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DYNAMICS OF THE RELATIONSHIP BETWEEN REAL CONSUMPTION EXPENDITURE AND ECONOMIC GROWTH IN INDIA

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Abstract

It is a general consensus that the economic growth in developing countries is necessarily consumption-led instead of production/investment-led. The reason might be that the share of consumption (private) in Gross Domestic Product (GDP) in these economies usually ranges between 70 to 75 per cent. Consumption expenditure with its dominant share in GDP is bound to contribute the most in real GDP growth. Thus, what is wrong in consumption-led growth? If people don't consume, why should someone produce? The very act of consumption would encourage private sector to produce more. Thus, consumption-led growth would turn into production/investment-led growth and eventually the economy would move to a high growth trajectory. Therefore, this paper is an attempt to investigate the dynamics of the relationship between real consumption expenditure and economic growth in a developing country like India. The study by employing Cointegration test and estimating the vector error correction regression for the sample period of 1950-51 to 2008-09, provides the evidence of long-run equilibrium relationship among variables. The causality test in the error correction model indicates that there exists a unidirectional causal relationship which runs from real private consumption expenditure to economic growth in the long-run. However, the Granger causality test indicates that there is no short-run causality between them.

Key Words: *Real Consumption Expenditure, Economic Growth, GDP, Cointegration, Error Correction Model, Granger Causality*

JEL classification Code: *C13, C22, C32, C51, E20*

I. INTRODUCTION

The study of dynamic relationship between real consumption expenditure and economic growth in a developing country like India keeps a wide relevance for the academicians, researchers, and policy makers. Economists in developing countries often consider the economic performance of their country in terms of consumption

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level as it constitutes the largest Gross Domestic Product (GDP) component. Consumption expenditure has an immediate impact on GDP. An increase in consumption expenditure causes GDP to rise by the same amount, other things being unchanged. Moreover, since current income (GDP) is an important determinant of consumption, the increase in income will be followed by a further rise in consumption expenditure. This appears to represent a positive feedback loop that runs between consumption and income and thus, between consumption and economic growth.

Besides, the argument that consumption expenditure with its dominant share in GDP is bound to contribute the most in real GDP growth in developing countries, may be looked upon as follows: the very act of consumption would encourage private sector to produce more and thus, consumption-led growth would turn into production/investment-led growth thereby moving the national economy to a high growth trajectory.

And, the case of India is no exception. Real consumption (private) expenditure contributed over 60 per cent to real GDP growth in India during 1950-51 to 2008-09. So, many analysts are quite enthusiastic on the role of real consumption expenditure in shaping the future growth trajectory in India. Against this backdrop, the role of real consumption expenditure as a key growth driver needs to be carefully considered.

II. REVIEW OF LITERATURE

The belief of economists' that consumption-led growth prevails in the long-run has been empirically investigated at different times for different countries. Guisan (2001) presents a critical review of causality and cointegration between private consumption and GDP in 25 OECD countries for the period 1960-1997 and suggests the convenience of re-estimation of the relation, maintaining own GDP as explanatory variable in each, and excluding other countries GDP.

Gil-Alana (2003) presents a generalised fractional time series modelling of the relationship between consumption and income in the UK for the period 1955 -1984 and suggests that fractionally cyclical models may be adequate when modelling macro-economic time series.

Guisan (2004) analyse the results of several tests, Granger Causality, Modified Granger Causality, Engle-Granger Cointegration, and Hausman tests, to detect the causal relationship between real consumption and real GDP in Mexico and the United States. The main finding are: there is no evidence of Granger Causality in Mexico, but there is the evidence of bilateral Granger Causality in US; there is the evidence of bidirectional modified Granger Causality in both the countries; there is evidence of a cointegrated relationship between consumption and GDP in the US, but it is ambiguous in case of Mexico; last, there is a mixed evidence of Hausman causality in both the countries.

Gomez-Zaldivar (2009) further investigated the causality between consumption and GDP for Mexico and US. The results reveal that there is no evidence of either causality or cointegration between the Mexican series for consumption and GDP, but in case of the US series, the evidence of causality from consumption to GDP is there along with the evidence of cointegration.

In view of such mixed results about the causal relation between real consumption expenditure and economic growth, and almost non-existing literature for developing countries like India, this paper is an attempt to revisit the issue in case of India.

It is with this objective, the Section III proceeds to discuss the data and methodology of the study; Section IV makes the empirical analysis; and Section V summarizes and concludes.

III. DATA AND METHODOLOGY

The objective of this study is to investigate the dynamics of the relation between real consumption expenditure and economic growth in India for the period 1950-51 to 2008-09. To this end, the primary model showing the estimation of the long-run relationship between real consumption expenditure and economic growth in India is, thus specified in its log-linear form as follows:

$$\log GDP_t = \alpha_0 + \alpha_1 \log PCE_t + \varepsilon_t \quad (1)$$

Where GDP_t is the Gross Domestic Product used as a proxy to capture the Economic Growth of India; PCE_t is the real consumption expenditure; α's are constants; t is the time trend; and ε is the random error term.

The study employed annual observation expressed in natural logarithms for the sample period spanning from 1950-51 to 2008-09. The variable Economic Growth has been measured by the GDP at factor cost and at constant prices (GDP_t). Similarly, the variable real consumption expenditure has been captured by the private final consumption expenditure in the domestic market at constant prices (PCE_t). Private final consumption expenditure (PCE) is defined here to cover the household final consumption expenditure and the final consumption expenditure of non-profit making bodies serving households. It concerns with the expenditure of resident and non-resident households in the domestic market. It is obtained by adding expenditure on durable, semi-durable, non-durable goods and services calculated at 1999-2000 prices. All the required and relevant annual data pertaining to the study have been obtained from the database on Indian Economy maintained by Reserve Bank of India.

The estimation methodology employed in this study is the Cointegration and error correction modelling technique. The entire estimation procedure consists of three steps: first, unit root test; second, Cointegration test; third, the error correction estimation.

Unit Root Test

The econometric methodology, first examines the stationarity properties of each time series of consideration. The present study uses Augmented Dickey-Fuller (ADF) unit root test to examine the stationarity of the data series. It consists of running a regression of the first difference of the series against the series lagged once, lagged difference terms and optionally, a constant and a time trend. This can be expressed as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \alpha_2 Y_{t-1} + \sum_{j=1}^{p} \alpha_j \Delta Y_{t-j} + \varepsilon_t \tag{2}$$

The additional lagged terms are included to ensure that the errors are uncorrelated. In this ADF procedure, the test for a unit root is conducted on the coefficient of Y_{t-1} in the regression. If the coefficient is significantly different from zero, then the hypothesis that Y_t contains a unit root is rejected. Rejection of the null hypothesis implies stationarity. Precisely, the null hypothesis is that the variable Y_t is a non-stationary series ($H_0 : \alpha_2 = 0$) and is rejected when α_2 is significantly negative ($H_a : \alpha_2 < 0$). If the calculated value of ADF statistic is higher than McKinnon's critical values, then the null hypothesis (H_0) is not rejected and the series is non-stationary or not integrated of order zero, I(0). Alternatively, rejection of the null hypothesis implies stationarity. Failure to reject the null hypothesis leads to conducting the test on the difference of the series, so further differencing is conducted until stationarity is reached and the null hypothesis is rejected. If the time series (variables) are non-stationary in their levels, they can be integrated with I(1), when their first differences are stationary.

Cointegration Test

Once a unit root has been confirmed for a data series, the next step is to examine whether there exists a long-run equilibrium relationship among variables. This is called cointegration analysis which is very significant to avoid the risk of spurious regression. Cointegration analysis is important because if two non-stationary variables are cointegrated, a VAR model in the first difference is misspecified due to the effects of a common trend. If cointegration relationship is identified, the model should include residuals from the vectors (lagged one period) in the dynamic VECM system. In this stage, Johansen's cointegration test is used to identify cointegrating relationship among the variables. The Johansen method applies the maximum likelihood procedure to determine the presence of cointegrated vectors in non-stationary time series. The testing hypothesis is the null of non-cointegration against the alternative of existence of cointegration using the Johansen maximum likelihood procedure.

In the Johansen framework, the first step is the estimation of an unrestricted, closed p^{th} order VAR in k variables. The VAR model as considered in this study is:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots.. + A_p Y_{t-p} + BX_t + \varepsilon_t \tag{3}$$

Where Y_t is a k -vector of non-stationary $I(1)$ endogenous variables, X_t is a d-vector of exogenous deterministic variables, A_1.........A_p and B are matrices of coefficients to be estimated, and ε_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables.

Since most economic time series are non-stationary, the above stated VAR model is generally estimated in its first-difference form as:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + BX_t + \varepsilon_t \tag{4}$$

Where, $$\Pi = \sum_{i=1}^{p} A_i - I, \quad and \quad \Gamma_i = -\sum_{j=i+1}^{p} A_j$$

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank $r < k$, then there exist $k \times r$ matrices α and β each with rank r such that $\Pi = \alpha\beta'$ *and* $\beta' Y_t$ is I(0). r is the number of co-integrating relations (the *co-integrating rank*) and each column of β is the co-integrating vector. α is the matrix of error correction parameters that measure the speed of adjustments in ΔY_t.

The Johansen approach to cointegration test is based on two test statistics, viz., the trace test statistic, and the maximum eigenvalue test statistic.

A. Trace Test Statistic

The trace test statistic can be specified as: $\tau_{trace} = -T \sum_{i=r+1}^{k} \log(1-\lambda_i)$, where λ_i is the *ith* largest eigenvalue of matrix Π and T is the number of observations. In the trace test, the null hypothesis is that the number of distinct cointegrating vector(s) is less than or equal to the number of cointegration relations (r).

B. Maximum Eigenvalue Test

The maximum eigenvalue test examines the null hypothesis of exactly r cointegrating relations against the alternative of $r + 1$ cointegrating relations with the test statistic: $\tau_{\max} = -T \log(1-\lambda_{r+1})$, where λ_{r+1} is the $(r + 1)^{th}$ largest squared eigenvalue. In the trace test, the null hypothesis of $r = 0$ is tested against the alternative of $r + 1$ cointegrating vectors.

It is well known that Johansen's cointegration test is very sensitive to the choice of lag length. So first a VAR model is fitted to the time series data in order to find an appropriate lag structure. The Akaie Information Criterion (AIC), Schwarz Criterion (SC) and the Likelihood Ratio (LR) test are used to select the number of lags required in the cointegration test.

Vector Error Correction Model (VECM)

Once the cointegration is confirmed to exist between variables, then the third step requires the construction of error correction mechanism to model the dynamic relationship. The purpose of the error correction model is to indicate the speed of adjustment from the short-run equilibrium to the long-run equilibrium state.

A Vector Error Correction Model (VECM) is a restricted VAR designed for use with non-stationary series that are known to be cointegrated. Once the equilibrium conditions are imposed, the VECM describes how the examined model is adjusting in each time period towards its long-run equilibrium state. Since the variables are supposed to be cointegrated, then in the short-run, deviations from this long-run equilibrium will feedback on the changes in the dependent variables in order to force their movements towards the long-run equilibrium state. Hence, the cointegrated vectors from which the error correction terms are derived are each indicating an independent direction where a stable meaningful long-run equilibrium state exists.

The VECM has cointegration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationship while allowing for short-run adjustment dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The dynamic specification of the VECM allows the deletion of the insignificant variables, while the error correction term is retained. The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long-run equilibrium state.

In this study the error correction model as suggested by Hendry has been used. The general for of the VECM is as follows:

$$\Delta GDP_t = \beta_1 \sum_{i=1}^{n} \Delta GDP_{t-i} + \beta_2 \sum_{i=1}^{n} \Delta PCE_{t-i} + \lambda EC_{t-1} + \varepsilon_t \tag{5}$$

Where Δ is the first difference operator; EC_{t-1} is the error correction term lagged one period; λ is the short-run coefficient of the error correction term ($-1 < \lambda < 0$); and ε is the white noise.

The error correction coefficient (λ) is very important in this error correction estimation as greater the co-efficient indicates higher speed of adjustment of the model from the short-run to the long-run.

IV. EMPIRICAL RESULTS

At the outset, the Pearson's correlation coefficient between real private consumption expenditure and gross domestic product has been calculated over the sample period and its significance has been tested by the t-test.

The value of Pearson's correlation coefficient (r) between these two time series over the sample period is 0.99. It shows that real private consumption expenditure and gross domestic product are positively related in India and that to a very high degree of correlation is evident between these two variables. To test whether this value of 'r' shows a significant relationship between two time series, student's t-test has been used. The null hypothesis of the test is $r = 0$ against the alternative of $r \neq 0$. Since the t-statistic at 56 degrees of freedom is 52.539 and the critical value of t at 5% level of significance is less than it, the null hypothesis is rejected. So, it can be said that the correlation between real private consumption expenditure and economic growth is statistically significant. Correlation, however, does not say anything about long-run relationship and thus, leaves unsettled the debate concerning the long-run relationship between real private consumption expenditure and economic growth.

Before proceeding with the empirical analysis, it is required to determine the order of integration for each of the two variables used in the analysis. The Augmented Dickey-Fuller unit root test has been used for this purpose. And, the results of such test are reported in Table 1.

Table 1
Results of Augmented Dickey-Fuller Unit Root Test

Variables in their First Differences with trend and intercept	*ADF Statistic*	*Critical Values*	*Decision*
GDP_t	-10.862	At 1% : -4.13 At 5% : -3.49 At 10% : -3.17	Reject Null hypothesis of no unit root
PCE_t	-9.345	At 1% : -4.13 At 5% : -3.49 At 10% : -3.17	Reject Null hypothesis of no unit root

It is clear from the Table-1 that the hull hypothesis of no unit roots for both the time series are rejected at their first differences since the ADF test statistic values are less than the critical values at 10%, 5% and 1% levels of significances. Thus, the variables are stationary and integrated of same order, i.e., I(1).

In the next step, the cointegration between the stationary variables has been tested by the Johansen's Trace and Maximum Eigenvalue tests. The results of these tests are shown in Table 2.

Table 2
Results of Johansen's Cointegration Test (GDP_t & PCE_t)

Hypothesized Number of Cointegrating Equations	*Eigen Value*	*Trace Statistics*	*Critical Value at 5% (p-value)*	*Maximum Eigen statistics*	*Critical Value at 5% (p-value)*
None*	0.245	18.038	15.494(0.02)	15.777	14.26460(0.02)
At Most 1	0.039	2.260	3.841 (0.13)	2.260	3.841466 (0.13)

* denotes rejection of the hypothesis at the 0.05 level

The null hypothesis of no Cointegration between real private consumption expenditure and gross domestic product (r = 0) based on both the maximum eigenvalue test and the trace test is rejected at the (5%) level of significance. However, the null hypothesis that ($r \leq 1$) could not be rejected which indicates the existence of only one cointegration equation between the two time series at 5% level of significance.

Thus, the two variables of the study have long-run equilibrium relationship between them. But in the short-run there may be deviations from this equilibrium and we have to verify that whether such disequilibrium converges to the long-run equilibrium or not. And, Vector Error Correction Model can be used to generate this short-run dynamics.

The estimation of a Vector Error Correction Model (VECM) requires selection of an appropriate lag length. The number of lags in the model has been determined according to Akaike Information Criterion (AIC). The lag length that minimizes the AIC is 2. Then an error correction model with the computed t-values of the regression coefficients is estimated and the results are reported in Table 3.

Table 3
Estimates for VECM Regression

$$\Delta GDP_t = 0.237\Delta GDP_{t-1} - 0.082\Delta GDP_{t-2} - 0.871\Delta PCE_{t-1} - 0.217\Delta PCE_{t-2} - 0.211EC_{t-1} + 0.082$$

Regresses	*Estimated Coefficient*	*t-value*	*p-value*
ΔGDP_{t-1}	0.2375	0.899	0.372
ΔGDP_{t-2}	-0.0827	-0.339	0.735
ΔPCE_{t-1}	-0.8719*	-2.643	0.010
ΔPCE_{t-2}	-0.2172	-0.721	0.473
EC_{t-1}	-0.2112*	-4.105	0.0001
Constant	0.0822	6.550	0.00000001

* Significant at 1% level

It is clear that the estimated coefficient of error-correction term (EC_{t-1}) is statistically significant and has a negative sign, which confirms that there is not only any problem in the long-run equilibrium relation between the independent and dependent variables at 5% level of significance, but its relative value (-0.2112) for India shows the rate of convergence to the equilibrium state per period. Precisely, the speed of adjustment of any disequilibrium towards a long-run equilibrium is that about 21.12% of the disequilibrium in GDP is corrected each year.

Furthermore, the negative and statistically significant value of error correction coefficient indicates the existence of a long-run causality between the variables of the study. And, this causality is unidirectional in our model being running from the PCE to the GDP. In other words, the changes in GDP can be explained by real private consumption expenditure.

The coefficients of the first and second differences of GDP and PCE lagged one and two periods in Table 3 are statistically insignificant (except for ΔPCE_{t-1}) which indicates the absence of short-run causality from PCE to GDP based on VECM estimates. But some degrees of causality runs from one period lag PCE to GDP in the short-run. In order to confirm this result of the short-run causality between the GDP and the PCE based on VECM estimates, a standard Granger causality test has been performed based on F-statistics.

Table 4
Results of Granger Causality Test

Null Hypothesis	*F-Statistic*	*Probability*	*Decision*
ΔGDP does not Granger Cause ”PCE	0.490	0.615	Accept
ΔPCE does not Granger Cause ”GDP	1.215	0.305	Accept

(Number of lags = 2)

The result in Table-4 indicates that private consumption expenditure does not Granger cause the GDP at the 5% level of significance. This result supports the previous result obtained from VECM that there is no short-run causality at the 5% level of significance. Based on this causality tests, changes in the private consumption expenditure cause changes in the GDP in the long-run, but not in the short run.

This econometric calculations, thus presents a contradiction. The VECM estimates indicate some sort of short-run causality between the variables of the study while the Granger causality test rejects it. In this context “we must not forget that Economics and Econometrics are social sciences, where mathematics is just an instrument that should be used in a flexible way to solve social questions and to obtain solutions to important problems, giving always priority to the relevance from the economics point of view and not to the mathematical sophistication” (Guisan, 2001).

V. CONCLUSION

In this paper, the relationship between the real private consumption expenditure and economic growth for a developing country like India has been investigated using popular time series methodologies. In this study real private consumption expenditure is measured in terms of private final consumption expenditure in the domestic market at constant prices (PCE) and economic growth in terms of Gross Domestic Product (GDP) at factor cost and at constant prices. The data properties are analysed to determine the stationarity of time series using the Augmented Dickey-Fuller unit root test which indicates that the two series are I(1). The results of the Cointegration test based on Johansen’s procedure indicate the existence of the Cointegration between GDP and PCE. Therefore, the two variables have a long-run equilibrium relationship exists, although they may be in disequilibrium in the short-run. The vector error correction model based on VAR indicates that about 21.12% of disequilibrium is corrected each year. In addition, the negative and significant error correction term in GDP equation supports the existence of a long-run equilibrium relationship between PCE and GDP. Furthermore, the estimates of the VECM indicate the existence of a unidirectional causality running from PCE to GDP. The Granger causality test indicates that there is a causal relationship running from PCE to GDP in the long-run but not in the short-run.

Since the days the new economic policies are implemented, Indian economy has undergone a structural shift owing to a strong and sustained economic growth for a reasonably longer period of time which fuelled rapid changes in consumer spending patterns. The real per capita GDP grew at an average rate of almost 6 per cent per annum during the period, thus giving rise to the average income of the people. The pent-up desire to improve living standards encouraged the people to increase consumption expenditure. A more than five-fold increase in workers' remittances eased the liquidity constraints of the recipient households which enhanced their purchasing power, especially in rural areas; it also provided an important hedge against higher domestic inflation; and therefore, influenced their consumption behaviour.

The rise in per capita income and surge in inflows of workers' remittances contributed to the rise in real private consumption expenditure during the period. The real private consumption expenditure grew by an average rate of 5 per cent per annum during 1990-2009. The consumption boom during the period pointed to the following facts. First, the higher consumer spending feeding back into economic activity provided adequate support to the on-going growth momentum. Second, it suggested the emergence of a strong middle class with more purchasing power which is a healthy sign for business expansion and social transformation.

However, for sustaining the longer-term momentum of growth, investment must rise at a faster pace than consumption expenditure. Real investment (gross fixed capital formation) grew at an average rate of 9 per cent per annum during 1990-2009 as opposed to private consumption expenditure growing by 5 per cent per annum during the same period. In fact, real investment grew about twice as fast as private consumption expenditure.

Investment-to-GDP ratio (investment rate) also surged during the period – rising from 28.7 per cent in 1990-91 to 37.4 percent by 2008-09 – an increase of 8.7 percentage points in about two decades. In other words, rising consumer spending fed back into economic activity and as a result, the demand for goods started rising. Investors, on the other hand, taking advantage of growing demand, expanded their business operation to meet such demand and hence, the economy continued to expand. The expanding economy generated jobs, increased the incomes of the people and helped alleviate poverty. Therefore, the importance of the growth of real private consumption expenditure in the economic growth of a developing economy like India cannot be overemphasized.

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