



# The Impact of Second Generation FDI Reforms on the Stock Market Development in India

Gopal Bihari Saraswat, Madhav Saraswat, Arnab Chakraborty

**Abstract:** *The Governments took a series of initiatives as a measure of second-generation reforms in Foreign Direct Investment (FDI). The FDI reform initiatives had started since 1991 as foundation of Indian economy and the governments over the period contributed to emerge India as destination for Foreign Direct Investment in the world. These reforms played an important role in capital formation in stock markets and developments in the economy. This paper attempts to study the impact of second-generation economic reforms in FDI and its impact on Stock Market Development (SMD) in India.*

*This paper uses a multivariate unrestricted VAR (Vector Autoregression) model to investigate the impact of the reforms in FDI on the development of stock market in India. The study used the quarterly data of FDI inflow, exchange rates and terms of trade (Exports/Imports) from 2004 to 2017 to find the long run impact of FDI reforms on the SMD. The SMD is the ratio of stock market capitalization to the Gross Domestic Product (GDP) of the country.*

*The study uses the unrestricted VAR to generate impulse responses to find the impact of one standard deviation innovation change in one variable on other. Further, Unit Root Test, Granger causality test statistics and variance decomposition (VDC) respectively have been applied to identify variables stationarity, the causality and percent change in variance due to one standard deviation innovation in other variable.*

*The findings of the study conclude that there were structural breaks in the data during 2007Q1 and 2011Q1 due to US financial crisis that lead to high volatility in the Indian stock market. Further, finding concluded that there is a bidirectional causality between foreign direct investment and the stock market development. Finally, study revealed that FDI and terms of trade are also having a bidirectional causality where shock in terms of trade brings a change of 25.15 percent in FDI inflows.*

**Keywords:** *Economic Reforms, Exchange Rates, Foreign Direct Investment, Stock Market Development, Terms of Trade.*

## I. INTRODUCTION

The year 1991 has acquired a revolutionary status as a time of change in the planning of Indian future (Singh).

This was the year of change when the Narasimhan Government had taken a series of LPG reforms to signal the opening up the Indian economy for foreign multinational companies. India had travelled a long journey since then from an initial FDI investment of US \$ 2 billion in 1991 to US \$ 45 billion in 2005 (UNCTAD, online database).

Furthermore, the Indian economy received a major FDI inflows due to second generation reforms initiatives had taken by the Indian Government to woo the foreign investors. As a result, India received FDI inflow of US \$ 209 billion in between 2014 to 2017.

The Indian Government took a series of reforms measures by allowing 100 percent foreign equity ownership in some sectors in 2005. Further, FDI rules were relaxed in mining, aircraft maintenance and a hike in ceiling of public sector oil refineries came into force. Addition to it, an exception to foreign investors from minimum capitalization and three-year lock in period were also provided to give impetus to FDI inflow in 2009-10.

Modi Government had initiated a series of FDI reforms just after forming the Government and came with a flagship scheme of Make in India in 2014. The government increased FDI limit in several sectors like defense, railway, construction, manufacturing of medical devices, mining, e-commerce, stock exchange and insurance and pension schemes.

The objectives of reforms were to opening up the economic sectors and to expand the base of gross domestic product (GDP). A stable micro economic environment boosts the stock market capitalization and other economic indicators. The relationship of stock market capitalization and GDP results in a new variable that is stock market development (SMD). SMD is a multi-dimensional concept where stock market capitalization is deflated by GDP. The SMD increases significantly when economy is developed, however, the stock market capitalization in SMD refers to numbers of firms participating in stock market (Tsaganos et al.).

In this paper, we examine the effect of FDI reforms on the SMD and will investigate short and long run relationship of both the variables. Furthermore, study also investigates the relationship of FDI inflow to SMD, terms of trade (TOT) and exchange rate. This study later decomposes and study the variance and impulse response in one variable due to shock from other. This paper is divided into five sections: Introduction, Literature Review, Research Design, Empirical Results and Conclusion respectively.

Manuscript published on 30 September 2019

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## II. LITERATURE REVIEW

(Valerio F. Garcia and Lin Liu) study on 15 industrial and developing countries that highlighted the important determinants of stock market development. The study concluded that real income, savings rate, financial intermediary development and stock market liquidity are the important determinants of the stock market development. The study was based on Korea, Malaysia, Peru, Philippines, Taiwan, USA, Venezuela, Mexico, Brazil, Chile, Colombia, Indonesia, Japan, Argentina and Thailand. The study of (Henry) on liberalization and economic reform and its impact on equity markets in emerging countries concluded that countries' cost of equity capital falls when it opens up the economy for the foreign players. Further, economic reforms that result in economic liberalization boost the confidence of investors and so as the country's equity price index.

(Bekaert et al.) study concluded that equity market liberalization contributes an average of 1 percent increase in annual economic growth. Further, findings revealed that all economies who liberalize their equity markets could not witness 1 percent growth in GDP i.e. economic growth of 1 percent is specifically happened to some countries only. (Adjasi and Yartey) concluded that stock market development and economic growth are positively correlated in long run. Further, cross country growth regression indicated a strong relationship among the predetermined variables. The study of (Adjasi and Yartey) on stock market development in Africa concluded that equity market and growth of the economy are positively correlated. Further, stock market contributes largely to the growth of the corporates in Africa. Corporates are largely depending on equity financing and new issue market contributed around 21 percent in the financing of the corporates.

(Adam and Tweneboah) study on Ghana stock market development (SMD) and foreign direct investment (FDI) concluded that there is a long run relationship between FDI, exchange rates and SMD in Ghana. Further, study revealed that stock market development is prone to the shocks generating from fluctuation in FDI in Ghana.

The study used multivariate VAR model to construct an error correction model to find short and long run relationship among the variables. Finally, impulse responses and variance decomposition were used to find impact of one standard innovation change in foreign direct investment to stock market development of Ghana. The study of (Malik and Amjad) on the relationship of foreign direct investment (FDI) and stock market development suggested that FDI plays a positive role in boosting the confidence of investors and stock market development (SMD) in Pakistan in long run. Further, findings suggested bidirectional causality between FDI and economic growth of the country. On the contrary, unidirectional causality found between economic growth and FDI. The study used time series data from 1985 to 2011 and Johansen co-integration and Granger causality test to find cointegration and causality between the variables. Finally results concluded that the aggregate market capitalization and FDI have positive cointegration in sectors where FDI concentration is high.

(Deepak and Shollapur) study based on Indian stock markets' behaviour in response to economic reforms in

India. The study concluded that Indian stock market is semi strong efficient and announcement of economic reforms and Reserve Bank of India did not have any significant impact in short run on the India stock market. Finally, study revealed that Indian stock market depends on forward looking information those could help to predict the stock market behaviour in long run. The panel data study of (Soumaré and Tchana) on relationship of FDI and Financial Market Development (FMD) concluded that there is a bidirectional causality between FDI and FMD. Further, study revealed that there is an ambiguous relationship exists between FDI and banking sector development and study could not define this relationship. This study is based on 29 emerging economies with data span from 1994 to 2006. Addition to it, study used bivariate VAR model to find causality between the variables.

(Tsagkanos et al.) study on FDI and stock market development in emerging countries suggested that FDI and SMD is having a positive long run relationship. But on the contrary relationship is not significant in short run. The study classified period in two parts (i) 1988-2001 (ii) 2002-04. The findings of the study revealed that FDI and SMD were cointegrated for a full sample period but not for sub sample period.

The study of (Levine and Zervos; Adjasi and Yartey; Valerio F. Garcia and Lin Liu; Bekaert et al.) discussed about the stock market development and other macro-economic factors. Furthermore, above studies emphasized the importance of factors responsible for SMD in emerging markets but findings were limited to establish causality of reforms and SMD in the studies. On the contrary, studies of Adam & Tweneboah, (2009); Henry, (2000); Malik & Amjad, (2013); Soumaré & Tchana, (2015); Tsagkanos et al., (2019) found causality of FDI and stock market development in economies but largely focused on other economies except India. The study of (Deepak and Shollapur) focused on Indian SMD and FDI relationship but limited to financial announcement and their repercussions on Indian stock market. The study of former literatures had a dearth of literature those specifically identified the impact of FDI reforms on stock market development. Therefore, present study tries to investigate the impact of second-generation reforms in FDI on the stock market development in India. The study is divided in the following sections: (i) Introduction (ii) Review of Literature (iii) Research Design (iv) Empirical Results (v) Conclusion

## III. RESEARCH DESIGN

### A. Data Description

The study deals with the second generation FDI reforms and their impact on SMD in India. The variables under study are Stock Market Development (SMD), FDI inflow, exchange rate (₹/\$) and terms of trade (ratio of exports to imports) in India. The SMD is the ratio between Stock market Capitalization to Gross Domestic Product. The sample period for the study covers the quarterly data from 2004Q1 to 2017Q4 with total 56 observations. Later, all time series are transformed to log for data analysis.



The data for SMD, FDI inflow, exchange rate and terms of trade are collected from online data base of St. Louis Fed. The availability of SMD data were yearly time series therefore, converted to quarterly for further analysis.

**B. Methodology**

All variables data are plotted on line graph to judge the trend and insight from the variables. Further, a regression equation was calculated to find the significance of the variables. The multiple break point Bai-Perron test is applied to find the structural break in the time series data. If there is any structural break in data then a dummy variable is calculated for each break.

To judge the nature of problem and insight form the statistical prospective a descriptive statistic is calculated with common sample. Further, Augmented Dickey Fuller unit root test is applied in levels and first difference on log variables to confirm stationarity. Later, an unrestricted vector autoregression (VAR) is calculated with optimum lag length criterion. The optimum lag criterion make a VAR stabilize for further decision making. Finally, diagnostic tests like LM test for autocorrelation, Jarque-Bera test for normality and white noise heteroskedasticity test were applied before further econometric analysis so that VAR equation model remain stable.

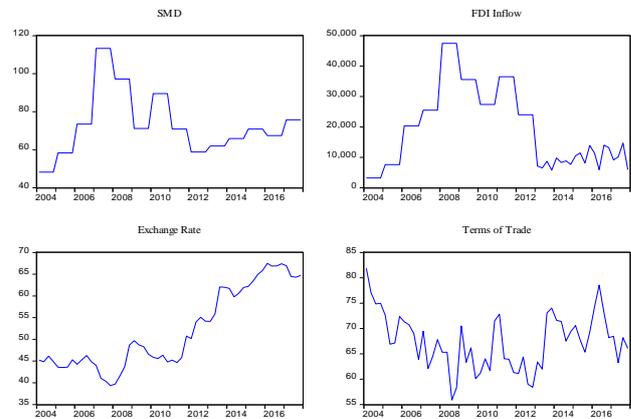
To find the causality among the variables Granger causality test and variance decomposition test were applied. Variance decomposition used to decompose the variable and shock transmission from one variable to other. Finally, impulse responses were calculated to find the impact of one standard deviation innovation in one variable to other.

**IV. EMPIRICAL RESULTS**

**A. Primary Results**

The foreign Direct Investment had grown considerably from 3218 million U.S. \$ to 47472 million U.S. \$ between 2004Q1 and 2008Q3 (Figure 1). FDI slowed down drastically from its peak of 47472 million U.S. \$ to 8728 million U.S. \$ between 2008Q4 and 2013Q3. This slowdown may be the aftermath of the global recession started in 2008 due to U.S. subprime lending crisis. The FDI inflow picked up its momentum again in 2014Q3 to 14692 million U.S. \$.

On the other hand, Stock Market Development (SMD) were following the path of FDI inflow in India since 2004Q1 to 2012Q3 (Figure 1). But later, due to second-generation economic reforms initiated by the new Government, growth in Stock market Capitalization and GDP lead SMD to increase considerably in the year 2014. The drop in SMD due to lingering effect of global crisis of 2008 were recovered by almost 30 percent in 2017Q4.



**Figure 1: SMD, FDI Inflow (million U.S. \$), Exchange Rate & Terms of Trade from 2004Q1 to 2017Q4**

The Indian currency gained value against U.S. dollar by end of the year 2008 but later due to global recession and uncertainty ₹ depreciated since then and reached to its peak of 67.5 per U.S. dollar in 2006Q2. The global crude price collapse that hit the global market in 2014 had brought down the value of Indian currency due to major volatility in global crude prices.

The terms of trade (ratio between exports and imports) plunged heavily due to costly imports and less exports of India. Indian economy touched down the bottom ratio of 55.9 in 2008Q3 from its peak of 81.9 of 2004Q1. The terms of trade faced a major volatile phase pre and post the global financial crisis. But, the 2014 crude price collapse benefited India by cutting down the crude import bill, as India is the third largest crude importer in the world. Hence, lower crude price and pace of GDP brought Indian terms of trade ratio to 78.6 by 2016Q2.

The descriptive statics (Table 1) summary shows that the average SMD is 73.07 which long term average and same as year 2006. Further, FDI inflow, exchange rates and terms of trade average are laying at 1969.86, 52.06 and 67.50 respectively.

**Table 1 : Descriptive Statistics 2004Q1 to 2017Q4**

	SMD	FDI_Inflow	Exchange_Rate	Terms_Of_Trade
<b>Mean</b>	73.07343	19669.86	52.06615	67.50995
<b>Median</b>	70.89515	17513.96	48.47963	67.62732
<b>Maximum</b>	113.3330	47472.19	67.48787	81.86496
<b>Minimum</b>	48.24390	3218.000	39.35593	55.88699
<b>Std. Dev.</b>	16.48998	13175.88	9.129423	5.471273
<b>Skewness</b>	0.989201	0.594967	0.454474	0.202281
<b>Kurtosis</b>	3.532246	2.249551	1.658492	2.704934
<b>Jarque-Bera</b>	9.793834	4.617936	6.126939	0.585047
<b>Probability</b>	0.007470	0.099364	0.046725	0.746378
<b>Sum</b>	4092.112	1101512.	2915.705	3780.557
<b>Sum Sq. Dev.</b>	14955.57	9.55E+09	4584.050	1646.416
<b>Observations</b>	56	56	56	56

But on the contrary, median values of all the variables are low in comparison to their mean values except terms of trade.

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The maximum value of FDI inflow India received during the study was 47472.19 million US \$ whereas the lowest was 3218 million US \$. The terms of trade also witnessed major change as maximum stand at 81.86 and minimum at 55.88 respectively. Indian exchange rates remain fluctuating during the global volatility and maximum and minimum valued were 67.48/US \$ and 39.55/US \$ respectively. Finally, SMD achieved the highest value ever at 113.33 and lowest as 48.24 during the period under the study.

All study variables remain volatile as standard deviation is high, especially the FDI inflow. Further, all the time series are positively skewed and platykurtic (kurtosis<3) except SMD which is leptokurtic (kurtosis>3). Finally, JarqueBera test statistics suggest that all the time series are normally distributed (probability>5%) except SMD which is not normally distributed as prob value is less than 5 percent.

## B. Bai-Perron Multiple Break Point Test

A time series having a structural break leads to mis-specification of the model.

Therefore, Bai-Perron Multiple break point test has been applied to find the structural break in the time series. The test statistics suggested that there are two structural breaks in the time series equation residuals at 2007Q1 and 2011Q1. Therefore, two dummy variables dummy\_2007Q1 and dummy\_2011Q1 are assigned for each break in the time series.

## C. Unit Root Test

The Augmented Dickey Fuller unit root test statistics (Table 2) of SMD, exchange rate, FDI inflow and terms of trade suggested that all variables are having a unit root at levels either on intercept or trend and intercept at 5 percent significance level. Furthermore, the null hypothesis that series has a unit root is accepted at 5 percent level. On the contrary, all the time series are stationary at first difference and results are significant at 5 percent level and the hypothesis that series has a unit root is rejected at 5 percent significance level.

If all variables under study are stationary and then VAR should be estimated with these variables because any shock to stationary variables have only temporary effect on the change of variables (Holden).

**Table 2: Unit Root Test Statistics**

Variables	ADF Test Statistics			
	Levels		First Difference	
	Intercept	Trend & Intercept	Intercept	Trend & Intercept
log(SMD)	-2.30467	-2.29376	-7.25954	-7.27985
P-Value	0.1742	0.43010	0.00000	0.00000
log(terms_of_trade)	-4.11459	-4.03841	-6.49223	-6.57267
P-Value	0.00200	0.01290	0.00000	0.00000
log(exchange_rate)	-0.30287	-3.12417	-5.71392	-5.69015
P-Value	0.91740	0.11140	0.00000	0.00010
log(FDI_inflow)	-2.2103	-2.3122	-6.5705	-7.3205
P-Value	0.20510	0.42040	0.00000	0.00000

## D. VAR and Econometric Analysis

(Sims) provided multivariate vector autoregression (VAR) framework for macro- econometric. A VAR is a n-equation, n-variable linear model where each variable is in turn explained by its own lagged values plus current and past values of remaining n-1 variables.

Therefore, A multivariate VAR model (Table 3) is estimated using log(SMD), log(exchange\_rate), log(FDI\_inflow) and log(terms\_of\_trade) respectively with lag length of 5. A VAR may get mis specified if lag length chosen is too large or small. Therefore, a recommended lag length of 5 is chosen based on Akaike information criterion (AIC) value (-9.051148) by using lag length selection criterion.

Further, Autocorrelation LM test is applied to find the serial correlation and the null hypothesis that there is no serial correlation is rejected at 5 percent significance and supported the earlier choice of 5 lag length for VAR.

The other diagnostic test for model specification like Jarquebera test for normality was used and the null hypothesis that VAR is normal was accepted at 5 percent significance level as prob>5%. Finally, VAR residual heteroskedasticity test were applied to find homoscedasticity of VAR. The white noise heteroskedasticity test results indicated that there is no heteroskedasticity and the null hypothesis that there is white noise heteroskedasticity rejected at 5 percent significance level as prob value is 77.81 percent.

**Table 3: VAR Statistics of log(SMD), log(FDI\_inflow), log(Exchange\_rate) and log(terms\_of\_trade) with 5 lags to each variable.**

	Standard errors in ( ) & t-statistics in [ ]			
	Log(SMD)	Log(FDI_Inflow)	Log(Exchange_Rate)	Log(Terms_of_Trade)
Log(SMD(-1))	0.434762 (0.12258) [ 3.54664]	0.819542 (0.46728) [ 1.75387]	-0.054491 (0.06357) [-0.85713]	0.113760 (0.10065) [ 1.13021]
Log(SMD(-2))	-0.128349 (0.13472) [-0.95270]	-0.085000 (0.51354) [-0.16552]	0.050417 (0.06987) [ 0.72160]	0.094220 (0.11062) [ 0.85174]
Log(SMD(-3))	0.016543 (0.13273) [ 0.12463]	-0.318131 (0.50597) [-0.62876]	-0.096673 (0.06884) [-1.40436]	0.094763 (0.10899) [ 0.86947]
Log(SMD(-4))	-0.175541 (0.14223) [-1.23423]	1.615081 (0.54215) [ 2.97901]	0.125903 (0.07376) [ 1.70690]	-0.116407 (0.11678) [-0.99677]
Log(SMD(-5))	-0.074486 (0.13794) [-0.53998]	-0.716137 (0.52582) [-1.36194]	0.051239 (0.07154) [ 0.71624]	0.006415 (0.11327) [ 0.05664]
Log(FDI_Inflow (-1))	0.011176 (0.04721) [ 0.23676]	0.063403 (0.17994) [ 0.35235]	-0.020926 (0.02448) [-0.85476]	-0.065082 (0.03876) [-1.67907]
Log(FDI_Inflow (-2))	0.107014 (0.04115) [ 2.60051]	0.045102 (0.15686) [ 0.28752]	-0.012647 (0.02134) [-0.59258]	-0.009513 (0.03379) [-0.28154]
Log(FDI_Inflow (-3))	-0.005014 (0.03747) [-0.13379]	0.383364 (0.14284) [ 2.68384]	0.010029 (0.01943) [ 0.51608]	-0.022614 (0.03077) [-0.73495]
Log(FDI_Inflow (-4))	0.111523 (0.04315) [ 2.58443]	0.249818 (0.16449) [ 1.51874]	-0.022230 (0.02238) [-0.99332]	0.067337 (0.03543) [ 1.90045]

Log(FDI_Inflow (-5))	-0.058804	-0.082254	-0.010467	-0.062087
	(0.04234)	(0.16139)	(0.02196)	(0.03476)
	[-1.38894]	[-0.50967]	[-0.47670]	[-1.78597]
Log(Exchange_Rate(-1))	-0.510811	-0.344028	1.002851	-0.162939
	(0.34057)	(1.29823)	(0.17663)	(0.27965)
	[-1.49985]	[-0.26500]	[ 5.67782]	[-0.58266]
Log(Exchange_Rate(-2))	0.708134	1.594330	-0.046908	0.635063
	(0.48573)	(1.85155)	(0.25191)	(0.39884)
	[ 1.45787]	[ 0.86108]	[-0.18621]	[ 1.59229]
Log(Exchange_Rate(-3))	0.012431	-2.837449	-0.156494	-0.289690
	(0.46226)	(1.76210)	(0.23974)	(0.37957)
	[ 0.02689]	[-1.61027]	[-0.65277]	[-0.76321]
Log(Exchange_Rate(-4))	-1.030137	-0.507955	-0.194319	-0.810498
	(0.48864)	(1.86265)	(0.25342)	(0.40123)
	[-2.10816]	[-0.27271]	[-0.76680]	[-2.02005]
Log(Exchange_Rate(-5))	1.452521	0.540522	0.286787	0.622370
	(0.34066)	(1.29857)	(0.17667)	(0.27972)
	[ 4.26381]	[ 0.41625]	[ 1.62327]	[ 2.22497]
Log(Terms_of_Trade(-1))	0.141795	0.520569	-0.228052	0.124275
	(0.20621)	(0.78604)	(0.10694)	(0.16932)
	[ 0.68763]	[ 0.66227]	[-2.13248]	[ 0.73398]
Log(Terms_Of_Trade(-2))	0.419497	2.577841	-0.052796	0.055494
	(0.20510)	(0.78180)	(0.10637)	(0.16840)
	[ 2.04538]	[ 3.29732]	[-0.49636]	[ 0.32953]
Log(Terms_Of_Trade(-3))	-0.046247	0.751246	-0.004810	0.109327
	(0.23018)	(0.87742)	(0.11937)	(0.18900)
	[-0.20091]	[ 0.85620]	[-0.04030]	[ 0.57844]
Log(Terms_Of_Trade(-4))	0.121683	0.539236	-0.077702	-0.325538
	(0.21342)	(0.81352)	(0.11068)	(0.17524)
	[ 0.57016]	[ 0.66284]	[-0.70203]	[-1.85769]
Log(Terms_Of_Trade(-5))	-0.361569	0.026590	-0.052982	-0.032484
	(0.17604)	(0.67105)	(0.09130)	(0.14455)
	[-2.05389]	[ 0.03962]	[-0.58033]	[-0.22473]
C	-1.199895	-14.64549	2.391567	4.594695
	(1.97781)	(7.53918)	(1.02572)	(1.62399)
	[-0.60668]	[-1.94258]	[ 2.33160]	[ 2.82926]
Dummy_2007q1	0.238000	-0.328286	-0.006027	-0.082003
	(0.04428)	(0.16877)	(0.02296)	(0.03635)
	[ 5.37545]	[-1.94515]	[-0.26247]	[-2.25563]
Dummy_2011q1	-0.164633	-0.065949	0.030165	-0.005963
	(0.03322)	(0.12663)	(0.01723)	(0.02728)
	[-4.95606]	[-0.52082]	[ 1.75095]	[-0.21861]

**E. Granger Causality Test**

The Granger causality test statistics (Table 4) indicated that SMD Granger cause FDI inflow and the null hypothesis SMD does not Granger cause FDI inflow rejected at 5 percent significance level. Furthermore, test statistics suggested that exchange rate Granger cause FDI inflow and the hypothesis exchange rate does not Granger cause FDI inflow rejected at 5 percent significance level.

Finally, the hypothesis terms of trade do not Granger cause FDI inflow too rejected at 5 percent significance level and results recommended that terms of trade Granger cause

FDI inflow. Additionally, the hypothesis FDI inflow does not Granger cause terms of trade is rejected at 5 percent significance i.e. terms of trade and FDI inflow both are having a bidirectional causality.

On the contrary, the hypothesis for causality of SMD to FDI inflow, exchange rate and terms of trade are rejected at 5 percent significance level. Addition to that, the Granger hypothesis of causality of exchange rate, terms of trade to SMD and exchange rate to FDI inflow are rejected at 5 percent significance level. Finally, bidirectional causality between exchange rate and terms of trade also rejected at 5 percent significance level.

The Granger Causality test statistics summarized that FDI inflow have direct causality to SMD, exchange rate and terms of trade. Furthermore, results indicated that FDI inflow and terms of trade are having a bidirectional causality to each other.

**Table 4: Granger Causality Test Statistics**

Null hypothesis:	Obs	F-statistic	Prob.
Log(FDI_Inflow) Does Not Granger Cause Log(SMD)	51	0.33919	0.8861
Log(SMD) Does Not Granger Cause Log(FDI_Inflow)		4.26457	0.0033
Log(Exchange_Rate) Does Not Granger Cause Log(SMD)	51	1.59529	0.1836
Log(SMD) Does Not Granger Cause Log(Exchange_Rate)		1.89331	0.1171
Log(Terms_of_Trade) Does Not Granger Cause Log(SMD)	51	1.05340	0.4003
Log(SMD) Does Not Granger Cause Log(Terms_of_Trade)		1.95498	0.1066
Log(Exchange_Rate) Does Not Granger Cause Log(FDI_Inflow)	51	2.48775	0.0472
Log(FDI_Inflow) Does Not Granger Cause Log(Exchange_Rate)		0.33021	0.8917
Log(Terms_of_Trade) Does Not Granger Cause Log(FDI_Inflow)	51	2.53038	0.0442
Log(FDI_Inflow) Does Not Granger Cause Log(Terms_of_Trade)		2.75157	0.0315
Log(Terms_of_Trade) Does Not Granger Cause Log(Exchange_Rate)	51	1.17216	0.3398
Log(Exchange_Rate) Does Not Granger Cause Log(Terms_of_Trade)		1.78043	0.1390

**F. Variance Decomposition**

The variance decomposition analysis (Table 5) that captures the impact of one variable to other for 10 quarter time horizons. The results indicated that SMD explains variation of 100 percent in one quarter and 54.51 percent in 10 quarters in itself. Further, SMD explains merely 7.5 percent change in FDI inflow, 14.90 percent in exchange rate and 23.07 percent in terms of trade in long run respectively. There is no significant short run impact on any of the variables due to SMD fluctuations.

Further, FDI inflow explain 16.12 percent SMD in short run (2 quarters) and 26.70 percent in long run (8 quarters) respectively.

## The Impact of Second Generation FDI Reforms on the Stock Market Development in India

FDI inflow explain itself 88.15 percent in short run and 29.14 percent in long run. The variance decomposition result indicated that there is untraceable impact of FDI inflow on exchange rate in short run (1 quarter) but 12.54 percent in long run. Similarly, FDI inflow have miniscule impact on term of trade in short run but 33.39 percent in long run. Hence, long run impact of FDI inflow on terms of trade is significant in explaining the bidirectional causality.

The exchange rate explains 8 percent fluctuation in SMD and 2 percent in FDI inflow in long run respectively. Additionally, exchange rates explain 95.95 percent change in itself in short run and 54.73 in long run. Finally, exchange rate explains significant fluctuations in term of trade in long run i.e. 34.97 percent.

The terms of trade explain 7.9 percent change in SMD in long run and 6.45 percent in short run in FDI inflow respectively. The terms of trade explain 15.35 percent change in FDI inflow and 19.22 percent exchange rates in

long run respectively. The results indicated that terms of trade do cause significant change in FDI inflow and exchange rate in long run. Finally, terms of trade explain 92.22 percent itself in short run and 57.51 percent in long run respectively.

The variance decomposition results summary suggests that SMD, exchange rate and terms of trade having a direct relationship in explaining the variance in FDI inflow. The SMD explains 7.5 percent variation in FDI inflow, exchange rate 2 percent and terms of trade 15 percent respectively during a span of 10 quarters. Furthermore, FDI and terms of trade are having a bidirectional causal effect where FDI explains 33.39 percent variations in terms of trade but the later explains merely 15 percent variation in FDI inflow. The results of variance decomposition are supporting the claim made by the hypothesis testing under of Granger causality test and ensure the validity of the former results.

**Table 5: Variance Decomposition Results**

Variance Decomposition of Log(SMD):					
Period	S.E.	Log(SMD)	Log(FDI_Inflow)	Log(Exchange_Rate)	Log(Terms_of_Trade)
1	0.061325	100.0000	0.000000	0.000000	0.000000
2	0.070331	93.66419	0.114688	5.270686	0.950440
3	0.079514	75.95047	4.803327	4.236682	15.00952
4	0.082076	72.29551	4.554515	4.448761	18.70122
5	0.088325	63.33382	6.598567	5.233603	24.83401
6	0.089570	61.58445	6.585251	7.025905	24.80440
7	0.092102	58.52326	6.834465	11.15849	23.48379
8	0.093141	57.25580	6.738779	12.92381	23.08162
9	0.094825	55.25590	7.640093	14.39010	22.71390
10	0.095696	54.51952	7.505890	14.90238	23.07221

Variance Decomposition of Log(FDI_Inflow):					
Period	S.E.	Log(SMD)	Log(FDI_Inflow)	Log(Exchange_Rate)	Log(Terms_of_Trade)
1	0.233763	11.84564	88.15436	0.000000	0.000000
2	0.241735	16.12881	82.55768	0.229134	1.084377
3	0.281269	11.98103	62.29672	0.572160	25.15009
4	0.302036	11.29537	56.43757	4.134815	28.13225
5	0.356308	29.46791	41.17318	3.606884	25.75203
6	0.384737	27.28267	35.56982	7.856781	29.29073
7	0.414256	25.55346	33.63717	10.72761	30.08176
8	0.426095	26.70660	31.81243	10.41181	31.06916
9	0.451630	25.30653	29.35405	12.71677	32.62265
10	0.455437	24.91851	29.14263	12.54646	33.39240

Variance Decomposition of Log(Exchange\_Rate):

Period	S.E.	Log(SMD)	Log(FDI_Inflow)	Log(Exchange_Rate)	Log(Terms_of_Trade)
1	0.031804	2.888317	1.151755	95.95993	0.000000
2	0.047361	5.060217	1.677689	87.84041	5.421685
3	0.060600	5.691596	1.431349	82.69610	10.18095
4	0.069754	8.573158	1.107885	73.16026	17.15870
5	0.075625	8.750798	0.953908	64.33704	25.95825
6	0.080522	8.808842	1.483882	58.87513	30.83215
7	0.083533	8.570094	1.464498	55.74536	34.22005
8	0.087043	7.932743	1.766236	54.51969	35.78133
9	0.089855	7.804777	2.062988	54.98224	35.15000
10	0.092144	8.202193	2.078534	54.73967	34.97960

Variance Decomposition of LOG(Terms\_of\_Trade):

Period	S.E.	Log(SMD)	Log(FDI_Inflow)	Log(Exchange_Rate)	Log(Terms_of_Trade)
1	0.050354	1.213438	6.459646	0.105943	92.22097
2	0.053272	1.215602	14.04010	1.077014	83.66728
3	0.055397	1.385507	14.28377	6.337019	77.99371
4	0.056086	1.978654	14.86502	6.684433	76.47190
5	0.063556	2.427253	18.36682	9.739594	69.46633
6	0.064850	6.037465	17.69992	9.375813	66.88680
7	0.065511	7.464785	17.35678	9.325440	65.85299
8	0.066479	7.803358	16.86243	9.577174	65.75704
9	0.070239	7.356913	16.00828	17.72859	58.90622
10	0.072250	7.917146	15.35509	19.21112	57.51665

Cholesky Ordering: Log(SMD) Log(FDI\_Inflow) Log(Exchange\_Rate) Log(Terms\_Of\_Trade)

**G. Impulse Response**

The generalized impulse response to Cholesky one standard deviation plotted on multiple graphs (Figure 2) below indicated that when there is one standard deviation innovation happened to SMD due to shock from itself, bring SMD down until Q3. Similarly, FDI inflow and exchange rate also came down sharply during the same period between Q1 to Q3 due to the shock from SMD. On the contrary, due to shock from SMD, terms of trade upsurge and become positive by the end of Q3.

The Impulse response of SMD to FDI inflow shown that one standard deviation innovation shock from FDI inflow brought a major volatile phase in SMD during the period of

10 quarters. Additionally, FDI inflow was getting most of its shock from itself that made it volatile during all the quarters.

Furthermore, the impulse shock from FDI brought exchange rate up during the first three quarters and later made it volatile.

The impulse response multiple graph plot summarizes that fall in first three quarters FDI inflows bring down the exchange rates and terms of trade. As a result, SMD falls due to fall in FDI inflow, exchange rate and terms of trade. Later, increased FDI inflow between Q3 to Q6 brought the terms of trade and SMD up until Q6 but exchange remain volatile during this phase too.

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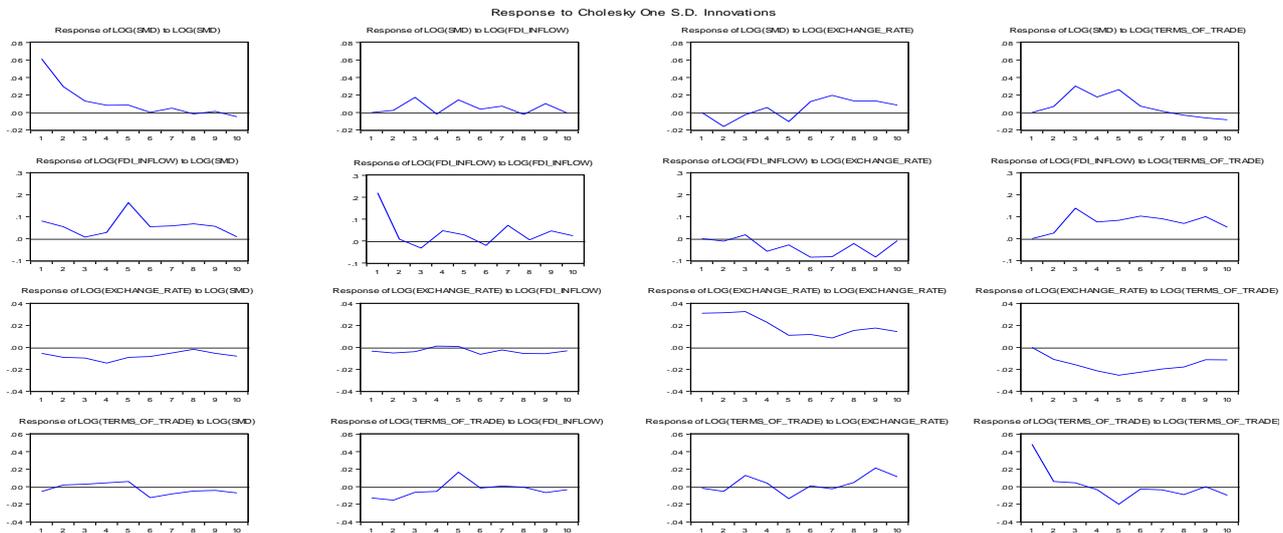


Figure 2: Impulse Response Graph

## V. CONCLUSION

The study is an attempt to identify the role of second generation FDI reforms on the stock market development (SMD). The study objectives were to examine the effect of FDI inflow on SMD and to analyze the relationship among FDI inflow, SMD, exchange rate and terms of trade respectively. The review of literature of past studies suggested that earlier studies focused merely on the relationship of FDI and SMD and ignored the importance of other macro-economic variables such as exchange rate and terms of trade. But the present study considered macro-economic factors such as exchange rate and terms of trade along with FDI and SMD to investigate the combined relationship among the variables.

The test results of Granger Causality and Variance Decomposition suggested that there is a bidirectional causality between FDI and SMD and both influence each other in long run. This finding is in accordance with the findings of the study of (Soumaré and Tchana) but contradicts the findings of (Adam and Tweneboah) which stated that there is a unidirectional causality between FDI and SMD. Furthermore, findings suggested that there is a positive relationship between FDI and SMD and this finding is also in accordance with the finding of (Malik and Amjad). Finally, the results concluded that there is a bidirectional causality between FDI and terms of trade which contrary to the earlier finding of (Dash and Sharma) which proposed a unidirectional causality.

The VDC statistics suggested that shocks in terms of trade could cause a change of 15 percent in SMD and 25.15 percent in FDI respectively in short run. Furthermore, the combined results summary of Granger causality and VDC analysis suggested that there is a causality from exchange rate to FDI inflow and terms of trade. The variance decomposition statistics revealed that exchange rate may cause a change of 34.97 percent in terms of trade in long run. Addition to it, shock in SMD may bring a change of 33.39 percent in terms of trade in long run. Similarly, shock from FDI could result a change of 24.91 percent in SMD long run. Finally, the impulse response analysis revealed

that volatility in FDI inflow do cause a variation in SMD and exchange rate in long run.

The present study concludes that FDI, SMD, exchange rate and terms of trade respectively plays an important role in shaping up the policy framework in a country like India. Further, the macroeconomic structure of the policy making rely on these four pillars in the economy. The study contributes to the existing knowledge of research by revealing the fact that policy maker may not merely rely on the relationship of FDI and SMD but they should consider the terms of trade, exchange rate along with the FDI and SMD at the time of bringing reforms and drafting measures in the foreign direct investment policy. These measures must require to have a robust economic foundation based on the reforms in FDI, SMD, exchange rate and terms of trade so that the economy may woo the foreign investors and provide a sustainable environment for the future investment to come.

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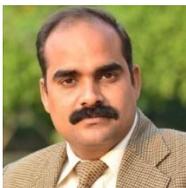
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