

Dynamic relationship between Exchange rate and Stock Returns; Empirical Evidence from Colombo Stock Exchange

Amarasinghe AAMD

Department of Accountancy & Finance,
Faculty of Management Studies,
Sabaragamuwa University of Sri Lanka
E-mail: malithamarasingha@yahoo.com

Dharmaratne DG

Department of Accountancy & Finance,
Faculty of Management Studies,
Sabaragamuwa University of Sri Lanka
E-mail: dunu@sab.ac.lk

Abstract

This study examines the causal relationship between stock returns and exchange rate, using monthly data for the period from 2003 to 2012. Stock returns have been calculated using All Share Price Index (ASPI) in Colombo Stock Exchange and the details on exchange rate has been collected from the data released by the Central Bank of Sri Lanka.

Augmented Dickey Fuller test was used to find out the stationary of the data series and the Granger Causality test was used to check any causal relationship between stock returns and exchange rate. Outcomes showed that, there is one way causal relationship between variables. That is stock returns does Granger Cause exchange rate but exchange rate does not Granger Cause stock returns. Finally, to check the result of the Granger Causality Test, a regression was run. The result of the regression shows that stock return is not a significant factor for exchange rate changes. That implies a contradictory result between Granger causality and regression.

Key words: Stock Return, Exchange Rate, Granger Causality, Regression

1. Introduction

The stock market plays a vital role in the modern economy since it acts as a mediator between lenders and borrowers. That is, a well-functioning stock market may assist the development process in an economy. The economic theory suggests that stock prices should reflect expectations about future corporate performance. Thus, in order to formulate country's macroeconomic policies, the causal relations and dynamic interactions among macroeconomic factors and stock market are very important. Further, investors believe that monetary, exchange rate and interest rate policies of the country and macroeconomic events have a great influence on volatility of the stock prices which implies that macroeconomic variables can influence

investors' investment decisions and motivates many researchers to observe the relationships between stock returns and macroeconomic variables. Thus detecting the association between stock prices and exchange rates has become crucial for the academicians, practitioners and policy makers.

The empirical debate regarding the interaction between stock prices and exchange rates has been started few decades ago. Since then a good number of empirical studies so far have been conducted to investigate the relationship between the variables. But the researchers have found contradictory results regarding the existence of relationship and the direction of relationship which has made the area disconcerted environs of finance literature. Some of the studies showed that there is a significant positive relationship between the variables, such as, Aggarwal (1981), Giovannini and Jorion (1987), and Roll (1992). But some of the studies counter this argument and showed a significant negative relationship between the variables, such as, Soenen and Hennigar (1988). Some other studies find that there is no significant relationship between the variables, such as, Franck and Young (1972), Solnik (1987), Chow et al. (1997), and Bhattacharya and Mukherjee (2003). Bahmani-Oskooee and Sohrabian (1992), Nieh and Lee (2001) found no long-run relationship between the variables. So there is no empirical harmony among the researchers regarding the interactions between stock prices and exchange rates which justify the need of more research in this area to contribute to the literature.

All these studies have provided different results and the results have changed according to the macroeconomic factors used, the research methodology employed and the countries examined.

2. Problem Statement

Though financial economists, policy makers and investors have long-attempted to understand dynamic interactions between exchange rate and stock returns, the exact patterns of the interactions remain unclear, the nature and strength of the dynamic interactions between them is of high interest and need to be evaluated empirically.

Therefore, the researcher examines the dynamic relationship between exchange rate and stock returns in order to identify the impact of exchange rate changes on stock returns with special reference to Colombo Stock Exchange.

“What is the relationship between exchange rate and stock market returns?”

3. Objectives of the study

The major objective of the study is to identify the dynamic relationship between exchange rate and stock returns.

The specific objectives of the study are;

- To find whether there is a positive, negative or no relation between variables.
- To investigate the co-integration between variables.
- To give practical implications.

4. Development of hypotheses

In order to find the relationship between exchange rate and stock returns the following hypothesis is formed.

$H_0: \beta_i = 0$ Vs

$H_1: \beta_i \neq 0$

β_i = the coefficients of exchange rate

5. Significance of the Study

Investors have a great interest in discovering exchange rate changes that may help forecast stock prices. They can more appropriately manage their positions and portfolios, if they can use news on exchange rate changes as a reliable indicator for where the stock return is headed. Meanwhile, policymakers pay attention to the situation of the stock market reactions on exchange rate changes as a leading indicator of future stock market activity.

Investment analysts, fund managers and marginal investors can devise fundamentals based investment strategies in order to earn extra returns. It provides academic scholars with extra information on the application of methodology in order to identify the dynamic relationship between variables.

6. Literature Review

Existing literature were found out between exchange rate and stock returns and they were reviewed in order to identify the relationship between variables. Kim, (2003) asserts that the continuing increases in the world trade and capital movements have made the exchange rates as one of the main determinants of business profitability and equity prices. The association between stock prices and exchange rates has aimed at the minds of economists in view of the fact that they both take part in a country's economy growth. Thus, the increased investment opportunities and the volatility of exchange rates led the attention of the investors on the risk of their investment decisions, hedging and diversifying their portfolios.

Joseph, (2002) argues that exchange rate changes affect the competitiveness of firms through their impact on input and output price. When the exchange rate appreciates, since exporters will lose their competitiveness in international market, the sales and profits of export firms will shrink and the stock prices will decline. Alternatively, importers will increase their competitiveness in domestic markets. Hence, their profit and stock prices will increase and the depreciation of exchange rate will make adverse effects on exporters and importers. Thus, the currency appreciation has both a negative and a positive effect on the domestic stock market for an export-dominant and an import-dominated country respectively (Ma and Kao, 1990).

First, a considerable number of studies aimed at testing the exchange rate movements on stock returns in both industrialized and emerging countries which have recorded a positive relation. Aggarwal (1981) explored the relationship between changes in the dollar exchange rates and change in indices of stock prices using U.S. stock price data and the effective exchange rate and showed that stock prices and the value of the U.S. dollar is positive and the relationship is stronger in the short run than in the long run.

Mukherjee and Naka (1995) also show that the relationship between Tokyo stock prices and the exchange rate is positive.

Granger, Huang and Yang (1998) examine the causality issue using Granger causality tests and Impulse response functions for nine Asian countries and where for Japan and Thailand. They found that exchange rates lead stock prices with positive correlation while for Taiwan they suggest stock prices leads exchange rates with negative correlation. However, no relationship was found for Singapore and bi-directional causality was discovered for the remaining countries.

Niarchos and Alexakis (2000) investigated the predictability of stock market prices with exchange rate in the Athens Stock Exchange suggesting that monthly stock prices impact positively with exchange rate.

Chang (2002) used the two-factor model of Jorion (1990) to examine industry-level currency risk of Taiwan's stock market around the Asian financial crisis and conclude that export-oriented industries are positively affected by the depreciation of the Taiwan dollar and the results further show that the exchange rate risk is less for larger firms than for smaller firms as documented by studies such as Nance, Smith and Smithson (1993) and Chow, Lee and Solt (1997).

On the other hand, Mishra (2004) attempt to examine whether stock market and foreign exchange markets are related to each other or not and their forecast error variance decomposition indicates that the exchange rate return affects the stock return.

Similarly, Phylaktis and Ravazzolo (2005) in Pacific Basin countries, Ratanapakorn and Sharma (2007) in US and Sohail and Hussain (2009) in Pakistan examine the long-run and short-run relationships between stock prices and exchange rate and their evidence suggest that exchange rate had a significant positive impact on stock returns.

Amare and Mohsin (2000) also examine the long-run association between stock prices and exchange rates for nine Asian countries on monthly data employing co-integration technique and the long-run relationship between stock prices and exchange rates was found only for Singapore and Philippines.

The existence of a relationship between stock prices and exchange rate has received considerable attention for many years and several studies have confirmed a negative association between the two variables. Ajayi and Mougoue (1996), in eight advanced economies record that domestic currency depreciation has a negative both short-run and long-run effect on the stock market.

Soenen and Hanniger (1988) and Kim (2003) employed monthly data on stock prices and exchange rates discovering a strong negative relationship between the value of the U.S. dollar and the change in stock prices.

Like in US, in their study, Ibrahim and Aziz (2003) analyze the linkage between stock prices and exchange rate, discovering that stock prices have a negative association with the exchange rate in Malaysia.

Further, Doong et al. (2005) investigate the dynamic relationship between stocks and exchange rates for six Asian countries and their results reveal that there is a significant negative relation between the stock returns and the contemporaneous change in the exchange rates for all countries except Thailand.

On the other hand Pilinkus and Boguslankas (2009) analyze the short run relationships and conclude that exchange rate negatively influence on stock market prices in Lithuania.

There are some other related studies specifically focused on granger causality between stock prices and exchange rate. Abdulla and Murinde (1997) applied co-integration approach to examine the long-run relation between stock price index and the real effective exchange rate for Pakistan, Korea, India and Philippines and found a long-run relationship for India and Philippines, a unidirectional causality from exchange rates to stock prices for both Pakistan and Korea. Further, they show a unidirectional causality from exchange rate to stock prices for India but for Philippines the reverse causation from stock prices to exchange rates was found.

Another interesting study which relates to Sri Lankan context by Muhammad and Rasheed (2001), examines whether stock prices and exchange rates are related to each other or not for four South Asian countries, including Pakistan, India, Bangladesh and Sri-Lanka, and their standard Granger causality tests show a bi-directional causality between these two financial variables for Bangladesh and Sri Lanka.

Hatemi and Irandoust (2002) also study a possible causal relation between exchange rates and stock prices in Sweden using monthly nominal effective exchange rates and stock prices and find that Granger causality is unidirectional from stock prices to effective exchange rates.

On the other hand, Smyth and Nandha (2003) investigate the relationship between exchange rates and stock prices for the same countries as selected by Muhammad and Rasheed (2001), their empirical results reveal unidirectional causality running from exchange rates to stock prices for only India and Sri Lanka meaning that changes in exchange rates affect stock prices through influencing firms' exports in India and Sri Lanka.

Stavarek (2005) investigates the nature of the causal relationship between stock prices and effective exchange rates in four old EU-member countries (Austria, France, Germany, and the UK), four new EU-member countries (Czech Republic, Hungary, Poland, and Slovakia) and in the USA. The results show

much stronger causality in countries with developed capital and foreign exchange markets. The evidence also implies more powerful long-run as well as short-run causal relations in the period 1993-2003 than during 1970-1992. Further, causalities seem to be predominantly unidirectional with a direction running from stock prices to exchange rates.

The dynamic relationships between stock prices and economic variables in six Asian-Pacific selected countries examined by Mahmood & Dinniah (2009) using monthly data on stock price indices and foreign exchange rates and find long run equilibrium and short run multivariate causality between these variables.

On the contrary, Vygodina (2006) empirically explores the exchange rates and stock prices nexus for large-cap and small-cap stocks for the period 1987-2005 in the USA and result of study reveals that there is Granger causality from large-cap stocks to the exchange rate. However, he confirms that there is no causality for small-cap stocks and the nature of the relationship between stock prices and exchange rate is changing over time.

Wonghangpo and Sharma (2002) investigate the role of exchange rate on the stock prices in the ASEAN countries using monthly data in the long and short run and report their Granger causality tests indicate that the past values of exchange rate in these ASEAN countries are able to predict future changes in their stock prices.

Unlike all the above studies on the impact of exchange rate on stock price movements Franck and Young (1972) in US, Nieh and Lee (2001) in G-7 countries and Patra and Poshakwale (2006) in Greece, confirm that stock prices cannot be predicted by the movements of exchange rate.

7. Data and methodology

7.1 Data sources, description and variables

This study attempts to investigate the dynamic relationship between exchange rate and stock market returns in Sri Lanka. The data used in this study are sampled on a monthly basis over the period from January 2003 to December 2012.

All Share Price Index (ASPI) is considered to find the stock market returns.

Exchange rates that are hypothesized to influence stock returns are obtained from the publications of Central Bank of Sri Lanka.

7.2 Econometric model

The data series which were used in this study were time series data. Time series data assumes that the underlying time series is stationary (Gujarati 2003). Therefore, prior to deciding on the appropriate model, the stationary of the variables are tested using unit root testing. There are various unit root tests used in previous literature. In this study Augmented Dickey Fuller test was used to investigate the stationary.

Augmented Dickey Fuller (1979) used following regression

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^m \Delta Y_{t-1} + \varepsilon_t$$

Where Δ is the difference operator, β , δ & α are the coefficient to be estimated, Y is the variable whose time series properties are examined and ε is the error term.

It is applied Granger causality test (Granger 1988) to find out any causal relationship between stock prices and exchange rates. This test involves following equations

$$\Delta SP_t = \beta_0 + \sum_{i=1}^q \beta_{1i} \Delta SP_{t-i} + \sum_{i=1}^q \beta_{2i} \Delta ER_{t-i} + \varepsilon_{1t}$$

$$\Delta ER_t = \varphi_0 + \sum_{i=1}^r \varphi_{1i} \Delta ER_{t-i} + \sum_{i=1}^r \varphi_{2i} \Delta SP_{t-i} + \varepsilon_{2t}$$

Where SP_t and ER_t represent stock returns and exchange rate, ε_{1t} and ε_{2t} are uncorrelated stationary random process and t denotes the time period.

Finally a regression was run to check the relationship between stock returns and exchange rate, using following model,

$$Y = \alpha + \beta x + \varepsilon_t$$

It is considered as $\alpha = 0.05$ which indicate the P value is in between 0.01 to 0.05. There 95% confidence level was expected.

8. Data Analysis and Discussion

At first, it is used Augmented Dickey Fuller test to find out the stationary of the data set. The results of the test are given in the Table 01 below. The data on stock returns are stationary at level in constant and constant & linear trend which reject the null hypothesis that data has a unit root. The data series on exchange rate is not stationary at level but it is stationary in constant & linear trend at 10% significant level. The first difference exchange rate is stationary in both the constant and constant & linear trend. So it rejects the null hypothesis that data has a unit root.

Table 01: Unit root test results

Variables	Augmented Dickey Fuller			
	Level		First Difference	
	Constant	Constant & Linear trend	Constant	Constant & Linear trend
	Test Statistics			
Stock returns	-9.3491*	-9.3079*	-10.608*	-10.555*
Exchange rate	-0.3275	-3.194***	-7.1572*	-7.1939*
	Critical Values			
1 percent	-3.486551	-4.037668	-3.486551	-4.037668
5 percent	-2.886074	-3.448348	-2.886074	-3.448348
10 percent	-2.579931	-3.149326	-2.579931	-3.149326

Notes: * Indicates stationary at 1% level,
 *** indicates stationary at 10% level

After determining the stationary of the data set, the stationary data were used for the Granger Causality Test to find out any causal relationship between stock returns and exchange rate. The result (Table 02) showed that there is one way causal relationship between stock returns and exchange rate which indicates that Stock returns are influence to the exchange rate movements but changes in exchange rate are not influence to the stock returns. The null hypothesis that exchange rate does not Granger Cause is accepted but it is rejected that stock returns does not Granger Cause exchange rate.

Table 02: Granger Causality Test results

Null Hypothesis:	F-Statistic	Probability
EXR does not Granger Cause RTN	1.30929	0.27411
RTN does not Granger Cause EXR	5.76983	0.00412

Finally a regression was run on the relationship showed in Granger Causality test that, exchange rate depends on the stock returns. For the regression model the first difference of exchange rate was taken as Y and stock return was taken as X. Result in the table 03 showed that, stock return is not a significant factor for exchange rate changes. As well as the R^2 value is 0.7%, which indicates that the fitted model is not a suitable one.

Table 03: Regression Results

Model	B	Std. Error	t	Sig.
Constant	.283	.126	2.242	.027
RTN	.000	.000	-.888	.376

These results imply a contradictory result between Granger causality and regression. Though the results of Granger Causality test shows an effect of stock returns on the exchange rate changes, the result of regression shows that there is no any relationship between exchange rate and stock returns.

9. Conclusion

This study examined the causal relationship between exchange rate and stock returns. It was used monthly data for the period begins from January 2003 to December 2012. Augmented Dickey Fuller test was used to check the stationary of the data set and Granger Causality Test was used to find out any causal relationship between exchange rate and stock returns. Finally a regression was used to check the result of Granger Causality test. The results of the Augmented Dickey Fuller test showed that the level data of stock returns were stationary and the first difference of the exchange rate was stationary. Using stationary data, Granger Causality test was implemented. Outcome showed that one-way causality which is stock return does Granger Cause exchange rate but exchange rate does not Granger Cause stock returns. It implies that stock returns will influence for exchange rate. Finally a regression was run on the stationary data to check the result came from the Granger Causality test. Results indicate that there was no any relationship between exchange rate and stock returns. That was contradictory result with the Granger Causality test. Though the Granger causality test shows a relationship between stock returns and exchange rate, regression shows there is no any relationship between variables.

References

- Abdalla, I. S. & Murinde, V. (1997). Exchange Rate and Stock Price interactions in emerging financial markets: Evidence on India, Korea, Pakistan and Philippines. *Applied Financial Economics*, 7, 25-35.
- 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, 7-12.

- Ajayi, R. A. & Mougou, M. (1996). On the dynamic relation between stock prices and exchange rates. *The Journal of Financial Research*, 19, 193-207.
- Amare, T., and M. Mohsin (2000) Stock Prices and Exchange Rates in Leading Asian Economies: Short Run versus Long Run Dynamics. *Singapore Economic Review* 45: 2, 165–181.
- Bahmani, O. M. & Sohrabian, A. (1992). Stock Prices and the effective exchange rate of the dollar. *Applied Economics*, 24, 459-464.
- Bhattacharya, B. & Mukherjee, J. (2003). Causal Relationship Between Stock Market and Exchange Rate. Foreign Exchange Reserves and Value of Trade Balance: A Case Study for India, Paper presented at the Fifth Annual Conference on Money and Finance in the Indian Economy, January 2003.
- Chang, Y., (2002), The Pricing of Foreign Exchange Risk around the Asian Financial Crisis: Evidence from Taiwan's stock market, *Journal of Multinational Financial Management*, 12(3), July 2002, 223–238.
- Chow, E. H., Lee, W. Y. & Solt, M. S. (1997). The exchange rate risk exposure of asset returns. *Journal of Business*, 70, 105-123.
- Doong, S.C., Yang, S.Y. & Wang, A.T., (2005), The Emerging Relationship and Pricing of Stocks and Exchange Rates: Empirical Evidence from Asian Emerging Markets, *Journal of American Academy of Business, Cambridge*, 7(1), 118-123.
- Franck, P. & Young, A. (1972). Stock Price Reaction of Multinational Firms to Exchange Realignments. *Financial Management*, 1, 66-73.
- Giovannini, A. & Jorion, P. (1987). Interest rates and risk premia in the stock market and in the foreign exchange market. *Journal of International Money and Finance*, 6, 107-124.
- Granger, C. W. J., Huang, B. & Yang, C. (2000). A bivariate causality between stock prices and exchange rates: Evidence from recent Asian flu. *The Quarterly Review of Economics and Finance*, 40, 337-354.
- Hatemi, J.A. & Irandoust, M., (2002), An Analysis of Exchange Rates and Stock Prices: Evidence for Sweden, *Bulletin of Economic Research*, 44(2), 197-203.
- Ibrahim, M., & Aziz, M., (2003), Macroeconomic Variables and the Malaysian Equity Market: A Rolling through Subsamples, *Journal of Economic Studies*, 30(1), 6-27.
- Jorion, P. (1990). The Exchange Rate Exposure of US Multinationals. *Journal of Business*, 63, 331-345.
- Joseph, N., (2002), Modelling the Impacts of Interest Rate and Exchange Rate Changes on UK Stock Returns. *Derivatives Use, Trading & Regulation*, 7(4), 306-323.
- Kim, K., (2003), Dollar Exchange Rate and Stock Price: Evidence from Multivariate Cointegration and Error Correction model, *Review of Financial Economics*, 12, 301-313.
- Ma, C.K. & Kao, G.W., (1990), On Exchange Rate Changes and Stock Price Reactions, *Journal of Business Finance and Accounting* (Summer), 441-449.
- Mahmood, W. M. W., Dinniah, N. M., (2009). “Stock Returns and Macroeconomics Variables: Evidence from the six Asian specific countries” *International Research Journal of Finance and Economics*, ISSN 1450-2887 Issue 30 (2009), 155-163.
- Mishra, A.K., (2004), Stock Market and Foreign Exchange Market in India: Are they Related?, *South Asia Economic Journal*, 5(2), 209-232.
- Muhammad, N. & Rasheed, A. (2003). Stock Prices and Exchange Rates: Are they Related? Evidence from South Asian Countries. Paper presented at the 18th Annual 18 General Meeting and Conference of the Pakistan Society of Development Economists, January 2003.
- Mukherjee, T. K. & Naka, A., (1995), Dynamic Relations between Macroeconomic Variables and the Japanese Stock Market: An Application of a Vector Error Correction Model. *Journal of Financial Research*, 18, 223-237.

- Nance, D.R., Smith, C.W. & Smithson, C.W., (1993), On the Determinants of Corporate Hedging, *Journal of Finance*, 48(1), 267-284.
- Niarchos, N.A., and C.A. Alexakis, 2000, "The Predictive Power of Macroeconomic Variables on Stock Market Returns: The Case of the Athens Stock Exchange," *Spoudai*, 50(2), 74-86.
- Nieh, C. C. & Lee, C. F. (2001). Dynamic relationship between stock prices and exchange rates for G-7 countries. *The Quarterly Review of Economics and Finance*, 41, 477-490.
- Patra, T. & Poshakwale, S., (2006), Economic Variables and Stock Market Returns: Evidence from the Athens Stock Exchange, *Applied Financial Economics*, 16, 993-1005.
- Phylaktis, K., & Ravazzolo, F., (2005), Stock Prices and Exchange Rate Dynamics, *Journal of International Money and Finance*, 24, 1031-1053.
- Pilinkus, D. and Boguslauskas, V. (2009). The short-run relationship between stock market prices and macroeconomic variables in Lithuania: An application of the impulse response function. *Engineering Economics*, 5(65), 26-34.
- Ratanapakorn, O. & Sharma, S.C., (2007), Dynamic Analysis between the US Stock Returns and the Macroeconomic Variables, *Applied Financial Economics*, 17, 369-377.
- Roll, R. (1992). Industrial structure and the comparative behavior of international stock markets indices. *Journal of Finance*, 47, 3-41.
- Smyth, R. & Nadha, M., (2003), Bivariate Causality between Exchange Rates and Stock Prices in South Asia, *Applied Economics Letters*, 10, 699-704.
- Soenen, L. A. & Hennigar, E. S. (1988). An analysis of exchange rates and stock prices: The US experience between 1980 and 1986. *Akron Business and Economic Review*, Winter, 7-16.
- 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 Economic and Social Review*, 47, No. 2, 183-198.
- Solnik, B. (1987). Using financial prices to test exchange rate models: A note. *Journal of Finance*, 42, 141-149.
- Stavárek, D. (2005): Exchange Market Pressure in New EU-member Countries. In: Money, Banking and Financial Markets. Proceedings from the International Conference. Bratislava, Ekonóm, 2005, 244-248.
- Vygodina, A. V. (2006). Effects of size and international exposure of the US firms on the relationship between stock prices and exchange rates. *Global Finance Journal*, 17, 214-223.
- Wongbangpo, P. & Sharma, C.S., (2002), Stock Market and Macroeconomic Fundamental Dynamic Interactions: ASEAN-5 Countries, *Journal of Asian Economics*, 13, 27-51.