Long-Run Relationship Between GDP And Consumption Behaviour in India: Co-Integration Analysis

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***Abstract*—India is one of the growing economies of the world. In terms of Nominal Gross domestic Product (GDP) India is in 6th position in the world. It has been found from the Keynesian consumption theory that there is positive relationship between income and consumption. Hence, the present paper examines the long-run relationship GDP with PFCE and GFCE. The present study used secondary time series data with co-integration and Vector Error Correction Models. It has been found from the study that the GFCE, PFCE and GDP are stationary with second difference. GDP is co-integrating with PFCE. PFCE is also co-integrating with GDP. Hence, GDP and PFCE in India are having long-run equilibrium and stable relationship. GDP corrects the errors within GDP by 69.12 percent and 21.9 percent with PFCE in the second year. PFCE corrects the errors within PECF by 7.41 percent and 19.68 percent with GDP in the first year. GDP and GFCE in India will go together. Hence, GDP is co-integrating with GFCE. GFCE is also co-integrating with GDP. Accordingly, GDP and GFCE in India are having long-run equilibrium and stable relationship. GDP does correct 7.12 percent of the errors in equilibrium within the GDP in the second period. GFGC does correct 289.4 percent of the errors in equilibrium with the GDP in the second period. Therefore, income generation process and consumption processes are having strong and long-run relationship. Accordingly, there is a need to improve the consumption behavior of the people to have stronger economic process.**

***Index Terms*—Income, Consumption Expenditure, Co-integration, Error Correction, Long-Run Relationship and Stationarity**

I. INTRODUCTION

India is one of the growing economies of the world (Makin, 1988). As per International Monetary Fund (IMF), in terms of Nominal Gross domestic Product (GDP) India is in 6th position ($4,060,207,000,000) in the world (Anjum & Mohammed, 2000). It has been found from the Keynesian consumption theory that there is positive relationship between income and consumption (Leonardo & Amartya, 2006), (Atrayee & Hendrik, 2009), (Lau & Tang, 2009). India is also having big population and therefore, there will be higher consumption expenditure (Gaber & Stevan, 2010). There are two important consumptions in India; consumption expenditure by private people, which is known as Private Final Consumption Expenditure (PFCE) and by government, which is Government Final Consumption Expenditure (GFCE). The present paper examines the long-run relationship between GDP with PFCE and GFCE.

II. REVIEW OF LITERATURE

There is positive relationship between income and consumption (Premakumara, 2013). The previous studies have examined the linkages between GDP and consumption expenditure in general (Raghbendra, 2001). Some of the studies have proved the causality GDP to consumption expenditure (Gaber & Stevan, 2010), (Sanghamitra, 2003).Some of the other studies have also proved the reverse causality (Premakumara, 2013).

Few research works have also proved the long-run relationship between income and consumption by using co-integration and auto regressive distributed lag models (Craig, Martin, & Sergio, 2001), (Shruthi, Shastri, Giri, & Geetilaxmi, 2017). Very few studies have also proven the no relations between income and consumption (Suleyman, Degirmen, & Ahmet,

2014),(Lau & Tang, 2009). However, most of these studies are conducted in Europe and USA (Anjum & Mohammed, 2000).Rarely, studies found for developing and under developed countries (Banday & Aneja, 2016),(Gaber & Stevan, 2010). With respect to India, GFCE, PFCE and GDP are not used for long-run relationship. Accordingly, 'Long-Run Relationship between GDP and Consumption Behaviour in India: Co-Integration Analysis' will provide sufficient evidences to explain the relationship between income and consumption expenditure.

III. METHODOLOGY

The present study has used secondary time series data. The data has been collected for the period from 2005-06 to 2019-20. The study has followed econometric methodology. The necessary steps like checking for growth trends, stationarity have carried out before using the data in the econometric models. All the variables used in the present work are of integrated of second order. The Granger causality, Johansen co-integration and Vector Error Correction Models (VECM) are used to analyze the relationship between consumption and expenditure.

IV. RESULTS AND DISCUSSION

The following section presents the results and discussion. As backdrop, the following table presents descriptive for the data.

Table 1: Descriptive for PFCE, GFCE and GDP (In Crore)

Description	PFCE	GFCE	GDP
Mean	5482068	1000090	9722816
Median	5179091	9742620	9213017
Maximum	8259704	1484272	14515958
Minimum	3469138	596646	5914614
Std. Dev.	1566051	280465	2817075.

Source: Researcher computed the results by using actual data.

The descriptive information about the consumptions and GDP are presented in the above table. It is revealed from the table that the average Private Final Consumption Expenditure (PFCE) is rupees 5482068 crore. The deviation in the average of PFCE is rupees 1566051 crore. The minimum of PFCE during the period was rupees 3469138 crore and maximum of PFCE was rupees 8259704 crore.

It is also found from the table that the average Government Final Consumption Expenditure (GFCE) is rupees 1000090 crore. The deviation in the average of GFCE is rupees 280465 crore. The minimum of PFCE during the period was rupees 3469138 crore and maximum of PFCE was rupees 8259704 crore.

It is also found from the table that the average Gross Domestic Product (GDP) is rupees 9722816 crore. The deviation in the average of GDP is rupees 2817075 crore. The minimum of GDP during the period was rupees 5914614 crore and maximum of GDP was rupees 14515958 crore.

Table 2: Growth of Consumptions and GDP in India (In Percentage)

Variable	CAGR	t-ratio	p-value
PFCE	6.35	70.54	0.000
GFCE	6.36	22.85	0.000
GDP	6.35	70.54	0.000

Source: Researcher computed the results by using actual data.

The growth in consumptions and GDP are presented above. It is found that the growth coefficients of all variables are significant at one percent level. Accordingly, PFCE is steadily increasing by 6.35 percent, GFCE is steadily increasing by 6.36 percent and GDP is increasing by 6.35 percent. Hence, there are guaranteed positive trends in consumption and income in India.

The test of unit root is done in order to determine order of integration of time series using Augmented Dickey Fuller (ADF) test. All the variables were tested for stationarity and their order of integration was established. The existence of unit root in the variables implies non stationary and the estimation based on the non-stationary process is likely to lead to spurious regression or unreliable results. Accordingly, any analysis based on this result will be meaningless. Therefore, the test of stationarity is imperative.

The ADF results without drift and trend, with drift and with drift and trend are presented in the above table. At the level, none of parameters were stationary. The FD is found stationary at five per cent level of significance, with first difference and with the model without drift and trend. PD is stationary at five percent level of significance, with first difference and the

model without drift and trend. RD is stationary at one percent level of significance, with first difference and the model without drift and trend.

Table 3: Stationarity Test for GFCE, PFCE and GDP

Variable	t-test value	Significance	Model	Level
GFCE	-4.0317	0.0008	None	*I ~ (2)*
PFCE	-5.5085	0.001	None	*I ~ (2)*
GDP	-4.031789	0.0008	None	*I-(2)*

Source: Researcher computed the results by using actual data.

Note: *I ~ (2) means integrated of order two;* the variable stationary at second difference.

The test of unit root is done in order to determine order of integration of time series using Augmented Dickey Fuller (ADF) test. The existence of unit root in the variables implies non stationary and the estimation based on the non-stationary process is likely to lead to spurious regression or unreliable results. Accordingly, any analysis based on this result will be meaningless. Therefore, the test of stationarity is imperative.

The GFCE, PFCE and GDP are found stationary at one percent level with second difference. Hence, use of co-integration to establish the long-run relationship is appropriate and valid.

Table 4: Co-integration between GDP and PFCE

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.426911	12.79939	12.32090	0.0415
At most 1 *	0.348093	5.562095	4.129906	0.0218
Trace test indicates 2 co-integrating eqn (s) at the 0.05 level				

Source: Researcher computed the results by using actual data.

The Johansen test has used to estimate the long-run relationship between GDP and PFCE in India. It has been found from the co-integration test that the trace has identified two co-integrating equations. Means, the variables used in this analysis have been co-integrating with each other.

Accordingly, there has been long-run stable relationship between GDP and PFCE in India. Therefore, GDP and PFCE in India will go together. Accordingly, GDP is co-integrating with PFCE. PFCE is also co-integrating with GDP. Hence, GDP and PFCE in India are having long-run equilibrium and stable relationship.

Table 5: VECM Test for GDP and PFCE

Vector Error Correction Estimates		
Standard errors in () & t-statistics in []		
Error Correction:	D(GDP)	D(PFCE)
CointEq1	-0.622678	0.204159
	(0.83486)	(0.31026)
	[-0.74584]	[0.65803]
D (GDP (-1))	0.809374	0.239051
	(0.76725)	(0.28513)
	[1.05490]	[0.83838]
D (GDP (-2))	-0.691169	-0.218980
	(0.61840)	(0.22981)
	[-1.11768]	[-0.95286]
D (PFCE (-1))	-0.196796	-0.074073
	(1.31355)	(0.48815)
	[-0.14982]	[-0.15174]
D (PFCE (-2))	2.137485	0.636187
	(0.95124)	(0.35351)
	[2.24706]	[1.79965]
C	-78830.69	164623.5
	(466494.)	(173362.)
	[-0.16899]	[0.94959]

Source: Researcher computed the results by using actual data.

The Vector Error Correction (VEC) model has been used to find the short-term disturbance in the long-run relationship and to identify the variable which responsible to restore the relationship between GDP and PFCE in India.

It is found from the VEC that both GDP and PFCE correct the short-term disturbances in the long-run relationship.

GDP corrects the errors within GDP by 69.12 percent and 21.9 percent with PFCE in the second year. PFCE corrects the errors within PECF by 7.41 percent and 19.68 percent with GDP in the first year.

Therefore, the short-run errors in long run relationship between GDP and PFCE will be corrected and long-run relationship will be established.

Table 6: Co-integration between GDP and GFCE

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.639788	19.15747	18.39771	0.0391
At most 1 *	0.364021	5.883659	3.841466	0.0153
Trace test indicates 2 co-integrating eqn (s) at the 0.05 level				

Source: Researcher computed the results by using actual data.

The Johansen test has used to estimate the long-run relationship between GDP and GFCE in India. It has been found from the co-integration test that the trace has identified two co-integrating equations. Means, GDP and GFGC have been co-integrating with each other. Accordingly, there has been long-run stable relationship between GDP and GFCE in India. Therefore, GDP and GFCE in India will go together. Hence, GDP is co-integrating with GFCE. GFCE is also co-integrating with GDP. Accordingly, GDP and GFCE in India are having long-run equilibrium and stable relationship.

Table 7 VECM Test for GDP and GFCE

Vector Error Correction Estimates		
Standard errors in () & t-statistics in []		
Error Correction:	D(GDP)	D(GFCE)
CointEq1	-0.111063	0.059071
	(0.14428)	(0.02224)
	[-0.76978]	[2.65553]
D (GDP (-1))	0.652592	0.037465
	(0.39934)	(0.06157)
	[1.63417]	[0.60850]
D (GDP (-2))	-0.071198	0.068561
	(0.42484)	(0.06550)
	[-0.16759]	[1.04673]
D (GFCE (-1))	0.761322	0.393623
	(1.81839)	(0.28035)
	[0.41868]	[1.40402]
D (GFCE (-2))	-2.894038	0.187938
	(2.06532)	(0.31843)
	[-1.40125]	[0.59021]
C	394542.7	-36385.19
	(248511.)	(38314.8)
	[1.58763]	[-0.94964]

The Vector Error Correction (VEC) model has been used to find the short-term disturbance in the long-run relationship and to identify the variable which responsible to restore the relationship between GDP and GFCE in India. It is found from the VEC that both GDP and GFGC correct the short-term disturbances in the long-run relationship only in the second period. GDP does correct 7.12 percent of the errors in equilibrium within the GDP in the second period. GFGC does correct 289.4 percent of the errors in equilibrium with the GDP in the second period. Therefore, the short-run errors in long run relationship will be corrected and long-run relationship will be established.

V. CONCLUSION

The present paper examined the relationship between GDP and Consumption expenditures using secondary time series data and econometric models. It has been found from the study that the GFCE, PFCE and GDP are stationary with second difference. GDP is co-integrating with PFCE. PFCE is also co-integrating with GDP. Hence, GDP and PFCE in India are having long-run equilibrium and stable relationship. GDP corrects the errors within GDP by 69.12 percent and 21.9 percent with PFCE in the second year. PFCE corrects the errors within PECF by 7.41 percent and 19.68 percent with GDP in the first year. GDP and GFCE in India will go together. Hence, GDP is co-integrating with GFCE. GFCE is also co-integrating with GDP. Accordingly, GDP and GFCE in India are having long-run equilibrium and stable relationship. GDP does correct 7.12 percent of the errors in equilibrium within the GDP in the second period. GFGC does correct 289.4 percent of the errors in equilibrium with the GDP in the second period. Therefore, income generation process and consumption processes are having strong and long-run relationship. Accordingly, there is a need to improve the consumption behavior of the people to have stronger economic process.

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