

Relationship between Capital Expenditure and Economic Growth in Indian Economy during the Post-reform period

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Abstract

The present study makes an attempt to examine the effect of central government capital expenditure (CGCE), gross fixed capital formation (GFCF), and foreign direct investment (FDI) on Real GDP growth rate for the period 1990-91 to 2018-19. Auto Regressive Distribution Lag (ARDL) model and Error correction model techniques have been used. The results suggest that there is a long run relationship between real GDP growth rate and CGCE, GFCF and FDI. The study confirms that the capital expenditure of the central government, Gross Fixed capital formation and Foreign Direct Investments have significantly contributed for economic growth in India during the post-reform period. As the central government terminated loans given to the states, the proportion of capital expenditure in the total expenditure was declined in a drastic manner during the post-reform period as compared to pre-reform period. The study also reveals that the proportion of development expenditure in the total capital expenditure should be raised in order to take up more capital projects. The study highlights that the government should focus more on enhancing the proportion of capital expenditure in the total expenditure to achieve higher economic growth.

Key Words: *Capital Expenditure, Gross Fixed Capital Formation, Economic Growth, Auto Regressive Distribution Lag model, Error Correction Model*

1.Introduction

The expansion in the economic activities and growing responsibilities of the government have contributed for increase in public expenditure in India since 1950. The total public expenditure of the central government in both revenue and capital accounts was Rs.530 crore in 1950-51. It rose to Rs.1,63,520 crore in 1990-91 and further to Rs.26,98,552 crore in 2019-20 (RE). In 2020-21 Union Budget the total public expenditure is estimated at Rs.30,42,230 crore. The public expenditure is broadly classified into both development and non-development expenditure. The budget of the central government consist of both Revenue budget and Capital budget. Receipts and disbursements with respect to Capital Account will be shown in the Capital Budget. Total capital receipts of the central government consist of Market borrowings (net), Small savings, Provident funds, Special deposits, Recovery of loans, Disinvestment receipts, External loans (net). Total capital expenditure consists of spending on economic development, social & Community development, defense, general services and loans to States & U'ts. As the central government terminated loans given to the states, the decline in the share of capital expenditure in the total expenditure was more during the post-reform period when compared with pre-reform period (*Reserve Bank of India Bulletin, December 2008*).

Table 1.1: Trends in Financial Outlays, Transfer Payments, Loans & Financial Investments of the Central Government during Planning Period (Rs. in Crore)

Five-year Plan	Total Financial Outlays	Total Transfer Payments to the Rest of the Economy	Total Financial Investments & Loans to the Rest of the Economy (Gross)	Total Expenditure
First Plan (1951-52 to 1955-56)	1854	932	966	3751
Second (1956-61)	3406	1816	2600	7823
Third (1961-66)	6701	3484	5076	15261
Annual Plan (1966-69)	5121	3621	4740	13481
Fourth (1969-74)	12745	9490	10760	32994
Fifth (1974-79)	23527	23003	21145	67674
Sixth (1980-85)	50708	60514	47034	158256
Seventh (1985-90)	113590	160538	89764	363892
Eighth (1992-97)	253275	454179	127752	835206
Ninth (1997-2002)	431711	902546	150754	1485011
Tenth (2002-07)	660192	1575997	123921	2360110
Eleventh (2007-12)	1286341	3475161	212323	4973825

Source: *Economic Survey 2019-20 Volume 2, A 55*

The above table provides information on total expenditure of the central government in terms of Financial outlay, transfer payments to the rest of the economy and Financial Investments & loans to the rest of the economy (Gross) during the planning period. Final outlays include Government consumption expenditure and Gross capital formation. The above table reveals that the financial

outlays of the central government rose from a mere Rs.1,854crore in first five-year plan to Rs.23527 crore in fifth five-year plan and then it rose to Rs.2,53,275 in Eighth five-year plan and finally to Rs.12,86,341 crore in the Eleventh five-year plan. Total transfer payments to the rest of the economy increased from Rs.932 crore in first five-year plan to Rs.4,54,179 crore in Eighth five-year plan and further to Rs.34,75,161 crore in Eleventh five-year plan. Total financial investments&loans to the rest of the economy also increased considerably from Rs.966 crore in first five-year plan to Rs.1,27,752 crore in Eighth five-year plan and finally to Rs.2,12,323 in Eleventh five-year plan. Total expenditure of the central government in terms of financial outlays, transfer payments and financial investments&loans rose from Rs.3,751 crore in First five-year plan to Rs.8,35,206 crore in Eighth five-year plan and then to Rs.49,73,825 crore in Eleventh five-year plan.

As the capital expenditure of the government is directly linked with economic growth, The association between capital expenditure and economic growth is an important subject of analysis and debate, especially for developing and emerging economies across the world like India. A central question is whether capital expenditure increases the GDP growth rate of the economy?

1.1 Objectives of the Study

The main objective of this study was to study the impact of Central government capital expenditure on Real GDP growth in India for the period 1990-91 to 2018-19. The specific objectives were:

1. To study the trends in capital receipts and capital expenditure of the central government for the period 1990-91 to 2018-19
2. To study the trends in development and non-development capital expenditure of the central government for the period 1990-91 to 2018-19.
3. To study the trends in Gross Fixed Capital Formation, FDIs and Gross Domestic product at factor cost in Indian economy for the period 1990-91 to 2018-19

1.2 Literature Review

Olusola Joel Oyeleke, Jamiu Ayinla Raheem, Olanipekun Emmanuel Falade (2016) in their article entitled *"Government Capital Expenditure and Economic Growth in Nigeria: Any Lesson from Disaggregated Functional Analysis?"* Have made an attempt to investigate the influence of disaggregated functional government capital expenditure on economic growth in Nigeria using error correction technique of estimation for the period 1970-2013. The study reveals a long run association between public capital expenditure and economic growth. The study also reveals a negative association between capital expenditure on economic services and economic growth and the economy of Nigeria has not been benefitted from such spending on economic services. The authors opine that the government should monitor its spending on all developmental projects to achieve the desired results.

Basema Al-Sharif¹, Adel Bino (2019) in their article entitled *"The Role of Government Capital Expenditures in Economic Growth in Jordan"*, have attempted to examine the impact of Government Capital Expenditures on Economic Growth in Jordan using for the period 1977-2016. In Jordan during the time period (1977-2016). The findings indicate that the change in capital expenditures as a percentage of GDP has long-term equilibrium and has a short-term effect and there is a short-term

impact of net fixed capital formation and net tax on economic growth. the results also indicate that is a short-term and long-term effect of government debt on economic growth.

Ben Etimudoh, et al,(2018) in their article entitled *“Effect of Administrative Capital Expenditure on Economic Development:An Emerging Nstion Outlook”*, have attempted to study the effect of administrative capital outflow on recurrent outflow on economic development in Nigeria using Augmented Dickey-Fuller test andJohansen test for co-integration for the period 1999- 2016. The study indicates a long run association between government capital spending and economic growth. The study also reveals a non-significantrelationship betweenGDP and economic services.

Chukwuemeka,Valentneokolo, et. al, (2018) in their article entitled *“Economic Analysis of Capital Expenditure and Infrastructural Development in Nigeria”*, have examined the impact of capital expenditure on infrastructural development in Nigeria using autoregressive distributed lag (ARDL) model for the period 1970-2017. The results indicates that the capital expenditure, construction expenditure and non-oil revenue have the potency of accentuating infrastructural development in the long-run. The authors opine that the economy of Nigeria can depend on external debt for investing on productive activities other than infrastructural development.

NazifiAbdullahiDarma(2014) in his article entitled *“Federal Capital Expenditure and its Impact on Economic Growth in Nigeria”*, has examinedthe impact of federal capital expenditure on economic growth in Nigeria using Ordinary Least Squares for the period 1980-2010. The study reveals thatthe Total Capital Expenditure, Capital expenditure on administration capital expenditure on social community services and capital expenditure on transfers have positive impact on economic growth. the results also indicates the negative impact of capital expenditure on economic services

AlexandraHukom(2015) in his article entitled *“Effect of Capital Expenditures, Economic Growth And Poverty on Human Development in Central Kalimantan”*has examined the impact of capital spending, economic growth and poverty rates onthe Human Development Index using regression equation for the period 2006-2013. The results indicates a positive relationship between Capital expenditure and Human Development Index. The study also reveals a positive association between economic growth and Human Development Index and a negative association between poverty levels and Human Development Index. The authors opine that the governmentshould give more priority for Human Development in the planning process as it influences the economic growth of the country.

1.3. Methodology

The study attempts to examine the effect of central government capital expenditure (CGCE), gross fixed capital formation (GFCF), and foreign direction investment (FDI) on real GDP growth rate.In order to examine the relationship between economic growth, government capital expenditure, gross fixed capital formation, and foreign direction investment, a linear equation is specified as following:

$$GDP_t = \beta_0 + \beta_1 CGCE_t + \beta_2 GFCF_t + \beta_3 FDI_t + \varepsilon_t \rightarrow (1)$$

β_0 is constant term, β_1 , β_2 and β_3 are coefficients or long run parameters of central government capital expenditure gross fixed capital formationand foreign direction investment respectively. ε_t is white noise error term.

The study initially applies augmented dickey fuller (ADF) test to examine the stationarity of the given time series of CGCE, GFCF, FDI and real GDP growth rate. Auto Regressive Distribution Lag (ARDL) model has been used as it can be applied irrespective of whether the given time series are I(0) or I(1) to examine the relationship between real GDP growth (GDP) and CGCE, GFCF, FDI as follows:

$$\Delta(GDP)_t = \alpha_0 + \alpha_1(GDP)_{t-1} + \alpha_2(CGCE)_{t-1} + \alpha_3(GFCF)_{t-1} + \alpha_4(FDI)_{t-1} + \sum_{i=1}^p \delta_i \Delta(GDP)_{t-i} + \sum_{i=1}^p \gamma_i \Delta(CGCE)_{t-i} + \sum_{i=1}^p \theta_i \Delta(GFCF)_{t-i} + \sum_{i=1}^p \varphi_i \Delta(FDI)_{t-i} + \epsilon_t \rightarrow (2)$$

α_0 is constant term, $\alpha_1, \alpha_2, \alpha_3$ and α_4 are coefficients of one period lagged values of CGCE, GFCF and FDI respectively. Δ is first difference operator and p is number of lags for each of the independent variables. $\delta_i, \gamma_i, \theta_i$ and φ_i are coefficients of lagged values of change in GDP, CGCE, GFCF and FDI. p is number of lags as decided by Akaike Information Criterion (AIC) and Schwarz criterion (SC). ϵ_t is error term.

The study conducts Wald test to examine the existence of long-run relationship among the variables. Once long run association among the given variables is confirmed, the study applies the following error correction model to assess the long association between GDP and CGCE, GFCF and FDI, based on error term derived from equation (1).

$$\Delta(GDP)_t = \alpha_0 + \sum_{i=1}^p \delta_i \Delta(GDP)_{t-i} + \sum_{i=1}^p \gamma_i \Delta(CGCE)_{t-i} + \sum_{i=1}^p \theta_i \Delta(GFCF)_{t-i} + \sum_{i=1}^p \varphi_i \Delta(FDI)_{t-i} + \pi(ECT)_{t-1} + \epsilon_t \rightarrow (3)$$

π is coefficient of error correction term (ECT) derived from long run model in equation 1. ϵ_t is white noise error term of the model.

In every stage, to test the robustness of the results, Breusch–Godfrey serial correlation Lagrange multiplier (LM) test has been used to examine serial correlation in residuals of the regression model. Wald coefficient restrictions test has been used to examine whether coefficients derived from the model indicate long run association or not. To examine the parameter stability, recursive estimates have been done.

2. Trends in Capital Receipts and Capital Expenditure of the Central Government

Table 2.1: Capital Receipts and Expenditure of the Central Government (Rs. in Crore)

year	Capital Receipts	Central Govt. Capital Expenditure	Difference between Capital Receipts and Expenditure
1990-91	38997	27327	11670
1991-92	38528	25612	12916
1992-93	36178	29825	6353
1993-94	55440	33190	22250
1994-95	68695	32294	36401
1995-96	58338	34504	23834
1996-97	61544	34533	27011

year	Capital Receipts	Central Govt.Capital Expenditure	Difference between Capital Receipts and Expenditure
1997-98	99077	27667	71410
1998-99	130064	34415	95649
1999-00	115707	40530	75177
2000-01	134184	35036	99148
2001-02	162500	44838	117662
2002-03	180531	27134	153397
2003-04	211333	111368	102105
2004-05	200391	19519	180872
2005-06	179549	56310	123239
2006-07	144482	50620	93862
2007-08	197978	116289	81689
2008-09	299863	88267	211596
2009-10	453063	107720	345343
2010-11	402428	151837	250591
2011-12	568918	141042	427876
2012-13	582152	155822	426330
2013-14	563894	175296	388598
2014-15	484448	187460	296988
2015-16	582579	284268	298311
2016-17	609886	270309	339577
2017-18	702650	297869	404781
2018-19	686352	316623	369729

Source: Budget documents of the Government of India.

The above table 2.1 provides information on capital receipts, capital expenditure and difference between capital receipts and capital expenditure. It can be observed from the table that the capital receipts of the central government has recorded a considerable increase during the post-reform period. The amount of capital receipts increased from Rs.38,997 crore in 1990-91 to Rs.1,62,500 crore in 2000-01 and in 2018-19, the capital receipts were to tune of Rs.6,86,352 crore. Capital expenditure also increased considerably since 1990-91. It consists of spending on economic development, social & Community development, defense, general services and loans to States & U'ts. The capital expenditure of the central government stood at Rs.27,327 crore in 1990-91. It rose to nearly Rs.35,036 crore in 2000-01 and further to Rs.1,51,837 crore in 2010-11 and then it is estimated at Rs.3,16,623 crore in 2018-19. It can be observed from the above table that the difference between capital receipts and capital expenditure has grown considerably from Rs. 11,670 crore in 1990-91 to Rs.99,148 crore in 2000-01 and further to Rs.4,04,781 crore in 2017-18 then declined to Rs.3,69,729 crore in 2018-19. It is inferred that the entire capital receipts mobilized from different sources are not transformed as capital expenditure.

Table 2.2: Non Developmental and Developmental Capital Expenditure of the Central Government (Rs. in Crore)

Item	1990-91	2000-01	2010-11	2016-17(RE)	2017-18(BE)
A. Non-developmental Expenditure	5364	14219	79829	92619	100347
1. Defence Services	4552	12384	62056	79370	86529
2. Border Services	65	214	2421	0	0
3. Fiscal Services	725	1117	10360	4303	3420
4. Others	22	504	4992	8945	10398
B. Developmental Expenditure	8023	11155	60842	150994	169462
1. Railways	1632	3269	18385	46155	55000
2. Post&Telecom	409	769	274	249	336
3. Social&Community Services	491	1342	6497	11565	15616
4. General Economic Services	1067	87	20757	37257	26200
5. Agri&allied	55	58	325	1550	3754
6. Industry&Minerals	769	596	2134	3913	4709
7. Power,Irrigation&Flood control	2748	2142	675	3312	5449
8. Transport&Communicagion	630	2606	9219	45508	56983
9. Public works	223	286	2577	1484	1414
C. Loans&Advances	13940	9662	11166	26696	28060
Capital Expenditure	27327	35036	151837	270309	297869

Source: *Hand Book of Statistics on Indian Economy, September 2019.*

The above table 2.2 provides information on development and non-development capital expenditure of the central government during the post-reform period. It is observed that the development expenditure of the central government is increasing at a faster rate as it rose from Rs.8023 crore in 1990-91 to Rs.60,842 crore in 2010-11 and further to Rs.1,69,462 crore in 2017-18. This is mainly due to increase in the volume of expenditure under the heads like transport&communication,, General Economic Services,Railways, power,irrigation&flood control etc. Non-development expenditure also has increased considerably due to increase in expenditure on Defense services followed by expenditure on others head.The expenditure of the central government on defense in 1990-91 was Rs.4552 crore.it rose to Rs. 62056 in 2010-11 and further to Rs.86,529crore in 2017-18. The non-development expenditure under others head also increased considerably fromRs.22 crore in 1990-91 to Rs.4,992 crore in 2010-11 and finally to Rs.10,398 crore in 2017-18. It is observed that non-development capital expenditure of the central government increased from Rs.5,364 crore in 1990-91 to Rs.79,829 crore in 2010-11 and then to Rs. 10,0347 crore in 2017-18.

3. Trends in Central Government Capital Expenditure, GFCF, FDI and Real GDP Growth

Capital formation plays an important role in the process of economic development in developing economies like India. Net additions made to the existing stock of capital in a given period of time is referred as capital formation. Capital formation in developing economies like India is at low when compared with developed economies across the world. Lack of strong financial institutions, demonstration effect, High rate of growth of population, Low rate of growth of national income and per capita income, Small size of market and lack of infrastructural facilities are the factors responsible for low rate of savings and investments in the economy. As a result India is experiencing low rate of capital formation. Aggregate of gross additions to fixed assets (Construction, Machinery and equipment) plus change in stocks in a given period is referred as Gross Fixed Capital Formation.

Foreign Direct Investments are also contributing towards India's Gross Fixed Capital Formation. FDI inflow has been increased during the reform period as the government has removed all restrictions on capital inflow from abroad. The rate of domestic savings and investments should be raised to attain a rapid economic growth.

Table 3.1: Trends in Central Government Capital Expenditure, GFCF, FDI and Real GDP Growth

year	Central Govt. Capital Expenditure (Rs. in Crore)	Gross Fixed Capital Formation (Rs. in Crore)	FDI (Rs. in Crore)	GDP Growth(%)
1990-91	27327	347966	174	5.3
1991-92	25612	328594	316	1.4
1992-93	29825	358162	965	5.4
1993-94	33190	354848	1838	5.7
1994-95	32294	388410	4126	6.4
1995-96	34504	451596	7172	7.3
1996-97	34533	465355	10015	8.0
1997-98	27667	506706	13220	4.3
1998-99	34415	555913	10358	6.7
1999-00	40530	599973	9338	8.0
2000-01	35036	591610	18404	4.1
2001-02	44838	682143	29245	5.4
2002-03	27134	679170	24397	3.9
2003-04	111368	750940	19830	8.0
2004-05	19519	931028	26947	7.1
2005-06	56310	1081792	39457	9.5
2006-07	50620	1231265	102652	9.6
2007-08	116289	1430764	139421	9.3
2008-09	88267	1480943	190645	6.7
2009-10	107720	1594475	157819	8.6

year	Central Govt.Capital Expenditure (Rs. in Crore)	Gross Fixed Capital Formation (Rs. in Crore)	FDI (Rs. in Crore)	GDP Growth(%)
2010-11	151837	1769792	132358	8.9
2011-12	141042	2997733	154961	6.7
2012-13	155822	3145793	146954	4.5
2013-14	175296	3194924	186830	4.7
2014-15	187460	3278096	215893	4.6
2015-16	284268	3492183	294258	7.6
2016-17	270309	3783778	283292	7.1
2017-18	297869	4136572	253977	7.2
2018-19	316623	4548452	301932	6.8

Source: (1) *HandBook of Statistics on Indian Economy 2006&2019*

(2) *Economic Survey: 2014-15&2019-20*

The above table 3.1.provides information on the trends in capital expenditure of the central government, Gross fixed capital formation, FDI and Real GDP Growth of Indian economy since 1990-91. It is observed that Centralgovernment's capital expenditure which was Rs.27,327 Crore in 1990-91 increased by approximately four times to Rs.1,11,368 crore in 2003-04 and then declined to Rs.19,519 crore in 2004-05. Again the capital expenditure increased from Rs.56,310crore in 2005-06 to Rs.297869 crore in 2017-18 and then to Rs.3,16,623 crore in 2018-19.It is clear from the above tablethat the central government capital expenditure has shown some improvement in 2000s when compared with the first decade of reform period.

Gross fixed capital formation (GFCF)has increased considerably during the post-reform period. GFCF had increased from Rs.3,47,966cfrore in 1990-91 to Rs.5,99,973 crore in 1999-00.GFCF has risen very rapidly since 2003-04. It has gradually increased from Rs.7,50,940crore in 2003-04 to Rs.29,97,733 crore in 2011-12 and then to Rs.41,36,572 crore in 2017-18. The same again increased to Rs.45,48,452crore in 2018-19.

During the post-reform period Indian economy has witnessed a tremendous growth in terms of FDI inflows It is observed that the actual inflows of FDI's increased from Rs.174 crore in 1990-91to Rs.9,338 crore in 1999-00 and then to Rs.39,457 crore in 2005-06. FDI inflows into India was very much impressive in 2006-07.The actual inflows during 2006-07 were registered at Rs.1,02,652crore and thetrend continued in the next two subsequent years also. The entire world economy has witnessed a decline in FDI inflows during 2009-10 and 2010-11 and the same was observed in India. Again FDI inflows into India in Rupee terms increased to Rs.1,54,961 crore in 2011-12 and then declined to Rs. 146954 crore in 2012-13.Inflows during 2013-14 wererecorded at Rs. 186830 crore and increased significantly toRs. 215893 crore in 2014-15and then to Rs. 294258 crore in 2015-16. Though FDI inflows declined in the next two subsequent years finally rose to Rs.301932 crore in 2018-19.During the period1990-91 to 1999-2000 the average annual growth of GDP at factor Cost was registered at 5.8 percent. It rose to 7.2 per cent during 2000-01 to 2009-10 and then declined to 6.44 per cent for the period 2010-11 to 2018-19.

4. Empirical Results and Analysis

The study aims at examining the long run association between dependent variables; real GDP growth rate and explanatory variables; CGCE, GFCF and FDI. Initially, unit root test is conducted using ADF to ensure that none of the series is I(2). From the table 4.1. it is observed that CGCE, GFCF and FDI are non-stationary at level, null hypothesis of unit root i.e. the given series is non-stationary has not been rejected at 5% level. However, RGDP has been found to be stationary at level, as the null hypothesis has been rejected (p value of 0.0199). But when the first differences of CGCE, GFCF and FDI are tested, there is an evidence of stationarity as null hypothesis of unit root has been rejected at 5% level. Since, CGCE, GFCF and FDI are integrated of order 1 i.e. I(1) and real GDP growth rate is I(0), the study applies ARDL model to assess the relationship between the variables.

Table 4.1: Results of ADF test for Unit Root

No. of lags	At Level				First Differences		
	CGCE	GFCF	FDP	RGDP	CGCE	GFCF	FDP
2	1.92 (0.9997)	2.16 (0.9998)	0.556 (0.9857)	-3.393 (0.0199)*	-6.44 (0.000)*	-4.059 (0.0042)*	-4.344 (0.0021)*

* Significant at 5% level

Values in parenthesis are p values.

Optimum number of lags has been decided as 2 using AIC and SC. From table 4. 2, it is observed that previous year GDP cause change in real GDP growth rate as it is statistically significant at 10% level (p value of 0.077). However, there is no evidence of previous year CGCE, GFCF and FDI having impact on real GDP growth rate. It is also observed that changes in GDP, CGCE, GFCF and FDI of the previous two years also do not have any effect on real GDP growth rate. In other words, there is no short run association between CGCE, GFCF and FDI. The study applies Wald coefficient restrictions test where null hypothesis of $\alpha_1=\alpha_2=\alpha_3=\alpha_4=0$ (i.e coefficients of one year lagged GDP, CGCE, GFCF and FDI) has been tested. The study examines whether lagged values of GDP, CGCE, GFCF and FDI collectively cause real GDP growth rate. Rejection of null hypothesis of coefficients individually and jointly being equal to zero, indicates that GDP, CGCE, GFCF and FDI are co-integrated and have long run association, as evident from p value of 0.011.

Table 4.2: ARDL Estimates

Dependent Variable (Δ real GDP growth rate)

Independent Variables	Coefficients	t-statistics	p-values
C	-9.742623	-1.956	0.076**
GDP(-1)	1.344135	1.954	0.077**
CGCE(-1)	0.000040	1.305	0.219
GFCF(-1)	0.000000	0.138	0.893
FDI(-1)	-0.000040	-1.497	0.163
Δ (GDP(-1))	0.330312	0.763	0.461
Δ (GDP(-2))	0.119773	0.539	0.601

$\Delta(\text{CGCE} (-1))$	-0.000050	-1.400	0.189
$\Delta(\text{CGCE} (-2))$	-0.000016	-0.670	0.517
$\Delta(\text{GFCF} (-1))$	-0.000001	-0.474	0.645
$\Delta(\text{GFCF} (-2))$	0.000002	0.918	0.378
$\Delta(\text{FDI}(-1))$	0.000040	1.458	0.173
$\Delta(\text{FDI}(-2))$	0.000022	1.022	0.329
Diagnostic tests	test statistics	p-values	
Breusch–GodfreyLM serial correlation	2.590	0.120	
Wald coefficient restrictions test Null Hypothesis: $\alpha_1=\alpha_2=\alpha_3=\alpha_4=0$	5.696	0.011*	

* Statistically significant at 5 level

** Statistically significant at 10% level

To test the robustness of the results, the model has been further subject to Breusch–GodfreyLM serial correlation test to examine the null hypothesis of no serial correlation in the residuals derived from the model. No serial correlation has been observed as evident from the p value of 0.120. When the stability of the model has been examined by *recursive estimates* CUSUM, it is observed that estimated coefficients of the model are stable (figure 1).

Figure 4. 1: Stability in Coefficients of ARDL Model-Recursive Estimates

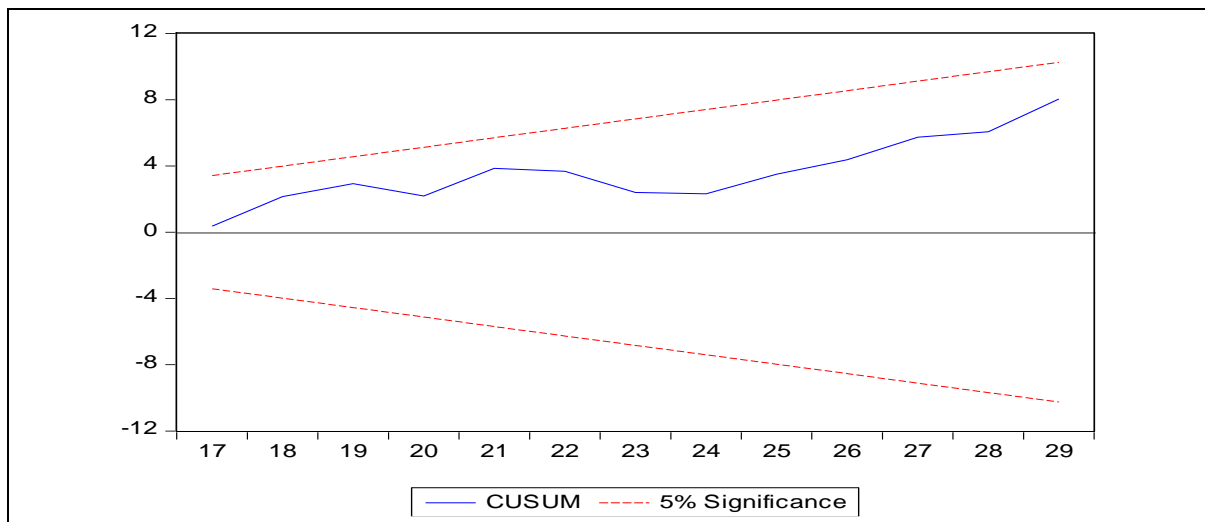


Table 4.3: Long run Estimates

	Coefficients	t statistics	p values
C	6.621661	11.496	0.000*
CGCE	-0.0000001	-0.003	0.997
GFCF	-0.0000013	-1.256	0.221
FDI	0.0000199	1.626	0.117

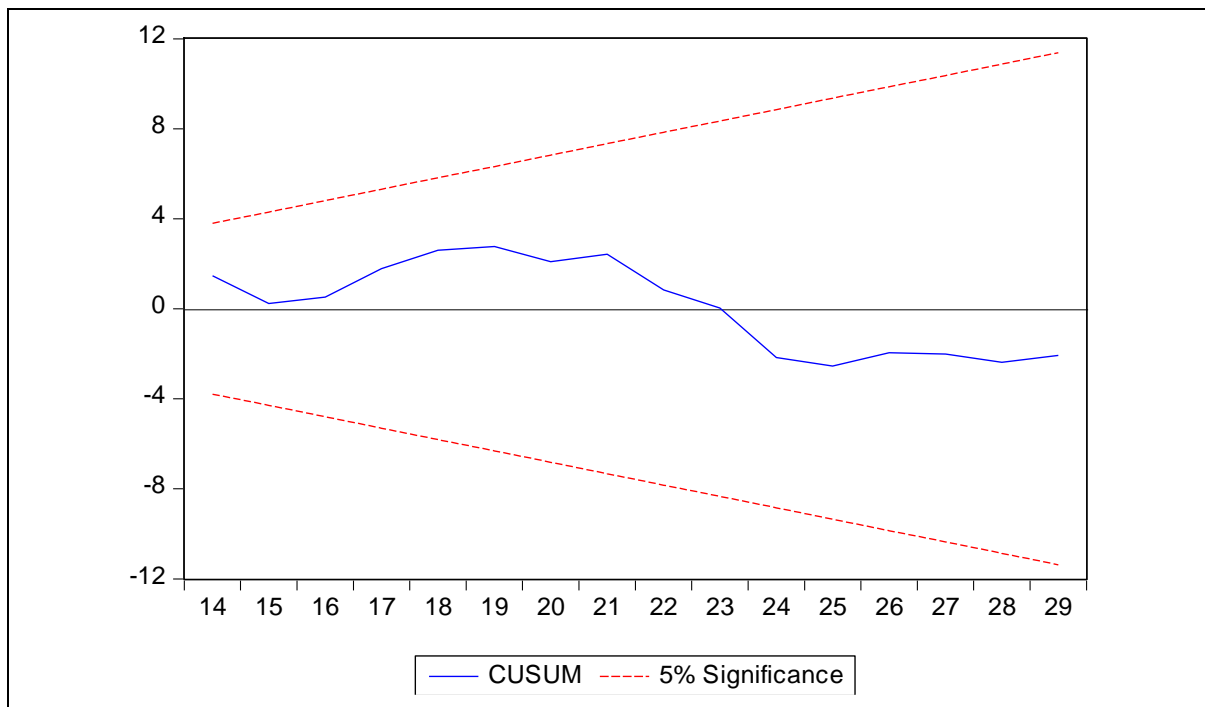
* Statistically significant 5% level

Table4. 4: Error Correction Model

	Coefficients	t statistics	p values
C	0.45886	0.872265	0.3960
$\Delta(\text{GDP}(-1))$	0.02170	0.075099	0.9411
$\Delta(\text{GDP}(-2))$	0.15493	0.69583	0.4965
$\Delta(\text{CGCE}(-1))$	-0.00001	-0.81711	0.4259
$\Delta(\text{CGCE}(-2))$	-0.00001	-0.74397	0.4677
$\Delta(\text{GFCF}(-1))$	-0.00001	-0.40835	0.6884
$\Delta(\text{GFCF}(-2))$	-0.00001	-0.0789	0.9381
$\Delta(\text{FDI}(-1))$	0.000003	0.170992	0.8664
$\Delta(\text{FDI}(-2))$	0.000009	0.566651	0.5788
ECT(-1)	-0.69555	-2.19336	0.0434*
Diagnostic tests	test statistics	p-values	
Breusch–Godfrey LM serial correlation	1.0525	0.375	
Wald coefficient restrictions test:			
$\gamma_1 = \gamma_2 = 0$	0.4264	0.660	
$\theta_1 = \theta_2 = 0$	0.0867	0.917	
$\varphi_1 = \varphi_2 = 0$	0.1745	0.842	

Based on the error term derived from long run estimates (table 3), error correction model has been developed, the results of which are presented in table 4. It is observed that coefficient of error correction term (π) is negative (-0.69555) and statistically significant (p value of 0.0434). It indicates that disequilibrium in real GDP is adjusting at the rate of 69.56% towards long run equilibrium due to long run association between GDP and CGCE, GFCF and FDI. It implies that CGCE, GFCF and FDI have long run impact on real GDP growth rate. The study also examines whether coefficients of lagged values of change in CGCE ($\gamma_1 = \gamma_2 = 0$) are individually and jointly equal to zero. Null hypothesis of coefficients being equal to zero has not been rejected as evident from p value of 0.660, indicating no short run association between CGCE and real GDP growth rate. Similarly, coefficients of lagged values of change in GFCF ($\theta_1 = \theta_2 = 0$) and FDI ($\varphi_1 = \varphi_2 = 0$) are also tested whether they are individually and jointly equal to zero or not. As observed from the respective p values of 0.917 and 0.842, it indicates non-rejection of null hypothesis of coefficients being equal to zero. It implies that even GFCF and FDI do not have impact on real GDP growth rate in the short term. However, there is clear evidence from the statistically significant negative value of error correction term (ECT), there is a long run relationship between real GDP growth rate and CGCE, GFCF and FDI. To ensure the robustness of the model, serial correlation among the residuals is tested using Breusch–Godfrey LM serial correlation test. Null hypothesis of no serial correlation in residuals of the model has not been rejected, indicating the robustness of the model. From figure 2, it is also observed that the estimated coefficients of the model are stable.

Figure 4.2: Stability in Coefficients of Error Correction Model-Recursive Estimates



5. Conclusion

From the above discussion it can be concluded that there is a long run relationship between real GDP growth rate and CGCE, GFCF and FDI as it is evident from the statistically significant negative value of error correction term (ECT). The study confirms that the capital expenditure of the central government, Gross Fixed capital formation and Foreign Direct Investments have significantly contributed for economic growth in India during the post-reform period. As the central government terminated loans given to the states, the decline in the share of capital expenditure in the total expenditure was more during the post-reform period when compared with pre-reform period. The proportion of development expenditure in the total capital expenditure should be raised in order to take up more capital projects. The entire capital receipts mobilized from different sources should be transformed as capital expenditure. It should be the responsibility of the government to focus more on enhancing the proportion of capital expenditure in the total expenditure to achieve higher economic growth.

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