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CONTENTS

Stock Market Bubble-Burst Cycle in Bangladesh: Policy Implications

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Abstract

The objective of this study is to examine the characteristics and causes of the stock market bubble burst cycle in Bangladesh for the sample period from 2004-2014. This paper also examines whether the stock market return has any relationship with macro and bank-specific variables in Bangladesh. Pair-wise Granger Causality tests, Cointegration and Vector Error Correction Models (VECM) are used to examine the relationship. Empirical results derived from Granger Causality test, Cointegration and Vector Error Correction Model (VECM) show that there is a two-way causality from excess liquidity and private sector credit to share price index. However, there is a one-way causality from inflation to share price index. Bank deposit rate has significant negative impact on stock price index implying that an increase in the deposit rate would decrease share price index as people shift their preference to relatively less risky bank savings schemes.

1 Introduction

The stock prices of the country's main bourse, the Dhaka Stock Exchange (DSE) witnessed the steepest ever single day fall of 551 points or 6.71 percent and stood at 7654.41 on December 19, 2010, after reaching its highest level ever at 8918.51 on December 05, 2010. The decelerated trends of DSE general index continued, and the index came down to 5203.08 on February 28, 2011, a 41 percent decline from its peak. In order to have a dynamic, vibrant, sustainable, efficient, and sound capital market for financing long-term funds of the corporate sector, the share markets of Bangladesh were at a bull run since January 06, 2009. The DSE general price index was 2756.65 on January, 09 went up to 4535.53 on December 31, 2009, with the active participation of both institutional and public investors. After the price correction in December 2010, the stock price index stood at 3738.70 on April 10, 2013.

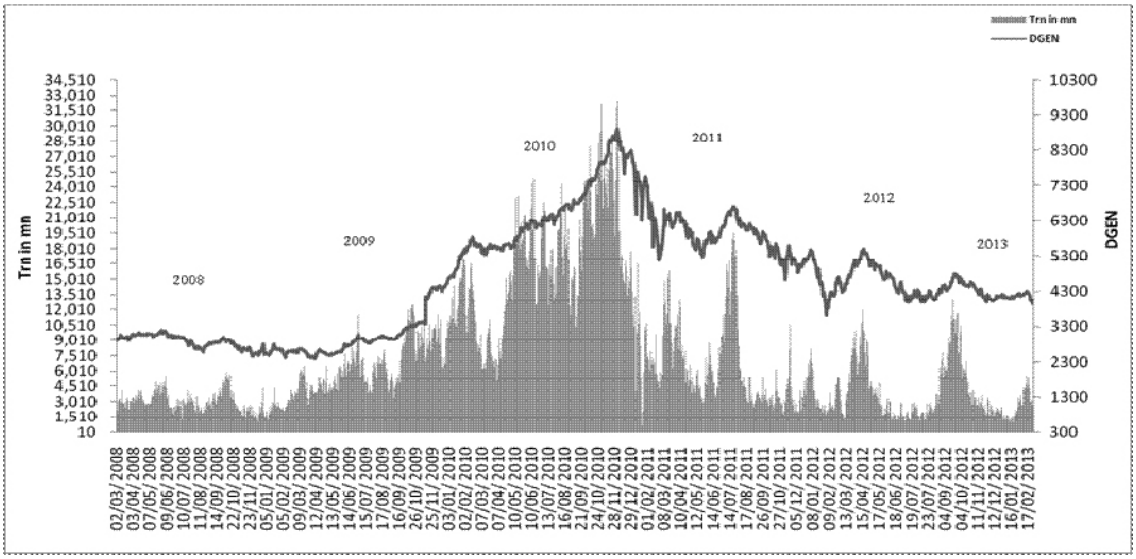

Figure 1: DSE Performance from March 2008 to February 2013

Therefore, the objective of this study is to examine whether there is any relationship between the episodes of the bubble-burst cycle and the bank's excess liquidity, money supply (M2), private sector credit (PSC), deposit rate and inflation in Bangladesh. This will guide us to find the causes of stock market volatility in Bangladesh and its policy implications. International experience of asset price bubble and burst cycles and the role of monetary policy in addressing the situation are analyzed in detail in this paper to draw some policy lessons.

Before collapsing the share market in December 2010, a sign of imbalance in various macroeconomic variables showed up. For example, companies' dividend yield, which is considered as a fundamental indicator to measure the strength of a business showed considerable divergence from the overall price-earnings ratio. Historical evidence (Germany in 1927 and Japan in 1990) show that the higher the gap between the Price/Earning (P/E) ratio and the dividend, the possibility of bursting a bubble is also more elevated. Figure 2 shows that in November and December 2010 before the stock market crash the gap between P/E and dividend yield was higher in Bangladesh.

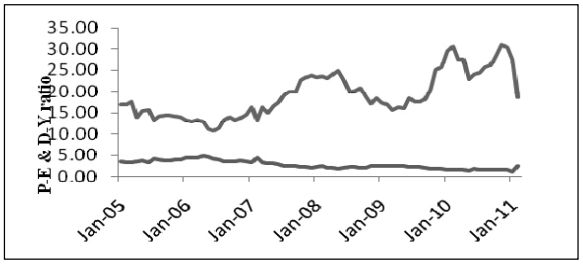

Figure 2: Price-Earning ratio and Dividend Yield

In 1996, Bangladesh experienced an episode of a stock market bubble burst. The DSE all shared price index, float at around 1,000 in June 1996, reached at 3,627 on November, 05 of the same year. At the markets' peak, shares were trading at an average of over 80 times of relevant earnings. Trading data shows that during this period, market capitalization went up by 265 percent and the average daily turnover increased by over 1000 percent. The stock market prices dropped close to 70 percent at the end of April 1997 from the peaks on November 05, 1996. Investors lost their lifetime savings before taking any position against it.

The plan of the paper is as follows. In section-II, we review the literature with a particular focus on the economic bubble. Section-III discusses the monetary policy development, asset price, and inflation scenario in Bangladesh. In section-IV, we examine the issue with some empirics; in this regard, an appropriate methodology is specified, and the results are analyzed. The final section concludes the paper with some policy implications.

2. Literature Review

There are two major schools of thought on the role of monetary policy in addressing asset price inflation. The first one is outlined by former Federal Reserve Chairman Alan Greenspan and popularized by former US Fed Chairman Ben Bernanke (1999, 2000, and 2010). According to this school of thought, it is the regulatory and not the monetary response, that is needed in the face of asset price misalignment. Analyzing housing price data, Bernanke showed that only a small portion of the house price increased between 1977 and 2002, and this can be attributed to US monetary policy (2010). Presenting cross-sectional data for G20 nations for the same period, he remarked that there is little correlation between monetary policy and housing prices in those economies.

The second school of thought places greater emphasis on the informational aspect of asset price as it has a significant impact on future inflation. This school argues that a central bank concerned with stabilizing inflation about a particular target level is likely to achieve superior performance by adjusting its policy instruments not only in response to its forecast of future inflation and the output gap, but to housing prices as well (Cecchetti, 2000). They, however, said that it is better to ignore equity prices when deciding on monetary policy, as they are rather noisy (Cecchetti, 2000).

A large number of studies examined the relationships between the stock market and the macroeconomic variables. For Example, Nisha (2016) examined the influence of a set of global macroeconomic factors and a combination of both domestic and global macroeconomic variables, on the behavior of Dhaka Stock Exchange. To examine the impact of macroeconomic variables on the stock returns, monthly data series covering a period of 15 years from January 2000 to December 2014 have been used. Vector Auto Regression model is used to examine the long run and short run relationship between macroeconomic variables and the monthly stock returns of Dhaka Stock Exchange. The empirical result shows that money supply is the most important factor for Bangladesh followed by the industrial production index, consumer price index, interest rate, exchange rate, and gold price.

Ahmed and Imam (2007) also examined the relationship between stock market and selected macroeconomic variables in Bangladesh for the sample period from July 1997 to June 2005. The authors used share price index to represent the stock market and several macroeconomic variables namely broad money supply, treasury bill rate, interest rate, GDP and industrial production index. Using cointegration, vector error correction models (VECM) and Granger causality

tests, the study examined both the long-run and short-run relationships between the stock market index and the macroeconomic variables. The empirical results a show long run relationship when a change of interest rate is added to the model, the existence of significant long run relationship was observed with the money supply, GDP growth, and interest rate change. However, the test shows the presence of a unidirectional causality from interest rate change to the stock market return.

Sohail and Hossain (2012) investigated the responses of stock prices to macroeconomic variables i.e. industrial production index, consumer price index, money supply, real effective exchange rate, three months treasury bills rate, and on three stock indices i.e. ISE10 index, LSE25 index, and KSE100 index relating three stock exchanges namely Islamabad Stock Exchange, Lahore Stock Exchange, and Karachi Stock Exchange respectively. Johansen cointegration Technique was applied to examine the long-run relationships during the year from 1970 to 1992. The empirical results showed that industrial production has long run positive impact on stock prices in all three markets in Pakistan. The exchange rate was positively affecting all indices except Islamabad Stock Exchange10 index. Inflation was positively related to stock returns at Karachi Stock market, while it was negatively related to rest of the two markets. The money supply affected stock returns negatively, while treasury bills rate had mixed effect.

Ahmad (2008) investigates the nature of the causal relationships between stock prices and the key macroeconomic variables representing a real and financial sector of the Indian economy for the period March 1995 to March 2007 using quarterly data. The model variables are the index of industrial production, exports, foreign direct investment, money supply, exchange rate, interest rate, NSE Nifty and BSE Sensex. Johansen`s approach of co-integration and Granger causality test have been applied to explore the long-run relationships while BVAR modeling for variance decomposition and impulse response functions has been applied to examine short-run relationships. The results of the study reveal differential causal links between aggregate macroeconomic variables and stock indices in the long run. However, causal pattern is similar in both markets in the short run. The study indicates that stock prices in India lead economic activity except for movement in the interest rate. Interest rate seems to lead the stock prices. The empirical results indicate that Indian stock is market driven not only by actual performance, but also by expected potential performances. The study also reveals that the movement of stock prices is not only the outcome of the behavior of key macroeconomic variables, but is also one of the causes of movement in another macro dimension in the economy.

2.1 Characteristics of Bubble Economy

The mathematical definition of an asset price bubble uses the fair price of a financial asset as its starting point. This theoretical price is the present value of the future cash flow of the asset. Charles Poor Kindleberger offers the most widely accepted definition of economic and financial bubble (Kindleberger, 1991, p.20) *".. a bubble may be defined loosely as a sharp rise in price of an asset or a range of assets in a continuous process, with the initial rise generating expectations of further increases and attracting new buyers–generally speculators interested in profits from trading in the asset rather than its use of earning capacity. The increase is usually followed by reverse expectations and a sharp decline in price often resulting in a financial crisis".*

Some economists argue that there is room for a more discretionary role for a central bank. For example, Gruen *et al.* (2007) focuses on the information availability on a bubble and provides suggestions on whether a central bank should deal with a bubble through an activist or nonactivist approach According to them, where sufficient information is not available, the central bank should refrain from an activist approach and continue to make policy decisions based on simple rules such as the Taylor rule. However, if the central bank possesses sufficient information, it may take an activist approach to deal with it.

Komaromi (2006) argued that the formation of a bubble starts with a clear and continuous rise in share prices caused by an exogenous shock affecting the economy. This initial displacement influences outlook in a positive way, generating expectations of further growth. If stock prices distinctly begin to grow, uninformed investors, partly due to the deduction problem, take this as a positive signal. The share of particular industries and companies may become famous. New buyers appear on the market and the proportion of shares increases within portfolios, causing a surge in trading volume. Many investors are pursuing an active feedback strategy. This, coupled with the lack of relevant information, amplifies noise trading.

Okina *et al*. (2001) identified three major characteristics of the Japanese bubble economy in the late 1980s, namely, a substantial rise in asset prices, including both the stock prices and real estate; overheating of economic activity led by capital investment, and increase in money supply and credit based on the experiences of Japan in the late 1980s.

Chadha *et al.* (2003) found that while focused on inflation targeting, the central banks of the US, the UK, and Japan have reacted to asset prices when there were perceptions of large misalignment that posed a threat to the macroeconomic condition during the sample period of September 1979 to December 2000. In their

experiment, they used a forward-looking Taylor rule with asset price and exchange rate augmentation.

Goodhart (2000) explores the issue using data from G7 nations for the sample period of 1972 to 1998 with a simple structural model proposed by Rudebusch and Svensson (1998) and conclude that there is a role for an active response to asset price movements from a monetary policy perspective. He also agrees with most economists in the field that asset prices do contain significant information about future inflation.

Borio and Lowe (1992) point to the rapid domestic growth of credit as the principal instigator of financial instability, especially when accompanied by rapid increases in the asset price and (or) an investment boom. Their goal in this particular paper was to explore the usefulness of credit, asset price, and investment as predictors of the future instability of the financial system. They found that credit gap is the best single indicator of future economic instability; they also found that taking two signs together produces less noisy signals than when they are considered separately. However, they also conclude that the threshold values of these indicators are rather circumstantial. The paper also dedicates significant weight to the fact that asset price discrepancies and financial instability can arise in a small inflationary environment as well.

3 An Overview of the Development of Macroeconomic Variables in Bangladesh

Before the crash in December 2010, the stock markets in Bangladesh experienced a bull run for the past two years. The country's central index, DGEN, increased from 2800 points in 2009 to 8781.24 points on November 25, 2010, showing an unprecedented rise within a year. The number of investors also increased significantly, and reflected in the growth of beneficiary owner (BO) accounts that stood at 2.92 million as of October 4, up by 38 percent from 2.12 million in June 2009. The number of investors increased significantly as the beneficiary owner's (BO) account stood at 3.2 million at the end of December 2010 up from 1.0 million recorded in January 2009.

The country's financial market, embracing banks, insurance companies, and non-banking institutions, together with massive small investors have so far had substantial investments in the capital market. A local newspaper reported a story of a rickshaw puller who opened a BO account to apply for an IPO of a company. This shows an involvement of a vast number of vulnerable uninformed ignorant investors all over the country who can trade by staying at Zilla Up-Zilla City or Town levels. The situation of the stock market went higher beyond any justified level and could not be explained by fundamentals. For example, there was no significant technological innovation, new information, or trade volumes, or economic activity of the company.

Figure 3 shows the share price index and GDP growth with their long-term trends as measured by the Hodrick–Prescott filter method.[1] From Figure 3, it is evident that during the period of the bull run of the share price the actual stock price index is much higher than its long-term trend, indicating an overheating of the market. According to the trend, the level should be at around 6,000 while it was running over 8,000, risking the fall of price as well as leading towards its long-term trends. Currently, it is running below the long-term trends indicating that there is some room to increase. The index may increase in the near future.

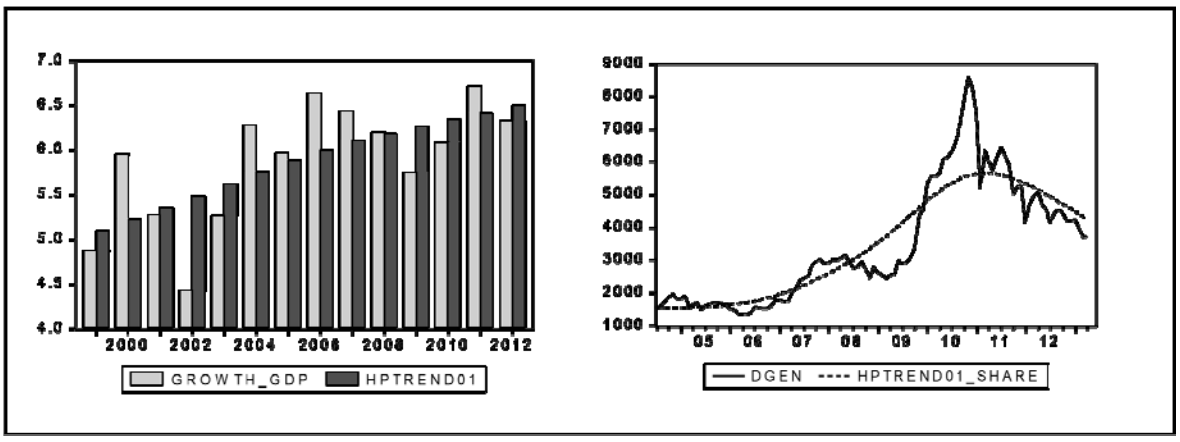

Figure 3: Actual and Potential Real GDP and Share Price Index

Source: Author's Calculation.

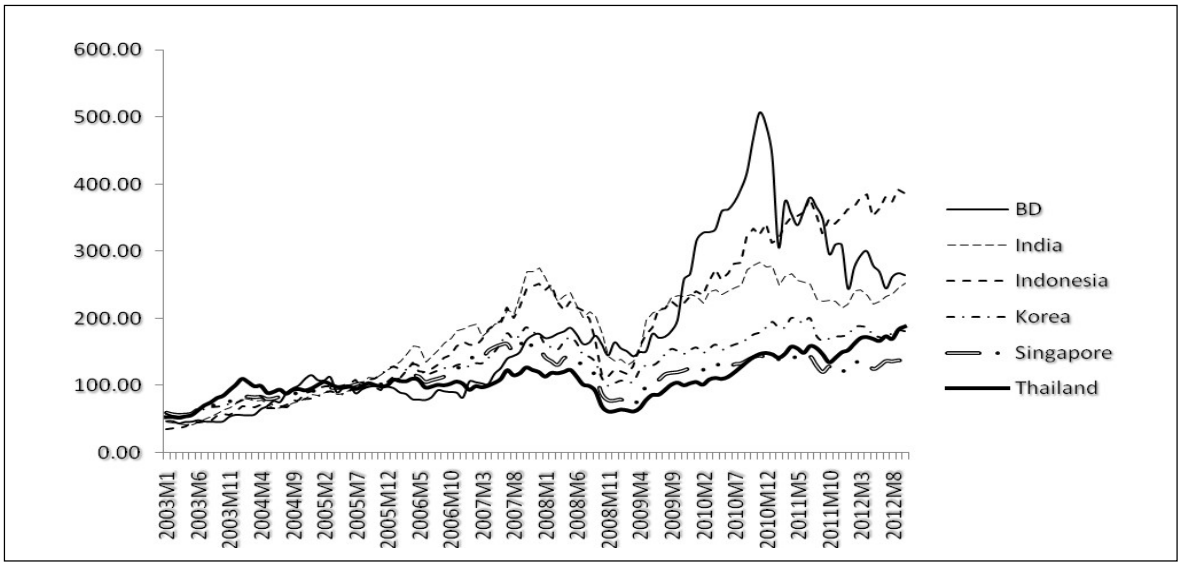

Figure 4: Comparison of Recent Trends in the Share Price Index of some Selected South and East Asian Countries

Table 1: Market Capitalization to GDP, Price Earnings Ratio and Dividend Yield as of January 2013

Exchange	No. of Listed Securities	Market Capitalisation/ GDP	PE	Dividend Yield	Market Capitalisation/ GDP	PE	Dividend Yield	Interest Rate(%) Lending Rate
Asia - Pacific	2009-10				2012-13			
Bangladesh	517	43.92	24.08	1.70	25.53	11.54	4.75	13.73
BSE India	2 050	72.55	21.61	1.15	67.84	16.69	1.48	7.75
Bursa Malaysia	5 195	60.33	17.00	2.20	144.94	14.00	3.00	3.00
Colombo SE	919	6.67	28.21	1.10	29.59	15.23	2.35	7.50
Hong Kong Exchanges	287	5.64	18.00	2.90	1154.55	17.00	2.40	0.50
Singapore Exchange	914	94.68	15.00	3.00	297.24	12.00	3.10	0.04
Taiwan SE Corp.	1 540	147.54	24.00	3.80	158.88	22.00	3.40	1.88

Source: World Federation of Exchanges, IMF, World Economic Outlook.

The unusual rise of share prices in Bangladesh does not match most of the economies in Asia. The trends of the stock market in some selected South Asian economies show that after reaching a trough in January 2009, the share price indices of India, Pakistan, and Sri Lanka started to increase while the process began a year later in Bangladesh. The *Monthly Review* (September 2010) of the Dhaka Stock Exchange shows that during July 2010, there was some inflow of funds of about USD 12 million, while domestic money and the credit market also remained buoyant with ample liquidity. Figure 4 shows that the equity prices in South and East Asian markets have shown signs of an uptrend since January 2010 following the better than expected global recovery and a low inflation situation. Among the seven countries, the Bangladesh share price index was the highest followed by the Indonesian and Indian indices, though the comparison with regards to the list of stocks and market capitalization varies significantly.

Table-1 demonstrates a comparison of market capitalization to GDP, PE and dividend yield of some selected Asia-Pacific countries. Bangladesh's performance regarding PE ratio and dividend yield are much better than other Asia-Pacific countries.

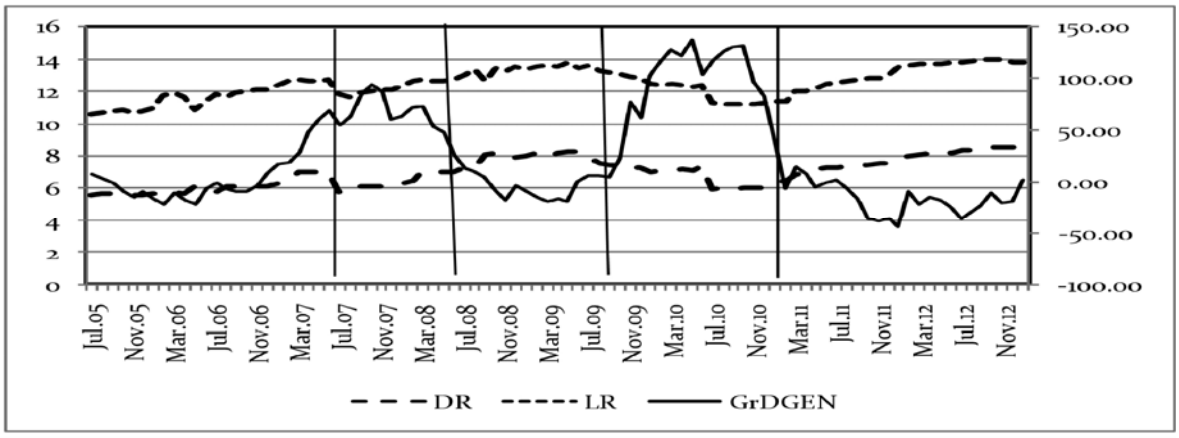

Figure 5: Trends in Deposit and Lending Rates with the Growth of Share Price Index

Source: Economic Trend, BB

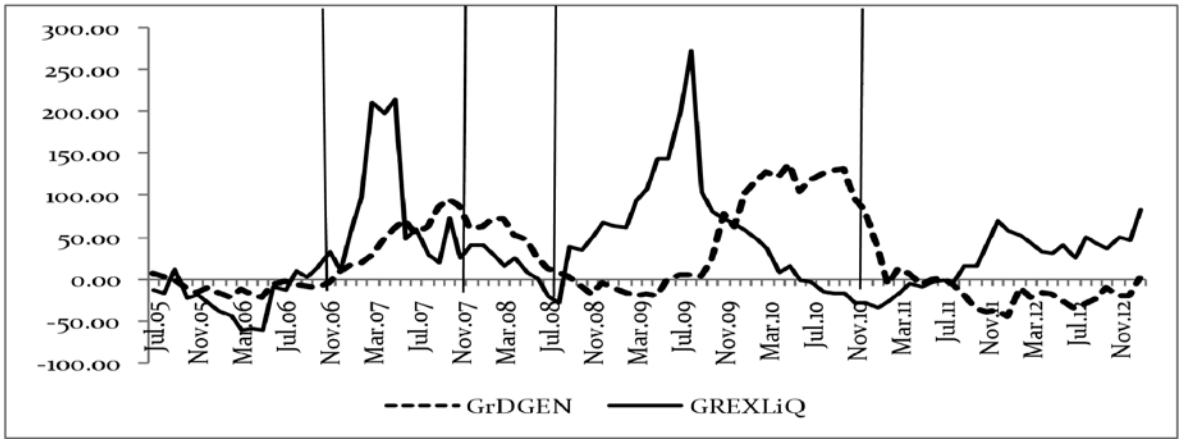

Figure 6: Growth in Excess Liquidity and Share Price Index

Source: Research Department, Dhaka Stock Exchange, BB

Figure 5 shows that during 2009-10, the deposits and lending rate were decelerating due to the easy monetary policy stance of the central bank following the global financial crisis in 2007-08. The banking system was kept liquid deliberately to avoid a liquidity crisis. Historical evidence, including recent recession, proves that easy monetary and credit policies for a long time create a liquidity glut in economies that help to form bubbles.

From Figure 6, it is evident that excess liquidity in the banking system piled up during the stock market uptrend in 2007-08 and 2009-10. The uptrend in the share market, and the unused excess liquidity in the banking system went to the stock exchange due to profit motive stance of commercial banks and lack of scope for alternative investment.

Besides, during this period, 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. In December 2009, the total amount of margin loan provided by banks and NBFIs substantially increased by 164.41 percent to Taka 77.82 billion from Taka 4.21 billion in 2006. The excess liquidity of banks recorded a growth of 57.17 percent from Taka 86.10 billion in December 2006 and stood at Taka 334.27 billion in December 2009. The total investment by banks and NBFIs jumped by 87.30 percent to Taka 43.58 billion in 2009 from Taka 6.63 billion in 2006. The investments by banks increased significantly by 97.55 percent to Taka 36.91 billion in 2009 from Taka 4.79 billion in 2006. Investments by NBFI were up to Taka 6.66 billion- a growth of 53.46 percent from Taka 1.84 billion in 2006. Also, the Government of Bangladesh took 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 rushed to the stock market where returns were apparently much higher than in other investments. Figures-7 and 8 show the trends in money supply (M2) and private sector credit and share price index growth. During the period between October 2007 and March 2009 and again May 2010 to October 2011, both private sector credit and M2 growth were higher than the projected monetary expansion of the central bank. Figure 7 shows that private sector credit is more closely related to the stock market price than the M2. It is also revealed from Figure 7 that though initially the share price index and the private sector credit moved together, later share price index was the reason that increased more private sector credit. Figure 7 shows that private sector credit peaked after the stock market index peaked during 2007-08 and 2009-2010, implying that the higher share price index induced private sector credit to increase.

There is also a close link between the share price index and inflation during 2004 to 2011, as evident from Figure 9. However, it shows considerable divergence from each other in recent period implying that higher inflation is not responsible for increasing the share price index.

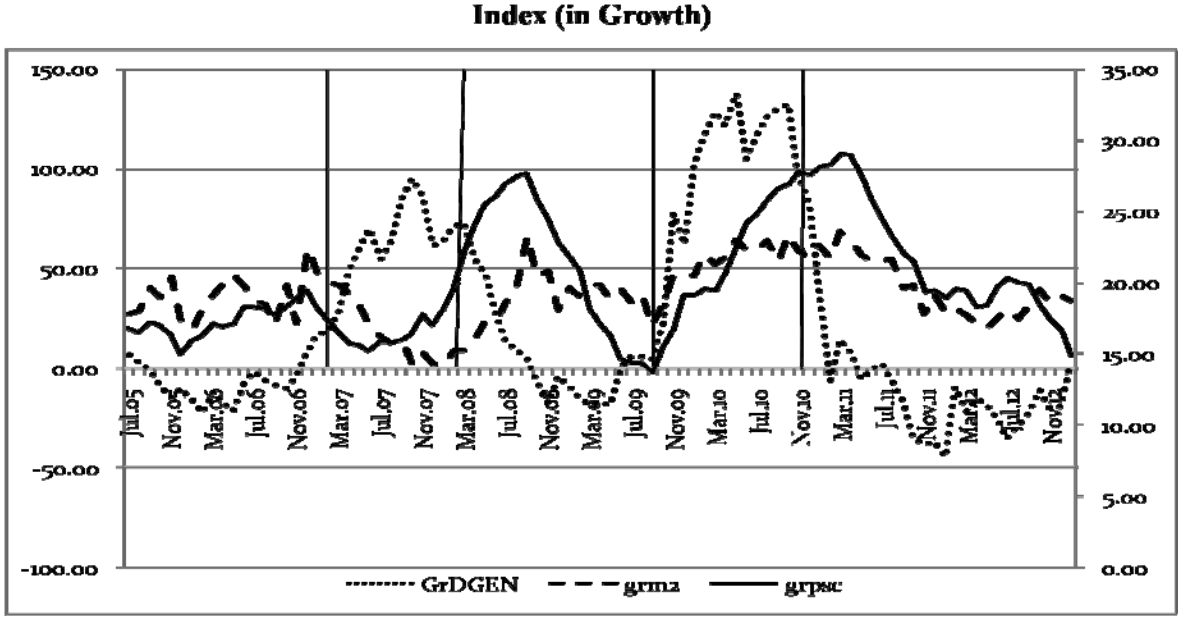

Figure 7: Trends in Money Supply (M2), Private Sector Credit (PSC) and Share Price

Source: Economic Trends (various issues), a Bangladesh Bank Publication.

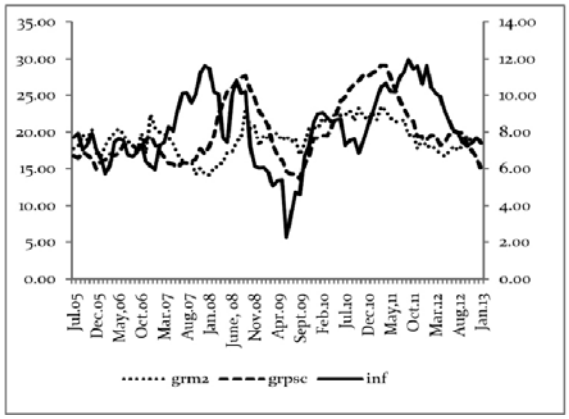

Figure 8: Trends of growth in M2, PSC and CPI Inflation

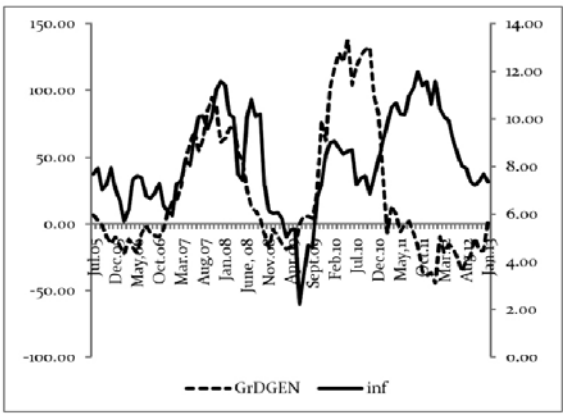

Figure 9: Trends of growth in Share price Index and CPI Inflation

Data Source: Economic Trends, Statistics Department, Bangladesh Bank, Various Issues.

4 Methodology, Model Specification, and Empirical Results

In this section, an attempt has been made to analyze the relationship between the share price index of the Dhaka Stock Exchange and some related macroeconomic variables.

To draw policy implications, a series of macro-economic and bank-specific variables are used in this study. Unlike other studies this study uses private sector credit which is considered to be one of the most important factors during the episodes of the bubble-bust cycle in Bangladesh In doing so, Granger Causality test followed by the Cointegration and Vector Error Correction (VECM) models have been estimated. All data have been collected from the Economic Trends and Dhaka Stock Exchange website. The model uses the following variables:

DGEN= The log of Share Price Index (General) of the Dhaka Stock Exchange

IPI= The log of Industrial Production Index.

CPI= The log of the Consumer Price Index (2005=100)

EXR= The log of the Bilateral Nominal Exchange Rate

Deposits Rate= The Fixed Deposits rate on less than 3-month maturity

M2= The log of Broad Money Supply (in crore Taka)
PSC= The log of Private Sector Credit (in crore Taka)

4.1 Empirical Results:

The Pair-wise Granger Causality Test

The Pairwise Granger Causality tests between the share price index of Dhaka Stock Exchange (DGEN), broad money (M2), excess liquidity (EXLIQ) in the banking system, private sector credit (PSC), deposit rate(DR), inflation and the exchange rate for the sample period from 2004:07 to 2014:07 show that there is two way causality between the *private sector credit and DGEN* (Table-2). However, after four months, it is the higher share price index that increase private sector credit.

The pair-wise Granger Causality test between *stock price index and the excess liquidity* show that there is two way causality that runs from excess liquidity to share price index and stock price index to excess liquidity (Table-2).Though the evidence of the causality between M2 and DGEN did not appear during the full sample period of 2004:07 to 2014:07, an evidence of one-way causality from the share price index to M2 showed up during the period of stock market bubble. This implied that money supply does not directly cause share price index. However, during the particular time of 2008:07 to 2010:12, money supply is one of the factors that creates excess liquidity in the banking system, which in turn increased private sector credit.

Table-2: Pairwise Granger Causality Tests:

Variable: Growth rate of Broad Money (M2), Private Sector Credit (PSC), Excess Liquidity (EXLIQ), General share price index of Dhaka Stock Exchange (DGEN)

Null Hypothesis	No. of Observation	F-Statistic	Probability
M2 does not Granger Cause DGEN *DGEN does not Granger Cause M2*	90	0.79 0.46	0.38 0.50
EXLIQ does not Granger Cause DGEN *DGEN does not Granger Cause EXLIQ*	90	8.23 3.57	0.01*** 0.06*
GRPSC does not Granger Cause GRDGEN *GRDGEN does not Granger Cause GRPSC*	90	12.91 34.27	0.01** 0.00***
Deposit does not Granger Cause DGEN *DGEN does not Granger Cause DEPOSIT*	90	0.57 0.07	0.45 0.07*
INFLATION does not Granger Cause DGEN *DGEN does not Granger Cause INFLATION*	*90*	*3.06* *0.57*	*0.02* *0.69*
IPI does not Granger Cause DGEN *DGEN does not Granger Cause IPI*	*90*	*10.97* *3.88*	*0.01* *0.06**

*, **, *** denote significant at 1%, 5% and 10% level.

Table-3: Augmented Dickey-Fuller (ADF, 1979) and Phillips-Perron (PP, 1998) Tests for Unit Root

Variables	ADF	Prob.	PP	Prob.	*Variables*	ADF	Prob.	PP	Prob.
LCPI	-0.16	0.93	-0.22	0.97	**Δ*LCPI***	-6.57	0.00	-6.21	0.00
LEXR	-0.26	0.92	-0.21	0.93	**Δ*LEXR***	-9.53	0.00	-9.53	0.00
LM2	-0.49	0.98	-0.59	0.98	**Δ*M2***	-3.38	0.00	-15.49	0.00
LDGEN	-1.32	0.61	-1.35	0.60	**Δ*DGEN***	-10.01	0.00	-10.03	0.00
LPSC	-0.66	0.84	-0.17	0.96	**Δ*PSC***	-3.42	0.00	-8.13	0.00
LEXLIQ	-1.43	0.56	-2.30	0.17	**Δ*EXLIQ***	-13.94	0.00	-19.34	.0.01
DR	-0.92	0.77	-0.87	0.79	***DR***	-10.75	0.00	-10.75	0.00
IPI	-1.33	0.62	-1.37	0.59	**Δ*LIPI***	-11.01	0.00	-12.03	0.00

*Δ denote first difference. LCPI=log of consumer price index. LEXR=log of Exchange Rate. LM2-= log of (M2), LDGEN=log of General Price Index of Dhaka Stock Exchange. LPSC=log of Private Sector Credit. LEXLIQ=log of Excess Liquidity. DR=Deposit Rate. IPI=log of Industrial Production Index. *** implies significant at the 1 percent level.*

The pair-wise Granger causality test between inflation and DGEN for the sample period from 2004:07 to 2014:07 shows that though there is one-way causality between inflation and the share price index, the evidence of two way causality cannot be rejected during the period from 2004:07 to 2014:07. This implies that initially, higher share price index induces inflation to increase, and then higher inflation transmit induces an increase in the stock price index. In the long-run, inflation causes the stock price index to increase. A similar result is found for the deposit rate.

4.2 Empirical Results from Co-integration

Stationary of the Time Series Data

The empirical analysis involves some steps. Any regression result with non-stationary provides spurious relationships between variables and, therefore, provides misleading implications of the relationship. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series is said to be co-integrated. The stationary linear combination is called the co-integrating equation and may be interpreted as a long-run equilibrium relationship between the variables. The purpose of the co-integration test is to determine whether a group of non-stationary series is co-integrated. If a series of non-stationary variables are co-integrated, they form the basis for Vector Error Correction Model (VEC).

Unit Root Test Results

To see whether the variables included in the model are non-stationary a series of Unit Root Tests are performed without trend and with the intercept.

The estimated results using Augmented Dickey-Fuller (ADF, 1979) and Phillips-Perron (PP, 1998) tests show that the null hypothesis, H_0, (has a unit root) cannot be rejected for any variable. According to the ADF and PP test LCPI LEXR, LM2 LDGEN LPSC, LEXLIQ, DR, and IPI has a unit root in levels while they are stationary in the first differences. Therefore, these variables fit the basis to test for co-integration. The idea of co-integration is to determine if the stochastic trends in all the variables that contain unit roots have a long-run cointegrating relationship between them.

4.3 Estimation Results of Co-integration

In our empirical evaluation we have applied Johansen (1991 and 1995) and Johansen and Juselius (1990,992) multivariate co-integrating methodology which jointly determine empirically the number of *r* (maximum *k-1*) co-integrating vectors from a vector of *k* endogenous variables in the model along with coefficients of the variables and the adjustment parameters to a 8th order VAR (with maximum lags eight) to test for co-integration.In our deterministic trend component specification in co-integrating equations, we choose case-3 (linear trend assumption) that is, we assumed that the level series of endogenous variables have linear deterministic trends, but the cointegrating equations have only intercepts (constants). Based on the literature and data analysis several models of cointegration and vector error correction have been estimated. The results using the variable of excess liquidity in the banking system, CPI inflation, and deposit rate with the share price index came out with the best results in terms of significance level and the expected signs. The estimated models using M2 did not show any long run relationship with the share price index but did show short-term dynamics. Results are presented in Table-4.

Table 4: Johansen's Cointegration Tests

Null Hypothesis	Alternative Hypothesis	Trace Test		Maximal Eigen Value Test	
		Statistics	95% Critical Value	Statistics	95% Critical Value
r=0	r=1	136.45*	94.15	56.17*	39.37
r≤1	r=2	80.28*	68.52	43.08*	23.46
r≤2	r=3	57.20*	47.20	29.95*	27.07
r≤3	r=4	5.72	12.25	5.71	13.25

*(**) denotes rejection of the hypothesis at the 5 %(1%) level. Trace test indicates 3 co-integrating equation(s) Max-eigen value test indicates 3 co-integrating equation(s) at both 5% and 1% levels.

Source: Author's Calculation

Table 5: Normalized Co-integrating Coefficients (or Eigenvectors)

Log DGEN	log of EXLIQ	log of CPI	Log of IPI	DR	@trend
1.00	0.49	3.60	0.36	-0.50	-0.03
	(3.51)	(2.16)	(3.82)	(-7.14)	(0.001)

(t-value in parentheses). **Source:** Author's Calculation

Several critical remarks could be developed from the results of co integrating relations. The elasticity of share price index, excess liquidity, CPI and the deposit rates *are* 0.49, 3.60, 0.36 and -0.50 respectively. Furthermore, the adjustment coefficients or feedback parameter values of different cointegrating variables gives an indication of whether the feedback parameter values were sufficiently high to determine the variables of interest such as *LEXLIQ, LCPI, LIPI, and DR* in an endogenous fashion. In the Appendix, it can be seen that the dependent variable, i.e. the share price index, is likely to be endogenously determined by its direct determinants.

4.4 Vector Error Correction (VEC) Models

A vector error correction (VEC) model is performed to see the short-run dynamics since the variables are integrated one, (I(1)) and they are co-integrated. The co-integrating relationships reveal the factors that affect the long-run level of the share price index. However, in the short run, deviations from these relations could occur as a result of shocks to any of the relevant endogenous variables. Thus, after testing for co-integration, a VECM is estimated. The VECM is conditional on co-integrating vectors and thus, specified as to regress the first (time) difference of each non-stationary endogenous variable at time-t on one period lag (at time -1) of the cointegrating equation/vector (s) and the lagged (at time-t-i) first (time) differences of all of the endogenous variables in the system. In fact, when we impose number of co-integrating vectors as restrictions on the endogenous variables in the VAR, we move to VEC model whose general form is:

$$\Delta x_t = c_o + \sum_{i=0}^{p-1} \gamma_i \Delta x_{t-i} + \delta_i ECT_{t-i} + \omega_t$$

In our case the model of the types of VECs will be as follows:

$$\Delta LDGEN = c_0 + \sum_{i=0}^{p-1} \gamma 1_i \Delta(LEXLIQ)_{t-i} + \sum_{i=0}^{p-1} \gamma 2_i \Delta(LCPI)_{t-i} + \sum_{i=0}^{p-1} \gamma 3_i \Delta(IPI)_{t-i} + \sum_{i=0}^{p-1} \gamma 4_i \Delta(DR)_{t-i} + \delta_i EC_{LDGEN} + \omega 1_t$$

Where EC is the error correction term (generated from the co-integrating equation) capturing the disequilibrium or deviation that arise at the level of the share price index, and the factors cause this imbalance. The parameter δ is the speed of adjustment (in the case of short run imbalances) in bringing about the equilibrium that is, removing the deviation. We can draw several important conclusions from the empirical results of the VEC model; first, the error correction term is significant (at the 1-percent error level) in our specification as implied by the Granger representation theorem. VEC performed using a lag of four which is confirmed by the Log-likelihood test, Akaike Information Criteria and also by Final Prediction Error. The error correction term was found negative and significant for D(LDGEN) with the speed of adjustment of -0.13, implying that the speed of adjustment to the equilibrium is moderate.

In the present context, Granger representation theorem would imply that if there was any short-run deviation of share price index (long-run equilibrium) it was automatically removed by appropriate change or adjustment of *excess liquidity, price level, industrial production index and the deposit rate*. However, there are several features to be analyzed. Most of the adjustment coefficients of lagged values of explanatory variables were not significant. The value of R^2 is reasonably good which is 0.50.

5 Conclusion

The objective of this study was to analyze the monetary policy response in the aftermath of the stock market bubble burst in Bangladesh. This paper also examines the relationship between the share price index and the macroeconomic variables in Bangladesh. The empirical results, as measured by the Granger Causality tests, Cointegration and Vector Error Correction Model (VECM) for the sample period from 2004:7-2014:7 show that there is two way causality from excess liquidity, private sector credit, and industrial production index to the share price index. An increase in the share price would increase the private sector credit if there is excess liquidity in the money market. An increase in the share price index would increase the industrial production index and also an increase in the industrial production index would increase the share price index. The empirical result also shows that there is a one-way causality from inflation to share price index. The deposit rate has significant negative impact on the share price index implying that an increase in the deposit rate decreases share price index as people would shift their preference to relatively less risky banks savings schemes rather than risky and volatile share market and vice versa. On the other hand, like other studies, this study does not find any direct causality between broad money (M2) to share price index for the sample period of 2004:7-2014:7. The empirical results from Co-integration and Vector Error Correction Model (VECM) and of the share price index and macroeconomic and bank-specific variables also support the above findings. Therefore, policy implications of this study would be monetary authority should keep an eye on the private sector credit disbursement as the market has substantial evidence of fund diversion from bank to share market, which may end up creating a bubble in the market.

Other Policy Recommendations

It has been argued that for the policy makers the more relevant issue is not whether an asset-price bubble exists, but rather what combination of events in the financial and real sectors exposes the financial system to a materially increased level of risk. However, on the role of assets prices there are extensive consensuses as follows:

- Central Banks should not target asset prices
- Central Banks should not try to prick a bubble
- Central banks should not follow mop up strategy after the burst of a bubble, which means injecting enough liquidity to avoid a macroeconomic meltdown.

In this situation, following recommendations have been made to rescue the sinking share market:

Increase buying capacity of the Banks and Financial Institutions;

Increase the depth in the capital market, especially the supply side, and take prompt actions to float the Government shares in the market are required;

Monetary policy must remain tight despite calls by certain quarters. The more uncomfortable liquidity conditions in the banking sector will be required to contain inflation and remove inefficiencies in the financial market.

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Appendix

Table-III.4: Vector Error Correction (VEC) Model: Short-run Adjustments for the share price movement, by excess liquidity, deposit interest rate, and the price level

Co-integrating Terms and Determinants of **Δ LDGEN**$_t$ the Share Price Behavior			
ECT(LDGEN)$_{t-1}$	-0.14(-2.85)		
ΔLDGEN t-1	0.02(0.12)		
ΔLDGEN t-2	0.07(0.61)		
ΔLDGEN t-3	0.09(0.78)		
ΔLDGEN t-4	0.11(0.85)		
*Δ LCPI*t-1	-0.07(-0.06)		
*Δ LCPI*t-2	-1.03(-0.86)		
*Δ LCPI*t-3	-3.06(-2.59)		
*Δ LCPI*t-4	-2.14(-1.92)		
ΔLREMITT$_{t-1}$	-0.01(-0.08)		
*ΔLREMITT*t-2	-0.10(-0.84)		
ΔLREMITT$_{t-3}$	-0.18(-1.60)		
ΔLREMITT$_{t-4}$	-0.10(-1.15)		
*Δ LEXLIQ*t-1	-0.01(-0.20)		
*Δ LEXLIQ*t-2	-0.04(-0.70)		
*Δ LEXLIQ*t-4	-0.01(-0.50)		
Δexr $_{t-1}$	-0.84(-0.47)		
Δexr $_{t-2}$	-3.32(-1.80)		
Δexr $_{t-3}$	-0.07(-0.03)		
Δexr $_{t-4}$	-1.74(-0.94)		
ΔDRt-1	*0.02(0.56)*		
ΔDRt-2	*0.01(0.47)*		
ΔDRt-3	*0.01(0.19)*		
ΔDRt-4	*-0.01(-0.30)*		
Constant	0 .02(1.61)		
R^2	0.50		
S.E	0.01	F-Statistics	1.67