IMPACT OF PRIVATE CORPORATE INVESTMENT ON ECONOMIC GROWTH

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Introduction

The government of every economy aims to achieve higher rate of economic growth so that it can provide its citizens a more comfortable life by providing not only the basic amenities of life but also a better standard of living than before. For achieving this objective every government frame and implement policies related to higher levels of economic growth and development. The key role is assigned to Investment in all the sectors of the economy. The balanced growth strategy by Rosenstein Rodan, Nurkse and by Lewis also assigned a pivot role to simultaneous investment in all the sectors of the economy for its growth and development and also the contrast view of unbalanced growth strategy by Hirshman also assigned a key role to investment but not simultaneously in all the sectors of the economy but by creating imbalance in the economy through investment only in the strategic sectors of the economy and later on its spill over effects will lead to the growth of other sectors too.

Since independence, Indian economy has developed and executed various long term as well as short term plans which are monitored by planning commission of India now called NITI Aayog after 2014 to enhance the level of investment in the economy. The latest reforms such as Make in India Campaign, Digital India, Skill Development programs etc. by Modi government also relied on investment in all the spheres of the economy to boost economic growth. Thus, we can say that investment plays a pivot role in achieving higher levels of economic growth and development. The present paper is an attempt to econometrically test the role of private corporate investment (one of the variables of gross domestic investment) in boosting the growth of Indian economy.

Literature Review

The **Neoclassical** theory cited that for the long-run equilibrium of any competitive economy attention must be to the accumulation of capital goods, growth in population, and technological progress. **Domar-Harrod models (1969),** favoured investment as the key to promoting economic growth. , the new growth theories since the mid-1980s, epitomized **by Romer (1986, 1990),** stated that higher growth rate could be achieved if the externality associated with investment could be internalized. **Lucas (1988),** Growth is generated by assuming that the incentive to invest in human capital is non-decreasing in human capital. Lucas postulates a production function of human capital which is constant returns to scale in human capital. **Barro (1990)** reconfirm the view that the accumulation of physical capital are the drivers of long-run economic growth. Whereas, The **Classical growth models,** supported the hypothesis of saving promoting economic growth. **Lewis's (1955),** also advocated saving-led growth. **Bacha (1990) and Jappelli and Pagano (1994)** claimed that savings contribute to higher investment and higher GDP growth in the short-run.

Besides this, some recent researchers found mixed results whether it is economic growth which drives Investment or vice-versa. **Saiyed (2012)** found a bidirectional causality between Investment and economic growth. **Roy and Mandal (2011), Tawiri (2010), Mofrad (2012), Mehanna (2011), Rao (2004)** found a uni-directional causality between both the

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variables running from Investment to Economic growth. **Mehrara and Musai (2013), Mustefa (2014)** found a unidirectional causality running from economic growth to investment. **Anwer and Sampath (1999)** found mixed results for different countries whereas **Cheung *et. al.* (2012)** found a weakened relationship between the two variables. Thus, we can see that the impact of investment on economic growth is still a debateable issue. No consensus is seen amongst the theorists as well as researchers regarding the exact relationship between the two variables and regarding the direction of causality and cointegration between investment and economic growth. Some of the studies concluded that both the variables are cointegrated in short run and long run whereas some other studies didn't find any direct relationship between them. Even no consensus is seen regarding the direction of causality between the variables.

Objective of the study

The main of objective of the study is to examine the co-integration and causal relationship between private corporate investment and economic growth.

Data Source and Methodology

The present analysis is based upon secondary data for the period 1970-2016 for India. The data is collected from Handbook on Indian economy by Reserve Bank of India collected by Central Statistical Organisation (C.S.O).

To investigate the co-integration and causality between Private corporate investment and economic growth, first of all, Augmented Dickey Fuller test (ADF) will be used to test the stationarity of the series. If the variables will be of the same order of integration then, Johansen (1990) co-integration technique will be used else Auto-regressive Distributed Lagged (ARDL) model will be used. Based on the results Error correction model (ECM) will be used for long run equilibrium relationship else short run ARDL model will be applied to test short run relationship between the variables. Lastly, to check the direction of causality, Granger's Causality test will be applied.

Relationship between Private Corporate Investment and Economic Growth.

GDP at MP or Nominal GDP is a monetary measure of market value of final goods and services produced within the domestic territory of the economy during an accounting year. It is the most common estimator of the performance of the whole country and also widely used for making international comparisons. No doubt, Real GDP is a true indicator of economic growth as it considers the effect of cost of living on the purchasing power of the people but bulk of the countries use nominal GDP for computing there National Income Accounting. Besides this, the other variables in the present study are at nominal rates so for the symmetry of results, Nominal GDP or GDP at current prices is used**.** On the other hand private corporate investment can be either in the form of purchasing of shares, bonds and debentures or in the form of net increase in the stock of capital goods such as machines, tools and implements to boost private gains. Our major concern here is that if private corporate sector investment adds to the economic growth of the nation or not. For testing the relationship between the two following model will be used:

$$\ln GDP = f(\ln PCI) \quad \ldots\ldots (1)$$

$$\ln PCI = f(\ln GDP) \quad \ldots\ldots (2)$$

where, lnGDP is Gross domestic product at market prices taken in its natural log form. lnPCI is private corporate sector investment taken in its natural log form. The econometric expression of the equation (1) and (2) is as follows:

$\ln RGDP_t = \alpha + \beta_1 \ln(PCI)_t + \varepsilon_t$ ..... (3)

$\ln RPCI_t = \alpha + \gamma_1 \ln(GDP)_t + \varepsilon_t$ …….. (4)

Where ε_t denotes a serially uncorrected white noise error term with a mean of zero and a constant variance. The variables are transformed to their natural logarithm in order to avoid the problem of heteroskidasticity in the residuals of estimated model.

Testing of Unit Root: Augmented-Dickey Fuller (ADF) Test

To analyse weather the two variables under study i.e. GDP and PCI are cointegrated or not, we need to check the stationarity of the vaiables by using Augmented-dickey Fuller (ADF) test. The application of ADF test carries null hypothesis of non-stationarity of time series against the stationary alternative. The rejection of null hypothesis will be done by following the three guidelines: 1. p-value should be significant at 5%. 2. The value of trace-statistics in absolute terms should be greater than critical values at 1%, 5% and at 10%. 3. For the acceptance of model, the value of coefficient should be negative. Table 1 displays the results of ADF test statistics for GDP and PCI.

Table: 5.1 Unit Root Table : Augmented Dickey-Fuller Test (Schwarz Info Criterion)

Variables	At level (Trend and Intercept)					First difference (Intercept)					Order Of Integration
	p-value	t-statistic	Critical Value @ 1%	Critical Value @ 5 %	Cofficient	p-value	t-statistic	Critical Value @ 1%	Critical Value @ 5 %	Cofficient	
Gross Domestic Product	0.353	-2.445	-4.181	-3.516	-0.183	0.0000	-4.803	-3.589	-2.930	-0.678	I(1)
Private Corporate Sector Investment	0.0546	-3.4737	-4.1756	-3.5131	-0.4490	0.0000	-6.9211	-3.5885	-2.9297	-1.0760	I(0)

Note: 1. The results have been computed by using ADF test using eviwes software 9.

Source: Author's Calculations

It is clear from table1 that in case of GDP, the data is stationary at first order of difference i.e. at I(1) where p-value is significant at 0.0000 and also the value of t-statistic in absolute terms i.e. -4.803is greater than their critical value at1% and 5% i.e. at -2.930. Whereas, Private corporate sector Investment (PCI) are stationary at level. i.e. I(0) using both intercept and trend. The value of t-statistic -3.4737 respectively is greater than its critical value -3.5131 at 5% level of significance. Since the order of integration is not same amongst the variables that is why we cannot use Johansen (1988) test for co-integration which is based on the limitation that order of integration should be same for all the variables. For analysing the impact of

these variables on each other we shall be applying ARDL approach to co-integration in the subsequent section.

Auto-Regressive Distributed Lag (ARDL): A Co-integtation Approach

As shown on table 1, the variables are stationary at mixed order of integration i.e. either of I(0) or at I(1) but none of them are stationary at I(2) therefore, Johansen approach to co-integration is not valid but we can successfully run ARDL approach (also known as Bound test) to examine the long run relationship between the variables. The ARDL framework for the existing variables is shown via following model:

$$\Delta \ln(GDP) = \alpha_0 + \sum_{j=1}^{n} b_j \Delta \ln(GDP)_{t-j} + \sum_{j=0}^{n} c_j \Delta \ln(PCI)_{t-j} + \delta_1 \ln GDP_{t-1} + \delta_2 \ln PCI_{t-1} + e_{1t}$$

The parameters δ_1 where i = 1 and 2 are corresponding long-run multipliers, while the parameters b_j and c_j are the short-term dynamic coefficients of ARDL model.

The null hypotheses of the model exhibits no cointegration (i.e. $\delta_1 = \delta_2 = 0$) against existence of co-integration as an alternate hypotheses (i.e. $\delta_1 = \delta_2 \neq 0$). Before applying ARDL model to test the existence of equilibrium between the variables, it is mandatory to determine optimum lag structure for the model which depends upon AIC and SIC criterion. The guideline says that optimum lag structure is one where the value of AIC and SIC criterion is minimum. We shall be running VAR to get the optimum lag length for the model.

Table: 2: Lag length selection for co-integration analysis using VAR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	27.85021	NA	2.20e-07	-1.142511	-0.931401	-1.066180
1	234.1684	350.7410	2.57e-11	-10.20842	-8.941762*	-9.750438
2	260.2564	37.82750	2.58e-11	-10.26282	-7.940609	-9.423181
3	285.9681	30.85414	2.94e-11	-10.29841	-6.920649	-9.077116
4	313.1231	25.79725	3.73e-11	-10.40616	-5.972849	-8.803213
5	343.4328	21.21675	5.59e-11	-10.67164	-5.182781	-8.687042

Notes: * Indicates lag order selected by the criterion.
Source: Author's calculations

Table 2 provides AIC and SIC values of the model. In econometrics literature it is quoted that optimum lag length would be the one where the values of AIC and SIC is minimum, if in case any clash emerges between the two criterions, then one must decide the optimum lag length based on SBC criterion. Here, in our case too such clash has emerged, AIC criterion is minimum with 1-5 lag length whereas SIC criterion is minimum with 1-1 lag length. Thus, we will go with 1-1 lag length to test the presence of co-integration with the help of ARDL model.

Results of ARDL model is given in table 3. The sign of coefficient in the model is positive and p-value is less than 5% which means that both GDP and PCI are positively affecting each other and are co-integrated in long run.

Table: 3 ARDL long-run coefficient model results: GDP and GDI

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP	0.833911	0.046729	17.84577	0.0000

PCI	0.056637	0.024018	2.358145	0.0236
C	0.744723	0.212337	3.507263	0.0012
Notes: i) Lag length criterion used in ARDL model based on SIC criterion is 1, 0, 0, 1, 0. **Source:** Author's calculations				

The r-square value of the model depicted in table 3 is 0.999784 and p-value is zero, which means the model is statistically fitted well.

Bounds test approach of co-integration

The null hypotheses of the Bounds test approach states that there does not exist any long run relationship whereas, alternate hypotheses depicts existence of long run relationship. The criterion guideline says that if the f-value is below I(0) bound, we cannot reject null hypotheses and if the f-value is higher than the I(1) bound, we can reject null hypotheses of no co-integration. The value of F-statistics and Bound range for different dependent variables is displayed in table 4.

Table: 4 ARDL Bound Testing Model: GDP and PCI

Equation	F-statistics	Degree of freedom	I(0) Bound	I(1) Bound
GDP as dependent variable	1.860330	4	2.86**	4.01**
PCI as dependent variable	9.402099	1	4.94**	5.73**

Notes: i)*, ** and *** represents significance at 1%, 5% and 10% levels of significance, respectively using Schwarz Criterion.
ii)Author's calculations

Table.4 shows that there is existence of co-integration between PCI & GDP, when GDP is independent variable, as the value of F-statistics in all the three cases is greater than I(1) bound at 5.505336. Whereas, no co-integration exist when GDP is a dependent as the value of F-statistic is below I(0) Bound at 1.860330. In the next step, we would be using Error Correction Model in case of co-integrated variables and in case of non-cointegrated variables, we will be estimating short-run ARDL.

5.1.4 Short-run Estimation of the Model

As we have find that there doesn't exist any long run co-integration when GDP is a dependent variable therefore, we shall be applying short run ARDL model. Algebraically, GDP as dependent variable model looks as follows:

$$d(GDP_) = c + dd(PCI(-1))$$

Where, d represents the 1st difference of the variables, c is a constant term, (-1) depicts one year lagged structure of the variables. The short run econometric expression of the above model is described below:

$$\Delta lngdp_t = \boldsymbol{\alpha_{01}} + \sum_{i=1}^{p} b_{1i}\Delta ln(GDP)_{t-i} + \sum_{i=1}^{q} b_{1i}\Delta ln(PCI)_{t-1} + e_{1t}$$

Where, e_{1t} is the noise term for time period't'.

Table: 5 Short run Coefficients of GDP as dependent variable

Redundant Variable Test	Independent Variables (PCI)
Coefficient	0.019085
t-Statistics	0.636148
p-Values	0.5284
Std. Error	0.030000
Note: p-value is calculated at 5% level of significance. **Source:** Author's calculations.	

It is evident from table 5, that value of lnPCI (i.e. at its first difference) has been regressed upon the 1st difference lagged terms the of dependent variable lnGDP is statistically insignificant as p-value is greater than 5% at 0.5284, depicting that these variables have no direct positive effect on GDP in short period. The model is free from the problem of hetroskidasticity, serial correlation and it has successfully passed CUSUM test of stability.

Estimation Long-run Coefficients of the Model

The econometric expression of the long run relationship between GDP and PCI, where, GDP is the dependent variable as follows:

$$\Delta \ln PCI_t = \alpha_0 + + \sum_{i=1}^{p} c_{1i} \Delta \ln(PCI)_{t-i} + \sum_{i=1}^{q} c_{2i} \Delta \ln(GDP)_{t-1} + \lambda ECT_{t-1} + e_{1t}$$

Where, λ = speed of adjustment parameter with a negative sign i.e. $(1- \sum_{i=1}^{q} {}^{-¿}_{¿} \delta_i)$,

ECT = extracted residuals from the regression of the long run-run equation i.e. $(\ln DV_{t-1} - \theta X_t)$, DV is the Dependent Variable,

$\theta = \sum_{i=1}^{q} \beta_i / \alpha$ is a long run parameter,

e_{1t} = is the white noise term.

Table 6: ARDL Estimation of Long-run Coefficients, PCI and GDP		
Coefficient	**P-value**	**ECT(-1)**
2.694883	0.0645**	0.3987 (-0.179081)
Notes: i) * and **represents probability value at 5% and 10% level of significance respectively. **ii)** ( ) represents value of coefficient in ECT. **Source:** Author's calculations		

From the above table, it is clear that in case of PCI (DV), a 1% increase in GDP will cause 2.69% increase in PCI. The p-value in this case is significant at 10% level of significance. The model is free from the problem of hetroskidasticity, serial correlation and it has successfully passed CUSUM test and squared CUSUM test of stability.

Granger's Causality Test

After knowing the long-run and short-run relationship between the variables, the last step is to examine the direction of causality between the variables. The null hypotheses depicts presence of causal relationship between the variables against non-existence of causal relationship as an alternate hypotheses. The null hypotheses will be accepted or rejected at

5% level of significance. The results of Granger's Causality test is shown in the table 7

Table 7: Results of Granger's Causality Test

Null Hypothesis:	F-Statistic	Prob.
PCI does not Granger Cause GDP	1.81378	0.1853
GDP does not Granger Cause PCI	9.71200	0.0033

Source: Author's Calculations

The above table shows that a uni-directional causality is running from GDP to PCI as the p-value is calculated at 0.0033, meaning that null hypotheses is accepted at 5% level of significance. Whereas, other way causality is not seen between these variables.

Conclusion

It is concluded that the government should make policy measures to boost its GDP if it wants it PCI to flourish.

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