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The Association between Foreign Direct Investment (FDI), Economic Growth (EG) and Government Expenses on Infrastructure (GI) in India

Piyali Roy Chowdhury, Anuradha. A

Abstract: ***The article analyses impact of Foreign Direct Investment (FDI) on two macroeconomic variables, namely, Economic Growth (EG) and Government expenses on Infrastructure (GI) in India. The study is analyzed distinctively for two different variables for a period from 1975 to 2017 by applying Auto Regressive Distributed Lag (ARDL) Modelling and Granger Causality approach. The result shows that there is significant impact of FDI on Government expenses on Infrastructure (GI) for both short and long run. In short run, gradual increment of FDI generates more expenditure on Infrastructure from Government. But, in long run, expenditure on Infrastructure is reduced as FDI rises. This result confirms the absolute necessity of the basic growth of infrastructure in any economy at the first level of its development that can be subsequently reduced further in long run. On the other hand, it is surprising to find no significant impact of FDI on Economic Growth in India for both short and long run. The analysis also specifies that in short run FDI granger causes GI and EG, while EG again granger causes FDI. Therefore, it can be proposed if there happens to be further relaxation of FDI policies rather than keeping restrictions on some of crucial sectors like power and defense, it will enhance Government Infrastructure and Economic growth more in short run. As a result of bidirectional causality, Economic growth, in return, will attract more FDI for the benefit of Indian economic development. Instead of giving priorities to other variables, this study concentrates on specifying two major macroeconomic variables which can be utilized as the ultimate measures of development for a transition economy like India.***

Key Words: ARDL Model, Economic Growth, Foreign Direct Investment, Government expenses on Infrastructure

I. INTRODUCTION

The liberalization of Indian economy has come forward with many changes since 1991. One of the crucial changes in the investment strategy in Indian market is the name as Foreign Direct Investment (FDI). The contribution of Foreign Direct Investment (FDI) in India is well specified and researched many a times since then. The openness of Indian economy is quite motivating for foreign investors to channelize their corpus into Indian market. The performance of FDI, therefore, shows its stable nature into Indian economy. Although there exists a continuous devaluation in Indian currency against Dollar, the stability in foreign investment proves the return out of it. Either developed or developing economy, any of them, has its impact of FDI on them. The impact is related to the macroeconomic factors of respective countries. The most crucial factor for development in any economy is economic growth rate. The growth rate of Gross Domestic Product (GDP) ultimately shows the condition and trends in its development. Also, there exists a lot more factors which are affected with the flow of FDI in the country. A few of them can be named as interest rate, employment, Government expenses, call money rate, broad money rate, foreign exchange reserve, investment in stock market, etc. The relationship of each variable can be explored with FDI following which several economic policies can be formed accordingly. The huge area of this macroeconomic scenario creates interest to work upon it further deeply. In this context, the study analyses the impact of FDI on two macroeconomic variables, as, Economic growth (EG) and Government expenses on Infrastructure (GI) separately for a period 1975-2017. The study does a comparative analysis of two impacts, one on Economic growth (EG) and the other on Government expenses (GI). The analysis finally gives some suggestive economic policies which directly came out from the results of our econometric methodology. The sections are divided as follows: Section two details on the review of literature and gap of it. Also, the objective of the study is specified there. Section three will discuss the sources of the variables and the description of it. Section four will throw light on the econometric methodology and its results. Section five provides the conclusion of the paper.

II. REVIEW OF LITERATURE

The study analyses the interrelation between FDI, Economic Growth and Government Expenses on Infrastructure in India. In this aspect, some previous related studies have been taken into account and discussed as the review of literature. Chadee, D.D., & Schlichting, D.A. (1997) observed three major facts while discussing the trends in FDI in Asia Pacific regions. At the first level, it was found that FDI was increasing its volume gradually in those areas.

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***** Correspondence Author
Piyali Roy Chowdhury*, VITBS, Vellore Institute of Technology, Chennai, India.
Anuradha. A, VITBS, Vellore Institute of Technology, Chennai, India.

The second observation was shift of contribution of FDI from primary sectors to manufacturing and tertiary sectors.
The third level of finding was FDI as a prime factor to contribute positive economic growth in these economies. Borensztein, E, et al. (1998) examined the effect of FDI on economic growth conducted over 69 developing countries. The study suggested that FDI is crucial for allocation of technology and an important contributor to economic growth of the developing economies. Chakraborty, C., &Basu, P. (2002) analyzed the nexus between GDP, FDI, the unit labor cost and the share of import duty in tax revenue in India. The study found there is short run granger causality running from GDP to FDI. Asiedu, E. (2006) explored factors influencing FDI in Africa as domestic marketplaces, natural resources, infrastructure, low inflation, an effective legal structure and a good investment atmosphere.
Ghosh, S., &Gregoriou, A (2008) explored the determinants of economic growth as tax rate and public expenditure in developing economies. Petri, P. A. (2012) explored that FDI is influenced by technology policies of host countries which ultimately stimulate FDI-friendly atmosphere in them. Bhattacharyya, J., & Bhattacharya, M. (2012) analyzed the relationship between FDI inflow, economic growth, merchandise trade and services trade of India. The study explored impact FDI on economic growth. Pradhan, R. P, et al. (2013) examined a long run cointegration between FDI, transport infrastructure and economic growth in India. The study explicated the presence of long run association with a short run bidirectional causality between infrastructure and FDI, infrastructure and GDP and FDI and GDP. Azam, M, et al. (2014) analyzed the effects of GDP per capita income, infrastructure and gross domestic investment on inward FDI. The result shows positive and significant impact of these variables on FDI for Asian countries.
Nistor, P. (2014) found out a level of correlation between FDI and economic growth in Romania. The study also exposes the impact of FDI on economic growth in the same country. It concludes with a positive influence of FDI on economic growth in the country. Doytch, N. (2015) examined how sectoral FDI reply to business cycle of host countries in South and East Asian economies. Pegkas, P. (2015) analyzed a long run cointegration between FDI and economic growth in Eurozone countries. The analysis also revealed the impact of FDI on economic growth which is positive and significant in these countries. Donaubauer, J, et al (2016) explored that foreign aid that specifically designed for improvement in host countries' infrastructure helps augmenting it the most rather than other foreign investment in host country economies. Gunby, P (2017) estimated the impact of FDI on economic growth in China. The study concludes with little impact of FDI in Chinese economy. Bunte, J. B (2018) examined the effect of FDI in different natural resources sectors on economic growth. It explained the positive effect in mining and no impact on agriculture and forestry. Sengupta, P., &Puri, R. (2018) analyzed the relationship between FDI and GDP in India and neighbor countries of it. The study explored FDI playing a crucial role in aggravating economic growth in these countries. Also, the quantum of FDI differ in each country in accordance with the policies in each economy.
The above literatures are confined with the relationship of FDI and different macroeconomic variables for Africa and Asian countries specifically. The gap of the literature is as follows:
a. Here, the researcher tries to explain the process of Indian economic development by considering minimum number of variables which can explain the same to a large extent.
b. The study wants to prove the importance as well as sufficiency of the two variables explaining the overall condition of development for a transition economy like India.
In this context, it explores the influence of Foreign Direct Investment (FDI) inflows on two important macroeconomic factors, namely, first Economic Growth (EG) and second, Government expenses on Infrastructure (GI). The analysis explains the effect of the above-mentioned variables for long run and short run during period 1975-2017. It also specifies some policy suggestions as well which may be beneficial for a transition economy like India to create influence in the platform of world economies.
The objectives of the study, thus, can be sorted out, here, as:
a. To find out the influence of FDI on Economic Growth (EG) for short run as well as long run.
b. To find out the influence of FDI on Government expenses on Infrastructure (GI) for short run as well as long run.
c. To analyze Granger Causality between (FDI, EG) and (FDI, GI) separately.

III. METHODOLOGY

For data analysis, world bank statistics were chosen for period 1975-2017. Out of the variables in the current study, the first variable is Foreign Direct Investment (FDI), the second variable is Economic Growth (EG) and the third variable is Government expenses on Infrastructure (GI). To compute the long run and short run influence of FDI on these two variables, ARDL model was taken into consideration. The analysis then is tested against short run Granger causality to know the direction of causality between the two different sets of variables, (FDI, EG) and (FDI, GI).
The description of the variables are as follows:
As described in World Bank, Foreign Direct Investment (FDI) is considered as net inflows (total inflows less total outflows) of investment from abroad with ten percent or more voting rights. It is aggregation of valuation of equity, earnings from reinvestment, long term and short-term capital. Finally, FDI is divided by GDP to get the required variable for the analysis of this study.
Next, Economic Growth (EG) and Government expenses on Infrastructure (GI) are also calculated based on the definition of World Bank. Economic Growth (EG) considered as growth rate of GDP measured in local currency. Government expenses on Infrastructure (GI) are measured as Air transport, freight (million ton-km). Air freight, here, is analyzed as the size of freight, diplomatic bags and express, carried on each flight stage measured in metric tons times kilometers travelled. Before subjecting the data to causality tests, time series variables need to be checked for stationarity. Augmented Dicky Fuller (ADF) Test, and Phillips Perron (PP) Tests are considered for this purpose here.

To measure the effect of long and short run trend, Auto Regressive Distributed Lag Modelling approach has been chosen. ARDL model is established on the ground that all the underlying variables should be either integrated to order zero [I(0)] or order one[(I(1)], but none will be of I(2) because of its spurious outputs in the analysis. For checking short run causality, Granger Causality approach has been selected.

IV. RESULTS

The outcomes of Augmented Dicky Fuller (ADF) Test, and Phillips Perron (PP) are represented in Table (1) and Table (II).

Table I: Result of unit root tests based on log of the variables - ADF, and PP:

	T stat		Critical Values	
Variables	ADF	PP	ADF	PP
ln(FDI)	(2.913)	(2.826)	(2.933)	(2.933)
ln(EG)	(5.703)*	(5.761)*	(2.933)	(2.933)
ln(GI)	(0.324)	(0.395)	(2.933)	(2.933)

*indicates significant at 5% level

Table II: Result of unit root tests based on first difference of log of the variables - ADF, and PP:

	T stat		Critical Values	
Variables	ADF	PP	ADF	PP
ln(FDI)	(8.592)*	(2.935)	(11.110)*	(2.935)
ln(GI)	(5.389)*	(2.935)	(5.330)*	(2.935)

*indicates significant at 5% level

A. ARDL Bound Test for Cointegration Results:

To explore long run and short run relationship among Foreign Direct Investment (FDI), Economic growth (EG) and Government expenses on Infrastructure (GI), the investigators have performed Auto Regressive Distributed Lag (ARDL) model. The objective is to observe the impact of FDI on two macroeconomic variables, as, Economic growth (EG) and Government expenses on Infrastructure (GI) separately for a period 1975-2017. All the variables are framed in time series. The reason of analyzing ARDL model, here, is that it covers three advantages over the other time series techniques. First, the variables need not to be integrated of the same order. Variables can be of order zero, one or fractionally integrated. Here, from table I and II, the result shows that FDI is I(1), Economic Growth is I(0) and Government Infrastructure is I(1). So, the data confirms the suitability of applying ARDL model in this context. The second is ARDL is more effective for small sample data size. The third advantage is by using ARDL, one can get an unbiased long run relation among the variables. The ARDL applied in this study is as follows:

$$\Delta lnY_{1t} = a_1 + \sum_{i=1}^{n}\beta_{1i}\Delta lnY_{1(t-i)} + \sum_{j=0}^{n}\gamma_{1j}\Delta lnX_{(t-j)} + y_{11}\ ln[Y_{1(t-1)} + y_{12}\ ln[X_{(t-1)} + e_{t1} \quad (1)$$

$$\Delta lnY_{2t} = a_2 + \sum_{i=1}^{n}\beta_{2i}\Delta lnY_{2(t-i)} + \sum_{j=0}^{n}\gamma_{2j}\Delta lnX_{(t-j)} + y_{21}\ ln[Y_{2(t-1)} + y_{22}\ ln[X_{(t-1)} + e_{t2} \quad (2)$$

All the variables associated here are ln(.) or Logarithmic operator. Δ is first difference and et is the error term.
The specifications of the factors used here are:
Y1t = Economic growth (EG)
Y2t= Government expenses on Infrastructure (GI)
Xt = Foreign Direct Investment (FDI)
The first step in ARDL model is to measure (1) and (2) by Ordinary Least Square (OLS). By this, the long run association among Economic growth (EG), Government expenses on Infrastructure (GI) and Foreign Direct Investment (FDI) can be extracted. (1) and (2) are tested to discover the significance of coefficients of the lagged independent variables by applying F test. The Null (H0) hypothesis for long run estimation of coefficients of the independent variables states that $y_{11} = y_{12} = y_{21} = y_{22} = 0$, i.e, no cointegration among the variables in long run, against the alternative hypothesis $y_{11} \neq y_{12} \neq y_{21} \neq y_{22} \neq 0$, as the presence of cointegration. Two groups of critical values can be sorted out of the table prescribed by Pesaran (Pesaran et al.,2001). The first group of values that are considered as upper bound assessed on the hypothesis that all the variables taken into the study are integrated to order one and the second group of values that are considered as lower bound are integrated to order zero. If the value of calculated F statistic exceeds the upper bound values, it ascertains the rejection of Null Hypothesis of no cointegration and explains a long run cointegrating relationship among the three variables and vice versa. If calculated F statistic falls in between the upper and lower bound values, the result is inconclusive. Therefore, here arises a need to perform the test again to avoid spurious results in the study.
The calculated F statistic values of long run cointegration are noted in Table III.

Table III: Results from ARDL Bound Test (Independent Variable: FDI)

Dependent Variables		F statistic		Critical Values	Decision of Cointegration	
EG	GI	5.899	5.101	3.62-I(0) 4.16-I(1)	Yes	Yes

Note : Lower and Upper-bound critical values are taken from Pesaran et al. (2001), Table CI (ii) Case II.
The calculated values of long run coefficients of the above model are given below in Table (IV) and Table (V).
Table (IV): Result showing Long run coefficients of ARDL Bound Test [Dependent Variable= Economic growth (EG) and Independent Variable= Foreign Direct Investment (FDI)]

Variables	Factor Coefficient	Value of t-statistic	Probabilistic value
C	0.41	2.537	0.016
ln(FDI)	0.457	1.421	0.165

Table (V): Result showing Long run coefficients of ARDL Bound Test [Dependent Variable= Government expenses on Infrastructure (GI) and Independent Variable= Foreign Direct Investment (FDI)]

Variables	Factor Coefficient	Value of t-statistic	Probabilistic value
C	4.033	8.790	0.0000
ln(FDI)	(2.01)*	-2.749	0.0093

*indicates significant at 5% level

The details of the short run and long run coefficients are reported below in Table (VI) and Table (VII).

Table (VI): Analysis of (5) [ARDL (1,3)]

Variables	Factor Coefficient	Value of t-statistic	Probabilistic value
$\Delta \ln(FDI)_t$	(0.405)	(1.544)	0.132
$\Delta \ln(FDI)_{t-1}$	(0.233)	(0.881)	0.384
$\Delta \ln(FDI)_{t-2}$	0.398	0.244	0.113
$(ECT)_{t-1}$	(0.776)*	(4.329)	0.0001
R Squared-0.570595			
DW-statistic 1.954170			

*indicates significant at 5% level

Table (VII): Analysis of (6) [ARDL (1,2)]

Variables	Factor Coefficient	Value of t-statistic	Probabilistic value
$\Delta \ln(FDI)_t$	(0.090)	(1.639)	0.11
$\Delta \ln(FDI)_{t-1}$	0.148	2.562	0.015
$(ECT)_{t-1}$	(0.096)*	(4.019)	0.0003
R Squared-0.207076			
DW-statistic 1.613437			

*indicates significant at 5% level

To show short run causality, Granger Causality test was implemented. The results of Granger Causality are discussed in Table (VIII) and Table (IX).

B. Granger Causality and Short Run Direction of Causality

Table (VIII): Granger Causality Test between FDI and Economic Growth (EG)

Null Hypothesis	F Statistic	Probability
ln(FDI) does not Granger Cause ln(EG)	5.077**	0.0114
ln(EG) does not Granger Cause ln(FDI)	7.556**	0.0018

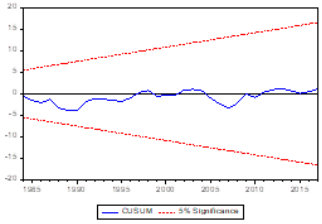
** indicates significant at 1% level.

Table (IX): Granger Causality Test between FDI and Government expenses on Infrastructure (GI)

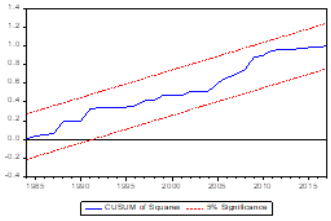
Null Hypothesis	F Statistic	Probability
ln(FDI) does not Granger Cause ln(GI)	3.45433*	0.0424
ln(GI) does not Granger Cause ln(FDI)	1.29760	0.2857

** indicates significant at 1% level.

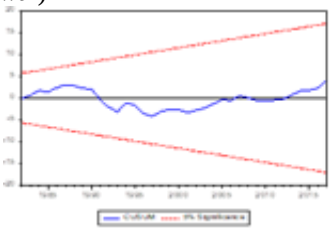
C. Stability Test of the Two Models



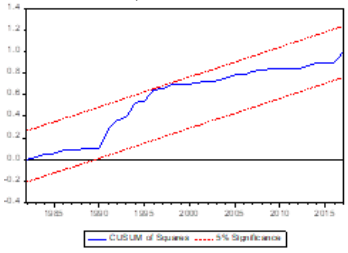
a.Result of CUSUM Test of Model (FDI and Economic Growth)



b. Result of CUSUM Square Testof Model ((FDI and Economic Growth)



c. Result of CUSUM Test of Model (FDI and Government Expenses on Infrastructure)



d. Result of CUSUM Square Test of Model (FDI and Government Expenses on Infrastructure)

V. DISCUSSION

The above table (III) shows the presence of cointegration among first set of variables- FDI and Economic Growth. Also, it is established for the second set of variables – FDI and Government expenses on infrastructure. The values of F-Statistic is 5.898903 and 5.101126 respectively which are higher than tabulated values of the variables integrated with order one.

Once the cointegration is established, the long run model of FDI, Economic growth (EG) and Government expenses on Infrastructure (GI) is stated as below:

$$lnY_{1t} = \Omega_1 + \sum_{i=1}^{n}\beta_{3i} lnY_{1(t-i)} + \sum_{j=0}^{n}\gamma_{3j} lnX_{(t-j)} + \mu_{t1} \quad (3)$$

$$lnY_{2t} = \Omega_2 + \sum_{i=1}^{n}\beta_{4i} lnY_{2(t-i)} + \sum_{j=0}^{n}\gamma_{4j} lnX_{(t-j)} + \mu_{t2} \quad (4)$$

The estimated coefficients of the long run model explain the long run impact of FDI on Economic Growth (EG) and Government expenses on Infrastructure (GI). Table (IV) shows that the impact of FDI is insignificant on Economic Growth. Table (V) describes the impact is significant and negative. This clarifies that in long run, when net FDI inflows increases, Government expenses on Infrastructure (GI) reduces. The possible reason may lie in the area that once infrastructure is established in proper way, the variability in expenses on it becomes stagnant and goes down as shown in our analysis.

The short run and long run relationship, together, are expressed in (5) and (6).

The Error Correction Term along with short run causality is noted below as:

$$\Delta lnY_{1t} = \Pi_1 + \sum_{i=1}^{n}\beta_{5i}\Delta lnY_{1(t-i)} + \sum_{j=0}^{n}\gamma_{5j}\Delta lnX_{(t-j)} + {}_{\eta_1} ECT_{t-1} + \Psi_{t1} \quad (5)$$

$$\Delta lnY_{2t} = \Pi_2 + \sum_{i=1}^{n}\beta_{6i}\Delta lnY_{2(t-i)} + \sum_{j=0}^{n}\gamma_{6j}\Delta lnX_{(t-j)} + {}_{\eta_2} ECT_{t-1} + \Psi_{t2} \quad (6)$$

The coefficients in the above parenthesis βi, ɣj and ϕk explain the short run relationship among the variables and the coefficient with ECTt-1, η, explains the long run causality among the variables for the period mentioned in the study. It is also noted as speed of adjustment from short run disequilibrium to long run stable equilibrium with due course of time.

The short run causality expresses that there is no significant influence of FDI on Economic Growth. But, the impact of FDI on Government expenses on Infrastructure (GI) are positive and significant. It explains that, in short run, net inflows of FDI increases the expenses on infrastructure by Government by way of creating and improving environment for future economic development. Once the infrastructure is established in short run, the need of further expansion on infrastructure in long run is reduced.

The Error Correction Term (ECT) for FDI and Economic Growth is negative and significant. There is 78 percent probability to move from short run disequilibrium to long run stable equilibrium. The capacity of absorbing external shock, in this case, is extremely fast to move back to its original level. In case of FDI and Government expenses on Infrastructure, the possibility is only 9.6 percentage. It explains the comparative weakness of these two-time series to move back to its original form from its disequilibrium in short run.

Later, R- squared values, normality, autocorrelation of variables and autocorrelation of residuals, heteroskedasticity, linearity and stability of the two models were checked. The first model with variables FDI and Economic growth has R square as 0.570595 to explain the actual scenario. For checking normality of the first model, Jarque- Bera (JB) statistic has been applied. The JB Value (JB- 2.42, Probability-0.30) accepts the Null hypothesis of normality of the data. The model also passes through serial correlation tests. The Breusch-Godfrey Serial Correlation LM Test gives F statistic value as 0.100690 (Prob-0.90). It proves data are not serially correlated. Autocorrelation of residuals are judged through Durbin Watson (DW) Test statistic. Here, DW value is 1.954170. Further, it passes through Breusch-Pagan-Godfrey Heteroskedasticity Test. The F value is 0.597845(Prob-0.70). It demonstrates the data is not heteroskedastic in nature. Then the model is tested against nonlinearity problems. The Ramsey RESET Test value (F-0.243720, Prob- 0.62) accepts the Null hypothesis of linearity of the data. Finally, the steadiness of the model is checked by CUSUM and CUSUM Square tests. The results show that the model is stable for both the tests. Fig. 1 and Fig. 2 explain the stability of the model graphically.

The second model with FDI and Government Infrastructure together explains the actual scenario with R square as 0.207076. Normality of the second model, Jarque- Bera (JB) statistic is (JB- 2.88, Probability-0.24) which accepts the Null hypothesis of normality of the data. The Breusch-Godfrey Serial Correlation LM Test shows F statistic value as 1.687511 (Prob-0.20). which further clarifies that the data are not serially correlated. In this model, DW value is 1.613437. Further, it passes through Breusch-Pagan-Godfrey Heteroskedasticity Test. The F value is 0.469591 (Prob-0.76). It demonstrates the data is not heteroskedastic in nature. Then the model is tested against nonlinearity problems. The Ramsey RESET Test value (F- 1.555820, Prob- 0.22) accepts the Null hypothesis of linearity of the data. The steadiness of the model is checked by CUSUM and CUSUM Square tests. The results here also show that the model is stable for both the tests. Fig 3 and Fig 4 explain the stability of the model graphically.

Finally, Granger Causality (GC) Tests are performed to check the short run directional causality for the two models. The results of GC Tests are mentioned in Table (VIII) and Table (IX).

In Table (VIII), Null hypothesis of non-causality between the two variables is rejected in both the sides. Hence, in case of FDI and EG, the Granger causality is bidirectional. Both the variables granger causes each other in short run. Table IX rejects the Null hypothesis of non-causality from one side. For FDI and GI, the causality runs from unidirectional way. Only FDI granger causes GI in short run.

VI. CONCLUSION

After analyzing the econometric results, it is clearly found that, the impact of FDI on Government expenses on infrastructure is significant in both short and long run. In contrast, any significant impact is absent in case of economic growth. However, while testing Granger Causality test in short run, it was observed that there exists a bidirectional causality between FDI and Economic growth and unidirectional causality from FDI to Government expenses on infrastructure.

Analyzing the results of the study, the researchers have tried to give some impressions towards policy issues of Government of India linking FDI, Economic Growth and Government expenses in infrastructure in two stages.

In this study, it is proved that FDI helps augmenting infrastructure development which is a basic requirement of any economic development to begin with in short run. As in India, power and defense sector are not allowed with hundred percent FDI, in the first stage, focus should be given on framing proper policies on those sectors by allowing higher volume of FDI to intensify infrastructure development. Once it is established, one can expect economic growth at the second stage as infrastructure works as one of the important contributors towards economic growth in India (Ghosh, S., &Gregoriou, A. ,2008). It will not only help Indian economy to fix the economic challenges in short run by being a lucrative host country to others, but also, provide a better way to exist in world economic platform in long run.

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AUTHORS PROFILE

Piyali Roy Chowdhuryis pursuing Ph.D from Vellore Institute of Technology, Chennai, India. She has completed her MBA in Finance specialization from West Bengal University of Technology, Kolkata, India. She has three years of work experience and seven years of teaching experience. Her area of research is Macroeconomics, Stock market and Econometric modelling.

Anuradha A* is an Assistant Professor (Senior) in VIT Business School, VIT, Chennai Campus, Tamil Nadu, India. She has received her Doctoral degree from Bharathiar University, Coimbatore. She has done her MBA in Marketing and Finance, M.Sc., in Economics from Avinashilingam University for Women, Coimbatore, India. She has three years of industry experience and around 12 years of teaching experience in the fields of Marketing and Economics. Her research interests include retail management, Macroeconomics and supply-side economics using quantitative techniques. She has actively contributed research works in various national and international journals and conferences.