A Study of FDI Inflow to ASEAN Economies (2022-2030)

Dr Somesh Sharma
School of Management
Graphic Era Hill University
Bhimtal, UK, India
Somesh.sharma1982@gmail.com

Dr. Manmohan Bansal
Faculty of Management
Invertis University
Bareilly, UP, India
manmohanssvgi@gmail.com

Dr. Ashish Kumar Saxena
School of Management
IFTM University
Moradabad, UP, India
sxenaashish1983@gmail.com

Abstract

The world is observing a change in the flow of foreign direct investment. Developed countries are facing a fall in real world's foreign direct investment inflow in the world economy while the stake of emerging economies is increasing. ASEAN economies are the best destination for foreign investment because of their demographic, geographic, and economic conditions. In recent times, the trade war between China and USA and the Pandemic have opened a plethora of opportunities for ASEAN economies. The past trend of inward flow of FDI showed an increasing trend in case of ASEAN economies in the foregoing years, while the forecasted rate of inward flow of FDI using best fit ARIMA model showed a rising trend and followed the historical trend over the period of current decade. The study's findings will help foreign investors show the future of the inward flow of FDI in ASEAN economies and help them make investment decisions.

Keywords- ARIMA, PACF, ACF, ASEAN, Forecasting

1. INTRODUCTION

A group of ten Southeast Asian countries (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam) termed as Association of Southeast Asian Nations (ASEAN) to promote economic and cultural exchange. ASEAN economies are key economic power in the Asian continent and accounted for $ 182 billion of FDI in 2019. Foreign direct investment (FDI) is a type of cross-border investment in which a resident of one country establishes a long-term interest in and considerable influence over a resident of another economy. During 2020-2021 ASEAN economies recorded a sharp fall in FDI flow to $ 137 billion due to poor economic conditions. Despite the fall in FDI flow, ASEAN economies are an attractive investment destination for investors with their increased share of 13.7% of total global FDI in 2022 compared to 11.9% in 2019.

To maintain the current level of FDI and to increase the share of ASEAN economies in global FDI, the policymakers have signed a regional comprehensive economic partnership (RECP) agreement to boost the flow of FDI to economic development and to achieve fifteen percent of worldwide FDI stock and more than 33% of worldwide FDI flows. For foreign investors, key strategists or policy decision-makers officials, and regulators, it is important to comprehend the future of FDI inflow and the factors that drive the rapid expansion of ASEAN economies. Hence, this research work-study foreign direct investment inflow into ASEAN economies for the period (2022-2030) is projected with the help of ARIMA models for the next eight years, i.e., 2022 to 2030.

The study attempt to identify the future trend for FDI inflow to ASEAN economies after pandemic. This attempt would be helpful to foreign investors

978-1-6654-9058-0/22/$31.00 ©2022 IEEE

when deciding where to invest based on the future flow of FDI inflow in the ASEAN economies. The forecasted FDI inflow will help to identify the past trend and to predict the future FDI inflow to provide an accurate picture and a base for a sound investment decision. Research on the expected inward flow of FDI inflow in ASEAN economies will assist in determining the likelihood of FDI inflow in the present time and examine whether they will continue.

2. REVIEW OF LITERATURE

Shuang and Kanchana piloted a study to examine and project the association between foreign direct investment, tourism, and economic development in ASEAN economies. The Granger causality test checks the causal association between FDI, tourism, and economic growth. According to the study, ASEAN economies positively and negatively influence FDI and tourism on economic development [1]. Tajul researched to measure the impact of institutional quality on foreign direct investment inflows into ASEAN economies. The study revealed that the improvement in institutional quality of the competitor economies affects the flow of FDI into ASEAN economies. ASEAN economies should double its level of institutional quality to attract more FDI inflow [2]. ASEAN is emerging as one of the leading destinations for FDI inflows and a destination for a production base for multinational corporations. To maintain the same level of economic development and flow of FDI, ASEAN should integrate itself with the rest of Asia and substantially deepening its internal integration to strengthen the future of FDI inflow and economic development [3]. Jagadish and Santosh conducted a study to examine the determinants of foreign direct investment inflow into ASEAN economies. They used the fixed effects quantile regression (QR) technique to examine the effect of different variables on the FDI inflows into ASEAN economies. The study's findings suggest that financial expansion, natural wealth, and the political regime are the key components of a more significant flow of FDI inflows into ASEAN economies [4]. Raeskyesa and Suryandaru examined the pragmatic outcome between Competitiveness and FDI inflows in ASEAN from 2007-2017. The study discovered that the ASEAN countries have a resilient and optimistic connotation among competitiveness and the FDI inflow. Variable institutional quality, market size, health, and primary education significantly appealed to inward foreign direct investment in the region [5]. Laura conducted a study to categorize the variables that encouraged and discouraged foreign investment into ASEAN economies. Data and variables related to FDI inflows from 1990 to 2014 were analyzed to conclude that ASEAN economies will continue attracting foreign investors due to their competitive advantages [6]. Van and Quan conducted a study to determine the impact of economic and political variables on FDI inflows into ASEAN countries. The observed outcomes specify that growth rate in the economy, tax liability, inflation in the economy, and excellence of the financial institution, are the essential drivers that pointedly invite FDI. However, the growth rate in the population and the worth of political institutions are adversely related to the inward flow of FDI [7]. Muhlis, in his research, attempted to study the connotation of R&D (research and development) expenditure, FDI, and growth rate in the economic development of G-7 countries from 1996-2011. A unidirectional relation was found between foreign investment to R&D spending and the growth rate of economic development [8]. Jere et al., conducted a study to find the best method to forecast. He used three methods (1) Simple exponential smoothing (SES), (2) Holt-Winters exponential smoothing (HWES), and (3) ARIMA for forecasting. Results of the finding suggested ARIMA (1,1,5) as the preeminent fit method among all the three methods with maximum accuracy in results. Forecasted values obtained from ARIMA (1,1,5)

showed a gradual increase in FDI inflow into Zambia. [9]. Nyoni and Muchingami researched the future FDI inflow in India using the Box Jenkins ARIMA model. ARIMA with parameter (p,d,q) (1,1,0) was the best fit model to forecast the FDI inflow. Annual FDI inflow data from 1960 to 2017 was collected to forecast the future of FDI inflow in India. Results of the study suggested that forecasted value will follow the same trend as in the past, subject to changes in economic variables. Perera conducted a study to know the future of FDI in Sri Lanka. He used ARIMA (1,1,6) and (1,0,6) to forecast the FDI inflow in Sri Lanka for a period of 50 years (2014-2064). The study's findings suggested that the future trend of FDI inflow is the same as in the past and matches the real trend. [11].

Above discussed research concluded that FDI is a key component in economic development. The flow of foreign investment (FDI inflow) can change the economy's fate and affect economic growth and development. Forecasting of Foreign investment (FDI inflow) using the best time series forecasting method will help get an accurate picture of foreign investment (FDI inflow). Research findings of the studies discussed above preferred ARIMA as best fit time series model with maximum accuracy to forecast. Projection of foreign investment (FDI inflow) in ASEAN economies can give an idea of future foreign investment (FDI) by providing an exact prediction of future FDI inflow to foreign investors, which will assist them in knowing the trend of economic development and foreign investment.

3. RESEARCH METHODOLOGY

The purpose of this study is to explore the historical and existing trends and to forecast the inflow of FDI in ASEAN economies. To achieve the purpose of this study, the objects of the study are divided into two (1) To get the best fit and ARIMA model to forecast the FDI Inflow (2) To project the FDI Inflow in the current decade in ASEAN economies. This study aims to forecast upcoming FDI Inflow in ASEAN economies by using ARIMA for 9 years, ranging from 2022-to 2030.

The methodology followed in the study supports the use of secondary sources of data to analyze the existing movement and forecast the future FDI inflow in ASEAN economies. FDI inflow data (related to ASEAN economies) was collected from the UNCTAD database. ARIMA a time series forecasting technique was used to estimate the FDI inflows. ADF test and Phillips Perron tests were used to check the level of stationarity in the data series. PACF correlogram, ACF Correlograms, level of differencing were used to find parameters (p,d,q) of the ARIMA model. The best fit ARIMA model was selected with the help of parameters (p,d,q) identified. In-built AUTO.ARIMA function in software R was used to check the authenticity of the selected ARIMA model. Line charts are used to show the past and future trends in FDI inflow in the ASEAN economies. Analysis and forecasting were done using statistical software R.

4. FORECASTING OF FOREIGN DIRECT INVESTMENT INFLOW IN ASEAN ECONOMIES

Analysis and Discussion

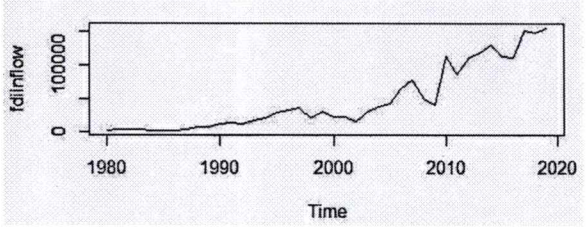

FIGURE 1 - FDI INFLOW IN ASEAN ECONOMIES; Source: 'AUTHOR'

The trend in FDI inflow In Figure 1, showed moving trends with minor fluctuation in recent trends Descriptive statistics of the past data hold great variations which indicate that mean,

variance, and covariance are not the same over the period and graphic figures do not track an unceasing trend and variation are noticed over the period, indicating that the FDI inflow series for ASEAN economies do not track stationary configurations. A pictorial inspection of the data of FDI inflow in figure 1 discloses a rising trend, specifying that it is non-stationary.

The first stage in forecasting using time series analysis is to examine the status of stationarity before using any of the techniques of time series forecasting. The Augmented Dickey fuller test (ADF) test is a consistent statistical test for defining the existence of unit root or stationarity in data series. The Augmented Dickey-Fuller (ADF) and Phillips-Perron tests are used for ASEAN's FDI inflow data set.

TABLE 1 - TEST STATISTICS OF UNIT ROOT TESTS AT LEVEL; Source- 'AUTHOR'

	ADF test statistics	Phillips-Perron test statistic
probability	0.994	0.9955
t-Statistics	1.6398	0.9755
test critical value:		
1%	-3.621	-3.6104
5%	-2.9434	-2.9389
10%	-2.6102	-2.6079

Test statistics of unit root tests (ADF and Philips Perron tests) given in table 1 revealed that the probability scores of ADF and Phillips Perron tests are more than .05, and the t-statistics (ADF and Philips Perron) are more than the test critical values at 1%,5% and 10% level of significance thus we can accept the null hypothesis that data series is non-stationary and can conclude that original FDI inflow data series does not seem stationary. Now the original time series (FDI Inflow) is differenced at first to change it into a stationary time series.

FIRST ORDER DIFFERENCE

FDI inflow data series (non-stationary) in ASEAN economies will now be converted into a stationary time series using the first order of difference.

ADF and Phillips Perron tests are used to assess the presence of unit roots in the differenced time series at first order. Table 2 shows the tests score of ADF and Philips Perron tests which accept the alternative hypothesis of stationary time series at 1st order of differencing and reject the null hypothesis of unit root or non-stationary time series, thus, it can be concluded that FDI inflow data series differenced at 1st order follows a stationary pattern, so the value of parameter d is 1 in ARIMA model (p,d,q).

TABLE 2- TEST STATISTICS OF UNIT ROOT TESTS AT FIRST ORDER OF DIFFERENCING; SOURCE: AUTHOR

	ADF test statistics	Phillips-Perron test statistic
probability	0.01	0.01
t-Statistics	-8.8655	-9.7467
test critical value:		
1%	-3.6155	-3.6155
5%	-2.9411	-2.9411
10%	-2.609	-2.609

PARTIAL AUTO CORRELOGRAM AND CORRELOGRAM

Visualization of PACF and ACF plots gives an idea to find the parameters of the best fit ARIMA model. AR and MA (p & q) of the best suitable model are identified using PACF and ACF plots.

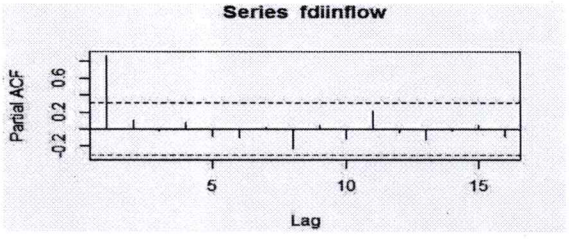

FIGURE 2- PACF DIFFERENCED SERIES- ASEAN; SOURCE: 'AUTHOR'

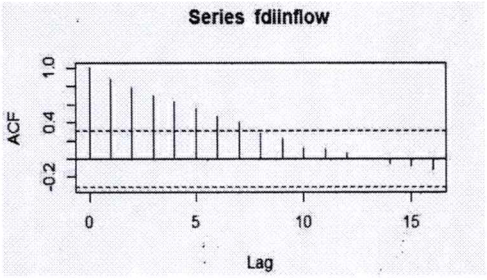

FIGURE 3- ACF DIFFERENCED SERIES-ASEAN; SOURCE: 'AUTHOR'

A graphic assessment of the PA Correlogram or PACF plot revealed that Auto regression (AR =p) is equal to 0 as it dies down fast and cut off before lag 1 and all its bar are within the boundary. A graphic assessment of the ACF plot suggests the Moving average (MA =q) equals 1 as it is falling progressively with the lag length. As a result, the AR and MA (p & q) values in ARIMA (p,d,q) are 0 and 1, respectively. The ARIMA model's probable parameters are AR = 0, integrated = 1, and moving average = 1. As a result, ARIMA (0,1,1) is our recommended model for forecasting the projected value of FDI inflow into ASEAN economies.

AUTO.ARIMA FUNCTION

To find the best fit for ARIMA model, the "auto. arima" inbuilt function (software R) can be used to find the best ARIMA model. Legitimacy of the chosen model (ARIMA (0,1,1) with the help of PACF and ACF correlogram) is checked using "auto.arima" function.

TABLE 3- ARIMA COEFFICIENT- ASEAN; SOURCE: 'AUTHOR'

Arima model		
Series: FDI inflow		
ARIMA(0,1,1) with drift		
Coefficients:	ma1	drift
	-0.4675	3928.957
s.e. 0.1290 1289.878		
sigma^2 estimated as:	230349415	log likelihood=-429.91
AIC=865.82	AICc=866.51	BIC=870.81

Test statistics of the "auto.arima" function in table 3 suggest the ARIMA (0,1,1) with drift as best fit model same as we found with the help of PACF and ACF correlogram. Result yields of the "auto.arima()" function in table 3 fulfills all the analytic proving of ARIMA (0,1,1) with drift model as AIC, and BIC value is maximum at the given ARIMA (0,1,1) with drift model; henceforth ARIMA (0,1,1) with drift is used to forecasting the inward flow of FDI in ASEAN. Estimates of the inward flow of FDI using the selected model exhibited a growing trend in inward flow of FDI over the next 8 years (2022-2030).

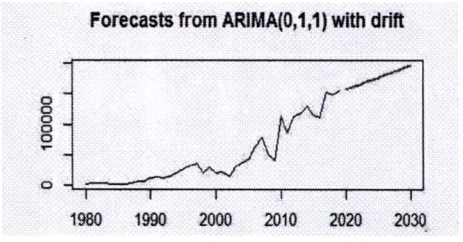

FIGURE 4-FORECAST OF FDI INFLOW IN ASEAN; SOURCE: 'AUTHOR'

TABLE 4- FORECASTED VALUE OF FDI INFLOW-DEVELOPING ECONOMIES SOURCE: 'AUTHOR'

Year	Forecast	LO 80%	HI 80%	LO 95%	HI 95%
2022	164614	164375.9	164852	164375	164852
2023	168543	168284	168801	168284	168801
2024	172471.9	172194	172749	172194	172749
2025	176400.9	176105	176696	176105	176696
2026	180329.8	180017	180642	180017	180642
2027	184258.8	183930	184587	183930	184587
2028	188187.7	187843	188531	187843	188531
2029	192116.7	191758	192475	191758	192475
2030	196045.7	195673	196418	195673	196418

Figure 4 shows the expected trend of the inward flow of FDI in general at 80% and 95% confidence. Figure 5 exhibited a positive movement in inward FDI flow during the year from 2022 to 2030. The estimated value of Inward flow of FDI would be $164614 million in 2022 and $ 196045.7 million in 2030. The forecasted values similarly track the same pattern as in the past. Forecasted values of the inward flow of FDI

into ASEAN show an increasing flow over 8 years (2022-2030) and shall follow the same pattern of inward flow of FDI as in the past.

5. CONCLUSION

This study attempts to fix the parameters (p,d,q) of the ARIMA model to find the best fit ARIMA model to predict the inward flow of FDI inflow in ASEAN economies. The observed investigation approved that ARIMA (0,1,1) with drift model is the best fit model for projecting inward flow of FDI inflow in ASEAN economies.

This research study empirically probed the future of the inward flow of FDI in ASEAN. A study of past and the current trend of inward flow of FDI in ASEAN economies exhibited a growing trend over last two decades while a more or less a constant trend in the previous decade. A study of future FDI inflow into current decade using time series analysis (ARIMA) showed an increasing trend over the period of 2022-2030. The forecasted values of inward flow of FDI in ASEAN look to track the past movement. The projected value of inward flow of FDI is $196045.7 Million for the year 2030. In conclusion, there is an expected smooth increase of inward flow FDI in ASEAN over the period (2022-2030).

6. RESEARCH IMPLICATIONS, LIMITATION OF THE STUDY, AND SCOPE FOR FURTHER RESEARCH

The results of the study will help to assess the past and current performance of the ASEAN economies on the movement of the inward flow of FDI and to motivate them to choose the best investment destination. ASEAN economies will benefit from this research as they create foreign investment policies that encourage more foreign investment. This research widens the scope of further research in diagnosing the factors that shall contribute to the growth rate of inward flow of FDI in the ASEAN economies and factors that shall motivate foreign investors to choose the most attractive destination for investment. The major limitation related to the study is that only inward flow of FDI is taken as an economic variable, and the projection of inward flow of FDI is made using only the time series data of FDI inflow, and other variables are ignored.

REFERENCES

[1] Liu, S., and Chokethaworn, K., 2020. The Analysis and Forecasting on Foreign Direct Investment, Tourism and Economic Growth in ASEAN Countries , International Journal of Management and Applied Science,Volume-6, Issue-8, pp. 13-18,

[2] Masron, T.A., 2017. Relative institutional quality and FDI inflows in ASEAN countries", Journal of Economic Studies, Vol. 44 No. 1, pp. 115-137.

[3] Kawai, M., and Naknoi, K., 2015. ASEAN Economic Integration through Trade and Foreign Direct Investment: Long-Term Challenges. ADBI Working Paper 545. Tokyo: Asian Development Bank Institute

[4] Sahu,P.J., and Dash,.K.S., 2021. What Explains FDI Inflows to ASEAN Countries? Evidence from Quantile Regressions. Journal of Asian Economic Integration, Vol. 3, issue: 1, PP. 25-37

[5] Raeskyesa, S. G. D., Suryandaru, A. R., 2020. Competitiveness and FDI inflows in ASEAN member countries. International Journal of Business and Economic Sciences Applied Research, Vol. 13, Iss. 1, pp. 14-20

[6] Diaconu, L. 2014. The foreign direct investments in South-East Asia during the last
two decades. Procedia Economics and Finance 15 (2014) 903 – 908

[7]Van Cuong Dang & Quang Khai Nguyen | Gabriela Borz (Reviewing editor) (2021) Determinants of FDI attractiveness: Evidence from ASEAN-7 countries, Cogent Social Sciences, 7:1

[8] 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.

[9] Jere, S., Kasense, B. & Chilyabanyama, O. (2017). Forecasting Foreign Direct Investment to Zambia: A Time Series Analysis. Open Journal of Statistics, 7, 122-131.

[10] 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.

[11] 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.