

Impact of Macroeconomic Variables on the Stock Market Returns in Bangladesh: Evidence from Dhaka Stock Exchange (DSE)

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ABSTRACT: *The purpose of the study is to determine whether the macroeconomic factors have an impact on stock market performance in Bangladesh. For this empirical analysis, time series data have been collected starting from January 2013 to December 2020. I have selected four macroeconomic variables which are interest rate, inflation rate, exchange rate and money supply. DSEX index has been used as a proxy for stock market return which is the dependent variable. In the analysis part, several statistical models are used. To ensure that statistical analysis does not depict any forged results this study used the Augmented Dickey Fuller test to check whether the selected variables have unit root or not. Later, Johansen's Co-integration test is used to find out whether the variables are co-integrated or not. Finally, the Vector Error Correction Model is used to find out the long run causality and short run causality between selected variables. The reasons for this insignificant model can be the trend or rumor driven investment tendency of investors and inefficient form of institutional infrastructure. Despite having very weak long run and short run causal relationship among variables, this project paper will help astute investors and policy makers in effective decision-making regarding Bangladesh stock markets.*

Keywords: *Broad Money, Dhaka Stock Exchange Limited, Granger Causality, Interest rate, Macroeconomic variables, Stock market, Vector Error Correction Model.*

1. INTRODUCTION

It is recognized that stock market play a pivotal role in growing industries and commerce of a country that eventually affect the economy. The

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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 (Islam and Habib, 2016) . 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 (Auzairy, Ahmad and Ho, 2011). Macroeconomic indicators such a compositions of data which frequently used by the policy makers and investors to gathering knowledge for current and upcoming investment priority.

The issue whether the stock market performance leads or follows economic activity is now becoming very controversial in Bangladesh as the stock market has gained much attraction in the last few years (Filipe Chauque and AP Rayappan, 2018). Almost all the indicators such as market capitalization, trading volume, turnover and the market index have shown tremendous growth, although it has volatility. In this end, how does and at what extent the stock market returns of Bangladesh respond to the changes in macroeconomic determinants remains an open empirical question (Alam, 2020). Understanding the main macroeconomic variables, which may impact the Bangladesh stock market index, with the recent data could be helpful for policy makers, investors and all other stakeholders.

1.1 Statement of the Problem

Investment in the stock market is very interesting as well as risky among all other available investment vehicles. The stock market in Bangladesh has experienced rapid fluctuations and extreme downfall in the year of 1996 and 2010. From then policy-makers and researchers are finding the reasons behind the stock market fluctuation relentlessly. As the stock market performance affects the economic progress of a nation many researchers have tried to find out the driving factors behind the changes in performance.

1.2 Objectives of the Project Paper

- To identify the macroeconomic variables that have an impact on stock market performance.
- To determine the extent to which macroeconomic variables affects stock market return.
- To gain a proper understanding of the relationship between macroeconomic variables and stock market return by using the Vector Error Correction Model.
- To see whether the dependent variable (DSEX) causes independent variables used in the report through Granger Causality test.
- To see whether independent variables cause dependent variable (DSEX) through Granger Causality test.

A detailed review of the literature would provide a framework for the study and serves as a linkage of previous findings to the general problem of the current study, helps in establishing the theories that are relevant to the study being undertaken, and assists in developing an appropriate research methodology and research procedure for the study.

2. LITERATURE REVIEW

2.1 Research Conducted Outside of Bangladesh

The relationship between monthly stock returns and inflation was studied by Nelson (1976) from 1953 to 1974 using US economic data and he found a negative relationship between stock return and inflation. Later this same conclusion regarding the negative relationship between stock return and inflation was given by Fama (1981, 1982), Geske and Roll (1983), Gallagher and Taylor (2002). Marshall (1992) concluded that real economic fluctuations and monetary policy fluctuations are the main reasons behind the negative relationship between inflation and stock return. In 1992, Bahmani-Oskooee and Sohrabian combined study on a topic named “Impact of Macroeconomic Variables on Stock Market” using macroeconomic variables S&P 500 index and US dollar exchange rate.

Bahmani (1992) concludes that this research found out that bidirectional causality exists between the variables used but there was no long run relationship. Later, in 1995 Mukherjee and Naka conducted a research on “Relationship between stock market returns and the main macroeconomic variables”. The relationship between the return of the

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Japanese stock market and several macroeconomic variables like interest rate, money supply, inflation rate, exchange rate, industrial production index was examined by Mukherjee and Naka (1995) and they had shown a closely co-integrated relationship between these variables. Ibrahim and Aziz investigated four macroeconomic variables to identify their impact on stock market return in the context of Malaysia. They used an auto-regression model and found a long run relationship between these variables. Gunasekarage et al. (2004) analyzed the fundamental relationship between stock return and five macroeconomic variables and found a minor impact of five macroeconomic variables on stock market return. Kizys and Pierdzioch (2009) recognized that macroeconomic variables affect both domestic and international stock markets simultaneously. The impact of macroeconomic variables on stock market return was investigated by Chen (2007) using Markov-switching models and he used the monthly return of the S&P 500 index as the dependent variable and specific macroeconomic variables as independent variables.

He concluded that macroeconomic variables exert an asymmetric effect on stock return. Later, Ivrendi and Guloglu (2012) conducted their research and complied with the same conclusion as Chen. In December, 2015, three researchers: Mahmoud Ramadan Barakat, Sara H. Elgazzar and Khaled M. Hanafy conducted a study named "Impact of Macroeconomic Variables on Stock Markets: Evidence from Emerging Markets X. According to Bahmani, (1992), they used few variables including CPI, interest rate, exchange rate and money supply. In their study, what they found is that all the macro economic variables are co integrated in both of the countries

2.2 Research Conducted in Bangladesh

In the context of Bangladesh there are a few studies related to the impact of macroeconomic variables on stock market return. The relationship between stock prices and exchange rates was investigated by one Bangladeshi researcher Rahman Uddin (2009) for the period of 2003 to 2008. He claimed in his studies that there is no co-integrating relationship between these variables using the Granger causality test. Later the relationship between stock prices and selective macroeconomic variables like M1, M2, inflation, exchange rate and interest rate were examined by another Bangladeshi researcher Afzal and Hossain (2011) and he found that there exists co-integration between stock prices with M1, M2 and inflation Rate that indicates the long run relationship. They used the time frame from 2003 to 2011 and used the co-integration test and Granger causality test to identify the relationship. This study also showed a causal

relationship between stock market return with money supply M1 and exchange rate in the short run. Another study regarding the impact of macroeconomic variables on stock market return was investigated by Ali (2011). He found no causal relationship between stock return with the inflation rate, GDP, CPI, export receipt interest rate investment, industrial production index, lending interest rate and national income deflator and bilateral causal relationship between stock market return and exchange rate. In December 2013, Mahedi Masduzzaman did a research “Impact of Macroeconomic Variables on the Stock Market Returns in Bangladesh: Does a Meaningful Impact Exist?” Several variables were used- CPI, exchange rate, broad money supply, industrial production and interest rate. Masduzzaman (2013), performed Johansen Co-integration tests which found out that there was long run relationship between macro variables and stock prices.

3. RESEARCH DATA AND METHODOLOGY

This study used secondary data on monthly basis starting from January 2013 to December 31, 2018, a total of 72 observations. This study used four macroeconomic variables which are interest rate, inflation rate, exchange rate and money supply. DSEX index has been used as a proxy for stock market return which is the dependent variable for this empirical analysis.

Data Collection

Summary of the key variables used for analysis is given below:

Table 01: Information on operational variables.

Variables	Symbol	Units	Explanation
Stock Market Index	DSEX	%	Return from DSE broad index (DSEX)
Interest rate	INT	%	Scheduled Banks’ weighted average interest rate
Inflation	INF	%	Rate of Inflation in Bangladesh
Money Supply	M2	Crone Taka	M2 includes coins, notes and other money equivalents
Foreign exchange	EXG	Taka	National Currency per US Dollar, Period average

Source: Author

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Data Analysis of the Study

Data used in this study are all quantitative data, so quantitative approaches have been used.

- A descriptive as log normal which means “log” is normal. analysis based on the raw data has been generated by using E Views 9 and then tabulated indicating mean, mode, median, minimum values, maximum values etc.
- A graphical representation of the data has been presented.
- The stationary test has been performed for Unit Root by using the Augmented Dickey Fuller test in E Views 9. Different models have been used based on whether data is stationary at level, at the first difference, or second difference.
- A pair wise correlation matrix has also been tested to see whether there is any multi co linearity problem or not.
- Johansen’s Co-integration Test will be performed to find out whether the variables like interest rate, inflation rate, exchange rate, money supply, stock index return are integrated and also the linear combination of these variables are integrated.
- If all the variables are non-stationary at level but stationary at the first difference and all the variables have co-integration among themselves, the Vector Error Correction Model has applied to find long run relationship among variables.
- Then data has been transformed into logarithm form as most of the statistics models require data to be linear. The data set has been used as log normal which means “log” is normal.

Model Specification for the Study

The appropriate models for data analysis have been chosen based on whether the collected data of the chosen variable are stationary, co-integrated and whether there is multi co linearity problem, causality and hetero elasticity among the variables.

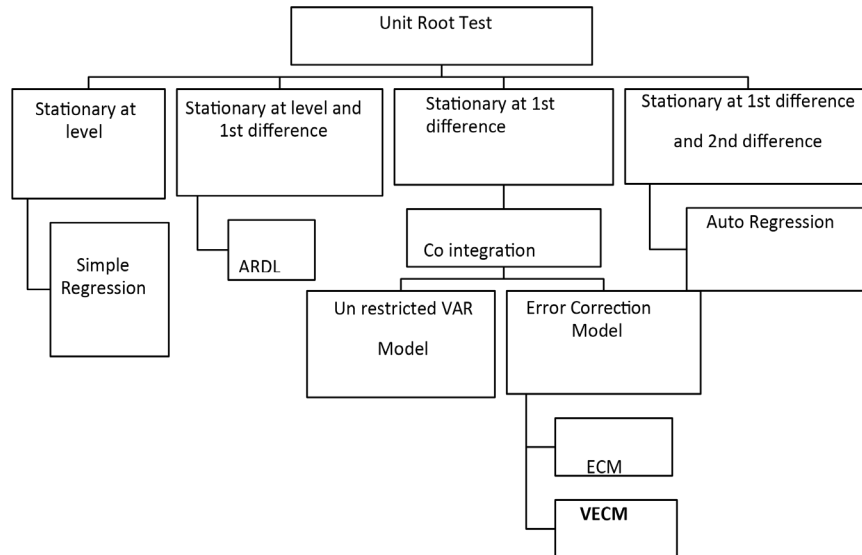


Figure 01: Summary of statistical model selection based on data stationary.

Definition of Key variables:

DSE Broad Index (DSEX): A stock market index like DSEX index is the statistical indicator that measures the change in the market value of selected sets of stocks. I have calculated the index return using the following formula: $(\text{Index Return } R_t = (P_t / P_{t-1}) - 1)$. Interest Rate: This study will use the weighted average rate of interest of a scheduled bank as a proxy of interest rate. It is the rate of interest that is given to the depositors for the deposit. Inflation Rate: Inflation is measured with the consumer price index.

For this study I will take the monthly average rate of inflation which is measured by the Consumer Price Index (CPI). Exchange Rate: Exchange rate is the rate at which one country’s currency is exchanged for another country’s currency. For this study I will take the monthly average national currency per US dollar as a proxy of the exchange rate. Broad Money Supply (M2): Broad money (M2) includes not only physical assets but also highly liquid assets. For empirical analysis, I will take M2 as a representative of the money supply and converted the original data into the logarithm form.

4. DATA ANALYSIS

In this data analysis I have conducted the Augmented Dickey Fuller test, Johansen’s Co- integration test, Vector Error Correction Model and also

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residual diagnosis to find out the long run causality and short run causality between selected variables and stock market return. Descriptive statistics are broken down into measures of central tendency and measures of variability or spread. The following table shows the summary of the raw data;

Table 02: Descriptive Statistics of the variables.

Particulars	DSEX	EXG	INF	INT	M2
Mean	8.479894	4.373455	-2.778542	-2.75296	13.62754
Median	8.463147	4.361824	-2.797	-2.76865	13.637
Maximum	8.749393	4.429626	-2.604	-2.44415	13.96
Minimum	8.142906	4.348987	-2.922	-3.02826	13.24
Std. Dev.	0.137712	0.026494	0.104387	0.207265	0.208451
Skewness	0.014065	1.122298	0.37037	0.192323	-0.144622
Kurtosis	2.432663	2.745495	1.739244	1.482838	1.834141
Jarque-Bera	0.967987	15.30896	6.414609	7.349204	4.32867
Probability	0.616317	0.000474	0.040466	0.025359	0.114826
Sum	610.5524	314.8888	-200.055	-198.213	981.183
Sum Sq. Dev.	1.346481	0.049836	0.773668	3.050071	3.085074
Observations	72	72	72	72	72

Source: Output from EViews9

The above stated table shows the summary statistics of the variables that is necessary to know the pattern of the data. The result of the skewness how that the data of DSEX, exchange rate, inflation rate, interest rate and broad money supply are normally distributed. Again, as the values of kurtosis are less than 3, all the data have normal skewness.

Pair wise Correlation Matrix between Variables

Pair wise correlation matrix has been formed to see whether there is any multi co linearity problem in the data set (Eberly College, 2009). the hypothesis has been formed:

H0: There is multi co linearity problem between two independent variables.
H1: There is no multi co linearity problem between two independent variables.

Table 03: Pair wise Co relation Matrix.

	logDSEX	logEXG	logINF	logINT	logM2
logDSEX	1				
logEXG	0.680692 0.00	1			
logINF	-0.609632 0.00	-0.650041 0	1		
logINT	-0.802296 0.00	-0.666493 0.00	0.894648 0.00	1	
logM2	0.837972 0.00	0.79505 0.00	-0.808178 0.00	-0.95286 0.00	1

Source: E Views 9 Output

Table 3 shows the pair-wise correlation matrix presented above has been performed using E views 9 at a 5% significance level. The first value of each cell indicates the correlation between variables and the second value indicates the P-value. The above table indicates that the P-values of the chosen variables are less than alpha (5%) which means that there is a *significant relationship (means the correlation is different from zero)* between four pairs of independent variables. It means that the null hypothesis can't be rejected and thus there is a multi co linearity problem among the independent variables (MAHZABIN,2016).

Unit Root Test of the Variables (Augmented Dickey Fuller Test)

In order to identify whether the selected variables are stationary or non-stationary, I have conducted the Augmented Dickey Fuller Test. The hypothesis of this test is given below:

Null Hypothesis, H0: There is unit root in the variable or variable is not stationary.
Alternate Hypothesis, H1: There is no unit root in the variable or variable is stationary.

If the test statistics is more than the critical value and p value is less than 5%, the null hypothesis is rejected and the alternate hypothesis is accepted. If the critical value is more than the test statistics and p value is greater than 5%, the null hypothesis is accepted and the alternate

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hypothesis is rejected. All hypotheses are tested at 10% level of significance. The summary result of the Augmented Dickey Fuller test is given below:

Table 04: Augmented Dickey Fuller Test Result.

Variables			DSEX	Interest	Inflation	Exchange rate	M2
Level	Trend	T Statistics	-1.561	-1.478	-0.670	0.6608	-1.357
		P Value	0.4973	0.539	0.8469	0.9904	0.598
	Trend and Intercept	T Statistics	-2.560	-0.616	-2.832	-2.050	-3.224
		P Value	0.2995	0.975	0.1911	0.5639	0.0881
Stationary at level			No	No	No	No	No
First Difference	Trend	T Statistics	-8.347	-2.922	-4.459	-5.269	-10.072
		P Value	0	0.0481	0.0006	0	0.0001
	Trend and Intercept	T Statistics	-8.424	-3.218	-4.555	-5.833	-10.215
		P Value	0	0.0897	0.0026	0	0
Stationary at First Difference			Yes	Yes	Yes	Yes	Yes

Source: Output from EViews9

From the above result, it can be seen that the p value of level data in both intercept criteria and intercept plus trend criteria is more than 5% significance level. So, the null hypothesis is not rejected and the conclusion is that the variables have unit root and data are not stationary at level. On the other hand, the p value of first difference data in both intercept criteria and intercept plus trend criteria is less than a 5% significance level. So, the null hypothesis is rejected and the alternate hypothesis is accepted. Therefore, the conclusion of the Augmented Dickey Fuller test Result is that all the variables-logDSEX, logINT, logNF, logEXG and logM2 are non- stationary at level and stationary at first difference. As all the variables are stationary at first difference, I will conduct the Vector Error Correction Model for analysis.

Johansen's Co-integration Test Result

The precondition for running Johansen's Co-integration test and VECM is that the data must be non-stationary at level and stationary at first difference. As the Augmented Dickey Fuller test, shows that the variables under the study have this property so further analysis can be preceded.

Trace Statistics:

In order to identify the co-integration among variables two statistics is uses such as Trace Statistics and Max-Eigen Statistics. T he hypothesis for trace statistics is given below:

Null Hypothesis, H0: The variables have no co-integration among themselves
Alternate Hypothesis, H1: The variables have co-integration among themselves

Table 05: Output of Johansen Co-integration test (Trace Statistics).

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.398653	77.26517	69.81889	0.0113
At most 1	0.320895	41.66436	47.85613	0.1683
At most 2	0.141648	14.57584	29.79707	0.8068
At most 3	0.053239	3.883955	15.49471	0.9127
At most 4	0.000777	0.054377	3.841466	0.8156

Source: EViews9

From the above table, it can be seen that, the p-value is less than 5% when there is no co- integrated equation, the null hypothesis is rejected and the alternate hypothesis is accepted. So, there exists co-integration among variables. Again, the p-value is greater than 5% when there is at most 1 co integrated equation, the null hypothesis is not rejected in this case. So, the conclusion of this trace statistics indicates 1 co-integrated equation at a 5% significance level.

Max-Eigen Statistics:

Null Hypothesis, H0: The variables have no co-integration among themselves
Alternate Hypothesis, H1: The variables have co-integration among themselves

Hypothesized		Max-Eigen	0.05	
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Table 06: Output of Johansen Co-integration test (Max-Eigen Statistics).

No. of CE(s)	Eigen Value	Statistic	Critical Value	Prob.**
None *	0.398653	35.60081	33.87687	0.0308
At most 1	0.320895	27.08852	27.58434	0.0578
At most 2	0.141648	10.69188	21.13162	0.678
At most 3	0.053239	3.829578	14.2646	0.8769
At most 4	0.000777	0.054377	3.841466	0.8156

Source: E Views 9

From the above table, it can be seen that, the p-value is less than 5% when there is no co-integrated equation, the null hypothesis is rejected and the alternate hypothesis is accepted. So, there exists co-integration among variables. Again, the p value is greater than 5% when there is at most 1 co-integrated equation, the null hypothesis is not rejected in this case. So, the conclusion of this Trace statistics indicates 1 co-integrated equation at a 5% significance level. As the trace and Max-Eigen statistics indicates 1 co-integrated equation at a 5% significance level, it can be said that there is a long run relationship between selected variables and they will move together in the long run. As there is co-integration, the series are related and can be combined in a linear fashion (Hossain, 2012). That is, even if there are shocks in the short run, which may affect movement in the individual series, they would converge with time (in the long run). So I estimate both long-run and short-run models through the use of a vector error correction model.

Vector Error Correction Model Output

Long Run Causality:

As the variables are co-integrated the next step is to test for the significance of the long run relationship among variables. The significance of long run relationship is identified by vector error correction model. The hypothesis for VECM model is given below:

H0: The Independent variables do not cause the dependent variable in the long run
H1: The variables cause the dependent variable in the long run

Using 1 lag the software generated specification of the vector error correction model is here;

Table 07: Vector Error Correction Model Output.

		Coefficient	Std. Error	t-Statistic	Prob.
C(1)	CointEq1	-0.01548	0.014881	-1.040411	0.0321
C(2)	D(DSEX(-1))	-0.04911	0.127574	-0.384948	0.7016
C(3)	D(EXG(-1))	-1.19746	2.086818	-0.573823	0.5681
C(4)	D(INT(-1))	-0.0989	0.539836	-0.183212	0.04552
C(5)	D(INF(-1))	0.244062	0.548112	0.445278	0.6576
C(6)	D(M2(-1))	0.256921	0.61623	0.416924	0.6782
C(7)	C	0.002465	0.009026	0.273095	0.7857
R-squared		0.025669	Mean dependent var		0.004345
Adjusted R-squared		-0.06713	S.D. dependent var		0.047763
S.E. of regression		0.049339	Akaike info criterion		-3.08554
Sum squared resid		0.153366	Schwarz criterion		-2.8607

Source: Output from EViews9

In the above table C (1) is the co-efficient of a co-integrating model or the error correction term. In other words, it is the speed of adjustment toward equilibrium. As the co-efficient of the co- integrated equation is negative in sign and the p value is less than 5%, it can be said that there is a long run causality running from interest rate, inflation rate, exchange rate, and money supply to the stock market return. The significantly negative co-efficient of -0.01548 indicates that the speed of adjustment from the previous period’s disequilibrium in stock market return is 1.54% and it is the substantial speed of adjustment to correct disequilibrium for reaching long run equilibrium.

Thus, the previous year’s deviation from the long-run equilibrium is corrected at a speed of 1.548%. In the case of interest rate, a percentage change in interest rate is associated with a 9.89% decrease in DSEX on average ceteris paribus in the short run. The other variables have a p-value that is greater than the 5% significance level. The co-efficient of selected four macroeconomic models and their relationship in long run with the stock market return is given below:

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- a) **Interest Rate:** As can be seen from the above table, the co-efficient of interest rate is C (4) which is negative and significant at 5% level, it can be concluded that interest rate has a long run relationship with the stock market return.
- b) **Exchange Rate:** The co-efficient of exchange rate C (3) is negative but the p value is greater than 5%. So, there is *no long run relationship* between stock market return and exchange rate in the long run.
- c) **Inflation Rate:** The co-efficient of inflation rate is positive and the p value is higher than 5%. So, there is *no long run relationship* between stock market return and inflation rate in the long run. But as the number of lag is 1, if the linear hypothesis is tested, it can be seen that there is a short run causality that inflation has on stock market return.
- d) **Money Supply:** The co-efficient of the money supply is positive and the p value is greater than 5%. So, there is no long run relationship between stock market return and money supply rate in the long run.

In summary, the R square is 0.025669 which indicates that only 2.57% of the dependent variable DSEX is explained by the selected independent variables including interest rate, inflation rate, exchange rate and broad money supply. Therefore, the model is insignificant as the value of R square is less than 60% and most of the variables are not significant at the 5% level of significance.

So, it is concluded that the impact of selected macroeconomic variables on stock market return is very low. Though there should have been a significant relationship between variables and stock market return, the overall model is insignificant. The reasons behind the insignificant model can be the insufficiency of data and abnormal pattern of observed variables.

Short Run Causality:

In order to find out the short run causality I have used Wald test. The hypothesis for Wald test is given below:

Null Hypothesis, H0: The co-efficient of variables is zero
Alternate Hypothesis, H1: The co-efficient of variables is not zero

Interest Rate:

Table 08: Wald Test Output for Interest Rate.

Test Statistic	Value	df	Probability
t-statistic	-0.18321	63	0.048552
F-statistic	0.033567	(1, 63)	0.048552
Chi-square	0.033567	1	0.048546

Source: Outcome of EViews9

From the above table, it can be seen that the probability value of Chi-square is less than 5% and therefore, the null hypothesis is rejected. It indicates that the coefficient of interest rate is not zero. So, *there is an impact of interest rate* on the stock market return in the short-run.

Exchange Rate:

Table 09: Wald test output for exchange rate.

Test Statistic	Value	df	Probability
t-statistic	-0.57382	63	0.5681
F-statistic	0.329273	(1, 63)	0.5681
Chi-square	0.329273	1	0.5661

Source: Outcome of EViews9

The above table the probability value of Chi-square is greater than 5% and therefore the null hypothesis is accepted. It indicates that the coefficient of exchange rate is zero. So, *there is no impact* of exchange rate on the stock market return in the short-run.

Inflation Rate:

Table 10: Wald test output for inflation rate.

Test Statistic	Value	df	Probability
t-statistic	0.445278	63	0.046576
F-statistic	0.198273	(1, 63)	0.046576
Chi-square	0.198273	1	0.046561

Source: Outcome of EViews9

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From the above table, it can be seen that the probability value of Chi-square is less than 5%, thus, the null hypothesis is rejected. It indicates that the co efficient of inflation rate is not zero. So, there is *an impact of inflation rate* on the stock market return in the short-run.

Money Supply:

Table 11: Wald test output for Money Supply.

Test Statistic	Value	df	Probability
t-statistic	0.416924	63	0.6782
F-statistic	0.173826	(1, 63)	0.6782
Chi-square	0.173826	1	0.6767

Source: Outcome of EViews9

As the probability value of Chi-square is greater than 5%, the null hypothesis is accepted. The coefficient of money supply is zero. So, *there is no impact* of money supply on the stock market return in the short- run. In summary, from the Wald test results it can be seen that only interest rate and inflation have probability value of Chi-square which is less than 5%. It indicates that only the interest rate and inflation have impact on the stock market in the short-run and thus these have significant relationship with the stock market return in the short-run. On the other hand, exchange rate and broad money supply have the probability value of Chi-square which is higher than 5% and it indicates that exchange rate and broad money supply have no impact on the stock market in the short run. Thus, exchange rate and broad money supply have no significant relationship with the stock market return in the short run.

Pair wise Granger Causality Test:

As VECM model has been developed, Granger Causality test has been performed to see whether there is any causal relationship between stock market in Bangladesh and the macroeconomic variables (Masduzzaman 2013).

H0: Lagged (5lagges) logX does not cause lagged (5lagges) logY H1: Lagged (5lages) logX causes lagged (5lagges) logY

Table 12: Summary of Granger Causality Test.

Null Hypothesis:	Obs	F-Statistic	Prob.	Comment
EXG does not Granger Cause DSEX	71	0.00074	0.9784	Do not reject H0

DSEX does not Granger Cause EXG		36.2117	8.00E-08	Do not reject H0
INT does not Granger Cause DSEX	71	5.65024	0.0203	Do not reject H0
DSEX does not Granger Cause INT		8.28857	0.0053	Reject H0
INF does not Granger Cause DSEX	71	1.17708	0.2818	Do not reject H0
DSEX does not Granger Cause INF		2.36476	0.1287	Do not reject H0
M2 does not Granger Cause DSEX	71	5.47076	0.0223	Do not reject H0
DSEX does not Granger Cause M2		2.32276	0.1321	Do not reject H0

Source: Outcome of EViews9

The probability of each of the cases is greater than the alpha (5%) except for the interest rate. This indicates that for the variables inflation rate, exchange rate and broad money supply null hypothesis can't be rejected. And for this, it can be said that there is *no causal relationship* between stock market performance and the selected three among four macro variables such as inflation rate, exchange rate and broad money supply. On the other hand, as interest has a probability that is less than the alpha (5%), the null hypothesis is rejected. Therefore, there is a *causal relationship* between stock market performance and the interest rate. As for most of the cases, either DSEX is not caused by macro variables or macro-variables are not caused by DSEX and therefore, it is a confusing conclusion whether the stock market index in Bangladesh acts as a *leading indicator* or not (Barakat and Elgazzar,2016).

RESIDUAL DIAGNOSTIC

Testing for Serial Correlation:

In this study I have used Breusch-Godfrey Serial Correlation LM Test to identify whether the residuals are serially correlated or not. The decision criteria for test are:

Null Hypothesis, H0: There is no serial correlation in residuals

Alternate Hypothesis, H1: There is a serial correlation in residuals

Table 13: Serial Correlation LM Test output.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.358607	Prob. F(1,64)	0.5514
Obs*R-squared	0.395613	Prob. Chi-Square (1)	0.5294

Source: Outcome of EViews9

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As the above table indicates that the p value of observed R square is greater than 5%, null hypothesis is not rejected. So, there is no serial correlation in residuals and it is the good sign for any statistical model. Therefore, the following models can be continued without worrying about whether the derived outcome from each model statistically significant or not.

Testing for Heteroskedasticity:

I have used Breusch-Pagan-Godfrey Heteroskedasticity Test to identify whether the variables are heteroskedastic or not. The hypothesis for this test is shown below:

Null Hypothesis, H0: There is no hetero skedasticity in residuals
 Alternate Hypothesis, H1: There is a hetero skedasticity in residuals

Table 14: Hetero skedasticity test output.

Hetero skedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.429379	Prob. F(10,59)	0.1902
Obs*R-squared	13.65143	Prob. Chi-Square (10)	0.1895
Scaled explained SS	13.69058	Prob. Chi-Square (10)	0.1876

Source: Outcome of EViews9

From the above table it can be seem that the p-value of observed r square is greater than 5% and therefore, the null hypothesis is not rejected. Thus, it can be said that there is no hetero skedasticity in residuals and this is the good sign for any statistical model.

Testing for Normality:

The next step is to check the basic assumption of whether the residuals follow normal distribution or not. For this Jarque-Bera test is used to check the null hypothesis. The hypothesis for this test is given below:

If the p value is less than 5% the null hypothesis is rejected and alternate hypothesis is accepted. The output of the Jarque-Bera test for normality is shown below:

Null Hypothesis, H0: Residuals are normally distributed
Alternate Hypothesis, H1: Residuals are not normally distributed

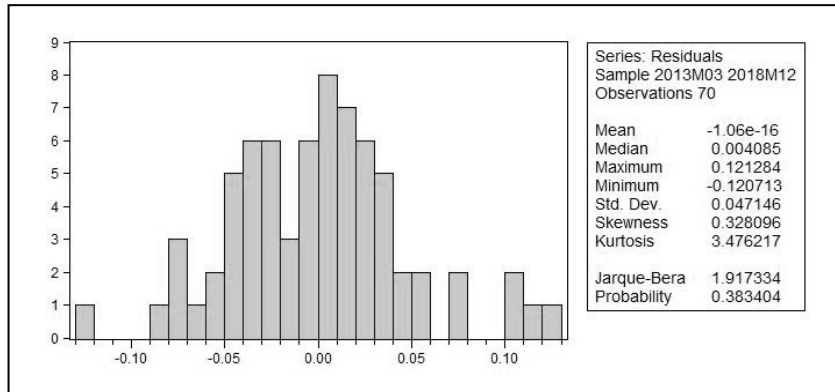


Figure 02: Normality test output.

From the above graph, we can see that the probability of Jarque-Bera is 38% which is higher than 5%. As the p-value of observed R square is greater than 5%, null hypothesis is not rejected. So, the residuals are normally distributed and this is the desirable outcome for any statistical model. In summary, under the Residual diagnostic analysis, Breusch-Godfrey Serial Correlation LM Test has found out that this model has no serial correlation; Breusch-Pagan-Godfrey Heteroskedasticity Test has found out that this model has no heteroskedasticity and the Jarque-Bera test has found out that the residuals are normally distributed. Therefore, the Residual diagnostic analysis shows that the model has all the positive results that are required for establishing a good statistical model.

Compliance and contrast between empirical results and analysis results

Table 15: Compliance of empirical results and analysis results.

Relationships	Empirical Results	Results of Analysis	Compliance
Co-integration between the macro variables	Closely co-integration relation	Closely co-integration relation	√
Impact of interest rate on DSEX in the long run	Negative relationship in the long run	Negative relationship	√
Impact of inflation rate on DSEX in long run	Negative relationship in the long run	No relationship	×
Impact of exchange rate on DSEX in the long run	Long term relation	No relationship	×

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Impact of Broad Money Supply on DSEX value	Long term relation	No relationship	×
Stock market return and interest rate in short run	Causal relationship	Causal relationship	√
Stock market return and inflation rate in short run	Causal relationship between	No causal relationship	×

Source: Author

The empirical results show that there is significant impact of all four chosen variables of this study such as interest rate, inflation rate, exchange rate and broad money supply have long term relation with the stock market return but the analysis of the collected data shows that only the interest rate has long term relation with the stock market return and other variables have no impact on the stock market in the long run. However, the empirical results found short term causal relationship among the four variables and stock market and the results of the analysis also have compliance with this but still the model of analysis is insignificant.

Probable Reasons for Insignificant Model

In this study, the model established for analyzing the impact of macroeconomic variables on stock market return is insignificant as the R Square value is less than 60%. There can be many reasons for this insignificant statistical model. Major issues are:

- **Limited Number of Observation:** DSEX return is taken as a proxy of stock market return but this index is introduced in 2013. As the number of observations for this study is only 72, the model does not capture the true economic theory and thus showing insignificant relationship.
- **Inadequate Number of Variables:** In this study used only four macroeconomic variables. If the number of variables can be increased the model would be significant.
- **Trend and Rumor Driven Investment Strategy of Investor:** In Bangladesh, majority of investors follow trend and rumor driven investment strategy. They do not predict the change in stock return by analyzing macroeconomic variables.

In summary, it can be said that elimination of above stated limitation can make the model statistically significant that means increasing the number

of observations and variables is necessary to capture the actual relationship. It can be said that though theoretically there is a relationship between macro-economic variables and the stock market index, this study fails to figure out that relationship which is due to the above-mentioned constraints. Therefore, if it were possible to overcome these constraints, the model can find statistically significant.

5. FINDINGS AND CONCLUSION

This study has scrutinized the relationship between the macroeconomic variables and the stock market of Bangladesh during the time period of 2013 to 2018. The project paper has used four macro variables including interest rate, inflation rate, exchange rate and broad money supply and analyzed their impact on the DSEX index. The results of Vector Error Correction model and Wald test have shown that interest rate, exchange rate, money supply and inflation rate do not have any significant relationship with the stock market. It is found that the previous year's deviation from the long-run equilibrium is corrected at a speed of 1.548%. In the short run, inflation rate and interest rate have positive and negative relationship with stock return respectively.

However, the negative relationship of interest rate with stock market return cannot be asserted strongly because of having weak R square for the overall model. R square is 0.025669 which indicates that only 2.57% of dependent variable DSEX is explained by the selected independent variables and thus, the model is insignificant as the value of R square is less than 60%. It indicates that the impact of interest rate on stock market return is significant but the long-run relationship is not quite certain. Furthermore, the Granger Causality test indicates that except interest rate, there is no causal relationship between the other three macro-economic variables and stock market in Bangladesh, so it is difficult to say whether stock market acts as a leading or lagging indicator in the country.

The findings of this study pointed out that Bangladesh stock markets do not follow the fundamental and theoretical relationships between stock return and macroeconomic variables. In point of fact, economic fundamentals cannot explain Bangladesh stock market accurately. The stock market of Bangladesh is suffering from weak institutional infrastructure, corporate governance, lack of accountability and transparency, questionable transparency of market transactions etc (Rasheed, Saeedi, Gebiril and Hariraj, 2020). The hindrances presented above increases the vulnerability of the stock market and that's why Bangladesh stock market is far away from economic fundamentals. If it

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were possible to increase sample size, there is possibility to get statistically significant relationship and make thereby policy implication for the stock market in the country.

REFERENCES

- [1] AFZAL, N. and Hossain, S. (2012). *Bangladesh development studies*, XXXIV (4), pp.1- 11.
- [2] Alam, N., 2020. Do Oil Price Shock, and Other Macroeconomic Variables Affect the Stock Market: A Study of The Saudi Stock Market. *Humanities & Social Sciences Reviews*, 8 (3), pp.1234-1242.
- [3] Auzairy, N., Ahmad, R. and Ho, C., 2011. Stock Market Deregulation, Macroeconomic Variables and Stock Market Performances. *International Journal of Trade, Economics and Finance*, pp. 495-500.
- [4] Barakat, M. and Elgazzar, S. (2016). Impact of macroeconomic variables on stock market: Evidence from Emerging Markets. *International Journal of Economics and Finance*, 1 (1916-971X), pp.1-13.
- [5] Bayezid ali, m. (2011). The impact of selected micro and macroeconomic variables on the stock prices of emerging stock market: a case of dhaka stock exchange (dse). pp.68-84.
- [6] Chowdhury, E. (2015). Measuring the Effect of Macroeconomic Variables on the stock market return: Evidence from Chittagong Stock Exchange. *Faculty of Business Studies, premier university*.
- [7] E. DALLAL, G. (2012). *How to read the output from multiple linear regression analyses*. [Online] <http://www.jerrydallal.com>. Available at: <http://www.jerrydallal.com/lhsp/regout.htm> [accessed 21 mar.2018].
- [8] Filipe Chauque, D. and AP Rayappan, P., 2018. The Impact of Macroeconomic Variables on Stock Market Performance: A Case of Malaysia. *Edelweiss Applied Science and Technology*, pp.100-104.
- [9] Garrison, C. and Lee, F. (2018). The effect of macroeconomic variables on economic growth rates: A cross-country study.
- [10] Haque, M. (2016). Impact of Some Selected Macroeconomic Variables (Money Supply and Deposit Interest Rate) on Share Prices: A Study of Dhaka Stock Exchange (DSE). *International Journal of Business and Economics Research*, 5(202-209.), pp.1-8.

- [11] Islam, K. and Habib, M., 2016. Do Macroeconomic Variables Impact the Indian Stock Market?. *Journal of Commerce and Accounting Research*, 5(3).
- [12] Janrattanagul, J. (2011). Macroeconomic Variables and the Stock Market Movements in Thailand. SSRN electronic journal.
- [13] Kim, H. (2005). Do Macroeconomic Variables Forecast Stock Returns? SSRN Electronic Journal.
- [14] Lorie, J. and Kimpton, M. (2009). The stock market: theories and evidence. Homewood, Ill.: R.D. Irwin.
- [15] MAHZABEEN, S. (2016). Impact of Money, Interest Rate and Inflation on Dhaka Stock Exchange (DSE) of Bangladesh. *JBT*, XI, pp.1-14.
- [16] Masduzzaman, M. (2013). Impact of Macroeconomic Variables on the Stock Market Returns in Bangladesh: Does a Meaningful Impact Exist?. *European Journal of Business and Management*, 3 (8), pp.1-17.
- [17] Masduzzaman, M. (2015). Impact of Macroeconomic Variables on Stock Market Returns in Bangladesh. Does a Meaningful Impact Exist? *Journal of Ministry of Finance Finance Division*.
- [18] Mehrara, M. (2006). The Relationship between Stock Market and Macroeconomic Variables: a Case Study for Iran. *Iranian Economic Review*, 10 (17), pp.1-12.
- [19] Moshi, H. and Kilindo, A. (2012). The impact of government policy on macroeconomic variables. Nairobi: African Economic Research Consortium.
- [20] Rasheed, A., Saeedi, M., Gebril, N. and Hariraj, K., 2020. Impact of Macroeconomic Variables on Stock Market of Malaysia. *International Journal of Psychosocial Rehabilitation*, 24 (02), pp.1205-1214.
- [21] Singh, D. (2010). Causal Relationship Between Macro-Economic Variables and Stock Market: A Case Study for India. *Pakistan Journal of Social Sciences (PJSS)*, 30 (263-274), pp.1-12.
- [22] Statistics Solutions. (2014). *Multi collinearity - Statistics Solutions*. [online] Available at: <http://www.statisticssolutions.com/multicollinearity/> [Accessed 21 Mar.2018].