

Forecasting Foreign Direct Investment Inflows into India Using ARIMA Model

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ABSTRACT

The aim of this research is to forecast the inflows of foreign direct investment into India for twelve months. For that purpose ARIMA (Auto Regressive Integrating Moving Average) model is used. This study covers 17 years monthly FDI inflow data of India. Before forecasting the value of FDI inflows it is essential to test the stationarity of the data series. The data set is found to be non-stationary at level and is stationary at first differencing. The study results shows that the total inflow value during July 2017 to July 2018 is 163899.64million US dollars and the average inflow value during these periods is 12607.66million US dollars. The predicted average percentage of increase in the inflows will be 7.69%.

Keywords: FDI, Augmented Dicky Fuller Test, ARIMA, Forecasting, Time series.

INTRODUCTION

FDI is an important source of finance for all developing countries especially in India .Need for FDI depends on the savings and

investment rate in any country. Foreign Direct investment acts as a bridge to fulfil the gap between investment and saving. In the process of economic development foreign capital helps to cover the domestic saving constraint and provide access to the superior technology that promotes efficiency and productivity of the existing production capacity and generate new production opportunity.

FDI (Foreign Direct Investment) is a type of investment made by an investor who is a non-resident. FDI has played an import role in the growth and development of a nation like India. It acts as a major source of finance to our country. FDI in several sectors is an additionally of resource which helps in promoting domestic manufacturing and job creation. India's trade in services have increased overtime and services accounts for the largest share in India's foreign direct investment inflows and outflows. Investments in service activities e.g. education, research & development, information & communication technology etc. is essential for nation.

OBJECTIVES OF THE STUDY

- To forecast the foreign direct investment inflows using ARIMA model.

REVIEW OF LITERATURE

Salah (2011): He forecasted the inflow value of FDI in Jordan for a period of twenty years. The tools used for analysis were Minitab and E-Views3.1. He found out that the expected FDI inflow will be 29207.06 during the year 2030 with a growth rate of 3.2%.

Prasanna (2015): Forecasted the FDI inflow value of Srilanka between 2014-2064. For forecasting the data he used ARIMA (1, 1, 6) and ARIMA (1, 0, 6) had been used. The results of the study found out that Srilanka would receive more than 2 billion dollars during the forecasted periods.

RESEARCH METHODOLOGY

To forecast the inflow values of FDI, data for a period of 17 years (April 2000 to June 2017) have been taken from RBI website (Reserve Bank of India), DIPP (Department Of Industrial Policy And Promotion) website. The data series consists of 207 observations. So for getting more reliable result logarithmic values of FDI inflows are also used. All the values are in US dollar million. Analysis has been done by using E-views 7.

Steps in ARIMA modelling

The following are the steps in ARIMA Modelling

- 1) Identify model
- 2) Estimate Parameters
- 3) Diagnostic checking
- 4) Forecasting

Hypothesis

Null hypothesis, H_0 = Variable is not stationary.

Alternate hypothesis, H_1 = Variable is stationary.

ANALYSIS AND INTERPRETATION

Before forecasting the inflow values, the time series values must be checked for stationarity. In time series analysis stationarity of data can be checked by using Augmented Dicky Fuller Test (ADF) test. So in ADF test it is essential to check the stationarity of the variable at level and at first or second order differencing. If it stationary at first order difference it can be represented as I (1). If it is stationary at second order difference it can be represented as I (2). The results of Augmented Dicky Fuller Test as follows.

<Insert Table No: 1 here>

The table no: 1 shows that FDI inflow values are non-stationary at level. But they are found to be stationary at their first differencing.

ARIMA MODEL FORECASTING

The first and foremost step in forecasting is model identification with the help of a correlogram

<Insert Figure No: 1 here>

From figure no: 1, it is found that the model for forecasting is AR (1), because the number of spikes decays after first lag.

Now the second step is to estimate the parameters.

<Insert Table No: 2 here>

From table no: 2 it is found that the variable is statistically significant. Because the probability value is less than 0.05%. Now the third step is diagnostic checking. I.e, statistically checking whether the model is fit for forecasting or not. The diagnostic checking can be done with the help of ARIMA graph and a table.

< Insert Figure no: 2 here>

< Insert Table no: 3 here>

From figure no 2 and table no: 3 it is found that the model is good fit. This model satisfies the diagnostic checkings also. So the current

model satisfies all the requirements of forecasting.

RESULTS OF ARIMA FORECASTING

< Insert Table no: 4 here>

< Insert Figure no: 3 here>

The above graph shows the FDI inflows after forecasting. The red line in the graph shows the actual data and the blue line in the graph shows the forecasted value of FDI inflows. LNFDIUSF stands for the log(FDI) inflow values in us dollars million after forecasting and LNFDIUS stands for log(FDI) values in us dollars million .

CONCLUSION

ARIMA model is used for forecasting the inflow value of FDI into India during the period between July 2017 and July 2018. The empirical analysis have been done on the monthly time series between April 2000 to June 2017. Using the ADF test it is found that the variable(FDI inflow)is stationary at its first differencing .ARIMA forecasted output shows that the total FDI inflow into India From July 2017 to July 2018 is 163899.64 million US dollars and the average inflow value during these periods is 12607.66 million US dollars. The predicted average percentage of FDI inflows could be 7.69%.

RESEARCH CONTRIBUTION

The forecasting result shows an increasing trend. The policy makers of India and the foreign investors of other countries can plan their investment strategies based on this results. They can formulate better policy decisions for the next coming months of investment.

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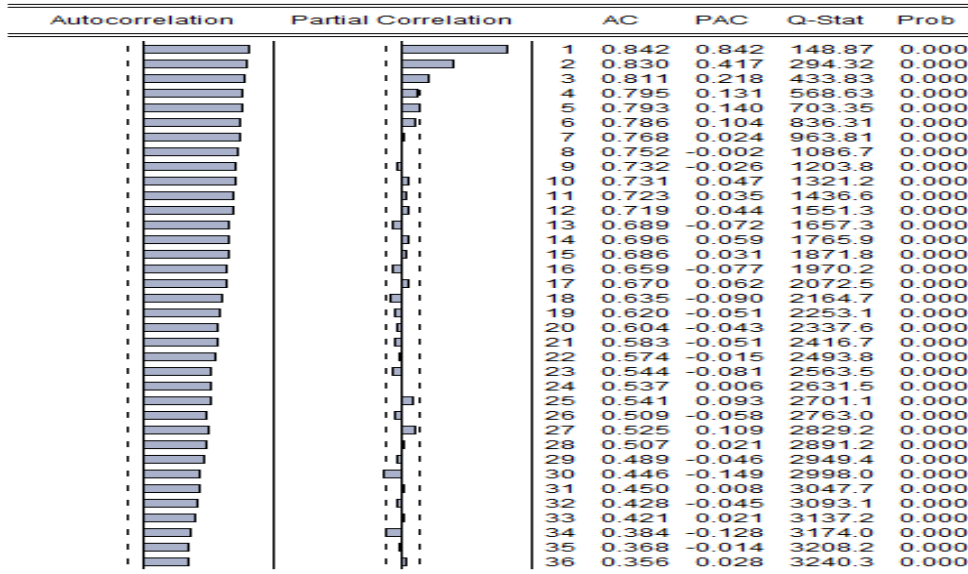
APPENDIX

Table 1: Results of Unit Root Testing Using Augmented Dicky Fuller Test

	<i>FDI Inflow values at level</i>	<i>FDI Inflow values at first differencing</i>
<i>ADF test Statistics</i>	-1.815180	-11.18630
<i>p-value</i>	0.3724	0.0000

Source: Author compilation using E-views

Figure No: 1 Correlogram



Source: Author compilation using E-views

Table no: 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.006229	0.281887	24.85474	0.0000
AR(1)	0.850407	0.036406	23.35882	0.0000

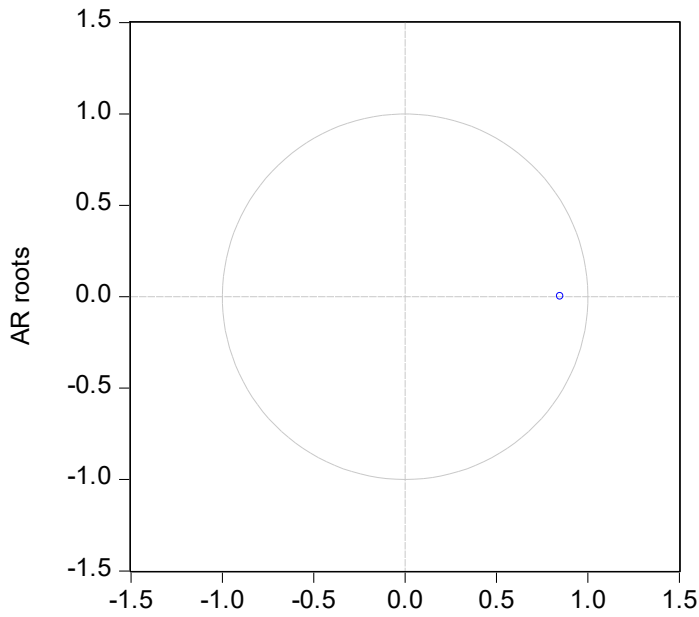
R-squared	0.727867	Mean dependent var	6.902424
Adjusted R-squared	0.726533	S.D. dependent var	1.150917
S.E. of regression	0.601861	Akaike info criterion	1.832080
Sum squared resid	73.89621	Schwarz criterion	1.864389
Log likelihood	-186.7042	Hannan-Quinn criter.	1.845147
F-statistic	545.6347	Durbin-Watson stat	2.738534
Prob(F-statistic)	0.000000		

Inverted AR Roots	.85
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Source: Author compilation using E-views

Figure No: 2

Inverse Roots of AR/MA Polynomial(s)



Source: Author compilation using E-views

Table no: 3

AR Root(s)	Modulus	Cycle
0.850407	0.850407	

No root lies outside the unit circle.
ARMA model is stationary.

Source: Author compilation using E-views

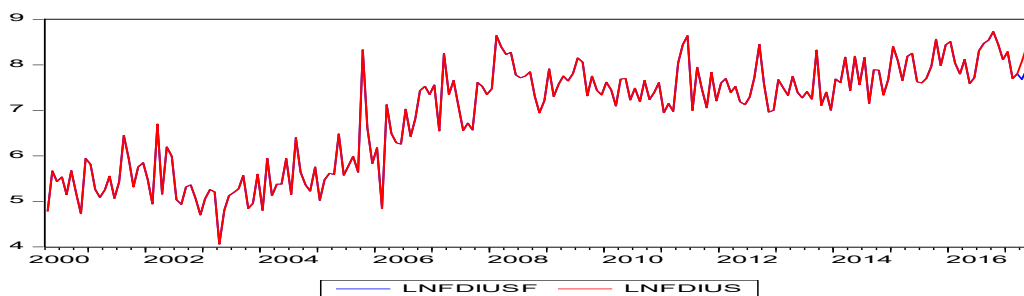
Table no: 4

MONTH&YEAR	FORECASTED VALUE(in us dollar million)	FORECASTED VALUES IN %
JULY-2017	5746.527	3.50
AUGUST-2017	6450.98	3.94
SEPTEMBER-2017	7241.791	4.41
OCTOBER-2017	8129.546	4.96
NOVEMBER-2017	9126.128	5.57

DECEMBER-2017	10244.88	6.25
JANUARY-2018	11500.78	7.01
FEBRUARY-2018	12910.63	7.87
MARCH-2018	14493.31	8.85
APRIL-2018	16270.02	9.92
MAY-2018	18264.52	11.14
JUNE-2018	20503.53	12.50
JULY-2018	23017.01	14.04
TOTAL	163899.64	99.96
AVERAGE	12607.66	7.69

Source: Author compilation using E-views

Figure no: 3 (ARIMA FORECASTED GRAPH)



Source: Author compilation using E-views