

A Study to Forecast Foreign Direct Investment Inflow to G-7 Countries for the Period 2018-2030

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ABSTRACT

The study is aimed to forecast the Foreign Direct Investment inflows in the G7 countries, for a period of 12 years ranging from 2018 – 2030. G-7 is a group of 7 member countries comprises of United States of America, United Kingdom, Canada, Japan, France, Germany, Italy. The Economies of G-7 countries are known as world's highly economically and industrially developed countries. G-7 countries are highly ranked on Human development index and accumulates the big national wealth. G-7 countries are owning 60% of the world Gross Domestic Product, therefore attract large Foreign Direct Investment inflows. G-7 countries account for 41.57% of the total world FDI inflow in year 2016 and 29.84% in year 2017, this share is decreasing continuously over the years. FDI inflow in G-7 also accounts for 2.18% of total GDP of G-7 countries and 1.16% in year 2017. This is a major cause of concern to the key policy formulators as G-7 countries are facing problems like decrease in GDP, growth rate, employment opportunities, decrease in per capita income, decrease in industrial output and demand. These problems can be overcome by drafting a more favorable economic policy which will encourage more FDI inflow. There is ample scope for increasing regional co-operation among the member countries in the field of foreign direct investment, among the member countries and with the other regional groups.

Keywords: G-7 countries, ARIMA, Auto correlation Function, Partial auto correlation function.

INTRODUCTION:

Foreign Direct Investment (FDI) is termed as the flow of foreign capital from a one country to a host country to have control in assets, to set manufacturing or service facilities and to perform business activities. Foreign Direct Investment is a key to the economic development of any nation and plays a key role in economic growth and development.

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Structure of the Paper:

This paper is structured as (1) the introductory note, (2) a literature review, (3) the research methodology used followed by a discussion on findings and results, ending with a brief concluding section.

LITERATURE REVIEW:

Followings are few significant empirical contributions that are made by various researchers in the area of forecasting of FDI inflow using ARIMA model and role of FDI inflow into economic growth and development. Pirlogeanu.D.(2017) in his studies focused on important factors that influence the flow of foreign investment in G-7 and studied the pattern of FDI factors in foreign Investment policy of G-7 countries

Salah et.al [SALA2011] in his study determined the forecasted values of FDI inflow for a period of 19 years for Jordan by applying ARIMA models based on data from 1981-2010. This study aimed at only fitting of ARIMA model for FDI forecasting for 20 years.

Batchelor, R., (2000) in his study compared the accuracy and information of macroeconomic forecast for G-7 countries. In his research he tried to find the accuracy of private sector forecast in terms of mean absolute error and root mean square error for OECD and IMF.

A study By (Muhlis et al. 2017) was focused on to study the relationship between research and development expenditure, foreign direct investment and economic growth on G-7 countries over a period of 1996-2011. It was found that there is a unidirectional relation between foreign direct investments to Research & Development expenditures and to economic growth

A study by (Mostafa & Mahmood, 2015), focused on the rise of the BRICS in terms of economic growth and their challenge to the G7 countries. This study was also aimed to study the various economic variables that are leading to the superior performance of BRICS over G-7 countries

Perera.P. (2015) in a study of FDI focused on forecasting of FDI inflow in Srilanka from 2014-2064 using ARIMA model

A study by Drysdale.P (2011) was focused on growth of BRICS and its relationship with G-7 and other industrialized countries and emerging role of BRICS in the developed nations and also study the opportunities of G-7 countries in BRICS

OBJECTIVES OF THE STUDY:

The basic purpose of this paper is to project the assessment of Foreign Direct Investment of G-7 for the next 12 years from 2018-2030. This study also focused on study the pattern and trends of FDI inflow into G-7 countries.

METHODOLOGY:

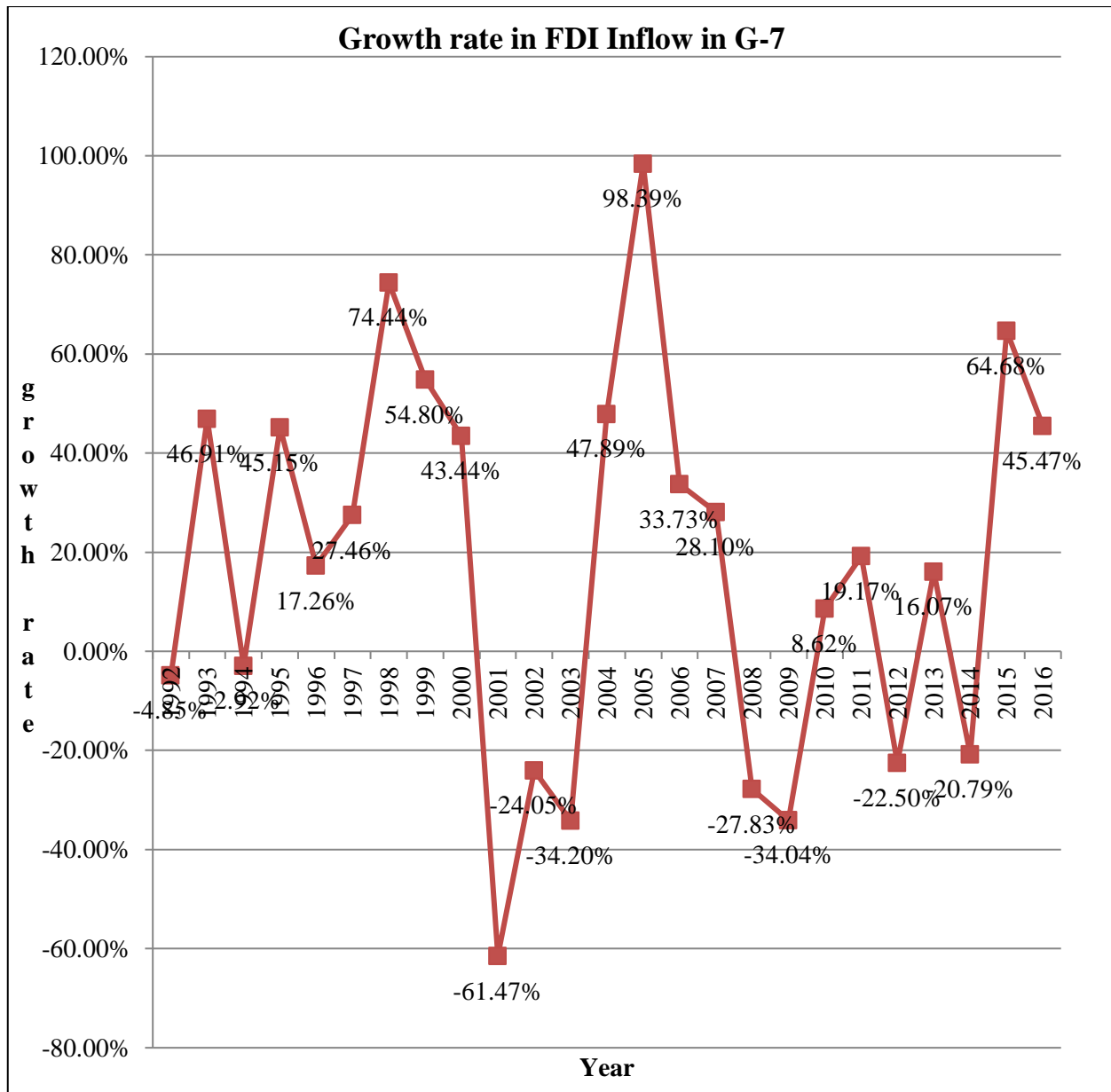
The data used in the research connected to FDI inflow in G-7 countries are drawn from the data source of United Nations Conference on Trade and Development (UNCTAD).

In this study time series analysis is used to forecast the value of FDI in G-7 using R software, IBM SPSS and MS excel. To test the normality of data Shapiro-Wilk is applied on FDI data. To test the Stationary of data series Augmented Dickey-Fuller Test was applied. After the stationary check of data, Auto Correlation Function and Partial Auto Correlation Function was performed and ACF and PACF plot were plotted to find the best suited ARIMA model for the study by applying Box Jenkins Model. the study plotted the Auto Correlation Function (ACF) and Partial Auto Correlation Function (PACF) and then Box-Jenkins model was used to select the best suited model for the current study. Using Box Jenkins model, ARIMA (0,1,0) was identified as best fitted model to assess the inward FDI flow to G-7 for the period 2018-2030

Growth Pattern of FDI Inflow into G-7 Countries

Year	FDI inflow growth rate per annum	Year	FDI inflow growth rate per annum
1992	-4.85%	2005	98.39%
1993	46.91%	2006	33.73%
1994	-2.92%	2007	28.10%
1995	45.15%	2008	-27.83%
1996	17.26%	2009	-34.04%
1997	27.46%	2010	8.62%
1998	74.44%	2011	19.17%
1999	54.80%	2012	-22.50%
2000	43.44%	2013	16.07%
2001	-61.47%	2014	-20.79%
2002	-24.05%	2015	64.68%

Year	FDI inflow growth rate per annum	Year	FDI inflow growth rate per annum
2003	-34.20%	2016	45.47%
2004	47.89%		



From the above table and graph it can be easily seen that growth rate in FDI inflow was 98.39% and then onwards a sharp decline in growth rate can be seen over a continuous period. This decline in FDI Inflow into G-7 countries was due to poor performance of G-7 countries on economic growth, industrial production, high rate of unemployment and shifting of FDI inflow into developing countries and like the economic groups like BRICS, ASEAN etc. Sub prime crisis in USA also hampered the growth of FDI inflow into G-7 countries. Poor performance of some of the member countries of G-7 also contributed into the negative and poor growth rate of FDI Inflow into G-7 countries

Forecasting of FDI inflow forecasting using ARIMA:

Results and Discussion:

Normality Tests for FDI Volume:

IBM SPSS Statistics 21 is used to test whether the data used in research follow the normal pattern of distribution or not are This is checked by the testing the following hypothesis.

H0: Data / Variables used in the study follows the normal distribution

H1: Data / Variables used in the study do not follow the normal distribution

To check the validity of the data whether it is normally distributed or not, Shapiro Wilk test is applied in IBP SPSS statistics. Data statistics of Shapiro Wilk statistics are as follows:

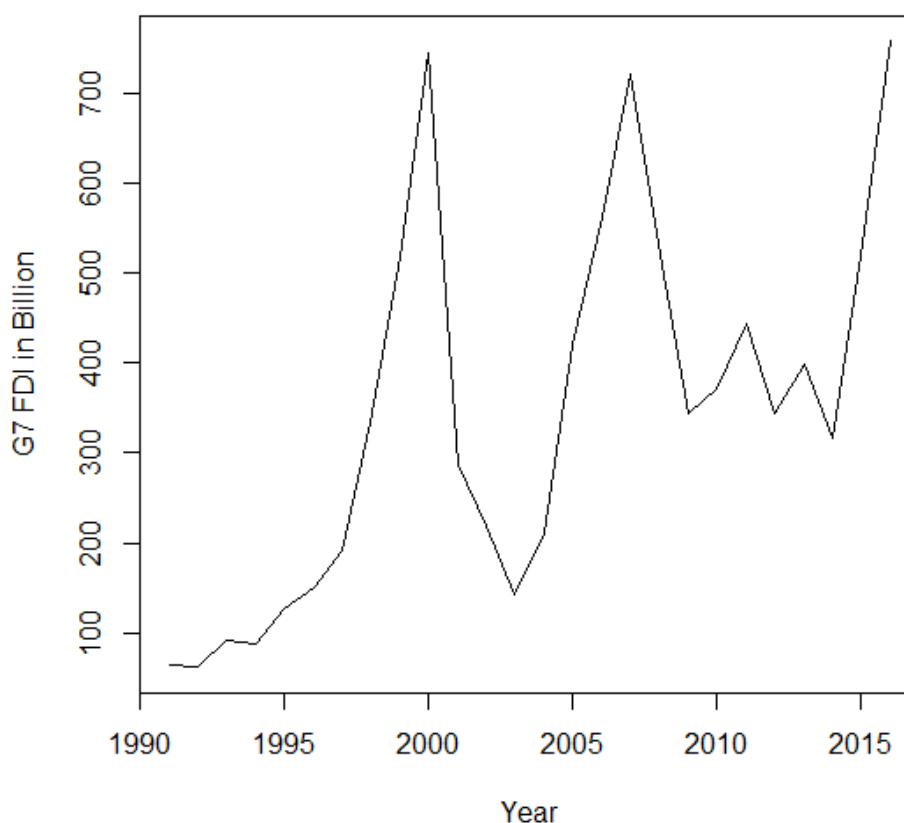
Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
FDlinflow	.111	26	.200*	.939	26	.126
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

Test statistics of Shapiro-Wilk normality test shows, P-value is .126 which is more than significance level of .05, P- value >0.05, thus we can draw a conclusion that data is following the normal distribution so null hypothesis is accepted and alternate hypothesis is rejected. Above results specify that FDI data is normally distributed.

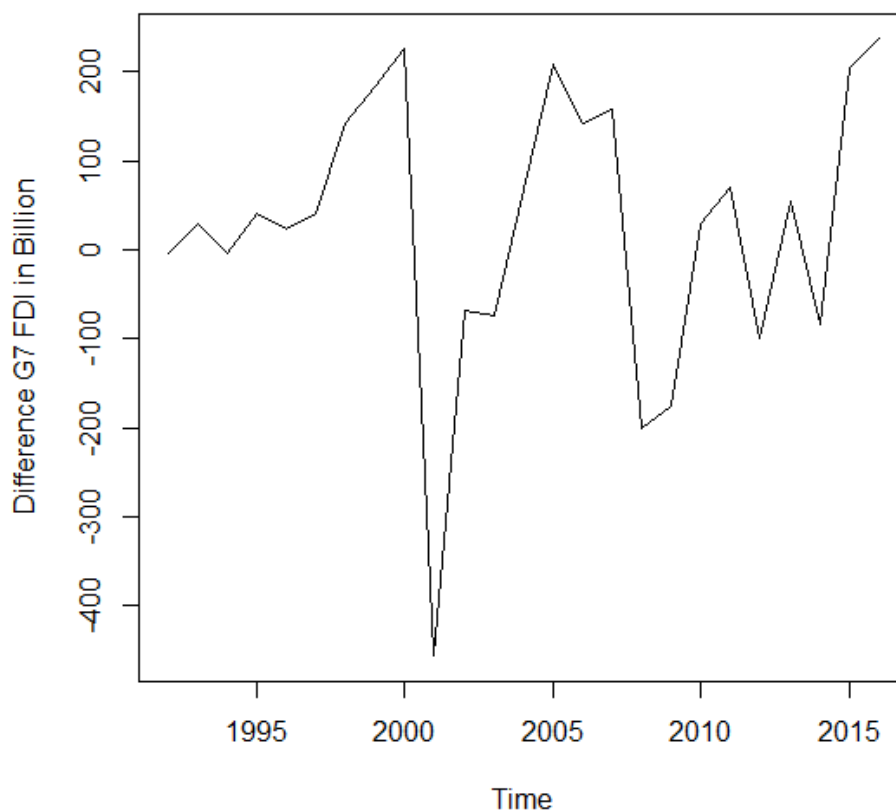
Verification of Stationary of data:

Stationary of data refers to a shift in time doesn't source a change in the form of the distribution. A stationary process has the property that the mean, variance and covariance structure remains the same over the period. Many statistical tests can be used to check the stationary of data however a visual inspection of time series plot will also provide important insights regarding whether the time series data follow the stationary pattern. If a visual inspection of data shows the mean and variance follow the same pattern with time then series seems stationary. Visual inspection of time series reveals a constant trend in FDI



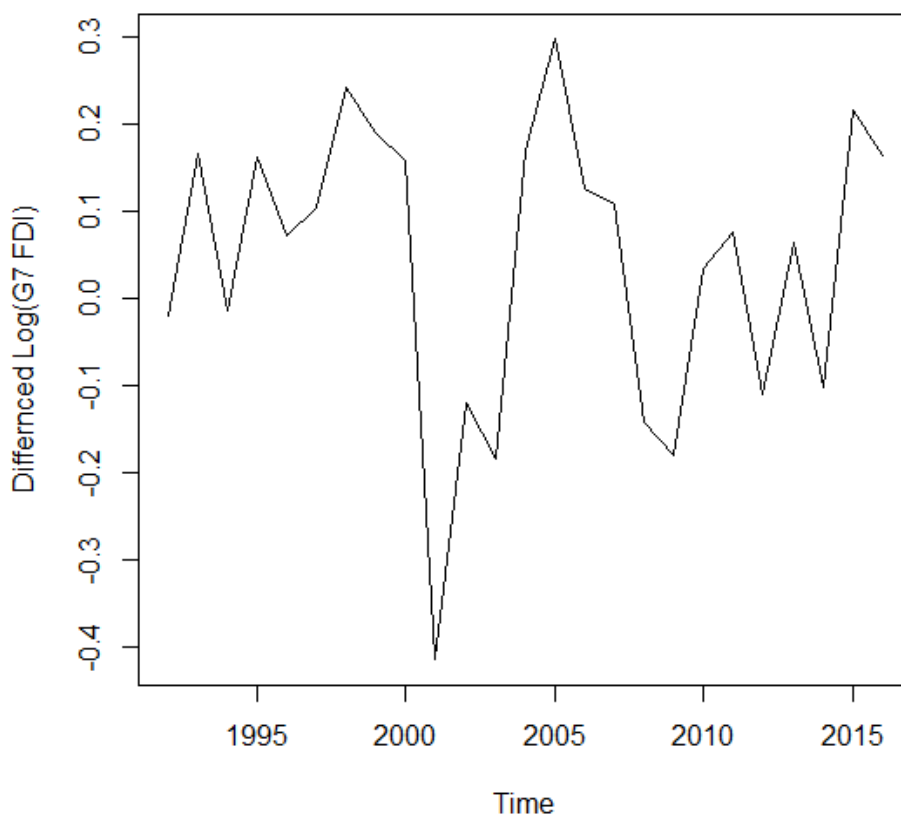
The above chart shows a high upward and downward trends for FDI inflow and there is also a seasonal component so to remove the seasonal component and make the data series a stationary one, the first order of differencing is applied by using the following formula.

1st Differencing (d=1)	$Y'_t = Y_t - Y_{t-1}$
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The above series appears non stationary on mean and variance as wide gap is identified into mean and variance so now to make the series stationary we will transform the original series into log transform by applying the following formula

1st Differencing (d=1) of log of FDI Inflow	$Y_t^{new'} = \log_{10}(Y_t) - \log_{10}(Y_{t-1})$
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Now the series looks stationary on both mean and variance. This also gives us the idea that I or integrated part of our ARIMA model will be equal to 1 as 1st difference is making the series stationary

Verification of Stationary:

A stationary process has the property that the mean, variance and covariance structure do not change overtime. It is important to perform the unit root tests in the order of integration of the form to identify the variable FDI in its first difference. ADF test is used to test the stationary in the given data and following hypothesis are formed

Hypothesis:

H0: Data series is not stationary in nature.

H1: Data series is stationary in nature.

Augmented Dickey-Fuller Test

data: diff(log10(gfdits))

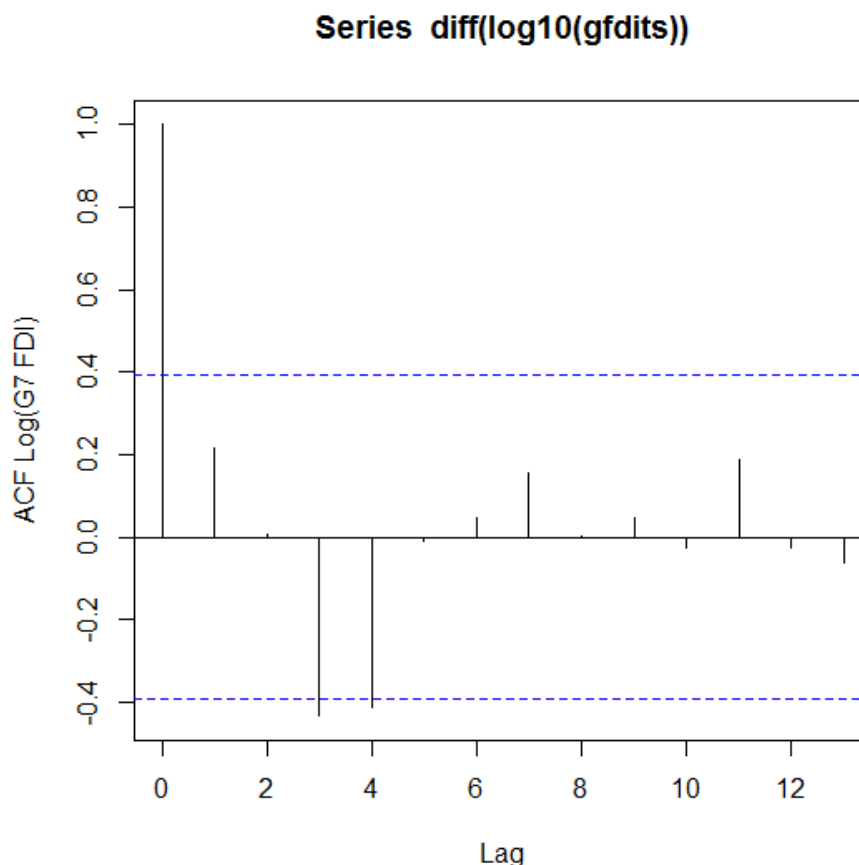
Dickey-Fuller = -3.8636, Lag order = 2, p-value = 0.03117

Augmented Dickey fuller test statistics shows that P-value < .05 this show rejection of null hypothesis and acceptance of alternative hypothesis at 5% significance level so we can say that FDI data series is stationary.

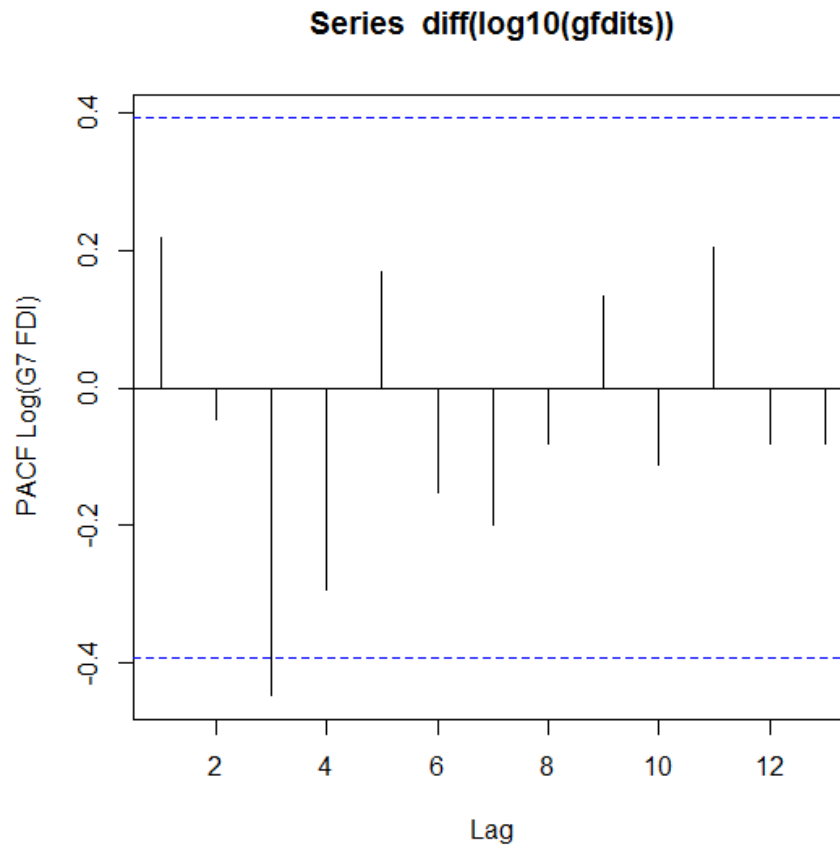
Model identification:

Now for identification of model for forecasting (pdq) autocorrelation factor (ACF) and partial autocorrelation factor (PACF) plots are used to identify patterns in the data which is stationary on both mean and variance. The idea is to identify presence of AR and MA components in the residuals

Box and Jenkins (1972) model is commonly used for identification of best suited ARIMA model by applying Auto Correlation Function (ACF) and the Partial Auto Correlation Function (PACF) From Auto correlation function plot the behavior of autocorrelation for the G-7 FDI inflow data can be seen so as per ACF plot, ACF is computed by using Moving Average (MA) (0), as it cuts off before lag 1 and lies down sharply.

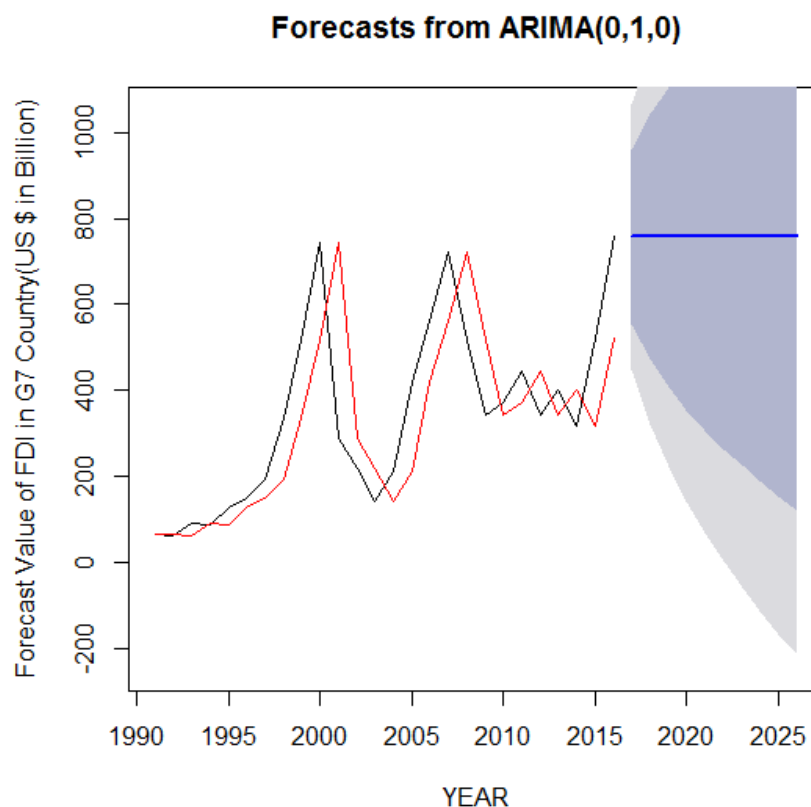


The Auto repressiveness of data can be measured by partial autocorrelation function that deals with the dependence between current values and future values after removing the effect of the intervening values. PACF plot provides the details of the behavior of partial autocorrelation for G-7 FDI data.



From the above PACF plot, it can be seen that Auto regression AR (0) could be seen as it dies down quickly and cut off before lag 1. From the above PACF and ACF plots, ARIMA model (p,d,q) of (0,1,0) is identified as the best fitted model for the forecasting of FDI inflow into G-7 countries.

Forecasting of FDI to G-7 Countries:



Year	Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2017	288.5027	247.6906	329.3149	226.0860	350.9195
2018	299.3877	251.1058	347.6696	225.5469	373.2285
2019	310.2727	255.5309	365.0144	226.5524	393.9929
2020	321.1576	260.6418	381.6735	228.6066	413.7086
2021	332.0426	266.2575	397.8277	231.4329	432.6522
2022	342.9276	272.2650	413.5901	234.8585	450.9966
2023	353.8125	278.5882	429.0369	238.7668	468.8583
2024	364.6975	285.1725	444.2225	243.0746	486.3204
2025	375.5825	291.9778	459.1871	247.7202	503.4447
2026	386.4674	298.9732	473.9617	252.6565	520.2783
2027	397.3524	306.1342	488.5706	257.8462	536.8586
2028	408.2374	313.4414	503.0333	263.2595	553.2152
2029	419.1223	320.8788	517.3658	268.8719	569.3728
2030	430.0073	328.4332	531.5814	274.6631	585.3515

CONCLUSION:

Total Expected FDI inflow for the forecasted period is US \$ 5029.5702 billion and which is expected to be average US \$ 359.2550 billion per year. To maintain the expected flow of FDI inflow in G-7 countries is a prime concern for the policy makers of the key members of the group. It is a prime concern for the member countries of G-7 as FDI flow has reduced significantly or growth in FDI inflow has reduced significantly due to increased inflow of FDI into other regional block or groups like BRICS, ASEAN and SAARC. G-7 countries should focus on new macro policy initiatives like increase in employment, industrial growth, advanced technical know how, change in banking and monetary co-operation among the member countries so that they can maintain the growth of development.

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