

# Testing the Granger Causality of FDI Inward in Developing Economies: A Pair-Wise Study of America, Africa, and Asia

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## Article Info

Volume 83

Page Number: 573 - 581

Publication Issue:

May - June 2020

## Abstract:

The purpose of this paper is to test the causality of FDI inward in developing economies particularly to America, Africa, and Asia region as a whole. This study has used yearly FDI inward data of Africa, America, and Asia for the period ranging from 1970 to 2018. Empirical analysis has been carried out in order to assess whether there is causality exists among Africa, America and Asian region FDI inward flows by Granger Causality test. The result shows that the causality of FDI inward of America can be used to predict the growth of FDI Inward of Africa, FDI Inward of Asia can be used to forecast FDI Inward of Africa, and FDI Inward America can be used to estimate the FDI Inward flow of Asia. The causality between FDI Inward of Africa and America, FDI Inward of Africa and Asia and FDI Inward Asia and America does not show significant results by chosen lag2. The bi-directional causality or pair-wise causality has been found between the selected regions using different lag. The practical implications in the study to select best model depend upon the lag selection; when lag changes the result of granger causality test also changes a lot, it means that the lag selection affect the result. The originality of the study has become significant because no study has been examined the Granger causality test of FDI inward of America, Africa, and Asia altogether.

## Article History

Article Received: 11 August 2019

Revised: 18 November 2019

Accepted: 23 January 2020

Publication: 09 May 2020

**Keywords:** Granger-causality, FDI-Inward, Africa, America, and Asia.

## I. INTRODUCTION

The need and importance of FDI in developing economies are indisputable, their companies want funding, expertise for expanding their sales from multinationals. The countries need private investment to boost their domestic sectors, which help to increase jobs and wages in the country. In 2018, despite the decline of global trend of FDI, Africa economies attracted and rose to \$46 billion which is 11% increased after the successive declined in the previous two years. Some economies Africa which includes Egypt, Nigeria and Ethiopia were reduced their flow of FDI by significant increases in other countries, mostly captured by South Africa. The multinationals are active in Africa, mainly in sub-Sahara region. In 2019, the expected growth and

development in Africa based on the implementation of free trade area agreement.

The FDI inward in North Africa mount by 7%, which is equal to \$14 billion, along with Egypt remained the largest FDI recipient, but comparatively less to previous year by 8%, which is equal to \$6.8 billion. The FDI inward in Morocco and Sudan rose by 36 and 7 percent in 2018, but in Tunisia FDI flow has increased by 18 percent, but France is the largest investor country that invests funds in Tunisia followed by Qatar. However, West Africa FDI fell up to 15 percent which is equal \$ 9.6.

Similarly, Nigeria substantial fell 43 percent. On the other hand, Ghana received the largest FDI in West Asia. The FDI inward in Kenya, Congo, showed positive sign but Angola continued to be

negative. The FDI inward in developing economies Asia rose only by 4 percent which is equal to \$ 512 billion in 2018. Moreover China increased its FDI inward by 4 percent which is undoubtedly all-time high FDI inflows equal to \$139 billion, despite the trade war tension between United States and China. The majority of FDI received in China, Singapore and Hong Kong (World Investment Report, 2019). India and Turkey also attracted positive FDI flows in Asian region. The FDI inward in American developing economies do not show a promising sign, however, FDI in Brazil and Cambodia declined up to 6 percent.

Columbia also fell 20 percent equal to \$11 billion. In Central America, Mexico rose \$32 billion of inward FDI, which is not equal to the previous year, but North America jumped by 7 percent, which indicated that FDI inward moving towards northern region of America. In this study, we used all countries' FDI inward flows, which belong to developing economies of America, Africa, and Asia for testing the FDI inward directional relationship

between the regions, which can clear the picture of effect of FDI inward among these destinations. The FDI inward after taking the first difference of the yearly data series shows that Asia received the highest FDI inward; however Africa received the least FDI inward among these three regions of the world. See table 1.

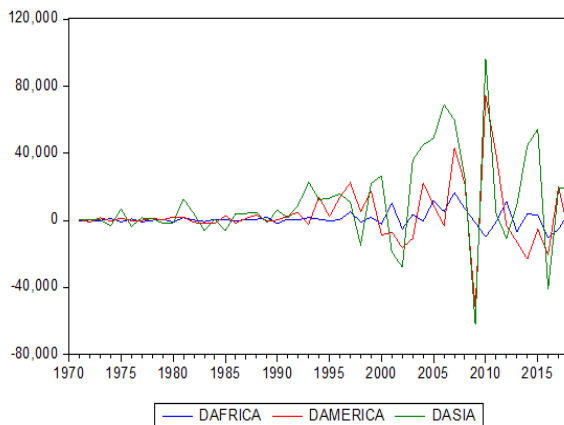
Figure 1 exhibits that during the period from 1975 to 1979, the FDI inward of America, Africa, and Asia had consistent but after 1990 Asia started attracting multinational to invest the fund in developing countries like China, India, Singapore and others. After 2010, we can see that there was significant shift in investing the fund towards developing economies of Asia because of cheap labor, volume of consumers and many facilitate activities which give a multinational a better chance to earn more money in doing business outside the country but surprisingly Asia ran ahead of attracting FDI around the world.

**Table 1** Result of Descriptive Statistics of FDI Inward of Developing Economies

	DAFRICA	DAMERICA	DASIA
Mean	929.8975	3025.240	10642.77
Median	470.0792	348.1150	4452.103
Maximum	16437.33	74424.55	96443.14
Minimum	-10391.74	-52338.02	-62107.66
Std. Dev.	4829.884	18330.02	26990.10
Skewness	0.683498	1.006254	0.581797
Kurtosis	5.200140	7.968968	4.906118
Jarque-Bera	13.41859	57.48167	9.974479
Probability	0.001220	0.000000	0.006824
Sum	44635.08	145211.5	510853.1
Sum Sq. Dev.	1.10E+09	1.58E+10	3.42E+10
Observations	48	48	48

**Source:** Calculated and Compiled by Researchers (Output of E-Views)

Figure1 Exhibits the FDI Inward of Developing Economies



Source: Output of EViews

## II. EXTENSIVE LITERATURE REVIEW

FDI determines the largest source of Investment for developing economies, and its gives acceleration and expansion of international production activities. Nearly one-third of incoming finance in developing economies comes from FDI and used for growth and development. There is too much research available on FDI which conduct empirical studies, but still scholars are concentrating on new dimensions for the same. Few studies revealed the importance of FDI inward in developing economies in research papers. Mallampally and Sauvant (1999) suggested FDI in developing countries leads to economic development, and the government wants to increase it, the world market is highly competitive for attracting investment. Liu, Shu, and Sinclair (2009) examined the interplay between import, export, FDI and economic growth by conducting VECM and granger causality test. The result found that there are two-way directional relationships between some variables. Apergis (2009) found that there exists association between inward and outward FDI by using 35 countries data over the period from 1981 to till 2004. It shows that FDI inward has a significant relationship with FDI outward when researchers split into the category of developing and developed countries bi-directional panel causality has been found. Liargovas and Skandalis (2012) examined that trade openness is useful to attract FDI inflow in developing economies. The results of the study revealed that in long run, trade openness has

positively contributed to increasing FDI inflow by using panel regression analysis. Tanaka and Arita (2016) they found under their investigation that the policy reform promotes FDI has significantly improved the sales of multinational companies in developing economies, they concluded that the policy reforms directly reduced the entry cost of foreign firm. The firm-level changes have a significant impact on individual firms concerning level of production. Kaur, Khatua and Yadav (2016) tested the impact of FDI Inflow to developing economies on the infrastructure development specifically Indian perspective, they found under their study that factors like road network and railway transportation attracted FDI and helpful in reinforcing the infrastructure in the country but FDI inflow is seen skewed particularly in few states of India. Sinha, Chaudhury, and Sengupta (2019) Empirically examine the co-movements of terrorist activities and MNCs' decisions on FDI in selected developing countries, particularly in the Pacific and Asia region, and their findings revealed that FDI inflows negatively influenced by terrorist activities in the developing economies. Bruhn, Calejario, and Mendonca (2019) found that the productivity spillover effects of foreign direct investment (FDI) in the Latin American economies and the role of foreign presence and government intervention in industrial policy, which affects the total factor productivity. Polyxeni and Theodore (2019) investigated the factors of foreign capital working in developing economies vis-a-vis terrorist activities; they concluded that terrorism restraint FDI flow in the recipient countries. Previous studies shed light on various gaps carried out in this field. The study becomes significant because no research has been found to examine the Granger causality test of developing economies particularly Asia, America and Africa as a whole. It is an honest effort by the researchers to provide his sincere contributions in this regard.

## III. OBJECTIVES OF THE STUDY

Testing the causality between the developing

economies of America FDI inward to Africa FDI Inward; Asia FDI inward flows to Africa FDI Inward, and America FDI inward to Asia FDI inward or vice versa.

#### IV. HYPOTHESES OF THE STUDY

The following hypotheses have been formulated for testing under this study.

1. FDI inward of America does not Granger Cause FDI Inward Africa
2. FDI inward of Africa does not Granger Cause FDI Inward America
3. FDI inward of Asia does not Granger Cause FDI Inward Africa
4. FDI inward of Africa does not Granger Cause FDI Inward Asia
5. FDI inward of Asia does not Granger Cause FDI Inward America
6. FDI inward of America does not Granger Cause FDI Inward Asia

#### V. RESEARCH METHODOLOGY

For time-series data, Granger (1969) proposed this test in order to determine whether X causes Y and to observe how much of the current series of Y can be predicted by its past values of Y and to test if lags are added then the values of X can improve the explanation of the model. Y is considered to be granger caused by X, if X variable help to predict Y, or Vice versa. If we found the results are statistically significant and X Granger causes Y and Y Granger causes X, then causation showed bi-directionally. In Granger Causality test, the selection of the number of lags is crucial to use in the test regressions. However, it is better to use more lags rather than fewer, since this test is very much relevant to all past information. With the help of EViews, researchers run bivariate regressions of the form, for all possible pairs of (X, Y) series in the group. For testing the Null ( $H_0$ ) hypothesis, the researchers considered F-statistics. The null hypothesis assumes that X does not Granger-cause Y in the first regression equation and that Y does not Granger-cause X in the second regression equation below

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \dots + \alpha_l y_{t-l} + \beta_1 x_{t-1} + \dots + \beta_l x_{t-l} + \varepsilon_t \dots \dots \dots (1)$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \dots + \alpha_l x_{t-l} + \beta_1 y_{t-1} + \dots + \beta_l y_{t-l} + u_t \dots \dots \dots (2)$$

$$\beta_1 = \beta_2 = \dots = \beta_l = 0$$

Again, Clive Granger (1980) and (2004) applied this in determining the causation and time series analysis and co integration, but the recent used by Foresti (2006) where he tested the directional relationship between stock price and economic growth, Plihal (2016) applied to examine the relationship between stock market and macroeconomic indicators specifically in Germany. Yu-Chi and Lin (2018) used this to predict tourism, FDI, and economic growth, particularly in Taiwan. The result presented in this paper has estimated through bivariate or pair-wise Granger causality test in order to assess the causality between the developing economies of America FDI inward to Africa FDI Inward, Asia FDI inward flows to Africa FDI Inward and America FDI inward to Asia FDI inward or vice versa. Hence by using these results, the researchers could tell it is possible to predict the future series of any selected developing economies FDI inward with the help of past series of any developing economies.

#### VI. RESULTS AND DISCUSSION

Yearly data of FDI inward of developing economies of America, Africa, and Asia have obtained from the database of UNCTAD statistics for the period ranging from 1970 to 2018. We also collect analytical data on FDI from the yearly reports from UNCTAD. The FDI inward yearly data of developing economies of Africa, America, and Asia have used for the analysis. The first step before apply test is to check the stationarity of series of FDI inward of America, Africa, and Asia. The researchers applied Augmented Dickey fuller test for testing the stationarity of data series, but no series of FDI inward found stationary at level (see table 2). Therefore, the researchers converted the data series into first differences. The FDI inward data series of America, Africa, and Asia have found stationary at

first difference of series. All the series found stationary with significant values at 0.000, which means the Null Hypothesis  $H_0$  of non-stationarity have rejected at 5% confidence level (see table 3). After the stationarity test was satisfied, the researchers computed Pair-wise Granger Causality test. This test is useful for predicting the series. Therefore the lag selection is essential for estimating model. Finally researchers applied granger causality test on the FDI inward data series in order to test the direction of causality between FDI inward of America to Africa, Asia to Africa, and America to Asia or Vice versa. The following models have been prepared to test the causality between the FDI inward flows of different economies.

In applying the Granger Causality test, it is crucial to select the information criterion to base the decision on the number of lags to use the test of regression. It is better to use more lag because many previous studies use the criterion of Akaike and Schwarz to formulate these selections. The optimal value is 5 lag applied for estimating the model in this study. Since this theory implied in terms of past information, it is the opinion of the researchers to pick the lag length, which gives the justification over which one variable could help to predict the other with time.

In the first Model, we reject the Null hypothesis that FDI inward flows of America does granger causes Africa FDI inward, but we can not reject the alternative hypothesis that Africa does not have a granger that cause America FDI Inward. Therefore it appears that granger causality runs one way from America to Africa and not the other way. The f-statistic shows that America's FDI inward does cause granger causality Africa, but Africa FDI inward does not cause America FDI Inward. Thus it can be argued that the past value of America FDI inward contributes to the prediction of the present value of Africa FDI (see table 4 and 5). Moreover, in single regression, it can be showed that when we moved it into 5 lags, the causality becomes bi-directional with significant probability value less than 0.5 percent. So it is clear, when lag changes, the result also changes.

It means lag selection affects the result. Reminding that past value of FDI inward of America could predict the future value of FDI inward of Africa. The Null hypothesis  $H_0$  Africa FDI inward does not granger cause America at lag 2 has accepted, but the null hypothesis rejected when we used more lags; the result has changed. (see table 6 and 7)

In Second Model, the Null hypothesis says that Asia FDI inward does not cause Africa FDI Inward, the direction of causality seems positive, the f-statistic shows the significant p-value 0.008 which means that the past value of FDI inward of Asia could be used to predict the future values of Africa FDI inward, therefore Asia FDI inward granger cause Africa FDI inward but Africa FDI inflows do not cause Asia FDI Inward flow. It means that granger causes only one way not bi-directional, the outcomes clearly stated that the Asia FDI inward cause Africa but Africa FDI inward does not cause Asia. So the null hypothesis does not reject bi-directionally.

Nevertheless, we moved lag from 2 to 4, and the relationship becomes bi-directional; we cannot accept the null hypothesis rather than reject null hypothesis. Therefore the direction of causality found bidirectional, and the past data could be used to predict the future FDI inward flow of both series. The decision has changed in selecting lag 4, the outcome explained that FDI inward of Asia does granger cause Africa and FDI inward of Africa do granger cause Asia (see table 5 and 7).

In Third Model, the Null Hypothesis  $H_0$ , the Asia FDI inward does not granger cause America at lag 2, but the value of F-statistic showed that the FDI inward of Asia does granger cause FDI inward of America at lag 4 and 5, the direction of causality does not found at lag 2 and 3, therefore the null hypothesis is rejected (see table 4, 5 & 6), but only in case of selected lag 5, there exist the directional causality and therefore with the past value of FDI inward of America could be estimate the future value of FDI inward of Asia (see table 8). At lag 4 and 5, FDI inward of Asia does granger cause FDI inward of America. On the other hand, at lag 2 and 5

it showed granger cause FDI inward Asia. At last, concluding our test for granger causality reflects the effects on developing economies among each other, particularly America FDI inward to FDI inward to Africa but, FDI inward of Africa to America and FDI inward Asia to Africa. It seems granger causality selecting the different lags. There we can estimate or computed the predicted value of FDI flow by using past FDI series.

## VII. CONCLUSION

The relationship between FDI inward of America, FDI inward of Africa, and FDI inward of Asia are fascinating in the competitive world business environment. This paper has tried to assess the possibility that one variable can granger cause to others. During the period, the inflow of foreign direct investment has been influencing not only to one economy but also had effect on the other developing economies; however the government of all countries of emerging economies took initiatives to attract foreign investment from the other countries of the world. In the study, the researchers focused on FDI inward of Africa, America, and Asia to test whether past series of FDI inward of one developing economies could be used to predict the future data of other emerging economies concerning FDI inward. For to assess the causality between the developing economies of Asia FDI inward flows to Africa FDI

Inward, America FDI inward to Africa FDI Inward, and America FDI inward to Asia FDI inward or vice versa the researchers applied Granger causality test. The result shows that FDI inward of America does granger cause FDI inward of Africa or vice –versa at lag 3, 4, and 5, but on the other hand, the FDI inward of Asia does granger cause FDI Inward of Africa or vice –versa at lag 4. However FDI inward of Asia does granger cause FDI inward of America or vice-versa at lag 5. The p-values in all cases are significant, it means in all cases there are bidirectional relationship between the developing economies, the results show that it is possible to investigate the flow of FDI inward of different economies by using past data of one economy that could be used to predict the future FDI inward flow of other developing economies. The developing economies of Africa, America, and Asia include all countries in these continents. Hence we can say that the past data of one developing economies of FDI inward could be used to predict the future data of other emerging economies FDI inward. We propose two research directions to widen and enrich this field of research. The first opportunity relates to Flow of FDI Inward in Eastern Asia and its impact on India's Economy. A second future research opportunity relates to advancing Granger Causality Test of FDI inward of Eastern Asia and India's FDI Inward and its Impact on Stock Market.

**Table 2** Statistics of Augmented Dickey-Fuller Test before Converted Yearly FDI Inward Data Series.

Hypotheses	Exogenous:	Test critical values:	T-Statistic	Prob.*
Null Hypothesis: AFRICA FDI Inward has a unit root	Constant	5% level	-2.923780	0.9023
	Constant, Linear		-3.506374	0.6270
	Trend		-1.947816	0.8294
	None		-2.923780	0.8432
Null Hypothesis: AMERICA FDI Inward has a unit root	Constant		-3.506374	0.3368
	Constant, Linear		-1.947816	0.7543
	Trend		-2.923780	0.9983
	None		-3.506374	0.8642
Null Hypothesis: ASIA FDI Inward has a unit root	Constant		-2.923780	0.9983
	Constant, Linear		-3.506374	0.8642
	Trend		-3.506374	0.8642

None -1.947816 0.9980

Source: Compiled through Output of EViews

**Table 3** Statistics of Augmented Dickey-Fuller Test after Converted Yearly FDI Inward Data Series into First Difference

Hypotheses	Exogenous:	Test critical values:	t-Statistic	Prob.*
Null Hypothesis: DAFRICA FDI Inward has a unit root	Constant		2.925169	0.0000
	Constant, Linear Trend		-3.508508	0.0000
	None		-1.947975	0.0000
Null Hypothesis: DAMERICA FDI Inward has a unit root	Constant	5% level	-2.925169	0.0000
	Constant, Linear Trend		-3.508508	0.0000
	None		-1.947975	0.0000
Null Hypothesis: DASIA FDI Inward has a unit root	Constant		-2.925169	0.0000
	Constant, Linear Trend		-3.508508	0.0000
	None		-1.947975	0.0000

Source: Compiled through Output of EViews

**Table 4** Exhibits the Outcomes and Decisions of the Hypothesis of the Granger Causality test

Direction of Causality	Lags	Decision	Outcome
DAMERICA > DAFRICA	2, 3,4 and 5	Reject Null Hypothesis	FDI inward of America does Granger Cause FDI Inward Africa
DAFRICA > AMERICA	3,4 and 5	Reject Null Hypothesis	FDI inward of Africa does Granger Cause FDI Inward America
DASIA > DAFRICA	2, 3,4 and 5	Reject Null Hypothesis	FDI inward of Asia does Granger Cause FDI Inward Africa
DAFRICA > DASIA	4	Reject Null Hypothesis	FDI inward of Africa does Granger Cause FDI Inward Asia
DASIA > DAMERICA	4 and 5	Reject Null Hypothesis	FDI inward of Asia does Granger Cause FDI Inward America
DAMERICA > DASIA	2 and 5	Reject Null Hypothesis	FDI inward of America does Granger Cause FDI Inward Asia

Source: Compiled through Output of EViews

**Table 5** Result of Pair-wise Granger Causality test by Selected 2 lags

Null Hypothesis:	Obs	F-Statistic	Prob.
DAMERICA FDI Inward does not Granger Cause DAFRICA FDI Inward	46	3.72377	0.0327
DAFRICA FDI Inward does not Granger Cause DAMERICA FDI Inward		0.28023	0.7570
DASIA FDI Inward does not Granger Cause DAFRICA FDI Inward	46	8.46743	0.0008
DAFRICA FDI Inward does not Granger Cause DASIA FDI Inward		0.10972	0.8963
DASIA FDI Inward does not Granger Cause DAMERICA FDI Inward	46	0.13612	0.8731
DAMERICA FDI Inward does not Granger Cause DASIA FDI Inward		4.03534	0.0251

Source: Output of EViews

**Table 6** Result of Pair-wise Granger Causality test by Selected 3 lags

Null Hypothesis:	Obs	F-Statistic	Prob.
DAMERICA FDI Inward does not Granger Cause DAFRICA FDI Inward	45	3.22849	0.0330
DAFRICA FDI Inward does not Granger Cause DAMERICA FDI Inward		4.47175	0.0087

Source: Output of EViews

**Table 7** Result of Pair-wise Granger Causality test by Selected 4 lags

Null Hypothesis:	Obs	F-Statistic	Prob.
DAMERICA FDI Inward does not Granger Cause DAFRICA FDI Inward	44	2.83516	0.0389
DAFRICA FDI Inward does not Granger Cause DAMERICA FDI Inward		5.05157	0.0025
DASIA FDI Inward does not Granger Cause DAFRICA FDI Inward	44	6.50293	0.0005
DAFRICA FDI Inward does not Granger Cause DASIA FDI Inward		3.14394	0.0261
DASIA FDI Inward does not Granger Cause DAMERICA FDI Inward	44	4.24091	0.0067
DAMERICA FDI Inward does not Granger Cause DASIA FDI Inward		2.52540	0.0582

Source: Output of EViews

**Table 7** Result of Pair-wise Granger Causality test by Selected 4 lags

Null Hypothesis:	Obs	F-Statistic	Prob.
DAMERICA FDI Inward does not Granger Cause DAFRICA FDI Inward	44	2.83516	0.0389
DAFRICA FDI Inward does not Granger Cause DAMERICA FDI Inward		5.05157	0.0025
DASIA FDI Inward does not Granger Cause DAFRICA FDI Inward	44	6.50293	0.0005
DAFRICA FDI Inward does not Granger Cause DASIA FDI Inward		3.14394	0.0261
DASIA FDI Inward does not Granger Cause DAMERICA FDI Inward	44	4.24091	0.0067
DAMERICA FDI Inward does not Granger Cause DASIA FDI Inward		2.52540	0.0582

Source: Output of EViews

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