Nature of the Pakistani Equity Premium and Conditional Heteroscedasticity

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Abstract

The Pakistani equity premium over the period 1998:07 to 2013:12: (i) followed a stationary trendless process with a break date of December1999, (ii) adjusted around its estimated threshold value symmetrically in the long run. When the short-run dynamic components are introduced to the model :(i) the return on the market portfolio asymmetrically responded to both the widening and the narrowing of the equity premium, (ii) the deposit rate as a proxy risk-free rate responded to the widening but not to the narrowing of the equity premium. Finally, the GARCH (1, 4) effect was present on the Pakistani monthly equity returns and their variance.

JEL classification: C22, F36, and G14.

1. Introduction

Since its introduction to the literature in 1985, the equity premium puzzle has spawned many efforts by a number of researchers to explain this anomaly away. With the exception of the following investigations, the majority of the studies concentrated on theoretically and empirically explaining the implausible equity premium puzzle. Buranavityawut and Freeman (2006) examined consumption risk and the equity premium. Blanchard (1993) studied the variation of the equity premium for a 50 year period. Fama and French (2002) compared the estimated unconditional equity premium to the realized market gains. Siegel (1999) investigated the variations of the size of the equity premium. Welch (2000) surveyed financial economists on their expectations on the future equity premium.

While the theoretical and empirical debates are still unsettled, equity is the major instrument to channel the financial resources from the capital surplus economic units (the savers) to the financial deficit units (the borrowers) in the direct financing mode of the market economies. In the capital market, the realized equity premium is the premium that corporations have to pay to obtain their financial resources, when they issue new equities or to acquire their treasury stocks, just like the difference between the loan rate and the risk free interest rate that financial institutions charge for loans to corporations. Therefore, the time path on which the equity premium adjusts towards its "normal" or equilibrium level following a shock has a major consequence on the cost of capital to corporations. Thus, policymakers should have accurate knowledge of the adjustment process of the equity premium when being disturbed by economic shocks or countercyclical monetary policy action in the equity market.

More specifically, equity premium, the difference between the return on the market portfolio and the risk-free interest rate has been a topic of considerable debate. From the theoretical perspective, the equity premium is the difference between the expected real return on market portfolio of common stocks and the real risk free interest rate. As initially recognized by Mehra and Prescott (1985), the historic U.S. equity premium, which is in the world's largest economy, appears to be much greater than what can be rationalized in the context of the standard neoclassical paradigm of financial economics. Mehra (2003) articulated that for the 1889-2000 period, the average annual real return on the US equity market has been about 7.9%, as compared to the real return on a relatively riskless security

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was 1.00%. This irrationally high average, dubbed "the equity premium puzzle" is not unique to U.S. capital market. Internationally, as reported by Dimson et al., (2006) over the 1900-2005 period, the equity premium measure relative to T-bills was 7.08% in Australia, 6.67% in Japan, 6.20% in South Africa, 3.83% in Germany, 5.73% in Sweden, 5.51% in the US, 4.43% in the UK, 6.55% in Italy, 4.54% in Canada, 6.79% in France, 4.55% in Netherlands, 4.09% in Ireland, 2.80% in Belgium, 3.07% in Norway, 3.40% in Spain, 2.87% in Denmark and 3.63% in Switzerland. The average equity premium for these 17 countries over this period of 106 years is 4.81%.

In late 2011, Dimson et al., (2011) updated the global evidence on the long-term realized equity risk premium, relative to both bills and bonds, in 19 different countries. Their sample was from 1900 to the start of 2011. They found that while there was considerable variation across countries, the realized equity risk premium was substantial everywhere. They reported that for a sample of 19-country world index, over the entire 111 years, geometric mean real returns were an annualized 5.5%; the equity premium relative to Treasury bills was an annualized 4.5%; and the equity premium relative to long-term government bonds was an annualized 3.8%. The expected equity premium is lower, around 3% to 3½% on an annualized basis.

The remainder of the study is organized as follows: Section 2 briefly describes the nature of the equity premium; Section 3 captures some highlights of the Pakistani equity market; Section 4 describes the data set and its descriptive statistics; Section 5 discusses the methodology and model's specification; Section 6 reports and discusses the empirical results; Section 7 provides some concluding remarks.

2. Equity Premium

Brealey and Myers (2003) articulated that an integral part of the economic and financial literature on equity premium is the assumption that "there is a normal, stable, risk premium on the market portfolio." Therefore, to estimate the ex-ante equity premium, the most popular method is to extrapolate the historically realized equity premium into the future (Welch, 2000). For example, Brealey and Myers (2000), described how to estimate a return for a diversified stock market portfolio. They do this by taking the current interest rate on U.S. Treasury bills plus the average equity premium over some historical time period. In other words, they simply extrapolated past returns forward. Brealey and Myers (2000) noted that their result is consistent with security analysts' forecasts of earnings growth. This assumption requires that the equity premium time series be mean-reverting. In addition, the capital asset pricing model (CAPM) conceptually postulates that investors set their required real earning yields as some markup relative to real risk free interest rates. In the equity market, this mark-up is the equity premium. If this equity premium becomes too high or low, the marketplace will put pressure on the investors to adjust it back to some "normal" or equilibrium equity premium. Specifically, the above assumption implies that the equity premium returns back to its long run equilibrium position following any shock.

Perhaps the state of the equity premium puzzle today still can be described best by one of the two researchers who originally recognized the anomaly: "After detailing the research efforts to enhance the model's ability to replicate the empirical data, I argue that the proposed resolutions fail along crucial dimensions" Mehra (2003). Also, Damodaran (2014) articulated that Equity risk premiums are a central component of every risk and return model in finance and are a key input into estimating costs of equity and capital in both corporate finance and valuation. Given their importance, it is surprising how haphazard the estimation of equity risk premiums remains in practice.

3. Highlights of the Pakistani Equity Market

In a paper in the previous issue of this journal, Nguyen (2014) provided a fairly complete description of the Pakistani equity market. The following are some highlights of his description of the country's stock market. The Karachi Stock Exchange (KSE) was established in September 1947, soon after Pakistan became independent, and was subsequently incorporated as a company limited by guarantee in March 10, 1949. The first index introduced in the KSE was based on fifty companies and was called the KSE 50 index. The KSE 100 Index was introduced on November 1, 1991 with the base value of 1,000 points. The computerized trading system, called the Karachi Automated Trading System (KATS), was introduced in 2002 with a capacity of 1.0 million trades per day and the ability to provide connectivity to an unlimited number of users.

Additionally, the All-Share index was introduced in 1995 which became operational on September 18, 1995. Both the KSE 100 and the KSE–All Share indices are calculated using the market capitalization method while the KSE 30 and KMI 30 indices are calculated using the "Free-Float Capitalization" method. The free-float methodology refers to an index construction methodology that takes into account only the market capitalization of the free-float shares of a company for the purpose of index calculation.

Pakistan also has two other Stock Exchanges: the Lahore Stock Exchange (Guarantee) Limited and the Islamabad Stock Exchange (Guarantee) Limited. The Lahore Stock Exchange is Pakistan's second largest stock exchange after the Karachi Stock Exchange. It came into existence in October 1970, under the Securities and Exchange Ordinance of 1969 by the Government of Pakistan in response to the needs of the provincial metropolis of the province of Punjab. It initially had 83 members. The Lahore Stock Exchange (Guarantee) Limited was the first stock exchange in Pakistan to use the internet and currently 50 percent of its transactions are carried out via internet. The Islamabad Stock Exchange is the youngest of the three stock exchanges of Pakistan. The Islamabad Stock Exchange was incorporated as a guarantee limited Company on October 25, 1989. It was licensed as a stock exchange on January 7, 1992.

The stock exchanges of Pakistan were operating as non-profit companies with a mutualized structure wherein members had ownership as well as trading rights. The corporatization and demutualization of stock exchanges entailed converting their structures from non-profit, mutually owned organizations to for-profit entities owned by shareholders. Demutualization is designed to create increased transparency at the Karachi Stock Exchange and greater balance between the interests of various stakeholders by clear segregation of commercial and regulatory functions as well as the separation of trading and ownership rights.

Table 1- Market Capitalization of Listed Companies as Percentage of GDP

Advanced Markets	2009	2010	2011	2012	***Asian Emerging Markets***	2009	2010	2011	2012
Canada	125.7	137.0	107.2	110.7	People's Republic of China	100.3	80.1	46.3	44.2
France	75.3	75.6	56.4	69.8	India	86.4	94.4	54.2	68.6
Germany	39.3	43.5	32.9	43.7	Malaysia	126.6	166.3	137.2	156.9
Japan	67.1	74.6	60.0	61.8	***Pakistan***	***20.5***	***21.6***	***15.5***	***18.9***
Rep. of Korea	100.3	107.3	89.2	104.5	Philippines	47.6	78.8	73.8	105.6
New Zealand	57.6	51.4	45.1	47.7	Sri Lanka	19.3	40.2	32.8	28.7

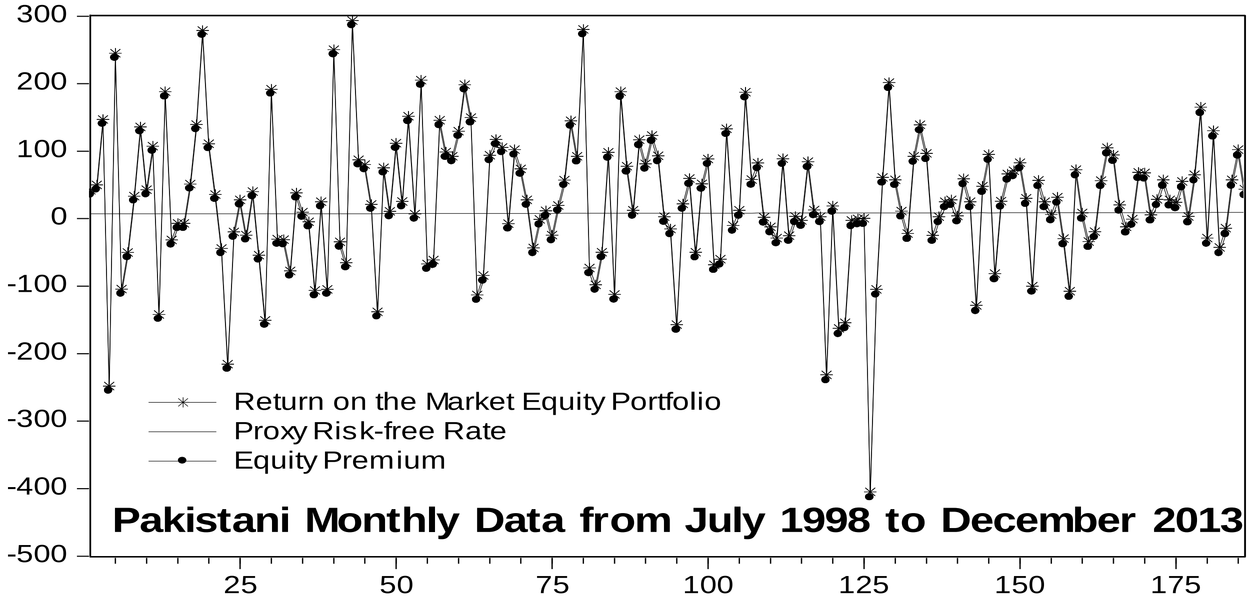
Singapore	160.1	170.4	125.8	150.8	Thailand	52.4	87.1	77.7	104.7
United States	108.5	118.9	104.3	119.0	Vietnam	21.8	19.2	14.8	23.2
Average	*91.7*	*97.3*	*77.6*	*77.1*	*Average*	*59.4*	*73.5*	*56.6*	*68.9*

Source: *World Bank, World Development Indicators. Market capitalization is the share price times the number of shares outstanding. Listed domestic companies are domestically incorporated companies listed on the country's stock exchange at the end of the year (2012). Listed companies do not include investment companies, mutual funds, or collective investment vehicles.*

The enactment of the 2012 Stock Exchanges (Corporatization, Demutualization & Integration) has brought Pakistan's capital market up to par with other international jurisdictions such as India, Malaysia, Singapore, USA, UK, Germany, Australia, Hong Kong and Turkey among others. The said Act has enabled the demutualization of stock exchanges, which is expected to result in expanding market outreach, attracting new investors, improving liquidity and enabling the stock exchanges to attract international strategic partners. It should also facilitate the consolidation of brokers leading to financially strong entities. As of February 21st, 2014 there are 579 companies listed on the KSE and the total market capitalization is Rs. 6,537.064 billion. The listing is done on the basis of strict rules and regulations laid out by the Securities Exchange Commission of Pakistan and the Karachi Stock Exchange (Guarantee) Limited. However, Table 1 indicates, the Pakistani equity market is still relatively small as a percentage of its GDP at the end of 2012.

4. Data and Descriptive Statistics

This study utilizes annualized monthly return on the market equity portfolio in Pakistan and the deposit rate as the proxy measure for risk-free rate. The data set, used in this investigation, covers the period from July, 1998 to December, 2013 where the data is available. The time-series data is obtained from the Pakistani Central Bank. In this analysis, let ER_t and RF_t denote the annualized monthly return on the Pakistani market equity portfolio and the proxy risk free rate, respectively. The monthly return on the market portfolio is annualized to be comparable to the risk-free rate which is stated in the annual basis. The difference between ER_t and RF_t is defined as equity premium and is denoted by EP_t. Figure 1 illustrates the behaviors of ER_t, RF_t and EP_t over the sample period.



Sources: Pakistani Central Bank

Figure 1

As to the descriptive statistics of the time series of the Pakistani annualized monthly return on market portfolio, its mean is 26.59 percent, ranging from -404.87 percent to 293.59 percent with standard error being 98.20 percent. The corresponding figures for the proxy risk-free rate were 8.06 percent, 7.08 percent, 9.15 percent and 0.64 percent, respectively. The average Pakistani equity premium over the sample period is 18.53 percent. Additionally, in their 2014 survey of market premium used in 2014 in 88 countries, Pablo et al. (2014) reported, in Table 2, the average premia of the following selected countries which show that Pakistani equity premium is the among the highest premia in its neighboring Asian countries and much higher than the corresponding figures in the advanced economies.

Table 2- Market Risk Premium Used in 2014 in Selected Advanced and Asian Emerging Makets

Advanced Markets	Mean	St. Div.	Min.	Max.	***Asian Emerging Markets***	Mean	St. Div.	Min.	Max.
Canada	5.3	1.2	3.0	10.0	People's Republic of China	8.1	3.5	3.9	20.0
France	5.8	1.5	2.0	11.4	India	8.0	2.4	2.3	16.0
Germany	5.4	1.7	1.0	12.4	Malaysia	6.4	6.8	3.4	8.8
Japan	5.3	2.4	2.0	16.7	***Pakistan***	***11.1***	***5.3***	***2.5***	***19.0***
Rep. of Korea	6.3	1.8	2.0	11.1	Philippines	8.1	1.4	6.4	11.0
New Zealand	5.6	1.4	2.0	18.0	Sri Lanka	11.3	2.0	9.0	14.0
Singapore	5.7	1.3	3.9	9.6	Thailand	8.0	1.8	6.0	15.1
United States	5.4	1.4	1.5	13.0	Vietnam	10.3	3.3	3.9	16.0
Average	5.6	1.6	2.2	12.8	*Average*	8.9	3.3	4.7	15.0

Source: *Market Risk Premium used in 88 countries in 2014: a survey with 8,228 answers, by Pablo Fernandez, Pablo Linares, and Isabel Fernandez Acín. IESE Business School. Downloadable in:* ***http://ssrn.com/abstract=2450452*****.**

5. Methodological Issues and Analytical Framework

5.1 Structural Break

Historically, every economy would experience many business cycles caused by internal and external shocks; therefore, countercyclical monetary policy measures would be used to bring the economy back to its long-run path. Pakistan is no exception! Consequently, the spread between return on market equity portfolio and the risk free rate, the equity premium, is most likely to suffer some structure breaks. To search endogenously for the possibility of any structural break in the equity premium, this investigation utilized Perron's (1997) endogenous unit root test function with the intercept, slope, and the trend dummy, as specified by equation (1), to test the hypothesis that the spread between return on the market equity portfolio and the proxy measure of the risk-free interest rate has a unit root.

$$EP_t = \mu + \theta DU + \varsigma t + \xi DT + \delta D(T_b) + \zeta EP_{t-1} + \sum_{i=1}^{k} \psi_i \Delta EP_{t-i} + \upsilon_t \quad (1)$$

where $DU = 1(t > T_b)$ is a post-break constant dummy variable; t is a linear time trend; $DT = 1(t > T_b)$ is a post-break slope dummy variable; $D(T_b) = 1(t = T_b + 1)$ is the break dummy variable; and ε_t are white-noise error terms. The null hypothesis of a unit root is stated as $\zeta = 1$. The break date, T_b, is selected based on the minimum t-statistic for testing $\zeta = 1$ (see Perron, 1997).

5.2 Threshold Autoregressive (TAR) model

To further investigate the nature of the Granger causality between the equity premium and the risk-free rate, this study uses the threshold autoregressive (TAR) model, developed by Enders-Siklos (2001) that allows the degree of autoregressive decay to depend on the state of the equity premium, i.e. the "deepness" of cycles. The estimated TAR model would empirically reveal if the premium tends to revert back to the long-run position faster when the premium is above or below the threshold. Therefore, the TAR model indicates whether troughs or peaks persist more when shocks or countercyclical monetary policy actions push the equity premium out of its long-run equilibrium path. In this model's specification, the null hypothesis that the basis contains a unit root can be expressed as $\rho_1 = \rho_2 = 0$, while the hypothesis that the basis is stationary with symmetric adjustments can be stated as $\rho_1 = \rho_2$.

The first step in the Enders-Siklos' (2001) procedure is to regress the equity premium, EP_t, on a constant and an intercept dummy (with values of zero prior to the structural break date and values of one for the structural break date and thereafter), as specified by equation (2).

$$EP_t = \pi_0 + \pi_1 Dummy_t + \varepsilon_t \quad (2)$$

The saved residuals, ε_t from the estimation of equation (2), denoted by $\hat{\varepsilon}_t$, are then used to estimate the following TAR model:

$$\Delta\hat{\varepsilon}_t = I_t \rho_1 \hat{\varepsilon}_{t-1} + (1 - I_t)\rho_2 \hat{\varepsilon}_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta\hat{\varepsilon}_{t-p} + \hat{u}_t \quad (3)$$

where $\hat{u}_t \sim i.i.d.(0, \sigma^2)$, and the lagged values of $\Delta\hat{\varepsilon}_t$ are meant to yield uncorrelated residuals. As defined by Enders and Granger (1998), the Heaviside indicator function for the TAR specification is given as:

$$I_t = \begin{cases} 1 & if\ \hat{\varepsilon}_{t-1} \geq \tau \\ 0 & if\ \hat{\varepsilon}_{t-1} < \tau \end{cases} \quad (4)$$

The threshold value, τ, is endogenously determined using the Chan (1993) procedure which obtains τ by minimizing the sum of squared residuals after sorting the estimated residuals in an ascending order, and eliminating 15 percent of the largest and smallest values. The elimination of the largest and the smallest values is to assure that the $\hat{\varepsilon}_t$ series crosses through the threshold in the sample period. Throughout this study, the included lags are selected by the statistical significances of their estimated coefficients as determined by the *t-statistics*.

5.3 The Asymmetric Error-Correction Models

Moreover, to investigate the short-run asymmetric dynamic behavior between the return on the market equity portfolio and the risk–free interest rate, this study specifies and estimates the following asymmetric error-correction model. The estimation results of this model can be used to discern the nature of the Granger causality between the return on the market stock portfolio and the risk-free rate. Additionally, the following TAR-VEC model differs from the conventional error-correction models by allowing asymmetric adjustments toward the long-run equilibrium.

$$\Delta ER_t = \alpha_0 + \rho_1 I_t \hat{\varepsilon}_{t-1} + \rho_2 (1 - I_t)\hat{\varepsilon}_{t-1} + \sum_{i=1}^{n} \alpha_i \Delta ER_{t-i} + \sum_{i=1}^{q} \gamma_i \Delta RF_{t-i} + u_{1t} \quad (5)$$

$$\Delta RF_t = \tilde{\alpha}_0 + \tilde{\rho}_1 I_t \hat{\varepsilon}_{t-1} + \tilde{\rho}_2 (1 - I_t)\hat{\varepsilon}_{t-1} + \sum_{i=1}^{n} \tilde{\alpha}_i \Delta ER_{t-i} + \sum_{i=1}^{q} \tilde{\gamma}_i \Delta RF_{t-i} + u_{2t} \quad (6)$$

where $u_{1,2t} \sim i.i.d.(0, \sigma^2)$ and the Heaviside indicator function is set in accord with (4). This model specification recognizes the fact that the return on market equity portfolio responds differently depending on whether the equity premium is widening or narrowing, due to the nature of economic shock or countercyclical policy.

5.4 GARCH(s, r)-M Model

As to the equity premium in relation to market volatility and economic condition, Graham and Harvey (2009) analyzed the history of the equity premium from surveys of U.S. Chief Financial Officers conducted every quarter from June 2000 to March 2009. They defined equity premium as the expected 10-year S&P 500 return relative to a 10-year U.S. Treasury bond yield. They noted that these surveys were conducted during the darkest parts of a global financial crisis. They further indicated that the equity premium sharply increased during the crisis. The authors also found that the level of the equity premium closely tracks the market volatility as measured by the VIX. Additionally, from June 2000 to March 2012 surveys, Graham and Harvey (2012) found that while the equity premium sharply increased during the financial crisis peaking in February 2009, and then steadily fell until the second quarter 2010. These aforementioned results indicated that the equity premium is affected by market volatility and economic condition of the economy.

The Pakistani economy has become more and more internationalized and the international economic landscape over the sample period has been dotted with international political and social turmoil. These developments exacerbate the variance of equity premium and cause the variance to be different from some sub-periods to others over the sample period. Additionally, the graph of the Pakistani equity premium in Figure 1 strongly supports the different variances in the Pakistani equity premium from one sub-period to another period. Therefore, another important question for investors, policy makers, and corporate executives is whether the fluctuations in the equity premia of the market portfolio and hence their variances from the one month affect the premia and the variances in the next month. To this end, this investigation specifies and estimates the following GARCH(s, r)-in-Mean (GARCH-M) model to discern this possibility. GARCH-M models have been very popular and effective for modeling the volatility dynamics in many asset markets.

$$EP_t = c + \lambda\omega_t^2 + \varepsilon_t \quad (7)$$

$$\omega_t^2 = \alpha + \sum_{l=1}^{r} \beta_l \varepsilon_{t-l}^2 + \sum_{m=1}^{s} \eta_m \omega_{t-m}^2 \quad (8)$$

where EP_t is the equity premium, and ω_t^2 is the variance of the Pakistani equity premium at time *t*; ε_t is a disturbance; c is a constant; λ, α, β_l, and η_m are the parameters to be estimated of the model. The retentions of these estimated coefficients, including the constant term c, are determined by the calculated z-statistics at the 5 percent level of significance. The *r* and *s* indices are the highest subscripts *l* and *m* of retained β_l and η_m.

6. Empirical Results

6.1 Results of the Test for Structural Break

The estimation results of Perron's endogenous unit root tests are summarized in Exhibit 1. An analysis of the empirical results reveals that the post-break intercept dummy variable, *DU, is positive* and the post-break slope dummy variable, *DT,* is negative and both are insignificant at any conventional level. The time trend is positive and is insignificant at a 5 percent level. The break dummy variable, $D(T_b)$, is positive and is significant at any conventional level. The empirical results of these tests suggest that the Pakistani equity premium followed a stationary trendless process with a break date of December 1999.

Exhibit 1- PERRON'S ENDOGENOUS UNIT ROOT TEST, PAKISTANI DATA, 1998:07 - 2013:12

$$EP_t = 4.1513 + 14.1432DU + 2.1011t - 2.1213DT + 253.6801D(T_b) + 0.0014EP_{t-1} + \upsilon_t$$

(0.07769) (0.2487) (0.4334) (-0.4373) (2.5514*) (0.0195)

No. of augmented lags: $k = 0$ Break Date: Dec. 1999 $t(\alpha = 1) = -13.5612$

Notes*: Critical values for t-statistics in parentheses: Critical values based n = 100 sample for the break-date (Perron, 1997). "*" indicates significance at 1 percent level.*

6.2 Results of Cointegration Test with Asymmetric Adjustment

To examine whether or not the Pakistani equity premium , EP_t, and the risk-free rate, RF_t, are co-integrated when allowing for possible asymmetric adjustments, the equity premium is regressed on a constant and an intercept dummy with values of zero prior to December 1999 and values of one for December 1999 and thereafter. The estimation results are reported in Exhibit 2.

Exhibit 2- ESTIMATION RESULTS FOR EQUATION (2), PAKISTANI DATA, 1998:07 - 2013:12

$$EP_t = 17.7540Dummy_t + \varepsilon_t$$

(7.6010*)

ln L = -1,117.2016 $R^2 = 0.0286$ DW statistic[(a)] = 1.9493

Notes*:* *"*" indicates significance at 1 percent level.*

(a) *As articulated by Enders and Siklos (2001, p. 166), in this type of model specification, ε_t may be contemporaneously correlated.*

The residuals from them above estimation are used to estimate the TAR model specified by equations (3) and (4). The estimation results for the TAR model are reported in Exhibit 3. Over all, the empirical results reveal that the null hypothesis of symmetry, $\rho_1 = \rho_2$, cannot be rejected at any significant level, based on the partial *F = 0.1308*, indicating statistically that adjustments around the threshold value of Pakistani equity premium are symmetric.

Additionally, The calculated statistic Φ_{μ} = *0.0976* indicates that the null hypothesis of no co-integration, $\rho_1 = \rho_2 = 0$, should not be rejected at the 5 percent significance level.

Exhibit 3- UNIT ROOT AND TEST OF ASYMMETRY, PAKISTANI DATA, 1998:07 - 2013:12

ρ_1	ρ_2	τ	$H_0 : \rho_1 = \rho_2 = 0$	$H_0 : \rho_1 = \rho_2$	aic	sic
-0.8465*	-0.7558*	-86.5545	Φ_{μ} = 0.0976	*F* = 0.1308	9.0595	9.2317
	$Q_{(12)}$=8.0960[0.8627]		*ln L = -1,104.2772*	*$F_{(4,179)}$=44.3137**	DW = 2.0079	

Notes: *The null hypothesis of a unit root, $H_0 : \rho_1 = \rho_2 = 0$, uses the critical values from Enders and Siklos, 2001, p. 170, Table 1 for four lagged changes and n = 500.. "*" and "**"indicate 1 percent and 5 percent levels of significance, respectively. The null hypothesis of symmetry, $H_0 : \rho_1 = \rho_2$, uses the standard F distribution. τ is the threshold value determined via the Chan (1993) method. $Q_{(12)}$ denotes the Ljung-Box Q-statistic with 12 lags.*

The estimation results actually reveal that both ρ_1 and ρ_2 are statistically significant at any conventional level. In fact, the point estimates suggest that the premium tends to decay at the rate of $|\rho_1| = 0.8465$ for $\hat{\varepsilon}_{t-1}$ above the threshold, $\tau = -86.5545$ and at the rate of $|\rho_2| = 0.7558$ for $\hat{\varepsilon}_{t-1}$ below the threshold.

$\hat{\varepsilon}_{t-1}$ > -86.5545 is indicative that an economic shock or a countercyclical monetary policy action causing a decline in the risk-free rate, such as an expansionary monetary policy, has widened equity premium. This widening of the premium initiates a downward adjustment in the equity premium. Similarly, $\hat{\varepsilon}_{t-1}$ < -2.8391 is indicative that an economic shock or a countercyclical monetary policy action causing an increase in the risk-free rate, such as a contractionary monetary policy, has narrowed equity premium. This narrowing of the premium initiates an upward adjustment in the premium. However, the aforementioned failure to reject the null hypothesis that $\rho_1 = \rho_2$ at any significant level, based on the partial *F = 0.1308*, indicates a symmetric adjustments of the equity premium about its threshold to negative and positive shocks in the long run.

6.3 Results of the Asymmetric Error-Correction Models

Exhibit 4 summarizes the estimation results for the TAR-VEC model specified by equations (4), (5) and (6) using the Pakistani return on the market equity portfolio and the risk-free rate. In the summary of the estimation results, the partial F_{ij} represents the calculated partial *F-statistic* with the p-value in square brackets testing the null hypothesis that all coefficients *ij* are equal to zero. "*" indicates the 1 percent significant level of the *t-statistic*. $Q_{LB\ (12)}$ is the Ljung-Box statistic and its significance is in square brackets, testing for the first twelve of the residual autocorrelations to be jointly equal to zero. *lnL* is the log likelihood. The overall *F-statistic* with the p-value in square brackets tests the overall fitness of the model. The retained estimated coefficients α_i, γ_i, $\tilde{\alpha}_i$, and $\tilde{\gamma}_i$ are based on the 5 percent level of significance of the calculated *t-statistics*.

An analysis of the overall empirical results indicates that the estimated equations (5) and (6) are absent of serial correlation and have good predicting power as evident by the Ljung-Box statistics and the overall *F-statistics*, respectively.

Exhibit 4- ASYMMETRIC ERROR CORRECTION MODEL, PAKISTANI DATA, 1998:07 - 2013:12

Eq. (5)	**Independent Variables** *Overall* $F_{(8,152)} = 20.6011[0.0000]$; *lnL= -948.7369;* $Q_{(12)}$ *=3.2300[0.9937];* $\overline{R}^2$ *= 0.4950*			
ΔEP_t	$\alpha_{17} = \alpha_{23} = \alpha_{24} = 0$	$\gamma_2 = \gamma_{14} = \gamma_{16} = 0$	ρ_1	ρ_2
	Partial F_{11} *=3.1579[0.0265]*	*Partial* F_{12} *= 3.4460[0. 0183]*	-0.859360*	-0.95235*
Eq. (6)	**Independent Variables** *Overall* $F_{(8,164)} = 48.2456[0.0000]$; *lnL= 569.9177;* $Q_{(12)}$ *=19.8890[0.0692];* $\overline{R}^2$ *= 0.6873*			
ΔRF_t	$\tilde{\alpha}_1 = \tilde{\alpha}_3 = \tilde{\alpha}_8 = \tilde{\alpha}_{11} = 0$	$\tilde{\gamma}_6 = \tilde{\gamma}_{12} = 0$	$\tilde{\rho}_1$	$\tilde{\rho}_2$
	Partial F_{11} *=7.2258[0.0000]*	*Partial* F_{12} *= 163.8196[0. 0000]*	0.000030*	0.000003

Notes: *Partial F-statistics for lagged values of changes in the return on Pakistani market portfolio and the proxy risk-free rate, respectively, are reported under the specified null hypotheses.* $Q_{(12)}$ *is the Ljung-Box Q-statistic to test for serial correlation up to 12 lags. "*" indicates 1 percent level of significance of the t-statistics.*

With regard to the short-run dynamic Granger causality between equity premium and the risk-free rate, the partial *F-statistics* in equation (5) reveal a bi-directional Granger-causality between the risk-free rate to the equity premium; i.e., the equity premium responds to both its own lagged changes and the lagged changes of risk-free rate as well. Similarly, the empirical results for equation (6), the partial *F-statistics* suggest that the risk-free rate responds not only to its own lagged changes but also to lagged changes of the equity premium in the short run. Over all, the TAR-VEC estimation results seem to suggest that the Pakistani equity market responds to monetary, fiscal policy and economic shocks which change the proxy risk-free rates. This finding indicates that the Pakistani economic policies influence its equity market in the short run.

As to the long-run adjustments, the statistical significances of the error correction terms and $|\rho_2| > |\rho_1|$ in equation (5) indicates that the equity premium asymmetrically responds to negative and positive shocks when short-run dynamic components are introduced to the model. Since ρ_1 and ρ_2 are significant at any conventional level, the estimation results of the TAR-VEC reveal that equity premium reverses to the long-run equilibrium faster when the equity premium is below the threshold than when it is above the threshold. With regard to the risk-free rate, the estimation results of equation (6) show $|\tilde{\rho}_2| < |\tilde{\rho}_1|$ and only both $|\tilde{\rho}_1|$ is statistically significant at any conventional level, indicating that the risk-free rate only responds to the widening but not the narrowing of the equity premium in the long run.

6.4 Results of the GARCH(s, r)-M Model

As aforementioned, the retentions of the estimated coefficients of equations (7) and (8) are determined by the calculated z-statistics at the 5 percent level of significance. The *r* and *s* indices are the highest subscripts *l* and *m* of retained β_l and η_m which are *l* =1 and *m*=4, respectively. The values of *l* and *m*, in turn, suggest GARCH (1, 4) be the best model for this investigation**.** The estimation results of the GARCH (1, 4)-M model are reported in Exhibit 5.

An analysis of the estimation results of the GARCH(r, s)-M model suggests the presence of GARCH (1, 4) effect on the Pakistani monthly equity returns and their variance. Financially, the empirical results indicate that the fluctuations in the equity premia on the market portfolio and their variances from the one month affect the premia and the variances in the next month.

Exhibit 5- GARCH (1, 4)-M MODEL RESULTS, PAKISTANI DATA, 1998:07 - 2013:12

$$EP_t = 0.0022\omega_t^2 + \varepsilon_t \tag{9}$$

(2.9123*)

$$\omega_t^2 = 6{,}042.8740 + 0.0582\varepsilon_{t-1}^2$$

(2.0887*) (4.2019*)

$$-0.5207\omega_{t-1}^2 - 0.3498\omega_{t-2}^2 + 0.5695\omega_{t-3}^2 + 0.5576\omega_{t-4}^2 \tag{10}$$

(-2.8557*) (-2.8419*) (5.5613*) (2.7758*)

Notes: *Akaike info criterion=11.9034; Schwarz criterion =12.0248; Hannan-Quinn Criterion=11.9526; Log likelihood = -1,100.0170; Durbin-Watson Statistic = 1.9543.*
"" indicates the 1 percent level of significance.*

7. Concluding Remarks

While the theoretical debate on the anomalous equity premium is unsettled, equity has been an important instrument channeling the financial resources from the capital surplus economic units (the savers) to the financial deficit units (the borrowers) in the direct financing mode of the market economy. This study uses the well known TAR and the GARCH (1, 4)-M models to analyze the behavior of the Pakistani equity premium. This study utilizes annualized monthly return on the market equity portfolio in Pakistan and the banks' deposit rate as the proxy measure for the risk-free rate. The equity premium is defined as the difference between the monthly change in the Pakistani equity premium and the proxy risk-free rate. The data set used in this investigation covers the period from the months of July 1998 to December 2013 where the data on the risk-free rate is available. Descriptive statistics reveal that the equity premium over the sample period is 18.53 indicating that the Pakistani equity premium is among the highest premia in its neighboring Asian countries and much higher than the corresponding figures in the advanced economies.

Perron's endogenous unit root test reveals that the equity premium is a stationary trendless process with a structural break date of December 1999. The threshold autoregressive TAR model reveals that the Pakistani equity market symmetrically responds to monetary, fiscal policy and internal or external economic shocks, which is indicative that the policy makers use these instruments to effectively manage the equity market in the long run.

With regard to the short-run dynamic Granger causality between the equity premium and the risk-free rate, the estimation of equation (5) revealed a bi-directional Granger-causality between the risk-free rate to the equity premium. Similarly, the empirical results for equation (6), suggest that the risk-free rate responds not only to its own lagged changes but also to lagged changes of the equity premium in the short run. Taken together, the empirical results of the TAR-VEC suggest that the Pakistani equity market responds to monetary, fiscal policy and economic shocks which change the proxy risk-free rates. These findings indicate that the Pakistani economic policies matter in the short run.

As to the long-run and when short-run dynamic components are introduced to the model, the TAR-VEC reveal that the equity premium reverses to the long-run equilibrium faster when the equity premium is below the threshold than when it is above the threshold. However, the risk-free rate only responds to the widening but not the narrowing of the equity premium.

Finally, the empirical investigations suggest GARCH (1, 4)-M is the best model for this investigation**.** The significance of the GARCH (1, 4)-M indicates the presence of a GARCH (1, 4) effect on the Pakistani monthly equity returns and their variance.

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