing percentage purpose. There are several stylized facts we have found:

- Most real returns on stock markets are between 1.5 and 10. However China with a real return of 0.091 is the only exception. It should be paid attention to this extremely low return in the Chinese stock market. Jue (2006) showed that Chinese A-Share market provides an equity premium of 8.7% during 1992-2000, however, during 2001-2005, the equity premium was -11.89%. The high volatility in Chinese stock market helps to explain the extremely low return during 1993-2010. Another important phenomenon I noticed is the relatively stable average return on short-term debt. In most countries it ranges approximately from 0.9 to 3.8; however Japan and Singapore (with their yearly observations) are outliers in this respect.
- Annualized standard deviations of stock returns are much more volatile than those of returns on short-debt. Another noteworthy fact is that the annualized standard deviations of stock returns in quarterly data are less volatile than those in yearly data.

## Table 2

### Excess return and consumption

| Country | Sample period | $er_e$ | $\sigma(er_e)$ | $\overline{\Delta c}$ | $\sigma(\Delta c)$ |
|---|---|---|---|---|---|
| **Japan** | 1971-2009 | 3.593 | 25.389 | 1.872 | 2.351 |
| **Singapore** | 1973-2008 | 1.949 | 32.336 | 3.468 | 4.707 |
| **Hong Kong** | 1977-2009 | 8.353 | 33.301 | 3.667 | 4.336 |
| **Indonesia** | 1988-2009 | 6.063 | 52.610 | 5.597 | 3.714 |
| **Korea** | 1988-2009 | 4.890 | 36.798 | 5.187 | 5.370 |
| **Malaysia** | 1988-2009 | 5.048 | 32.463 | 4.679 | 6.263 |
| **Philippines** | 1988-2009 | -0.474 | 39.729 | 2.061 | 1.364 |
| **Taiwan** | 1988-2009 | 2.169 | 42.128 | 2.672 | 2.783 |
| **Thailand** | 1988-2009 | 2.174 | 46.446 | 3.736 | 4.407 |
| **China-Mainland** | 1993-2009 | -3.285 | 44.432 | 12.717 | 6.893 |
| **India** | 1993-2009 | 5.072 | 39.363 | 3.626 | 2.447 |
| **Pakistan** | 1993-2009 | 2.608 | 52.663 | 4.180 | 5.474 |
| **Sri Lanka** | 1993-2009 | -1.398 | 45.647 | 2.899 | 2.548 |
| | | | | | |
| **Singapore** | 1975.3-2009.4 | 6.028 | 26.752 | 1.257 | 4.310 |
| **Japan** | 1980.3-2009.4 | 1.660 | 21.991 | 0.861 | 2.484 |
| **Hong Kong** | 1981.2-2009.4 | 6.080 | 31.373 | 2.782 | 8.777 |
| **Korea** | 1996.1-2009.4 | 2.363 | 38.922 | 3.214 | 7.267 |

Table 2 gives information about real excess return and real consumption growth. The table is organized in the same way as Table 1. The following results were found:

- Most countries experienced positive excess return, however in some countries this is not the case. These exceptions occur in the Philippines, Sri Lanka and China-Mainland. Also, the standard deviations of excess returns which range from 25 to 53 approximately are highly volatile, resulting from highly volatile standard deviations of stock returns.
- Both the mean and standard deviation of real consumption growth are stable, indicating consumption smoothing. Only China's average real consumption growth is an exception with a consumption growth above 10. A possible explanation for this is might be its fast growing economy, which implies both higher production and consumption.

# 5 Results

In this section, result and analysis of equity premium puzzle will be presented. Table 3 describes the equity premium puzzle by using equation (16). Where $\overline{aer_e}$ illustrates the left hand side of equation (16) and basically is the average excess stock return plus one-half the variance of the excess stock return. Moreover, $\sigma(er_e)$ is the annualized standard deviation of excess return, whereas $\sigma(\Delta c)$ is the annualized standard deviation of real consumption growth. The fourth and the fifth column report correlation and covariance between real excess stock returns and real consumption growth respectively. The last two columns contain coefficients that are indicators for risk aversion. RRA(1) states risk aversion coefficient which is calculated by using equation (16) directly. RRA(2) equals to $\overline{\mathrm{aer_e}}$ divided by one, setting the correlation between excess stock return and real consumption growth is one. In a standard model, real consumption growth should be positively correlated with excess return. In order to know the puzzle coming from low correlation between excess return and real consumption growth, RRA(2) is used .

When looking at the results in Table 3, I find that all countries with quarterly data have an equity premium puzzle. The coefficients of risk aversion are all above 10 which is the benchmark for an existing equity premium puzzle. However, regarding to countries with yearly sample, the equity premium puzzle is a robust phenomenon only in Taiwan, Philippines, Indonesia, India, Hong Kong, Japan, and Singapore. Pakistan and China-Mainland show negative RRA(1) due to negative correlation between excess return and real consumption growth. The coefficients of risk aversion are below 10 in Malaysia, Thailand,

## Table 3
### The equity premium puzzle

| Country | Sample period | $\overline{\alpha er_e}$ | $\sigma(er_e)$ | $\sigma(\Delta c)$ | $\rho(er_e, \Delta c)$ | $cov(er_e, \Delta c)$ | RRA(1) | RRA(2) |
|---|---|---|---|---|---|---|---|---|
| **Japan** | 1971-2008 | 6.764 | 25.716 | 4.701 | 0.562 | 33.961 | 19.916 | 11.189 |
| **Singapore** | 1973-2007 | 8.566 | 30.675 | 9.415 | 0.399 | 57.652 | 14.857 | 5.932 |
| **Hong Kong** | 1977-2008 | 12.617 | 33.088 | 8.671 | 0.432 | 61.912 | 20.379 | 8.795 |
| **Indonesia** | 1988-2008 | 17.227 | 52.450 | 7.591 | 0.047 | 9.309 | 185.067 | 8.654 |
| **Korea** | 1988-2008 | 4.998 | 36.340 | 10.966 | 0.395 | 78.800 | 6.342 | 2.508 |
| **Malaysia** | 1988-2008 | 8.673 | 32.354 | 12.629 | 0.758 | 154.817 | 5.602 | 4.245 |
| **Philippines** | 1988-2008 | 5.108 | 39.359 | 2.681 | 0.287 | 15.141 | 33.734 | 9.680 |
| **Taiwan** | 1988-2008 | 8.258 | 41.456 | 4.720 | 0.242 | 23.677 | 34.878 | 8.441 |
| **Thailand** | 1988-2008 | 10.490 | 46.217 | 8.884 | 0.685 | 140.578 | 7.462 | 5.110 |
| **China-Mainland** | 1993-2008 | 3.208 | 43.896 | 13.786 | -0.214 | -64.795 | -4.950 | 1.060 |
| **India** | 1993-2008 | 8.658 | 37.754 | 4.894 | 0.157 | 14.535 | 59.563 | 9.371 |
| **Pakistan** | 1993-2008 | 12.767 | 52.292 | 10.948 | -0.200 | -57.328 | -22.270 | 4.460 |
| **Sri Lanka** | 1993-2008 | 0.261 | 39.369 | 5.096 | 0.667 | 66.941 | 0.391 | 0.261 |
| | | | | | | | | |
| **Singapore** | 1975.3-2009.3 | 6.957 | 26.820 | 4.316 | 0.249 | 28.790 | 24.163 | 6.010 |
| **Japan** | 1980.3-2009.3 | 4.466 | 22.085 | 2.493 | 0.138 | 7.582 | 58.906 | 8.111 |
| **Hong Kong** | 1981.2-2009.3 | 9.831 | 31.509 | 8.788 | 0.017 | 4.807 | 204.507 | 3.551 |
| **Korea** | 1996.1-2009.3 | 12.267 | 39.281 | 7.334 | 0.312 | 90.022 | 13.627 | 4.258 |

Korea and Sri Lanka. It should be noted that in Korea there exists an equity premium puzzle in the quarterly sample; however it does not exist in the yearly sample. More importantly, from these results we can infer a general conclusion that all countries that have a RRA(2) below 10 have no premium puzzle.

### 5.1 Developed Market vs. Emerging Market

The countries are divided into developed and emerging market based upon openness and development criteria in the Asian stock market. Based on these criteria are Hong Kong, Japan and Singapore defined as countries with developed markets, whereas the rest of the countries are defined as countries with emerging markets. Table 1 states that the volatilities of the stock market returns of the developed markets are smaller than those of the emerging markets. Moreover, the returns on short-debt in developed markets are less than the returns in emerging markets. Also, in all developed markets exists an equity premium puzzle according to result of Table 3, however this is certainly not the case in all emerging markets.

### 5.2 Compare the results with previous studies

Regarding to Korea with quarterly sample, my conclusion is consistent with the outcome which Park and Kim (2009) presented. However, this is not the case in China. In my study, there is no the equity premium puzzle in China, while Liu and Wang (2005) got an opposite opinion. Two main factors may explain the discrepancies between my results and those of Liu and Wang (2005). The first regards the difference in the data sets. I used sample period from 1993 to 2009, whereas Liu and Wang (2005) employed shorter sample period which is 1992-2001. The negative equity premium after 2001 can not contribute the equity premium puzzle. Moreover, it should be noted that the Chinese equity risk premium is highly volatile. According to Jue (2006), Chinese A-Share market provides an equity premium of 8.7% during 1992-2000, however, during 2001-2005, the equity premium is -11.89%. The second possible explanation is difference in the proxy of equity returns. Even though both Liu and Wang (2005) and I adopt one-year deposit rate as proxy of the risk-free rate, we get equity return from different data source. Liu and Wang (2005) measured equity return only on the Chinese A-Share market, in contrast, I use yearly MSCI index to calculate equity return. MSCI index include A, H, B, Red and P Chip share classes as well as Hong Kong-listed companies. Given these two factors, it is understandable to obtain different conclusion for the Chinese market.

## 6 Conclusion and Discussion

In this paper, I test the existence of the equity premium puzzle in Asian countries. The results indicate that the equity premium puzzle is not a robust phenomenon in Asian countries. The equity premium existed only in Taiwan, Philippines, Indonesia, India, Hong Kong, Japan, Singapore and Korea.

However, there are several limitations to the conclusions of in this paper. One drawback of present analysis is small sample size. The research period is endeavoured to be longer to incorporate more data and minimize short-term biases, however the history of assert return is very short in emerging markets. One possible way to fix this problem is considering higher frequency data such as quarterly or monthly data. Conducting the analysis with large sample size may add to the credibility and correctness of study. However, consumption data has low frequency, I cannot find monthly consumption data.

Another limitation is the existence of risk-free assets in some Asian countries. Previous studies used 3-month Treasury bill rate as risk-free rate in U.S., however, some Asian countries do not have such asset, such as Korea and Hong Kong. As a consequence, I used deposit rate as a substitution. This effect may influence the final result on whether existence of the equity premium puzzle.

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# APPENDIX

## Data appendix

## China-Hong Kong

1. Sample dates: 1977 to 2008 and 1981 Q2 to 2009 Q3.
2. Yearly and quarterly Household Consumption Expenditure (seasonally adjusted), at current prices, from IMF's International Financial Statistics.
3. Yearly population, from IMF's International Financial Statistics. The yearly statistics were used to interpolate quarterly population figures, assuming constant growth rate.
4. Consumer Price Index, from Census and Statistics Department.
5. Yearly and quarterly MSCI stock index, from Morgan Stanley Capital International.
6. HKD DEPO overnight – middle rate used as risk-free rate.

## China- Mainland

1. Sample dates: 1993 to 2008.
2. Yearly Household Consumption Expenditure (seasonally adjusted), at current prices, from IMF's International Financial Statistics.
3. Yearly population, from IMF's International Financial Statistics.
4. Consumer Price Index, from DATASTREAM.
5. Yearly MSCI stock index, from Morgan Stanley Capital International.
6. Deposit rate used as risk-free rate.

## China-Taiwan

1. Sample dates: 1988 to 2008.
2. Yearly Household Consumption Expenditure (seasonally adjusted), at current prices, from DATASTREAM
3. Yearly population, from IMF's International Financial Statistics.
4. Consumer Price Index, from DATASTREAM.
5. Yearly MSCI stock index, from Morgan Stanley Capital International.
6. Money-market rate (30 days) used as risk-free rate.

## India

1. Sample dates: 1993 to 2008.
2. Yearly Household Consumption Expenditure (seasonally adjusted), at current prices, from IMF's International Financial Statistics.
3. Yearly population, from IMF's International Financial Statistics.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly MSCI stock index, from Morgan Stanley Capital International.
6. Treasury-bill used as risk-free rate from 1988-2006, and money-market rate used as risk-free rate from 1992-1997 and from 2007-2010

## Indonesia

1. Sample dates: 1988 to 2008.
2. Yearly Household Consumption Expenditure (seasonally adjusted), at current prices, from IMF's International Financial
3. Yearly population, from IMF's International Financial Statistics.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly MSCI stock index, from Morgan Stanley Capital International.
6. Money-market rate used as risk-free rate.

## Japan

1. Sample dates: 1971 to 2008 and 1980 Q3 to 2009 Q 3.
2. Yearly and quarterly Household Consumption Expenditure (seasonally adjusted), at current prices, from DATASTREAM
3. Yearly population, from IMF's International Financial Statistics. The yearly statistics were used to interpolate quarterly population figures, assuming constant growth rate.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly and quarterly MSCI stock index, from Morgan Stanley Capital International.
6. Financing bill rate used as risk-free rate.

## Korea

1. Sample dates: 1988 to 2008 and 1996 Q1 to 2009 Q3.
2. Yearly and quarterly Household Consumption Expenditure (seasonally adjusted), at current prices, from DATASTREAM

3. Yearly population, from IMF's International Financial Statistics. The yearly statistics were used to interpolate quarterly population figures, assuming constant growth rate.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly and quarterly MSCI stock index, from Morgan Stanley Capital International.
6. Money-market rate used as risk-free rate.

## Malaysia

1. Sample dates: 1988 to 2008.
2. Yearly Household Consumption Expenditure (seasonally adjusted), at current prices, from IMF's International Financial
3. Yearly population, from IMF's International Financial Statistics.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly MSCI stock index, from Morgan Stanley Capital International.
6. Treasury-bill rate used as risk-free rate.

## Pakistan

1. Sample dates: 1993 to 2008.
2. Yearly Household Consumption Expenditure (seasonally adjusted), at current prices, from IMF's International Financial
3. Yearly population, from IMF's International Financial Statistics.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly MSCI stock index, from Morgan Stanley Capital International.
6. Treasury-bill rate used as risk-free rate from 1992-1997 and from 2000-2010. Money-market rate used as risk-free rate only in 1998 and 1999.

## Philippines

1. Sample dates: 1988 to 2008.
2. Yearly Household Consumption Expenditure (seasonally adjusted), at current prices, from IMF's International Financial
3. Yearly population, from IMF's International Financial Statistics.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly MSCI stock index, from Morgan Stanley Capital International.
6. Treasury-bill rate used as risk-free rate.

## Singapore

1. Sample dates: 1973 to 2007 and 1975 Q3 to 2009 Q3.
2. Yearly and quarterly Household Consumption Expenditure (seasonally adjusted), at current prices, from DATASTREAM
3. Yearly population, from IMF's International Financial Statistics. The yearly statistics were used to interpolate quarterly population figures, assuming constant growth rate.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly and quarterly MSCI stock index, from Morgan Stanley Capital International.
6. Treasury-bill rate used as risk-free rate.

## Sri Lanka

1. Sample dates: 1993 to 2008.
2. Yearly Household Consumption Expenditure (seasonally adjusted), at current prices, from IMF's International Financial
3. Yearly population, from IMF's International Financial Statistics.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly MSCI stock index, from Morgan Stanley Capital International.
6. Treasury-bill rate used as risk-free rate, except in 1997 which used money-market rate.

## Thailand

1. Sample dates: 1988 to 2008.
2. Yearly Household Consumption Expenditure (seasonally adjusted), at current prices, from IMF's International Financial
3. Yearly population, from IMF's International Financial Statistics.
4. Consumer Price Index, from IMF's International Financial Statistics.
5. Yearly MSCI stock index, from Morgan Stanley Capital International.
6. Treasury-bill rate used as risk-free rate, from 1987-1988 and from 2002-2010. Money-market rate used as risk-free rate from 1990 to 2001