

A COMPARATIVE STUDY OF FUTURE TREND OF FDI INFLOW INTO DEVELOPING AND DEVELOPED ECONOMIES

SOMESH SHARMA

School of Management, Graphic Era Hill University, India.

RAHUL

Department of Commerce, DAV PG College, Varanasi, India.

MUKESH KUMAR

FMS, Gopal Narayan Singh University, Jamuhar, India,

Date of receipt: 09/03/2021

First Review: 05/05/2021

Second Review: 21/07/2021

Acceptance: 15/07/2021

ABSTRACT

The world is witnessing a change on the geopolitical and economical front. Developed economies are facing a decline in their economic influence in the world economy while developing economies are getting noticed in geopolitics and on the economic front. FDI as a key variable of economic development contributed a lot to the economic development of economies. A comparative study of the past trend of FDI inflows into developing and developed economies showed an increasing trend in developing economies while a strong variance is noticed in the FDI Inflow trend in developed economies in the previous decades. The projected value of FDI inflows using the ARIMA model showed an increasing trend in developing economies while a declining or constant trend in developed economies over the next decade. The projected value of FDI inflows in the coming decade follow the same trend in the past.

Keywords: ACF, ARIMA, ADF test, Correlogram, Foreign Investment, Forecasting, PACF.

INTRODUCTION

The world is witnessing a change in the geopolitics and concentration of economic power. The importance of developing economies is getting momentum in international platforms. Developed economies are losing their dominance economically and at institutional platforms. Major causes of the shift in the role of developed economies are noticed as lower growth rate in GDP and GDP per capita, the decline in FDI inflow, the low growth rate of population, and decline in the growth rate of total trade, in comparison to the developing economies. In developed economies, GDP growth rates were 26.19% and 27.24% in the year 2016 & 2017 in comparison to 28.3% and 29.08% in developing economies, GDP per capita growth rate were 1.29% and 1.93% in developed economies while the rates were 2.46% and 3.06% developing countries. Population growth rates were .43% and .41% in developed economies while the rates were 1.3% and 1.285 in developing economies (Sharma 2020). Developed Economies are the highest recipient of FDI flow, noticed a decline in FDI inflow. In developed countries, FDI Inflow was declined by -37% to \$712 billion in comparison to FDI inflow of \$1133 billion in the year 2015-16 while FDI inflows to developing countries remained the same as of the level of 2016 to \$671 billion with no growth in the year 2017. Most of the developing countries in Asia secured FDI inflow equal to the level of the year 2016 (UNCTAD- Investment report 2018).

Due to improved performance of developing economies on GDP growth rate, GDP per capita, FDI inflow, increased population growth rate, and increase in trade growth rate, more investment opportunities are generating in developing economies and foreign investors are shifting their investment from developed and transition economies to developing economies. Developed economies secured 55%, 50%, and 52% of total World FDI while developing secured 41%, 46%, and 45% of total World FDI and transitional economies secured 2%, 2%, and 2% of total World FDI in the years 2017, 2018 and 2019 (World Investment Report, 2020) which showed the shift of foreign investment from developed economies to developing economies. FDI flows weakened abruptly in developed

economies and economies in the transition while it seems stable and increasing in developing economies, rising by 2 percent (World Investment Report, 2019). As an outcome, developing economies accounted for a rising share of worldwide FDI, at 54 percent, from 46 percent in 2017 (World Investment Report, 2019). FDI flows to developed economies touched to their lowermost point since 2004, decreasing by 27 percent while FDI flows to developing economies continued constant, rising by 2 percent to \$706 billion. (World Investment Report 2019). This shift in FDI flow to developing economies is a result of the high rate of return on investment, better economic prospects, growth opportunities, and influence of developing economies in the changed geopolitical scenario in the world economy.

A comparative study of forecasting of FDI Inflow in developing and developed economies will help to find out the future of FDI inflow into the coming decade and to confirm the continuation of the current trend in the future period.

LITERATURE REVIEW

Mostafa and Mahmood, (2015) conducted a study to assess the potential of BRICS to challenge and overtake the G-7 in terms of economic potential. The finding of the study suggests that BRICS can lead to G-7 in the case of economic growth as several factors and uncertainties can deter economic influence and power. (Iulica & Georgiana, 2013) researched to study the impact of the role of emerging economies like BRICS on economic, political, and strategic influences on international decision-making framework. The findings of the study suggest that growing economies are ready to replace the existing group of economies like G-7 which are holding the dominant position in economic, political, and strategic influence in the world economy. (Asongu et al,2018) conducted a study to explore the degree of association between FDI and economic development in fast-growing economies. They used panel analysis to study the variables that regulate the way of FDI into BRICS and MINT economies. Results of the study concluded that the size of the market, infrastructure

accessibility, and openness of trade are the utmost important variables in inviting FDI to BRICS and MINT, while the obtainability of natural resources and institutional quality are irrelevant. (Pirlogeanu,2017) conducted a study to understand the relationship between the different macro-environmental variables and foreign direct investment into G-7 economies. He used the Pearson correlation test to study the relationship between various macro-environmental variables and FDI. He concluded that G-7 economies are accounted for 60% of World GDP, therefore attract a higher value of FDI Inflow. His study also concluded that FDI inflow is a key variable of economic development and growth.

Mihaela, (2014) investigated to study the association between trade and FDI in G-7 economies using the Granger causality test. The result of the study revealed that there is a unidirectional relationship between FDI and trade over the long run and a bidirectional association exists between FDI and trade in the short run. (Sookroo,2018) conducted a comparative study of income and income equality among the BRICS and G-7 economies. Findings of the study suggest that BRICS economies noticed a high growth rate of GNI in comparison to G-7 economies while income equality is much higher in BRICS in comparison to G-7 countries. The study also revealed that BRICS economies are having higher prospects for economic growth in comparison to G-7 countries. (Goyal et al.,2020) conducted research to study the role of FDI in economic development and the impact of various political and environmental variables on the flow of FDI in G-7. The findings of the study suggest that economic variables are more important in attracting FDI in comparison to political variables and the flow of FDI is one of the important considerations in the economic development of G-7 economies.

Sabir et al., (2019) researched to study the relationship between institutional quality and FDI inflow into developing and developed countries. Results of the study suggest that the impact of institutional quality is much higher in the case of developed economies in comparison to developing economies. The study also suggests that political, legal, and other environmental variable are more effective in attracting foreign

investment in developed economies while these variables are not very significant in developing economies. Economic variables are very significant in developing economies in attracting FDI while less effective in the case of developed economies.

Nunnenkamp, (2011) conducted a study to know the pattern of FDI in emerging countries. The findings of the study concluded that FDI is one of the important sources of economic development and finance, but it was not uniformly distributed among all the developing countries. Policymakers of developing countries should create immovable domestic assets to offer a competitive advantage in the race for FDI among the members of developing economies. Trang et al, (2019) directed an investigation to examine the effect of FDI on emerging countries in the long run and short run. Results of the investigation suggest that FDI is helpful in the economic development of developing countries in the extended long run while it has an adverse effect in the short run. The study also revealed that supply of money, availability of human capital, the value of the total domestic investment, and availability of domestic credit are the primary variables for long-run economic growth. Teli, (2014) in his study revealed that India is one of the most attractive destinations for FDI after the US and China. He also discovered that Mauritius and Singapore were the major countries that accounted for the major flow of FDI in India.

The service sector attracted the major portion of FDI. He also discovered that FDI has an optimistic effect on the related economic development of the Indian economy. (Siddiqui,2014) conducted a study to understand the importance of FDI in the development of emerging nations of South Asia and the East Asian region. Major findings of the study suggest that developing countries of the region noticed a sharp increase in FDI and economic performance after implementing the economic reform. (Joshua et al,2020) their study found that economic development is not possible with economic integration and FDI is a very important driver of economic growth. They performed an analysis of FDI inflow on economic growth over the 200 countries of different income

groups. Study revealed that a 1% variation in FDI rises growth by 0.062%, 0.17%, 0.12%, and 0.68% in the low-income, lower-middle-income, upper-middle-income, and high-income nations. It seems that FDI energies grow best in high-income economies related to low-income groups, which may be associated with a better and more welcoming business setting in developed nations.

Sharma and Rahul, (2019) conducted a study to forecast the foreign direct investment inflows in G-7. They used the ARIMA model to forecast the FDI inflows in G-7 countries. The finding of the study showed that the forecasted value of FDI inflows in G-7 economies will follow a constant trend which would contribute to the existing problem of the low growth rate of GDP, industrial output, and demand and unemployment. Drysdale, (2011) performed a study to study the economic relation between the BRICS and G-7. The finding of the study enumerates the importance of BRICS economies in the changing global economic scenario. The study focused on BRICS and its relationship with G-7 and other industrialized countries and the emerging role of BRICS in the developed nations and also study the opportunities to G-7 economies in BRICS.

Veni, (2020) conducted a study to explore the potential of BRICS in the changed macro-economic scenario. She attempted to study the pattern of FDI inflow into BRICS and FDI outflow from BRICS to the rest of the world. The trend showed an increase in both inflow and outflow of FDI. Projection of FDI inflow and outflow was done with the help of regression analysis and results showed an increasing trend in FDI Inflow and outflow in BRICS. (Sharma et al,2018) directed research to study the future of FDI inflows in BRICS. They used regression analysis to forecast the FDI inflows in BRICS. Projected values showed an increasing trend in FDI inflows in the next 20 years. The study also concluded that FDI will follow an increasing trend in the future.

Muhlis et al, (2017) in their study focused on studying the association among research and development spending, FDI, and

economic growth on G-7 countries throughout 1996-2011. It was found that there is a unidirectional relation between FDIs to research & development expenditures and economic growth. (Jere et al, 2017) in their study consider three models Simple exponential smoothing (SES), Holt-Winters exponential smoothing (HWES), an autoregressive integrated moving average (ARIMA) for forecasting of FDI inflow into Zambia. In the comparison of the three models, ARIMA (1,1,5) was found the fittest model. Results of the study showed a gradual increase in FDI inflow.

Nyoni and Muchingami (2019) conducted a study to forecast the FDI inflow into India, Using Box-Jenkins ARIMA methodology. They used annual time series data on FDI inflow in India from 1960 to 2017. Using the ARIMA model parameter ARIMA (1,1,0) was found the best suitable model using the AIC approach. The study also focused that prediction was done with the help ARIMA model portrays the real trend of FDI inflows and are subject to economic changes. (Perera,2015) in a study of FDI, focused on forecasting of FDI inflow in Srilanka from 2014-2064 using ARIMA model. The investigation shows both mean and variance transforms with a growing movement for the projecting period. FDI data is stationary as per the statistics of the ADF test. ARIMA (1, 1, 6) and ARIMA (1,0,6) were found as best fitted and ideal models to forecast FDI in Sri Lanka. His study concluded that results from ARIMA forecasting matches with the real trends. Biswas, (2015) in his research attempted to build a model to forecast, using time techniques to forecast FDI inflows in India. Yearly time series data on Foreign Direct Investment of India was used for a period 1992- 2014. Box – Jenkins model was used in the study for its suitability with regards to the sample database. The results found in the ARIMA model have revealed that FDI is succeeding in a growing trend over the predicted period (2015-2034). Lartey et al, (2016) in their compared various ARMA model to forecast and to find out the model which predicts results more accurately to the actual. He found ARMA (1,1) with a drift the most suitable ARMA model to project the FDI flow. He concluded that on average FDI would grow by 11.1%. (Nandi,2012) conducted a study to compare the trend of FDI into developing and developed countries. The trend in FDI flow showed a shift

from developed to developing countries like BRICS. A tough competition is seen to attract FDI Inflow into developing and developed economies. The increased flow of foreign investment in developing economies positioned them as upcoming superpowers in the world economy. Most of the studies discussed above have accepted the fact that FDI inflow is one of the considerable variables in economic development. The level of FDI inflow can influence the level of economic development. Projection of FDI inflow through time series analysis helped in forecasting the value of FDI inflows. Most of the above-discussed studies favored ARIMA as one of the most accurate techniques for forecasting. Forecasting of FDI inflow into developing and developing economies can give investors an accurate picture of future FDI inflows which will help to understand the direction of economic development and to draft the policies to attract more foreign investment to hold a key position in the world economy.

OBJECTIVE OF STUDY

The objective of this research is to explore and compare the past and current trends of FDI inflow into developing and developed economies and to predict the same for the upcoming decade. To achieve the main purpose of the study, objectives are subdivided into two parts (1) To get the best fit ARIMA model to forecast the future values (2) To predict the future flow of FDI inflow into developing and developed economies in the upcoming decade. This study is designed to find out the future trend of FDI inflow into developing and developed economies with the help of the ARIMA model for a period of 10 years, ranging from 2020-2030.

RESEARCH METHODOLOGY

The research methodology of this study included the usage of secondary sources of data to study the current and future movement of FDI inflows into developing and developed economies and to predict the upcoming FDI inflows. Statistics related to FDI inflows have been obtained from the record of UNCTAD. Information associated with the current level of FDI Inflows into developing and developed economies have been collected

from reports of the UNCTAD database. Forecasting s of FDI inflows in developing and developed economies was done using an Autoregressive Integrated moving average (ARIMA). Stationarity in the data series was checked with the help of the Augmented Dickey fuller test. The selection of a suitable ARIMA model was completed with the support of PACF, ACF plots, and level of difference. Parameters of the ARIMA model (p, d, q) were selected using partial autocorrelation correlogram and correlogram. The legitimacy of designated ARIMA models was tested with the auto.arima function in R software. The accuracy of prediction was checked through the MASE and MAPE statistics. Analysis and forecasting were performed on statistical software of R, EViews, and M.S. Excel.

Forecasting of Foreign Direct Investment Inflow in Developing Economies

ANALYSIS AND DISCUSSION

The plot of FDI in Figure 1 showed up moving trends with negligible variations in recent time. A careful graphic examination of the time series data revealed that descriptive statistics like the mean, variance, and covariance are not constant and changed with time which shows that the FDI inflow series of developing economies does not track stationary patterns.

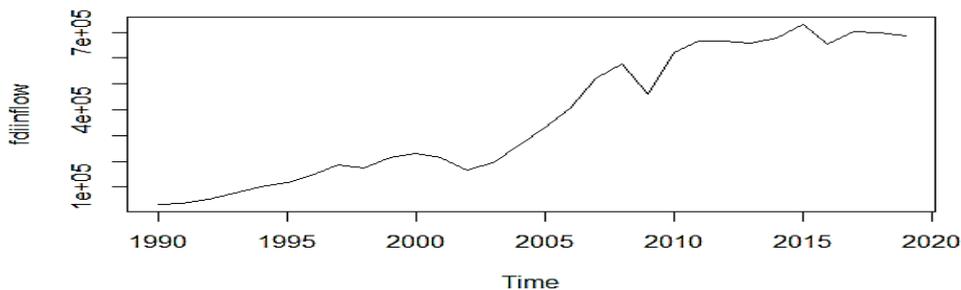


Figure-1 FDI inflow in Developing Economies

A Visual inspection of figure 1 of the time series of FDI inflow in developing economies discloses an increasing movement thus it appears nonstationary.

The first step in time series analysis is testing stationarity to apply any of the time series models for forecasting. A very reliable statistical test to check the unit root in the series or to check the stationarity of the data series is to AD test. ADF test is used on the original data series of FDI Inflow of developing economies.

Table 1- Test statistics of Augmented Dicky Fuller Test on original data series of Developing Economies

Null Hypothesis: FDI_INFLOW_IN_MILLIONS has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.714974	0.8275
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

*Mackinnon (1996) one-sided p-values.

Details of test statistics of ADF test in table 1 showed that value of ADF test is greater than the t-statistics at 1%,5%, and 10% level of significance and P score (value) is more than .05 so data series appears not to follow the stationary pattern. To transform the non-stationary time series into a stationary time series, the original time series is differenced in the first order.

First Order Difference

Original data series of FDI inflow in developing economies are differenced at First Order to convert the nonstationary time series into a stationary time series.

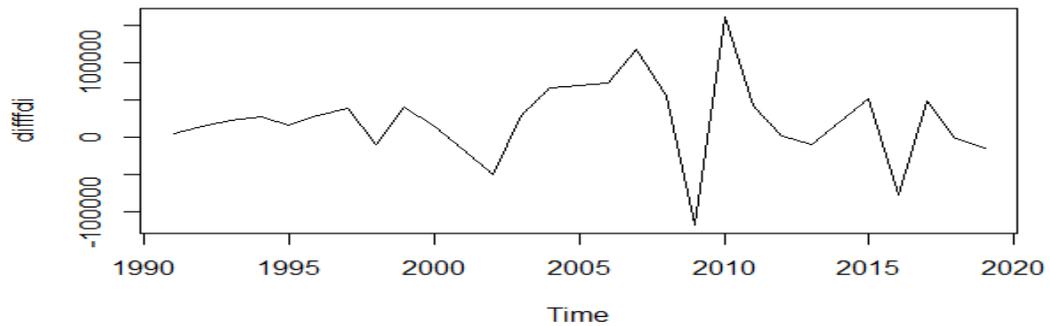


Figure-2 FDI Inflow of differenced series at 1st order -Developing Economies

Graphical inspection of Figure 2, a time series plot found by carrying out differencing at first order, seems constant on mean, variance, and covariance and now series of FDI inflow in developing economies seems stationary.

Table 2- ADF test differenced series at order 1- Developing Economies

Null Hypothesis: D(FDI_INFLOW_IN_MILLIONS) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.922671	0.0000
Test critical values:		
1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

To test the unit root in the differenced time series at first order, ADF test is applied and ADF test statistics in Table 2 supports the alternative hypothesis that differenced time series at order 1, does not have a unit root and discard the null hypothesis of a unit root in the time series. Outcomes of ADF test in table 2 showed the value of ADF test is less than the value of t-statistics at 1%,5%, and 10% level of significance and P-value is less than .5 thus the original time series differenced at first order is stationary, so the value of parameter d is 1 in ARIMA model (p,d,q).

Partial Auto Correlogram and Correlogram

Parameter of best suitable ARIMA model can be identified with the help of PACF and ACF Plots. A visual inspection of PACF and ACF plots is used to get the most appropriate value AR & MA (p & q) parameter in the ARIMA model.

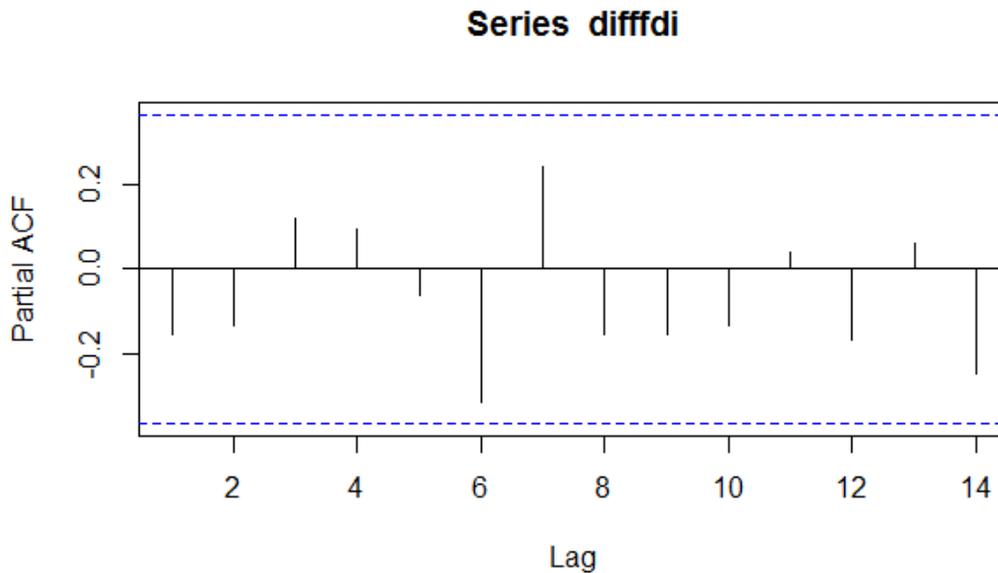


Figure 3- PACF differenced series-Developing Economies

Source:

'Author'

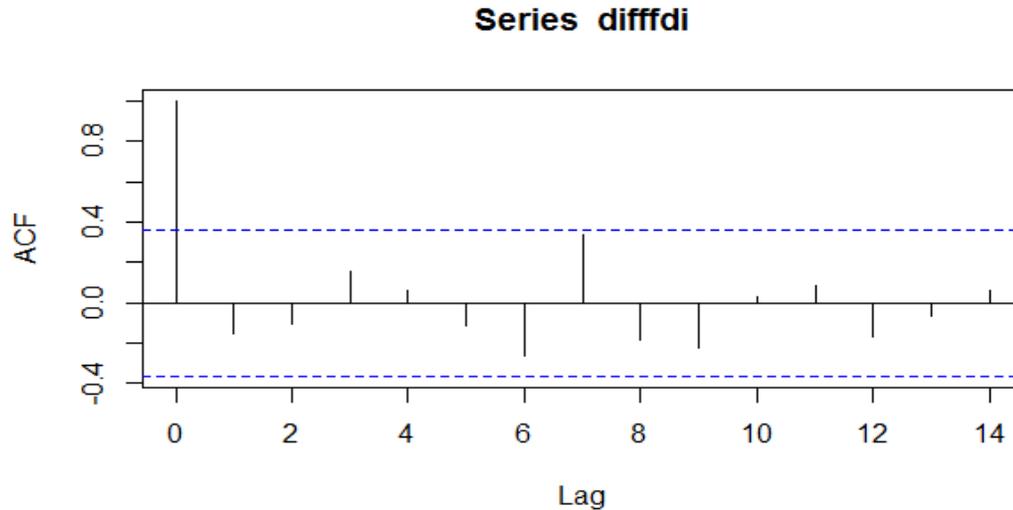


Figure 4- ACF Differenced series- Developing Economies

PA Correlogram and Correlogram in Figures 3 and 4 suggest the value of AR and MA (p & q) in ARIMA (p,d,q) as 0 and 0 correspondingly. Our projected parameters of the ARIMA model are AR =0 Integrated =1 and moving average =0. Hence ARIMA (0,1,0) is our best fit model to forecast the projected value of FDI inflows in developing economies.

Auto.Arima Function

The validity of the chosen model of ARIMA (0,1,0) is checked by in-built AUTO.ARIMA function in R software which offers the best-fitted model. "auto.arima()" function advised the same ARIMA (0,1,0) with drift as best fitted model which we found with the help of Partial Auto correlogram and correlogram. Outputs of "auto.arima()" function are given in table 3. ARIMA (0,1,0) with drift model fulfills all the diagnostic checking, hence we used ARIMA (0,1,0) with drift for the forecasting of FDI inflow in developing economies.

Table 3- ARIMA coefficient- Developing Economies

Series: fdiinflow
ARIMA(0,1,0) with drift

Coefficients:

drift
22416.345
s.e. 9788.913

sigma² estimated as 2.878e+09: log likelihood=-356.46

AIC=716.91 AICC=717.37 BIC=719.65

Source: 'Author'

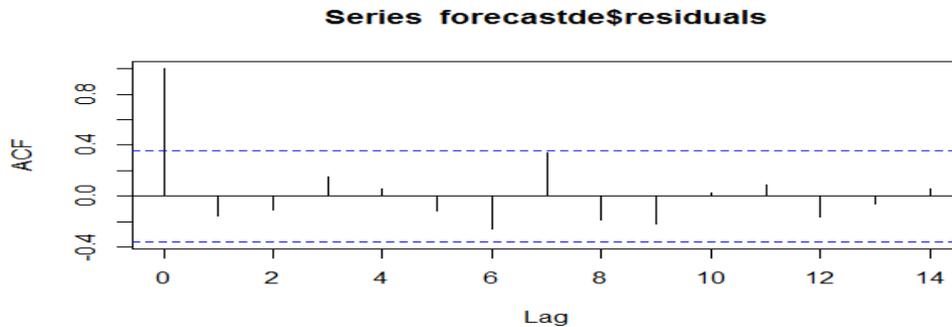


Figure-6 ACF Plot of residuals- Developing Economies

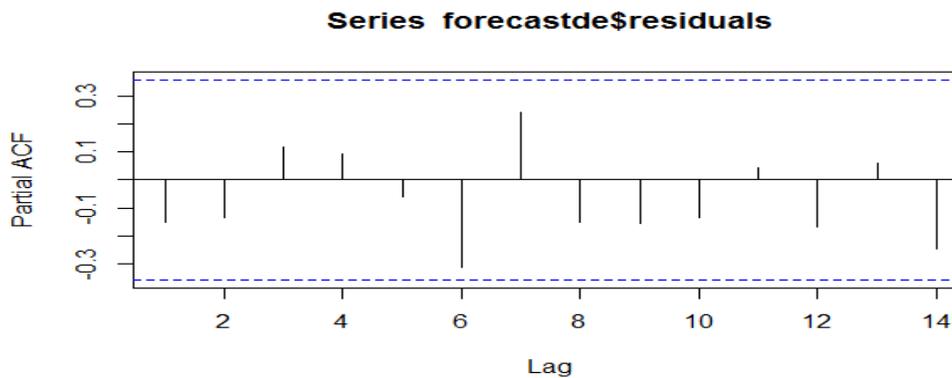


Figure-7 PACF Plot of residuals- Developing Economies

Figures 6 & 7 are built on the residuals produced by ARIMA (0,1,0) with drift. Figure 6 showed the ACF plot of residuals, and it is fine among

the boundaries which advocate no autocorrelation. Figure7 PACF plot showed that variance of the residual series does not change much across the past data. This suggests that the alteration of the residual series can be treated as remaining infinite, and the proposed model suits the statistics fairly and the prediction using this model will be exact.

Table: 4- Training set error measures of ARIMA model (0,1,0) with drift-Developing Economies

Training set error measures:

Training set:	ME	RMSE	MAE	MPE	MAPE	MASE	ACF1
Value:	0.41	51828.42	35954.09	-2.74	11.44	0.84	-0.152

Table 4 showed the MAPE value of the test since it is a proportion that shows that our estimate is around 11.84% off and the correctness of the forecast is 88.56%. In reverence to MASE values familiarized by Rob J Hyndman, a MASE value of less than 1 demonstrates that the prediction will be healthier, and in this model, MASE value is .84 which is less than 1 so we can say that forecast by ARIMA model (0,1,0) with drift would be better. The selected model satisfies all the residual diagnostics and confirms all the property checks of the best fit ARIMA model. Forecasted value of FDI inflows with the help of ARIMA (0,1,0) with drift model showed an increasing trend over next 10 years in developing economies.

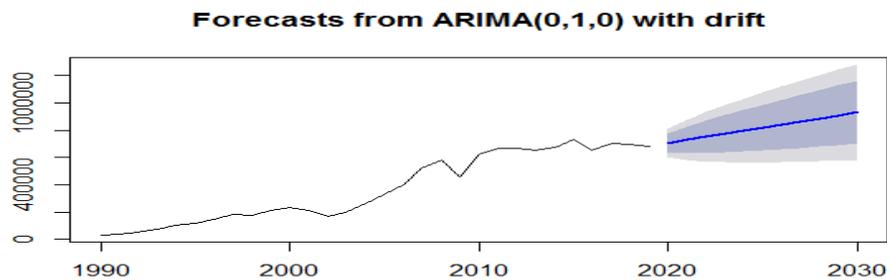


Figure-5 Forecast of FDI inflows in Developing Economies

Table 5 & Figure 5 showed the expected values and movement of FDI inflows. Visual inspection, of figure 5 showed an optimistic trend in FDI inflow for a period of 10 years from 2020 to 2030.

Table 5 - Forecasted Value of FDI Inflow- Developing Economies

Point	Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2020	707139.3	638387.3	775891.4	601992.2	812286.5
2021	729555.7	632325.6	826785.8	580855.1	878256.3
2022	751972.0	632890.0	871054.1	569851.8	934092.3
2023	774388.4	636884.3	911892.5	564094.0	984682.8
2024	796804.7	643070.5	950539.0	561688.5	1031921.0
2025	819221.1	650813.6	987628.5	561664.1	1076778.0
2026	841637.4	659736.6	1023538.3	563444.1	1119830.7
2027	864053.8	669593.6	1058513.9	566652.6	1161454.9
2028	886470.1	680213.9	1092726.3	571028.5	1201911.7
2029	908886.4	691473.4	1126299.5	576381.8	1241391.1
2030	931302.8	703278.0	1159327.6	582569.0	1280036.6

The shaded portion of the plot in figure 5 showed the forecasted value of FDI inflows at 80% and 95% confidence. The expected values correspondingly track the movement of the past data. From the above finding, it can be determined that FDI inflows in the future will track a growing trend over 10 years in developing economies.

Forecasting of Foreign Direct Investment Inflow in Developed Economies

ANALYSIS AND DISCUSSION

The plot of FDI in figure 8 showed up moving trends with negligible variations in recent time. A careful graphic examination of the time series data revealed that descriptive statistics like the mean, variance, and covariance are not constant and changed with time which shows that the FDI inflow series of developed economies does not track stationary patterns.

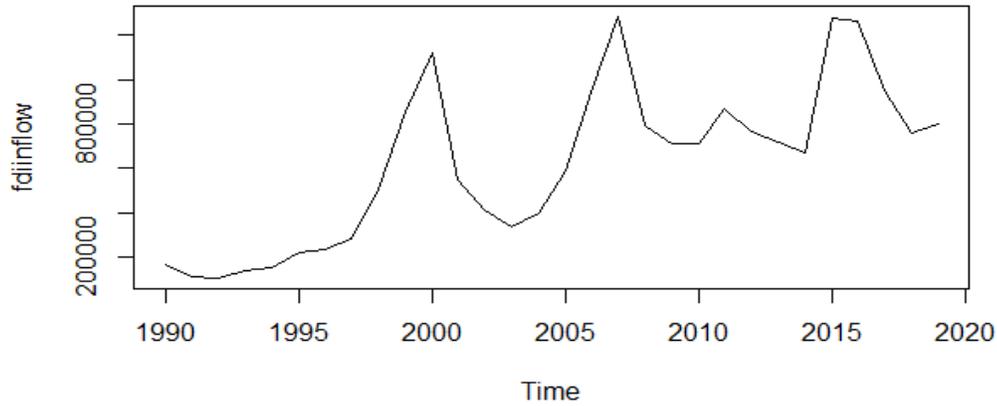


Figure 6- FDI inflow-Developed Economies UNCTAD database'

A Visual inspection of figure 8 of the time series of FDI inflow in developed economies discloses a decreasing movement thus it appears nonstationary. The first step in time series analysis is testing stationarity to apply any of the time series models for forecasting. A very reliable statistical test to check the unit root in the series or to check the stationarity of the data series is to ADF test. ADF test is used on the original data series of FDI Inflow of developed economies.

Table 6- Test statistics of Augmented Dickey Fuller Test on original data series of Developed Economies

Null Hypothesis: FDI_INFLOW_IN_MILLIONS__DEVELOPED_ECONOMIES has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on AIC, maxlag=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.536329	0.1181
Test critical values:		
1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Details of test statistics of ADF test in table 6 showed that value of ADF test is greater than the t-statistics at 1%,5%, and 10% level of significance and P score (value) is more than .05 so data series appears not to follow the stationary pattern. To transform the non-stationary time series into a stationary time series, the original time series is differenced in the first order.

FIRST ORDER DIFFERENCE

Original data series of FDI inflow in developed economies are differenced at First Order to convert the nonstationary time series into a stationary time series.

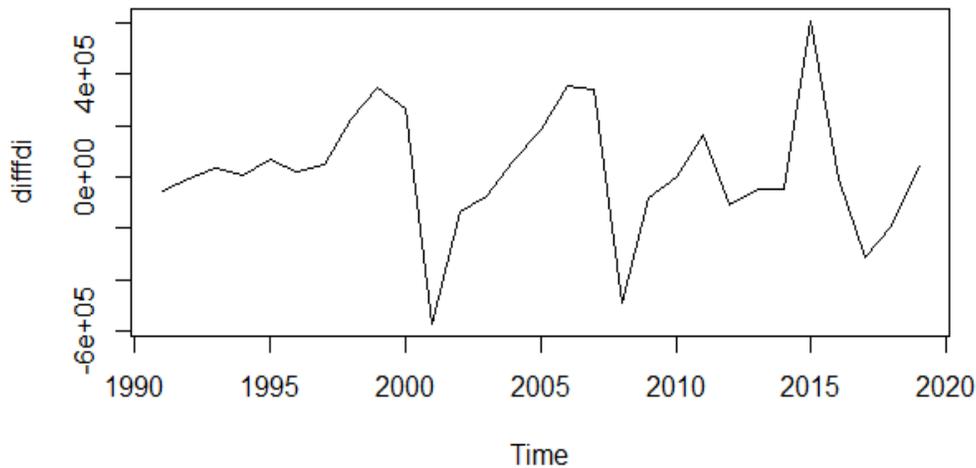


Figure 7- FDI Inflow of differenced series at 1st order-Developed Economies

Graphical inspection of Figure 9, a time series plot found by carrying out differencing at first order, seems constant on mean, variance, and covariance and now series of FDI inflow in developed economies seems stationary.

Table 7- ADF test differenced series at order 1- Developed Economies

Null Hypothesis: D(FDI_INFLOW_IN_MILLIONS__DEVELOPED_ECONOMIES) has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on AIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.631747	0.0011
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

To test the unit root in the differenced time series at first order, ADF test is applied and ADF test statistics in Table 7 supports the alternative hypothesis that differenced time series at order 1, does not have a unit root and discard the null hypothesis of a unit root in the time series. Outcomes of ADF test in table 7 showed the value of ADF test is less than the value of t-statistics at 1%,5%, and 10% level of significance and P-value is less than .5 thus the original time series differenced at first order is stationary, so the value of parameter d is 1 in ARIMA model (p,d,q).

PARTIAL AUTO CORRELOGRAM AND CORRELOGRAM

Parameter of best suitable ARIMA model can be identified with the help of PACF and ACF Plots. A visual inspection of PACF and ACF plots is used to get the most appropriate value AR & MA (p & q) parameter in the ARIMA model.

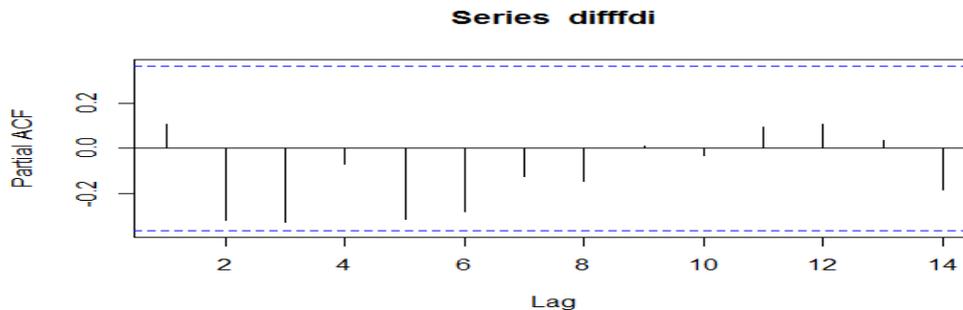


Figure 8- PACF differenced series-Developed Economies

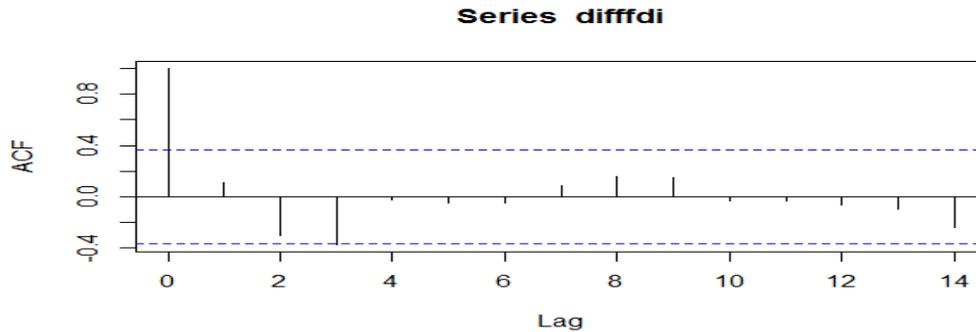


Figure 9- ACF Differenced Series-Developed Economies

PA Correlogram and Correlogram in Figures 10 and 11 suggest the value of AR and MA (p & q) in ARIMA (p,d,q) as 0 and 0 correspondingly. Our projected parameters of the ARIMA model are AR =0 Integrated =1 and moving average =0. Hence ARIMA (0,1,0) is our best fit model to forecast the projected value of FDI inflows in developed economies.

Auto.Arima Function

The validity of the chosen model of ARIMA (0,1,0) is checked by in-built AUTO.ARIMA function in R software which offers the best-fitted model. “auto.arima()” function advised the same ARIMA (0,1,0) as the best-fitted model which we found with the help of Partial Auto correlogram and correlogram.

Table 8 - ARIMA coefficient-Developed Economies

Series: fdiinflow			
ARIMA(0,1,0)			
sigma^2 estimated as 5.757e+10: log likelihood=-400.4			
AIC=802.81 AICC=802.96 BIC=804.18			

Outputs of “auto.arima ()” function are given in table 8. ARIMA (0,1,0) model fulfills all the diagnostic checking, hence we used ARIMA (0,1,0) for the forecasting of FDI inflow in developed economies.

Figures 13 & 14 are built on the residuals produced by ARIMA (0,1,0). Figure 12 showed the ACF plot of residuals, and it is fine among the boundaries which advocate no autocorrelation. Figure 12 PACF plot showed that variance of the residual series does not change much across the past data. This suggests that the alteration of the residual series can be treated as remaining infinite and the proposed model suits the statistics fairly and the prediction using this model will be exact.

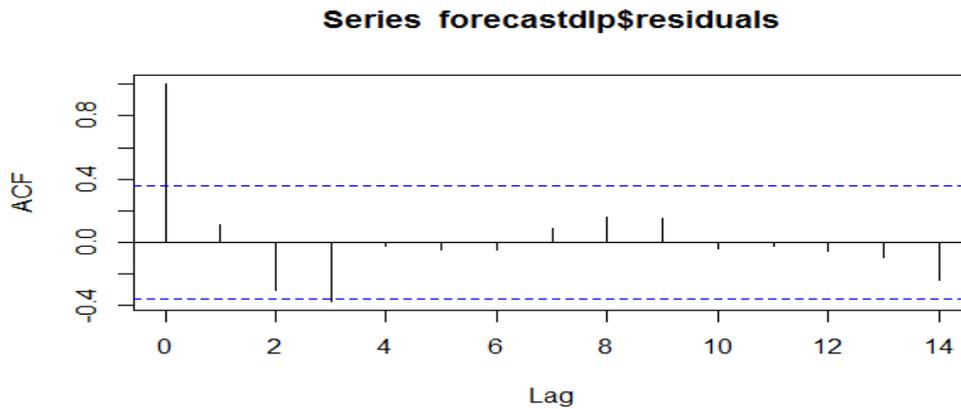


Figure-10 ACF Plot of residuals- Developed Economies

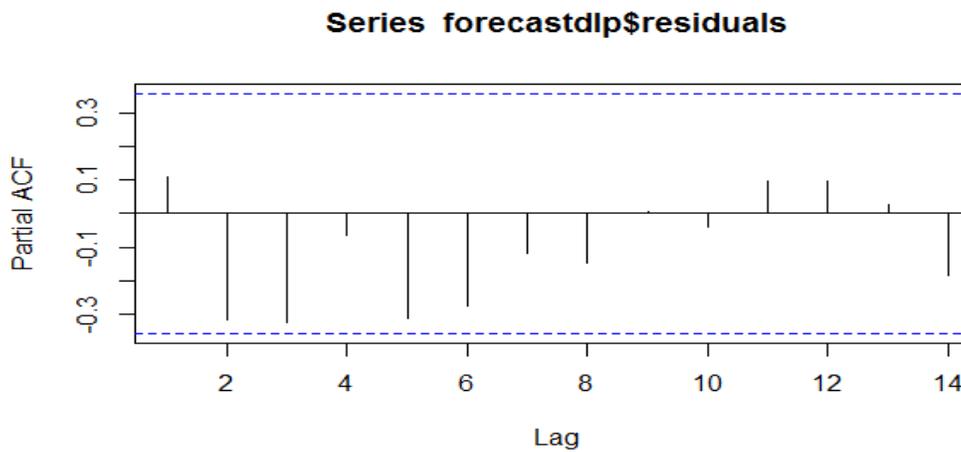


Figure-11 PACF Plot of residuals- Developed Economies

Table 9- Training set error measures of ARIMA model (0,1,0) -Developed Economies

Training set error measures:

Training Set:	ME	RMSE	MAE	MPE	MAPE	MASE	ACF1
Value	21007.74	235900.9	162971.2	0.091	24.97	0.96	0.109

Table 9 showed the MAPE value of the test since it is a proportion that shows that our estimate is around 24.97% off and the correctness of the forecast is 75.03%. In reverence to MASE values familiarized by Rob J Hyndman, a MASE value of less than 1 demonstrates that the prediction will be healthier, and in this model, MASE value is .96 which is less than 1 so we can say that forecast by ARIMA model (0,1,0) would be better. The selected model satisfies all the residual diagnostics and confirms all the property checks of the best fit ARIMA model.

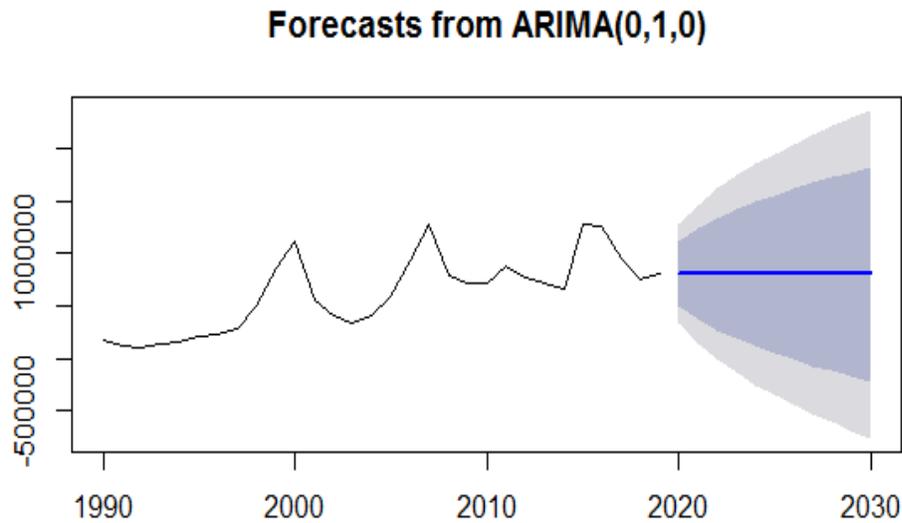


Figure-12. Forecast of FDI inflows in Developed Economies

Table 10- Forecasted Value of FDI Inflow- Developed Economies

Point	Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2020	800239	492751.62	1107726	329977.63	1270500
2021	800239	365386.18	1235092	135188.99	1465289
2022	800239	267655.23	1332823	-14277.58	1614756
2023	800239	185264.24	1415214	-140283.74	1740762
2024	800239	112676.31	1487802	-251297.39	1851775
2025	800239	47051.81	1553426	-351661.40	1952139
2026	800239	-13296.14	1613774	-443955.63	2044434
2027	800239	-69466.65	1669945	-529861.01	2130339
2028	800239	-122223.14	1722701	-610545.11	2211023
2029	800239	-172121.48	1772599	-686858.02	2287336
2030	800239	-219581.27	1820059	-759441.51	2359920

The forecasted value of FDI inflows with the help of the ARIMA (0,1,0) model showed a constant trend over the next 10 years in developed economies. Table 4 & Figure 5 showed the expected values and movement of FDI inflows.

Visual inspection, of figure 5 showed a constant trend in FDI inflow for a period of 10 years from 2020 to 2030. The shaded portion of the plot in figure 5 showed the forecasted value of FDI inflows at 80% and 95% confidence. The expected values correspondingly track the movement of the past data. From the above finding, it can be determined that FDI inflows in the future will track a constant trend over 10 years in developed economies.

Comparison of FDI inflow into BRICS and G-7

Global trends in FDI Inflows showed a massive change in the movement of FDI inflow. An increase is noticed in the FDI inflow in developing economies as the share of developing economies in global FDI inflows has shown a constant trend, increased from 18% to 20% in the year

2017 & 2018 (World Investment report 2019) while other economies noticed a declining growth rate.

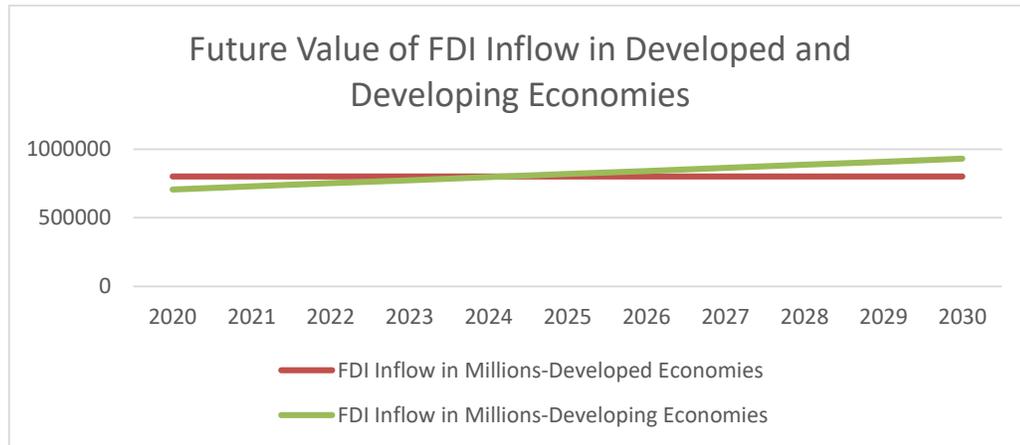


Figure-13 Future trend of FDI inflow in Developed and Developing Economies

A comparative study of forecasted values of FDI inflows among developing and developed economies in figure 16 showed that the future trend of FDI inflows in developing economies shall follow an increasing trend while in developed economies, the future trend will follow a constant trend over the next 10 years. The forecasted trends of FDI Inflows in developing and developed economies follow the past trend. From the above comparison, it can be concluded that FDI inflows will follow the increasing trend in developing economies while a constant or negative trend can be seen in FDI inflow into developed economies.

CONCLUSION

This Paper empirically investigated the future of FDI inflow into developing and developed economies. The projected values of FDI inflows into developing and developed economies seem to follow the past trend. A study of the past trend of FDI Inflow into developing economies showed an increasing trend over the decade while the trend of FDI Inflow in developed economies was declining. Forecasted values of FDI inflow into the coming decade showed an increasing trend in developing

economies and a constant trend into developed economies. Forecasted values of FDI inflow in developed economies are following the constant or declining trend same as in the past and validating the causes (decline in GDP growth rate, the low growth rate in per capita, and low rate of population growth) of low FDI inflow. Forecasted values of FDI inflow in developing economies are following the increasing trend in FDI flow same as in the past and validating the causes (decline in GDP growth rate, the low growth rate in per capita, and low rate of population growth) of increasing FDI inflow.

REFERENCES

- Asongu, S., Akpan, U.S. & Isihak, S.R. (2018). Determinants of foreign direct investment in fast-growing economies: evidence from the BRICS and MINT countries. *Finance Innovation*, 4, 26.
- Biswas, A. (2015). Forecasting Net Foreign Direct Investment Inflows in India: Box-Jenkins ARIMA Model. *International Journal of Management and business studies*, 5(3), 49-58.
- Can, M. (2017). The Relationship between Research & Development Investment Expenditure, Foreign Direct Investment and Economic Growth: Panel Causality and Co-integration Analysis for G-7 Countries. *Journal of Applied Economic Sciences*, 7(1), 58-69.
- Goyal, K.A., Rajput, N., Thanki, H., & Kundu, A. (2020). Political and Economic Determinants of Foreign Direct Investment in G7 Economies. *Finance India*, 34(2), 501–512
https://unctad.org/system/files/official-document/wir2019_en.pdf
(accessed on 29th January 2021)
https://unctad.org/system/files/official-document/wir2020_en.pdf
(accessed on 11th February 2021)
<https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=96740> (accessed on 27th January 2021)
- Ioana-Iulica, M., & Georgiana, M. (2013). Economic Realities and Prospects of Brics and G7. *Management Strategies Journal*, 20(2), pages 67-72.

- Jere, S., Kasense, B., & Chilyabanyama, O. (2017). Forecasting Foreign Direct Investment to Zambia: A Time Series Analysis. *Open Journal of Statistics, 7*, 122-131.
- Lartey, S., Ampaw, E. M., Gyasi-Agyei, K. A., & Nte- Adik, N. M. (2016). Modeling and Forecasting of Foreign Direct Investment (FDI) Inflows to Ghana (1994-2010). *Africa Development and Resources Research Institute Journal, Ghana, 25 7(3)*, 1-17.
- Mostafa, M.G., & Mahmood, M. (2015). The rise of the BRICS and their challenge to the G7. *International Journal of Emerging Markets, 10(1)*, 156-170
- Nandi, S. (2012). Comparative analysis of Foreign Direct Investment trends in emerging economies. *Procedia - Social and Behavioral Sciences 37*, 230 – 240
- Nunnenkamp, P. (2001). Foreign direct investment in developing countries: What policymakers should not do and what economists don't know, Kieler Diskussionsbeiträge, No. 380, ISBN 3894562285, Institut für Weltwirtschaft (IfW), Kiel
- Nyoni, T., & Lovemore, M. (2019). Foreign Direct Investment (FDI), dynamics in India: what do ARIMA models tell us? MPRA Paper No. 93986, posted 18 May 2019 07:57 UTC.
- Perera, P. (2015). Forecasting Foreign Direct Investment (FDI) in Sri Lanka for the period from year 2014-2064. *International Journal of Arts and Commerce, 4(1)*,34-45.
- Pirlogeanu, D. (2017). The determinants of foreign direct investment inflows in G7 countries. *Revista Economica, 69(3)*, 85-93
- Sabir, S., Rafique, A. & Abbas, K. (2019). Institutions and FDI: evidence from developed and developing countries. *Finance Innovation, 5*, 8.
- Sharma, S. (2020). *Forecasting of Foreign Direct Investment in BRICS for the year 2018-2040: A Model Based Study*. Ph. D thesis, Faculty of Management, Invertis University, Bareilly
- Sharma, S., & Rahul (2019). A Study to Forecast Foreign Direct Investment Inflow to G-7 Countries for the Period 2018-2030. *International Journal of Management Studies, 1(8)*, January 2019, 104-111,

- Sharma.S., Rahul & Saxena, K. A., (2018). Projected FDI Inflows to BRICS Members. *VIMARSH - A Bi-Annual Peer-Reviewed Refereed Journal*, 9 (2), 37-46
- Siddiqui, K. (2014). Flows of Foreign Capital into Developing Countries: A Critical Review. *Journal of International Business and Economics*, 2(1), 29-46
- Simionescu, M. (2014). The Relationship between Trade and Foreign Direct Investment in G7 Countries a Panel Data Approach. *Journal of Economics and Development Studies*, 2(2),447-454.
- Sookroo, S. (2018). An analysis of income inequality between BRICS and G7 countries (Master's thesis, Faculty of Commerce, Law and Management, Wits Institutional repository environment on Dspace). Retrieved from <http://wiredspace.wits.ac.za/handle/10539/26423>
- Teli, B.R. (2013). A critical analysis of foreign direct investment inflows in India. *Procedia - Social and Behavioral Sciences*, 133, 447 – 455.
- Trang Thi-Huyen Dinh & Vo, D.H., & Vo, A.T., & Nguyen, T.C. (2019). Foreign Direct Investment and Economic Growth in the Short Run and Long Run: Empirical Evidence from Developing Countries. *Journal of Risk and Financial Management*, 12(4), pages 1-11.
- Udi J. & Mathew E.M., & Samuel A.S. (2020). Global FDI Inflow and Its Implication across Economic Income Groups, *Journal of Risk and Financial Management*, 13(11), 1-15.
- Veni, K. L. (2020). Inflow and Outflow of Foreign Direct Investments in BRICS Countries - An Analysis. *Economy*, 2020, 7(2). 98-103