

CAUSAL RELATIONSHIP BETWEEN MACROECONOMIC VARIABLES AND STOCK PRICES IN PAKISTAN

Faiza Saleem, Mohd Norfian Alifiah
Faculty of Management,
Universiti Teknologi Malaysia
Johor Bahru, Johor, Malaysia.

ABSTRACT

The intention of this research is to provide empirical evidence regarding causality among interest rate, inflation rate and exchange rate with stock prices in Pakistan for the period from 1990 to 2015. The findings from cointegration test indicated that there was a negative relationship of interest rate, inflation rate and exchange rate with stock prices. Granger causality test result shows unidirectional causality running from interest rate to stock prices and no causality was observed for inflation rate and exchange rate. The overall evidence proposed that equity market of Pakistan does not incorporate substantial information of interest rate, inflation rate and exchange rate in its stock prices and do not reflect the macroeconomic condition of the country.

Key words: Interest rate, inflation rate, exchange rate, stock prices, Pakistan

1. INTRODUCTION

In many countries the stock markets are becoming an integral part of their economies. Due to introduction of free and open economic policies and advancement of technologies, investors are finding easy access to stock markets around the world. The purpose of the stock market is to facilitate the exchange of securities between lender and borrower. The participants in the stock market range from small individual stock investors to large hedge fund traders. Stock prices are the prices of securities traded on the stock exchange which is also called as stock market; it plays an important role in economic prosperity and fostering capital formation and sustaining economic growth (Adjasi, Harvey, and Agyapong, 2008; Hamrita, Abdallah, and Ammou, 2009; Quayes, 2010; Pilinkus, 2015). The prices of the securities traded on the stock market are changed on a daily basis and these are determined by demand and supply. Some of the factors behind decreases or increases in the demand and supply of a stock could comprise market behavior, company fundamentals and external factors (Kurihara, 2006). The fact that stock market indices indicates the health of the economy. The increasing

importance of the stock market has motivated the formulation of many theories to describe the working of the stock markets.

The performance of the stock market is affected by the macroeconomic variables (Rafay, Naz, and Rubab, 2014; Mgammal, 2012; Rjoub, Türsoy, and Günsel, 2009; Saeed, 2012). Investors consider macroeconomic variables as important factors when they value stocks. Interest rate, inflation rate and exchange rate are very important among these macroeconomic variables which affect the performance of the stock market. Interest rate is the cost of borrowing and also used as a discount rate to discount future cash flows of the financial assets. Whereas, exchange rate is the value of one currency in expression of another currency. Similarly inflation is the average increase in prices of goods and is affected by money supply. A rapid increase in inflation also affects negatively the performance of the stock market (Sohail, and Hussain, 2009).

The Karachi Stock Exchange (KSE) is the largest and oldest stock exchange in Pakistan. It is the most liquid market and many national and international

securities are enlisted on it. It was declared as the "Best Performing Stock Market of the world in the year 2002 by the international magazine "Business Week". Pakistani government has introduced several reforms to stabilize the performance of the capital market. These reforms are aimed at a balanced development of the Pakistan capital markets and financial sector (Husain, 2004). From the year 2005-2008, KSE showed very significant and record performance. KSE 100 index crossed 14000 which is life high performance of Pakistani equity markets (Ali *et al.*, 2010). The contributing factors include the expansion in the economic activities, strength in the exchange rate, low lending interest rate, and improvement in recovery of outstanding loans, payment of foreign debts, merger and acquisitions etc. In order to attract investors, the country develops policies for privatization, liberalization and deregulation which will ultimately effect the performance of stock market.

The purpose of this research study is to determine the causality of interest rate, inflation rate, exchange rate and stock prices in Pakistan.

2. LITERATURE REVIEW

Many studies examined the empirical relationships between interest rate, inflation rate, exchange rate and stock prices. Nishat, Shaheen, and Hijazi (2004) examined the relationship between a set of macroeconomic variables like money supply, inflation rate, interest rate, index of industrial production and the KSE Index. The results from cointegration test and Granger causality test revealed that variables were cointegrated and long-run negative relations were found between inflation and stock prices. In addition the results from Granger causality test showed that causality ran from selected macroeconomic variables to stock prices. Moreover, Khan *et al.* (2012) studied the impact of inflation rate on stock returns of KSE 100 index. The result from multivariate regression showed that there is a weak relationship between the dependent variable and independent variable. The impact of inflation rate was insignificant on stock returns of KSE 100 index.

Al-Mukit (2013) examined relationship between interest rate and stock market performance for a sample of Bangladesh companies for the time period of 1991 to 2012. The result from

cointegration technique reveals a significant long run negative relationship between the variables. The study concludes that a one percent increase in interest rate causes 13.20 % decrease in market index. Moreover, Granger causality analysis suggests the existence of a unidirectional causality from interest rate to market index. Likewise, Hasan and Javed (2009) revealed a negative relationship of the interest rate with equity market returns in Pakistan. This negative relationship also be found in other studies (Kim, 2003; Nissim and Penman 2003; Hsing 2004; Khrawish *et al.*, 2010). Moreover Khrawish, Siam, and Jaradat (2010) observed the impact of interest rates on the stock market capitalization rate in Amman Stock Exchange (ASE). The results from regression analysis showed a positive relationship between government prevailing interest rate and stock market capitalization rate in Jordan. In the similar context, Ishfaq, Ramiz, and Awais (2010) used multiple regression analysis and concluded that change in interest rate has a significant impact on stock returns in Pakistan. Similarly Jawaid and Haq (2012) examined the effects of interest rates and their volatilities on stock prices of banking industry of Pakistan. The results

from cointegration analysis revealed a significant negative long run relationship between interest rate and stock prices. Whereas, the results from causality analysis shows unidirectional causality runs from interest rate to stock prices.

The relationship of stock prices with exchange rate was firstly examined by Franck and Young (1972) and the results from this study showed no relationship between stock prices and exchange rate. Moreover, Ishfaq *et al.* (2010) examined the relationship between stock return and exchange rates in Pakistani economy. The data of short term exchange rate (Rs/US \$) and stock market returns (KSE-100) had been used. The results from multiple regression showed that the change in exchange rate has a significant impact on stock returns over the sample period. Moreover, Aggarwal (1981) used simple regression analysis to explore the relationship of dollar exchange rate and stock prices indices. The study undertakes monthly data of U.S. exchange rate and stock prices during the periods of 1974-1978. The results of this study showed that stock prices and the value of the U.S. dollar both are positively related. Similarly, a positive cointegration between stock market prices and foreign

exchange rate has also been found by Singh, Mehta, and Varsha, (2011). Likewise, Khan and Ali (2015) examined the direction of causation between the volatilities of exchange rate and stock market prices in Pakistan. The study takes monthly time series data of Karachi Stock Exchange prices (KSE-100 Index) and exchange rate of Pakistan (rupee against US dollar) during the time period of January 1992 to February 2013. The results from Granger causality test show a bidirectional relationship between the exchange rate volatility and the variability of stock market prices in Pakistan.

3. RESEARCH METHODOLOGY

The stock market returns are the true reflector of the changes in variables (exchange rate, interest rate and inflation rate) of any economy. To test this relationship, we collect the data of interest rates, inflation rate, exchange rate and stock market return (KSE 100 index points) from the period of 1990-2015 on yearly basis. Data for interest rate, inflation rate and exchange rate for Pakistan has been taken from the Asian Development Bank website, and data for index has been taken from KSE and

Yahoo Finance. The study applied Augmented Dickey Fuller (ADF) Unit Root test proposed by Dickey and Fuller (1979), Johansen's co-integration test proposed by Johansen (1991) and Granger-causality test proposed by Granger (1988), Engle and Granger (1987). Statistical package STATA was used for these analyses.

The empirical model is given as following:

$$SP = \alpha + \beta_1 IR + \beta_2 INF + \beta_3 ER + \epsilon$$

Where SP= stock prices, IR = interest rate, INF= inflation rate, ER= exchange rate, ϵ = error term, α = intercept and β_1 , β_2 and β_3 = coefficients.

Hypothesis of the study are

H 1: There is a significant relation between inflation and stock prices

H 2: There is a significant relation between interest rate and stock prices

H 3: There is a significant relation between exchange rate and stock prices

4. RESULT AND DISCUSSIONS

Augmented Dickey-Fuller (ADF)

Augmented Dickey-Fuller (ADF) unit root test has been used in order to find out the non stationarity and stationarity of the data at level and at first differences. The results in Table 1 suggest that all the variables are stationary in the first

difference. The test result reject the null hypothesis that there is a unit root in the first difference for stock prices, interest rate, exchange rate and inflation rate.

Table 1. Augmented Dickey Fuller (ADF) unit root tests at first differences

| Variables | Stock Prices | Exchange Rate | Inflation Rate | Interest Rate |
|----------------------|--------------|---------------|----------------|---------------|
| Lag | 0 | 0 | 0 | 0 |
| Coefficient | -1.4510 | -0.9434 | -1.2619 | -0.9627 |
| Test Statistics | -7.535 | -4.427 | -6.019 | -4.518 |
| 5 % critical Value | -3.000 | -3.000 | -3.000 | -3.000 |
| Probability | 0.000 | 0.000 | 0.000 | 0.000 |
| Order of Integration | I(1) | I(1) | I(1) | I(1) |

Cointegration Test

The study applies cointegration tests in order to investigate any possible long-run equilibrium relationship between the series. Cointegration means the linear combination of time series variables. Engle and Granger (1987) develop this methodology. This method helps to find out the presence of number of cointegrating vectors and the presence of any vector depends upon two likelihood ratio tests developed by Johansen (1991). The results from this test

indicate that the null hypothesis is rejected because the value of both trace test (λ_{trace}) and maximum eigenvalue test (λ_{max}) is greater than the critical value at five percent level of significance. This indicates that the annual data for this study from 1990 to 2015 support the intention that in Pakistan there exist a long term relationship between interest rate, inflation rate, exchange rate and stock prices. The normalized cointegration equation for this model indicates that a 1 percent increase in the exchange rate, the stock prices is predicted to decrease by 0.026782 percent. Also show that 1 percent increase in the inflation rate is associated with 0.35971 percent decrease in the stock prices. Finally the same equation shows that 1 percent increase in the interest rate is associated with 7.98121 percent decrease in the stock prices, by holding all other factors constant. α is 0.958186 which show the average value of the dependent variables when all the independent variables are equal to zero. This shows that there is negative relationship between exchange rate, interest rate, inflation rate and stock prices in Pakistan. Table 2 shows the result of Johansen cointegration test.

Table 2. Johansen cointegration test

| | | | | |
|----------------------------------------|---------------|-------------------|---------------|----------|
| Trend | Constant | Lags | 3 | |
| Max Rank | 0 | Trace Statistics | 60.14 | |
| | | 5% Critical Value | 47.21 | |
| Max Rank | 0 | Max Statistics | 36.546 | |
| | | 5% Critical Value | 27.07 | |
| Normalized Co integrating Coefficients | | | | |
| Stock Prices | Exchange Rate | Inflation Rate | Interest Rate | C |
| 1 | -0.000287 | - 0.003597 | - 0.079812 | 0.958186 |
| Sig. | 0.267 | 0.806 | 0.009 | 0.006 |

Granger Causality Test

This test proposed by Engle and Granger (1981). It tells us about the direction of causality, and table 3 shows the result of Pairwise causality.

The results of Granger causality reveal one unidirectional causality running from interest rate to stock prices. The P-value of the null hypothesis is 0.0017 which is less than 5% also the F statistic value is 10.989. So the null hypothesis has been rejected and alternative hypothesis has been accepted. For all other variables there is no significant p value, as a result all other null hypotheses have been accepted and alternative hypotheses have been rejected. The study of Shah *et al.* (2012) demonstrates a unidirectional causality

from interest rate to market index for the economy of Pakistan. Similar causality is found in the study of Cifter and Ozun (2007) for the economy of Turkey.

Table 3. Pairwise Granger Causality Test

| Null Hypothesis | Obs | F-Statistic | Prob. |
|----------------------------------------------------|-----|-------------|--------------|
| Exchange Rate does not Granger Cause Stock Prices | 26 | 0.29088 | 0.8311 |
| Stock Prices does not Granger Cause Exchange Rate | | 1.2413 | 0.3458 |
| Inflation Rate does not Granger Cause Stock Prices | 26 | 0.16322 | 0.9187 |
| Stock Prices does not Granger Cause Inflation Rate | | 1.0121 | 0.4275 |
| Interest Rate does not Granger Cause Stock Prices | 26 | 10.989 | 0.0017 ** |
| Stock Prices does not Granger Cause Interest Rate | | 0.06039 | 0.9795 |

Note: ** significant at 5% respectively.

5. CONCLUSION

The study has analyzed the causal relationship between macroeconomic variables and stock prices in Pakistan. The macroeconomic variables were represented by interest rate, exchange rate and inflation rate whereas the stock prices is represented by KSE100 index. The study applies cointegration technique and Granger causality test to analyze the causal relationship between macroeconomic variables and stock prices in Pakistan.

The study found one unidirectional causality running from interest rate to stock prices and no causality was observed for interest rate to stock prices and inflation rate to stock prices in any direction. The study shows that Pakistani equity markets are not having causal relationship with macroeconomic variables and concluded that macroeconomic variables cannot be used to predict stock prices in Pakistan.

REFERENCES

[1] Adjasi, C., Harvey, S. K., and 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.

[2] Aggarwal, R. (1981). Exchange rates and stock prices: A study of the US capital markets

under floating exchange rates. *Akron Business and Economic Review*, 12(1), 7-12.

[3] Ali, I., Rehman, K. U., Yilmaz, A. K., Khan, M. A., and Afzal, H. (2010). Causal relationship between macro-economic indicators and stock exchange prices in Pakistan. *African Journal of Business Management*, 4(3), 312-319.

[4] Cifter, A. and Ozun A. (2007). Estimating the effects of interest rates on share prices using multi-scale causality test in emerging markets: evidence from Turkey. *Munich Personal RePEc Archive*, Paper No: 2485, 1-14.

[5] Dickey, D. A., and Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366a), 427-431.

[6] Engle, R. F., and Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 55(2), 251-276.

[7] Franck, P., and Young, A. (1972). Stock price reaction of multinational firms to exchange realignments. *Financial Management*, 1(3), 66-73.

[8] Granger, C. W. (1988). Some recent development in a concept of causality. *Journal of econometrics*, 39(1), 199-211.

[9] Hamrita, M. E., Ben Abdallah, N., and Ben Ammou, S. (2009). The multi-scale interaction between interest rate, exchange rate and stock prices. *Munich Personal RePEc Archive*, Paper No. 18424, 1-11.

[10] Hasan, A., and Javed, M. T. (2009). An empirical investigation of the causal relationship among monetary variables and equity market returns. *The Lahore Journal of Economics*, 14(1), 115-137.

[11] Hsing, Y. (2004). Impacts of fiscal policy, monetary policy, and exchange rate policy on real GDP in Brazil: A VAR model. *Brazilian Electronic Journal of Economics*, 6(1).

[12] Husain, I. (2004). Financial sector reforms in Pakistan. *Italy-Pakistan Trade and Investment Conference*. Rome, September 28, 2004. 28: 2004.

[13] Ishfaq, M., Ramiz, R., and Awais, R. (2010). Do interest rate, exchange rate effect stock returns? A Pakistani perspective. *International Research Journal of Finance and Economics*, 50(1), 146-150.

[14] Jawaid, S. T., and Haq, A. U. (2012). Effects of interest rate, exchange rate and their volatilities on stock prices: Evidence from banking industry of Pakistan. *Theoretical and Applied Economics*, 8(8), 153.-166.

[15] Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica: Journal of the Econometric Society*, 59(6), 1551-1580.

[16] Khan, R. E. A., and 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.

[17] Khan, Z., Khan, S., Rukh, L., Imdadullah, K and Rehman, W. (2012). Impact of interest rate, exchange rate and inflation on stock returns of KSE 100 index. *International Journal of Economics and Research*, 3(5), 142-155.

- [18] Khrawish, H. A., Siam, W. Z. and Jaradat, M. (2010). The relationships between stock market capitalization rate and interest rate: Evidence from Jordan. *Business and Economic Horizons*, 2(2), 60-66.
- [19] Kim, K. H. (2003). Dollar exchange rate and stock price: Evidence from multivariate cointegration and error correction model. *Review of Financial Economics*, 12(3), 301-313.
- [20] Kurihara, Y. (2006). The relationship between exchange rate and stock prices during the quantitative easing policy in Japan. *International Journal of Business*, 11(4), 365-375.
- [21] Mgammal, M. H. H. (2012). The Effect of inflation, interest rates and exchange rates on stock prices: comparative study among two GCC countries. *International Journal of Finance and Accounting*, 1(6), 179-189.
- [22] Muktadir-Al-Mukit, D. (2013). The effects of interest rates volatility on stock returns: Evidence from Bangladesh. *International Journal of Management and Business Research*, 3(3), 269-279.
- [23] Nishat, M., Shaheen, R., and Hijazi, S. T. (2004). Macroeconomic Factors and the Pakistani Equity Market. *The Pakistan Development Review*, 43(4), 619-637.
- [24] Nissim, D. and Penman, S. (2003). The association between changes in interest rates, earnings, and equity values. *Contemporary Accounting Research*, 20(4), 775-804.
- [25] Pilinkus, D. (2015). Stock market and macroeconomic variables: Evidences from Lithuania. *Economics and Management*, 14(1), 884-891.
- [26] Quayes, S. (2010). Does budget deficit lower equity prices in USA? *Economics Letters*, 107(2), 155-157.
- [27] Rafay, A., Naz, F., and Rubab, S. (2014). Causal relationship between macroeconomics variables: Evidence from developing economy. *Journal of Contemporary issue in business research*, 3(2), 88-99.
- [28] Rjoub, H., Türsoy, T., and Günsel, N. (2009). The effects of macroeconomic factors on stock returns: Istanbul stock market. *Studies in Economics and Finance*, 26(1), 36-45.
- [29] Saeed, S. (2012). Macroeconomic factors and sectoral indices: A study of Karachi stock exchange (Pakistan). *European Journal of Business and Management*, 4(17), 132-152.
- [30] Shah, A., Rehman, J. U., Kamal, Y. and Abbas, Z. (2012). The interest rates-stock prices nexus in highly volatile markets: Evidence from Pakistan. *Journal of Basic and Applied Scientific Research*, 2(3), 2589-2598.
- [31] Singh, T., Mehta, S., and Varsha, M. S. (2011). Macroeconomic factors and stock returns: Evidence from Taiwan. *Journal of economics and international finance*, 3(4), 217-227.
- [32] Sohail, N., and Hussain, Z. (2009). Long-run and short-run relationship between macroeconomic variables and stock prices in Pakistan: The case of Lahore Stock Exchange. *Pakistan*