Dynamic Linkages between Macroeconomic Factors and Stock Prices: Evidence from an Emerging Market

Mr. Sarwar Uddin Ahmed
Mr. Md. Zahirul Quiyum
Mr. Mohammad Fahad Noor

Abstract

The purpose of this study is to investigate the predictability of selected macroeconomic factors in determining the stock prices in the context of an emerging market by taking the case of Dhaka Stock Exchange (DSE) of Bangladesh. Johansen co integration test, vector error correction model, and Granger causality test have been used to conduct this study. The Granger causality test has found bidirectional causality between remittances & stock prices and unidirectional causality between narrow money supply & stock prices that runs from the narrow money supply to stock prices. On the other hand, inflation affects stock prices in both short-term and long-term periods. Finally, money supply, remittance inflows and inflation have been found to be the most influential factors in determining stock prices in both short-run and long-run periods.

Introduction

Capital market plays a central role in channelling long-term funds from savers to the deficit public companies through financial instruments like shares and debentures. In addition, stock market is believed to be an important factor to achieve the sustainable economic growth as it provides a wide choice to the investors to choose the most efficient firms. Rapidly changing economic structure, governance composition, policy and institution on a global scale have made the role of capital markets more critical. In contrast, capital market in developing economies sometimes fails to support industrialization through savings mobilization and investment fund allocation and maturity transformation because of the existence of active informal credit market; low-degree of ownership management separation; drawbacks of informational asymmetry; and difficulty in maturity transformation due to low level of accumulated financial assets (Ahmed, 2000). Capital market also called stock market plays an important role to accelerate the economic development of a country by circulating accumulated investable funds to the most prospective profitable companies (Hoque, 2005; Shafiullah, 2007). In order to attract funds to the capital market it is important to provide adequate return to the investors by ensuring that stock prices reflect their true economic value. Therefore, it is significantly important to understand the determinants of stock prices, i.e., the behaviour of stock prices in the stock market. Various economic theories and empirical evidences suggested and supported the idea that stock prices are influenced by macro economic factors in both developed and developing economy. Numerous studies have been conducted to examine the relationships between macroeconomic variables and stock prices in industrialized economies; but only few studies have been conducted to examine such relationship in developing economies like Bangladesh. After 1980s (Menike 2006) the relationship between macroeconomic variables and stock prices has been examined in Emerging Stock Markets (ESMs). However, over the past decade interest in investing in emerging markets has grown considerably. According to Harvey (2005) the returns and risks in ESMs have been found to be higher, relative to developed markets. This paper examines the link between macro-economic factors, such as, money supply, exchange rates, imports, inflation, remittances, with stock prices in the context of Dhaka Stock Exchange (DSE) of Bangladesh.

Mr. Sarwar Uddin Ahmed
School of Business
Independent University, Bangladesh

Mr. Md. Zahirul Quiyum
School of Business
Independent University, Bangladesh

Mr. Mohammad Fahad Noor
School of Business
Independent University, Bangladesh

Literature Review

Till date various studies have been conducted examining the linkage between macro-economic factors and stock prices (for example: Fama, 1981; Firth 1979, Kim, 2003, Kandir, 2008; Richards & Simpson, 2009; Aydemir & Demirhan, 2009; Ali , 2011). Some of them have found positive, some negative and some found neutral relationship between them. A summary of these studies has been provided below. This will help to draw the conceptual framework for this study.

The asset market approach to exchange rate determination explains a weak or no association between exchange rates and stock prices. According to this approach, exchange rate is the price of an asset, the price of a unit of foreign currency in domestic currency. It explains that exchange rates are determined by the expected future exchange rates and stock price may be affected by factors different from the factors affect the exchange rates (Muhammad and Rasheed, 2002). Many researchers have studied the relationship between stock prices and exchange rates in both developed and developing economies. Kandir (2008) studied in Turkey, Ratanapakor and Sharma (2007) studied in U.S.A., Mukherjee and Naka (1995) studied in Japan, and Aggarwal (1981) conducted the study in USA on the relationship between exchange rates and stock prices; and they found out that stock prices are positively related to exchange rates in their studied economies.

Kim (2003) studied in USA, Entorf, Moebert, and Sonderhof (2009) studied in Malaysia, Ibrahim and Aziz (2003) studied in Malaysia on the similar relationship; and they found that stock prices are negatively related to exchange rates. Ozair (2006) used quarterly data from 1960 to 2004 periods to examine the causal relationship between stock prices, and exchange rates in the U.S.A. and he also found no causal linkage between these two financial variables.

Inflation also affects the volatility in stock prices positively and negatively. Gultekin (1983) studied in multiple countries, Choundry (2001) studied in multiple inflation subsistence economies, and Firth (1979) studied the relationship between inflation and stock price and found that stock prices are positively related. Defina (1991) argued that inflation can be positively related to stock prices if equities can be considered as hedge against inflation. According to Fisher (1930), stock markets are not dependent on inflation expectations; thus stock prices and inflation should move in the same direction. However, Nishat and Shaheen (2004) studied in Pakistan, Maysami, and Koh (2000) studied in Singapore, Eita (2011) studied in Namibia, Mohammed and Shaheen (2004) studied in Pakistan, Wongbangpo and Sharma (2002) studied in ASEAN 5 countries, and Osei (2006) studied in Ghana on the relationship between stock prices and inflation.They found that stock prices are negatively related to inflation in their studied economies.

Money supply is also one of the important factors affecting stock prices positively or negatively. An increase in money supply can influence the inflation to rise, which will push the discount rate up, and in turn, will decrease the stock market returns down (Fama, 1981). So, in that case, money supply and stock market returns will be negatively related. Eita (2011) investigated the relationship between money supply and stock market prices in Namibia and found that money supply is positively correlated with stock market prices. V. Rasiah (2010) in his study found that money supply affects stock market return in the context of Malaysian capital market. Shiblee (2009) found Linear Relationship between Money Supply (M1) and Stock Prices and it was concluded that money supply showed the strongest relation with respect to stock prices and can be used to predict stock prices. Mukherjee and Naka, 1995; Maysami and Koh, 2000; Osei, 2006; Rahman et al., 2009; Chen et al., 2005; and Naceur et al., 2007 encountered positive relationship between money supply and stock market returns. Moreover, according to Boyle (1990), changes in the uncertainty of the money supply will modify the expected prices of investors that they will demand to assume the risk of keeping stocks and will alter the risk premium of stock prices. Investors form their expectations based on price level of financial assets and the uncertainty of money supply will affect prices of financial assets (Ali, Rehman, Yilmaz, Khan, and Afzal; 2010). So, monetary uncertainty will negatively influence the stock prices.

When the demand for imported goods increases, it will in turn increase the amount of imports and profits from those imported goods. So, the future prospects of import oriented companies will be good and it will increase the stock prices of these import oriented companies. Contrary to that, imports can indirectly affect the stock market through influencing the exchange rates for the domestic currency. The payments for imported goods are needed to be made in foreign currencies and the increase in imports will increase the demand for foreign currencies in exchange of domestic currency. Which will depreciate the domestic currency and the price per unit of the foreign currency in domestic currency will increase. So, imports can affect stock prices directly or indirectly.

When remittance inflows into the domestic market increase, the domestic currency will be appreciated against the foreign currencies. Therefore, the domestic stocks will become expensive to the foreign investors and it will in turn discourage foreign investors to invest into the domestic stock market. According to this scenario, remittance will negatively affect the stock prices. Contrary to that, an increase in the remittance inflows into the domestic market will increase the available funds into the money circulation. So, domestic investors will have more funds to invest in domestic stocks; this will in turn heat up the domestic stock market and will increase prices. According to these theories, it can be said that remittance affects stock market positively and negatively.

Hypothetical Model

Based on the related literature review conducted above and theoretical understanding, it can be said that stock price is a linear function of money supply, exchange rates, consumer price index, imports, and remittances and can be expressed in the following form:

SPI = *f* (EXR, M1, CPI, IM, REM) ……………………..................……..(1)

Here, EXR = Exchange rates, M1 = Narrow money supply, CPI = Consumer price index, IM = Imports, REM = Remittances, and SPI = All Shares Price index.

Data and Methods

Data Source

This study has used 94 observations of each variable for the period of July, 2002 to April, 2010. Monthly series have been used for each variable and secondary sources have been used to collect these monthly series. Monthly series of macroeconomic variables have been compiled from Monthly Economic Trends issued by Bangladesh Bank, and monthly data of all Share Price Index (SPI) have been collected from Monthly Review publication issued by Dhaka Stock Exchange Ltd.

Methods

At first, the time series variables have been transformed into log values and Augmented Dickey Fuller (ADF) test* and Phillips-Perron (PP)** test have been used for six variables to investigate their order of integration. All of the time series are expressed in logarithm and the letter L has been placed in front of the each variable name to symbolize this transformation.

* In statistics and econometrics, an **augmented Dickey-Fuller test (ADF)** is a test for a unit root in a time series sample.

** In statistics, the **Phillips–Perron test** (named after Peter C. B. Phillips and Pierre Perron) is a unit root test. That is, it is used in time series analysis to test the null hypothesis that a time series is integrated of order 1.

$$\Delta y_t = \alpha y_{t-1} + \delta x_t' + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \ldots + \beta_p \Delta y_{t-p} + v_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Here; y is the variable under consideration; Ä is the first difference operator; t captures the time trend; v_t is the random error; and á, ä, & $\hat{a}_{i = 1, 2, p}$ are parameters to be estimated. The error term is white noise that is ensured by choosing the optimum lag length. The null hypothesis is that á equals zero and this hypothesis is needed to be rejected to conclude that the series is stationary.

$$t_\alpha = t_\alpha(\gamma_0 / f_0)^{1/2} \quad T(f_0 - \gamma_0)\ \{se\ (\alpha)\}/2\ (f_0)^{1/2}\ s \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

In this statistic, Üis the estimate of á; $t_á$ is the estimate of t-ratio of á; se (Ü) is the coefficient standard error; s is the standard error of the test regression; f_0 is an estimator of the residual spectrum at frequency zero; and $ã_0$ is the consistent estimate of the error variance. The appropriate lag length has been selected by using both likelihood ratio (LR) and Information Criteria methods. The lag length is needed to be specified for conducting Johansen co integration test. The results of the test can differ with different lag lengths, so it is important to select appropriate lag length for conducting the co integration test. Two alternative methods are available to select the lag length, LR test (Likelihood Ratio test) and information criteria.

$$LR \quad (T - m) \{\log|\Omega_{f-1}| - \log|\Omega_f|\} \sim x^2 (k^2) \quad \ldots\ldots\ldots\ldots (4)$$

In Equation 4, the hypothesis is that the coefficients on lag are jointly zero using the x^2 statistics and is needed to be tested starting from the maximum lag. Here, m is the number of parameters per equation and (T – m) is the Sims' small sample modification which is employed instead of T. The modified LR statistics will be compared to the 5% critical values starting from the maximum lag, and lag will be decreased by one at a time until the rejection is achieved. However, LR assumes the residuals of vector autoregressive models to be normally distributed and it follows a pair wise procedure to provide information about the lag length.

$$AIC = -2\int / T + 2k / T \quad \ldots\ldots\ldots\ldots (5)$$
$$SC = -2\int / T + k \log T / T \quad \ldots\ldots\ldots\ldots (6)$$
$$HQ = -2\int / T + 2k \log (\log T) / T \quad \ldots\ldots\ldots (7)$$

In equations 5, 6, and 7: T is the number of observations; k is the total number of estimated parameters in the VAR; and +• is the value of the log of the likelihood function. However, it has been suggested that AIC information criteria yields more accurate prediction regarding the appropriate lag length for small sample than SC and HQ do. So, AIC is a more reliable information criteria method in selecting appropriate lag length than others.

The Lagrange Multiplier (LM) test* has been used to test for serial correlation in the calculated residuals using vector auto regression (VAR) model at that determined lag length

* **The LM (Lagrange Multiplier) test** is a general principle for testing hypotheses about parameters in a likelihood framework. This term was coined after the name of an eighteenth century Joseph Louis Language. Lagrange Multiplier (LM) test has been used to check for autocorrelation among the error terms obtained from a vector auto regression (VAR) model of variables with 5 lag orders. Table 5 presents the results of LM test and it shows that the null hypothesis of no serial correlation among residuals can't be rejected for any of the 8 lags at 10% significance level.

to ensure the assumption that no serial correlation is present in the disturbance terms at the appropriate lag order. In choosing the appropriate lag length, the important criteria that must be fulfilled is that residuals are uncorrelated. Lagrange Multiplier (LM) test is used to check for serial correlation (or autocorrelation) among the error terms, e_t, in the regression function.

$$e_i = \beta_1 X_1 + \left(\sum_{s=1}^{p} \alpha_s e_{i-s}\right) + v_i \quad \ldots\ldots\ldots\ldots (8)$$

In equation 8, residuals are regressed on original regressors X_i and lagged residuals up to order p. So, the LM test statistics is computed by multiplying the number of observations with the uncentered R^2 from the test regression and it follows the asymptotically distribution as x^2 (p).

The co integration test investigates whether there is a long-run relationship between stochastic trends, X_t and Y_t. All of the time series variables must be co integrated in order to discover any kind of causality between X_t and Y_t. Johansen co integration technique has been used in this study to search for co integration among time series variables.

The Johansen Co integration test has been used to detect the presence of co integration relationship among selected variables and determine the long-run equilibrium function. Johansen-Juselius multivariate co integration technique tests both the existence and number of cointegration vectors and can be expressed as:

$$X_t = \Pi_1 \Delta X_{t-1} + \Pi_2 \Delta X_{t-2} + \ldots + \Pi_k X_{t-k} + v_t \ldots\ldots\ldots (9)$$

Here, X_t is a N * 1 vector of variables that are integrated in order 1; Ð is a N * N long run cointegration matrix whose rank determines the number of cointegrating vectors; and v_t is a vector of normally and independently distributed error term.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} \ln(1 - \lambda_i) \ldots\ldots\ldots (10)$$

In equation10, $ë_i$ is the eigen-values, T is the total number of observations. The trace statistic investigates the statement that the number of distinct cointegrating relationships is less than or equal to r under the null hypothesis against the alternative hypothesis statement of more than r cointegrating relationship. On the other hand, the maximum eigen value statistic can be presented as follows:

$$\lambda_{max}(r) = -T \ln(1 - \lambda_{r+1}) \ldots\ldots\ldots (11)$$

The vector error correction (VEC) model has been used to determine the error term and assess the long-term and short-term linkages between explanatory and independent variables over the period. The changes in the dependent variable are a function of disequilibrium in the co integrating relationship as well as changes in other explanatory variable(s) and disequilibrium in the co integration relationship is represented by the error correction term. The vector error correction (VEC) model for selected variables in this study is described as follows:

$$\Delta LSPI_t = C_1 + \sum_{i=1}^{n} \varphi_i \Delta LSPI_{t-i} + \sum_{i=1}^{n} \tau_i \Delta LM1_{t-i} + \sum_{i=1}^{n} \alpha_i \Delta LCPI_{t-i} + \sum_{i=1}^{n} \beta_i \Delta LREM_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta LEXR_{t-i} + \sum_{i=1}^{n} \rho_i \Delta LIM_{t-i} + \lambda_i EC_{t-1} + v_t \ldots\ldots\ldots (12)$$

In equation 12; the variables are: LSPI = All Shares Price Index in logarithm, LM1 = narrow money supply in logarithm, LCPI = consumer price index in logarithm, LREM = remittances in logarithm, LEXR = exchange rates in logarithm, and LIM = imports in logarithm; Ä is the first difference operator; C is the intercept; EC_{t-1} is the error correction term which represents the extent to which any disequilibrium in the short run is corrected and ë represents the corresponding parameter; ö, ô, á, â, ã, and ñ are coefficients of short term dynamics among cointegrating variables; and v_t is the white noise disturbance term.

Finally, the Granger Causality test is used to examine the long-term causality between dependent and independent variables. Granger Causality test shows the presence of unidirectional or bidirectional causality, whether one variable causes the other variable or not.

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_i y_{t-i} + \beta_1 x_{t-1} + \ldots + \beta_i x_{t-i} + \varepsilon_t$$
$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \ldots + \alpha_i x_{t-i} + \beta_1 y_{t-1} + \ldots + \beta_i y_{t-i} + \mu_t \ldots (13)$$

For each equation, reported F-statistics are the Wald statistics* for the joint hypothesis and can be expressed as:

$$\beta_1 = \beta_2 = \ldots = \beta_i = 0 \ldots\ldots\ldots (14)$$

However, it is possible that theoretically one variable Granger causes the other; whereas in actual evidence no causal relationship can be detected between two variables (Granger, Huang, and Chin-Wei, 2000).

Results

Most of the financial time series are normally non stationary in level and can also follow different distributions. **Table I** presents the statistical properties of all of the selected time series at level.

* The Wald test is a parametric statistical test named after the name of statistician Abraham Wold. Whenever a relationship within a between data items can be expressed as a statistical model with parameter to be estimated from a sample, the world test can be used to test the time value of the parameter based on the sample estimate.

At first, all of the time series variables under this study have been transformed into logarithm form and tested for stationary as all of the transformed variables are integrated in order 0. The **Table II** presents the results of both ADF and PP tests on logarithmically transformed variables at level. The outcomes clearly suggest that both ADF and PP tests could not reject null hypotheses of all share price index (SPI), money supply (M1), exchange rates (EXR), imports (IM), consumer price index (CPI) and remittances (REM) at 1%, 5%, or 10% significance level.

Table III recommends that at the first difference of all of the time series variables; both ADF and PP tests reject null hypotheses of all share price index (SPI), money supply (M1), exchange rates (EXR), imports (IM), consumer price index (CPI) and remittances (REM) at 1% significance level.

Table IV presents the different suggestions regarding the appropriate lag length provided by various selection methods. According to LR test statistics, the appropriate lag length is 5. However, statistics of different information criteria methods in **Table IV** indicate different lag lengths that are appropriate. AIC information criteria suggests that the appropriate lag order is 5, while SC and HQ suggest 1 and 2 as appropriate lag orders consecutively.

Table V presents the summary estimates of trace statistics and max-eigen value statistics through unrestricted co integration rank test. Null hypothesis has been assumed as no co integrating vector i.e. r = 0 or r d• 1 against alternative of having co integrating vector i.e. r e•1 or r = 2. According to MacKinnon-Haug-Michelis (1999) *p*-values of the trace statistics and max-eigen value statistics, it is revealed that there exists one co integrating vector at 5 percent level of significance.

The parameters of variables for the long-run co integration equation has been normalized on LSPI and presented in **Table VI**. All of the estimated parameters except the parameter of LIM are statistically significant at 7.3% significance level. LM1, LCPI, & LIM are positively related to LSPI and LEXR & LREM are negatively related to LSPI in the long run.

Estimated parameters of the dynamic short run movements of stock prices have been reported in **Table VII**. The coefficient of error correction term carries the negative sign. It is significant at 6% level and the coefficient of error correction term suggests that 13.7% of previous month's disequilibrium in the stock prices from the equilibrium path will be corrected in the current month. In **Table VII**; short term coefficients of lagged variables have been presented up to lag order five.

Table VIII shows the result of the Ganger Causality Test. There is a unidirectional causality from narrow money to stock prices at 10% significance level. The bidirectional causality exists between remittances and stock prices at less than 8% level of significance. However, long-run causal relationship of any direction has not been detected between exchange rates, imports, consumer price index, and stock prices.

Discussion

The results in this study show that exchange rates negatively affect the stock prices in the long run and the parameter is statistically significant at 1% significance level. This result is consistent with the findings of Soenen and Hennigar (1988) who found a significant negative correlation between exchange rates and stock prices. However, Muhammad and Rasheed (2002) found bi-directional long-run causality between exchange rates and stock prices in Bangladesh, and Sri Lanka. Also Hatemi-J and Irandoust (2002) found a possible causal relation between exchange rates and stock prices in the context of Sweden.

According to Fisher (1930), stock markets are not dependent on inflation expectations; thus stock prices and inflation should move in the same direction. In this study, it was found that inflation positively affects stock prices in the long-term and the coefficient is statistically significant at less than 1% significant level. The five month lagged inflation negatively affects the current month's stock prices in the short run and the coefficient is statistically significant at 5% significant level. So, inflation affects stock prices in both short-term and long-term periods. This finding is in contrast to Spyrou (2001) and Floros (2004) who found that there is no significant long-run relationship between inflation and stock returns in Greece. However, Al-Khazali and Pyun (2004) found negative relationship in the short-run, but positive relationship in a co integration analysis for the long-run.

The different test outcomes indicate that the parameter of imports is not statistically significant in the long-run, but the parameters of different lagged imports are statistically significant in the short-run period. However, no direction of causality is detected between imports and stock prices by Granger causality. Therefore, imports only affect the stock prices in the short-run period.

According to the findings of these different tests, money supply positively affects the stock prices in the long run and the parameter is statistically significant at 7% significance level. But in the short run, one month lagged money supply negatively affects the stock prices in the current month and it is statistically significant at 4% significant level. It has also been found that unidirectional causality exists between money supply and exchange rates at 10% significance level and the causality runs from money supply to stock prices. So, the results supports that money supply affects stock prices in both long-run and short-run periods. In this regard Sprinkel's work (1964) is considered as pioneering step. In his work, he found a strong relationship between money supply and stock prices. A positive effect of money supply on stock market movement in Thailand has been found by Jakkaphong Janrattanagul (2009).

The results show that remittances negatively affect the stock prices in the long-run at nearly 0% significant level, but none of the lagged parameters of remittances are statistically significant within 10% level in the short-run. However, the bidirectional causality is detected between remittances and stock prices at less than 8% significance level. So, remittances affect the stock prices in the long-run period negatively. This finding is contrary to the customary prediction regarding remittance. One possible reason for this might be that, people are spending the remittance inflow more on real estate and consumption, than investing them into stock market, due to the perception of high risk involvement in the latter.

Conclusion

This study is a modest attempt to examine the linkage between macro-economic factors and stock prices by taking the case of an emerging market: Dhaka Stock Exchange. The empirical result of the study suggested that, all the selected variables present a unit root. According to the results of different tests, narrow money supply and remittance inflows have been detected as the most deterministic factors of stock prices for both long-run and short-run periods in this study. Although the findings are thought provoking, this study has several limitations. Among the macro-economic factors only a few have been considered in this study. There are other influencing macroeconomic factors that might affect the stock prices. A more comprehensive study by incorporating several other macroeconomic factors may be conducted to investigate their predictability in determining the stock prices in DSE. This area leaves the scope for further study.

References

- Aggarwal, R. (1981), "*Exchange rates and stock prices: A study of the United States capital markets under floating exchange rates.*" Akron Business and Economic Review, Vol.12 (Fall), pp. 7-12.
- Ali, Mohammad Bayezid (2011), "*Impact of Macroeconomic Variables on Emerging Stock Market Return: A Case on Dhaka Stock Exchange.*" Interdisciplinary Journal of Research in Business, Vol. 1, Issue. 5, May 2011 (pp.08-16).
- Aydemir, O., & Demirhan, E (2009), "*The Relationship between Stock Prices and Exchange RatesEvidence from Turkey.*" International Research Journal of Finance and Economic. Issue 23 (2009)
- Boyle, GW (1990), "*Money demand and stock market in general equilibrium model with variable velocity.*" J. Pol. Econ, Vol. 98, pp. 1039-1053.
- Choudhry, T. (2001), "*Inflation and rates of return on stocks: Evidence from high inflation countries.*" Journal of International Financial Markets, Institutions and Money, Vol.11, pp.75-76.
- Eita, Joel Hinaunye (2011), "*Determinants of stock market prices in Namibia.*" Department of Economics, Monash University.
- Entorf, H., Moebert, J. & Sonderhof, K. (2009), "*The foreign exchange rate exposure of nations.*" Open Economic Review.
- Fama, E.F. (1981), "*Stock returns, real activity, inflation and money.*" American Economic Review, Vol. 71(4), pp. 545—565.

- Firth, M. (1979), "*The relationship between stock market returns and rates of inflation.*" Journal of Finance, Vol. 34(3), pp. 743—749.
- Fisher, I. (1930), "*The Theory of Interest.*" New York: Macmillan.
- Granger, Clive W.J., Huang, Bwo-Nung, & Chin-Wei, Yang, (2000), "*A bivariate causality between stock prices and exchange rates: evidence from recent Asian flu*", The Quarterly Review of Economics and Finance 40, pp. 337–354.
- Gultekin, N.B. (1983), "*Stock market returns and inflation: Evidence from other countries.*" Journal of Finance, Vol. 38(1), pp. 49-65.
- Harvey, Campbell R. (2005), "*Predictable Risk and Returns in Emerging Markets in Emerging Markets.*" The Review of Financial Studies, Vol. 8, No. 3, pp. 773-816.
- Houqe, M. Nurul (2005), "*Measuring Stock Market Behavior: A case study of Shaka Stock Exchange.*" Journal of Business Studies, Vol. 26(2), pp. 61 – 74.
- Hatemi-J, A. & Irandoust, M., 2002, "*On the Causality between Exchange Rates and Stock Prices: A Note*", Bulletin of Economic Research 54:2, pp.197-203.
- Ibrahim, Mansor H. & Aziz, Hassanuddeen (2003), "*Macroeconomic variables and the Malaysian equity market a view through rolling subsamples.*" Journal of economic studies, 30, 6-27.
- Jakkaphong Janrattanagul (2009), "*The Effect of Change in Macroeconomic Data on Thailand Stock Market Returns.*"
- Kandir, Serkan Y (2008), "*Macroeconomic Variables, Firm Characteristics & Stock Returns: evidence from Turkey.*" Intl Research Journal of Finance and Economics, 16, 35-45.
- Kim, K. (2003), "*Dollar exchange rate and stock price: Evidence from multivariate cointegration and error correction model.*" Review of Financial Economics, 12, 301-313.
- Maysami, Ramin C., & Koh, Tiong S. (2000), "*A vector error correction model of Singapore stock market.*" International Review of Economic and Finance, Vol.9, pp. 79-96.
- Maysami, Ramin C., Howe, Lee C., & Hamzah, Mohamad A. (2004), "*Relationship between macroeconomic variables and stock market indices: Cointegration evidence from stock exchange of Singapore's All-S Sector Indices",* Jurnal Pengurusan, Vol. 24, pp.47-77.
- Mohiuddin, Alam, & Shahid. (2008), "*An Empirical Study of the Relationship between Macroeconomic Variables and Stock Price: A Study on Dhaka Stock Exchange.*" Working Paper No. AIUB-BUS-ECON-2008-21.
- 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.
- Muhammad, Naeem, & Rasheed, Abdul (2002), "*Stock prices and exchange rates: Are they related? : Evidence from South Asian countries.* The Pakistan Development Review, 41(4), pp. 535-550.
- Nishat, M., & Shaheen N (2004), "*Macroeconomic factors and Pakistani equity market.*" Department of Finance and Economics, Institute of Business Administration Karachi, Pakistan.
- Osei, K.A. (2006), "*Macroeconomic factors and the Ghana stock market.*" African Finance Journal, Vol. 8(1), pp. 26—37.
- Ozair, Amber, (2006), "*Causality between stock prices and exchange Rates: A case of the United States. Florida Atlantic University, Master of Science Thesis.*
- Rahman, A.R., Sidek, N.R.M., & Tafri, F.H. (2009), "*Macroeconomic determinants of Malaysian stock market.*" African Journal of Business Management, Vol. 3(3), pp. 95-106.
- Ratanapakor, O., & Sharma, S.C. (2007), "*Dynamic analysis between the US stock returns and the macroeconomic variables.*" Applied Financial Economics, Vol. 17, 369-377.
- Rehman, Jamshaid U., Iqbal, Asim, & Siddiqi, M. Wasim (2010), "*Co integration – causality analysis between public expenditures and economic growth in Pakistan.*" European Journal of Social Science, Vol. 13(4), pp. 556 – 565.

- Shafiullah, Mohammad (2007), "*Causal relationship between selected macroeconomic variables and stock market: A case study for Bangladesh.*" Bank Parikrama, Vol. 32, pp. 103 – 117.
- Shiblee L. (2009, December 29), *The Impact of Inflation, GDP, Unemployment, and Money Supplyon Stock Prices.*
- Soenen, L.A., & E.S. Hennigar, 1988, "*An Analysis of Exchange Rates and Stock Prices - The US Experience between 1980 and 1986*", Akron Business and Economic Review, (Winter), 7-16.
- Rasiah R. R. V. (2010), "*Macroeconomic Activity and the Malaysian Stock Market: Empirival Evidence of Dynamic Relations.*" The International Journal of Business and Finance Research, 4.
- Vygodina, Anna 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, pp. 214–223.
- Wongbangpo, P., & Sharma, C.S. (2002), "*Stock market and macroeconomic fundamental dynamic interactions: ASEAN-5 countries.*" Journal of Asian Economics, Vol. 13, pp.27-51.
- Wu, Ying, (2000), "*Stock prices and exchange rates in a VEC model-the case of Singapore in the 1990s.*" Journal of Economics and Finance, 24(3), pp. 260-274.

Table I : Summary Statistics of Selected Variables

Variable	Mean	Maximum	Minimum	Jarque-Bera	Probability	Observations
SPI	1749.202	4641.54	750.84	40.21455	0.000*	94
CPI	173.1928	223.36	132.76	7.180251	0.028*	94
EXR	64.85936	70.05	53.47	12.10014	0.002*	94
IM	817097.7	1469070	318739.5	5.24166	0.07***	94
REM	3396.457	7259.23	1330.11	8.992715	0.011*	94
M1	44382.85	79368.3	23540.3	6.807396	0.033*	94

(*) denotes critical value at 1% significance level. (**) denotes critical value at 5% significance level. (***) denotes critical value at 10% significance level.

Table II : Results of ADF and PP unit Root Tests in Order (0) [Level data]

Variable	Lag Length	ADF test statistics (Intercept)	p Values	PP test Statistics (intercept)	p Values
LSPI	0	0.373765	0.9808	0.047695	0.9599
LM1	1	0.101921	0.9643	0.746644	0.9926
LCPI	1	-0.196561	0.9341	-0.13112	0.942
LEXR	1	-1.457054	0.5509	-1.579524	0.489
LIM	2	-1.362832	0.5971	-1.625258	0.4657
LREM	2	-0.427373	0.8990	-0.774656	0.8213

(*) denotes critical value at 1% significance level. (**) denotes critical value at 5% significance level. (***) denotes critical value at 10% significance level.

Table III : Results of ADF and PP unit Root Tests in Order (1) [First Differencing]

Variable	Lag Length	ADF test statistics (Intercept)	p Values	PP test Statistics (intercept)	p Values
LSPI	0	-7.656956	0.0000*	-7.64494	0.0000*
LM1	0	-15.36041	0.0001*	-19.65723	0.0001*
LCPI	0	-6.66503	0.0000*	-6.228948	0.0000*
LEXR	0	-15.0059	0.0001*	-21.22342	0.0001*
LIM	1	-13.67608	0.0001*	-16.18903	0.0001*
LREM	1	-12.51167	0.0001*	-19.19934	0.0001*

(*) denotes critical value at 1% significance level. (**) denotes critical value at 5% significance level. (***) denotes critical value at 10% significance level.

Table IV : Outputs of VAR Lag Order Selection Criteria test [Included observations: 85]

Lag	LogL	LR	AIC	SC	HQ
0	516.992	NA	-11.88354	-11.71231	-11.81463
1	906.815	716.185	-20.11197	-18.9133*	-19.62957
2	961.60	93.00723	-20.54883	-18.32279	-19.6530*
3	994.623	51.45454	-20.4796	-17.22616	-19.17024
4	1023.88	41.50759	-20.32284	-16.042	-18.60000
5	1072.98	62.79973*	-20.62744*	-15.3192	-18.49112
6	1096.21	26.46705	-20.33038	-13.99474	-17.78058
7	1127.72	31.51771	-20.22614	-12.8631	-17.26286
8	1171.60	37.75259	-20.40927	-12.01883	-17.03251

(*) indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); AIC: Akaike information criterion; SC: Schwarz information criterion; and HQ: Hannan-Quinn information criterion.

Table V : Results of Co integration Test (Trace & Maximum Eigen value)

Null Hypothesis	Eigen value	Trace Statistic	5% Critical Value	Prob.**	Max-Eigen Statistic	5% Critical Value	Prob.**
r = 0	0.438403	112.915*	95.75366	0.002*	50.77338*	40.07757	0.0022*
r ≤ 1	0.299129	62.14166	69.81889	0.1756	31.27802	33.87687	0.099
r ≤ 2	0.161065	30.86364	47.85613	0.6738	15.45473	27.58434	0.7115
r ≤ 3	0.09829	15.40892	29.79707	0.753	9.104689	21.13162	0.8239
r ≤ 4	0.068902	6.304229	15.49471	0.6596	6.282358	14.2646	0.5773
r ≤ 5	0.000249	0.021871	3.841466	0.8823	0.021871	3.841466	0.8823

(*) denotes rejection of the hypothesis at the 0.05 level. (**) MacKinnon-Haug-Michelis (1999) p-values.

Table VI : Estimated Co integration Equation [Normalized on LSPI] [Degrees of Freedom = 82]

Variable	$ß_i$^	Standard Error	t-statistics	Probability value
C	-31.26793	-	-	-
LM1	2.065959	1.13621	1.81829	0.0727***
LCPI	10.47279	2.57225	4.07145	0.0001*
LEXR	-2.859479	1.13592	-2.51732	0.0138**
LIM	0.229924	0.30204	0.76124	0.4487
LREM	-3.554142	0.51614	-6.88594	0.001*

(*) denotes critical value at 1% significance level. (**) denotes critical value at 5% significance level. (***) denotes critical value at 10% significance level. (^) denotes normalized co integrating coefficients.

Table VII : Error Correction Model [Dependent Variable = ÄLSPI] [Observations = 88]

Variable	Coefficients	Standard Errors	t-statistics	Probability values
$EC_{(-1)}$	-0.137125	0.07117	-1.92673	0.0591***
C	0.018482	0.02044	0.90435	0.3697
$\Delta LSPI_{(-1)}$	0.436015	0.14025	3.10885	0.0030*
$\Delta LSPI_{(-2)}$	-0.086671	0.13378	-0.64787	0.5197
$\Delta LSPI_{(-3)}$	-0.038624	0.13257	-0.29135	0.7719
$\Delta LSPI_{(-4)}$	0.091656	0.13877	0.66048	0.5117
$\Delta LSPI_{(-5)}$	0.033108	0.15413	0.21480	0.8307
$\Delta LM1_{(-1)}$	-0.845675	0.39942	-2.11726	0.0387**
$\Delta LM1_{(-2)}$	-0.50667	0.48156	-1.05215	0.2972
$\Delta LM1_{(-3)}$	0.19537	0.43537	0.44874	0.6554
$\Delta LM1_{(-4)}$	-0.494109	0.38376	-1.28753	0.2032
$\Delta LM1_{(-5)}$	-0.071426	0.33603	-0.21256	0.8324
$\Delta LEXR_{(-1)}$	0.003075	0.46379	0.00663	0.9947
Δ $LEXR_{(-2)}$	-0.68964	0.51807	-1.33118	0.1885
Δ $LEXR_{(-3)}$	-0.1997	0.52086	-0.38341	0.7029
Δ $LEXR_{(-4)}$	-0.327616	0.49633	-0.66007	0.5119
Δ $LEXR_{(-5)}$	-0.571942	0.39652	-1.44239	0.1548
$\Delta LIM_{(-1)}$	0.165866	0.10006	1.65769	0.1030***
Δ $LIM_{(-2)}$	0.232525	0.11929	1.94919	0.0563***
Δ $LIM_{(-3)}$	0.262584	0.14195	1.84979	0.0696***
Δ $LIM_{(-4)}$	0.179193	0.13021	1.37618	0.1742
Δ $LIM_{(-5)}$	0.106124	0.10386	1.02176	0.3113
$\Delta LREM_{(-1)}$	0.314038	0.24053	1.30561	0.1970
Δ $LREM_{(-2)}$	0.273065	0.24349	1.12147	0.2669
Δ $LREM_{(-3)}$	0.038805	0.21687	0.17893	0.8586
Δ $LREM_{(-4)}$	-0.112339	0.17968	-0.62523	0.5344
Δ $LREM_{(-5)}$	0.166862	0.12836	1.29993	0.1990
$\Delta LCPI_{(-1)}$	0.843879	1.18312	0.71327	0.4786
Δ $LCPI_{(-2)}$	-0.310135	1.30614	-0.23744	0.8132
Δ $LCPI_{(-3)}$	-0.548683	1.35159	-0.40595	0.6863
Δ $LCPI_{(-4)}$	1.92966	1.38432	1.39394	0.1688
Δ $LCPI_{(-5)}$	-2.925308	1.39984	-2.08975	0.0412**
Adjusted R^2 = 0.127924	F-statistic = 1.411675		Degrees of Freedom = 56	

(*) denotes critical value at 1% significance level. (**) denotes critical value at 5% significance level. (***) denotes critical value at 10% significance level.

Table VIII : Results of Ganger Causality Test based on Vector Error Correction (VEC) Model

Null Hypothesis	Chi-sq	df	P values
Δ LM1 does not Granger Cause Δ LSPI	9.241329	5	0.0998***
Δ LSPI does not Granger Cause Δ LM1	4.950773	5	0.4219
Δ LEXR does not Granger Cause Δ LSPI	5.223034	5	0.3893
Δ LSPI does not Granger Cause Δ LEXR	4.977759	5	0.4186
Δ LIM does not Granger Cause Δ LSPI	5.351693	5	0.3745
Δ LSPI does not Granger Cause Δ LIM	5.324843	5	0.3775
Δ LREM does not Granger Cause Δ LSPI	14.1296	5	0.0148**
Δ LSPI does not Granger Cause Δ LREM	10.09759	5	0.0725***
Δ LCPI does not Granger Cause Δ LSPI	6.523733	5	0.2585
Δ LSPI does not Granger Cause Δ LCPI	1.968731	5	0.8535

(*) denotes critical value at 1% significance level. (**) denotes critical value at 5% significance level. (***) denotes critical value at 10% significance level.