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GDP and Outward Foreign Direct Investment from India: Co-Integration and Causality Test

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Abstract: ***India's outward foreign direct investment has experienced a Dynamic change over last decade after the liberalisation and globalisation of Indian economy that further achieves economic expansion and development in recent years. Approximately seven percent growth rate is witness by India from 1993-2011.This period also witnessed upward trend of outbound investment from India. UNCTAD (2015) has also nailed India as one of the leading outward investing economies. But a very few works have been done for exploring the long run relationship between outward FDI and GDP in context of the emerging economies like India. With this backdrop, the present study empirically investigates the long run and short run co – integrating relationship between India's GDP and OFDI. For empirical analysis various econometric tools like test of stationarity, Engle granger co-integration (as we have consider only two macro variables) and ECM model is used to test the causal association between the selected variables. It is found that there is long run causal relationship among OFDI and India's Growth rate. The results found that no short term causal association among India's OFDI and GDP by reflecting the fact that there are other factors which have influence on OFDI flows.***

Key words: GDP, outward FDI, Growth.

I. INTRODUCTION

Outward investment flows from developing countries has been showing an increasing trend since 1990s.However this trend has been questioned in many times due to lack of ownership advantages (brand loyalties, technical efficiency) of most of the developing countries.AS a indicator of growth, A country's economic status is identified with the help of GDP which further push the domestic investors to invest in outside of the country and to capture the world market. The ownership locational and internalisation theory (OLI) introduced by Dunning (1993) has also mentioned GDP as ownership advantage factor for a country.[1] India's outward FDI flow has also increased gradually from 1985 onwards[2]However that growth is quite affected in between 2010 to 2015 due to the downturn of the global financial market. But in terms of Percentage share in GDP, India's OFDI flows have started to recover[3].However very evidence found in terms of exploring the interrelation between These two selected macro indicator and there causal relation.

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II. REVIEW OF LITERATURE:

From Harrod-Domar to new growth theory, the economic growth models experienced a revolutionary change.

But one thing is common in every growth theory is acknowledging investment's role to fill the gap between actual and potential growth. Starting from Harrod-Domar model, where they state the dual role that investment plays by raising both income and productivity through multiplier and productivity effect. But in developing countries, increasing investment always put question on the domestic investment as it is not enough to raise growth rate that a country is required with having huge labour resources and lack of capital. Wong, N., and Goh, S., (2011) observed two views regarding the OFDI that impact on host country's economic growth. Firstly, if OFDI is substitute of domestic investment, then increase in OFDI cause in decrease in domestic output. Inversely if it is viewed as a complimentary to domestic production, then OFDI activities done by MNCs would lead to raise the domestic output also.

Additionally, Herzer, D., (2010) tries to empirically tested the shock of OFDI on the economic expansion by considering 50 countries as sample along with impact on USA's economic growth. In the former case he has found the strong association between OFDI and economic growth of the countries as a whole. While in the later case, though increase in GDP with the improving productivity is the pushing factor for the firms to invest overseas. Still the long run, increase in OFDI has both cause and consequences on economic growth. Lee, C.G., (2010) empirically examines the interaction between economic growth and OFDI in the Singapore city with the justification that having limited natural resources and endowment of land, Singapore experience outstanding economic performance. In his result, he has found that both are co-integrated i.e., OFDI's rising trend leading to go up the rate of per capita GDP but higher GDP per capita further declines the rate of outward FDI

However, the outflow of foreign direct investments add the capital exporter countries to utilise their national income over savings that lead to expand the fixed capital investment in abroad, increase their global competitiveness enhance the exports of goods and services as well. From this side, the foreign direct investment outflows opens the way for capital exporter countries to increase their Gross Domestic Product (GDP) as well as Real Gross National Products (GNP) by improving the investment along with production possibilities at abroad [7]

Despite of growing OFDI flows from India coincide with higher GDP , very few literatures and quantitative works have been found to explore the link between OFDI and GDP in case of emerging economies like India.

Thus this study removes the gap in the existing fiction by empirically testing both co-integration and causal relationship between the two.

III. DATA AND ECONOMETRIC METHODOLOGY:

Data: The study covers the annual time series data of OFDI and GDP of India from 1980 to 2016. Mainly collected from the online database of UNCTAD .The GDP values are basically in current price, which are converted to the constant prices by taking 2010 as base year and OFDI flows are taken for analysis as it is more comprehensive compare to stock[8]

Methodology: To partially identify the gap in existing literature, a time series econometric methodology is used for the analysis of the data. The two well-liked unit root tests viz, ADF and PP test is used. We found that that two series are non stationary at level but stationary at 1st difference. Engle-Granger residual based co-integration test is used for checking the association between GDP and OFDI from India.. According to this test, if the linear combination of two time series which gives us a stationary series then there exists co - integration relationship between the two time series[9]. The further step is to check short run relationship and Granger causality among the variables (i.e., whether GDP growth rate leads to increase rate of OFDI from India or not. For this ECM technique is used.

For ADF test, the following regressions are estimated –

$$\Delta yt = \propto 1 + \beta 1t + \delta\, yt - 1 + \theta 1i\, \Sigma\, \Delta\, yt - 1 + \epsilon 1t$$

Where y is the selected macro variable, i.e., OFDI, εt = white raise error term and $\propto$ and t represents constant and trend term respectively. When δ = 0, the time series is stationary otherwise not.

The lag length of ADF is selected on the basis of Akaike Information Criteria (AIC) and number of total observation is 36.

The Phillips- Perron (PP) test considers the following regression equation:

$$\Delta yt = \alpha 1 + \beta 1T + \pi 1\, yt - 1 + u1t$$

Where u1t is the disturbance term and t = Trend Term. When π = 0 time series is stationary indicating absence of unit root.

The ADF (Augmented Dicky fuller) and PP (Phillips-Parron) tests are used in checking the Stationarity of the overall data series. Then, the equation for testing co – integration is –

$$yt = \propto 1t + \beta xt + ut\ or$$
$$ut = yt - \propto 1t - \beta xt$$

Where, $yt = OFDI$, $\propto$= intercept term ut = random disturbance term

$xt = GDP$ t = Time period

After examining co-integration and association, the short run as well as causal relationship between the variables i.e., GDP and OFDI is going to be checked. For this error correction mechanism (ECM) The equation for testing ECM is-

$$\Delta yt = \beta 1 + \beta 2 \Delta xt + \beta 3ut - 1 + \varepsilon t$$

Where, X represents GDP and Y stands for OFDI. $ut - 1$ is the one period lagged value represents co-integration equation. Change in OFDI depends on change in GDP if the co-efficient of ECM (i.e., $\beta 3$) is negative and significant, then there exists a causal relationship between both the variable in the long run.

IV. MAJOR FINDINGS AND DISCUSSION:

Unit root:

Two unit root tests- Augmented Dicky fuller (ADF) and Phillips- Perron (PP) tests are used for testing the stationarity of the series. We can reject the H_o if the calculated value of the variable exceeds critical value at 5 percent level of significance (i.e., .05) or if the P value is lesser than 0.05 at significance level.

Table 1.1: Unit root test

Variable	Augmented Dicky Fuller test		Phillips- Parron test	
	Levels	1st difference	Level	1st difference
InGDP	2.23 (.99)	-4.74 (.0005*)	3.84 (1.00)	-4.73 (.0005*)
InOFDI	-1.019 (.73)	-8.47 (.000*)	-1.03 (.73)	-14.15 (0.00*)

Note:* represents the rejection of H_o at 0.05 percent level of significance.

Figures in the () brackets of ADF test indicate the Mackinnon (1996) one sided p- values for the rejection of H_o.

Figures in the () brackets of PP test indicate the Mackinnon (1996) one sided p- values for rejection of H_o.

From the table 1.1, it is seen that calculated values are less than critical values and the p -values for both the series exceeds 0.05 at levels .Which implies rejection of H_o at level i.e., both the time series has a unit root. When we take the 1st difference of the series, both the unit root test (ADF and PP test) shows rejection of H_o indicating that the time series has no unit root, it is stationary at 1st difference.

Engle Granger Co-integration test:

Engle-Granger residual based co-integration test is used for testing long run relationship among the selected variable (OFDI and GDP of India).We get the residual by regressing OFDI on GDP and then check the stationarity of the derived residual. According to the Engle-Granger procedure, there exists long term relationship between two non-stationary variables, if their linear combination gives us a stationary series. But we cannot use standard ADF critical values since the series is derived from regression. Engle-Granger gave their own critical values as the residuals are coming from the regression model. Along with, to select the optimal lag length for ADF based of Akaike information criteria (AIC)

Table 1.2: Engle-granger co-integration results

Sl No	Coefficient	Coefficient values	p-values
1	Constant	-125.88	0.00
2	In GDP	9.58	0.00
3	R2	0.84	
4	F-statistics	194.10	0.00
5	ADF Test Statistics for the residuals	-3.17 (lag 1)	

Note: The Engle-Granger Critical value is -2.95(at significance level 5%)

From the table 1.2 it is found that test statistics of the residuals is larger than the Engle-Granger critical values at 5 per cent significance level.

So there is a long term positive association is proved between OFDI and GDP of India, as estimated value is quite larger than the significant value (-2.95) given by Engle- Granger.

Thus we have found a co-integration relationship between the OFDI and GDP of India.

Error correction mechanism (ECM):

As Long run association between GDP and OFDI of India is verified by Engle granger test, Succeeding step is to examine the short run relationship as well as the Causal relation i.e., whether GDP growth leads to increase OFDI of India or not. To check the short run and causal relationship, ECM is used. Before that the residual diagnostic results have been shown to verify the validity of the regression equation for which we applied Jarque- Bera probability values, Breusch-Godfrey serial correlation LM test and Breusch-Pagan-Godfrey test for Normality, serial correlation and for Heteroscedasticity.

Table 1.3: Residual diagnostics

No.	Test	H_o	P values	Results
1	Normality	Normally distributed	0.0004	reject the H_o
2	Serial correlation	No serial correlation	.8249	Cannot reject the H_o
3	Heteroscedasticity	No heteroscedasticity	.7382	Cannot reject the H_o

Source: Author's own calculation.

The table 1.3 shows that, out of three least square assumptions, our model satisfies two assumptions, i.e., residuals are not serially correlated and there is no heteroscedasticity among the residuals. But our model fails in normality assumption. This is due to the fact prior to the liberalisation periods; OFDI from India was very low or insignificant. Even after liberalisation till 2000, the OFDI flows remain at a low level. It was after 2000, when India's OFDI increases significantly.

The ECM results are shown in table 1.4, where optimal lag length is chosen for applying ECM. From VAR lag length criteria, we have found that all the lag length selection criteria like LR, FPR, AIC, SIC, HQ suggests lag 1 as the optimum lag for ECM.

Table 1.4: ECM results

Sl No	Coefficient	Coefficient Values	'p-values'
1	Constant	-1.69	0.36
2	D(lnOFDI(-1))	-0.14	0.45
3	D(lnGDP)	33.66	0.14
4	D(lnGDP(-1))	2.25	0.92
5	ECT(-1)	-0.48	0.03**
6	R2	0.30	
7	F-Statistics	3.25	0.02**

Note: ** indicate significant at 5 per cent.

Table 1.4 represents the ECM results where to establish the causality from GDP to OFDI, the ECM term must have negative sign, at the same time significant at 5 percent significance level. The co efficient value of ECT is –0.48 which indicate the long run causality from GDP to OFDI that is it corrects the disequilibrium by 48 percent.

Table 1.5: Wald test

Test statistics	Value	Degrees of freedom	probability
F-statistics	1.23	(2,30)	.30
Chi-square	2.46	2	.29

Source: Author's own calculation

The above table (table 1.5) shows that the Granger causality from India's GDP to outbound investment. The H_o of Wald test is that the coefficient of D (lnGDP) and D(lnGDP(-1) is zero. Thus the current year GDP and one year lagged GDP cannot cause OFDI. We cannot reject the H_o as the probability value of F-statistics is greater than 0.05.Thus there is no short run causal relationship between OFDI and GDP of India.

V. CONCLUSION:

The focal point of this research paper is to empirically check the co-integrating association between India's GDP and OFDI (which consider actual flows instead of FDI commitments) by covering data from 1980 to 2016 for time series analysis. ADF as well as Philip perron test is then used to check that variables of the model are stationary or not. Moreover Engle Granger test is then used for checking the co-integration among the selected variables of the model and Error correction mechanism (ECM) is later on used. It is found that there is long run causal relationship among OFDI and GDP satisfied by Engle- Granger test. However our model fails in satisfying the normality assumption due to the fact that India's outward FDI flows show an increasing trend only after the liberalisation period. Before reform, India's OFDI flows are quite negligible. The results found that no short term causal association among India's OFDI and GDP by reflecting the fact that there are other factors which have influence on OFDI flows.

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