Foreign Direct Investment in India: An Econometric Analysis

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Abstract:

   Introduction and Purpose: The examination of FDI and its relationship with the economic growth is one of the controversial issues even after the liberalisation. But at the same time it is well recognized fact that the FDI is one of the key economic growth engines that help in fixing the numerous economic problems. Keeping into consideration a significant role played by FDI in economic development, the present study is conducted with a view to have econometric analysis of FDI in India.

   Data Base and Research Methodology: The study covered a period of 34 years from 1980 to 2013 and is based on the use of secondary data, which is collected from various published sources. The collected data is analyzed with the help of SPSS and E-Views. The independent sample t-test, multiple regression and ARIMA model are used.

   Findings and Suggestions: The significant difference exist in the FDI inflows during the pre and post-liberalization era, which

can be attributable to the change in policies adopted by the Government of India (GOI). The study provided with the relationship of diverse variables with FDI inflows which can be considered by GOI while determining the quantum and type of FDI inflows. The projection of FDI inflows for the upcoming 5 years has shown increasing trends. Hence, the timely and effective action can be taken by the GOI to ensure its effective utilization.

Key words: Foreign Direct Investment, Economic Growth, Auto Regressive Integrated Moving Average Model, Pre and Post-Liberalization.

Introduction

Economic development of a country to a large extent depends upon the flow of capital. The capital can be domestic capital or foreign capital. Domestic capital refers to the flow of capital from within the country, whereas foreign capital refers to flow of capital from outside the country. Further, the foreign capital may take several forms like Foreign Direct Investment (FDI) and Foreign Institutional Investment (FII). Foreign Direct Investment (FDI) refers to an investment made by a company or entity based in one country into a company or entity based in another country. An American company takes the majority stake in a company in China or a Canadian company setting up a joint venture to develop a mineral deposit in India are examples of FDI. According to OECD, FDI is defined as

> "An investment by a resident entity in one economy that reflects the objective of obtaining a lasting interest in an enterprise resident in another economy. The lasting interest implies the existence of a long-term relationship between the direct investor and the enterprise and a significant degree of influence by the direct investor on the management of the enterprise. The ownership of at least 10% of the voting power, representing the influence by the investor, is the basic criterion used." *(http://www.oecd-ilibrary.org assessed as on 13 May, 2014).*

The examination of FDI and its relationship with the economic development of India is one of the most controversial issues even after the liberalisation. This is largely because it is the area where there is greatest disconnection between economic theory and actual events in the real world. India has been the most preferred destination for FDI in terms of financial attraction, skill availability, and business environment. At the same time, strong macro-economic fundamentals, growing size of the economy and improving investment climate served as strong force for the global corporation to invest in India. Because of all these, India attracts large amount of FDI. At the outset, it is well recognized and accepted fact that the FDI is one of the key economic growth engines that help in fixing various economic problems. In other words, FDI is perhaps the key source that can mitigate any developing nation currency valuation. Keeping into consideration a significant role played by FDI in economic development, the present study is conducted with a view to have econometric analysis of FDI in India which includes the analysis of inflows of FDI in India during the pre and post liberalization era; to examine the determinants of FDI inflows as well as projection of FDI inflows in India.

Review of Literature

Sahoo and Mathiyazhagn (2003) examined the long-term relationship of FDI with the Gross Output (GO), Export (EX) and Labour Productivity (LP) in the Indian economy at the sector level by using the annual data from 1991-91 to 2001-10. The study use the panel co- integration (PCONT) test and revealed that there is no significant co-integrating relationship among the variable like FDI, GO, EX and LP. ***Chatterjee (2009)*** hypothesized that the FDI is an important factor in the globalization process and also investigated the different aspects of FDI at the macroeconomic level. The result provided the

knowledge about the nature of FDI is very important and that may help policy makers of both home and host country to take appropriate decisions. *Sahni (2012)* examined the determinants of FDI in India by taking time series data for the period 1992-93 to 2008-09 and provided that that GDP, inflation and Trade Openness are important factors in attracting FDI inflows in India during post-reform period whereas Foreign Exchange Reserves are not important factors in explaining FDI inflows in India. *Juma (2012)* explored the effect of FDI on economy growth in Sub-Saharan Africa region using data from 43 countries over the period 1980-2009. The ordinary least squares regressions using real GDP growth as the dependent variable and gross FDI inflation as the percentage of GDP as the key explanatory or independent variable. The result provided that FDI is the associated with higher growth in sub-Saharan Africa. *Devajit (2012)* investigated the impact of FDI on the Indian economy and provided that it is a strategic component is needed for sustained economic growth and development of India. Therefore, further opening up of the Indian economy is advisable to open up the export oriented sectors and accordingly higher growth of the economy could be achieved. *Gola et. al. (2013)* investigated the impact of FDI and provided that more than 50 per cent of total FDI inflows received came from Mauritius, Singapore and the USA. The main reason for higher levels of investment from Mauritius lies in the fact that India entered into a Double Taxation Avoidance Agreement (DTAA) by which the Mauritius is protected from taxation in India. Among the different sectors, the service sector had received the larger proportion followed by computer software and hardware and telecommunication sector.

From the literature review it is evident that there is huge importance of FDI in economic development of any nation and by seeking such importance of FDI in economic growth, the

present study is conducted to contribute towards the existing literature with new, fruitful and comprehensive findings.

Objectives and Hypotheses of the Study

1. To analyze the flow of Foreign Direct Investment (FDI) in India with reference to pre and post-liberalization period.
2. To examine the various determinants of FDI Inflows in India.
3. To forecast of the inflows of Foreign Direct Investment (FDI) in India.

Further, the following hypotheses are constructed:

H_{01}: There is no significant difference in the FDI inflows during pre and post-liberalization era.

H_{11}: There is significant difference in the FDI inflows during pre and post-liberalization era.

H_{02}: There is no significant relationship of independent variables (*GDP, AGGDP, EX, TB, TO, INFL, ELEC, COAL and WPI*) with FDI Inflows in India.

H_{12}: There is significant relationship of independent variables (*GDP, AGGDP, EX, TB, TO, INFL, ELEC, COAL and WPI*) with FDI Inflows in India.

Data Base and Research Methodology

The magnitude of FDI inflows is analyzed during the pre and post-liberalization period. Accordingly, the study covered a period of 34 years from 1980 to 2013, which includes 1980-1991 duration as pre-liberalization and 1992-2013 as post-liberalization. The study is based on the use of secondary data, which is collected from the following published sources: World Bank Statistics, Central Statistical Organization (CSO), Secretariat of Industrial Assistance (SIA), Economic Survey of Government of India, Department of Industrial Policy and Promotion (DIPP) and Handbook of Statistics on the Indian

Economy, RBI (various issues). The independent sample T-test is used to examine whether significant variation exist or not in the FDI inflows during pre and post-liberalization era. The multiple regression is used to examine the various determinants of FDI inflows in India. Beside this, Autoregressive Integrated Moving Average (ARIMA) model is used for the projection of FDI inflows into India. The collected data is analyzed with the help of SPSS and E-Views.

Variables Selection

The macroeconomic indicators of an economy are considered as the major factors which affect the FDI. The analysis of existing literatures provided a base in choosing the right combination of variables that explain the flow of FDI in a country. In order to choose the best variable, firstly, the major factors which influence the flow of FDI into country are considered and thereafter the appropriate proxy variables representing the factors are selected for the purpose of analysis and are shown in table 1.

Table 1 Proxy Variables Representing Factors Affecting FDI Inflows

S.No.	Factors	Proxy Variables
1	Market Size	Gross Domestic Product (GDP) & Annual Growth Gross Domestic Product (AGGDP)
2	Availability of Natural Resource	Coal Production
3	Infrastructure	Electricity
4	Economy Stability	Inflation, WPI
5	Government policy	Trade Openness, Trade Balance, Export

A. Dependent Variable

Foreign Direct Investment (FDI) Inflows: For the econometric analysis of FDI in India, we have taken FDI (net

inflows measured as BOP current US$) as dependent variable which is measured by number of independent variables.

B. Independent Variables

1. Gross Domestic Product (GDP): It acts as a barometer to measure the economic health of the economy. It is defined as the monetary value of all the finished goods and services produced within a country's borders in a specific time period. Higher GDP signifies the strong health of the economy and will lead to the flow of more capital form foreign. Accordingly, it is expected to have positive relationship with FDI inflows.

2. Annual Growth Rate of GDP (AGGDP): The annual growth rate in GDP measure the growth of GDP for each and every year. The annual growth rate in GDP is calculated as: (X2- X1)/ X1. Likewise, GDP it is also expected to have positive relationship.

3. Export (EX): The term export means selling and shipping of goods and service out of the port of a country. In International Trade, exports is refers to selling goods and services.
produced in the one country (home country) to other country (foreign country). It is expected to have positive relationship with the FDI inflows.

4. Trade Balance or Balance of Trade (TB): It is the difference between a country's exports and imports. Balance of trade is the largest component of a country's balance of payments. A country has a trade deficit if it imports more than it exports; the opposite scenario is a trade surplus. It is expected to have positive relationship with the FDI inflows.

5. Trade Openness (TO): It refers to the extent to which a country allows or has trade with other country. The trade-to-

GDP ratio indicator is used to examine the trade openness and it is calculated as the simple average (i.e. the mean) of total trade (i.e. the sum of exports and imports of goods and services) relative to GDP. This ratio is often called the trade openness ratio and is expected to have positive relationship with FDI inflows.

6. Inflation (INFL): It is defined as the continuous rise in the price of goods and services and fall in the purchasing power of money. High rate of inflation in any economy signifies the lack of stability in economy and inability of government or central bank to control the supply of money in the economy. Accordingly, it is expected to have negative relation with the FDI.

7. Infrastructure: Electricity (ELEC): The highly developed infrastructure is one of the requirements for establishment of industry, which include roads, rails, electricity and communication system etc. Out of these factors, we have taken electricity generation as variable and it is expected to have positive relationship with the FDI inflows.

8. Natural Resource: Coal (COAL): Availability of natural resources is one of the determinants of FDI inflows. It exhibit that for the manufacturing, the natural resources are required and countries in which natural resources are available the inflows of FDI will be more.

9. Wholesale Price Index (WPI): WPI is the price of a representative basket of wholesale goods. Some country use WPI change as central measure of inflation and it is expected to have negative relationship with the FDI.

Model Description

In the present study, FDI inflows in India are assumed as the function of GDP, AGGDP, EX, TB, TO, INFL, ELEC, COAL and WPI. Rewriting, it in the form of an equation will give us the following:

$$FDII_t = \alpha + \beta_1 GDP_t + \beta_2 AGGDP_t + \beta_3 EX_t + \beta_4 TB_t + \beta_5 TO_t - \beta_6 INFL_t + \beta_7 ELEC_t + \beta_8 COAL_t - \beta_9 WPI_t + \varepsilon_t$$

Where,

FDII = Foreign Direct Investment Inflows measured as net inflows as BOP current US$

GDP = Gross Domestic product at constant price (amount in Rs. Billion)

AGGDP = Annual Growth Rate of Gross Domestic Product

EX = Exports (Amount in Rs. Billion)

TB = Trade Balance i.e., total Exports (Amount in Rs. Billion) – total Imports (Amount in Rs. Billion)

TO = Trade Openness i.e., sum of Exports + Imports divided by GDP {(Ex+Im)/GDP}

INFL = Inflation measured in term of percentages of consumer price (annual percentage)

ELEC = Electricity generated in billion Kwh

COAL = Coal production measured in million tonnes

WPI = Wholesale price index annual average, and

t = time frame

Analysis and Interpretation

Descriptive Statistics

The descriptive statistics comprises of mean, standard deviation, minimum and maximum value of the variables under consideration is shown in table 2.

Table 2 Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
AGGDP	-2.84719	1.432076	*-0.72692*	1.082694
TB	-0.18117	0.012127	-0.09437	*0.046582*
ELEC	-4.87298	5.280064	0.553784	2.136175
WPI	2	2.41044	2.159397	0.108951
EX	2.7604	4.152317	3.336999	0.474119
GDP	1.056859	10.54638	6.171418	2.236783

TO	5.127909	9.216337	6.753128	1.075873
INFL	3.26256	13.87025	8.168893	3.092388
FDI	15.54539	24.49387	20.96495	2.443654
COAL	128.2	605.838	*319.8686*	*143.1167*

The table 2 shows that the mean value is least in case of AGGDP i.e. -0.72692 whereas highest mean value is in case of COAL. On the other hand the standards deviation is least in case of TB i.e. 0.046582, whereas highest standard deviation is in case of COAL.

Analysis of Flow of Foreign Direct Investment (FDI) in India with Reference to Pre and Post-Liberalization Era

Under this we tried to test the following hypothesis:
H_{01}: There is no significant difference in the FDI inflows during pre and post-liberalization era.
H_{11}: There is significant difference in the FDI inflows during pre and post-liberalization era.

Table 3 Results of Independent Sample T-test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	Df	Sig.	Mean difference	Std. Error difference	95% confidence interval of the difference	
								Lower	Upper
Equal variances assumed	39.421	0	-3.022	31	0.005	-12217	4.043	-2.041	3.971
Equal variances not assumed			-4.025	20	0.001	-12217	3.055	-1.855	-5.886

The table 3 shows the results of independent sample t-test. In this, the Levine test is an inferential statistics used to assess the equality of variance and is indicated by the p-value. If the of p-value is < 0.05 the evidence suggests that the variances are unequal. In the above table the Levine's test for equal variance

yield the p-value is .000 which is less than 0.05 meaning that the variance are assumed to be unequal. The p-value in case of unequal variance is .001 which is less than .05, hence our the null hypothesis that there is no significant difference in the FDI inflows during pre and post liberalization era is rejected at 5% level of significant. In other words, there is significant difference between FDI inflows during the pre and post liberalization era.

Analysis of Various Determinants of FDI Inflows in India

Under this section the various determinants of FDI inflows in India analyzed and we tried to test the following hypothesis:

H_{02}**:** There is no significant relationship of independent variables (*GDP, AGGDP, EX, TB, TO, INFL, ELEC, COAL, and WPI*) with FDI Inflows in India.

H_{12} **:** There is significant relationship of independent variables (*GDP, AGGDP, EX, TB, TO, INFL, ELEC, COAL, and WPI*) with FDI Inflows in India.

In order to analyze the various determinants of FDI Inflows in India, multiple regression is applied and results obtained are discussed are followings headings and tables. Firstly, the correlation matrix (table 4) is prepared showing the extent of correlation among the variables taken into consideration.

Table 4 Correlation Matrix

	FDI	GDP	AGGDP	EX	TB	TO	INFL	ELEC	COAL	WPI
FDI	1									
GDP	0.33	1								
AGGDP	0.44	-0.31	1							
EX	0.9	0.38	-0.3	1						
TB	0.28	-0.17	0.15	-0.21	1					
TO	-0.89	0.17	-0.25	0.97	-0.23	1				
INFL	-0.21	0.01	0.35	-0.18	-0.23	-0.18	1			
ELEC	-0.18	-0.53	0.07	-0.19	-0.05	-0.07	-0.01	1		
COAL	0.92	0.48	-0.3	0.96	-0.22	0.91	-0.04	-0.25	1	
WPI	0.09	-0.25	0.31	0.02	0.21	0.07	-0.12	-0.29	0.01	1

The table 4 shows that the GDP, AGGDP, EX, TB, COAL and WPI has positive relationship with FDI, whereas TO, INFL, ELEC has negative relationship with FDI. The AGGDP, TB, ELEC, WPI has negative relationship with GDP, whereas EX, TO, INFL, COAL has positive relation with GDP.

Table 5 Results of Multiple Regression

Model	Unstandardized Coefficients			T	Sig.
	B	Std. Error	Beta		
Constant	3.771	2.491		1.514	.143
GDP	1.198	6.508	.217	1.841	.048*
AGGDP	3.770	5.046	.064	.747	.462
EX	2.349	1.463	.798	1.605	.122
TB	4.954	2.279	.580	2.173	.040*
TO	-1.785	1.384	-.295	-1.290	.209
INFL	-.165	.092	-.228	-1.808	.130
ELEC	-6.461	3.758	-.374	-1.719	.098
COAL	9.540	3.981	1.108	2.396	.025*
WPI	5.525	2.273	.181	2.431	.023*
R Square= .0965		F= 15.827			p-value=.004

Significant at 5% Level

The table 5 shows that the value of R Square is .965, which indicates that 96.5% of the variation in FDI is due to independents variables taken into consideration. The P-value helps us to accept or reject the null hypothesis. Here, the p-value is .004 which is more than .05. Hence, our null hypothesis which states that there is no significant relationship of independent variables (*GDP, AGGDP, EX, TB, TO, INFL, ELEC, COAL and WPI*) with FDI Inflows in India is rejected. In other words, there is significant relationship of independent variables with FDI inflows.

FDIIt= 3.771+1.198GDPt+3.770AGGDPt +2.349EXt+4.954TBt – 1.785TOt –.165INFLt –.6.461ELECt +9.540COALt +5.525WPIt

Projection of FDI inflows in India for 5 years (2014 to 2018)

ARIMA Methodology is used in order to predict the value of FDI inflows in India. The projection of FDI Inflows in India involves various stages as: Firstly, the time series are tested for stationarity. Secondly, based on BOX –Jenkins methodology appropriate models are constructed to estimate the FDI Inflows. Finally, forecasting performance of the various type of ARIMA models are compared by computing various statistics.

Test for the Stationarity of the Series
In ARIMA model, first of all we test the stationary of the series using Augmented Dickey-Fuller (ADF) test.
Null Hypothesis: The Series is not stationary
Alternate Hypothesis: The Series is stationary.

Table 6 Results of Augmented Dickey-Fuller Test

Variables	P-Value	Achievement of Stationary
FDI	0.0000	At First Difference
GDP	0.0004	At Level
AGGDP	0.0000	At Level
EX	0.0006	At First Difference
TB	0.0000	At Second Difference
TO	0.0001	At First Difference
INFL	0.0092	At Level
ELEC	0.0047	At Level
COAL	0.0000	At Second Difference
WPI	0.0014	At Level

The table 6 shows the results of ADF test at level, first difference and second difference. Here, in order to meet the assumption we require rejection the null hypothesis which states that series is non stationary. If p-value is less than .05 then we will reject the null hypothesis. Accordingly the null hypothesis is rejected in case of GDP, AGGDP, INFL, ELEC and WPI at level. On the other hand FDI, EX, TO series become

stationary at first differencing, whereas TB and COAL series become stationary after second level differencing.

Determination of ARIMA (p, d, q) Model

After getting the stationary in all the series, the next step is to determine the ARIMA (p, d, and q) order. The ACF and PACF plots are constructed in order to determine the ARIMA order. The ACF and PACF plots are shown for FDI series in before log/lag transformation and after log/lag transformation in figure 1 and 2.
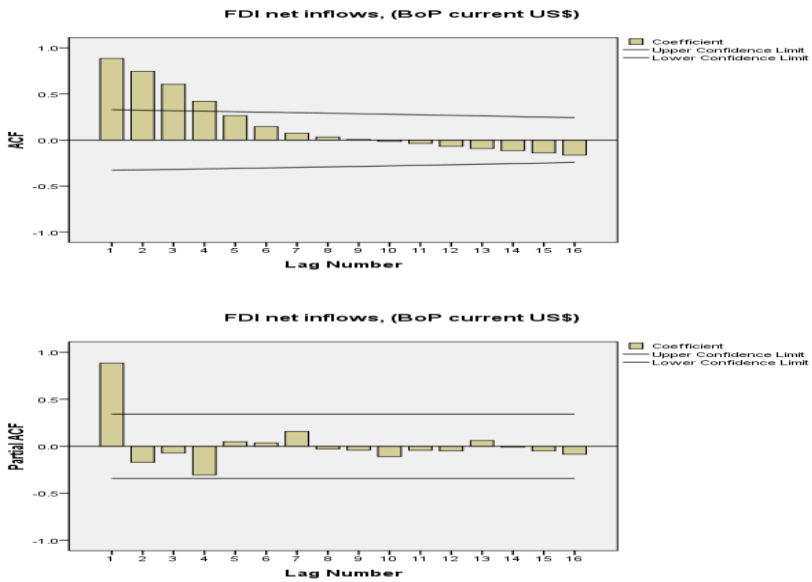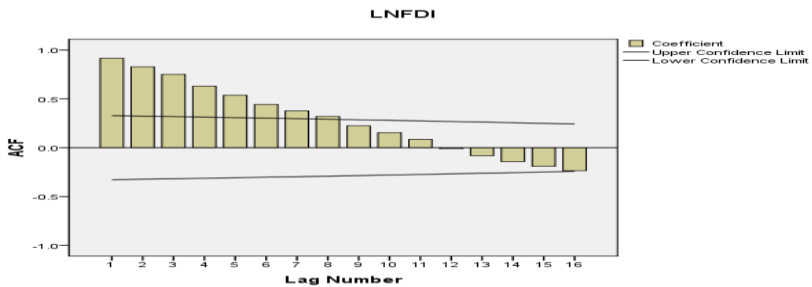

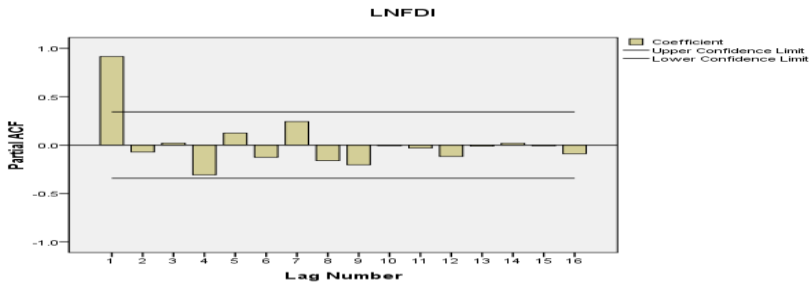**Figure 1 ACF and PACF before log/lag of FDI series**

Figure 2 ACF and PACF after log/lag of FDI series

On the basis of results of figure 1 and 2 and also by hit and trail the following orders to ARIMA model are selected: ARIMA (0,1,0); ARIMA (1,1,0); ARIMA (1,0,0) and ARIMA (1,1,1)

Results for Different ARIMA Models

In the view of above, various order of ARIMA are selected and time series ARIMA model applied using SPSS. The results obtained are shown in table 7.

Table 7 Results for Different ARIMA Model

	(ARIMA 0,1,0)	(ARIMA 1,1,0)	ARIMA (1,0,0)	ARIMA (1,1,1)
R-Squared	.781	.782	.783	.723
RMSE	5.83	5.89	5.82	5.84
MAPE	353.922	327.862	126.591	332.439
MAE	3.079	3.063	3.048	3.853
MaxAPE	6.718	6.215	1.881	6.488
MaxMAE	1.787	1.745	2.035	1.884
Normalized BIC	45.177	45.208	45.119	45.296

The table 7 shows the value of R-Squared, RMSE, MAPE, MAE, MaxAPE, MaxMAE, and Normalized BIC. For the selection of appropriate model four criterions namely, Normalized Bayessian Information Criteria (BIC), the R-Square, Root Mean Square Error (RMSE) and the Mean Absolute Percentage error (MAPE) are used. The high value of R-Square and lower value of BIC, MAPE, RMSE are preferable. From the above table the

set criteria is found in ARIMA (1,0,0), accordingly it assumed as
best model and used to predict value of FDI inflows in future.

Checking of Statistical Significance or Model Estimation

This is concerned with the checking of statistical significance of
the model selected above. For this the Ljung-Box Statistics are
considered which is a diagnostic tool used to test the lack of fit
of a time series model. The Ljung-Box Statistics, which shows
that model is not significantly different from 0, with value of
6.28 for 17 DF and associated p-value of 0.992, thus failing to
reject the null hypothesis of no remaining significant AR in the
residual of the model. Beside this the R-squared is .783 which is
high and desirable at the same time RSMS is minimum.

Model Diagnostic

It is concerned with testing the goodness of fit of the model and
for this the graphs of residuals of ACF and PACF are drawn
and shown in figure 3 and 4. It is shown that all the points are
randomly distributed and there is irregular pattern, meaning
that the model is adequate. Hence, the model is adequate and
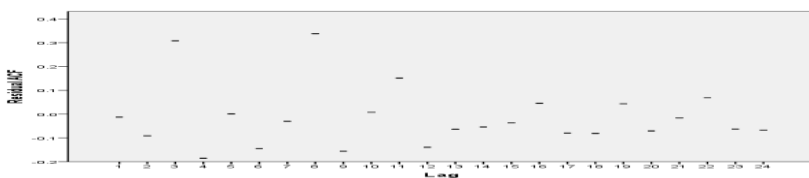now we can go for projection of FDI inflows in India.

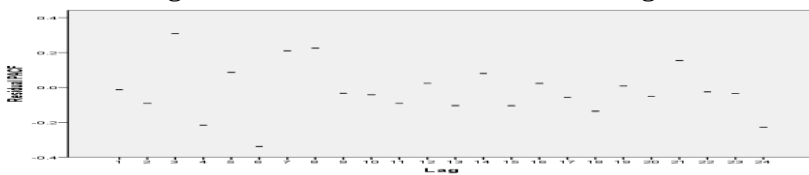**Figure 3 Residuals of ACF at Various Lags**

Figure 4 Residuals of PACF at Various Lags

Forecast on the Basis of Selected and Tested Model

The model selected above is used to predict the value of FDI inflows in India for 5 years (2014, 2015, 2016, 2017 and 2018).

Table 8 Forecast of FDI Inflows (BoP Current US$)

Year	Forecast	UCL	LCL
2014	9199602235	29740950367	-11341745896
2015	9378195801	28771731967	-10015340364
2016	9582544112	27361685212	-8196596989
2017	9816361224	25228374039	-5595651591
2018	10083896796	21688560435	-1520766843

The table 8 shows the predictions of FDI inflows in India for the forthcoming five years. Beside this, the upper and lower control limits are also shown. The forecast for FDI inflows shows the increasing trend for the projection period under consideration.

Conclusion

In the present era, fast increasing competition has provided with the growth of the fittest country only, which can be ensured by capital formation either with the help of domestic capital or with foreign capital. Accordingly, for the Indian economic growth more capital in the form of FDI is required and study has shown that in the coming years the FDI inflows will be more in India. The results of the study also provided that there is significant difference in the FDI inflows during the pre and post-liberalization era, which can be attributable to the change in policies adopted by the Government of India (GOI) during post-liberalization. Hence, the more comprehensive and FDI friendly policies can be deployed by the GOI to ensure more inflows. The relationship of diverse variables (*GDP, AGGDP, EX, TB, TO, INFL, ELEC, COAL and WPI*) with FDI inflows provided that TO, INFL, ELEC has negative relation, whereas others variables have positive relation. Hence, the relationship of all such variables can be considered by Government of India

(GOI) while determining the quantum and type of FDI inflows. The projection of FDI inflows for the upcoming 5 years has shown increasing trends. Accordingly, a timely and effective action can be taken by the Government of India to ensure more inflows in the productive areas or where there is actual requirement of capital.

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