Symmetric and Asymmetric influence of Trade Openness on Stock Prices: An Analysis Based on ARDL Bound Test

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Abstract

The aim of this research is to find out the short and long run relationship between the two important macroeconomic variables i.e., Exchange rate and Trade openness and BSE SENSEX. The impact of macroeconomic variables plays a vital role in the development of stock market. For analyzingboth type of relationships, the study applied the (ARDL) Autoregressive Distributed Lag model for short run and Bounds Testing Approach for long run relationship. Time series monthlydata from Jan 2009 to Dec 2019 have been taken for the research. For testing Chi Square values for confirming the short run relationship, the study applied the Wald test also. According to the results Exchange rate is affected the stock market in short run and results of Bound Testing Approach, both of the variables affected combinedly in long run. This research is useful to predict the new developments and changes in major stock prices due to import and export activities and also will suggest that what should be done by the policy makers to control the fluctuations in the exchange market which are highly responsible for changes in stock prices.

Keywords:Macroeconomic variable, Stock market, ARDL Model, BSE SENSEX, Wald Test, Exchange rate, Trade openness.

Introduction

Arbitrage pricing theory proposed by Ross(1976) which had been suggested that there are different macroeconomic variables which are affecting the stock market. The empirical literature in earlier researches tested the APT model which found that the major macroeconomic variables such as interest rates, money supply, exchange rate, inflation, trade openness industrial production and many more affect the stock returns (Fama, 1990,1981). The present value model in discounted cashflow also support the relationship between stock market and different major macroeconomic variables. According to present value model, stock prices are the sum of future cash flows at discounted values therefore all macroeconomic variables which are affecting the future cash flows also affects the stock prices. Different studies provided mixed findings. Additionally, the studies have paid more attention to both developed as well as the developing countries. By using the recent techniques since the developing countries have various risk and return profiles (Yousof and Majid, 2009). Moreover, somestudies concluded that developing countries have different economic structure which results risk and returns are usually higher in developing countries. Different macroeconomic variables such as trade balance, foreign direct investment, exchange rate, Gross domestic products, inflation, interest rates and many more plays a very important role to develop the world stock market in various dimensions.Changes in FDI affects the stock market majorly because it is highly affecting the profits and business opportunitiesof the companies, in addition other macroeconomic variables such as interest rate, exchange rate, industrial production index and consumer price index also play a very important role to develop the stock market development. Indian stock market remains volatile from 2007 to 2019 and during this period several crises were found. The first crash was observed in 2008 and continued till March 2009. These all crisis affected the overall economy in India and in turn the stock market as well. Especially, this crisis caused the stock market to drop major points around ten thousand. This instability in stock market mainly due to different uncertainty such as assassination of Indian government and judiciary crises. Keeping in view the volatility of Indian stock

market, the impact of macroeconomic variables such as industrial production index, exchange rate, inflation, trade openness and foreign direct investment had been examined in the past literature by considering the effect of stock market crisis as well. Anuruo(2011) further discussed that most of the previous studies also consider the linear relationship between financial variables and economic but in real situation these variables had non-linear association with each other. You et al. (2017) examined the nonlinear relationship between the oil prices on stock market varies across bullish, bearish as well as in the normal states of Chines stock market. Chang and Rajput (2018) examined the nonlinear(asymmetric) effect of macroeconomic variables on the stock market in India. Using nonlinear ARDL model, they have decomposed the macroeconomic variables into partial sum of negative and positive changes and concluded that all the major macroeconomic variables asymmetrically affect the stock prices. Some major studies failed to examine the asymmetric effect across various states of stock market. Further, some studies extended by examining the asymmetric effect of macroeconomic variables across bullish, bearish and the normal state of stock markets. Up to the best level of author's knowledge, no study so far simultaneously considered the asymmetric effect of all macroeconomic variables on different quantiles of the stock prices. Some study in past uses the Quantile ARDL model to examine the short run and long run relationships among the macroeconomic variables and the stock prices. This study extends in different ways, according to the past studies. Sectors include, Auto industry, Cement industry, banking industry, Oil and Gas industry and Power generation and distribution industry have same affected on its share prices. The ARDL model reflects the results, in the long run macroeconomic variables affects stock prices significantly and in the short run macroeconomic variables affects too. Moreover, the ARDL model estimation remains same when the structural breaks have been taken into consideration. Studies also emphasised to check whether the structural break occur in short run or not. Whereas in the long run, maximum macroeconomic variables affect possibly on the stock prices.

Literature Review

A set of time series data of around 30 years have been analysed for examining the relationship between trade, economic growth and FDI. Some positive factors have been found for the relationship between trade i.e import export and growth in Foreign direct investment. In the current business scenario, FDI is [laying a very crucial role for developing the economy of India. In this study bidirectional causal relation also found after applying the Granger causality test and long run relationship has been found among the variables, found with cointegration test (Jayachandran, G., &Seilan, A. 2010). For examining the interrelationship among a few major macroeconomic variables such as international trade, economic growth and FDI in North American and Middle eastern countries from 1999 to 2012 for analysing the long run relationship. A long run unidirectional causal relationship has been found among the variables. MENA countries can be compare with the developed countries, which had been considered in experience for analysing the trade liberalization and FDI (Kalai, M., &Zghidi, N. 2017). The growth in economy of the developing country always brings some efficiency in technology, It had been supported by many researchers in the past studies. It can be filled the gap between savings and investments. It may not be unique situation that FDI impacts the country's economy. ARDL bound testing approach has been applied to find out the long run relationship among the variables (Datta, K., &Lahiri, A. 2018).In Asian countries a combined study has been conducted to find out the short run and long run relationship among economic growth, exports and financial developments. For examining the direction of causality VECM based Granger causality test has been used. Causality did not find but a long run relationship has been found between the exports and financial developments (Shahbaz, M., &Mafizur Rahman, M. 2014). A study conducted to find out the structural break and a long run relationship among a few macroeconomic variables such as energy consumption, imports, financial developments, export, import, financial trade and capital in China over the period from 1971 to 2011. A unidirectional causal relationship also had been found and bidirectional causality found between energy consumption and trade. A short run relationship was existing between international trade and energy consumption and between international trade and economic growth. This outcome has been used by the policy makers for searching the source of energy for a sustainable

growth in to the economy (Muhammad, S., Saleheen, K., & Mohammad, I. T. 2012). In developing and developed countries, there are several trade agreements has been established with Malaysia. And its FTA members/partners had especially emphasized on MICECA (Malaysia-India comprehensive Economic Cooperation Agreement) With the remaining world, in a very large context the FTA policies of Malaysia assessed firstly. The study focused on potential sector of Malaysia where it can engage with a strong trade with India. Results of Granger causality shows that total export and import do not have any Granger cause Foreign Direct Investment from the partners of FTA. A causal relationship could not be established among the FTA members/partners (Sahu, P. K. 2014). Sometimes major changes in political and economic issues are defined the relationship among the macroeconomic variables and stock market, similar study done in Bulgaria, where the relationship had bee found between international trade and FDI on the basis of institutional and structural reforms. Policies for liberalization were very effective in the transition to the economy when the countries have managed successfully the institutional reforms. Due to entrance in Europe through Bulgaria, FDI inflow had been increased and the re-orientation of the trade activities for the EU members of the countries. International trade and the FDI both are complementary with each other and plays as a substitute in the economic system of Bulgaria (Bitzenis, A., Marangos, J., &Andronikidis, A. 2007). Rate of exports in Asian countries has simulated by economic growth and financial developments. A Granger causality test revealed a bidirectional causal relationship between the import & export activities, financial development and economic growth (Shahbaz, M., & Rahman, M. 2011). A panel quantile regression model has been used at different level of FDI to the host country. FDI cash inflows was gathered for secondary database in South Korea.Results based on conditional meanbased model specifically for Foreign direct investment were not very much informative in South Korea. The reason was, the determinants were different and depending on the different levels of FDI cash inflows, it has implied that the determinants of FDI cash inflows may be heterogeneous. Results revealed by Quantile Regression model(Kim, S. H., & Yang, J. H. 2014). ARDL bound approach to cointegrationtest has revealed a long run relationship in case of time series data of Australian stock market from period 1965 to 2010. Capitalization, international trade and financial development are the drivers of growth in economy both in short run and in long run (Muhammad, S., Mohammad, M. R., & Abdul, F. 2012).

Objective:

1. To examine the short run and long run relationship between selected macroeconomic indicators i.e., Exchange Rate & Trade Openness and share prices of BSE Sensex.

Research Methodology:

The study is focused on to find out the short run and long run cointegration relationship among the dependent and independent variables. For this study, BSE SENSEX (BSE) taken as a dependent variable where Exchange Rate (EXR) and Trade Openness (TO) taken as independent variables. Monthly time series data from January 2009 to December 2019 has been taken for the analysis. For testing short run relationship, study used ARDL (Auto Regressive Distributed Lag) model and Wald test and further for long run relationship, Bound testing approach has been used. For removing unit root from the time series data, ADF (Augmented Dicky Fuller) unit root test has applied. For lag length selection criteria has been decided by using VAR(Vector Autoregressive) Model and for examining the cointegration among the variables, study used Johanson Co-integration test.

Table 1: Data Description & Symbols

Variables	Symbols	Proxy Used
Exchange Rate	EXR	Real Exchange Rate
Trade Openness	TO	(Import + Export)/GDP Ratio
Stock Market	BS	Closing Price of BSE SENSEX

Source: E-Views 11

Table No. 1 is showing the variables, symbols and proxies used in to the research. Equation defined below, indicates the effect of exchange rate and Trade Openness.

BS=f(EXR,TO)

Table 2: Descriptive Analysis

	BS	EXR	TO
Skewness	.102	-1.346	-.632
Kurtosis	1.72	16.6	1.56
Jerque-Bera(JB)	3.543	787.165	5.828

Source: E-Views 11

Table No. 2 is showing, the descriptive analysis for all dependent and independent variables. BSE SENSEX is positively skewed while EXR and TO are skewed negatively. The values of Kurtosis of EXR is leptokurtic and the Trade Openness is in Platykurtic distributed where BSE SENSEX is in the position of normal distribution.

Results and Discussion

Table No. 3 is showing the results of Stationarity test by ADF Unit Root Testing approach. The hypothesis are as follows:

H0 : The Variables have no unit root

H1 : The Variables have a unit root

All time series data are stationary at first differencing.

Table 3 : Augmented Dicky Fuller Unit Root Test

Variables	Level	1st Difference	Null Hypothesis	Results
BSE SENSEX(BS)	NS	0.0001	Rejected at 1st difference	Stationary at first difference
Exchange Rate (EXR)	NS	0.0000	Rejected at first difference	Stationary at first difference
Trade Openness	NS	0.0000	Rejected at first difference	Stationary at first difference
*NS = Non-Significance				

Source: E-Views 11

Results of ARDL Model – Short Run

Table No. 4 is the results of ARDL model in Short Run, according to time series data of Exchange Rate(EXR) is affecting the stock market in short run because its P value is less than 5% level of significance, where Trade Openness (TO) is not affecting the stock market in Short Run as P value si more than 5% level of significance. For a confirmation of Short Run relationship, study conducted the Wald test also, in table No. 5,6 and 7. The results of Wald Test shows the value of F statistics and Chi square test which are less than 5% level of significance. Finally, it is concluded that only Exchange Rate is influencing the Stock Exchange (BSE SENSEX) in Short Run.

Table No. 4 Results of ARDL Model

Dependent Variable: DBSE
Method: ARDL
Date: 01/11/21   Time: 11:25

Sample (adjusted): 2009M04 2019M12				
Included observations: 129 after adjustments				
Maximum dependent lags: 4 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (4 lags, automatic): DEXR DTO				
Fixed regressors: C				
Number of models evaluated: 100				
Selected Model: ARDL(2, 0, 0)				
Note: final equation sample is larger than selection sample				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
DBSE(-1)	-0.122573	0.086246	-1.421201	0.1578
DBSE(-2)	-0.154995	0.082537	-1.877895	0.0627
DEXR	287.5218	65.06776	4.418805	0.0000
DTO	15.42892	18.34597	0.840998	0.4020
C	266.5347	93.02507	2.865193	0.0049
R-squared	0.169258	Mean dependent var	244.5367	
Adjusted R-squared	0.142460	S.D. dependent var	1080.589	
S.E. of regression	1000.663	Akaike info criterion	16.69270	
Sum squared resid	1.24E+08	Schwarz criterion	16.80355	
Log likelihood	-1071.679	Hannan-Quinn criter.	16.73774	
F-statistic	6.316048	Durbin-Watson stat	1.902066	
Prob(F-statistic)	0.000117			

Source : E-Views 11

Table: 5 Wald Test Results:1

Wald Test			
Equation untitled			
Test Statistic	Value	df	Probability
t-statistic	-1.421201	124	0.1578
F-statistic	2.019813	(1, 124)	0.1578
Chi-square	2.019813	1	0.1553
Null Hypothesis: C(1)=0		Null Hypothesis: C(1)=0	
Null Hypothesis Summary:		Null Hypothesis Summary:	
Normalized Restriction (= 0)	Value	Std. Err.	Normalized Restriction (= 0)
C(1)	-0.122573	0.086246	C(1)
Restrictions are linear in coefficients			

Table: 6 Wald Test Results:2

Wald Test			
Equation untittled			
Test Statistic	Value	df	Probability
t-statistic	4.418805	124	0.0000
F-statistic	19.52584	(1, 124)	0.0000
Chi-square	19.52584	1	0.0000
Null Hypothesis: C(1)=0		Null Hypothesis: C(1)=0	
Null Hypothesis Summary:		Null Hypothesis Summary:	
Normalized Restriction (= 0)	Value	Std. Err.	Normalized Restriction (= 0)
C(3)=0		287.5218	65.06776
Restrictions are linear in coefficients			

Table: 7 Wald Test Results:3

Wald Test

Equation untittled			
Test Statistic	Value	df	Probability
t-statistic	0.840998	124	0.4020
F-statistic	0.707277	(1, 124)	0.4020
Chi-square	0.707277	1	0.4003
Null Hypothesis: C(1)=0		Null Hypothesis: C(1)=0	
Null Hypothesis Summary:		Null Hypothesis Summary:	
Normalized Restriction (= 0)	Value	Std. Err.	Normalized Restriction (= 0)
C(4)=0		15.42892	18.34597
Restrictions are linear in coefficients			

Bound Test Results – Long Run

In Table No.8, bound testing results show the value of F Statistics is 32.318% ,which is above upper and lower bounds, I(0) and I (1) which indicates that variables are having a long run relationship in the given period of time. In long run all the variables are influencing each other.

Table No. 8 : Bound Test Results

ARDL Long Run Form and Bounds Test				
Dependent Variable: D(DBSE)				
Selected Model: ARDL(2, 0, 0)				
Case 2: Restricted Constant and No Trend				
Date: 01/13/21 Time: 12:50				
Sample: 2009M01 2019M12				
Included observations: 129				
Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	266.5347	93.02507	2.865193	0.0049
DBSE(-1)*	-1.277568	0.119338	-10.70542	0.0000
DEXR**	287.5218	65.06776	4.418805	0.0000
DTO**	15.42892	18.34597	0.840998	0.4020
D(DBSE(-1))	0.154995	0.082537	1.877895	0.0627
* p-value incompatible with t-Bounds distribution.				
** Variable interpreted as Z = Z(-1) + D(Z)				
Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEXR	225.0539	53.40645	4.213985	0.0000
DTO	12.07679	14.50846	0.832396	0.4068
C	208.6266	69.45791	3.003641	0.0032
EC = DBSE - (225.0539*DEXR + 12.0768*DTO + 208.6266)				
F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	32.31829	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5

Actual Sample Size	129			Finite Sample: n=80	
			10%	2.713	3.453
			5%	3.235	4.053
			1%	4.358	5.393

Conclusion

The research paper has analyzed the impact of exchange rate and the trade openness on Bombay Stock Exchange in past eleven years. The study was focused on the relationship in short run and long run. The macroeconomic variables had been taken as important influencers for the stock market developments. According to the results, we can say that the exchange rate is more effective for the stock market development in short run and long run both. Trade openness is less effective for the stock market volatility. The policy makers must pay attention on the effect of exchange rate fluctuations. The fiscal policy and the monetary policy must be formulated according to the fast effect of exchange rate on stock market.

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