A TIME-SERIES ANALYSIS OF IMPACT OF FDI ON ECONOMIC DEVELOPMENT IN INDIA DURING POST-REFORMS ERA (1991-2010)

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Abstract

This study examines the empirical association between Foreign Direct Investment (FDI) and Economic development (GDP) in India during 20-year-period (1991-2010) in the post-reforms era. With help of time-series regression model, where GDP has been regressed on FDI, after making both the non-stationary series (FDI and GDP) stationary through 2nd differencing of Augmented Dickey-Fuller Test, we found that FDI had a negative impact, and that too marginally significant, on India's economic development during this period, which is contrary to the common belief. The negative impact has been substantiated by the fact that the growth rate of FDI inflow into the economy during this period was greater than the growth rate of GDP, which implies some unabsorbed capital remained in the economy, leading to inflationary pressure, which, in turn, caused a fall in the development of the real sector further, establishing a negative impact of FDI on economic development.

Key Words: Time-series Analysis, FDI, Economic Development

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1. Introduction:

During the past two decades, foreign direct investment (FDI) has become of utmost importance in the developing world, with a growing number of developing countries succeeding in attracting substantial and rising amounts of inward FDI. Although the bulk of FDI continues to take place between OECD countries, the increase in FDI has particularly been pronounced in developing countries, largely reflecting the integration of large emerging economies, the so-called BRICs (Brazil, Russia, India and China), into the world economy. The increase of FDI into developing countries has been spectacular. The share of non-OECD countries in the global stock of inward FDI has risen from 22% in 1990 to 32% in 2005. China is, by far, the most important non-OECD country as a recipient of FDI, accounting for about one third of FDI in non-OECD countries in 2005. However, FDI inflows also tend to be sizable in many other emerging countries. Indeed, since the mid-1990s, inward FDI has become the main source of external finance for developing countries and is more than twice as large as official development aid.

The influx of FDI has increased rapidly during the late 1980s and 1990s all over the world reassuring the positive impact of FDI on economic development through capital, skill and technology transfer, market access and export promotion. Though, theoretical literature in economics identifies a number of channels through which FDI inflows may be beneficial to the receiving economy, but empirical literature has had more trouble in identifying these advantages in practice.

The role of FDI in stimulating economic growth is one of the controversial issues in the development literature. In the traditional Solow-type growth model, FDI enables host countries to achieve investment that exceeds their own domestic saving and enhances capital formation and potential beneficial impact of FDI on output growth is confined to the short run. In the long run, given the diminishing marginal returns to physical capital, the host economy could, either converge to a steady state of growth rate, leaving no permanent impact on the growth of the economy (De Mello) or, enjoy the growth rate in so far as it generates increasing returns in production via externalities and production spillovers, as suggested by endogenous growth models (Romer, Lucas, Barro and Sala-i-Martin).

2. Literature Review:

Economic theory forwards a multitude of reasons why FDI may result in enhanced growth performance of the host country. However, there is no unanimous convergence of opinions among the empiricists regarding positive impact of FDI on economic growth. While some studies observe a positive impact of FDI on economic growth, others, such as Aitkin and Harrison (1999), Djankov and Hoekman (2000), Damijan et al. (2001), Konings (2001), Castellani and Zanfei (2002a, 2002b), and Zukowska-Gagemann (2002), found a negative relationship between these two variables. In a survey, Mello (1997) found that FDI may stimulate growth through, i) capital spillovers by encouraging the adoption of new technology in the production process and ii) stimulating knowledge transfers by bringing in alternative management practices in place. Both, Mello and OECD in another study, stressed the economic and technological conditions in the host country. To be specific, the host countries have to attain a certain degree of development in education and/or infrastructure, before they can enjoy the fruits of FDI. Otherwise the potential benefits of FDI remain far from being realized, establishing either a weak or an insignificant impact on economic growth. Li and Liu (2005) found a significant endogenous relationship between FDI and economic growth from the mid-1980s.

Several studies, relying on a variety of cross-country regressions, have peeped into the conditions necessary for identifying FDI's positive impact on economic growth. Surprisingly, the studies emphasize on different closely related aspects of development. Blomstrom et al. (1994) argue that FDI has a significant positive growth effect when a country is sufficiently rich in terms of per capita income. Balasubramanyam et al. (1996) observe trade openness as being crucial for realization of growth impact of FDI. Borensztein et al. (1998) found that FDI encourages growth only in countries where the labour force has attained a certain level of education. Alfaro et al. (2004) drew attention to financial markets by saying that FDI promotes economic growth in economies with sufficiently developed financial market. Bengoa and Sanchez-Robles (2003) showed that FDI is positively correlated with economic growth and the enjoyment of the benefits from long-term FDI inflows requires the FDI host countries to have human capital, economic stability and liberalized markets. Durham (2004) suggested that the effects of FDI are contingent upon the 'absorptive capability' of host countries.

3. Motivation:

A considerable number of research articles have been published, which have proved a positive relationship between FDI and economic development. But, interestingly, there is no unanimous convergence of opinions among the empiricists regarding positive impact of FDI on economic growth, as some of them have obtained the positive impact of FDI on economic development contingent upon certain abiding conditions. This has made us extremely inquisitive to look into the impact of FDI on economic development during the study period and concomitant plausible cause of association thereto.

4. Objective:

To see, whether or not, during the 20-year-period (1991-2010), changes in the value of FDI had significantly explained variation in the value of GDP.

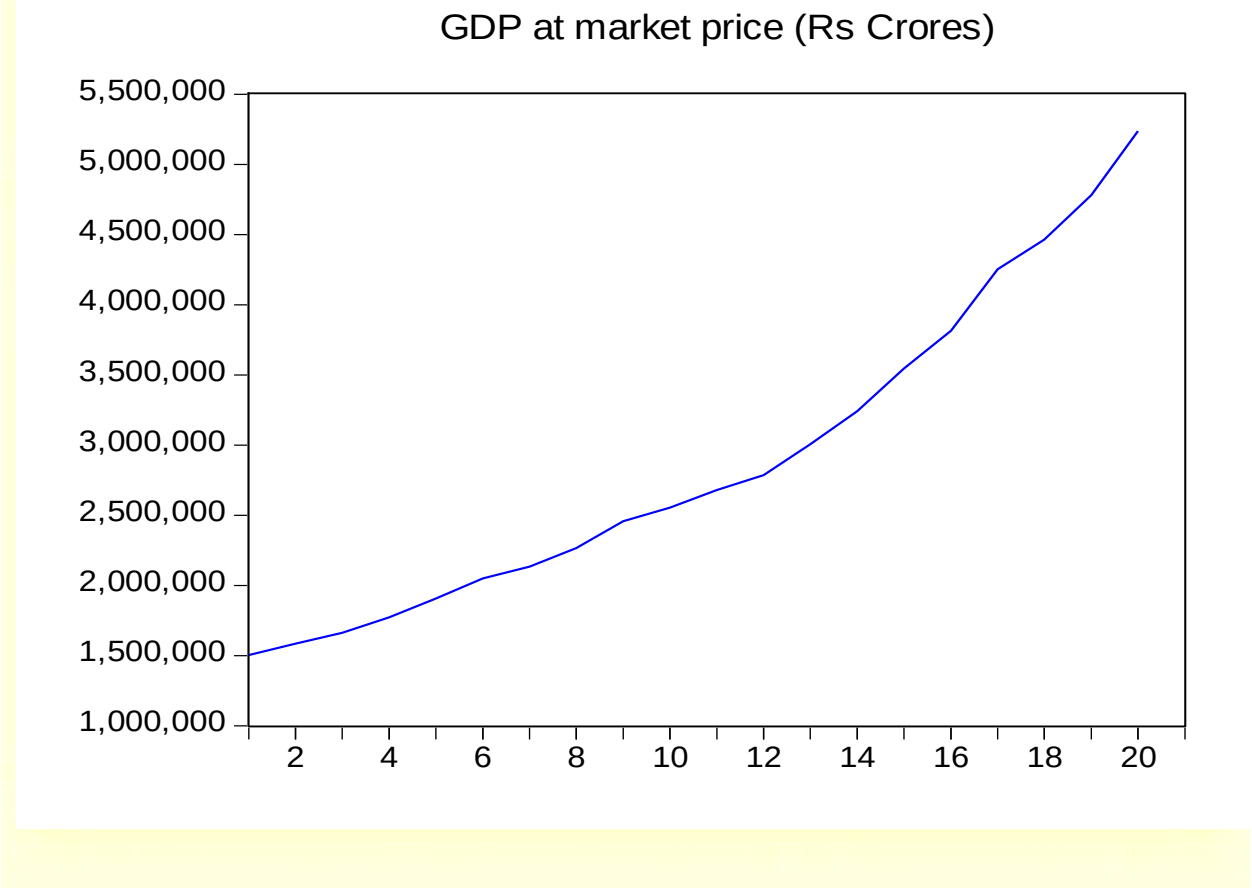
5. Methodology:

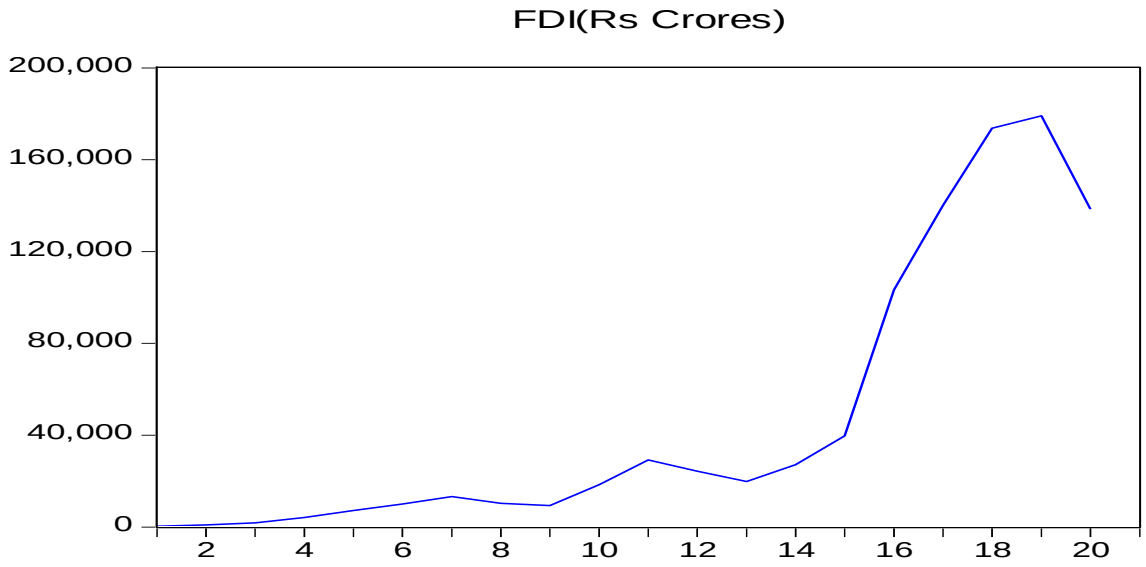
FDI data and GDP data, collected from RBI Bulletin, are as below**.**

Year	FDI (Rs Crores)	GDP at market price (Rs Crores)
1991	375	1503337
1992	965	1,585,755
1993	1838	1,661,091
1994	4126	1,771,702
1995	7172	1,905,899
1996	10015	2,049,786
1997	13220	2,132,798
1998	10358	2,264,699
1999	9338	2,456,363
2000	18406	2,554,004
2001	29235	2,680,280
2002	24367	2,785,013
2003	19860	3,006,254
2004	27188	3,242,209
2005	39674	3,544,348
2006	103367	3,812,974
2007	140180	4,253,184
2008	173741	4,462,967
2009	179059	4,780,179

2010	138462	5,236,823

Since GDP and FDI are both time series data, in order to see the relationship between them, first we have to check whether both the series are stationary or not. This can be checked with the help of simple graphs as well as Correlogram, as shown below;





Correlogram of GDP

Included observations: 20

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |****** |	. |****** |	1	0.826	0.826	15.806	0.000
. |***** |	. | . |	2	0.669	-0.044	26.738	0.000
. |**** |	. *| . |	3	0.516	-0.078	33.629	0.000
. |*** |	. *| . |	4	0.360	-0.109	37.200	0.000
. |**. |	. | . |	5	0.231	-0.032	38.760	0.000
. |* . |	. | . |	6	0.114	-0.061	39.165	0.000
. | . |	. | . |	7	0.012	-0.055	39.170	0.000
. *| . |	. | . |	8	-0.076	-0.061	39.381	0.000
. *| . |	. | . |	9	-0.145	-0.042	40.228	0.000
.**| . |	. *| . |	10	-0.213	-0.088	42.221	0.000
.**| . |	. *| . |	11	-0.273	-0.081	45.868	0.000
.**| . |	. *| . |	12	-0.331	-0.100	51.894	0.000

Correlogram of FDI

Included observations: 20

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |****** |	. |****** |	1	0.866	0.866	17.362	0.000
. |**** |	****| . |	2	0.618	-0.526	26.699	0.000
. |*** |	. | . |	3	0.354	-0.039	29.942	0.000
. |* . |	. | . |	4	0.145	0.064	30.519	0.000
. | . |	. | . |	5	0.019	0.043	30.530	0.000
. | . |	. | . |	6	-0.025	0.048	30.549	0.000
. | . |	.**| . |	7	-0.057	-0.236	30.659	0.000
. *| . |	. | . |	8	-0.093	0.003	30.976	0.000
. *| . |	. | . |	9	-0.141	-0.054	31.768	0.000
. *| . |	. | . |	10	-0.185	-0.006	33.272	0.000
.**| . |	. | . |	11	-0.206	0.011	35.354	0.000
.**| . |	.**| . |	12	-0.226	-0.216	38.165	0.000

From the graphs as well as Correlograms (where we have tested, with the help of Q-statistic, the joint significance of autocorrelation up to 12 lag order, since data is annual), we see that both the series are non-stationary. So, both of them are to be made stationary first to make a meaningful relationship between them. For checking stationarity statistically, we go in for Unit Root Test and with the help of 'Augmented Dickey Fuller Test', we check stationarity in the level first including an intercept in the equation, then including trend for the purpose of de-trending and at last taking 1st as well as 2nd differencing. Here, both the series, through 'Augmented Dickey Fuller Test', have become stationary after 2nd differencing, as shown below;

Null Hypothesis: D(FDI,2) has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic based on SIC, MAXLAG=3)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-3.699263	0.0201
Test critical values:	1% level	-4.121990	
	5% level	-3.144920	
	10% level	-2.713751	

Null Hypothesis: D(GDP,2) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.288777	0.0002
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

So, here the regression model is of the form; $\mathbf{gdp2 = \alpha + \beta * fdi2 + u_t}$; where, gdp2 = 2nd difference of the GDP series, and fdi2 = 2nd difference of the FDI series.

gdp2 =15924.95 - 2.126324*f**di2**

SE = (20239.98) (1.039642)

t = (0.786806) (-2.045247)

p = (0.4429) (0.0576)

(F-statistic = 4.183037) (p-value = 0.057639), (R^2 = 0.207255),(D-W statistic = 2.559821)

Here, in the above equation, 2nd difference of GDP has been regressed on 2nd difference of FDI. Since it is level regression, it signifies long-run relationship between FDI and GDP. From the output, we see that the value of FDI coefficient (- 2.126324) is insignificant, rather marginally significant, which implies that FDI has a negative impact on GDP, which is marginally significant. Overall fitness of the model is warranted from the significant value of F-statistic (4.183037) and 20.72% of the variation in gdp2 is explained by fdi2, which is warranted by the value of R^2.

The negative impact of FDI on GDP is based on the fact that during this period the cumulative growth rate of FDI inflow into the economy was much greater than the cumulative growth rate of GDP. To absorb this higher rate of FDI inflow, immediate translation of FDI into employment generation was very much needed. But, unfortunately, the growth rate employment in the economy during this period was much lesser than the growth rate of FDI. As a result, excess capital inflow into the economy remained unabsorbed, which led to inflationary pressure, which in turn, ate away the growth in the real sector, establishing a negative impact of FDI on GDP, as shown in the following table.

Year	Growth rate of GDP	Growth rate of FDI	Growth Rate of Employment	Growth Rate of Inflation
1991	-	-	-	-
1992	5.482336961	157.3333333	1.267217631	10.05774783
1993	4.750796939	90.46632124	-1.305767138	8.351552252
1994	6.658936807	124.4831338	1.130099228	12.6
1995	7.574467941	73.82452739	0.136276915	7.992895204
1996	7.549560601	39.64026771	1.878062058	4.605263158
1997	4.049788612	32.001997	4.568527919	4.402515723
1998	6.184411276	-21.64901664	2.427184466	5.948795181
1999	8.463111433	-9.8474609	0.698428536	3.269367448
2000	3.975023236	97.10858856	2.402774337	7.157604955
2001	4.944236579	58.83407584	1.596516691	3.596660244
2002	3.907539511	-16.65127416	-1.976190476	3.409795412
2003	7.943984463	-18.496327	0.534369687	5.455635492
2004	7.848804525	36.89828802	-2.246919546	6.480955088
2005	9.318924227	45.92467265	-2.743450321	4.5
2006	7.578996193	160.5409084	5.387547649	6.602870813
2007	11.54505643	35.61388064	-3.617072583	4.667863555
2008	4.932375369	23.94136111	-2.15161371	8.061749571
2009	7.107648342	3.060877974	-2.454615188	3.80952381
2010	9.552864025	-22.67241524	1.782437746	9.556574924
Cumulative Growth Rate	**129.3688635**	**890.3557398**	**7.3138139**	**120.5273707**

Source: Data for GDP, FDI, Employment and Inflation have been collected from RBI Bulletin and growth rate and cumulative growth rate have been computed by authors.

Next, we will check whether this model survives all the diagnostic tests of classical linear regression model to enjoy BLUE property or not, one by one.

Heteroskedasticity Test: White

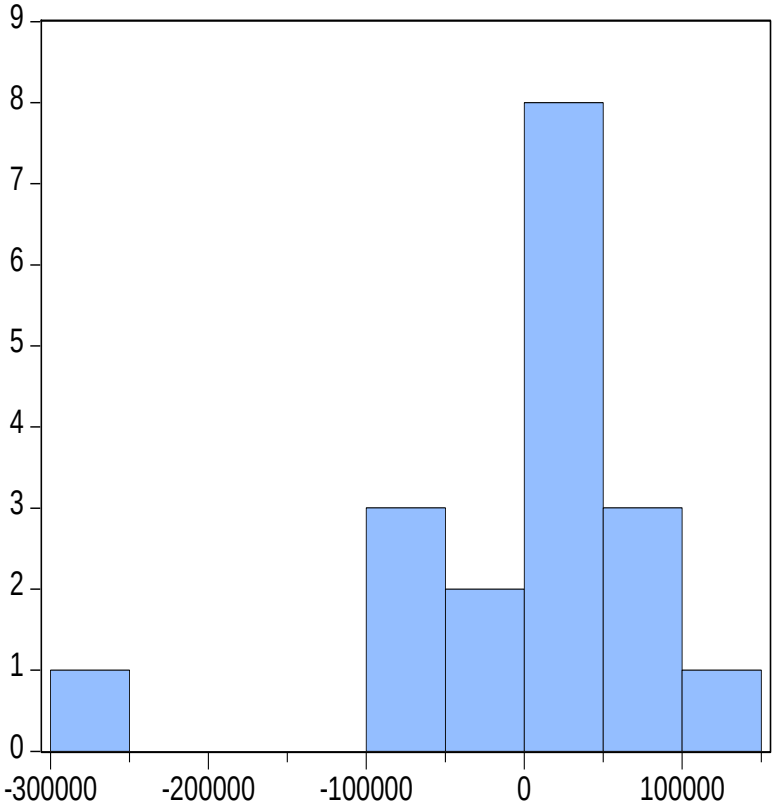
From the output of Eviews for 'White's general test of heteroscadasticity', we get three statistics; F-statistic (Wald version) – .225356 (p-value insignificant), χ^2 Statistic (LM version) – .250005 (p-value insignificant) and Scaled explained sum square (normalised version of explained sum of square) – .488026 (p-value not insignificant). From the above output, it is evident that there is no presence of residual heteroscadasticity

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.038007	Prob. F(2,14)	0.3799
Obs*R-squared	2.324472	Prob. Chi-Square(2)	0.3128

Breusch-Godfrey Serial Correlation test presents two statistics – F version and LM version, both of which are insignificant here, implying no residual autocorrelation.

Residual Normality: Jarque-Bera Test



Series: Residuals	
Sample 3 20	
Observations 18	
Mean	-2.83e-12
Median	21211.22
Maximum	101350.7
Minimum	-253266.8
Std. Dev.	82729.68
Skewness	-1.615611
Kurtosis	5.941171
Jarque-Bera	14.31846
Probability	0.000778

Jarque-Bera residual normality test has been applied. From the p-value of JB test, we see that the test statistic is significant and so the normality assumption is rejected. Therefore, residuals are not normally distributed in this case. Though 'Law of large numbers' and 'Central Limit Theorem' ensure residual normality, but if residuals are not normally distributed, in the presence of large outliers, dummy variables could be used to cure the problem. From the 'Actual-Fitted-

Residual' graph below, we see that the outlier is taking place at 18th observation (i.e., year 2008).

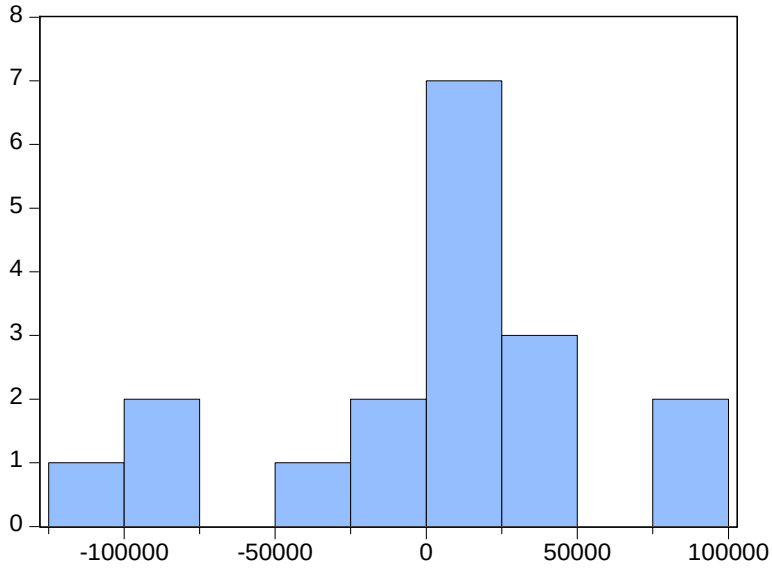
If we take the value of 18th observation equal to '1' and all other observations equal to '0', then a dummy variable can be created. Now, if gdp2 is regressed on fdi2 as well as on the dummy variable, then the problem of residual non-normality may be taken care of. The Dummy Variable Regression Equation is; $\mathbf{gdp2 = \alpha + \beta_1 * fdi2 + \beta_{2*} D18 + u_t}$, where D18 is the dummy variable. The output as well as normality test are shown below;

Dependent Variable: GDP2

Method: Least Squares

Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	30737.26	13866.82	2.216605	0.0425
FDI2	-2.164746	0.692748	-3.124868	0.0070
D18	-268204.0	58469.50	-4.587076	0.0004



After taking dummy variable (D18), which considers the outlier (2008 observation) as '1' and all others as '0' and then regressing gdp2 on fdi2 as well as D18, we see that residuals are normally distributed, which is vouched by the insignificant p-value (0.7300018) of JB test.

Ramsey RESET Test

	Value	df	Probability
F-statistic	1.085934	(1, 14)	0.3150
Likelihood ratio	1.344698	1	0.2462

Ramsey's RESET (Regression Specification Error Test) test signifies whether the model specification is appropriate or not. From the output, we have F-statistic not significant and Likelihood ratio statistic is also not significant, implying that there is no apparent non-linearity in the regression model.

Conclusion:

FDI had a negative long-term marginally significant impact on India's economic development during the period 1991-2010. The negative impact of FDI on GDP during the study period has made it clear from policy perspective that allowing FDI inflow into the economy only cannot warrant economic growth. Minimal level of development should be there in the economy to

absorb the inflow of foreign capital, or else the inflow can act to the detriment of economic development by not translating it into capital formation, causing inflationary pressure in the economy, in turn. So, from policy perspective, it is to be kept by policy makers in mind, that FDI is not the be-all and end-all. Under-utilisation of foreign capital, in absence of absorption capacity, may turn FDI into watered capital.

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