

## **Stock Prices and Exchange Rate Relationship Puzzle: A Case of Asian Markets**

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### **Abstract**

*This study utilized the OLS and Quantile regression approach to investigate the relationship between stock prices and exchange rate. Monthly data of exchange rate and stock market of Pakistan, China, Russia and Turkey from March, 2003 to July, 2017 have been used. For data of stock market major stock indices are used and currency exchange rate of country with respect to US dollar are used. The paper checked the stationarity of the series through ADF test as well as PP test and Engle & Granger to check the long run relationship. It is observed that none of the country exhibit long run equilibrium between exchange rate and stock prices. Results are same under two different methods of ordinary least square and Quantile regression. Both models show that coefficient of China is negative, which support the presence of portfolio balance effect in China. Results demonstrate that stock prices (SP) and exchange rate (EX) have asymmetric relationship as coefficients vary under different quantiles.*

**Keywords:** quantile regression; exchange rate; Asian markets

### **Introduction.**

Recent changes in stock market at global level, like financial integration between countries, financial markets and countries are more prone to adopt flexible exchange rate, have enhanced the interest to study the relationship between stock prices and exchange rate. Particularly international investment and portfolio opportunities has increased due to relaxation of the restriction on private capital. Meanwhile, risk of international investment and exchange rate volatility has increased as countries adopted the more flexible exchange rate. So, currency choice is pivotal factor in portfolio investment internationally. Hence, the choice of portfolio investment and currency decision is important because they both have effect on each other. Moreover, changes in stock market due to funds movement at international level, may affect the exchange rate value. Numerous studies have been conducted to explore the direction of relationship between EX and SP by using different samples and methodologies but found the mixed results. Limited relationship found by (Groenewold & Paterson, 2013; Zhao,

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2010), some studies (Jayasinghe & Tsui, 2008; Pan et al., 2007) identified that exchange rate effect the stock market. Huy (2016) identified that stock prices effect exchange rate. Some studies found unidirectional (Cuestas & Tang, 2015; Ray, 2012; Türsoy, 2017) and some found bidirectional (Bhunia, 2012; Khan & Ali, 2015; Liaquat et al., 2016) relationship. Mixed evidence of positive and negative relationship identified by (Mouna & Anis, 2016; Stavarek, 2005). No relationship by (Asaolu & Ogunmuyiwa, 2011; Safitri & Kumar, 2014). Negative relationship by (Adjasi, Harvey, & Agyapong, 2008; Akbar, Khan & Khan, 2012), positive relationship by (Phylaktis & Ravazzolo, 2005).

Reason of choosing these countries is that these four nations are going to become allied nations and have a rapid move to create a super power circle of four nations, as every country is putting best effort to strengthen this circle. While having a partnership with Pakistan and Russia, china has reliable relation with Turkey as well. Russia is also reestablishing its relation with Turkey along with strengthen relations with Pakistan. Meanwhile Pakistan for decades has particular close links with China and Turkey and recently started getting economic and military support from Russia. Turkey also remained major allies of Pakistan in terms of Trade, diplomacy, defense and economic cooperation. Meanwhile it enjoyed a stable relation of trade, economic and military with China as well. After China support to Erdogan in July 2016 their bilateral relation become stronger. Moreover, Ankara also getting closer to Moscow. It seems that nothing will restrain them from building a strong circle of tetra allied nations; Moscow, Ankara, Beijing, and Islamabad. After the completion of economic corridor, central Asian states and the four modern progressive Muslim states will practically form an economic bloc in an instant. So, it's all a game for economic strength in the future. Their economic relation is indicating that Pakistan-China-Russia superpower triangle is going to become reality as other nation are also showing interest to join this block, so this could be game changer for Asia and world as a whole.

### **Literature review**

In past decades the number of empirically studies examined the casual relationship between EX and SP but there is no clear stance that how these two markets are interacting. Th cause is the difference in macroeconomic conditions like economy size, level of inflow, development of the economy and the extent to which these markets are interconnected (Živkov, Njegić, & Markelić, 2014). Basically, there are two approaches through which these two markets are connected one is Dornbusch et al. (1980) flow oriented' model and other is stock oriented

model (Frankel, 1987; Branson, 1983). After the implementation of financial integration at global level plethora of studies empirically tested the relationship between SP and EX. However, all studies presented the different views about the relationship some identified no relationship and some found there exist relationship between SP and EX. The study of Moore and Wang (2014) identified that countries with low capital mobility, economic integration creates the link between SP and EX, confirming the flow-oriented approach and countries with high mobility of capital, financial integration is the main cause of link, which confirm the stock-oriented approach. Tsai (2012) investigated the dynamic relationship between SP and EX in six Asian countries and confirmed the presence of stock-oriented model. In Asian context another study of (Walid et al., 2011), indicate the presence of stock oriented model by using hidden Markov EGARCH model found that there exists negative relationship between SP and EX. Chkili, Aloui, and Nguyen (2012) investigate the relationship between SP and EX by using univariate and multivariate GARCH model in three European markets and exchange rate. Their study explores that there exist long memory and asymmetric in the relationship of the all series under consideration. Multivariate analysis show that there exists significance relationship between EX and SP in France and Germany. Study revealed the superiority of univariate FAIPARCH and bivariate CCC-FIAPARCH model for estimation of in sample and forecasting of out sample as compared to GARCH model. Further study suggests that the forecasting of portfolio market exposure and diversification benefit of SP and ER FIAPARCH model is most suitable.

Although the relationship between SP and EX is well documented in the literature. But studies show conflicting results. So, indirect relationship might not exist. However indirect relationship can be found if there is large amount of foreign capital inflow and outflow due to obvious profit opportunities, which cause the substantial quantity of money to enter or leave the market. So international trading effect exist at normal time, when there is no chance of foreign capital inflow and outflow and market is not volatile. But when market is more volatile, there is bubble in the market the considerable quantity of money will enter or leave the market, consequently the currency of country depreciates or appreciate. In such scenario there will be negative relationship between EX and SP. The goal of this study is to explore the relationship between SP and EX in Asian countries. As Asian countries are more exports oriented so there is more chance of attracting foreign capital. Hence, the presence of portfolio balance effect will indicate negative relationship.

### Methodology

This paper utilizes the unit root test by employing ADF (1984) test as well as PP test (1988) in order to avoid the spurious regression. Koenker and Bassett Jr (1978) introduced the Quantile regression which is commonly used in research to find the dependence relation between the variables. The linear model of ordinary least square is  $Y = \beta x' t + \mu$  which provide the estimation of conditional mean by just averaging the negative and positive distribution. The use of SRTs may provide the biased estimation because it just focused on mean value and provide no information regarding left and right tail distribution. So, this study utilizes Quantile regression for analyzing the relationship between SP and EX. Main advantage of this method is that it is more flexible, permit for more accurate description of the tails of distribution of y, more vigorous to outliers and non-normality, and does not require distributional assumptions to optimally estimate the parameters. The relationship between SP and EX can be analyzed more comprehensively by this method because it focusses on the median instead of mean behavior. It efficiently captures the entire conditional distribution of the response variable instead of only the mean as with ordinary least square. Moreover, this method examines the conditional distribution of response variable with regard to scale, location and shape.

### Data Analysis

This paper utilizes the monthly data of EX and SP in Pakistan, China, Russia and Turkey from March, 2003 to July, 2017. For data of stock market major stock indices are used and currency exchange rate of country with respect to US dollar are used. Its mean that value of currency depreciates with respect to increase in exchange rate. Table 1 indicate the descriptive statistic of the data. Which shows that sample mean is positive for stock indices and for exchange rate as well. Except Russia all the values show that exchange rate and stock indices are positively skewed for all other countries. To reduce the problem of spurious regression, it is essential to ensure that before estimating the model series are stationary. To test the stationarity Unit Rot test is conducted. By using ADF and PP-tests stationarity of the series is analyzed at level and first differences. Table 2 shows that all the series are non-stationarity at level but all series become stationary when their return are measured by first differences. Table 3 shows the different quantile function have different coefficient. The estimated results of table 3 show that coefficient using data of Pakistan, China, Russia and Turkey all are almost significant under different quantiles. The coefficient varies according to different quantiles,

in case of Pakistan and turkey all coefficient ranging from .10 to .90 are positive and significant whereas in case of china coefficient under .10 and .20 quantiles are not significant and under .20 to .90 quantiles all coefficient is negatively significant.

*Table 1: Results of Descriptive statistics*

Variables	Mean	SD	Skew	Kurt
<b>Countries</b>				
<b>Stock price index</b>				
Pakistan	11897.74	8677.832	1.10828	3.584594
China	2318.205	948.7943	1.25462	4.541107
Russia	1124.642	528.3446	-0.474124	1.717636
Turkey	44522.86	24056.78	0.065695	1.782309
<b>Exchange rate</b>				
Pakistan	75.8254	17.12899	0.3731	1.549303
China	7.248602	0.861984	0.042934	1.305354
Russia	31.38431	7.389572	3.041486	12.95009
Turkey	1.613865	0.352026	1.403704	4.943167

*Table 2: Results of unit root test*

Country	EX		SP	
	Levels	differences	levels	differences
<b>ADF test</b>				
Pakistan	0.272042	-6.523309	-1.547401	-11.97163
China	-0.793562	-8.039472	-1.911570	-8.894670
Russia	0.276835	-9.543146	-2.574251	-11.37210
Turkey	-0.547866	-11.79722	-1.847117	-7.494839
<b>PP test</b>				
Pakistan	0.181004	-10.14206	-1.543407	-11.94083
China	-0.621417	-8.416804	-1.917916	-9.201705
Russia	1.156083	-9.269405	-2.510668	-11.38616
Turkey	-0.7478131	-11.75351	-1.847117	-14.53252

In case of Russia the coefficient under .30 to .70 quantiles are not significant and under .10<sup>th</sup> and .20<sup>th</sup> quantile coefficients are significant and negative. And under .80 and .90 quantile coefficients are significant positive. Thus, result shows that there is asymmetric relationship between stock prices and exchange rate as coefficients vary under different quantiles. This paper tries to provide the new explanation on the relationship between SP and EX by using quantile regression. Results indicate that only in China there exist portfolio balance approach.

Table 3: Quantile regression model estimated results:  $\Delta \ln E_t = \alpha_0 + \alpha_1 \Delta \ln \frac{S_t + \mu_t}{\text{Country}}$

Country	Quantile	coefficient ( $\alpha_1$ )	t-statistic
	0.10	0.055298	2.546785
	0.20	0.05156	1.942548
	0.30	0.083635	2.219757
	0.40	0.222476	10.34042
Pakistan			
	0.50-0.187034		14.34886
	0.60-0.185366		15.74777
	0.70-0.171302		16.85255
	0.80-0.180448		20.18488
	0.90-0.170505		22.55193
	0.10-0.06455		-0.71792
	0.20-0.24808		-1.11062
	0.30-0.24406		-7.97611
	0.40-0.23806		-9.64752
China			
	0.50-0.22303		-9.80028
	0.60-0.22981		-9.38287
	0.70-0.17707		-4.57518
	0.80-0.09419		-5.44081
	0.90-0.08486		-6.15263
	0.10-0.07019		-6.66361
	0.20-0.04673		-3.54922
	0.30-0.02435		-1.63311
	0.40-0.00874		-0.6145
Russia			
	0.50-0.00528		0.41889
	0.60-0.006421		0.535585
	0.70-0.018951		1.54143
	0.80-0.035207		2.245531
	0.90-0.143188		2.284071
	0.10-0.084962		1.426568
	0.20-0.069545		1.714
	0.30-0.097609		2.818261
	0.40-0.087008		2.825425

Turkey		
0.50	0.133122	5.018385
0.60	0.13027	5.106758
0.70	0.141662	6.068692
0.80	0.169149	7.719429
0.90	0.167058	8.641259

on its local currency. Billah Dar et al. (2014) conclude that effect of stock prices on the appreciation of local currency depends on its level of strength. If the local currency is weak than growth in stock  $E_t$  is the exchange rate of a country:  $S_t$  is the stock price index of the country prices will have minimum contribution in enhancing the value of its currency whereas if the local currency is strong than growth of stock prices will strongly contribute in enhancing the value of local currency. Due to exchange rate stability, foreign investments improved, it enhances country export and help in maintaining balance of trade (Drine & Rault, 2006; Edwards, 1988; Jawaid & Raza, 2013; Khattak, Tariq, & Khan, 2012). So, in case of Pakistan one reason of lack of portfolio balance approach is that its currency is very weak and unstable. Inconsistent in policies is a main reason for the low value of Pakistani currency. Other reason may be money supply, as money supply have positive effect on exchange rate, in Pakistan money supply is continuously increasing. Excess supply makes it easy to acquire cheap and easy money by cutting down interest rate. Which in a result devalue the currency (Raza & Afshan, 2017). On the other hand, Pakistan and Turkey are facing the problem of trade deficit. Their exports are less than their imports. Balance of trade effect the currency exchange rate through its effect on supply and demand for foreign exchange. If a country exports are higher than imports, there would be higher demand for its goods resulting in increased demand for local currency which enhances the value of local currency. But Pakistan and turkey imports are higher as compared to its exports and having a trade deficit of 337775 PKR Million in July of 2017 and 6.01 billion in June 2017 respectively.

Portfolio balance approach does not exist all the time and everywhere. This approach exists only when there is bubbles in the economy, economy of the country is more volatile, it allows the absorption of foreign inflow into the country, there are obvious profit earning opportunities, and if economy of the country is not volatile, there is no profit making opportunity, absorption of foreign capital is not possible in the market than indirect effect of SP indices on EX might not occur. So, in normal time when there is no foreign capital inflow and outflow in the market than there exists only international trading effect. And during abnormal time period portfolio balance approach exist (Tsai, 2012).

## Conclusion

By using monthly data (from March 2003 to July 2017) SP and EX in four Asian countries (Pakistan, China, Russia and Turkey) the paper utilizes the unit root test to check the stationarity of the series through ADF test as well as PP test. Ordinary least square method and Quantile regression model to find out the relationship between EX and SP. The quantile regression model is used because OLS provide only average estimation of dependent variables, which may lead toward biased estimation.

Result indicate that data in all four countries doesn't have similar pattern in various coefficient under different quantile function. Results are same under two different methods of OLS and Quantile regression. Both models show that coefficient of China is negative, thus indicating the negative relationship between SP and EX which supports the presence of portfolio balance effect in China. The coefficients of Pakistan, Turkey and Russia have a positive sign indicating the absence of portfolio balance theory. Although the Quantile regression depicts the same results but coefficients under different quantiles shows variation. Which indicate that relationship between SP and EX vary according to market condition.

## References

- Adjasi, C., Harvey, S. K., & Agyapong, D. A. (2008). Effect of exchange rate volatility on the Ghana Stock Exchange. *African Journal of Accounting, Economics, Finance and Banking Research*, 3(3), 28-47.
- Akbar, M., Khan, S. A., & Khan, F. (2012). The relationship of stock prices and macroeconomic variables revisited: Evidence from Karachi stock exchange. *African Journal of Business Management*, 6(4), 1315-1322.
- Asaolu, T., & Ogunmuyiwa, M. (2011). An econometric analysis of the impact of macroeconomic variables on stock market movement in Nigeria. *Asian Journal of Business Management*, 3(1), 72-78.
- Bhunia, A. (2012). A causal relationship between stock indices and exchange rates-empirical evidence from India. *Research Journal of Finance and Accounting*, 3(1), 47-54.
- Billah Dar, A., Shah, A., Bhanja, N., & Samantaraya, A. (2014). The relationship between stock prices and exchange rates in Asian markets: A wavelet based correlation and quantile regression approach. *South Asian Journal of Global Business Research*, 3(2), 209-224.
- Branson, W. H. (1983). A model of exchange-rate determination with

- policy reaction: evidence from monthly data. In: National Bureau of Economic Research Cambridge, Mass., USA.
- Chkili, W., Aloui, C., & Nguyen, D. K. (2012). Asymmetric effects and long memory in dynamic volatility relationships between stock returns and exchange rates. *Journal of International Financial Markets, Institutions and Money*, 22(4), 738-757.
- Cuestas, J. C., & Tang, B. (2015). Asymmetric exchange rate exposure of stock returns: Empirical evidence from Chinese Industries. *The Sheffield Economic Research Paper Series (SERPS)*, 201502(021).
- Dornbusch, R., Branson, W. H., Kenen, P., Houthakker, H., Hall, R. E., Lawrence, R., . . . von Furstenburg, G. (1980). Exchange rate economics: where do we stand? *Brookings papers on economic activity*, 1980(1), 143-205.
- Drine, I., & Rault, C. (2006). Learning about the long-run determinants of real exchange rates for developing countries: A panel data investigation. *Contributions to Economic Analysis*, 274, 307-325.
- Edwards, S. (1988). Real and monetary determinants of real exchange rate behavior: Theory and evidence from developing countries. *Journal of Development Economics*, 29(3), 311-341.
- Frankel, J. A. (1987). *Monetary and portfolio-balance models of exchange rate determination*: University of California, Berkeley, Department of Economics.
- Groenewold, N., & Paterson, J. E. (2013). Stock prices and exchange rates in Australia: Are commodity prices the missing link? *Australian Economic Papers*, 52(3-4), 159-170.
- Huy, T. Q. (2016). The linkage between exchange rates and stock prices: Evidence from Vietnam. *Asian Economic and Financial Review*, 6(7), 363.
- Jawaid, S. T., & Raza, S. A. (2013). Dynamics of current account deficit: A lesson from Pakistan. *Transition Studies Review*, 19(3), 357-366.
- Jayasinghe, P., & Tsui, A. K. (2008). Exchange rate exposure of sectoral returns and volatilities: Evidence from Japanese industrial sectors. *Japan and the World Economy*, 20(4), 639-660.
- Khan, R. E. A., & Ali, R. (2015). Causality Analysis of Volatility in Exchange Rate and Stock Market Prices: A Case Study of Pakistan. *Asian Economic and Financial Review*, 5(5), 805-815.
- Khattak, N. U. R., Tariq, M., & Khan, J. (2012). Factors affecting the nominal exchange rate of Pakistan: An econometric investigation (1982-2008). *Asian Economic and Financial Review*, 2(2), 421.
- Koenker, R., & Bassett Jr, G. (1978). Regression quantiles. *Econometrica: Journal of Managerial Sciences*

- Journal of the Econometric Society*, 33-50.
- Liaquat, H., Gul, N., Irfan, A., & Sami, A. (2016). Pakistan's exports efficiency: An application of the stochastic frontier gravity model. *Abasyn Journal of Social Sciences–Special Issue*, 164-177.
- Mouna, A., & Anis, J. (2016). Market, interest rate, and exchange rate risk effects on financial stock returns during the financial crisis: AGARCH- M approach. *Cogent Economics & Finance*, 4(1), 1125332.
- Pan, M.-S., Fok, R. C.-W., & Liu, Y. A. (2007). Dynamic linkages between exchange rates and stock prices: Evidence from East Asian markets. *International Review of Economics & Finance*, 16(4), 503-520.
- Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75(2), 335-346.
- Phylaktis, K., & Ravazzolo, F. (2005). Stock prices and exchange rate dynamics. *Journal of international money and finance*, 24(7), 1031- 1053.
- Ray, S. (2012). Testing granger causal relationship between macroeconomic variables and stock price behaviour: Evidence from India. *Advances in Applied Economics and Finance*, 3(1), 470-481.
- Raza, S. A., & Afshan, S. (2017). Determinants of Exchange Rate in Pakistan: Revisited with Structural Break Testing. *Global Business Review*, 18(4), 825-848.
- Safitri, I. R., & Kumar, S. (2014). The impact of interest rates, inflation, exchange rates and GDP on stock price index of plantation sector: Empirical analysis on Bei in the year of 2008–2012. *Full Paper Proceeding TMBER*, 1, 55-61.
- Said, S. E., & Dickey, D. A. (1984). Testing for unit roots in autoregressive- moving average models of unknown order. *Biometrika*, 71(3), 599-607.
- Stavarek, D. (2005). Stock prices and exchange rates in the EU and the United States: evidence on their mutual interactions.
- Tsai, I.-C. (2012). The relationship between stock price index and exchange rate in Asian markets: A quantile regression approach. *Journal of International Financial Markets, Institutions and Money*, 22(3), 609- 621.
- Türsoy, T. (2017). Causality between Stock Prices and Exchange Rates in Turkey: Empirical Evidence from the ARDL Bounds Test and a Combined Cointegration Approach. *International Journal of Financial Studies*, 5(1), 1-10.
- Walid, C., Chaker, A., Masood, O., & Fry, J. (2011). Stock market

- volatility and exchange rates in emerging countries: A Markov-state switching approach. *Emerging Markets Review*, 12(3), 272-292.
- Zhao, H. (2010). Dynamic relationship between exchange rate and stock price: Evidence from China. *Research in International Business and Finance*, 24(2), 103-112.
- Živkov, D., Njegić, J., & Markelić, J. (2014). Exchange rate effect on stock returns in the East European emerging markets: A quantile regression approach. *Industrija*, 42(3), 7-21.