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An Empirical Analysis of the Relationship between Monetary Policy Stance and Stock Price in Bangladesh

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This paper investigates the empirical relationship between the monetary stance and stock market performance of Bangladesh using monthly data from January 2001 to December 2013. The empirical investigation was conducted using autoregressive distributed lag (ARDL) model consisting of five alternative measures of monetary indicators - 91 day T-bill rate, reserve money, broad money, call money rate and weighted average deposit rate and DSE General Index (DGEN) for stock market performance. In the case of using 91 day Treasury bill (T-bill) or call money rate as monetary indicators, a long-run co-integration relationship between DGEN, T-bill rate, CPI and exchange rate is found. However, in the case of broad money, reserve money and weighted average deposit rate, no long-run co-integration is found. Overall, this paper suggests that stock market valuation level is affected by monetary conditions.

Keywords: Monetary Policy, Stock Price, ARDL Model, Bangladesh
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I. INTRODUCTION

The central bank attempts to achieve its broader macroeconomic objectives like stabilising inflation and boosting economic growth by using monetary policy. However, transmission of changes in monetary policy actions like changes in policy rate or increase in money supply into real economy includes considerable lags. The capital market as an integral part of financial markets is very quick to incorporate such changes in monetary policy actions. Therefore, a more and relatively direct impact of changes in monetary stances can be traced using the stock market movement. In the framework of monetary transmission mechanisms through stock market, monetary policy action impacts stock market and stock market indices affect macroeconomic variables through their impact on

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consumption and investment spending (Goodhart and Hofmann2000). The paper attempts to identify the underlying short and long term link between stock market movement and monetary policy stance so that such a link can be used to improve the monetary policy formulation in terms of its transmission and coverage on the one hand and to assist investors in anticipating stock market movement in a better way using monetary policy variables on the other hand.

The stock market plays a crucial role in mobilising the long-term funds from the surplus units to deficit units with productive investment opportunity. Though banks also channelise funds, due to nature of banks' liability, banks in most cases are reluctant to lend long term funds or unwilling to invest in ventures which are highly risky.This hinders the pace of industrialisation. Stock market here fills this gap of long term and risky funds by designing instruments like common stocks, corporate bonds, debentures and preferred stocks, etc. An efficient and well-functioning capital market encourages the household savings while giving easy access to long term finance to firms with profitable investment opportunities. Moreover, a sound and efficient capital market allows the domestic firms to have access to foreign capital or foreign portfolio investment. Over the last few years, stock market in Bangladesh has experienced a tremendous growth in terms of market capitalisation, trading volume, average turnover, movement of stock indices and many other indicators. However, stock market experienced a sharp crash in 2010-11, which is much stronger in terms of severity and damage than the stock market crash happened in 1996. The loose monetary policy stance of Bangladesh Bank (BB), the central bank of Bangladesh, during the build-up of bubble and then the sudden tightening of monetary policy stance at the time of market crash are among major reasons for the recent bubble burst of stock market in 2010-11.

The monetary policy followed by BB in taking its monetary stance involves estimation of safe limit of monetary expansion (M2) on the demand side based on growth estimate of gross domestic product (GDP), consumer price index (CPI) and income velocity of money demand (Ahmed and Islam 2004). The simple relationship between reserve money and M2 allows the former to be an operating target and the latter as the intermediate target of monetary policy stance of BB. As BB has no direct control over the money supply, BB influences the money supply through a set of direct and indirect instruments like weekly auction of treasury bills and bonds, repurchase agreement (repo) and reverse repo, and infrequent changes in cash reserve ratio (CRR) and statutorily liquidity reserve (SLR).

As liquidity in the stock market and opportunity cost of investment in stock markets are affected by the changes in money supply and other monetary

instruments like auctions of treasury bill/bond, repo, reverse repo, bank rate, SLR and CRR through different transmission channels, there does exist a significant link between the monetary policy stance and stock market movement, which has been documented in a number of studies. For example, Bernanke and Kuttner (2005) pointed out that the most direct and immediate effects of monetary policy actions, such as changes in the federal funds rate, are on the financial markets; by affecting asset prices and returns, policymakers try to modify economic behaviour in ways that will help to achieve their ultimate objectives. Ehrmann and Fratzscher (2004) observed that monetary policy tightening of 0.5 per cent is associated with 3 per cent decline of stock price in the announcement day. So, understanding the dynamic link between monetary policy actions and the stock market, index behaviour has an important bearing for designing appropriate monetary policy.

This paper attempts to identify the underlying short and long term link between the stock market movement and monetary policy stance in the context of Bangladesh so that such a link can be used to improve the monetary policy formulation in terms of its transmission and coverage on one hand and to assist investors in anticipating stock market movement in a better way using monetary policy variables on the other hand.

II.THEORETICAL RELATIONSHIP BETWEEN MONETARY POLICY AND STOCK MARKET PRICE

The theoretical link between the monetary policy and the stock market price can best be understood within the framework of present value model or discounted cash flow (DCF) model. According to this widely used DCF model, the stock price (P_t) is the sum of present value of expected future dividends (D_{t+i}) during the holding period (t+T) and the price P_{t+T}at the end of holding period (t+T). Under the assumption of constant discount rate (r), it can be shown that

$$p_t = E_t\left[\sum_{i=1}^{T}\left(\frac{D_{t+i}}{1+r}\right)^{t+i}\right] + E_t\left[\left(\frac{P_{t+i}}{1+r}\right)^{t+T}\right] \quad (1)$$

where, E_t is the conditional expectations operator based on information available to market participants at time t, r is the required rate of return used by market participants to discount future dividends, and T is time horizon for the investor (stock holding period). As the holding period increases, discounted value of stock price P_t at the end of holding period (t+T) vanishes to zero and last part of right hand side of equation approaches to zero.

$$\lim_{T \to \infty} E_t \left[\left(\frac{P_{t+T}}{1+r} \right)^{t+T} \right] = 0 \quad (2)$$

Or equation (1) can be written in more familiar form of present value model.

$$p_t = E_t \left[\sum_{i=1}^{T} \left(\frac{D_{t+i}}{1+r} \right)^{t+i} \right] \quad (3)$$

Equation (3) suggests that changes in monetary stance can have impact on the stock price either through changes in interest rate used to discount the cash flows or through directly affecting the cash flow of company stock. According to New Keynesian theory, the central bank exerts some control of the real interest rate due to prices being sticky in the short run.

Contractionary monetary stance will raise the market interest rate which in turn increases the required rate of return used to discount the cash flow and hence stock price will decline and vice versa. Similarly, a monetary policy can impact the stock price by indirectly affecting its cash flow through bank lending channel. A tighter monetary stance will raise lending rate of banks to firms and individuals and both consumption and investment spending will be affected negatively. As a result, cash flow generating ability of the firm will be disrupted as many of marginal and average profitable investments will become uneconomical. As stocks are the claims of future economic output (Patelis 1997), real economic outputs are affected by the monetary stance and then stock price should also be affected by the monetary stance.

III.HISTORICAL PERFORMANCE AND RECENT DEVELOPMENT OF CAPITAL MARKET OF BANGLADESH

Efficient stock markets are important for financial stability, as vibrant stock markets contribute to a better pricing and efficient allocation of financial resources in the economy. In Bangladesh, financial sector is largely dominated by the banking sector contributing more than 90 per cent of annual funds mobilisation. However, in the last few years, capital market has experienced a steady growth in terms of almost all indices like market capitalisation, turnover, number of IPOs, index value (Table I) number of market intermediaries like merchant banks and asset management companies.[1] At the same time, market

[1]In Bangladesh capital market, there are 53 merchant banks, among them 43 operate as full-fledged merchant banks. There are 380 depository participants (DPs) (including the merchant banks), and their services range from full service DP to specialised services such as custodian services. There are 8 credit rating companies operating under the license of BSEC, to grade the credit quality of the listed companies and their securities. There are also 17 asset management companies and 9 trustees of asset backed securities working under the license of BSEC (Source: Annual Report of Bangladesh Bank 2012-13).

went through a severe volatility.[2] As depicted in Table I, market capitalisation has increased from Tk. 203.5 billion in FY2006 to Tk. 1977.4 billion in FY2013, an increase of almost 20 times. Market liquidity has also increased during that time period as annual turnover moved from Tk. 8.19 billion in 1996 to Tk. 46 billion in 2006 and Tk. 301 billion in FY2011.

TABLE I
HISTORICAL PERFORMANCE INDICATOR OF DSE

Year	FY96	FY01	FY06	FY10	FY11	FY12	FY13
Market cap (in crore taka)[3]	7936.17	7136.5	20350.2	227640.8	232701.6	193244.1	197743
General Index/ DSE Broad Index[4]	956.7	716.06	1339.52	6153.68	6117.23	4572.88	4385.77
Turn Over(Tk. in crore)	819.91	4909	4599.36	256353.6	325879.8	117145.1	85716.56
Total Issue Capital (Tk. in crore)	2001.05	3134	6455	21744.6	30104.5	38410.9	43407.3
Total Number of companies [5]	192	234	269	273	267	279	296
Market Cap to Broad Money	17.37%	8.19%	11.26%	62.71%	52.82%	37.37%	32.77%
Market Cap to GDP	4.77%	2.81%	4.90%	32.79%	29.21%	21.05%	19.05%

Sources: Various issues of *Monthly Economic Trend* published by Bangladesh Bank and *Monthly Review* published by Dhaka Stock Exchange.

[2]Market index value reached from around 3000 point in the beginning of 2008 to as high as high 8918 in December 2010. However, after that market experienced a sharp crash losing more than 50 per cent of its value within a period of 1 year.

[3]Market capitalisation excludes the treasury bonds.

[4]In Dhaka Stock Exchange, there were three indices namely DSE General Index, DSE All Share Price Index and DSE30 to gauge to movement of stock prices. However, DSE has introduced two international standard indices, which are known as the DSE Broad Index ('DSEX') and DSE 30 Index ('DS30') replacing earlier DGEN and DSE20 based on free float and Standard and Poor's (S&P) methodology with effect from January 28, 2013.

[5]In 2011, 64 companies were delisted from DSE main trading board and transferred to Over the Counter (OTC) market.

Market capitalisation to broad money ratio increased from 8.19 per cent in 2009 to more than 62 per cent in 2010. Afterwards, market capitalisation to broad money ratio slumped as the market went through a severe crash during the 2010-11 period. Similarly, market capitalisation to GDP ratio reached almost 32.8 per cent in FY2010 from just 2.81 per cent in FY2001, and then went down to around 20 per cent as market experienced a burst of its unsustainable bubble in 2010-11. Moreover, both number of companies and amount of funds raised through initial public offerings (IPOs) and right issue offerings have increased dramatically during the period under study (2004-2013), indicating that corporations are increasingly coming to capital market for long-term funds.

TABLE II
HISTORICAL PERFORMANCE INDICATOR OF DSE

Year	No. of IPOs	Fund Raised through IPOs (Amount in million taka)	(Funds raised through Right Issue (Amount in million taka)
2004	3	474	765
2005	17	1265.7	980
2006	7	1434	1233
2007	14	4638	1673
2008	12	8270	2112
2009	15	19047	2440
2010	25	28653	17601
2011	19	16898.7	18590
2012	15	16238	19759
2013	15	9104	1844

Overall, the market has observed a significant growth in terms of market capitalisation, stock price index, turnover, and capital market deepening, particularly since 2006.

IV. LITERATURE REVIEW

Like many other countries, maintaining a low and stable inflation and fostering higher inclusive growth are the two main objectives of the monetary policy of Bangladesh (Saidjada *et al.* 2013). However, the instruments of monetary policy do not influence these two objectives directly and immediately. Bernake and Kuttner (2005) argued that the most direct and immediate effects of monetary policy actions are on financial markets by affecting asset prices and returns.

Theoretically, stock prices show a positive relationship with money supply and an inverse relationship with interest rate. However, some of the studies found

evidence contradicting this hypothesis. Alatiqi and Shokoofeh (2008) conducted a study in the US market. They used seasonally adjusted M1 data as a proxy of money supply, while S&P 500 index data were used to measure stock price index. The interest rate was measured by both the three month Treasury bill rate and the average Treasury bond rate. By using co-integration technique, they showed that there is a lack of stable negative causal relation from money supply to interest rates, and from interest rates to stock prices, resulting in an insignificant long-term causal relation between money supply and stock prices.

Homa and Jaffe (1971) found a significant positive relationship between money supply and stock price index in the United States for the period of 1954 to 1969. Pearce and Roley (1985) examined the effect of money supply news on stock prices and found a negative relationship between unanticipated increases in the money supply and stock prices.

Rozef (1974) used monthly data of the United States for the period of 1947 to 1972 and found that the lag effect of monetary policy on stock market was essentially zero, indicating that the stock returns did not lag behind growth rates of money supply. However, current stock returns exhibited a significant relationship to current monetary growth rates and all relationships of stock returns to monetary variables significantly improved when current stock returns were related to future monetary data.

Neri (2004) analysed the relationship between monetary policy and stock market indices in the G-7 countries and Spain using the methodology of structural Vector Auto Regression (VAR) Model. The study found that contractionary monetary policy shocks, measured by exogenous increases in the short-term interest rate have, on average, small, negative and transitory effects on stock market indices. The persistence, the magnitudes and the timing of these effects differ significantly across countries.

Rapach (2001) provides another analysis, based on US data, of the effects of money supply shocks and other shocks on real stock prices. These shocks are identified by means of long-run restrictions. The main result is that each identified shock affects real stock prices. Expansionary monetary policy shocks have a positive effect on real stock prices, the response of which can be rationalised according to the standard present-values evaluation principle. The positive effect on output increases expected real dividends, while the decrease in the interest rate reduces the discount factor at which future dividend payments are evaluated. Basistha and Kurov (2008) in their study on stock market response to monetary policy under different macroeconomic conditions reported a much stronger response of stock market to unanticipated change in federal fund rate in the recession. MeilėJasienė and Arvydas Paškevičius (2009) in their study on the

money and capital markets of East European, West European, North American and Pacific Ocean region countries assessed whether capital markets and money markets develop in parallel i.e., the development of one market creates favourable conditions for the growth and development of the other, or the two markets perform as competitors. They concluded that for countries which are developing more rapidly, the competition between money market and capital market is more prominent.

Omran (2003) focused on examining the impact of real interest rates as a key factor in the performance of the Egyptian Stock Market, both in terms of market activity and liquidity. The co-integration analysis through Error Correction Mechanisms (ECM) indicated significant long-run and short-run relationships between the variables, implying that real interest rates had an impact upon stock market performance.

Coleman and Agyire-Tettey (2008) conducted a study on the impact of macroeconomic indicators like 91 day treasury bill, exchange rate change, lending rate, and inflation on the stock market where they found no significant impact of treasury bill on stock market. However, they found significant negative impact of lending rate from depository banks and inflation on stock market. Moreover, their study showed that Ghana Stock Market benefits from their home currency depreciation.

Mayasami, Howe and Hamzah (2004) found a co-integrated relationship between Singapore Stock Market and a set of macroeconomic variables. This result is consistent with the result found in Naka, Mukherjee and Tufte's (1998) study, where they applied Johansen's (1991) Vector Error Correction (VEC) model to analyse the relationship between the Indian Stock Market and a set of proxy macroeconomic variables. Gunasekarge *et al.* (2004) studied the influence of macroeconomic variables on stock market for Sri Lanka using the money supply, three month T-bill rate, the CPI and the exchange rate as proxy for macroeconomic variables. They provided some support for the argument that the lagged values of macroeconomic variables such as the CPI, the money supply and the treasury bill rate have a significant impact on the stock market index and the relationship is mostly unidirectional running from macroeconomic variables to stock market index except for the treasury bill rate. Moreover, they showed the relative endogeniety of stock index in that shocks to economic variables are explained only a minority of the forecast variance error of the market index with effects being persisted only in the short run.

A contradicting argument is found in Ali *et al.* (2010) where monthly data series of the six macroeconomic variables (money supply, index of industrial production, exchange rate, inflation and balance of trade) for the period of July

1990 to December 2008 of Pakistan were used. For stock exchange prices, the monthly data of Karachi Stock Exchange (KSE) general prices index was used. Overall, the study found no bi-directional Granger causality between macro-economic indicators and stock exchange prices in Pakistan.

Ali *et al.*'s finding is consistent with that of Ahmed and Imam (2007).They conducted a study using co-integration test to examine the relationships between the macroeconomic variables (industrial production index, broad money supply, GDP growth and interest rate) and capital market in Bangladesh by using monthly data series for the period of July 1997 to June 2005 (96 monthly observations). They found no long run relationship between stock market and these fundamental macroeconomic factors.

Rahman and Uddin (2009) investigated the interactions between stock prices and exchange rates in three emerging countries of South Asia namely Bangladesh, India and Pakistan. They used average monthly nominal exchange rates of US dollar in terms of Bangladeshi Taka, Indian Rupee and Pakistani Rupee and monthly values of Dhaka Stock Exchange General Index, Bombay Stock Exchange Index and Karachi Stock Exchange All Share Price Index for the period of January 2003 to June 2008 to conduct the study. Using Johansen co-integration and Granger causality test, this study found neither co-integrating relationship nor any causal relationship between stock prices and exchange rates in the countries.

Ahmed, Akhtaruzzaman and Barua (2007) studied the relationship between monetary policy and stock price in Bangladesh using monthly data on consumer price index, industrial production index, 28-day treasury bill rate, money supply (M1) and All Share Price Index of Dhaka Stock Exchange for the period from April 1997 to March 2006. The methodology of structural VAR was used and the study found that a contractionary monetary policy shock, measured by increase in the short-term policy interest rate (28-day treasury bill rate) has a small negative effect on the stock price index and the effect is temporary.

Afzal and Hossain (2011) analysed the relationship between the stock market and macroeconomic variables of Bangladesh, for example, narrow money (M1), broad money (M2), nominal exchange rate and inflation and reported the existence of co-integration between stock prices with each of the variables: M1, M2 and inflation rate, indicating a long-run relationship exists between them. Saidjada *et al.* (2013) assessed the responses of stock prices to monetary policy changes, exchange rate movements and domestic inflation in Bangladesh for the period July 1999-June 2012 using co-integration along with Vector Error Correction model. The results of this paper were inconclusive, particularly with

respect to the relationship between monetary policy and stock prices. The study found no co-integration and long run relationship when broad money or reserve money as a monetary policy variable was used. However, a long-run relationship was found when 91-day treasury bill rate as a monetary policy variable was used instead of broad money or reserve money.

This study incorporated the impact of structural changes on stock price index due to changing from fixed exchange rate regime to floating exchange rate from May 2003. This paper is expected to reduce the existing gap in the existing literature.

V. DATA AND METHODOLOGY

To estimate the effect of monetary policy shocks on stock prices, several variables have been identified that could capture the impact of the various transmission channels. Monthly data from January 2001 to December 2013 on the Dhaka Stock Exchange General Index (DGEN),[6] reserve money (RM), broad money (M2), treasury bill rate (TRB), consumer price index (CPI) and nominal exchange rate of BDT against USD (ER) have been used in this study. The Dhaka Stock Exchange General Index (DGENI) is used as a proxy for stock prices in Bangladesh.[7] This paper considers broad money, 91-day treasury bill rate, call money rate, domestic interest rate and reserve money alternatively as a monetary policy variable. To capture the relationship between stock prices and exchange rate, nominal exchange rate of Bangladeshi Taka *vis-à-vis* the United States dollar (BDT/USD) has been included in this study. Moreover, to estimate the impact of inflation, the CPI has been included in the study. All the variables,

[6]This is a value weighted index comprising all stocks except Z category stocks. In Bangladesh capital market, all stocks are categorised into 5 categories namely A, B, N, G and Z category. Stocks in Z category are regarded as junk stocks as they have not declared dividend in the most recent fiscal calendar year and not regular in holding AGM. DGEN is not float adjusted.

[7]Although we have taken DGEN as proxy for stock market return, we have also taken CSE All share price Index, a float adjusted value weighted broad based index of Chittagong stock exchange. Moreover, as DGEN adjusted the new issue using its open price on debut day of trading before 2010, for instance, when a new issue came to market, DGEN took offer price to calculate market cap of last day (P_{t-1}) and open price (Pt) to calculate market price for today, this adjustment error may have upward bias in the return of DGEN. We have adjusted this error by taking closing price of new issue on its 1st debut day of trading as $P_{t-1.}$ These different alternative measures of returns of market are taken to test the robustness of our results.

apart from TRB, Call Money Rate and Domestic Interest Rate, are expressed in natural logarithms. The data used in this study are collected from Bangladesh Bank, Bangladesh Bureau of Statistics and Dhaka Stock Exchange Ltd.

To see the impact of monetary policy variable on stock market, following regression has been run

$$LNDGEN = f(MPI, EXRATE, CPI) \quad (4)$$

Where

LNDGEN=Log of Dhaka Stock Exchange General Index

MPI=Monetary Policy Instrument

EXRATE= Exchange rate

CPI= Consumer Price Index

5.1 ARDL Model Specification

To empirically analyse the long-run relationships and dynamic interactions among the variables of interest, the model has been estimated by using the bounds testing (or autoregressive distributed lag (ARDL)) co-integration procedure. The autoregressive distributed lag (ARDL) model deals with single co-integration and is introduced originally by Pesaran and Shin (1999) and further extended by Pesaran *et al.* (2001). The ARDL approach has the advantage that it does not require all variables to be I (1) as the Johansen framework and it is still applicable even if the data set have I (0) and I (1) variables.

The procedure is adopted for the following three reasons. First, the bounds test procedure is simple. As opposed to other multivariate co-integration techniques such as Johansen and Juselius (Johansen and Juselius 1990), it allows the co-integration relationship to be estimated by OLS (Ordinary Least Square) once the lag order of the model is identified. Second, the bounds testing procedure does not require the pre-testing of the variables included in the model for unit roots unlike other techniques such as the Johansen approach. It is applicable irrespective of whether the regressors in the model are purely I(0), purely I(1) or mutually co-integrated. Third, the short-run and long-run coefficients of the model are estimated simultaneously and finally, the test is relatively more efficient in small or finite sample data sizes as is the case in this study. The procedure will, however, crash in the presence of I (2) series. Following Pesaran *et al.* (2001), as summarised in Choong *et al.* (2005), the

bounds test procedure is applied by modeling the long-run equation (1) as a general vector autoregressive (VAR) model of order *p*, in z_t.

$$z_t = c_0 + \beta t + \sum_{i-1}^{p} A_i z_{t-i} + \varepsilon_t, \quad t = 1,2,3, \dots \dots \dots \dots, T \tag{5}$$

where, z_t is a *K X 1* vector of variables, c_0 and $\beta$are *K X 1* vector of parameters, A_i is *K X K* matrices of parameters, and ε_t is a K X1 vector of disturbances. ε_t has mean 0, has covariance matrix Σ, and is i.i.d. normal over time. Any $VAR(p)$ can be rewritten as a VECM. Using some algebra, we can rewrite (2) in VECM form as

$$\Delta z_t = c_0 + \beta t + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta z_{t-i} + e_t \ , t = 1,2, \dots \dots, T \tag{6}$$

where, $\Pi = \sum_{j=1}^{j=p} A_j - I_k$ and$\Gamma_i = -\sum_{j=i+1}^{j=p} A_j$ contains the long-run multipliers and short-run dynamic coefficients of the VECM. z_t is the vector of variables y_t and x_t respectively. y_t is an I(1) dependent variable and x_t is a vector matrix of "forcing" I(0) and I(1) regressors as already defined with a multivariate identically and independently distributed (*i.i.d*) zero mean error vector, and a homoskedastic process. Further assuming that a unique long-run relationship exists among the variables, the conditional VECM (Equation 3) now becomes:

$$\Delta y_t = c_o + \beta t + \delta_{yy} y_{t-1} + \delta_{yxx} x_{t-1} + \sum_{i=1}^{p-1} \lambda'_i \Delta y_{t-i} + \sum_{i=0}^{p=1} \xi_i \Delta x_{t-i} + \varepsilon_{yt} \ , t = 1,2,\dots..,T \tag{7}$$

On the basis of equation (7), the conditional VECM of interest can be specified as

$$\begin{aligned} &\Delta lnDGEN_t = c_0 + \delta_1 lnDGEN_{t-1} + \delta_2 MPI_{t-1} + \delta_3 lnEXRATE_{t-1} + \delta_4 lnCPI_{t-1} + \\ &\sum_{i=1}^{p} \omega_j \Delta lnDGEN_{t-i} + \sum_{l=1}^{q} \varphi_l \Delta MPI_{t-l} + \sum_{m=1}^{q} \gamma_m \Delta lnEXRATE_{t-m} + \\ &\sum_{j=1}^{q} \eta_j \Delta lnCPI_{t-j} + \psi D_t + \varepsilon_t \end{aligned} \tag{8}$$

Here δ_t are the long run multipliers, c_0 is the drift, and ε_t are white noise errors. The first step in the ARDL bounds testing approach is to estimate equation (5) by ordinary least squares (OLS) in order to test for the existence of a long-run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables, i.e., H_0:$\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ against the alternative H_A:$\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$. We denote the test which normalises on LNDGEN by F_{LNDGEN} (LNDGEN|MPI, LNEXRATE, LNCPI). Two asymptotic critical values bounds provide a test for co-integration when the independent variables are I(d) (where 0≤d≤1):The lower critical bound assumes all the variables are I(0), meaning that there is no co-integration relationship between the examined variables. The upper bound assumes that all the variables are I (1), meaning that there is co-integration

among the variables. If the F-statistic is above the upper critical value, the null hypothesis of no long-run relationship can be rejected irrespective of the orders of integration for the time series. Conversely, if the test statistic falls below the lower critical value, the null hypothesis cannot be rejected. Finally, if the statistic falls between the lower and upper critical values, the result is inconclusive. The approximate critical values for the F-test are obtained from Pesaran and Pesaran (1997:478).

In the second step, once co-integration is established the conditional ARDL (p_1 , q_1 , q_2 , q_3 , q_4) long-run model for $lnDGEN_t$ can be estimated as

$$\Delta lnDGEN_t = c_0 + \sum_{i=1}^{p} \delta_1 lnDGEN_{t-i} + \sum_{i=0}^{q1} \delta_2 MPI_{t-i} + \sum_{i=0}^{q2} \delta_3 lnEXRATE_{t-i} + \sum_{i=0}^{q3} \delta_4 lnCPI_{t-i} + \psi D_t + \varepsilon_t \quad (9)$$

where all variables are as previously defined. This involves selecting the orders of the ARDL (p, q1, q2, q3, q4) model in the four variables using Baysian Criterion (SBC). In the third and final step, the short-run dynamic parameters are obtained by estimating an error correction model associated with the long-run estimates. This is specified as follows:

$$\Delta lnDGEN_t = \mu + \sum_{i=1}^{p} \omega_j \Delta lnDGEN_{t-i} + \sum_{l=1}^{q} \varphi_l \Delta MPI_{t-l} + \sum_{m=1}^{q} \gamma_m \Delta lnEXRATE_{t-m} + \sum_{j=1}^{q} \eta_j \Delta lnCPI_{t-j} + vecm_{t-1} + \varepsilon_t \quad (10)$$

Here ω, φ, γ and η are the short-run dynamic coefficients of the model's convergence to equilibrium, and $\boldsymbol{\upsilon}$ is the speed of adjustment.

VI. DISCUSSION AND RESULTS

The first step in proceeding with the ARDL Bounds Test involves testing for the stationarity of the variables to determine their order of co-integration. This is to make sure that none of the variables are I(2), since in the presence of I(2) variables, the computed F-statistics provided by Pesaran *et al.* (2001) are not valid (Ouattara 2004) as the bounds test is based on the assumption that the variables are I(0) or I(1).Therefore, the analysis of the dynamic properties of the variables in order to check their order of integration by means of testing for the presence of unit roots is carried out. Two different tests were used, namely, the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. Both tests were run with and without a time trend and a constant. Although the ADF is the most commonly used test, it sometimes behaves poorly as the size and power of the ADF has been found to be sensitive to the number of the lagged terms used,

as shown by Monte Carlo simulations. The Phillips and Perron tests are non-parametric tests of the null of the unit root and are often considered more powerful by many since they use consistent estimators of the variance. Table II presents unit root test results. Both ADF and Phillips and Perron tests suggest that there is insufficient evidence to reject the null hypothesis of non-stationarity for the variables- DGEN, CPI, Exchange Rate, Broad Money, Reserve money, 91-day T-bill and Deposit Rate. This is true for both types of specifications--with and without a deterministic trend. However, both the tests reject the null hypothesis of non-stationarity when applied to the differenced series, implying that all of these variables are I (1). Only the Call money rate, on the other hand, turns out to be a I(0) variable as null hypothesis of non-stationarity in the level form can be rejected.

TABLE III
RESULT OF UNIT ROOT TEST

Variables	Augmented Dickey-Fuller Test				Phillips-Perron Test				Order of Integration
	In Level		In First Difference		In Level		In First Difference		
	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	
DGEN	-1.449	-1.416	-8.57	-8.63	-1.35	-1.39	-11.99	-12.04	I(1)
	(0.55)	(0.85)	(0.00)	(0.00)	(0.60)	(0.86)	(0.00)	(0.00)	
CPI	0.89	-3.00	-6.84	-6.98	0.90	-3.057	-7.75	-7.78	I(1)
	(0.99)	(0.13)	(0.00)	(0.00)	(0.99)	(0.12)	(0.00)	(0.00)	
Exchange rate	-1.32	-1.72	-10.30	-10.31	-1.31	-1.97	-10.26	-10.26	I(1)
	(0.62)	(0.74)	(0.00)	(0.00)	(0.63)	(0.61)	(0.00)	(0.00)	
Broad Money	1.11	-2.65	-16.15	-16.32	1.75	-2.33	-17.07	-17.62	I(1)
	(0.99)	(0.26)	(0.00)	(0.00)	(0.99)	(0.42)	(0.00)	(0.00)	
Reserve	-0.417	-3.13	-15.29	-15.24	-0.164	-2.91	-15.517	-15.48	I(1)
Money	(0.91)	(0.10)	(0.00)	(0.00)	(0.94)	(0.16)	(0.00)	(0.00)	
91-day T-bill rate	-2.58	-2.64	-4.02	-3.99	-`1.71	-1.81	-7.69	-7.67	I(1)
	(0.10)	(0.26)	(0.00)	(0.01)	(0.43)	(0.70)	(0.00)	(0.00)	
Interest rate	-2.54	-2.52	-4.34	-4.33	-1.97	-1.93	-12.25	-12.22	I(1)
	(0.11)	(0.31)	(0.00)	(0.00)	(0.30)	(0.63)	(0.00)	(0.00)	
Call Money Rate	-5.08	-5.09			-6.01	-6.02			I(0)
	(0.00)	(0.00)			(0.00)	(0.00)			

In the first step of the ARDL analysis, the presence of long-run relationships in equation (1) using equation (5) is tested. Following the VECM version of the ARDL techniques developed by Pesaran *et al.* (2001), the appropriate lag length selected by the SBC is used in the model. Following the procedure of Pesaran *et al.* (1997), at first, an OLS regression for the first differences part of equation (5)

is estimated and then for the joint significance of the parameters of the lagged level variables when added to the first regression. According to Pesaran *et al.* (1997), "this OLS regression in first differences are of no direct interest" to the bounds co-integration test. The F-statistic tests the joint null hypothesis that the coefficients of the lagged level variables are zero (i.e. no long-run relationship exists between them).

Table IV presents the results of the Bounds testing technique, which reports the results of the calculated F-statistics (which is based on the Wald test) when the monetary policy variable of interest rate is Call Money Rate, Broad Money, T-bill Rate, Reserve money and Domestic Interest rate respectively. The calculated F-statistics $F(LNDGEN|CMON, CPI, EXRATE)$=7.82 is higher than the upper bound critical value 4.68 at the 1% level. Also $F(LNDGEN|TBILL, CPI, EXRATE)$=4.43 is also higher than the upper-bound critical value 3.79 at the 5% level. Thus, the null hypotheses of no co-integration are rejected, implying long-run co-integration relationships amongst the DGEN and call money rate and DGEN and T-bill rate. However, the calculated F statistics $F(LNDGEN|BM, CPI, EXRATE)$=1.87 and $F(LNDGEN|DIR, CPI, EXRATE)$ =1.52 is lower than the lower bound critical value 2.26. Thus, we cannot reject the null of no co-integration among the variables in these two equations. On the other hand, the calculated F-statistics $F(LNDGEN|LNRSV, CPI, EXRATE)$=3.12 which lies between the lower bound critical value and upper bound critical value and therefore we cannot conclusively determine when the variables are co-integrated or not.

TABLE IV
RESULTS FROM BOUND TEST (UNRESTRICTED INTERCEPT AND NO TREND)

	F statistics			Outcome		
F(LNDGEN|CMON,CPI,EXRATE)	7.82***			Co-integrated		
F(LNDGEN|BM,CPI,EXRATE)	1.87			Not Co-integrated		
F(LNDGEN|TBILL,CPI,EXRATE)	4.43**			Co-integrated		
F(LNDGEN|LNRSV,CPI,EXRATE)	3.12			Inconclusive		
F(LNDGEN|DIR,CPI,EXRATE)	1.52			Not Co-integrated		
	Lower Bounds Values			Upper Bound Values		
Bound Test Critical Values*	10%	5%	1%	10%	5%	1%
	2.26	2.62	3.41	3.35	3.79	4.68

Note: *The Bound test Critical values are based on Pesaran *et al.* 2001Table CI (iii) Case III: Unrestricted intercept and no trend.

6.1 Call Money Rate

Once it is established that a long-run co-integration relationship existed between DGEN, Call money, CPI and Exchange rate, equation (6) was estimated using the following ARDL (1, 2, 0, 0) specification selected based on Schwarz Bayesian Criterion. The results obtained by normalising on DGEN, in the long run are presented in Table V. The estimated coefficients of the long-run relationship show that monetary policy proxied by call money rate has a very high significant impact on stock price as proxied by DGEN. A 1 per cent increase in call money rate, leads to approximately 0.23 per cent decrease in stock price, implying monetary policy transmission through short-term interest rate channel. This is quite rational since a rise in call money raises the opportunity cost of investing in stock market and therefore, causes a fall in stock market price. The coefficients of CPI and exchange rate, on the other hand, although positive, appear to be insignificant, implying no valid causal relationship between those variables and DGEN.

TABLE V

ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CMON	-0.23257	0.1243	-1.9713[.041]
LNCPI	1.9087	2.1021	.90798[.365]
LNEXRATE	1.6101	4.9303	.32657[.744]
CONSTANT	-6.6884	9.9943	-.66922[.504]

The diagnostic tests presented in Table VI confirm that the estimated equation (6) possesses the desired statistical properties. Diagnostic tests such as the Godfrey Serial correlation LM test, Jarque-Bera test for normality, ARCH test for Heteroskedasticity and Ramsey RESET test for model specification confirm the validity of the estimated equation. Moreover, the CUSUM and CUSUM Square test signify that residual values are stable and within the critical 5 per cent critical boundaries.

TABLE VI

DIAGNOSTIC TESTS

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1)= .85580[.355]	F(1, 140)= .81425[.368]
B:Functional Form	CHSQ(1)= .18460[.667]	F(1, 140)= .17484[.676]
C:Heteroscedasticity	CHSQ(1)= 1.3989[.237]	F(1, 146)= 1.3932[.240]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on the regression of squared residuals on squared fitted values

The results of the short-run dynamic coefficients associated with the long-run relationships obtained from the ECM equation (7) are given in Table VII. The results show that the ECM coefficient is negative and significant at 10 per cent level of significance. Specifically, estimated coefficient of the ECM is 4 per cent, showing a slow speed of adjustment from the previous year to the long-run equilibrium as only 4 per cent of the error is being corrected each period. The signs of the short-run dynamic impacts are maintained to the long-run. However, while the second lagged difference of call money rate appears to be significant, the first lagged difference of call money rate is not significant. On the other hand, like their long term coefficients, the short-term coefficient of CPI and exchange rate is positive but not significant.

TABLE VII
ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL (1, 2, 0, 0) MODEL

Dependent Variable is dLNDGEN			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
ΔCMON(-1)	-5.66E-04	0.001864	-.30348[.762]
ΔCMON(-2)	-0.00704	0.001878	-3.7499[.000]
ΔLNCPI	0.079378	0.11515	.68932[.492]
ΔLNEXRATE	0.066961	0.19198	.34879[.728]
CONSTANT	-0.27816	0.40625	-.68470[.495]
ECM(-1)	-0.04159	0.024032	-1.7305[.086]

6.2 T-bill Rate

Since a long-run co-integration relationship among DGEN, T-bill rate, CPI and Exchange rate is found, equation (6) was estimated using the following ARDL (1, 0, 0, 0) specification selected based on Schwarz Bayesian Criterion. The results obtained by normalising on DGEN, in the long run are reported in Table VIII. The estimated coefficients of the long-run relationship show that monetary policy proxied by T-bill rate has a significant impact on stock price as proxied by DGEN. A 1 per cent increase in T-bill rate leads to approximately 0.17 per cent decrease in stock price. The inverse relationship between the T-bill rate and the stock price suggests how monetary policy transmits through short-term interest effect. The finding is similar to that of the link between call money rate and stock price and findings of Ahmed and Imam (2007), Afzal and Hossain (2011) and Saidjada *et al*. (2013).The finding implies that monetary policy stance has significant bearings for the stock market valuation level through interest rate channel. This is also rational since a rise in T-bill rate raises the opportunity cost of investing in stock market and therefore causes a fall in stock market price. The

coefficient of CPI is found to be positive and significant, implying a wealth effect of stock market valuation. The logic is that private individuals desire to smooth their periodic based on lifetime financial resources and as stocks are a significant component of financial wealth, stock price movements can affect permanent financial resources and, thus, private consumption. The increase in consumption may positively exert an influence on aggregate spending. The coefficient of exchange rate, on the other hand, although positive, appears to be insignificant, implying no valid causal relationship between exchange rate and DGEN. These findings are consistent since foreign portfolio investment in stock market in Bangladesh is less than 2 per cent of total market capitalisation during the period under study and only a handful of listed companies make revenues from exporting products and services.

TABLE VIII

ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
TBILL	-0.17	0.04	-4.1314[.000]
LNCPI	2.14	0.82	2.6289[.010]
LNEXRATE	1.59	1.99	.80086[.425]
CONSTANT	-8.98	4.30	-2.0868[.039]

The results of the short-run dynamic coefficients associated with the long-run relationships obtained from the ECM equation (7) are given in Table IX. The results show that the ECM coefficient is negative and significant at 1 per cent level of significance. Specifically, estimated coefficient of the ECM is 10 per cent, implying 10 per cent of the error is being corrected each period. The signs of the short-run dynamic impacts are maintained to the long-run.

TABLE IX

ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL (1, 0, 0, 0) MODEL

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
ΔTBILL	-0.01837	0.004343	-4.2300[.000]
ΔLNCPI	0.23058	.11424	2.0184[.045]
ΔLNEXRATE	0.17122	0.21416	.79950[.425]
CONSTANT	-0.96525	0.5258	-1.8358[.068]
ecm(-1)	-0.10752	0.029447	-3.6511[.000]

6.3 Stock Market Bubble-Bust during 2009-2011 and the Role of Monetary Policy

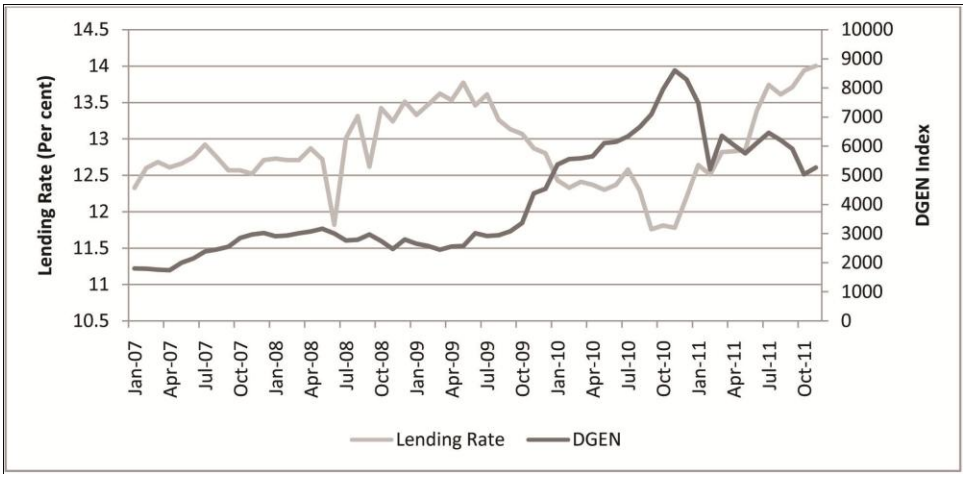
During the study period, the stock market in Bangladesh went through a significant bubble-bust in 2009-2011. This section analyses the bubble-bust of

stock market and corresponding monetary stances in Bangladesh. The DSE general price index was 2649 in January 2009 and reached its highest level ever at 8918.51 on 5 December 2010. However, the Dhaka Stock Exchange (DSE) witnessed the steepest ever single-day fall of 551 points or 6.71 per cent and stood at 7654.41 on 19 December 2010. The decelerated trends of DSE general index continued, and the index came down to 5203.08 on 28 February 2011, declined 41 per cent from its peak.

Therefore, this section examines whether there is any relationship between the episodes of bubble bust cycle (2009-2011) and the monetary policy variables such as money supply (M2), private sector credit (PSC), deposit rate and banks excess liquidity in Bangladesh. This will guide us to find the causes of stock market volatility in Bangladesh and its policy implications.

Figure 1 shows that during 2009-10, the deposits and lending rate was decelerating. Some argue that this is due to the easy monetary policy stance of the central bank following the global financial crisis in 2007-08 (Younus and Islam, Undated). The banking system was kept liquid deliberately to avoid a liquidity crisis. Historical evidence including the recent recession suggested that easy monetary and credit policies for a long time in a way create a liquidity glut in economies that help to form bubbles. Younus and Islam (undated) argued that the excess liquidity in the banking system piled up during the stock market uptrend in 2007-08 and 2009-10 and the unused excess liquidity in the banking system went to the stock market due to the profit motive stance of the commercial bank and less scope for the alternative investment, which in turn created excess demand for stock, thereby raising their price.

Figure 1: **Trend in Lending Rate and DGEN Index**



Besides, during this period, in Bangladesh's stock market, margin loan providing institutions such as banks, non-bank financial institutions (NBFIs), alliance financial institutions and permitted brokerage houses were providing margin loan to retail investors for buying securities from the secondary market. Younus and Islam (undated) reported that total amount of margin loan provided by banks and NBFIs substantially increased by 164.41 per cent to Taka 77.82 billion in December 2009 from Taka 4.21 billion in 2006. The excess liquidity of banks recorded a growth of 57.17 per cent from Taka 86.10 billion in December 2006 to Taka 334.27 billion in December 2009. The total investment by banks' and NBFIs jumped by 87.30 per cent to Taka 43.58 billion in 2009 from Taka 6.63 billion in 2006. Of this, investment by bank increased significantly by 97.55 per cent to Taka 36.91 billion in 2009 from Taka 4.79 billion in 2006 and investments by NBFI go up to Taka 6.66 billion, a growth of 53.46 per cent from Taka 1.84 billion in 2006. Additionally, the Government of Bangladesh had taken some steps to encourage foreign and domestic investors to invest in the securities market.

Therefore, in a situation of low deposits and savings rates together with a lack of alternative investment opportunities, funds rush to the stock market where returns were apparently much higher than in other investments. Younus and Islam (Undated) further mentioned that trends in during the period between October 2007 and March 2009 and again between May 2010 and October 2011, both private sector credit and M2 growth, were higher than the projected monetary expansion of the central bank.

In this backdrop of bubble creation, Bangladesh Bank (BB) has taken the following steps related to the capital market:

BB directed the commercial banks on 15 June 2010 to form separate subsidiary companies to operate merchant banking or brokerage activities. A bank would have to take permission from BB to set up a subsidiary company for merchant banking and no bank would be allowed to operate merchant banking activities with effect from 1 October 2010 without forming a subsidiary merchant banking company. Moreover, BB also increased CRR two times within the span of a few months in 2010.

On 15 June 2010, BB directed the commercial banks that the exposure limit of banks to invest in the capital market shall not be more than 10 per cent of their total liabilities.

BB curbed stock holdings of financial sector in the circular dated 22 August 2010. It restricted financial institutions investments in the stock market to 25 per cent of their paid up capital and reserves.

The result was inevitable. The Dhaka Stock Exchange (DSE) witnessed the steepest ever single day fall of 551 points or 6.71 per cent and stood at 7654.41 on December 19, 2010, after reaching its highest level ever at 8918.51 on December 05, 2010 and the index gradually came down to 5203.08 on February 28, 2011, declined 41 per cent from its peak.

VII. CONCLUSION AND POLICY IMPLICATIONS

This study attempts to examine the relationship between stock price and changes in monetary conditions in the context of Bangladesh for the period January 2001-July 2013.The existence of such an association has important bearings for both stock market participants and regulators since with respect to the former this issue relates to what drives the stock price return, while the latter are interested in whether monetary policy actions are transmitted through financial markets and the impact of changes in monetary conditions on the capital market. The proxies for shifts in monetary conditions are based on the 91 day treasury bill rate, reserve money, broad money, monthly average call money rate, and monthly weighted average deposit rate in banks. The main contribution of this study to the existing literature is that in addition to traditional monetary measures like T-bill rate, reserve money and broad money, other monetary policy indicators like call money rate and weighted average deposit rate have been considered. Moreover, unlike the traditional methodology of Johansen co-integration, ARDL has been employed to examine the dynamic relationship between stationary and non-stationary variables. Furthermore, unlike the traditional measure of single stock return (return on DGEN), alternative measures of stock market return like CSE All Share Price Index, return on DGEN adjusted for new issues and extreme events have been used for a more robust result. When Treasury bill is used as a monetary indicator, it is found that there exists a long-run co-integration relationship between DGEN, T-bill rate, CPI and exchange rate. The coefficient of CPI is found to be positive and significant, perhaps implying a wealth effect whereas the coefficient of exchange rate, although positive, appears to be insignificant, implying no valid causal relationship between exchange rate and DGEN. This may be due to low foreign portfolio investment in stock market of Bangladesh and fewer numbers of listed firms having their costs or revenue subject to exchange rate fluctuation. Moreover, when call money rate is used as monetary indicator, it is found that there exists a long-run co-integration relationship between DGEN, call money rate, CPI and exchange rate. However, no long-run co-integration is found when reserve money and broad money were used as monetary condition indicators. In the case

of weighted average deposit rate in banks as monetary indicator, the result of long-run co-integration is inconclusive. The fact that some of the monetary condition channels such as money supply, reserve money and weighted average interest rates are not functional and that some channels such as call money rate and T-bill rate are functional, this may be because of thin and shallow capital markets which are mostly dominated by retail investors unlike capital markets of developed countries, which seriously lacks in public confidence.

Overall, this study suggests that stock market valuation level is affected by monetary conditions as evidenced by changes in Treasury bill rate and call money rate. The implications of findings of this study that monetary policy stance affects stock prices through short term interest rates are that monetary authority should calibrate the appropriate policy response to the probable capital market misalignment, and that professional fund managers and other market participants should closely monitor possible changes in shorter term rates to design their investment strategy in the capital market.

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APPENDIX

Figure 1: **Trend of DSE General Index, Broad Money, Reserve Money and Official Exchange Rate**

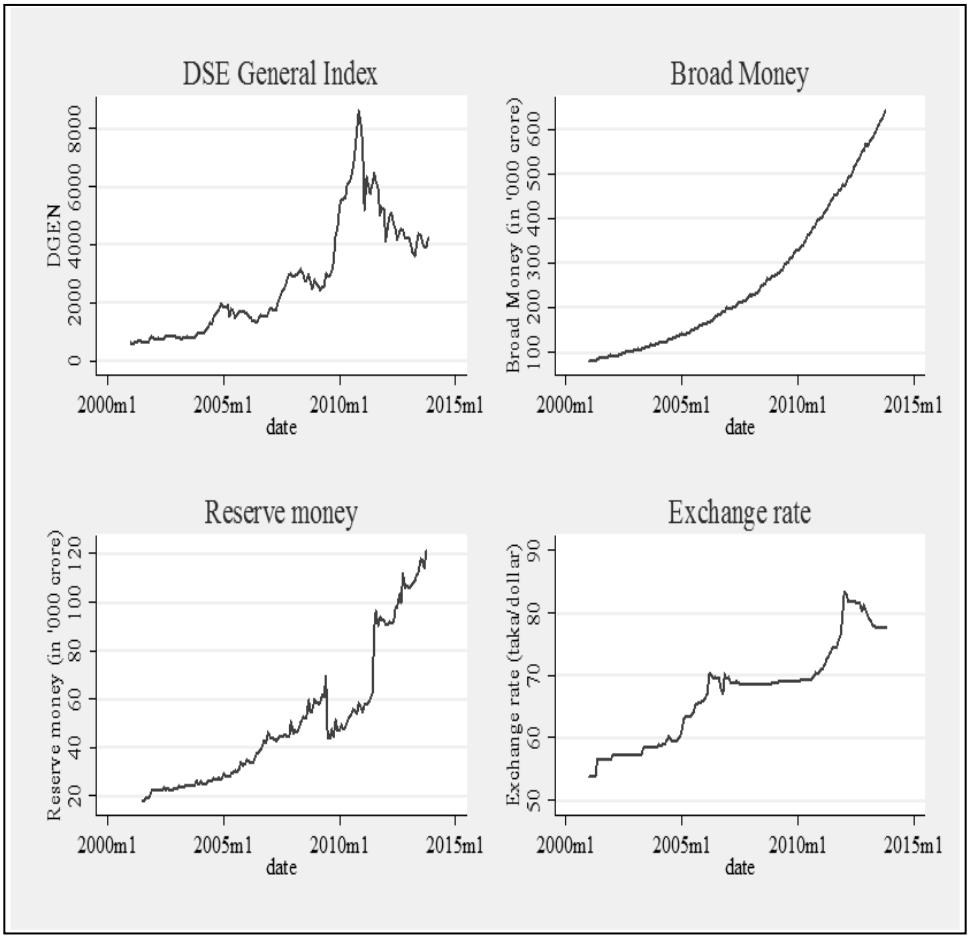

Figure 2: **Trend of Call Money Rate, Domestic Interest Rate, 91-day T-bill Rate and Consumer Price Index**

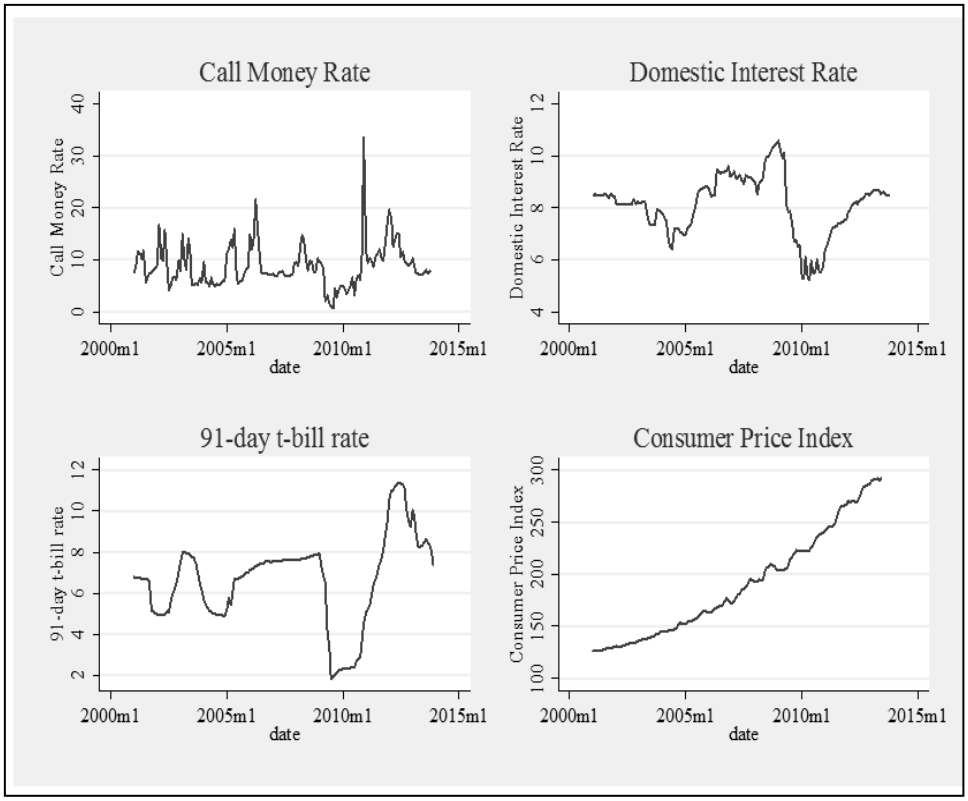

TABLE I

RESULTS FROM BOUND TEST (NO INTERCEPT AND NO TREND)

	F statistics			Outcome		
F(LNDGEN|CMON,CPI,EXRATE)	5.65***			Co-integrated		
F(LNDGEN|BM,CPI,EXRATE)	1.94			Not co-integrated		
F(LNDGEN|TBILL,CPI,EXRATE)	2.68			Inconclusive		
F(LNDGEN|LNRSV,CPI,EXRATE)	3.46*			Co-integrated		
F(LNDGEN|DIR,CPI,EXRATE)	1.79			Not co-integrated		
	Lower Bounds Values			Upper Bound Values		
Bound Test Critical Values (Based on Peseran et al. 2001;Table CI(i) Case I: No intercept and no trend)	10%	5%	1%	10%	5%	1%
	1.81	2.14	2.82	2.93	3.34	4.21

TABLE II

RESULTS FROM BOUND TEST (UNRESTRICTED INTERCEPT AND UNRESTRICTED TREND)

	F statistics			Outcome		
F(LNDGEN|CMON,CPI,EXRATE)	6.51***			Co-integrated		
F(LNDGEN|BM,CPI,EXRATE)	2.17			Not co-integrated		
F(LNDGEN|TBILL,CPI,EXRATE)	3.76			Inconclusive		
F(LNDGEN|LNRSV,CPI,EXRATE)	3.83*			Co-integrated		
F(LNDGEN|DIR,CPI,EXRATE)	2.01			Not co-integrated		
	Lower Bounds Values			Upper Bound Values		
Bound Test Critical Values (Based on Pesaran et al. 2001;Table CI(v) Case V: Unrestricted intercept and unrestricted trend)	10%	5%	1%	10%	5%	1%
	2.75	3.12	3.60	3.79	4.25	5.23

Impact of Call Money Rate on Stock Price

TABLE III

ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL (1, 2, 0, 0) MODEL (BOTH CONSTANT AND TREND)

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
ΔCMON(-1)	-5.00E-05	0.001938	-.025784[.979]
ΔCMON(-2)	0.006792	0.001896	3.5832[.000]
ΔLNCPI	-0.14471	0.25749	-.56201[.575]
ΔLNEXRATE	-0.06665	0.23606	-.28233[.778]
CONSTANT	1.4156	1.7874	.79196[.430]
TREND	0.001945	0.001999	.97305[.332]
ECM(-1)	-0.05734	0.028977	-1.9787[.050]

TABLE IV

ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
CMON	-0.1512	0.095113	-1.5897[.114]
LNCPI	-2.524	4.3795	-.57631[.565]
LNEXRATE	-1.1624	3.862	-.30099[.764]
CONSTANT	24.6895	26.9223	.91707[.361]
TREND	0.03392	0.029009	1.1693[.244]

TABLE V

ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL (1, 2, 0, 0) MODEL (UNRESTRICTED TREND AND NO CONSTANT)

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
ΔCMON(-1)	-4.958E-04	1.852E-03	-.26776[.789]
ΔCMON(-2)	7.055E-03	1.864E-03	3.7858[.000]
ΔLNCPI	2.358E-02	1.452E-01	.16238[.871]
ΔLNEXRATE	6.963E-02	1.614E-01	.43144[.667]
TREND	4.034E-04	4.537E-04	.88902[.375]
ecm(-1)	-4.545E-02	2.476E-02	-1.8359[.068]

TABLE VI

ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
CMON	-0.21111	0.12315	-1.7142[.089]
LNCPI	0.51879	3.0892	.16793[.867]
LNEXRATE	1.5318	3.8033	.40276[.688]
TREND	0.0088745	0.0098006	.90550[.367]

Impact on 91-day T-bill on Stock Price

TABLE VII

ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL (1, 0, 0, 0) MODEL (BOTH CONSTANT AND TREND)

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
ΔTBILL	-0.01594	0.004749	-3.3554[.001]
ΔLNCPI	-0.08163	0.27355	-.29839[.766]
ΔLNEXRATE	-0.01265	0.25908	-048814[.961]
CONSTANT	1.304	1.882	.69286[.490]
TREND	0.00249	0.001983	1.2555[.211]
ecm(-1)	-0.11717	0.030376	-3.8571[.000]

TABLE VIII

ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
TBILL	-0.13601	0.0421	-3.2306[.002]
LNCPI	-0.69667	2.3473	-.29679[.767]
LNEXRATE	-0.10794	2.21	-048841[.961]
CONSTANT	11.1294	15.9915	.69596[.488]
TREND	0.021249	0.016419	1.2941[.198]

TABLE IX

ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL (1, 0, 0, 0) MODEL (UNRESTRICTED TREND AND NO CONSTANT)

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
ΔTBILL	-0.01779	0.003914	-4.5463[.000]
ΔLNCPI	0.078207	0.14676	.53289[.595]
ΔLNEXRATE	0.12175	0.17143	.71020[.479]
TREND	0.00117	5.52E-04	2.1204[.036]
ecm(-1)	-0.11476	0.030122	-3.8097[.000]

TABLE X

ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
TBILL	-0.15505	0.0358	-4.3309[.000]
LNCPI	0.6815	1.2482	.54597[.586]
LNEXRATE	1.061	1.5045	.70520[.482]
TREND	0.010197	0.004123	2.4734[.015]

Impact on Reserve Money on Stock Price

TABLE XI

ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL (1, 1, 0, 0) MODEL (BOTH CONSTANT AND TREND)

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
ΔLNRSV	0.15694	0.10854	1.4459[.151]
ΔLNCPI	-0.21997	0.32452	-.67782[.499]
ΔLNEXRATE	-0.38141	0.22589	-1.6884[.094]
CONSTANT	5.0472	1.7355	2.9082[.004]
TREND	0.006106	0.002085	2.9279[.004]
ecm(-1)	-0.11609	0.033087	-3.5086[.001]

TABLE XII

ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
LNRSV	-1.5118	0.618	-2.4463[.016]
LNCPI	-1.8948	2.8939	-.65476[.514]
LNEXRATE	-3.2854	2.049	-1.6034[.111]
CONSTANT	43.4762	15.8361	2.7454[.007]
TREND	0.052593	0.017552	2.9964[.003]

TABLE XIII

ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL (1, 1, 0, 0) MODEL (UNRESTRICTED CONSTANT AND NO TREND)

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
ΔLNRSV	0.1517	0.11151	1.3604[.176]
ΔLNCPI	0.53101	0.20428	2.5994[.010]
ΔLNEXRATE	-0.16188	0.21894	-.73939[.461]
ΔCONSTANT	0.16024	0.48861	.32794[.743]
ecm(-1)	-0.07305	0.030456	-2.3984[.018]

TABLE XIV

ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
LNRSV	-2.1653	1.0261	-2.1103[.037]
LNCPI	7.2696	1.8475	3.9349[.000]
LNEXRATE	-2.2162	3.1573	-.70192[.484]
CONSTANT	2.1936	7.0636	.31055[.757]

TABLE XV

ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL (1, 1, 0, 0) MODEL (UNRESTRICTED TREND AND NO CONSTANT)

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
ΔLNRSV	0.13439	0.1112	1.2086[.229]
ΔLNCPI	0.52921	0.20271	2.6107[.010]
ΔLNEXRATE	-0.01952	0.19363	-.10079[.920]
TREND	2.73E-04	5.87E-04	.46564[.642]
ecm(-1)	-0.0833	0.031948	-2.6073[.010]

TABLE XVI

ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressor	Coefficient	Standard Error	T-Ratio[Prob.]
LNRSV	-2.3173	0.89669	-2.5843[.011]
LNCPI	6.353	2.0984	3.0275[.003]
LNEXRATE	-0.23427	2.3331	-.10041[.920]
TREND	0.003281	0.006572	.49915[.618]