

**Equity Risk Premium Puzzle  
And Investors' Behavioral Analysis**

—A Theoretical and Empirical Explanation From the Stock Markets in U.S. and China

**Chong Xu**

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Columbia University

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Quantitative Methods in the Social Sciences  
Institute for Social and Economic Research and Policy  
Columbia University in the City of New York  
International Affairs Building  
420 West 118<sup>th</sup> Street  
8<sup>th</sup> Floor, mail code 3355  
New York, New York 10027

**Abstract:** From traditional finance theories, large equity risk premium means high coefficient of relative risk aversion. However, historical data of stock returns in US and China's stock markets showed that, the corresponding risk aversion level was too high to be reasonable. This phenomenon is called Equity Risk Premium Puzzle. The article attempts to summarize and compare all the possible explanations for this puzzle, and the concept of "Loss Aversion" in behavioral finance theories has been successful in explaining the observed equity risk premium. Using simulations, I confirm the existence of equity risk premium in US and China's stock markets, and find that US's stock market generally has a Lower degree of equity risk premium than that of China's by comparing evaluation periods. Further calculations and predictions provide optimal mix of stocks and bonds in the portfolio to maximum prospective utilities and help raise policy suggestions for minimizing equity risk premium level and stabilizing financial markets in US and China.

**Keywords:** Equity Risk Premium; Behavioral Finance; Loss Aversion

*JEL Classification:* C33, D8, G15

## I. Introduction

Efficient Markets Hypothesis (EMH) of Fama (1965, 1970) and Capital Asset Pricing Model (CAPM) of Black (1972), Lintner (1965) and others, demonstrate that assets with higher risks have higher returns. In other words, investors who hold risky assets such as stocks get higher earnings as risk compensation, than those of investors who hold risk-free assets such as treasury bills. And the difference between the return rate of stocks and the return rate of risk-free securities is called equity risk premium (hereafter ERP). ERP is of fundamental importance for asset allocation decisions and estimates of the cost of capital in financial market (Haitao Li and Yuewu Xu, 2002).

“ERP Puzzle” was firstly declared by Mehra and Prescott (1985). Based on the standard general equilibrium model<sup>1</sup> under the assumption that individuals have additively separable utility functions and constant relative risk aversion, they applied the model into the historical data of stock returns in US market from 1889 to 1978. ERP level was 6.18% during that time, and the risk aversion coefficient was estimated to be between 30 and 40 through the equilibrium model.

To measure the positive change in marginal value of a dollar of income if consumption falls, the risk aversion coefficient is generally considered in the level of 10, but the real result from

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<sup>1</sup>  $E_t[r_{m,t+1} - r_{f,t+1}] + \frac{\sigma_m^2}{2} = \gamma \sigma_{mc}$  where  $\gamma$  is the risk aversion coefficient,  $r_{m,t+1}$  is market return rate in Log function,  $r_{f,t+1}$  is risk free rate in Log function, and  $\sigma_{mc}$  is covariance function of consumption and market return rate.

30 or 40 was too high to be reasonable. Imagine you are in a gamble where you may face a 50% chance to double your wealth and a 50% chance to have your wealth fall by half. With the risk aversion coefficient of 30, you would be willing to pay 49% of your wealth to avoid the 50% chance of losing your money by half, which seems absurd (Mehra and Prescott, 1985). The ERP puzzle was confirmed by Siegel (1997), who extended the time period studied by Mehra and Prescott back to 1802 and found the same result. Bradford (2004) also estimated that the equity risk premium between stocks and treasury bonds from 1926 to 1992 was as high as 9.2% in US's stock market.

China's stock market, rising up in the 1990s, experienced the same high ERP, confirmed by Shiwu Zhu and Chun Zheng (2003), and Zhiguo Li and Guoxing Tang (2002). Chufen Wu (2007) also calculated the equity premium which was 17.2% from 1997-2001, -13.9% from 2002-2005, and 110% from 2006-2007. From the numerical simulation on the standard CAPM mode, she computed the corresponding risk aversion coefficients which were 86, -69.5 and 550. However, in reality, there were few investors who had such a high-level risk aversion that the traditional finance theories failed to explain it very well. ERP puzzle has become a serious problem in China's stock market (Renhe Liu, 2005).

There are two schools providing the explanations for ERP puzzle: one is classical economics, and the other is behavioral finance. Many studies proved that the behavioral finance theories, such as myopic loss aversion, dynamic loss aversion and ambiguity aversion, have a powerful ability to explain ERP puzzle. However, few studies gave out a completed list of all the

possible theories and the comparison between them. Moreover, most of the studies founded on an empirical basis were outdated and lacked quantitative analysis of EPR from different stock markets and their micro-level analysis of market participants.

In the second part of this article, I attempt to summarize and compare the possible explanations for ERP puzzle, and the behavioral finance theories have been proved successful in explaining the observed ERP. By introducing comparative analysis of stock markets in US and China from the view of investors' behaviors, I raise two propositions that there are ERP puzzles in US and China from 1992 to 2009, and US's stock market generally has a lower degree of ERP than China's during this period. In the third section, I use stimulations to demonstrate my two propositions, and do further predictions for the optimal mix of stocks and bonds in the portfolio. Conclusions followed by policy suggestions will be presented in the last section.

## **II. Theoretical Analysis**

### **1. A general discussion of explanations for ERP puzzle**

#### **(1) Traditional Economics Aspect**

“Survival Bias” was raised by Brown and Goetzmann (1995) to explain the ERP puzzle. They thought the data studied by Mehra and Prescott was distorted because it only recorded stocks which survived during those time periods and missed those who had low earnings and were abolished. So the result was biased and the riskiness of stocks was overrated. However, this

explanation is not widely accepted because it is hard to test. Another explanation comes from Constantinides (1990). He introduced a conception of "Habit Formation" and assumed that the utility of consumption was based on the previous consumption level. Hence, the high equity premium could be accounted for consumers' strong detest of reducing the current consumption level. But this theory is weak due to its inconsistency.

Other efforts to provide alternative explanations for the ERP puzzle have been only partly successful. For example, Mankiw and Zeldes (1991) ascribed the different habits of consumption between stock holders and non-holders to ERP puzzle, and they pointed out that a minority of US's investors hold stocks whose consumption patterns differ from non-stock holders. Also, Fisher (1994) put compensation for transaction cost and argued that under a costly trading, the agents must be fairly compensated in the form of higher expected gross returns. But their findings could only explain a small part of the observed ERP.

## **(2) Behavioral Finance Aspect**

### **a. Myopic Loss Aversion**

Based on prospect theory raised by Kahneman and Tversky (1979), Benartzi and Thaler (1993, 1995) proposed investors' behavioral model and the theory of myopic loss aversion. Under the assumption that investors' utility function derived from the earning changes of their portfolios rather than the overall changes in value, they concluded that investors display "loss aversion": losses hurt significantly more than gains yield pleasure to them. From previously empirical research, it was proved that pain from losses is more or less two times degree of

happiness from gains (Tversky and Kahneman, 1991; Kahneman, Ketsch and Thaler, 1990). Benartzi and Thaler (1995) also mentioned that people's attitudes towards assets' riskiness depend on the frequency of assessing their portfolios. When they estimate their assets very frequently, the short evaluation period combined with loss aversion are referred to the theory of myopic loss aversion.

Here is an example that how the theory of myopic loss aversion explains the observed high ERP. Stock prices fall almost as often as they rise on a daily basis. If investors assess their assets every day, then they would feel painful facing the frequently falling price. Loss aversion even magnifies their pain because losses are psychologically doubled. Hence, they require higher returns from stocks as risk compensation. However, when investors evaluate assets once every 10 years, they may not feel any pain and find the stocks very attractive to them because stocks don't really decline in value over the long period, which will minimize the ERP level into a lower level.

Furthermore, Benartzi and Thaler (1995) proved by what combination of loss aversion and evaluation period would be necessary to explain the historical pattern of returns in US's stock market. They simulated monthly returns of stocks, bonds and treasury bills from 1926 to 1990, and found that investors have to assess their portfolios once every year in order to be indifferent between the historical distribution of returns on stocks and bonds. Also, when stocks have 30% to 55% weights on the overall portfolios, this optimal assets allocation will maximize the investors' prospective utilities. Those results are close to the reality (Benartzi

and Thaler, 1995), which demonstrates the superiority of this theory.

**b. Dynamic Loss Aversion**

Barberis, Huang and Santos (2001) introduced dynamic loss aversion in inter-temporal framework from the basis of prospect theory and myopic loss aversion. They proposed that the degree of loss aversion depends on prior gains and losses, meaning a loss that comes after prior gains is less painful than usual, because it is cushioned by those earlier gains. While a loss that comes after prior losses is more painful than usual as people become more sensitive to additional setbacks.

Barberis, et al. (2001) also cited “mental accounting” (Kahneman and Tversky, 1984; Thaler, 1980, 1985) to explain two situations which may result in high ERP. Firstly, when pain from losses is based on changes value in specific stock, then it is framed “narrowly”. For example, if one stock behaved well before but has a poor performance at the present time, investors are less concerned about the losses (they are loss insensitive), since the prior gains in stock value will cushion any of such losses. Then the stock is less risky to investors, which decreases the ERP level. However, if the stock keeps performing poorly, investors find it painful and become more sensitive to the possibility of further losses on the stock (they are loss sensitive). Hence they demand higher earnings than usual as the compensation for the bad performances of this stock, which drives the ERP up.

Secondly, when pain from losses is based on changes value in the overall portfolio, then it is

framed “broadly”. If the portfolio is performing better than before, investors will become loss insensitive, and the portfolio becomes more attractive with decreased ERP of stocks within the portfolio. However, if the portfolio continues to perform poorly, investors will become more sensitive to losses and expect higher compensation for risky assets within the portfolio.

Those two situations are different, though they look similar in principles. Barberis, et al. (2001) concluded that when assets are performing poorly, stock price is highly volatile in the first situation. However, in the second situation, the value premium largely disappears, because a stock's past performance no longer affects its return rate which is now determined at the portfolio level. Also, while there is a substantial equity premium, it is not as large as that under the narrow framework for stock accounting and investors are loss averse over portfolio level fluctuations, which are not as severe as the swings on individual stocks.

### **c. Ambiguity Aversion**

Subjective uncertainty is characterized by ambiguity if the decision maker has an imprecise knowledge of the probabilities of payoff-relevant events (Sujoy, 1998). Maenhout (2000) pointed out that investors may realize their limited predictions of the earning distribution in the future for the stocks they are holding and demand higher equity premium to compensate for the uncertainty.

Other theories such as subjective expected utility (SEU) theory (Bonoma and Johnston, 1979; Currim and Satin, 1983, 1984; Hauser and urban, 1977, 1979) computed risk as the

measurement of reflecting the decision-maker's response to uncertain outcomes defined in terms of specific probabilities of risk, however, exact probabilities cannot always be assigned to event, meaning probabilities are ambiguous too themselves (Sujoy, 1998). Barbara and Rakesh (1998) relaxed the constraints in SEU model and defined individuals as ambiguity averse, ambiguity seeking or ambiguity indifferent. Their findings suggested that if ambiguity is present in decision-making process, the overall attitude towards risk may be accentuated, which will increase the ERP level.

## **2. Comparison of the three behavioral finance theories**

Among the explanations for ERP puzzle, behavioral finance theories have been proved successful and plausible in consistently explaining a majority part of the observed ERP in stock market (Benartzi and Thaler, 1995). The three behavioral concepts mentioned above vary in terms of investor' behaviors when they make decisions to buy/sell risky assets.

Myopic loss aversion Theory describes a group of investors who are the most active participants in the stock market. They are busy with collecting information in order to make "rational" choices. Changes in stock price may result from any change in reality which could be the launch of a new regulation, adjustment of members of board, or market panic. Investors are aware of the complicated markets and their limited abilities to get reach to all of the information, so they are more likely to assess their assets as frequently as every day, which increases the ERP to a large extent.

Ambiguity aversion theory indicated that investors are the least active market participants. Facing the uncertainty of future return distribution, they believe any efforts to ensure the possibilities of uncertain outcomes in the future would be endless, and they are inclined to overrate the risk level of their assets and demand higher ERP level for compensation.

Investors in dynamic loss aversion theory behave less active than investors in myopic loss aversion theory do, but more active than investors in ambiguity aversion theory do. They often recall their past performances and think about whether they made good choices before. The action inertia drives them more sensitive if they failed in the past, but less concerned if they succeed before.

### **3. Comparison between US's Stock Market and China's Stock Market**

Rising up in the 1990s, China's equity market expanded rapidly following the opening of securities markets in the cities of Shanghai and Shenzhen. However, compared to US's stock market, China's stock market is immature and less developed (Fernald and Rogers, 2002): individual investors lack knowledge of the financial market, institutional investors still learn experiences of playing a leading role for the harmonious expansion of stock markets, and regulation system is incomplete (Xufen Wu, et al., 2007). There are three major differences between these two financial markets:

Firstly, China's stock market has lower ability of raising capital. The supply of Chinese equities is severely limited, stock market float of about \$70 billion (end-1997) amounts to

only about 6% of the value of total bank deposits, compared with 300% in the US's market (Fernald and Rogers, 2002). A large proportion of market participants are individual investors, who invest part of their wealth in stocks meaning they are very sensitive to risk and cannot bear exposing the money which may be used for their children's future education fees or their retirement funds to the high risk (Shude Zhang, 2007). To avoid losses, China's investors frequently assess their assets and they are famous for their industrious watching markets every day. Hence, China's stock market has higher ERP level. In US's stock market, there are mainly institutional investors, who are more experienced and knowledgeable in making investment choices (Claus and Thomas, 2001). Compared to China's investors, US's investors have a longer evaluating period to their assets and higher willingness of bearing risks.

Secondly, China's investors consider buying stocks as the speculation, while US's investors consider it as an investment. China's investors pay close attentions to the short-term returns, but lose interests in long-term development for the listed companies. Shleifer and Vishny (1997) argued that, Chinese investors are very well informed about the pricing differences and could each take a tiny position against pricing anomalies. The stock market is impelled by investors' behaviors of blind investing and following the crowd into a vulnerable status. Stock price in China's market is highly volatile and there is a high ERP level. However, in US's stock market, though there are financial crises and other big events happening, US's stock market is stronger in structure and its resistance to the external strike, which stabilizes the market and stock prices. (Yongmei Yuan, 2004),

Thirdly, Chinese capital controls make it difficult to invest overseas for Chinese investors (Fernald and Rogers, 2002). Though capital controls are good ways of coping with the financial crisis in emerging markets (Wilson, 1998; Krugman, 1999), the markets should be made more open and liberalized in order to develop quickly and diversify risks through international risk sharing (Kim and Singal, 2000). Within the confined stock markets, chaos will appear often as the economic development and financial innovation happen. Investors get confused and short sighted when there are prevalent speculations from institutional investors, unregulated disclosure of information from listed companies and not well-organized ordinances from regulatory agencies (Walter and Howie, 2001). Also, government intervention and macroeconomic control are dominant in China. Hence, investors have to frequently assess their assets to ensure their investments on certain risky assets are proper. In US's stock market, disorders could be decreased or eliminated in the shortest time due to its more matured system and completed regulation rules (Shiwu Zhu and Chun Zheng, 2003).

Based on the comparative analysis for China's stock market and US's stock market combined with the behavioral finance concepts, I present two propositions here:

**Proposition 1: There are ERP puzzles in both of US and China's stock markets from 1992 to 2009.**

To compare these two markets, I choose the analysis period starting from 1992 when public data of China's stock market became available. Both of the markets went through similar

fluctuations due to financial and economic crises, and market events during this period, as Graph 1 shows. Investors had the most active investment period in history, and increased uncertainty rising from unexpected incidents during the past 17 years encouraged investors to evaluate their portfolio more frequently and enhanced ERP level to a large extent.

Graph 1



**Proposition 2: US's stock market generally has a lower degree of equity risk premium than China's from 1992 to 2009.**

So far, no studies have explored a comparison of ERP level in China's stock market and US's stock market. However, it will be very interesting to know the different premium levels and structures between a developed and matured financial market like US's and a young and "irrational" financial market like China's. Since China's investors generally have a shorter evaluation period and lower willingness to bear risks, I propose that China's stock market has a higher degree of equity risk premium than US's.

### **III. Methods and Data Analysis**

#### **1. Data Sources**

Data of historical monthly returns of stocks and bonds from both of US and China's markets are downloaded from MSCI Barra database for country equity indices and Yahoo Finance database for 10-year Treasury bond rates.

Both of US and China country indices exhaustively cover the large- and mid-cap segments of the investable equity universe by targeting a range around 85% coverage of the free float-adjusted market capitalization in each market, while striving to achieve a balance between appropriate market representation in size segment composites within countries and reasonable size integrity across countries.

MSCI Barra China equity index is a proper representative of China's stock market, since there are three segment markets and special rules for different kinds of stocks: Shanghai Securities, Shenzhen Securities and Hong Kong Securities. Domestic-only shares (known as A Shares) are listed in either Shanghai or Shenzhen; Foreign-only shares are listed in Shanghai or Shenzhen (B Shares) or in Hong Kong (H Shares). For H-Share companies, the domestic A Share generally trades in Shanghai; otherwise, the A and B shares trade in the same market. In order to be representative enough, the MSCI China index include entire Chinese investment universe, combining A, H, B, Red and P Chip share classes as well as Hong Kong-listed companies.

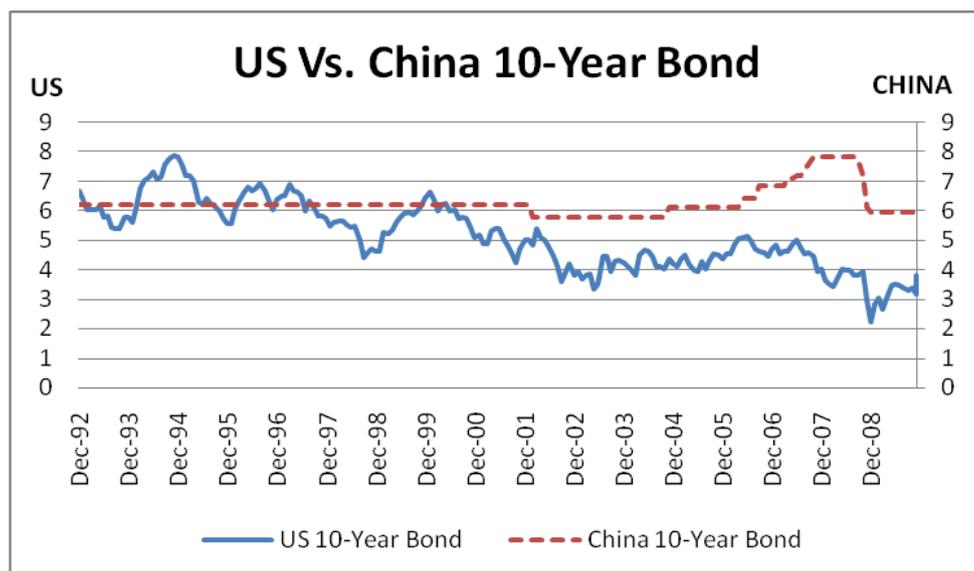
After getting monthly index data for stocks and bonds, I use payoff rate model to calculate n-month returns for stocks (which is also applied to 10 year Treasury bond):

$$r_t = \frac{P_t - P_{t-n}}{P_{t-n}}$$

Where  $r_t$  is the payoff rate at time point t,  $P_t$  is the closing price (rate) at time point t,  $P_{t-n}$  is the closing price (rate) at time point (t-n), and evaluation period n varies from 1 month to 24 months.

There are (205-n) data for n-month payoff rate for US's stock market and 10-year bond market, and China's stock market and 10-year bond market respectively from December 1992 to December 2009. Graph 1 and Graph 2 present comparative and detailed information: in the long term, US's stock market has a higher price level than China's, while China has a higher level of 10-year bond return rate than US's.

Graph 2



## 2. Methodology and Stimulation

Benartzi and Thaler (1995) employed cumulative version of prospect theory raised by Kahneman and Tversky (1979, 1992) in which utility is defined over gains and losses (i.e., returns) rather than levels of wealth, in order to demonstrate the existence of ERP and find out how often portfolio is evaluated. The notion of loss aversion is expressed in the prospect theory model with a constant loss aversion coefficient and it is hard to change it in investors' decision, but evaluation period could be easily tested and adjusted to minimize ERP. In this paper, I propose similar models and calculations, but apply them to the latest data in US's stock market and also China's market. The processes are as follows:

With data for n-month payoff rate, I use bootstrapping procedures in statistical software R to generate distributions of payoffs for various time horizons by drawing 100,000 n-month returns (with replacement) from time series data. Then, the n-month returns are applied to prospect theory model:

$$v(x) = \begin{cases} x^\alpha & \text{if } x \geq 0 \\ -\lambda(-x)^\beta & \text{if } x < 0 \end{cases}$$

Where,  $\lambda$  is the coefficient of loss aversion,  $\alpha$  and  $\beta$  are estimated to be 0.88 and  $\lambda$  is estimated to be 2.25. This notion captures the intuition of loss aversion that losses are psychologically doubled.

The prospective utility of a gamble  $G$ , which has payoff  $X_i$  with probability of  $p_i$  is given by:

$$V(G) = \sum \pi_i v(x_i)$$

Where  $\pi_i$  is the decision weight assigned to outcome  $i$ , and it depends on the cumulative distribution of the gamble, not only on  $p_i$ , we have:

$$\pi_i = w(P_i) - w(P_i^*)$$
$$w(p) = \frac{p^\gamma}{(p^\gamma + (1-p)^\gamma)^{1/\gamma}}$$

Where  $\gamma$  is estimated to be 0.61 in the domain of gains and 0.69 in the domain of losses. And  $P_i$  is the probability of obtaining an outcome that is at least as good as  $X_i$ , and  $P_i^*$  is the probability of obtaining an outcome that is strictly better than  $X_i$ . For each group of  $n$ -month returns, they are ranked from worst to best, and computed at 100 intervals along the cumulative distribution.

Evaluation period ( $n$ ) is the length of time over which an investor aggregates returns. The use of prospect theory is accompanied by a specification of frequency that returns are evaluated. Under the concept of loss aversion, the more frequently an investor evaluates his/her portfolio, or the shorter an evaluation period is, the less attractive the investor finds about his/her portfolio, and also the higher premium he/she will ask for compensation. Payoff returns generated from different evaluation periods have different distributions, which are reflected on  $P_i$ , and incur different levels of prospective utilities.

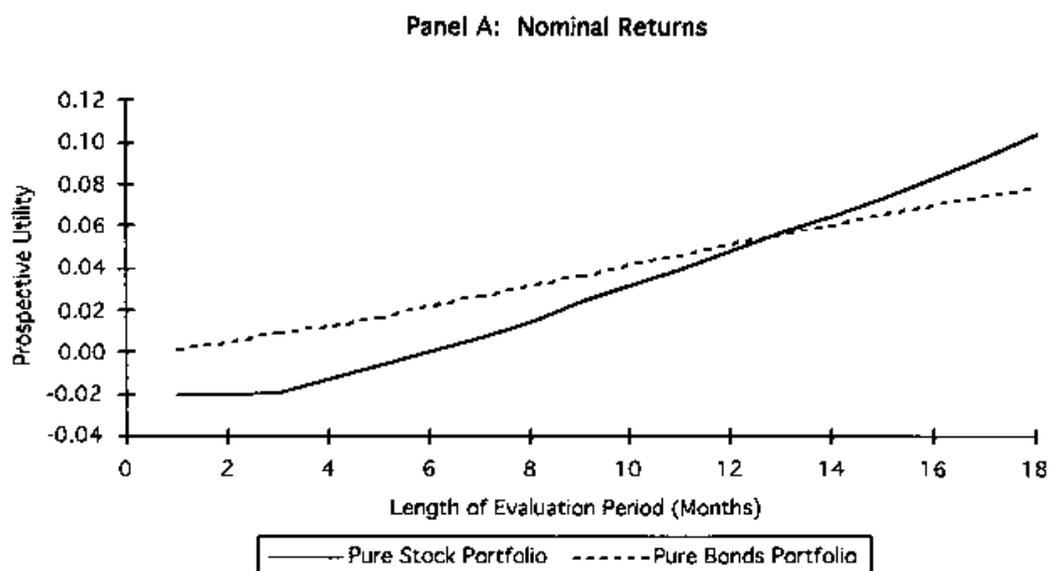
With all the information above, we could compute prospective utility of the given asset for any specific holding period (1 month to 24 months are reasonable). I will compare the utility between stocks and Treasury bonds in nominal returns, since Benartzi and Thaler (1995) pointed out that Treasury bonds are the closest substitutes of Treasury bills and nominal

returns are given prominence in most annual reports for investors. All the procedures are completed in R and statistical results are used to demonstrate two propositions developed before.

### 3. Results and Discussions

Benartzi and Thaler examined US's stock market from 1926 to 1990 and found as high as 6.5% annual ERP during that period. Further, they calculated the evaluation period (around 12 months) at which stocks and bonds are equally attractive (where the curves cross) as showed in Graph 3. As the length of evaluation period increases, stocks become more attractive to investors, and equity premium level decreases. Image an extreme example that you evaluate your stocks every 20 years, and then after 20 years you would treat stocks better than bonds since every stock increases in value in such a long term.

Graph 3<sup>2</sup>

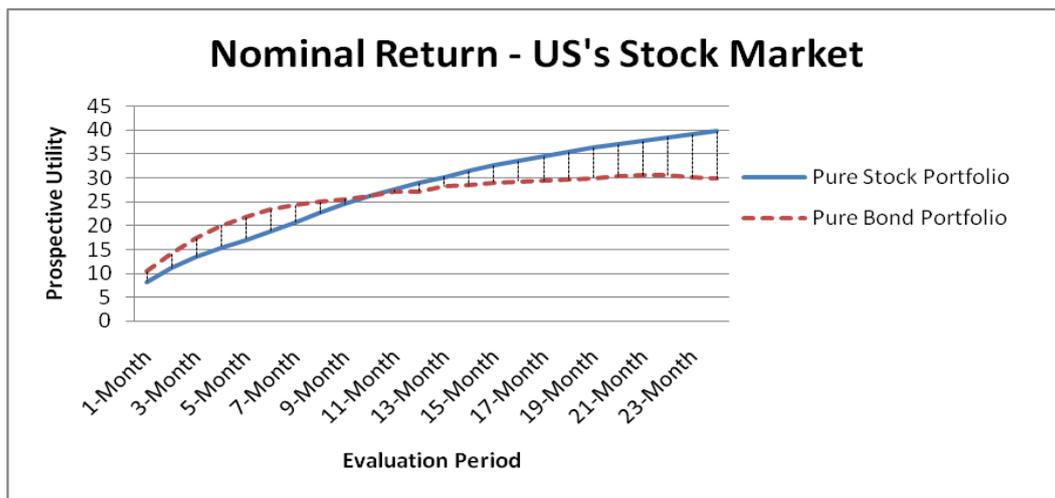


<sup>2</sup> Source: Benartzi Shlomo and Thaler Richard H. "Myopic Loss Aversion and the Equity Premium Puzzle". Quarterly Journal of Economics, 1995. Vol. 110, no. 1.

In my calculation for period 1992 to 2009, the equity premium is 8% and the evaluation period is 10 months, 2 months less than Benartzi and Thaler's, where stocks and bonds are indifferent to investors. In other words, for US's stock market, we have a higher ERP during the past 17 years than before. This result is reasonable since US's stock market is getting more and more unstable and influenced by other capital markets under globalization. Investors need to shorten the evaluation period to make a better investment decision. Table 1 is the descriptive statistics about n-month payoff returns for stocks and bonds. Graph 4 demonstrates the existence of ERP puzzle in US's stock market.

**Table 1**

Period	US Stock			US Bond		
	Mean	SD	Sharpe	Mean	SD	Sharpe
1-month	0.0059	0.0441	0.1337	-0.0006	0.0651	-0.0094
2-month	0.0120	0.0661	0.1817	-0.0019	0.0917	-0.0205
3-month	0.0179	0.0826	0.2161	-0.0036	0.1022	-0.0355
4-month	0.0240	0.0983	0.2446	-0.0050	0.1175	-0.0422
5-month	0.0303	0.1125	0.2697	-0.0061	0.1322	-0.0459
6-month	0.0366	0.1260	0.2903	-0.0077	0.1408	-0.0550
7-month	0.0424	0.1383	0.3066	-0.0094	0.1472	-0.0641
8-month	0.0484	0.1504	0.3222	-0.0115	0.1516	-0.0762
9-month	0.0542	0.1626	0.3333	-0.0137	0.1571	-0.0874
10-month	0.0595	0.1739	0.3424	-0.0167	0.1618	-0.1029
11-month	0.0642	0.1829	0.3510	-0.0187	0.1680	-0.1114
12-month	0.0699	0.1934	0.3612	-0.0212	0.1769	-0.1197
13-month	0.0763	0.2051	0.3719	-0.0258	0.1763	-0.1463
14-month	0.0825	0.2164	0.3813	-0.0287	0.1781	-0.1612
15-month	0.0895	0.2280	0.3924	-0.0306	0.1800	-0.1701
16-month	0.0978	0.2383	0.4102	-0.0335	0.1807	-0.1853
17-month	0.1067	0.2480	0.4303	-0.0366	0.1804	-0.2027
18-month	0.1158	0.2589	0.4475	-0.0395	0.1807	-0.2188
19-month	0.1255	0.2703	0.4643	-0.0429	0.1807	-0.2373
20-month	0.1356	0.2808	0.4829	-0.0459	0.1805	-0.2543
21-month	0.1455	0.2916	0.4990	-0.0493	0.1808	-0.2728
22-month	0.1555	0.3028	0.5136	-0.0542	0.1776	-0.3050
23-month	0.1655	0.3136	0.5279	-0.0593	0.1721	-0.3447
24-month	0.1761	0.3240	0.5434	-0.0641	0.1691	-0.3792

Graph 4<sup>3</sup>

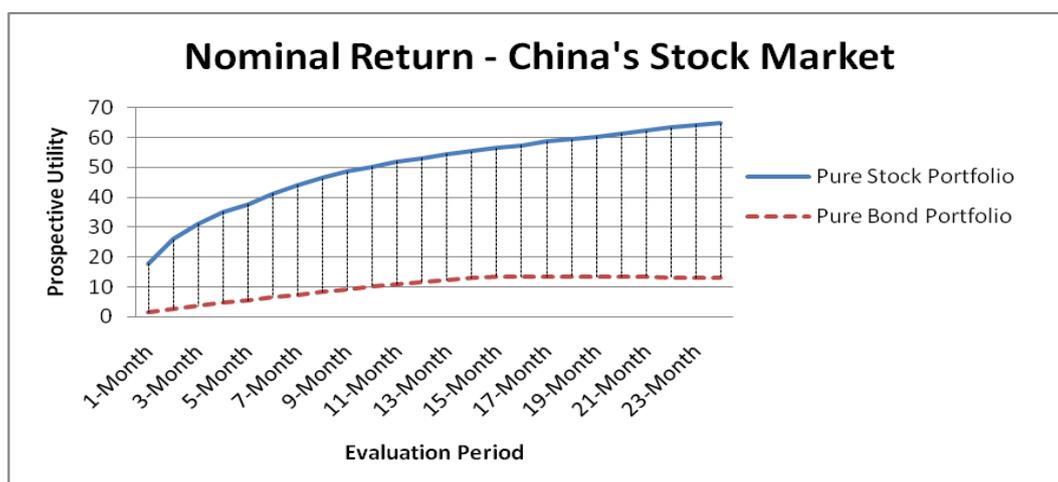
For China's stock market, there is an even higher ERP, since two lines never cross until the length of evaluation period reaches to minus. Indeed, the equity premium is as high as 10%. The prospective utility difference is getting huge as the length of evaluation period increases. Graph 5 demonstrate the existence of ERP and also its higher level in China's stock market than US's stock market. Possible reason for a non-existent positive evaluation period is that China has a strong government control over capital markets, which leads to an extremely low yield for Treasury bonds and high ERP in the stock market. Table 2 is the descriptive statistics about n-month payoff returns for stocks and bonds. So far, there are no published findings regarding China's stock market by using this procedure. More research should be conducted in this area to see its application and also whether loss aversion coefficient in prospect theory could stay constant in different capital markets.

<sup>3</sup> The unit for prospective utility is not consistent with Benartzi and Thaler's due to different sample period and different methods to calculate probability distribution of the gamble.

Table 2

Period	China Stock			China Bond		
	Mean	SD	Sharpe	Mean	SD	Sharpe
1-month	0.0037	0.1095	0.0340	-0.0001	0.0154	-0.0060
2-month	0.0085	0.1589	0.0534	-0.0001	0.0249	-0.0041
3-month	0.0137	0.2031	0.0677	-0.0001	0.0324	-0.0026
4-month	0.0183	0.2370	0.0771	-0.0001	0.0385	-0.0017
5-month	0.0220	0.2641	0.0833	0.0000	0.0444	-0.0005
6-month	0.0258	0.2849	0.0905	0.0000	0.0498	0.0005
7-month	0.0291	0.3051	0.0954	0.0001	0.0549	0.0015
8-month	0.0344	0.3274	0.1052	0.0002	0.0599	0.0025
9-month	0.0378	0.3469	0.1089	0.0002	0.0645	0.0034
10-month	0.0414	0.3720	0.1113	0.0003	0.0689	0.0043
11-month	0.0428	0.3870	0.1105	0.0004	0.0731	0.0051
12-month	0.0437	0.4055	0.1078	0.0005	0.0774	0.0061
13-month	0.0437	0.4235	0.1031	0.0006	0.0815	0.0069
14-month	0.0425	0.4375	0.0972	0.0008	0.0853	0.0093
15-month	0.0414	0.4505	0.0918	0.0018	0.0878	0.0200
16-month	0.0427	0.4646	0.0919	0.0030	0.0895	0.0337
17-month	0.0454	0.4799	0.0947	0.0043	0.0909	0.0477
18-month	0.0471	0.4921	0.0957	0.0057	0.0924	0.0614
19-month	0.0509	0.5111	0.0996	0.0070	0.0939	0.0747
20-month	0.0560	0.5326	0.1051	0.0083	0.0950	0.0878
21-month	0.0612	0.5556	0.1101	0.0097	0.0960	0.1008
22-month	0.0665	0.5809	0.1146	0.0110	0.0970	0.1137
23-month	0.0724	0.6033	0.1200	0.0124	0.0983	0.1263
24-month	0.0775	0.6219	0.1246	0.0138	0.0996	0.1388

Graph 5

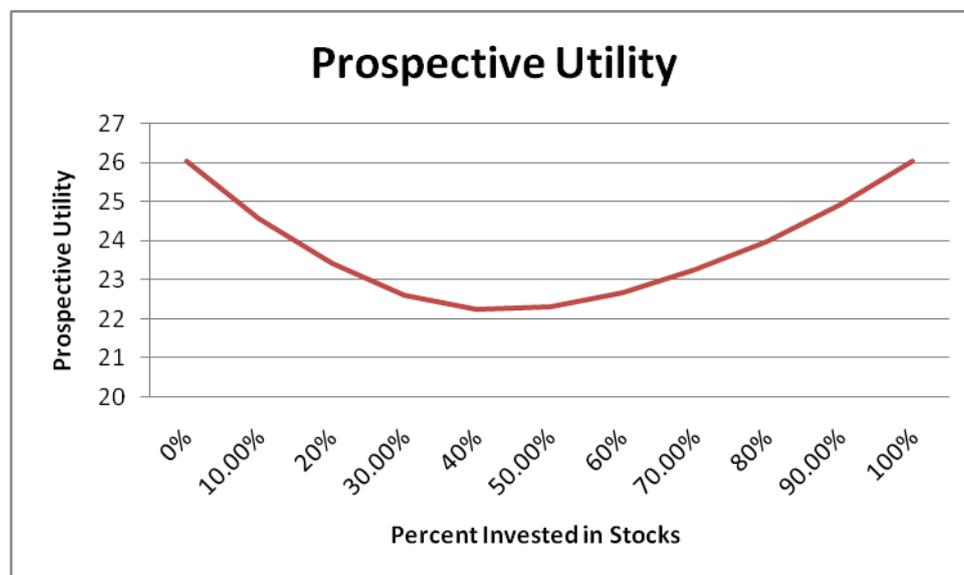


#### 4. Furthur Stimulations

For US stock market, we furthur ask the question that under 10-month evaluation period, what mix of the portfolio that investors choose to maximum their prospective utilities.

I compute the prospective utility of each portfolio mix between 100 percent bonds and 100 percent stocks in 10 percent increments. As Graph 6 shows, the optimal mix of portfolio which maximizes the prospective utility happens if investors hold 100% bonds or 100% stocks. The classic holding of 50-50, on the other hand, gives us the lowest prospective utility. One reason is that during this period, stocks and bonds both suffered from the financial crisis from late 2007, which makes prospective utility of holding pure stocks and pure bonds get indifferent to investors. Though this result is not consistent with historical observed behavior that institutions (primarily pensions funds and endowments) invest on average 47% in bonds and 53% in stocks, during the sample period in this paper, holding pure bonds for safety or unchanging equity portfolio is two popular investment philosophies.

Graph 6



For China's stock market, there is no optimal portfolio mix since no proper evaluation period is available. Facing such a high ERP, investing purely in stocks could earn high profits for risk-taking investors.

#### **IV. Conclusion**

This paper analyzes the equity risk premium puzzle in both US's stock market and China's stock market. I find that in the past 17 years, the ERP of US stock market becomes higher than before; China has an even higher ERP since its capital market formed which cannot be explained by traditional economic theory.

In the context of behavioral finance theories, loss aversion and evaluation period could explain the ERP puzzle together. Losses incur more pains than gains incur happiness; the shorter the evaluation period is, the less attractive investors find about stock investment, and the higher ERP the market has.

Loss aversion can be considered a fact of life (or a fact of preferences), however, evaluation period could be altered and adjusted. If institutional investors like pension funds and endowments could extend their evaluation periods, capital markets will have lower ERP and become more stable and safe for investment.

This paper uses constant loss aversion coefficient for both of US and China's capital markets,

but I think more research should be launched to study whether there are different versions in different capital markets considering different behavioral patterns of investors. I also hope there are more empirical papers studying ERP puzzle with the latest data and how the puzzle differs in different capital markets.

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