The Causality between Stock Market and Foreign Exchange Market of Pakistan

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Abstract
It is evidenced from the “goods market theory” and “portfolio balance approach” that the stock index and the Exchange Rate determine each other. This study tries to analyze the dynamic relationship between stock market index and exchange rate. To test Long run relationship between these two variables, Engle-Granger Co-integration test is used and it is evidenced that there is no long run relationship in both variables. To analyze, is there any causation in any direction in the variables? Granger Causality (GC) Test is used. The sample period of this study run over Jan 1995 to Jan 2010. The sample size includes 181 data points of month end closing values of stock market index and exchange rate. The results indicate no causal relationship. The contradicting results of this study to the literature is attributed the unstable political environment in Pakistan.

Key words: Karachi Stock Exchange 100 Index, Exchange rate, Granger Causality, Long Run Relationship

1. Introduction:

The role of developing economies cannot be ignored by the global investors in order to diversify the risk of their international investments portfolio. As the world trade is growing at an incredible pace, and the capital is moving across the globe, foreign exchange is determining the profitability of the global investors and return over their equity investments (Kim 2003). Korihara (2006), have statistically proved that many economic factors such as dividend, stock prices in other countries, interest rate, employment, exchange rate etc, drive local stock returns.

Exchange rates affect the firms’ competitiveness in international market and have an impact on the prices of output and input of firms (Joseph, 2002). When the domestic currency appreciates against the counter country currency, the value of exports in domestic terms will decline, which leads to loss and decrease in stock prices. On the contrary, the effect of appreciation of exchange rate is positive on import oriented country, this reduces cost of imports and the competitiveness of importers will increase in domestic market. Resultantly, their stock prices and profits will appreciate. The appreciation of domestic currency against foreign currency has negative consequences for export oriented industries and positive for imports-dominant country (Ma and Kao, 1990).
Several previous research studies have observed some unusual and unexpected movement in the stock return and the foreign exchange market. One group of research studies support the notion that the exchange rate and stock returns have short run unidirectional causality, and the exchange rate granger cause stock returns. These studies include Li and Huang (2009), Bahmani-Oskooee & Sohrabian’s (1992) and Chien-Chung Nieth & Cheng-Few Lee’s (2001). However, the other studies provide that stock prices granger cause exchange rates, e.g. Horobet et, al (2007). Other studies provide some evidences about significant positive relationship between the stock returns and foreign exchange rates, i.e. Aggarwal (1981), Giovannini and Jorion (1987), and Roll (1992). Research suggests a strong negative relationship between the two variables, the stock prices and the effective exchange rates, Soenen and Hennigar (1988). There is another group of researchers; their studies suggest that there is no significant relationship between stock market returns and foreign exchange rate i.e. Franck and Young (1972), Solnik (1987), Chow et al. (1997).

From findings of above mentioned studies we cannot say conclusively about the direction of causality between the two financial variables, exchange rate and stock returns. The findings of the above mentioned studies show that there is no empirical harmony about the relationship between stock market returns and foreign exchange rates and the question remain unresolved. Besides the above, the empirical literature is not as rich in findings on developing countries as it is on developed countries.

Most of the research is about the developed countries, though there are studies about the developing economies, but they are comparative studies. Very little work is done about the individual economy like Pakistan. Though; studies are available about the Pakistani economy, but they are relative, because Pakistani economy was studied within a group with other economies e.g. India, Bangladesh, Srilanka. Only few researches were found in the literature by Tahir and Keung (2003), Qayyum and Kemal (2006) which were regarding Pakistani economy. In their studies they only study the relationship between foreign exchange and stock market returns.

The remaining of the paper is organized as: section 2 describes a brief literature review, section 3 explains data and methodology, Section 4 focuses on the empirical results and the last section concludes the paper and presents a gateway for further research.
2. Literature review:

The literature on the relationship between stock prices and exchange rates is very rich, but inconclusive. Frank and Young (1972) are considered to be the pioneers to investigate the relationship between exchange rates and stock prices. Their study concluded with the findings that the two variables have no significant relation. Jorion (1990, 1991), Bodnar and Gentry (1993), and Bartov and Bodnar (1994) all support the empirical findings of Frank and Young (1972). Naeem and Rasheed (2002) investigate the dynamic relationship between stock prices and exchange rate for four south Asian countries for the period January 1994 to December 2000 using monthly data; they concluded that there is no short run and long run relationship between stock prices and exchange rate for Pakistan and India. No short run relationship was also found for Bangladesh and Sri Lanka; however, two way long run relationships exist between stock price and exchange rate. A study conducted by Lutfur Rahman and Jashim (2009) investigated the dynamic relationship between stock prices and exchange rates for three emerging South Asian countries Pakistan, India and Bangladesh. They found no causal relationship between the stock prices and exchange rates for these emerging markets. On the contrary Ang and Ghallab (1976) studied that how 15 US Multinational firms react to US Dollar change for a period of August 1971 to March 1973, and conclude that due to efficiency of stock market the stock adjust quickly to changes in the exchange rate. Aggarwal (1981) studied the relationship between the US Dollar and US Stock prices for the period Five years (1974 to 1978), and conclude that US Dollar and US Stock Prices are positively correlated.

Using data from developed and developing countries Moradoglu, Taskin and Bigen (2001), detected unidirectional causal relationship from exchange rates to stock returns. Only they found bidirectional causality between the variables in Mexico.

Many theoretical models have analyzed the dynamic causal relationship between stock price and exchange rates. One of them is “Goods market approach” by Dornbusch and Fischer, (1980). Their model suggests that fluctuations in exchange rates influence the competitiveness of the firm in the market, as the variation in the exchange rate affect the value of the earnings and the cost of financing, which is borrowed in terms of foreign currencies to finance their operations and therefore the stock prices of the firm. When the exchange rate (domestic currency) depreciate it make the local products (exporting products) more attractive for foreigners and demand for these exporting goods increases in the foreign market and hence the revenue and value of the exporting firm is positively effected and
therefore the stock price. On the opposite when domestic currency appreciates, it makes exports expensive and unattractive for the importer on the other side, which negatively affects the revenues and value of the exporting firm. However, the effect of variation in exchange rate on the revenue and value of importing firm is opposite to that of an exporting firm. We can conclude from the above premises that appreciation in exchange rate is negatively related to the stock prices of the exporting firm and positively related to stock price of importing firm.

In addition to that, the variation in exchange rate also affects the value of receivables and payables of the firm. The appreciation of exchange rate appreciate the value of receivables, mean receive more in terms of local currency, ultimately this appreciation of exchange rate appreciate the value of the firm. The effect of depreciation of exchange rate is negative over the value of the firm. The appreciation and depreciation of the exchange rate also positively and negatively affect the payments of the firm and hence the value of the firm. Hence it can be concluded that, the intensity of the effect of changes in exchange rate on stock prices is dependent upon the significance of foreign trade in the economy and the balance of payment imbalances at macro level. The empirical findings of Mao and Kao (1990) seem to be consistent with the “goods market theory” and suggest that the stock prices of export oriented economy is negatively affected by the appreciation of exchange rate, and for an import oriented economy the stock prices are positively affected by the appreciation of exchange rate. Using daily data for the period of 1985 to 1991 of eight advanced economies, Ajayi and Mougoue (1996), found that exchange rate fluctuation have a very strong significant impact upon the stock prices of these economies. Yu, Q (1997), used daily data from the three different markets (Hong Kong, Tokyo Ma and Singapore) for the period (1983-1994) and found a unidirectional causality from exchange rates to stock prices for Singapore, and bidirectional causality for Tokyo Market. Abdalla and Murinde (1997), using co-integration approach to investigate any causal relationship in exchange rate and stock prices in four Asian markets Pakistan, India, Korea and Philippine. In Pakistan and Korea they did not find any causality which is in consensus with the findings of early studies e.g. Frank and Young (1972), Jorion (1990, 1991), Bodnar and Gentry (1993), and Bartov and Bodnar (1994), but they detect unidirectional causality from exchange rate to stock prices in India and vice versa in Philippines. Chamberlin (1997), suggest that the US banking stock are affected by the changes in US dollar exchange rate. Pan, Fok and Lui (1999), report similar empirical findings that exchange rates are granger causing the stock prices, but the causality in the other
way around is significantly weak. Using data from developed and developing countries Moradoglu, Taskin and Bigen (2001), detected unidirectional causal relationship from exchange rates to stock returns. They found bidirectional causality between the variables only in Mexico.

In macroeconomics an alternate theory for exchange rate determination is the “Portfolio Balance Approach” which supports the hypothesis about the causal relationship between stock prices and exchange rates. Portfolio balanced approach stresses that exchange rate are determined by the fluctuation in the equity market and work under the demand and supply framework. An upward moving stock market of the country grabs the attention of the foreign investors to invest in the stock and diversify their portfolios; hence the upward movement brings more foreign currency to the country and increases the demand for the local currency, which leads to appreciation of the local currency. On the other side, when the stock market falls, the stocks lose its attraction to be added in the portfolio. And the investors then sell out their stocks to avoid further losses this leads to lower demand for local currency and the local currency depreciates. As a result the upward (downward) movement of the stock market of country will lead to appreciate (depreciate) the exchange rate of the country.

Smith (1992), used different models for investigating the causal relationship between stock prices and exchange rates, and concluded that the value of the equities have a significant influence over exchange rate. Libly (1993), used three different methods for lag selection, and tested for the causality. The study suggests that there is unidirectional causality which moves from stock prices to exchange rate, but there is no causal relationship between the stock prices and exchange rate in vice versa. Granger, Huang and Yang (2000) conducted a detailed study of the Philippine and South Korean market and concluded that in Philippine the unidirectional causality exists between stock market and exchange rate, and the direction of the causality is from stock exchange to exchange rates. Mansoor (2000), found no long run relationship between stock prices and exchange rates, but found unidirectional causal relationship from stock prices to exchange rates in short run. Sheng and Shuh (2004) studied the volatility spillover between stock market and foreign exchange market for the period May 1979 to January 1999, and concluded that stock market volatility significantly effect the volatility of foreign exchange market. Kate and Fabiola investigated the dynamics between the stock price and exchange rate for Pacific Basin Countries over the period 1980 to 1990 and find that the stock price and Exchange rates are positively related and the Stock prices are granger causing the exchange rate and no reverse causality.
Bhmani, Oskooee and Sohrabian (1992), investigated the variables for long run relationship. They used monthly data from 1973 to 1988, in short run the study findings suggest two way causal relationships from stock prices to exchange rates and vice versa, but in long run find no causal relationship between stock prices and exchange rate.

Soenen and Hennigar (1988), study suggested a strong negative relationship between the two financial variables, the stock prices and the effective exchange rates, during the period from 1980 to 1986.

Banerjee and Adhikary (2006), studied Bangladeshi market, and tried to find out long run and short run relationship among the stock return, exchange rates and interest rates. The found long run equilibrium relationship exist among the variables, and move from exchange rate and interest rates to stock prices.

Erbaykal and Okuyan (2007) studied thirteen developing countries and found causality relationship only in eight countries stocks price and exchanges rates. Five countries variables produce ne way causality, from stock prices to exchange rates. The bidirectional causality is found in three countries stocks prices and exchange rates. There was no causality for the remaining three countries. Sevuktekin and Nargelecekenler (2007), detect positive and two way causality between the financial variables from Turkish market for the period of 1986 to 2006.

Hye, Wasti, Khatoon and Imran (2009), studied the relationship between stock prices, exchange rates and demand for money in Pakistan, for the period of 1997:1 to 2006:4. The found the stock price has positive and statistically significant relationship with money demand and exchange rates have insignificant association with demand for money in long run.

3. Data and Methodology:

3.1 Data

To study the dynamic relationship between the stock market index and exchange rate, time series monthly data of stock index (monthly data of Karachi Stock Exchange 100 index) and exchange rate (Rupees per US dollar) were collected. The exchange rate data were obtained from www.oanda.com and the KSE 100 Index data were collected from www.marketwatch.com. The month end closing values have been used for KSE 100 Index and exchange rates. The data period covers January 1995 to January 2010 with total 181 observations.

The motivation behind the selection of the sample period from 1995 to 2010 was the ever changing political environment of Pakistan and engagement of Pakistan in global war in
terror as a front line ally of US. In this period Pakistani economy also suffered because of economic sanctions due the atomic blasts of 28th May, 1998 in response to Indian Atomic blasts. Another reason for the selection of this study period was the effect of global recession starting in the beginning of 2006 and still roaring over the global economy.

3.2. Econometric Methodology:

To check for the causality between stock index and exchange rate the Granger Causality (GC) test is used. The GC test is used to study whether two variables e.g. X & Y are related and which one cause the other or vise versa or neither one cause the other. There are four possible results from the GC test (i) X Granger cause Y (ii) Y Granger cause X (iii) No Granger causality exists between X and Y (iv) Bidirectional causality run from X to Y and Y to X.

Before using Granger Causality test following steps are taken:

To check stationarity in the data, Augmented Dickey Fuller test is used. This process is also called the test for unit root. If unit is present so the data in non-stationary and the first difference of the data is taken.

1. To find out that the data is co-integrated or not the Engle- Granger test is used. In this test the same order data is used.

2. And in the last the Vector Auto Regression test is used to find out the causality between the variables.

The Augmented Dickey Fuller (ADF) (1979, 1981) test is based on the following regression model:

Equation (1) tests for the unit root. Where \( \delta (Y_t - Y_{t-1}) \) and \( \delta (Y_{t-2} - Y_{t-3}) \) etc. Now to test it for a unit root, so as \( \delta \) and, it means that the unit root is present. When t (\( \tau \)) value of the coefficient of \( \delta \) in absolute terms is less than \( \tau \) critical value, so it indicates that the series is nonstationary. To make the data stationary usually the first difference of the data is taken and make is stationary. The null hypothesis for the unit root is that \( \delta \) is \( I (1) \).

The Granger Causality test use the following the regression equation to find out the causality between the stock index and exchange rate.

Where: \( KSE_{MKT} \) = Karachi Stock Exchange 100 index monthly closing values.

\( = \) = Monthly Pakistani Rupee to US Dollar exchange rates.

In equation (2), the dependent variable \( KSE_{MKT} \) is regressed upon the lagged terms of \( PKR_{EX} \) and \( KSE_{MKT} \). Similarly in equation (3) regress the dependent variable \( PKR_{EX} \)
upon the lagged values of the independent variables $KSEMKT$ and $PKREX$. The error terms in equation (2), and in equation (3) are the error terms of the regressions and supposed to be uncorrelated. The null hypothesis for equation (2) is that, that there is no evidence of causation form $KSEMKT$ to $PKREX$ and for equation (3) that there is no causation from $PKREX$ to $KSEMKT$. On the basis of these results, one of the above discussed four outcomes will be evidenced.

4. Empirical results
Augmented Dickey Fuller test of unit root was used to test the stationarity of both the variables. The Table 1 and Table 2 show the results for the test of stationarity for the KSE 100 Index (Stock Index) and Exchange Rate at level form. We are failed to reject the null hypothesis of non stationarity at level including the constant and trend for both the variables. The results for stationarity at difference level involving the constant and trend. The results are shown in Table 3 and Table 4. We are able to successfully reject the null hypothesis of non stationarity and accept the alternate that the data is stationary at first difference level. From the results given in table 3 and 4 we can proceed to perform the Engle Granger Co integration test.

Engle- Granger Co-integration test is used for finding out the long run relationship between Stock Index and Exchange Rate. The empirical results are given Table 5. The calculated “t” is not higher than the tabulated t-values at1% and 5%. We are unable to reject the unit-root hypothesis for the residuals. The results indicate that there is no long run relationship between the two variables in Pakistan. The Durbin Watson $d$ test of Co-integration and Johansen co-integration test confirm the results. The study supports the findings of Tahir and Keung (2003) and Abdalla and Murinde (1997).

As the co-integration is very much lag sensitive, therefore the AIC criterion for lag selection is used. Table 6 presents the F- statistics and its probability values, using the minimum AIC which is lag 2. Where result indicate very low F value means that we can not reject null hypothesis of no causality from Exchange rate to Stock Index and vice versa. It means that in Pakistan, nor Exchange rate Granger cause stock index and neither Stock index Granger cause Exchange rate. From the results it is concluded that in Pakistan there is no short run and long run relationship between Stock Index and Exchange rates. The results of this study (about the short run relationship between stock market index and exchange rate) are not supporting the result of Tahir and Keung (2003) and Abdalla and Murinde (1997).
5. Conclusion

The main purpose of this study is to empirically analyze the dynamic relationship between the Karachi Stock Exchange 100 Index and Exchange Rate (Pak Rupee / US Dollar). The variables used in this study were non stationary at level, and stationary at first difference. To check for co integration the Engle Granger test is used, the results indicate that there is no long run relationship between the two variables of the study. These results mean that the KSE 100 Index and Exchange rate (Pak Rupee / US Dollar) dose not move together in long run in Pakistan.

After performing the Augmented Dickey Fuller Test and Engle Granger Co integration test I perform the Granger Non Causality test. The results evidence no causality in either direction, nor from Exchange rate to Stock index neither in vise versa. The results of this study are contradicting the results obtained by the Tahir and Keung (2003) and Abdalla and Murinde (1997). One reason of the contradicting results is the unstable political environment of Pakistan over the study period from Jan 01, 1995 to Jan 01, 2010. Therefore, form the analysis of this study, though both variables are not Granger causing each other, when the investor want to make decision about the investment in either sector he must get information about each sector separately. It is also concluding that the Policy makers’ of Government of Pakistan about these two sectors of the economy should not use the information from any sector to make policies for the other sector. Hence the stable political environment is necessary for the stable economic development of the economy.
References


http://www.oanda.com/currency/historical-rates
http://www.marketwatch.com/investing/index/KSE100/historical?countryCode=xx
Annexure

Table 1 Panel A: Stationarity test for KSE 100 Index (stock index) at level form.

<table>
<thead>
<tr>
<th>Lags</th>
<th>Test with constant</th>
<th>Test with constant and trend</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tau calculated</td>
<td>Tau critical at 1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>−3.51</td>
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<td></td>
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</table>

Table 1 Panel B: Stationarity test for Exchange rate at level form.

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<tr>
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<td></td>
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</table>

Table 3 Panel A: Stationarity test for KSE 100 Index (stock index) at first difference.

<table>
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<td>Tau calculated</td>
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<td></td>
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</tbody>
</table>

* Denotes significance at 1% level
** Denotes significance at 5% level.
Table 4 Panel B: Stationarity test for Exchange rate at first difference

<table>
<thead>
<tr>
<th>Lags</th>
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<th>Tau calculated</th>
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<th>Test with constant and trend</th>
<th>Tau calculated</th>
<th>Tau critical at 1%</th>
<th>Tau critical at 5%</th>
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<td>1</td>
<td></td>
<td>−7.7743**</td>
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<td>−7.76448**</td>
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<td></td>
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</tbody>
</table>

* Denotes significance at 1% level
** Denotes significance at 5% level.

Tau values for the residuals.

Table 5. Engle Granger test for co-integration between Stock index and Exchange rate.

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<td>1%</td>
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Table 6. Granger Causality Test between Stock Indices and Exchange Rate.

<table>
<thead>
<tr>
<th>Null Hypothesis.</th>
<th>Exchange rate does not Granger cause stock Indices.</th>
<th>Stock indices does not Granger cause Exchange rate.</th>
<th>Lags.</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
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<td>KSE 100 index</td>
<td>2.521860 (0.059)</td>
<td>3.720486 (0.012)</td>
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<td>KSE 100 index</td>
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<td>3.691393 (0.003)</td>
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<td>18.36</td>
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<tr>
<td><strong>KSE 100 index</strong></td>
<td><strong>2.785114 (0.009)</strong></td>
<td><strong>3.017814 (0.005)</strong></td>
<td>3</td>
<td><strong>18.34</strong></td>
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<td>KSE 100 index</td>
<td>2.776268(0.004)</td>
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