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T-Y Granger Causality Between Stock Prices and Macroeconomic Variables: Evidence From Dhaka Stock Exchange (DSE)

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Abstract:
This study investigates the direction of the causal relationship between stock prices and macroeconomic aggregates in Dhaka Stock Exchange (DSE). By applying the techniques of unit–root tests, cointegration and the long–run Granger causality test proposed by Toda and Yamamoto (1995), we test the causal relationships between the DSE Stock Index and the thirteen macroeconomic variables, viz., consumer price index, deposit interest rate, foreign exchange rate, export payment, gross domestic product, investment, industrial production index, lending interest rate, broad money supply, national income deflator, foreign remittances and total domestic credit using monthly data for the period 1987 to 2010. The major findings are that DSI is any way do not granger cause CPI, deposit interest rate, export receipt, GDP, investment, industrial production index, lending interest rate and national income deflator. But unidirectional causality is found from DSI to broad money supply and total domestic credit. In addition bi-directional causality is also identified from DSI to exchange rate, import payment and foreign remittances.
Keywords: *Macroeconomic Variables, Cointegration, T-Y Granger causality*

1. Introduction:

In an emerging economy, it is generally agreed that stock market under general equilibrium must play a very important role in collecting and allocating funds in an efficient manner. They are required to meet at least two basic requirements of supporting industrialization through savings mobilization, investment fund collections and maturity transformation and ensuring the environment of safe and efficient discharge the aforesaid functions. In most of emerging markets economic reform programs including liberalization, privatization ands restructuring have not yet been completed or in the process of completion. In this case the knowledge of the prevailing relationship between stock prices and macroeconomic variables like consumption, investment, industrial production, GDP and the like, is predominantly important in the view of the fact that a stable relationship among these variables are likely to reform the important postulate in a variety of economic models. The relationship between stock market and the economy can be seen in two ways in general. The first relationship explains the stock market as the leading indicator of the economic activities of the country. Secondly, one may be seen through the possible impact of the stock markets in aggregate demand particularly through aggregate consumption and investment. If the relationship holds together, it results in some ambiguity concerning the direction of causality between fluctuations in stock markets and economic activities (Ahmed M. F., 2000).

In the view economic developments, it has become imperative to study the movements of stock returns as well as the numerous macroeconomic aggregates and indicators. This is because the stock market is the most sensitive segment of any developing economy. The macroeconomic events working on the investors' psychology affect their buy sell decision rules. This results in stock price volatility which in turn exert influence on the macroeconomic aggregates. The crucial question here is how instantaneously this information are transmitted to the investors and market analysts at large and reflected in the stock prices. This brings us to the issue of stock market efficiency. The interactions taking place over time, analysis of which necessitates a suitable time series analysis.

The purpose of the present paper is to investigate the interaction between the stock price and a set of macroeconomic variables, in the context of the Bangladesh economy for the period from 1987 to 2010 which also witnessed commencement of economic liberalization. The analysis of the interrelationship runs in terms of Efficient Market Hypothesis. The Efficient Market Hypothesis (semi-strong form), states that in a semi strong efficient market, everyone has perfect knowledge of all publicly available information and these are fully reflected in stock prices. Otherwise, the market participants are able to develop profitable trading rules and the stock market will not channel financial resources to the most productive sectors.

The use of Granger Causality Test in examining market informational efficiency has recently been found unable to capture many of the time series properties. This paper makes use of the most recently available econometric technique, as proposed by Toda and Yamamoto (1995), which overcomes the technical problems associated with the traditional Granger Causality test. The contribution of this paper lies first of all, in focusing on stock market efficiency with respect to macroeconomic fundamentals rather than identifying the determinants of equity returns as in most of the studies and secondly in applying the Toda and Yamamoto causality technique which is superior to traditional Granger Causality Test.

A survey of the existing literature including empirical evidences on the nature of causal relationships between macroeconomic aggregates and stock prices is conducted in Section 2.0 Section 3.0 discuses the methodology employed and presents the variables and data descriptions. Section 4.0 analyses the empirical results followed by concluding observation in Section 5.0.

2. Review of Literature:

After 1986, the relationship between macroeconomic variables and stock prices is extensively investigated. A brief overview of the studies using macroeconomic factors models is presented in this section. The findings of the literature suggest that a significant linkage exist macroeconomic variables and stock prices in developed economies but such relationship doesn't exist in developing economies.

The first group of studies covers developed economies. Chen, Roll and Ross (1986) test the multifactor model in the USA by employing seven macroeconomic variables. They found that consumption, oil prices, and the market index are not priced by the financial market. However, industrial production, changes in risk premium and twists in the yield curve are found to be significant in explaining stock return. Chen (1991) performed the second study covering the USA. Finding suggest that future market stock return could be forecasted by interpreting some macroeconomic variables such as default spread, term spread, one month T-bill rate, industrial production growth rate, and the dividend-price ratio. Clare and Thomas (1994) investigate the effect of 18 macroeconomic factors on stock returns in the UK. They find oil prices, retail price index, bank lending and corporate default risk to be important risk factor for the UK stock returns. Mukherjee and Naka (1995) use vector error correction approach to model the relationship between Japanese stock returns and macroeconomic variables. Cointegration relation is detected among stock prices and the six macroeconomic variables, namely exchange rate, inflation rate, money supply, real economic activity, long term government bond rate and call money rate. Gjerde and Saettem (1999) examine the causal relation between stock returns and the macroeconomic variables in Norway. Results show a positive linkage between oil price and stock returns as well as real economic activity and stock returns. The study, however fails to show a significant relation between stock returns and inflation. A recent study by Flannery and Protopapadakis (2002) reevaluate the effect of some macro announcement series on US stock returns. Among these series, six macro variables, namely, balance of trade, housing starts, employment, consumer price index, M1 and producer price index seem to affect stock returns. On the other hand, two popular measures of aggregate economic activity (real GNP and industrial production) do not appear to be related with stock returns.

Second group of studies investigate the relationship between stock prices and macroeconomic variables for some developing countries. Using cointegration techniques, Chowdhury A.R. (1995) explains the lack of efficiency in the emerging stock markets by investigating the issue of informational efficiency in the Dhaka Stock Exchange in Bangladesh. He argued that in an efficient market the prices of the securities fully reflect all available information i.e. stock market participants incorporate the information contained in money supply changes into stock prices. Initially he tested the bivariate relationship models between stock prices and money supply changes. Results from bivariate models suggest independence between the stock price and monetary aggregates. In other words Dhaka stock market is informationally inefficient. However, it is well known that bivariate models fail to address the obvious possibility that the relationship may be driven by another variable acting on both stock price and money supply. Hence multivariate models were estimated which shows the presence of a unidirectional causality from the money (both narrow and broad) to stock price. But the findings are insensitive to the functional form of the variables employed. Thus the stock prices do not immediately reflect changes in monetary policy and the market in inefficient. One important limitation of this study is that the cointegration test conducted only for bivariate model. In addition, causality test result showed that money supply (both M1 and M2) do not help to predict stock prices.

Ahmed M.F. (2000) examines the causal relation between DSE stock index and a couple of macroeconomic variables like consumption expenditure, investment expenditures, real economic activity measured by GDP and industrial production index. The author employed Granger (1988) causality test and found a causal relation from stock price to consumption expenditures. He also found a unidirectional causality from investment to stock prices; weak relationship between stock price and GDP and no causal relation between stock price and industrial production index. Finally he concluded in that study that stock market is not informationally efficient in Bangladesh.

Bhattacharya B. and Mukherjee J. (2003), investigates the nature of the causal relationship between stock returns and macroeconomic aggregates in India. By applying the techniques of unit–root tests, cointegration and the long–run Granger non–causality test recently proposed by Toda and Yamamoto (1995), we test the causal relationships between the BSE Sensitive Index and the seven macroeconomic variables, viz., money supply, index of industrial production, national income, rate of inflation, real effective exchange rate, foreign exchange reserves and trade balance using monthly data for the period 1992-93 to 2000-01. The major findings are that here is no causal linkage between (i) stock returns and money supply, index of industrial production and national income for the domestic sector and (ii) stock returns and real effective exchange rate, foreign exchange reserves and trade balance for the external sector. However, a bi-directional causality exists between stock return and rate of inflation.

Khan K.N. (2004) used the Theory of Cointegration and ECM to examine the relationship between inflation and stock market development (through market capitalization and stock turnover index). At first the existence of stationarity property is checked by applying ADF and PP test. When the variables are found to be integrated of the same order then cointegration test is conducted by using Johansen Maximum likelihood procedure to find out the presence of long run relationship between inflation and MCAP and inflation and stock turnover index. The estimated test result implies that the series moves together in the long run, negatively related and a potential link exist between them. This means inflation matters to stock market performance. ECM test result showed that 65 percent of the adjustment towards equilibrium occurs within a year.

Ahmed. M. N. and Imam M. Osman, (2007) examines the long run equilibrium and short tern dynamics between DSE stock index and a set of macroeconomic variables. In the macroeconomic variables they use money supply, 91 day T-bill rate, interest rate GDP and Industrial production index. They applied Johansen and Juselius (1990) maximum likelihood Cointegration test, Vector Error Correction Model (VECM) and also employed Granger Causality test. In the cointegration test, they found two cointegrating vectors but between them one is statistically significant. In the VECM test, they found that the lagged stock index was adjusted to long run equilibrium by percent by 43.82 percent by the combined lagged influence of all the selected macroeconomic variables. Granger causality test provides a unidirectional causality from interest rate change to stock market return.

Rahman J. , Iqbal A. and Siddiqi M., (2010) examines the nature and the direction of causality in Pakistan between public expenditure and national income along with various selected components of public expenditure by applying Toda-Yamamoto causality test to Pakistan for the period of 1971 to 2006. This study finds that there is a unidirectional causality running from GDP to government expenditure.

Asaolu T.O. and Ogunmuyiwa M.S. (2010) investigates the impacts of macroeconomic variables on share price of Nigeria. He used average share price of the Nigerian Stock Exchange as dependent variables and External Debt, Inflation rate, Fiscal Deficit, Exchange rate, Foreign Capital Inflow, Investment, Industrial output as independent variables. The findings of Granger Causality test indicated that Average Share Price (ASP) does not Granger cause any of the nine (9) macroeconomic variables in Nigeria in the sample period. Only exchange rate granger causes average share price when considered in pairs. The Johansen co-integration test and showed a long run relationship between share price and the macroeconomic variables. Error correction method also showed a weak relationship between share price and macroeconomic variables. That means stock price is not a leading indicator of macroeconomic variables in Nigeria and R-square value indicated that about 60 percent of the variation in stock prices in accounted for by macroeconomic variables in Nigeria.

Ali M. B. (2011) investigates the impact of changes in selected microeconomic and macroeconomic variables on stock returns at Dhaka Stock Exchange (DSE). A Multivariate Regression Model computed on Standard OLS Formula has been used to estimate the relationship. Regression coefficient reveals that inflation and foreign remittance have negative influence and industrial production index; market P/Es and monthly percent average growth in market capitalization have positive influence on stock returns. All the independent variables can jointly explain 44.48 percent variation in DSE all share price index. No unidirectional Granger Causality is found between stock prices and all the predictor variables except one unidirectional causal relation from stock price and market P/Es. Finally, lack of Granger causality between stock price and selected micro and macro variables ultimately reveals the evidence of informationally inefficient market.

3. Methodology:

3.1 Research Methods:

This study basically tries to examine the causal relationship between Dhaka Stock Exchange (DSE) all share price index (DSI) and a set of 13 macroeconomic variables like consumer price index (CPI), 3 months weighted average deposit interest rate (DIR), exchange rate of BDT against USD (EXR), export payment (EXRPT), gross domestic product at current market price (GDPMP), investment at market price (INVMP), industrial production index (IPD), 3 months weighted average commercial lending interest rate (LIR), broad money supply (M2), national income deflator (NID) foreign remittances (REMIT) and total domestic credit (TDC). At the beginning, Granger causality (1988) test was thought to be the most appropriate test for this study. To explain, in brief, a simple definition of Granger Causality, in the case of two time-series variables, ***X*** and ***Y***:

"***X*** is said to Granger-cause ***Y*** if ***Y*** can be better predicted using the histories of both ***X*** and ***Y*** than it can by using the history of ***Y*** alone."

We can test for the absence of Granger causality by estimating the following VAR model:

$$Y_t = a_0 + a_1 Y_{t-1} + ... + a_p Y_{t-p} + b_1 X_{t-1} + ... + b_p X_{t-p} + u_t \quad (1)$$

$$X_t = c_0 + c_1 X_{t-1} + ... + c_p X_{t-p} + d_1 Y_{t-1} + ... + d_p Y_{t-p} + v_t \quad (2)$$

Then, testing H_0: $b_1 = b_2 = ... = b_p = 0$, against H_A: 'Not H_0', is a test that ***X does not*** Granger-cause ***Y***.

Similarly, testing H_0: $d_1 = d_2 = ... = d_p = 0$, against H_A: 'Not H_0', is a test that ***Y does not*** Granger-cause ***X***.

In each case, a **rejection** of the null implies there is Granger causality. But later on we identify two major drawbacks of using Granger Causality test when more than two variables are considered:

Granger Causality test consider only two variables to examine the causal relation between them. But it does not consider the effects of other associated variables which are subject to possible specification bias. As pointed out by Gujarati (1995), causality is sensitive to model specification and the number of lags. It would reveal different results if any variable (s) was relevant and was not included in the model. Therefore the empirical evidence of a two variable Granger-Causality is fragile because of this problem.

Time series data are often non-stationary. This situation could exemplify the problem of spurious regression. Gujarati (1995) also said that when variables are integrated, the F-test procedure is not valid, as the test statistics don't have a standard distribution. Although researchers can still test the significance of individual coefficients with t-statistics, one may not able to use F-statistics to jointly test the Granger-Causality. Enders (2004) proved that in some special cases, using F-statistics to jointly test first differential VAR is permissible. First differential VAR also has its limitations, which can not be employed universally.

To sum up, because of the probable shortcomings of specification bias and spurious regression, this study does not carry out traditional Granger-Causality procedure to test the relationship between more than two variables. Later on we have decided to use Toda- Yamamoto (1995) procedure to examine the causal relation for our selected variables. Toda and Yamamoto (1995) proposed a simple procedure requiring the estimation of an 'augmented' VAR, even when there is cointegration, which guarantees the asymptotic distribution of the MWald statistic. This method is applicable "whether the VAR's may be stationary (around a deterministic trend), integrated of an arbitrary order, or cointegrated of an arbitrary order" (Toda and Yamamoto: Journal of Econometrics 66, 1995, pp. 227). This procedure has two important advantages over the standard causality tests. First, it conducts Granger causality tests with allowance for the long-run information often ignored in systems that requires first differencing and pre-whitening.2 Secondly, this methodology is useful because it bypasses the need for potentially biased pre-tests for unit roots and cointegration, common to other formulations such as the vector error correction model (VECM).

Toda and Yamamoto (1995) procedure involve a modified Wald (MWALD) test in an augmented VAR model, and do not require pretesting for cointegration properties of the system. The idea underlying the Toda–Yamamoto (TY) test is to artificially augment the true lag length (say, p) of the VAR model by the maximal order of integration (d_{max}) that might occur in the process. Then, one can estimate the VAR model with a (p + d_{max}) order, ignoring the coefficients of the last d_{max} lagged vectors, and test the linear or nonlinear restrictions on the first k coefficient matrices by the standard Wald test. Toda and Yamamoto (1995) prove that the Wald statistic used in this setting converges in distribution to a χ^2 random variable, no matter whether the process is stationary or nonstationary. The preliminary unit root and cointegration tests are not necessary to implement the DL test, since the testing procedure is robust to the integration and cointegration properties of the process.

Consider the following VAR(p) model:

$$Y_t = \gamma + A_1 Y_{t-1} + ... + A_p Y_{t-p} + \varepsilon$$

where, yt, c, and et ~(0, Ω) are n-dimensional vectors and A_k is an nxn matrix of parameters for lag k. To implement the T-Y test the following augmented VAR(p +d) model to be utilized for the test of causality is estimated,

$$Y_t = \hat{\gamma} + A\hat{Y}_{t-1} + ... + \hat{A}_p \hat{Y}_{t-p} + \hat{A}_p \hat{Y}_{t-p-d} + \hat{\varepsilon}$$

where the circumflex above a variable denotes its ordinary least squares (OLS) estimate. The order p of the process is assumed to be known, and d is the maximal order of integration of the variables. Since the true lag length p is rarely known in practice, it can be estimated by some consistent lag selection criteria. Note that if the maximal order of integration d =1, then the T-Y test becomes similar to the DL test. The jth element of Y_t does not Granger-cause the ith element of Y_t, if the following null hypothesis is not rejected:

H_0 : the row i; column j element in A_k equals zero for k = 1,…….., p

The null hypothesis is tested by a Wald test which is termed as modified Wald (MWALD) test in case of the augmented VAR outlined above.

3.2 Data and Data Sources:

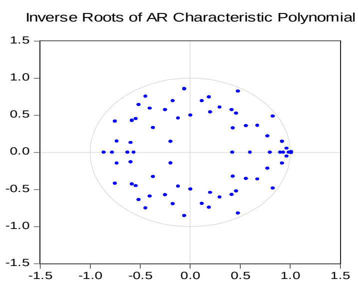
This study concentrates on investigating the causal relation between Dhaka Stock Exchange (DSE) all share price index and a set of 13 macroeconomic variables (i.e. consumer price index, 3 month weighted average deposit interest rate, foreign exchange rate, export receipt, gross domestic product at current market price, import payment, investment at market price, industrial production index, 3 months weighted average commercial lending interest rate, broad money supply, national income deflator, foreign remittance, total domestic credit). For the purpose of this study DSE all share price index data was collected for the period from January 1987 to December 2010. The data source of DSE all share price index is the *'Monthly Review'* publication issued by Dhaka Stock Exchange. Monthly data for the set of selected macroeconomic variables for the same period were collected from *'Monthly Economic Trends'* published by Bangladesh Bank. But due to abnormal stock price volatility was observed during the period from January 1996 to June 1997 (Total 18 months), so the stock price data along with monthly data for all other macroeconomic variables for the same period is not incorporated in to our study.

4. Empirical Result:

4.1 Unit Root Test:

T-Y procedure of Granger Causality proposes to test the order of integration in all the variables under each study. There have been a variety of unit root test that can be used for determining the order of integration (for example Dickey and Fuller, 1979; Sargan and Bhargava, 1983; Phillips and Parron, 1988; Kwiatkowski, Phillips, Schmidt, and Shin, 1992 among the others) and each has been widely used in the applied economics literature. In this study Augmented Dickey-Fuller (ADF) Test and Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test has been used to identify the order of integration in each and every variable. ADF test assumes a null hypothesis of nonstationary data series against an alternative hypothesis of stationary data series. On the other hand, KPSS assumes stationery data series as null hypothesis and nonstationary data series in the alternative hypothesis. The basic reason for selecting this two method is to ensure a cross check in estimating the order of integration in each variables. Table-1 presents the test result of the order integration under ADF test and KPSS test. Test result shows that DIR, EXR are I(0) variables and DSI, CPI, EXRPT, GDPMP, IMPMT, INVMP, IPD, LIR, REMIT, TDC are I(1) variables and m2 is I(2) variable under both ADF and KPSS test. Only one variable i.e. NID shows I(2) in ADF test and I(1) is KPSS test. Base on this test result we can say that out of 14 different variables, 10 of them are I(1), two of them are I(2) and remaining one variable show different order of integration under ADF and KPSS test. Similarity in the order of integration is significant in T-Y Granger Causality procedure because it is expected that when variables are integrated of the same order, they must have a cointegration relation that also contribute to have Granger Causal relation among the variables.

4.2 Selection of Lag length by Information Criteria:



When we know that 10 out of total 14 variables are I(1) then we set up a VAR model using all the variables regardless of the order of integration in the time series. In this case, the selection of appropriate VAR lag order is estimated based on Schwarz criterion (SC) and Hannan-Quinn criterion (HQ) information criteria which results VAR lag order one (see Table-2). But at this lag order the VAR model is severely affected by possible serial correlation and that's why we have performed VAR residual serial correlation LM test to identify the lag order at which serial correlation in the VAR model will be removed. This serial correlation LM test identify lag order five (see Table-3)that removes the existence of serial correlation in the VAR model. At this level, the VAR is found to be dynamically stable.

4.3 Johansen-Juselius Cointegration Test

The Johansen method applies the maximum likelihood procedure to determine the presence of cointegrating vectors in non-stationary time series as a vector autoregressive (VAR). Consider a VAR of order p

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \dots\dots\dots\dots + A_p Y_{t-p} + BX_t + \varepsilon$$

where Yt is a k-vector of non-stationary l(1) variables, Xt is a d vector of deterministic variables, and e1 is a vector of innovations. We can rewrite the VAR as:

$$\Delta Y_t = \prod Z_{t-1} + \sum_{i=1}^{p-1} \Gamma \Delta Y_{t-1} + BX_t + \varepsilon$$

Where

$$\Pi = \sum_{i=1}^{p} A_t - 1 \qquad \text{and} \qquad \Pi_i = \sum_{j=i+1}^{p} A_j$$

Here Yt is a vector of nonstationary variables. The information on the coefficient matrix between the levels of the series Π is decomposed as Π = $\alpha\beta'$ where the relevant elements of the α matrix are adjustment coefficients and the β matrix contains the cointegrating vectors. Johansen and Juselius (1990) specify two likelihood ratio test statistics to test for the number of cointegrating vectors' The first likelihood ratio statistics for the null of exactly r cointegrating vectors against the alternative of r+1 vectors is the maximum eigen value statistic. The second statistic for the hypothesis of at most r cointegrating- vectors against the alternative is the trace statistic. Critical values for both test statistics are tabulated in Johansen and Juselius (1990). The number of lags applied in the cointegration tests is based on the information provided by the SC and HQ information criteria.

The test of cointegration based on Johansen and Juselius (1990) has been performed assuming a linear deterministic trend and an optimum lag length of 5. At first, the unrestricted cointegration rank among the variables under study is examined through the use of trace statistics and eigenvalue statistics. Trace statistics test the null hypothesis of r = 0 or r ≤ 1 against alternative hypothesis of r ≥1 or r = 2. On the other hand maximum eigen value statistics test the null hypothesis of r = 0 or r = 1 against alternative hypothesis of r = 1 or r = 2. Table -4 reveals that trace statistics reject the null hypothesis of no cointegrating relationship among the variables. An examination of trace statistics with that of critical value at 5 percent indicates that there are three cointegrating equation among the variables. Another important test to identify the number of cointegrating vectors is examination of maximum eigen value. This test (see Table: 4) also reveals the identical result that there is three cointegrating equation among the variables.

However, 10 out of 14 variables are stationary at first difference. This means that dmax = 1. So, the study estimate a system of VAR at levels with a total of k+dmax= 5+1 = 6 lags in the model. Now a VAR model has been estimated with lag 5 for each and every endogenous variables and additional one lag (i.e. due to dmax =1) is used for all the variables as exogenous variables.

4.4 T-Y Granger Causality Test

The empirical results of Granger causality test based on Toda and Yamamoto (1995) methodology is estimated through MWALD test and reported in Table: 5. this table presents that the test result follows the chi-square distribution with 5 degrees of freedom in accordance with the appropriate lag length along with their associated probability.

According to this estimates DSI has no causal relation with CPI: which is not consistent with Emrah Ozbay (2009). This estimates also reveals that DSI has no causal relation with DIR. But DSI has bi-directional causality with EXR. This result is consistent with Aydemir and Demirhan (2009) but Emrah Ozbay (2009) found causal relation from stock price to exchange rate. On the other hand, Karamustafa and Kucukkale (2003) indicate that the stock returns are neither the leading nor the lagging variable of exchange rate.DSI also has no causal relation with EXRPT. DSI has no causal relation with GDPMP which is consistent with Ahmed M .F. (2000), Ahmed. M. N. and Imam M. Osman, (2007). But Emrah Ozbay (2009) found unidirectional causality from GDP to stock returns. DSI has bi-directional causality with IMPMT and no causal relation with INVMP. DSI has no causal relation with IPD. This result is also supported by Errunza and Hogan (1998), Karamustafa and Kucukkale (2003), Emrah Ozbay (2009), Ahmed M.F (2000), Ahmed. M. N. and Imam M. Osman, (2007). On the other hand, Erbaykal et al. (2008) report that industrial production index is effective on stock prices via inflation, indicating that industrial production can be used as leading indicators in estimating the stock prices. Similarly, Errunza and Hogan (1998) report that industrial growth rate volatility does Granger cause return volatility for Italy and Netherlands. Conversely, Ozturk (2008) and Kaplan (2008) report that stock prices lead real economic activity in Turkey. Furthermore, the direction of the causality between variables is only from stock market price to real economic activity. However, Nishat and Shaheen (2004) infer bilateral Granger cause between industrial production and stock prices.According to our estimates DSI has no causal relation with LIR. A less significant unidirectional causality was found by Ahmed. M. N. and Imam M. Osman, (2007), but Emrah Ozbay (2009) found bidirectional causal relation between stock price and interest rate. DSI has unidirectional causality from DSI to M2. This result is consistent with Ahmed. M. N. and Imam M. Osman, (2007) and Emrah Ozbay (2009). At the same time, DSI has no causal relation with NID. However, DSI has bi-directional causality with REMIT. Finally, there exists unidirectional causality from DSI to TDC.

5. Conclusion:

The main purpose of this study is to identify the lead and lag relationship between Dhaka Stock Exchange (DSE) all share price index (DSI) and a setoff thirteen selected macroeconomic variables. We have employed Toda – Yamamoto Granger causality Procedure which establish multivariate VAR and perform MWALD test to establish causal relation among different variables. This T-Y Granger Causality Procedure is considered to be a successful extension of original Granger Causality Test which considers only two variables to identify causal relation. According to various economic theories, macroeconomic variables should have relationship with the stock market which is considered to be a sensitive area of economic system. In the context of Bangladesh, using data set for the period from January 1987 to December 2010, our study found unidirectional causality from DSI to M2 and TDC and bi-directional causality between DSI and EXR, IMPMT & REMIT. This study found no causal relation between DSI and CPI, DIR, EXRPT, GDPMP, INVMP, IPD, LIR & NID. Our findings in this paper are partially supported by economic theories and evidence from other study. The results of the study may not consistently stable with the results of the previous studies due to differences between the macroeconomic factors used, the period covered, the research methodology employed and the countries examined. For the future research, this paper certainly assist other researchers to find clues about the lead and lag relationship between DSE all share price index and different macroeconomic variables.

Reference:

Ahmed M.F., (1998), "Equity Market Performance in Bangladesh: An Evaluation", *Savings And Development*, **XXII** (1), 67-93.

Ahmed M.F. (2000), "Emerging Stock Market and the Economy", *South East Asian Studies Series*, Nagasaki University, Japan.

Ahmed M.F. (2002), "Market Efficiency in Emerging Stock Markets: The Case of Dhaka Stock Exchange", *Savings And Development*, **XXVI** (1), 49-68.

Ahmed. M. N. and Imam M. Osman, (2007),"Macroeconomic Factors and Bangladesh Stock Market", *International Review of Business Research Paper*, **3**(5), 21-35.

Ali M. B. and Chowdhury T.A. (2010),"Effect of Dividend on Stock Price in Emerging Stock Market: A Study on the Listed Private Commercial Banks in DSE ", *International Journal of Economics and Finance*, **2(**4), 52-64.

Ali M.B., (2011), "Impact of Micro and Macroeconomic Variables on Emerging Stock Return: A Case on Dhaka Stock Exchange (DSE)." *Interdisciplinary Journal of Research in Business*, **1**(5), 08-16.

Asaolu T.O. and Ogunmuyiwa M. S., (2010), "An Econometric Analysis of the Impact of Macroeconomic Variables on Stock Market Movement in Nigeria", *Asian Journal of Business Management*, **3(**1), pp. 72-78.

Aydemir, O. and Demirhan, E. (2009), "The Relationship between Stock Prices and Exchange Rates Evidence from Turkey", *International Research Journal of Finance and Economics*, (23), pp. 207-215 [Online] Available at: http://www.eurojournals.com/irjfe_23_16.pdf [Accessed 9 February 2009].

Banerjee, P.K. and Adhikary, D. K. (2009), "Dynamic Effects of Interest Rate and Exchange Rate Changes on Stock Market Returns in Bangladesh", *Journal of Social and Management Sciences*, **XXXVIII** (1),28-40.

Bhattacharya B. and Mukherjee J. (2003), "India Stock Price Movements and Macroeconomic Context- A Time Series Analysis", *Journal of International Business and Economics*, **3**, 25-36.

Chen, N.F., R. Roll and S.A. Ross, (1986), "Economic Forces and the Stock Market". *Journal of Business* **59**, pp 383-403

Chowdhury A.R., (1995), “Is the Dhaka Stock Exchange Informationally Efficient?", *The Bangladesh Development Studies*, **XXlll**, 89-104.

Chung S. Kwon and Tai S. Shin, (1999), "Cointegration and Causality between Macroeconomic Variables and Stock Market Returns", *Global Finance Journal* **10.** 71-81.

Dickey, D. A. and W.A. Fuller, (1981), "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", *Econometrica* **48**, 1057-1072

Enders W. (2004), *Advanced Econometric Time Series* (Second Edition), New York: Willey.

Engle, R.F and C.W.J. Granger, (1987), "Cointegration and Error correction: Representation, Estimation and resting", Econimetrica, **55**(2), 251-276.

Fama, E.F., (1981), "stock Returns, Real Activity, Inflation and Money", *American Economic Review* **71**, 545-565.

Fama, E.F. (1990), "Stock Returns, Expected Returns, and Real Activity", *Journal of Finance* **45**, 1089-1 108.

Gunasekarage, A., and Pisedtatalasai, A., (2004), "Macroeconomic Influence on the Stock Market: Evidence from an Emerging Market in south Asia”, Journal of Emerging Market Finance, **3**(3), 285-304.

lmam, M. Osman, and A.S. M.M. Amin, (2004), "Volatility in the stock Return: Evidence from Dhaka Stock Exchange", Journal of the Institute of Bankers Bangladesh, **51(**1), 01-08.

lmam, M. Osman, (2000), "Capital Market Development: Problems and Prospects”, *Portfolio*, Chittagong Stock Exchange, Oct-Dec, 43-56.

Ahmed. M. N. and Imam M. Osman, (2007),”Macroeconomic Factors and Bangladesh Stock Market” *International Review of Business Research Paper*, **3(**5), 21-35.

Johansen, S. (1991), "Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models", *Econometrica* **59,** 1551-1580.

Johansen, S. and K. Juselius, (1990), "Maximum Likelihood Estimation and Inference on Cointegration-

With Application to the Demand for Money", *Oxford Bulletin of Economics and Statistics* **52**, 169-210.

Karamustafa O. and Kucukkale Y. (2003), "Long Run Relationships between Stock Market Returns and Macroeconomic Performance: Evidence from Turkey", *EconWPA* in its series Finance with number 0309010, http://129.3.20.41/eps/fin/papers/0309/0309010.pdf.

Khan K.N. (2004) "Inflation and Stock Market Performance: A case Study for Pakistan", *Savings and Development* , **6**, 87-100.

Mohiuddin, M. Rahman M.L. and Uddin, J. (2009), "Test of Efficiency in Emerging Stock Market: Evidence From Bangladesh", *Journal of Business Administration*, **35**(1& 2), 1-20.

Mookerjee R., and Yu Q. (1997), "Macroeconomic Variables and stock Prices in a Small Open Economy. The Case of Singapore", *Pacific-Basin Journal*, **5**, 377-388.

Naka A., Mukherjee, T. and Tufte D., (1998), "Macroeconomic Variables and the Performance of the Indian Stock Market", *Working Papers, Department of Economics & Finance*, University of New Orleans.

Nasseh A., and Strauss J. (2000), "Stock Prices and Domestic and International Activity: A Cointegration Approach", *The Quarterly Review of Economics and Finance*, **40**, 229-245.

Emrah Ozbay (2009),"The Relationship Between Stock Returns And Macroeconomic Factors: Evidence From Turkey", published MSc dissertation, University of Exeter, September 2009, Turkey.

Rahman J., Iqbal A. and Siddiqi M., (2010),"Cointegration –Causality Analysis between Public expenditure and Economic Growth in Pakistan", *European Journal of Social Sciences*, **13**(4), 556-565.

Soenen L., and Johnson R. (2001), "The Interrelationship between Macroeconomic Variables and stock Prices: The case of china", *Journal of Asia-Pacific*, **3**(1). 22-42.

Seddighi, H.R., Lawler, K.A., and Katos, (2000), A.V, *Econometrics: A Practical Approach* (Fisrt Edition), Routledge.

Shafiullah, M. (2007), "Causal Relationship Between Selected Macroeconomic Variables and Stock Market: A case for Bangladesh", *Bank Parikrama*, **XXXII** (1, 2, 3 & 4), 103-117.

Table – 1 : Test of Order of Integration

Variables	ADF Test						KPSS Test			
	ADF Test Stat						I(0)	I(1)	I(2)	Critical Value @ 1 %
	I(0)		I(1)		I(2)					
	t-stat	prob	t-stat	prob	t-stat	prob	LM Stat.	LM Stat.	LM Stat.	
DSI	-1.855270	0.6748	**-16.338**	**0.000**	----	----	0.347246	**0.203774**	-----	0.216000
CPI	0.451360	0.9991	**-3.5791**	**0.033**	-----	-----	0.410612	**0.203774**	-----	0.216000
DIR	-1.855270	0.6748	**-16.338**	**0.000**	-----	-----	0.098738	-----	-----	0.216000
EXR	-6.223315	0.000	----	-------	-----	-----	0.149819	-----	-----	0.216000
EXRPT	0.696686	0.9997	**-3.8934**	**0.013**	-----	-----	0.477794	**0.149495**	-----	0.216000
GDPMP	-1.547180	0.8108	**-16.301**	**0.000**	-----	-----	0.344127	**0.070707**	-----	0.216000
IMPMT	0.892090	0.9998	**-6.0157**	**0.000**	-----	-----	0.458712	**0.152689**	-----	0.216000
INVMP	-0.999552	0.9412	**-14.594**	**0.000**	-----	-----	0.477901	**0.051261**	-----	0.216000
IPD	-0.542909	0.9810	**-11.753**	**0.000**	-----	-----	0.527782	**0.076509**	-----	0.216000
LIR	-1.823144	0.6909	**-16.681**	**0.000**	-----	-----	0.225868	**0.060805**	-----	0.216000
M2	3.907506	1.000	**0.93718**	**0.999**	-15.96	0.00	0.487784	**0.541332**	0.0831	0.216000
NID	0.017701	0.9963	**-3.1615**	**0.094**	-29.13	0.00	0.371355	**0.117194**	-----	0.216000
REMIT	0.153964	0.9976	**-18.810**	**0.000**	-----	-----	0.483696	**0.097956**	-----	0.216000
TDC	0.8110764	0.9998	**-2.6113**	**0.275**	-----	-----	0.490458	**0.167305**	-----	0.216000

Table-2 : VAR Lag Order Selection Criteria

Endogenous variables: DSI CPI DIR EXR EXRPT GDPMP IMPMT INVMP IPD LIR M2 NID REMIT TDC						
Exogenous variables: C						
Lag	LogL	LR	FPE	AIC	**SC**	**HQ**
0	-22364.99	NA	8.64e+56	170.8320	171.0227	170.9087
1	-18932.35	6472.240	1.61e+46	146.1248	**148.9849***	**147.2743***
2	-18661.09	482.4663	9.17e+45	145.5503	151.0799	147.7728
3	-18459.77	336.5557	9.07e+45	145.5097	153.7087	148.8051
4	-18235.94	350.2677	7.76e+45	145.2973	156.1657	149.6655
5	-18062.30	253.1669	1.01e+46	145.4680	159.0059	150.9092
6	-17732.82	445.1753	4.23e+45	144.4490	160.6564	150.9631
7	-17373.93	446.5631	1.51e+45	143.2056	162.0824	150.7926
8	-17109.55	300.7097*	1.20e+45*	142.6836*	164.2298	151.3435

Table-3:VAR Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
Lags	LM-Stat	Prob
2	345.2810	0.0000
3	230.0568	0.0482
4	281.1994	0.0001
5	**219.5171**	**0.1197**
6	645.1005	0.0000
7	241.5213	0.0148
8	256.8226	0.0023
9	287.2645	0.0000
10	271.9245	0.0003
11	262.8853	0.0010
12	741.4978	0.0000

Table- 4 : Unrestricted Cointegration Rank Test (Trace) and (Maximum Eigenvalue)						
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	420.4800	239.2354	**0.0000**	144.4319	64.50472	**0.0000**
At most 1 *	276.0481	197.3709	**0.0000**	109.3084	58.43354	**0.0000**
At most 2 *	166.7397	159.5297	**0.0190**	54.64502	52.36261	**0.0287**
At most 3	112.0946	125.6154	0.2469	37.12491	46.23142	0.3336
At most 4	74.96972	95.75366	0.5445	28.67151	40.07757	0.5143

Table 5 :T-Y Granger Causality Test

Direction of Causality			df.	Chi-sq.	Prob.
DSI	~	CPI	5	5.729393	0.3334
CPI	~	DSI		1.801316	0.8759
DSI	~	DIR	5	3.351448	0.6460
DIR	~	DSI		7.076394	0.2150
DSI	→	**EXR**	**5**	**9.290916***	**0.0980**
EXR	→	**DSI**		**14.34270***	**0.0136**
DSI	~	EXRPT	5	4.161131	0.5265
EXRPT	~	DSI		7.648682	0.1767
DSI	~	GDPMP	5	1.088010	0.9552
GDPMP	~	DSI		0.707571	0.9826
DSI	→	**IMPMT**	**5**	**17.74316***	**0.0033**
IMPMT	→	**DSI**		**30.88673***	**0.0000**
DSI	~	INVMP	5	2.545285	0.7697
INVMP	~	DSI		0.746767	0.9803
DSI	~	IPD	5	6.182735	0.2888
IPD	~	DSI		8.049412	0.1535
DSI	~	LIR	5	4.239602	0.5155
LIR	~	DSI		0.440684	0.9941
DSI	→	**M2**	5	**21.69861***	**0.0006**
M2	~	DSI		7.972382	0.1586
DSI	~	NID	5	3.715160	0.5911
NID	~	DSI		5.736329	0.3327
DSI	→	**REMIT**	**5**	**22.83706***	**0.0004**
REMIT	→	**DSI**		**16.04603***	**0.0067**
DSI	→	**TDC**	5	**9.679069***	**0.0849**
TDC	~	DSI		3.844569	0.5720

* sig. at 10 percent level