THE DYNAMIC RELATIONSHIP BETWEEN STOCK MARKET RETURNS AND MACROECONOMIC VARIABLES: AN EMPIRICAL STUDY FROM BANGLADESH

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Abstract

In this research paper, attempt has been made to explore the dynamic relationship between stock market and macroeconomic variables i.e. DSE index and three key macro-economic variables (Exchange rate, Industrial production in and Reserve), by using unit root stationary tests and Johansen co-integration test. Monthly data has been used from June, 2003 to June, 2015 for all the variables, like, DSE index, Exchange rate, Industrial production in and Reserve. Results showed that the variables contained a unit root and were integrated of order one. The vector error correction model (VECM) (Johansen (1991)) is utilized to determine the impact of selected macroeconomic variables on stock market. Empirical results show that the stock market and macroeconomics variables have no long-term equilibrium relationship.

Keywords: DSE, Reserve, Exchange rate, Industrial production, Macroeconomic variables, Stock market, Dynamic relation.

***JEL Classification Codes*:** C32, F30, F31, H63

1.1 Introduction

The dynamic relationship between stock market returns and macroeconomic variables has been widely investigated, especially in developed markets. The early studies on the US stock markets by Lintner (1973), Bodie (1976), Jaffe and Mandelker (1977) and Fama and Schwert (1977) mainly examined whether the financial assets were hedges against inflation. These studies have reported a negative relation between stock returns and changes in the general price level. However, Fama (1981) found a direct positive relationship between stock market returns and real economic activities such as industrial production. Chen *et. al*. (1986), tested whether a set of macro-economic variables explained unexpected changes in stock market returns. It is recognized that stock markets play a pivotal role in growing industries and commerce of a country that eventually affect the economy. The importance of the stock markets has been well acknowledged in policy makers, portfolio managers, industries and investors perspectives. The stock market avail long-term capital to the listed firms by collecting funds from various potential investors, which allow them to expand in business and also offers investors alternative investment avenues to put their surplus funds in (Naik and Padhi, 2012). It is very interesting to invest in stock market but also a very risky trench of investment. So, potential investors always try to guess the movement of stock market prices to achieve maximum benefits and minimize the future risks. By concerning with the relationship between stock market returns and macroeconomic variables, investors might guess how stock market behaved if macroeconomic indicators such as exchange rate, industrial productions, interest rate, consumer price index and money supply fluctuate (Hussainey and Ngoc, 2009). Macroeconomic indicators such as compositions of data which frequently used by the policy makers and investors to gathering knowledge for current and upcoming investment priority (Masuduzzaman, 2012).

1.2 Objectives of the study

In this study the major of the study are as follows:

- To shed light on the nature of dynamic relationship that exists between the stock market and macro-economic variables, i.e., is it unilateral or bilateral.

1.3 Limitations of the Study

- For this study major limitation is analysis is mainly based on secondary data which is collected from the published annual reports of different institutions, industries and Bangladesh bank, therefore it may have potential bias from the data source as the limitation outlined.
- Besides to conduct the study only four (04) variables are collected. Small sample size may play a role to create doubt of its representativeness and there might be bias result. Such biasness is unavoidable and could affect the reliability and precision of findings.

2. Literature Review

Bohn and Tesar (1996), Rapidly growing economies of emerging markets have attracted the accumulated funds of developed economies that are in search of diversification benefits or eagerly look for higher returns, as named 'return chasers'. Cheung and Ng (1998), observed evidence of long-run co-movements between five national stock market indices and measures of aggregate real activity including the real oil price, real consumption, real money, and real output by employing quarterly stock index and macroeconomic data of Canada, Germany, Italy, Japan, and the US. Long-term relationships between the stock market index and various macroeconomic indicators are commonly investigated. Mookerjee and Naka (1995), on the other hand, show that short-run relationships among these variables exist in the Japanese stock market by employing a VECM in a system of seven equations.

Ajayi and Mougoue (1996), examine the relationship between stock prices and exchange rates by employing a bivariate error-correction model. They study both the short-run and long-run relationships between the two variables in eight major industrial markets. Their results show that an increase in domestic stock prices has a negative short-run effect on the domestic currency value. However, sustained increases in the domestic stock prices in the long-run cause an increase in the domestic currency, due to the increased demand for the currency. Rana, M. S., Anik, T. H., & Biplob, M. N. K. (2019) analyzed in that the exchange rate has significant relationship with International Trade. Muradoglu, Taskin and Bigan (2000), study the causal relationship between macroeconomic variables and stock returns in nineteen emerging markets, including Turkey. They conduct Granger causality tests for each country on a set of selected macroeconomic indicators. They conclude that two-way interaction between stock return and macroeconomic variables derives from the size of the stock markets, and their integration with the world markets, through various measures of financial liberalization by using a multivariate approach.

Ibrahim (2003), obtained results suggesting co-integration between returns and the money supply in the Malaysian stock market. Patra and Poshakwale (2006), examined the short-run dynamic adjustments and the long-run equilibrium relationships between selected macroeconomic variables, trading volume and stock returns in the Greek stock market during the period of 1990 to 1999.Anik, Tanvir & Biplob, Md. Nurul. (2019) specified in their investigation that as macro variables exchange rate and international trade are correlated.

Brahmasrene and Jiranyakul (2007), investigated the relationship between stock market and some macro-economic variables in Thailand. They used Unit root test, Granger causality and Co-integration test. They find that money supply impacted positively the stock market. But after post-financial crisis, industrial production, exchange rate and oil price impacted negatively on stock market. Kasman (2002), used industrial production, inflation, GDP growth and exchange rate as macroeconomic variables for business circle of the economy of Turkish.

She took daily returns, monthly standard deviations of stock returns. She concluded that the volatility measurement indicates upward trend of employment rate and increased economic stability. Chen, Roll and Ross (1986), summarized in their analysis that an equilibrium relationship exists between macroeconomic variables and stock prices. The concluded that the price of asset very sensitive to economic and unanticipated news.

3. Data and Methodology

The aim of study is to investigate the dynamic relation between stock market and macro-economic variables. We used panel data in analysis and we also used OLS (ordinary Least Square) method.

3.1 Data and Data sources

3.1.1 Data

The data used in our research is secondary data. Previous studies stated that advantage of using secondary data such as improvement of the clarity of the problem and the situation surrounding the issues and they can also provide additional information (CWBrodeur et al. 2011). Secondary data means data that are already available i.e., they refer to the data which have already been collected and analyzed by someone else.

Secondary data can be classified into internal and external. Internal secondary data is acquired within the organization where external secondary data is obtained from outside sources such as bank financial statement, annual report, textbooks, journal, articles, past year thesis.

3.1.2 Panel Data

Panel data is defined as the data that was generated from a small number of observations which covering a large number of units. In statistics and economics, multidimensional data also known as the panel data which contained elements of both time series and cross-sectional data. There are several advantages of using panel data, such as (i) they increase the sample considerably, (ii) studying repeated cross-section observation, panel data are better suited to study the dynamics of changes and finally, (iii) panel data enable us to study more complicated behavioral model.

3.1.3 Data Sources

For this analysis, data for period of13years (2003-2015) have been collected from the web sites of Bangladesh bank and IMF where these data are of secondary in nature. In this study, we extracted the data from the web sites of Bangladesh banks. We used the Microsoft Excel (2013) where we arranging it according to the years and variables. The numbers are easily processed due to the convenience and efficiency provided by the software. After arranging the data from excel, we proceed by using it to Eviews (version 7) in order to examine the relationship between these variables and stock market.

3.2 Methodology

3.2.1 The Unit Root Test

The empirical analysis begins with the stationary test of variables of the model where we have applied the standard ADP (Augmented Dickey-Fuller) test to conduct a check whether a variable is stationary or non-stationary manner. It may reflect spurious regression to regress a time series variable on another time series variable applying OLS estimation. Therefore, we need to examine stationary test prior to apply econometric methodology. Stationary is called when a series is found with time invariant mean and variance. On the other hand, a series with time dependent mean is called non-stationary. ADF Unit Root Test is based on the following three regression forms:

1. Without Constant and Trends: $\Delta Y_t = \delta Y_{t-1} + u_t$
2. With Constant : $\Delta Y_t = \alpha + \delta Y_{t-1} + u_t$
3. Without Constant and Trend $\Delta Y_t = \alpha + Bt + \delta Y_{t-1} + u_t$

The Hypothesis is H_0: δ=0 (Unit Root)

H_1: δ≠ 0

Decision rule:

If t* > ADF critical value, ==> not reject null hypothesis, i.e., unit root exists.

If t* < ADF critical value, ==> reject null hypothesis, i.e., unit root does not exist.

After conducting the unit root test, we will forward towards Johansen test of Co-integration followed by error correction Model.

3.2.2 Johansen Co-integration Test

To investigate the long-run relationship of the DSE index and macroeconomic variables as a system of equations, we employed the Johansen Co-integration test. Johansen developed two likelihood ratio tests for testing the number of Co-integration vectors (*r*): the trace test and the maximum Eigenvalue test.

The vector error correction model of Johansen (1991) uses the full information maximum likelihood method and the model aims to:

1. Test whether all variables are integrated of the same order by using unit root tests.

2. Find the truncated lag (*k*) such that the residuals from each equation of the vector error correction model are uncorrelated.

3. Regression DYt against the lagged differences of DY*t* and DY*t-k*. Then estimate the co-integrating vectors from the canonical correlations of the set of residuals from the regression equation using the set of variables in the model.

4. Determine the order of Co-integration using the ltrace and lmax test.

5. Test for the presence of a linear trend, test for linear restrictions on the co-integrating vectors.

6. By using the appropriate co-integrating vector, it determines the long run equilibrium relationship.

4. Analysis and Discussion

4.1 The Unit Root Test

This study uses DSE index, exchange rate, industrial production in and reserve. All data set, obtained from the Central Bank of Bangladesh, data base is monthly and runs from June2003 to June2015. This study aims to identify the dynamic relationships between stock market and macro-economic variables for Bangladesh. When the unit root test results are examined, it is observed that all four series, including DSE Index figures, are not stationary at their own levels. ADF test scores show that all variables are integrated from the first order I (1)). Since all variables are not stationary at their own levels, OLS model is not appropriate to test the relations of this study. VAR model is chosen as the basis to test the relationships between selected macro variables and stock market index figures. We know our null hypothesis is series has unit root, we can see in the below table that after taking first difference according to t statistics (which is greater than 1%,5% and 10% level critical value) and p value (which is less than .05), we can reject the null hypothesis and the data become stationary.

Table: 4.1 Unit root test statistics

Variables	Level t statistics	Level p value	First difference t statistics	First difference p value
DSE index	-1.809854	0.3746	-11.68259	0.0000
Exchange rate	-1.486772	0.5377	-10.29700	0.0000
Industrial production in	0.595883	0.9891	-5.845123	0.0000
Reserve	-0.515731	0.8836	-5.947132	0.0000

Null Hypothesis: LOG(DSE_INDEX) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-1.809854	0.3746
Test critical values:	1% level		-3.474567	
	5% level		-2.880853	
	10% level		-2.577147	

Null Hypothesis: LOG(EXCHANGE_RATE) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-1.486772	0.5377
Test critical values:	1% level		-3.474567	
	5% level		-2.880853	
	10% level		-2.577147	

Null Hypothesis: LOG(INDUSTRIAL_PRODUCTION_IN) has a unit root				
Exogenous: Constant				
Lag Length: 12 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			0.595883	0.9891
Test critical values:	1% level		-3.484198	
	5% level		-2.885051	
	10% level		-2.579386	

Null Hypothesis: LOG(RESERVE) has a unit root				
Exogenous: Constant				
Lag Length: 2 (Automatic - based on SIC, maxlag=13)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-0.515731	0.8836
Test critical values:	1% level		-3.475184	
	5% level		-2.881123	
	10% level		-2.577291	

After taking first difference

Null Hypothesis: D(LOG(DSE_INDEX)) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-11.68259	0.0000
Test critical values:	1% level		-3.474874	
	5% level		-2.880987	
	10% level		-2.577219	

Null Hypothesis: D(LOG(EXCHANGE_RATE)) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-10.29700	0.0000
Test critical values:	1% level		-3.474874	
	5% level		-2.880987	
	10% level		-2.577219	

Null Hypothesis: D(LOG(INDUSTRIAL_PRODUCTION_IN)) has a unit root				
Exogenous: Constant				
Lag Length: 11 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-5.845123	0.0000
Test critical values:	1% level		-3.484198	
	5% level		-2.885051	
	10% level		-2.579386	

Null Hypothesis: D(LOG(RESERVE)) has a unit root				
Exogenous: Constant				
Lag Length: 1 (Automatic - based on SIC, maxlag=13)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-5.947132	0.0000
Test critical values:	1% level		-3.475184	
	5% level		-2.881123	
	10% level		-2.577291	

4.2 Co-integration test

The VAR model is an effective means of characterizing the dynamic interactions among economic variables since it introduces very few restrictions (Lastrapes and Koray, 1990; McMillin, 1991). The use of the VAR model also allows inclusion of the appropriate lag lengths. This is important because of the time delays in the production of information concerning the macroeconomic variables. In particular, the transmission and incorporation of information into stock returns are not always instantaneous. This may be the case because reporting delays may create a lag between the observation of data concerning a macroeconomic variable and the incorporation of that information into stock returns (Abugri, 2006, p. 5). In order to decide what type of VAR model will be used in this study, after determination of unit roots and integration at first order, Johansen Co-integration tests are applied to control whether Co-integration exists among these four variables. Co-integration analysis is important, since if the error term coming from the linear combination of two variables is stationary, then there is Co-integration between the two variables. When there is no Co-integration between the two variables, then there is no long term relationship between two variables.

Table: 4.2 Johansen Co-integration test results

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.215732	57.32978	47.85613	0.0050
At most 1	0.112742	25.49617	29.79707	0.1445
At most 2	0.049356	9.825962	15.49471	0.2944
At most 3	0.024096	3.195291	3.841466	0.0738

Trace test indicates 1 co-integrating eqn(s) at the 0.05 level

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.215732	31.83361	27.58434	0.0133
At most 1	0.112742	15.67020	21.13162	0.2447
At most 2	0.049356	6.630671	14.26460	0.5337
At most 3	0.024096	3.195291	3.841466	0.0738
Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 lev				
1 Co-integrating Equation(s):		Log likelihood	-4184.253	
Normalized co-integrating coefficients (standard error in parentheses)				

DSE_INDEX	EXCHANGE_RATE	INDUSTRIAL_PRODUCTION_IN	RESERVE	
1.000000	1584.687	-1046.188	4.07E-06	
	(420.819)	(203.644)	(8.4E-07)	
2 Co-integrating Equation(s):		Log likelihood	-4176.418	
Normalized co-integrating coefficients (standard error in parentheses)				
DSE_INDEX	EXCHANGE_RATE	INDUSTRIAL_PRODUCTION_IN	RESERVE	
1.000000	0.000000	-132.5438	3.61E-07	
		(34.5456)	(2.3E-07)	
0.000000	1.000000	-0.576546	2.34E-09	
		(0.04938)	(3.2E-10)	

Co-integration analyses have been used to test long run relationships between macroeconomic variables and stock market. This study uses Co-integration analysis not only to test whether there is a long-term relationship between macro variables and stock market, but also to decide specific VAR model to use in adjustment and short-term coefficient estimations. Johansen test is used to test Co-integration among DSE index, Exchange rate, Industrial production in and Reserve by using up to four lags length. The lag length is decided by using Akaike IC. It is seen from Johansen Co-integration test, both Maximum Eigenvalue and Trace tests result in the same decision: there are at most one Co-integration relationships among four variables we study. This means that there is one long-term stable relationship among these four variables. In other words, looking at the information coming from the past changes in DSE index figures and three macroeconomic indicators, it may be concluded that all four variables move together in the long run.

As the four variables are co-integrated we can run the VECM model.

Table: 4.3

Vector Error Correction Estimates				
Date: 11/06/15 Time: 11:18				
Sample (adjusted): 2003M06 2014M04				
Included observations: 131 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
Co-integrating Eq:	CointEq1			
DSE_INDEX(-1)	1.000000			

EXCHANGE_RATE(-1)	1584.687			
	(420.819)			
	[3.76572]			
INDUSTRIAL_PRODUCTION_IN(-1)	-1046.188			
	(203.644)			
	[-5.13733]			
RESERVE(-1)	4.07E-06			
	(8.4E-07)			
	[4.87027]			
c	-45698.59			
Error Correction:	D(DSE_INDEX)	D(EXCHANGE_RATE)	D(INDUSTRIAL_PRODUCTION_IN)	D(RESERVE)
CointEq1	0.017353	3.69E-06	0.000478	-8305.423
	(0.00752)	(1.5E-05)	(0.00012)	(5788.34)
	[2.30746]	[0.24430]	[3.87873]	[-1.43485]
D(DSE_INDEX(-1))	-0.030008	-0.000143	-0.002381	-4315.370
	(0.09429)	(0.00019)	(0.00155)	(72576.2)
	[-0.31824]	[-0.75641]	[-1.54012]	[-0.05946]
D(DSE_INDEX(-2))	-0.081969	-0.000303	-0.002971	-70089.95
	(0.09358)	(0.00019)	(0.00153)	(72029.7)
	[-0.87589]	[-1.61436]	[-1.93667]	[-0.97307]
D(DSE_INDEX(-3))	-0.123485	-7.28E-05	-0.003756	22483.70
	(0.09554)	(0.00019)	(0.00157)	(73532.7)
	[-1.29255]	[-0.37982]	[-2.39837]	[0.30576]
D(DSE_INDEX(-4))	-0.130565	-0.000168	-0.002731	14380.09
	(0.09801)	(0.00020)	(0.00161)	(75440.2)
	[-1.33210]	[-0.85161]	[-1.70002]	[0.19062]
D(EXCHANGE_RATE(-1))	-50.87023	0.074579	-0.052739	40644357
	(46.8331)	(0.09402)	(0.76771)	(3.6E+07)
	[-1.08620]	[0.79322]	[-0.06870]	[1.12755]
D(EXCHANGE_RATE(-2))	4.988433	-0.229487	-0.489884	6706772.
	(46.5820)	(0.09352)	(0.76360)	(3.6E+07)
	[0.10709]	[-2.45398]	[-0.64155]	[0.18706]

D(EXCHANGE_RATE(-3))	23.51673	0.154558	-0.508878	35502514
	(44.0475)	(0.08843)	(0.72205)	(3.4E+07)
	[0.53389]	[1.74784]	[-0.70477]	[1.04719]
D(EXCHANGE_RATE(-4))	-59.62590	-0.105480	-0.211037	4114782.
	(44.0310)	(0.08839)	(0.72178)	(3.4E+07)
	[-1.35418]	[-1.19328]	[-0.29238]	[0.12142]
D(INDUSTRIAL_PRODUCTION_IN(-1))	14.74043	-0.015236	-0.130595	10519609
	(7.48321)	(0.01502)	(0.12267)	(5759709)
	[1.96980]	[-1.01417]	[-1.06461]	[1.82641]
D(INDUSTRIAL_PRODUC TION_IN(-2))	7.151457	-0.008777	0.086031	3363849.
	(7.10922)	(0.01427)	(0.11654)	(5471855)
	[1.00594]	[-0.61494]	[0.73822]	[0.61475]
D(INDUSTRIAL_PRODUCTION_IN(-3))	1.570182	-0.035064	-0.158885	2261858.
	(6.73559)	(0.01352)	(0.11041)	(5184274)
	[0.23312]	[-2.59310]	[-1.43901]	[0.43629]
D(INDUSTRIAL_PRODUCTION_IN(-4))	5.366327	-0.028153	-0.267606	-763154.0
	(5.45363)	(0.01095)	(0.08940)	(4197571)
	[0.98399]	[-2.57137]	[-2.99339]	[-0.18181]
D(RESERVE(-1))	-6.63E-08	-5.17E-10	-5.84E-09	-0.236326
	(1.2E-07)	(2.4E-10)	(2.0E-09)	(0.09373)
	[-0.54469]	[-2.11604]	[-2.92669]	[-2.52140]
D(RESERVE(-2))	3.25E-08	-5.15E-10	-1.30E-09	0.590682
	(1.3E-07)	(2.6E-10)	(2.2E-09)	(0.10127)
	[0.24686]	[-1.95140]	[-0.60044]	[5.83260]
D(RESERVE(-3))	2.26E-07	1.30E-10	3.62E-09	0.254978
	(1.4E-07)	(2.8E-10)	(2.3E-09)	(0.10696)
	[1.62537]	[0.46501]	[1.58972]	[2.38386]
D(RESERVE(-4))	8.04E-08	-1.99E-10	-2.80E-10	0.317899
	(1.4E-07)	(2.7E-10)	(2.2E-09)	(0.10471)
	[0.59108]	[-0.72958]	[-0.12564]	[3.03591]

C	-1.270715	0.388091	2.054166	-360376.4
	(44.7584)	(0.08986)	(0.73370)	(3.4E+07)
	[-0.02839]	[4.31907]	[2.79972]	[-0.01046]
R-squared	0.153041	0.325391	0.452946	0.706945
Adj. R-squared	0.025623	0.223901	0.370646	0.662857
Sum sq. resids	13732880	55.34762	3690.238	8.14E+18
S.E. equation	348.6114	0.699859	5.714628	2.68E+08
F-statistic	1.201092	3.206139	5.503594	16.03486
Log likelihood	-943.0679	-129.4485	-404.5363	-2718.607
Akaike AIC	14.67279	2.251123	6.450935	41.78026
Schwarz SC	15.06786	2.646188	6.846000	42.17533
Mean dependent	28.58111	0.148910	0.670742	1.37E+08
S.D. dependent	353.1653	0.794423	7.203450	4.62E+08
Determinant resid covariance (dofadj.)		1.18E+23		
Determinant resid covariance		6.51E+22		
Log likelihood		-4184.253		
Akaike information criterion		65.04203		
Schwarz criterion		66.71008		

We want to know what p value for each variable is. So to know the p value we use the system equation.

Table: 4.4

Dependent Variable: D(DSE_INDEX)		
Method: Least Squares		
Date: 11/06/15 Time: 11:21		
Sample (adjusted): 2003M06 2014M05		
Included observations: 132 after adjustments		
D(DSE_INDEX) = C(1)*(DSE_INDEX(-1) + 1584.68698671		
*EXCHANGE_RATE(-1) - 1046.18844966*INDUSTRIAL_PRODUCTION_IN(-1) + 4.06992355396E-06*RESERVE(-1) - 45698.5948229) + C(2)*D(DSE_INDEX(-1)) + C(3)*D(DSE_INDEX(-2)) + C(4) *D(DSE_INDEX(-3)) + C(5)*D(DSE_INDEX(-4)) + C(6) *D(EXCHANGE_RATE(-1)) + C(7)*D(EXCHANGE_RATE(-2)) + C(8) *D(EXCHANGE_RATE(-3)) + C(9)*D(EXCHANGE_RATE(-4)) + C(10) *D(INDUSTRIAL_PRODUCTION_IN(-1)) + C(11)*D(INDUSTRIAL_PRODUCTION_IN(-2)) + C(12)*D(INDUSTRIAL_PRODUCTION_IN(-3)) + C(13)*D(INDUSTRIAL_PRODUCTION_IN(-4)) + C(14)*D(RESERVE(-1)) + C(15)*D(RESERVE(-2)) + C(16)*D(RESERVE(-3)) + C(17) *D(RESERVE(-4)) + C(18)		

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.016175	0.007501	2.156303	0.0332
C(2)	-0.025817	0.094618	-0.272854	0.7855
C(3)	-0.067666	0.093376	-0.724668	0.4701
C(4)	-0.120723	0.095893	-1.258931	0.2106
C(5)	-0.139110	0.098206	-1.416512	0.1594
C(6)	-54.53561	46.94274	-1.161748	0.2478
C(7)	7.539144	46.72952	0.161336	0.8721
C(8)	19.26780	44.11368	0.436776	0.6631
C(9)	-57.41054	44.17588	-1.299590	0.1964
C(10)	13.73416	7.477070	1.836837	0.0688
C(11)	6.851277	7.134017	0.960367	0.3389
C(12)	2.553177	6.724318	0.379693	0.7049
C(13)	5.515040	5.474143	1.007471	0.3158
C(14)	-8.22E-08	1.22E-07	-0.675634	0.5006
C(15)	2.04E-09	1.30E-07	0.015665	0.9875
C(16)	2.13E-07	1.39E-07	1.531204	0.1285
C(17)	9.64E-08	1.36E-07	0.708543	0.4801
C(18)	0.992627	44.90533	0.022105	0.9824
R-squared	0.140202	Mean dependent var		27.33140
Adjusted R-squared	0.011986	S.D. dependent var		352.1076
S.E. of regression	349.9911	Akaike info criterion		14.67982
Sum squared resid	13964287	Schwarz criterion		15.07293
Log likelihood	-950.8679	Hannan-Quinn criter.		14.83956
Durbin-Watson stat	2.013324			

In the above we can derive the residual of the co-integrating equation when DSE index is the dependent variables. Here C(1) = Speed of adjustment towards long run equilibrium but it must be significant and the sign must be negative. In above we can see it is significant that's mean the p value is less than .05 but the coefficient sign is not negative. So we can say there are no long run causality from the three independent variables such as Exchange rate, Industrial production in and Reserve. Exchange rate, Industrial production in and Reserve have no influence on the dependent variables such as DSE index in the long run. In other word, there is no long run causality running from Exchange rate, Industrial production in, Reserve and DSE index. And there is also no short run relation going from the three independent variables such as Exchange rate, Industrial production in and Reserve.

Table: 4.5

Dependent Variable: D(EXCHANGE_RATE)				
Method: Least Squares				
Date: 11/06/15 Time: 11:23				
Sample (adjusted): 2003M06 2014M05				
Included observations: 132 after adjustments				
D(EXCHANGE_RATE) = C(19)*(DSE_INDEX(-1) + 1584.68698671 *EXCHANGE_RATE(-1) - 1046.18844966*INDUSTRIAL_PRODUCTIO N_IN(-1) + 4.06992355396E-06*RESERVE(-1) - 45698.5948229) + C(20)*D(DSE_INDEX(-1)) + C(21)*D(DSE_INDEX(-2)) + C(22) *D(DSE_INDEX(-3)) + C(23)*D(DSE_INDEX(-4)) + C(24) *D(EXCHANGE_RATE(-1)) + C(25)*D(EXCHANGE_RATE(-2)) + C(26) *D(EXCHANGE_RATE(-3)) + C(27)*D(EXCHANGE_RATE(-4)) + C(28) *D(INDUSTRIAL_PRODUCTION_IN(-1)) + C(29)*D(INDUSTRIAL_PRO DUCTION_IN(-2)) + C(30)*D(INDUSTRIAL_PRODUCTION_IN(-3)) + C(31)*D(INDUSTRIAL_PRODUCTION_IN(-4)) + C(32)*D(RESERVE(-1)) + C(33)*D(RESERVE(-2)) + C(34)*D(RESERVE(-3)) + C(35) *D(RESERVE(-4)) + C(36)				
	Coefficient	Std. Error	t-Statistic	Prob.
C(19)	2.93E-06	1.49E-05	0.196140	0.8448
C(20)	-0.000140	0.000189	-0.745204	0.4577
C(21)	-0.000294	0.000186	-1.580741	0.1167
C(22)	-7.11E-05	0.000191	-0.371963	0.7106
C(23)	-0.000173	0.000196	-0.884396	0.3783
C(24)	0.072224	0.093537	0.772145	0.4416
C(25)	-0.227848	0.093112	-2.447034	0.0159
C(26)	0.151829	0.087900	1.727297	0.0868
C(27)	-0.104057	0.088024	-1.182143	0.2396
C(28)	-0.015882	0.014899	-1.066028	0.2887
C(29)	-0.008969	0.014215	-0.630981	0.5293
C(30)	-0.034433	0.013399	-2.569854	0.0115
C(31)	-0.028057	0.010908	-2.572244	0.0114
C(32)	-5.28E-10	2.43E-10	-2.175238	0.0317
C(33)	-5.35E-10	2.59E-10	-2.061805	0.0415
C(34)	1.22E-10	2.77E-10	0.438244	0.6620
C(35)	-1.89E-10	2.71E-10	-0.696920	0.4873
C(36)	0.389545	0.089477	4.353565	0.0000

R-squared	0.324530	Mean dependent var		0.147452
Adjusted R-squared	0.223802	S.D. dependent var		0.791562
S.E. of regression	0.697383	Akaike info criterion		2.243160
Sum squared resid	55.44311	Schwarz criterion		2.636269
Log likelihood	-130.0486	Hannan-Quinn criter.		2.402902
Durbin-Watson stat	1.945837			

In the above we can derive the residual of the co-integrating equation when Exchange rate is the dependent variables. Here C(19) = Speed of adjustment towards long run equilibrium but it must be significant and the sign must be negative. In above we can see it is neither significant that's mean the p value is greater than .05 nor the sign of coefficient is negative. So we can say there are no long run causality from the three independent variables such as DSE index, Industrial production in and Reserve. DSE index, Industrial production in and Reserve have no influence on the dependent variables such as Exchange rate in the long run. In other word, there is no long run causality running from DSE index, Industrial production in, Reserve and Exchange rate. And there is no short run relation going from DSE index, Industrial production in and Reserve to Exchange rate except C (25), C (30), C (31), C (32) and C (33).

Table: 4.6

Dependent Variable: D(INDUSTRIAL_PRODUCTION_IN)		
Method: Least Squares		
Date: 11/06/15 Time: 11:24		
Sample (adjusted): 2003M06 2014M04		
Included observations: 131 after adjustments		
D(INDUSTRIAL_PRODUCTION_IN) = C(37)*(DSE_INDEX(-1) + 1584.68698671*EXCHANGE_RATE(-1) - 1046.18844966 *INDUSTRIAL_PRODUCTION_IN(-1) + 4.06992355396E-06 *RESERVE(-1) - 45698.5948229) + C(38)*D(DSE_INDEX(-1)) + C(39) *D(DSE_INDEX(-2)) + C(40)*D(DSE_INDEX(-3)) + C(41) *D(DSE_INDEX(-4)) + C(42)*D(EXCHANGE_RATE(-1)) + C(43) *D(EXCHANGE_RATE(-2)) + C(44)*D(EXCHANGE_RATE(-3)) + C(45) *D(EXCHANGE_RATE(-4)) + C(46)*D(INDUSTRIAL_PRODUCTION_IN (-1)) + C(47)*D(INDUSTRIAL_PRODUCTION_IN(-2)) + C(48) *D(INDUSTRIAL_PRODUCTION_IN(-3)) + C(49)*D(INDUSTRIAL_PRO DUCTION_IN(-4)) + C(50)*D(RESERVE(-1)) + C(51)*D(RESERVE(-2)) + C(52)*D(RESERVE(-3)) + C(53)*D(RESERVE(-4)) + C(54)		

	Coefficient	Std. Error	t-Statistic	Prob.
C(37)	0.000478	0.000123	3.878725	0.0002
C(38)	-0.002381	0.001546	-1.540123	0.1263
C(39)	-0.002971	0.001534	-1.936669	0.0553
C(40)	-0.003756	0.001566	-2.398371	0.0181
C(41)	-0.002731	0.001607	-1.700017	0.0919
C(42)	-0.052739	0.767713	-0.068696	0.9454
C(43)	-0.489884	0.763598	-0.641548	0.5225
C(44)	-0.508878	0.722051	-0.704767	0.4824
C(45)	-0.211037	0.721781	-0.292384	0.7705
C(46)	-0.130595	0.122669	-1.064613	0.2893
C(47)	0.086031	0.116538	0.738222	0.4619
C(48)	-0.158885	0.110413	-1.439005	0.1529
C(49)	-0.267606	0.089399	-2.993393	0.0034
C(50)	-5.84E-09	2.00E-09	-2.926688	0.0041
C(51)	-1.30E-09	2.16E-09	-0.600443	0.5494
C(52)	3.62E-09	2.28E-09	1.589716	0.1147
C(53)	-2.80E-10	2.23E-09	-0.125644	0.9002
C(54)	2.054166	0.733704	2.799722	0.0060
R-squared	0.452946	Mean dependent var		0.670742
Adjusted R-squared	0.370646	S.D. dependent var		7.203450
S.E. of regression	5.714628	Akaike info criterion		6.450935
Sum squared resid	3690.238	Schwarz criterion		6.846000
Log likelihood	-404.5363	Hannan-Quinn criter.		6.611468
Durbin-Watson stat	2.198901			

In the above we can derive the residual of the co-integrating equation when Industrial production in is the dependent variables. Here C (37) = Speed of adjustment towards long run equilibrium but it must be significant and the sign must be negative. In above we can see it is significant that's mean the p value is less than .05 but the coefficient sign is not negative. So we can say there are no long run causality from the three independent variables such as DSE index, Exchange rate, and Reserve. Meaning that DSE index, Exchange rate, and Reserve have no influence on the dependent variables such as Industrial production in the long run. In other word, there is no long run causality running from DSE index, Exchange rate, Reserve and Industrial production in. And there is no short run going from DSE index, Exchange rate and Reserve to Industrial production in except C (40), C (49) and C (50).

Table:4.7

Dependent Variable: D(RESERVE)				
Method: Least Squares				
Date: 11/06/15 Time: 11:25				
Sample (adjusted): 2003M06 2014M05				
Included observations: 132 after adjustments				
D(RESERVE) = C(55)*(DSE_INDEX(-1) + 1584.68698671 *EXCHANGE_RATE(-1) - 1046.18844966*INDUSTRIAL_PRODUCTIO N_IN(-1) + 4.06992355396E-06*RESERVE(-1) - 45698.5948229) + C(56)*D(DSE_INDEX(-1)) + C(57)*D(DSE_INDEX(-2)) + C(58) *D(DSE_INDEX(-3)) + C(59)*D(DSE_INDEX(-4)) + C(60) *D(EXCHANGE_RATE(-1)) + C(61)*D(EXCHANGE_RATE(-2)) + C(62) *D(EXCHANGE_RATE(-3)) + C(63)*D(EXCHANGE_RATE(-4)) + C(64) *D(INDUSTRIAL_PRODUCTION_IN(-1)) + C(65)*D(INDUSTRIAL_PRO DUCTION_IN(-2)) + C(66)*D(INDUSTRIAL_PRODUCTION_IN(-3)) + C(67)*D(INDUSTRIAL_PRODUCTION_IN(-4)) + C(68)*D(RESERVE(-1)) + C(69)*D(RESERVE(-2)) + C(70)*D(RESERVE(-3)) + C(71) *D(RESERVE(-4)) + C(72)				
	Coefficient	Std. Error	t-Statistic	Prob.
C(55)	-8556.722	5729.362	-1.493486	0.1381
C(56)	-3421.161	72266.39	-0.047341	0.9623
C(57)	-67038.43	71318.04	-0.939993	0.3492
C(58)	23073.08	73240.82	0.315030	0.7533
C(59)	12556.92	75007.07	0.167410	0.8673
C(60)	39862302	35853645	1.111806	0.2686
C(61)	7250998.	35690792	0.203162	0.8394
C(62)	34595951	33692883	1.026803	0.3067
C(63)	4587456.	33740393	0.135963	0.8921
C(64)	10304909	5710792.	1.804462	0.0738
C(65)	3299801.	5448777.	0.605604	0.5460
C(66)	2471593.	5135859.	0.481242	0.6313
C(67)	-731424.2	4181008.	-0.174940	0.8614
C(68)	-0.239719	0.092958	-2.578802	0.0112
C(69)	0.584187	0.099464	5.873327	0.0000
C(70)	0.252265	0.106325	2.372596	0.0193
C(71)	0.321315	0.103940	3.091348	0.0025
C(72)	122535.8	34297525	0.003573	0.9972

R-squared	0.707092	Mean dependent var	1.35E+08
Adjusted R-squared	0.663413	S.D. dependent var	4.61E+08
S.E. of regression	2.67E+08	Akaike info criterion	41.77187
Sum squared resid	8.15E+18	Schwarz criterion	42.16498
Log likelihood	-2738.943	Hannan-Quinn criter.	41.93161
Durbin-Watson stat	1.906759		

In the above we can derive the residual of the co-integrating equation when Reserve is the dependent variables. Here C (55) = Speed of adjustment towards long run equilibrium but it must be significant and the sign must be negative. In above we can see it is not significant that's mean the p value is greater than .05 but the coefficient sign is negative. So we can say there are no long run causality from the three independent variables such as DSE index, Exchange rate and Industrial production in. Meaning that DSE index, Exchange rate and Industrial production in have no influence on the dependent variables such as Reserve in the long run. In other word, there is no long run causality running from DSE index, Exchange rate, Industrial production in and Reserve. And there is no short run going from DSE index, Exchange rate and Industrial production in to Reserve except C (68).

5. Findings, Recommendations and Conclusion

5.1 Major study findings

Our regression model (**table 4.4**) where we take DSE index as dependent variables presents the output of the Ordinary Least Square (OLS) method to show the dynamic relation between stock market and macroeconomic variables. We can see that **R-square** is .140202 or 14.02% which is less than 60%. So it is not a good sign for this model. It indicates that the three independent variables can explain about 14.02% variability of dependent variable i.e. DSE Index. The **adjusted R-square** is also below 60% which is not a good sign at all. We know C (1)) is the speed of adjustment towards long run equilibrium and C (2) to C (18) are short run equilibrium. And we also know if the coefficient of C (1) is negative and the p value is less than .05 then it calls significant that means there is a long run relationship. Here we found the coefficient of C (1) is positive but the p value is less than .05, it doesn't fulfill the two criteria of significance.

So that we can say there is no long run relation going from Exchange rate, Industrial production in and Reserve to DSE index. And there is no short run going from Exchange rate, Industrial production in and Reserve to DSE index. It is not a good sign because we know at least 50% of the independent variables should be statistically significant with dependent variable.

Our regression model (**table 4.5**) where we take Exchange rate as dependent variables presents the output of the Ordinary Least Square (OLS) method to show the dynamic relation between stock market and macroeconomic variables. We can see that **R-square** is .324530 or 32.45% which is less than 60%. So it is not a good sign for these model. It indicates that the three independent variables can explain about 32.45% variability of dependent variable i.e. Exchange rate. The **adjusted R-square** is also below 60% which is not a good sign at all.

We know C (19)) is the speed of adjustment towards long run equilibrium and C (20) to C(36) are short run equilibrium. And we also know if the coefficient of C (19) is negative and the p value is less than .05 then it calls significant that means there is a long run relationship. Here we found the coefficient of C (19) is positive and the p value is greater than .05, it doesn't fulfill the two criteria of significance. So that we can say there is no long run relation going from DSE index, Industrial production in and Reserve to Exchange rate. And there is no short run relation going from DSE index, Industrial production in and Reserve to Exchange rate except (C(25) which is a lag of Exchange rate), (C(30), C(31) which are lag of Industrial production in), (C(32), C(33) which are lag of Reserve). It is not a good sign because we know at least 50% of the independent variables should be statistically significant with dependent variable.

Our regression model (**table 4.6**) where we take Industrial production in as dependent variables presents the output of the Ordinary Least Square (OLS) method to show the dynamic relation between stock market and macroeconomic variables. We can see that **R-square** is .452946 or 45.29% which is less than 60%. So it is not a good sign for these model. It indicates that the three independent variables can explain about 45.29% variability of dependent variable i.e. Industrial production in. The **adjusted R-square** is also below 60% which is not a good sign at all. We know (C (37)) is the speed of adjustment towards long run equilibrium and C (38) to C(54) are short run equilibrium. And we also know if the coefficient of C (38) is negative and the p value is less than .05 then it calls significant that means there is a long run relationship. Here we found the coefficient of C (38) is positive but the p value is less than .05, it doesn't fulfill the two criteria of significance.

So that we can say there is no long run relation going from DSE index, Exchange rate and Reserve to Industrial production in. And there is no short run going from DSE index, Exchange rate and Reserve to Industrial production in except (C(40) which is a lag of DSE index), (C(49) which is a lag of Industrial production in), (C(50) which is a lag of Reserve). It is not a good sign, because we know at least 50% of the independent variables should be statistically significant with dependent variable. Our regression model (**table 4.7**) where we take Reserve as dependent variables presents the output of the Ordinary Least Square (OLS) method to show the dynamic relation between stock market and macroeconomic variables. We can see that **R-square** is .707092 or 70.71% which is greater than 60%. So it is a good sign for this model. It indicates that the three independent variables can explain about 70.71% variability of dependent variable i.e. Reserve. The **adjusted R-square** is also above 60% which is a good sign.

We know C (55)) is the speed of adjustment towards long run equilibrium and C (56) to C(72) are short run equilibrium. And we also know if the coefficient of C (55) is negative and the p value is less than .05 then it calls significant that means there is a long run relationship. Here we found the coefficient of C (55) is negative but the p value is greater than .05, it doesn't fulfill the two criteria of significance. So that we can say there is no long run relation going from DSE index, Exchange rate and Industrial production in to Reserve. And there is no short run going from DSE index, Exchange rate and Industrial production in to Reserve except C (68) which is a lag of Reserve). It is not a good sign because we know at least 50% of the independent variables should be statistically significant with dependent variable.

5.2 Recommendation

We should take the followings measures to overcome the limitation of this model

- We use monthly data of this model; we should use quarterly or yearly data for significant result of this model.
- We only use four variables (DSE index, Exchange rate, Industrial production in and Reserve), we should use more variables for significant result of this model.

5.3 Conclusions

This paper analyzes long-term equilibrium relationships between a group of macroeconomic variables and the stock market. The macroeconomic variables are represented by DSE index, Exchange rate, Industrial production in and Reserve, model is employed to avoid potential misspecification biases that might result from the use of a more conventional vector auto regression modeling technique. All of the new research in this area has focused on industrial countries, with relatively little attention paid to developing countries. Accordingly, I believe that this paper will add to our understanding as to whether similar empirical results are observed in developing countries. In addition, these findings may have important policy implications because they could be crucial in areas such as the design of stabilization and adjustment programs.

The Johansen Co-integration test indicates that there exists a long run relationship between stock market and the macroeconomic variables tested. The empirical evidence shows that these macroeconomic variables are co-integrated i.e. there exists a co-integrating relation among the variables. After conducting VECM, we find there is no long run relationship among those variables and stock market. Analysis of the results indicates that this Co-integration relationship is consistent with the earlier findings, and the signs of the variables are also consistent with the earlier studies.

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