Income and Consumption Relationship in India: An ARDL Model Approach

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Abstract

The relation between income and consumption has been observed by economists for a long time. However, J K Keneys, for the first time, studied the theoretical level of the consumption behaviour and proposed Absolute Income Hypothesis (AIH) from *The General Theory* according to which the current consumption expenditure mainly depends on current income. India, being a country with diverse culture and socio economic conditions, is developing at a rapid pace with the introduction of economic reforms. A large private sector and functioning markets are subject to rigid state controls until the uncertain and gradual reforms of 1980s. In the political environments under which reforms are initiated and implemented, India continued to be open, participatory, and multiparty. This, in turn, led India to rise and can be considered to be one of the important events of the present century. This study attempts to analyse the relationship between income and consumption using the new approach of ARDL. Finally, along with long run relationship, the short term relations and structural breaks are also checked using this approach. It has also been revealed that India's consumption was significantly affected by the increase in GDP in the short and long run.

Keywords: *Income, Consumption, ARDL Bound Testing, Long-run Analysis, Short-run Analysis, India.*

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Introduction

The relation between income and consumption has been observed by economists for a long time. However, J K Keynes, for the first time, studied the theoretical level of consumption behaviour and proposed Absolute Income Hypothesis (AIH) from *The General Theory* according to which the current consumption expenditure mainly depends on current income. There is a positive and linear relation between consumption and income. In other words, it could be said that the current consumption is a stable function of current income. This aggregate relation between consumption and income is called as consumption function. This also means that as the level of national income increases, the level of the economy's consumption as well as saving increases. During the Keynesian economics, the theory of *consumption function* played an important role, and macroeconomists of 1950s and 1960s estimated the relationship between consumption and current income. With the preposition of Keynes (1936), the results were consistent for the estimation of the household consumption function. But according to Romer (2006), on an aggregate, consumption was empirically not found to be proportional to the level of "aggregate" income, which refuted the Keynesian proposition on aggregate level. Further, there were other developments and modifications in the consumption function theory and were carried out for closed economy behaviour.

Consumption accounts for around two-third of national income and is considered to be one of the important factors in macro-economic analysis and policy formulation of the government. The reason for this could be that the economy gets affected by household consumption as a whole, which behaves usually in the short as well as in the long run. Household consumption decision plays a very crucial role for short run analysis because these expenditures of households, for the most part, determine the aggregate demand which ultimately decide the levels of employment and income. At the same time, the long run consumption decision is also decisive as it is one of the determinants of the rate of growth of the economy. Consumption is driving the growth of the country (Kalyanaram, 2015). As compared to China, with consumption forming 42 percent of the GDP, India's consumption forms about 64 percent; the comparative numbers in the US, Europe and Japan are 70 percent, 58 percent and 55 percent respectively. The statistics show that India appears to be in the right mix.

India, being a country with diverse culture and socio economic conditions, is developing at a rapid pace with the introduction of economic reforms. Large private sector and functioning markets were subject to rigid state controls until the uncertain and gradual reforms of 1980s. After experiencing severe macroeconomic crisis in 1991, these became more systematic and broader, which led to a sustainable growth. In the political environment under which reforms were initiated and implemented, India continued to be open, participatory, and multiparty. This, in turn, led India to rise and can be considered to be one of the important events of the present century. It would be interesting to understand whether the development model leads to more sustainable growth in future.

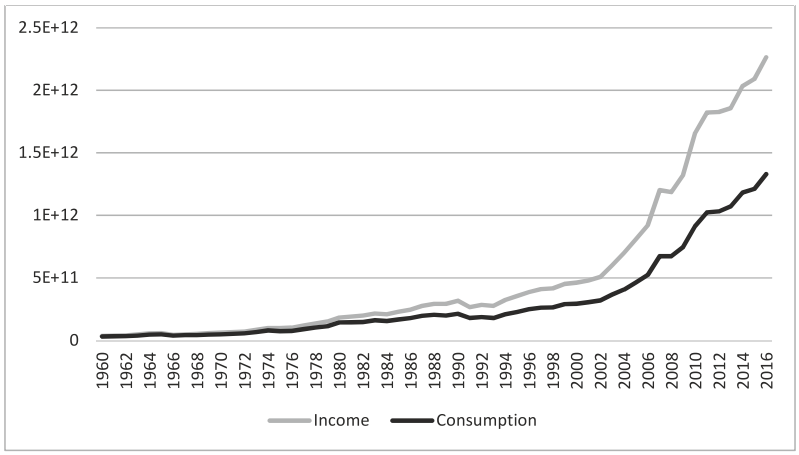

Figure 1: Dynamics of Income and Consumption in India
Source: Graph plotted based on data extracted from World Bank National Accounts Data

Evolution of Consumption and GDP in India

This section attempts to investigate the evolution of consumption and income in India during the years 1960 to 2016. Figure 1 shows the dynamics of these indictors in India. It can be depicted that after 2000 till 2008, and then 2009 to 2016, income increased at a higher rate in comparison to consumption. Fluctuation or a small decline was seen during 2008-09 because of years of crisis. This implies that consumers are saving more after 2000. The graph indicates that evolution of consumption and GDP were linear during the period 1960 to 2000 and then onwards, there was exponential growth.

It is to be noted that consumption is not adjusted by consumers in the same proportion as the shifts in the observed levels of GDP. This graph clearly shows that even if both consumption and income are increasing strongly during the period of analysis, the level of income has grown more in comparison to the level of consumption. The findings from this graph is in agreement with Keynes' remark and it can be witnessed that, with some variations, the difference between income and consumption grows along with the rising levels of income and consumption. It is apparent that an increase in the income level is tracked by increases in consumption.

To study the relation between consumption and income in the Indian economy has become a vital research problem. This study attempts to analyse the relationship between these variables for which the GDP is considered a proxy of income and household final consumption expenditure as a proxy of consumption, assuming income has a significant effect on consumption. Further, to justify whether the long-run relationship exists between these variables, the new approach of ARDL is applied. Finally, along with long run relationship, the short term relation and structural breaks are also checked using this approach.

Review of Literature

There are various studies which generated theoretical interest and, in turn, stimulated empirical work. Keynes' AIH established that current consumption expenditure only depends on current income. The value of marginal propensity to consume was less than average propensity to consume, and hence, it can be interpreted that the percentage of income saved increased with income. Later, James Tobin and Arthur Smithies, in their analysis, found that Keynes' hypothesis was true only in the short run while in the long run, the relationship between consumption and income is relatively proportional and it might be due to the influence of other factors on the long run

consumption, which was further supported by the study done by Kuznets in 1946.

According to Friedman's permanent income hypothesis (PIH), there existed a linear relation between current consumption and permanent income as opposed to current income, where the current consumption was the sum of permanent and transitory income. This implied that with short term change in income, there will not be any change in the consumption habit of consumers. This indicated that permanent income was the key determinant of the consumption function. Further, permanent income hypothesis (PIH) was given by Hall (1978) which implied that consumption followed a random walk. However, some shortcomings were observed in PIH theory. First, the permanent income variable was very difficult to be observed, and permanent income and permanent consumption make them difficult to isolate and statistically verify. Second, the determinants of permanent income were based on past experiences and expectations, and with the variation in these determinants, the permanent income changes. Third, the PIH was inconsistent with the basic laws of consumer behaviour because it assumed that there was no correlation between measured income and consumption. Fourth, there was no distinction between human and non-human wealth and contained income from both in a single term. Fifth, the PIH theory stated that all individuals' average propensity to consume (APC) were equal, irrespective of their income level, which violated the observed theory. In addition, the kinds of changes in income were not clear enough to decide whether they may be regarded as transitory or permanent.

Further, Ando and Modigliani (1963) developed Life Cycle Hypothesis (LCH) and stated that individuals planned their consumption and savings behaviour over the long term and intended to even out their consumption in the best possible manner over their entire lifetimes. According to this theory, consumption was likely to go through a life cycle similar to that of a human being. The theory assumed that a higher proportion of income was spent by the young and old generation while middle-aged people became traditional and spent a lower proportion of income. The main shortcoming of LCH was the difficulty to empirically test the hypothesis with inability to observe life cycle income. Furthermore, due to difficulty in assessing the life expectancy of a human being, it was difficult to identify the precise level of savings sufficient for their retirement period. Moreover, the theory did not elaborate the details of the age points that would signify the entry into middle age or retirement age. Also, the theory overlooked the effect of a person's behaviour and geographical location on his consumption pattern. However, LCH was considered as the most advanced in comparison to all the previously discussed theories (although with minimal empirical verifications) because it not only included assets as a variable in the consumption function, but also explained the reason for the condition MPC < APC in the short run and APC was constant in the long run.

There are various studies such as Modigliani, (1966); Davidson et.al, (1978); Ghatak, (1998); and Wen-Jen and Hsing, (1994) which focused on the different aspects of the hypothesis which included the test of linearity and co-integration between income and consumption in different countries. Past economic theories believed that income was the main factor of influencing consumption, which is, in turn, a function of demand.

Ahmad and Burney (1990), in their study, have given an alternative interpretation to Heckman's (1974) result. The study has shown that the necessary and sufficient condition to have a positive relationship between consumption and current labour income is that the elasticity of substitution between consumption and

leisure at a given age is greater than the elasticity of substitution between consumption (or leisure) at different ages. The study has also shown that the planned savings and anticipated labour income are positively correlated.

Högskola (2011) is the study on determining the relationship between GDP and consumption in China and India over the period 1978-2006. The GDP has been used as a proxy to represent income, and household final consumption as a proxy to represent consumption. ARDL (1, 1) model was used to explore the long run relation. The study has found that consumption income relation is in line with the theory. However, the relationship between GDP and consumption in China is giving a negative intercept, a negative time trend and larger than one marginal propensity to consume.

Evan Lau et al. (2011) studied the relationship between consumption of energy and GDP using the panel estimation for seventeen Asian countries. The authors identified that variables were in a stationary fashion in their first differences or were in I (1) process and revealed that there exists long-run positive equilibrium association among the variables.

Alimi (2013) conducted a study in Nigeria for the period 1970-2011 and tested the Keynesian absolute income. The data was analysed using least square model for the analysis of both MPC and APC and revealed that APC decreased with an increase in income, but in the long run, MPC was not stable. Ofwona (2013) conducted a similar kind of study between household consumption and income during 1992-2011 and revealed that in Kenya, the consumption function is determined by the Absolute income hypothesis.

Diacon and MAHA (2015) attempted to analyse the time-series cross-section data to investigate the co-integration relationship between consumption, income and GDP per capita (as a proxy of the level of standard of living). The panel data covered a large sample during for a period of 31 years, from 1980 to 2010 with a pool of 79 countries with three divisions based on income level of low, middle and high. The results of the study revealed that there was a stronger association between consumption and income in low and high income countries compared with middle income countries.

Chaudhary (2016), in the paper, has estimated the aggregate consumption function for Nepal using ARDL approach to co-integration analysis, developed by Pesaran et al. (1997 & 2001) for the time period of 1975 to 2015. The model has revealed the existence of long run association among the selected variables. Real income, exchange rate, interest rate and inflation rate are significant determinants of short run and long run real aggregate consumption function in Nepal. The elasticity coefficient of real income has been found higher, while coefficient of other variables is low but significant. Thus, this study has further confirmed the existence of strong income consumption relationship in Nepal.

Tursoy and Resatoglu (2016) investigated the relationship between energy consumption, gross domestic savings and gross domestic income of G7 countries, which include Canada, France, Germany, Great Britain, Italy, Japan and USA. Authors have adopted ARDL-bounds testing approach for the time series data from 1970-2012. The study showed that for determining the short run and long run behaviour of energy consumption per capita in these countries, a strong evidence of growth rate of income and gross domestic savings play a stronger role. The analysis of the study suggested that there was a positive relation between consumption per capita and gross domestic income in most of the countries. The results were in accordance with theory of Keynes of marginal

propensity to consume, which confirmed the absolute income hypothesis. On the other hand, there was a negative relationship between gross domestic savings and the energy consumption per capita. Hence, the relationship of consumption as a function of difference of income and savings in the long run was confirmed.

Akekere and Yousuo (2012) conducted research with the objective to examine the impact of change in income on Private Consumption Expenditure in Nigeria during the period 1981 to 2010. The analysis of the data was conducted using Ordinary Least Regression techniques and showed a positive significant impact of Gross Domestic Product /income on Private Consumption Expenditure. The results confirmed to the priori expectation, but the application of OLS technique was not statistically adequate and robust for the analysis and their work got nullified.

Mallik and Pradhan (2012) analysed the causal relation using Granger Causality between per capita consumption expenditure and personal income in India. The authors further applied Koyck approach to estimate the time period for adjustment of percapita personal consumption expenditure on personal disposal income for the period 1950 to 1993. The results showed a unidirectional causality run from per capita consumption expenditure to personal disposal income. The Koyck Model indicates that per capita personal consumption expenditure is regulated by personal disposal income within a comparatively long period of time. This indicated that people in India spent a major part of their income on consumption expenditure.

Ayeni and Akeju (2017) in their study empirically verified the dynamic relationship between consumption expenditureand income in Nigeria. The study was based on the experimentation with two major income hypotheses, the habit persistence and permanent income hypotheses. The analysis was conducted on the time series data in Nigeria for the period 1980 – 2014 which included the variables per capita personal consumption expenditure (PPCE) and per capita disposable income (PPDI). The results revealed that there was an average high speed of the short-run adjustment of consumption expenditure to changes in disposable income. This further indicated that consumption habits were rapidly adjusted to changes in disposable income. The results of the ARDL bound testing co-integration indicated that the long-run multiplier effect of marginal propensity to consume out of permanent income and showed that consumers save more than they spend in Nigeria.

Au and Yeung (2018) studied whether there exist short-run and long-run co-movement relationships between incomes and various consumption expenditure variables. Authors used the co-integration and common cycle analysis to detect the long-run co-movements between income and five types of consumption variables. The results provided supporting evidence for the common belief that income drives consumption in the long-run.

Damane (2018) in a study done on Lesotho, has further confirmed the existence of Keynesian theory of consumption as well as the existence of the life cycle permanent income hypothesis. Thus, the fact that income has a significant effect on consumption was further confirmed in the study.

Review of the literature throws light on the empirical study of the relationship between private consumption and a select group of other variables across developed and developing countries resulting in varied results. The results are different considering the differences in periods, region and methodologies used in the study. Majority of the studies concluded that there exists a positive relationship between consumption and income; it is negative between

consumption and inflation. Although, in general, there are many factors that may influence consumption, in this study, there is focus on the relationship between income and consumption, which is known as consumption function. It is the intention of the study to fill this gap in the literature. This study is an attempt to identify whether there exists a long run or short run relationship between these variables in case of India for the period 1994-2016.

Methodology

The data

The study's intent was to investigate the relationship between private consumption, national disposable income, annual time series data of GDP and household final expenditure consumption data for the time period 1994-2016. The data are collected from *World Bank National Accounts Data.* This study uses the logarithm of Gross Domestic Product (GDP) as a proxy to represent income (x) and the logarithm of household final consumption as a proxy to represent the consumption expenditure (y). As per Yu (2011), variable GDP is the total value of all final goods and services produced in a country in a given year, which is equal to total consumption, investment and government spending, plus the value of exports, minus the value of imports. Household final consumption expenditure (formerly private consumption) is a transaction of the national account's use of income account representing consumer spending. It consists of expenditure incurred by resident households on individual consumption of goods and services.

The Model

Past literature on time series empirical work assumed that the underlying time series was stationary and in case it was found to be non-stationary, the results were likely to be spurious. To overcome this problem of non-stationary time series, the first differenced variables are used. But, this may lead to elimination of the long run information from data set and merely provides short run information. To resolve this problem, the model is required to be tested first to determine whether long-run relationship exists among variables. There are varied techniques available to test for the existence of long-run equilibrium relationships in the levels among variables, which is mainly based on the use of co-integration techniques. The most commonly used techniques are the two-step residual-based procedure for testing the null hypothesis of no co-integration. Engle-Granger (1987) test, Johansen and Juselius (1990) tests and Johansen (1996) have provided full information for the maximum likelihood co-integration approach. The basic requirement for these techniques is that the variables should be integrated of order one which involves a certain degree of pre-testing, thus introducing a further degree of uncertainty into the analysis of levels relationship. Small samples, being another drawback, the Engle-Granger (1987) test and Johanson and Juselius (1990) methods are not reliable in such case.

In order to keep away from these problems, this paper has applied a relatively new approach to test the existence of a relationship between variables in levels. This technique is generalized by Pesaran and Pesaran (1997), Pesaran and Smith (1998), Pesaran and Shin (1999) and (Pesaran *et al,* 2001) and the technique is called Autoregressive Distributed Lag model (ARDL). The ARDL-bound testing approach was also applied by Tursoy and Resatoglu (2016) for estimating the short run and long run effect of savings and income on energy consumption in G7 countries. The ARDL model is preferable to the other co-integration methods because it does not involve the pre-testing of variables.The Error Correction Model (ECM) can be derived from ARDL model by a simple linear transformation (Banerjee *et al,* 1993). Another reason is the small sample properties of ARDL method (such as this study) are more robust and performs better to that of Johansen and Juselius's co-integration method (Pesaran and Shin 1999).

In order to test the existence of long run relationship, Pesaran, Shin and Smith (2001) developed an estimation model, the bounds test. This approach is used to test the existence of a level relationship among variables based on F test. To implement bound test, modelling (1) is used as a conditional ARDL-ECM:

$$\Delta y_t = \alpha + \sum_{j=1}^{n} \beta_j \Delta x_{t-j} + +\partial_1 y_{t-1} + \partial_2 x_{t-1} + e_t \quad (1)$$

Where α is drift component, e_t is white noise error, y_t represents consumption and x_t represents GDP.

Hypothesis

Null Hypothesis for this study is that there is no co-integration between GDP and consumption through the observed years of 1994 to 2016.

$$H_0: \delta_1 = \delta_2 = 0 \quad (2)$$

$$H_1: \delta_1 \neq \delta_2 \neq 0 \quad (3)$$

Null hypothesis in eq. (2) states that there is no co-integration between GDP coefficient and consumption coefficient, while the alternative hypothesis states that there is a significant long run relationship between these coefficients and it is expected that these coefficients of GDP and consumption are co-integrated in this paper.

Results

***Stationary Test*:** As referred by Nkoro and Uko (2016), the basic assumption for the application of ARDL bounds test is that the variables should not be integrated of order two and it can be either I(0) or I(1). So, before applying ARDL test, it is required to determine the order of integration of all variables using the unit root test to ensure that the variables are not I(2) so as to avoid spurious results. In the presence of variables integrated of order two, the values of F statistics provided by Pesaran et al. (2001) cannot be interpreted. As explained by Dickey and Fuller (1976 and 1981), the standard Augmented Dickey-Fuller (ADF) unit root test was applied to confirm the order of integration of GDP and Consumption variables. The findings of the unit root tests using ADF test are presented in Table 1. Referring to the ADF test statistic, it was found that log(GDP) and log(Consumption) do not have a unit root taking first difference, i.e. both the series are integrated of order one I(1). Noticeably, it has been tested that the series under test is not integrated of order two I(2). ARDL bound test approach is implemented with both the series integrated of order one I (1), as proposed by Pesaran *et al*. (2001).

Table 1: Augmented Dickey Fuller Test

Series	Null Hypothesis (H_0)	t-statistic	Probability	Decision
Log(GDP)in level	H_{01}:Log(GDP) has unit root	0.482376	0.9846	Accept H_{01}
Log(GDP) 1st Difference	H_{03}:D(Log(GDP)) Series has unit root	**-6.7864***	**0.0000**	**Reject H_{01}**
Log(consumption) in level	H_{02}:Log(consumption) Series has unit root	-1.1090	0.7058	Accept H_{02}
Log(consumption) 1st Difference	H_{04}: D(Log(consumption)) Series has unit root	**-10.114***	**0.0000**	**Reject H_{02}**

Source: Author's calculation using Microfit Ver. 5 Software.
*Note: *significant at 1% level of significance.*

ARDL Bound Test for co-integration:

To empirically analyse the long-run relationships and short run dynamic interactions among the variables of interest (income and consumption), the autoregressive distributed lag (ARDL) co-integration technique is applied and equation (1) is estimated using OLS procedure to examine the presence of long run relationship between consumption and GDP. The

result of the bound test as shown in Table 2 revealed that the computed F-statistic 12.06781 is significant, which is higher than the upper bound critical value (7.84) at 1 percent level of significance, using the unrestricted intercept and unrestricted trend.

Table 2: ARDL: Co-integration Test Results

Bound test for co-integration					
Critical value bounds of the F statistic: unrestricted intercept and unrestricted trend					
90% level		**95% level**		**99% level**	
I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
4.04	**4.78**	**4.94**	**5.73**	**6.84**	**7.84**
F statistic	**12.06781**				
Sample Size	**18**				
K is the number of regressors: 4					

Source: Author's calculation using Eviews 8.0

The result implies that null hypothesis of no co-integration was rejected at 1 percent level of significance and there exists co-integration between the GDP and consumption in India. There can be at least long run or short run relationship between GDP and Consumption.

Long Run Analysis

To check the stability of the long-run and short-run model coefficients, the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) tests are applied. The results of CUSUM and CUSUMQ tests are presented in Figures 1 and 2 which show that the CUMSUM of recursive residuals and CUSUMSQ of recursive residuals are within the critical bonds which imply that all coefficients in the ARDL model are stable in India during the sample period. As can be seen from Figures 2 and 3 that the blue line is not crossing the green and the red line; hence, there is no issue of recursive residuals in terms of mean (Figure 2: CUSUM chart) and in terms of variance (Figure 3: CUSUMSQ chart) so the steps can be processed further.

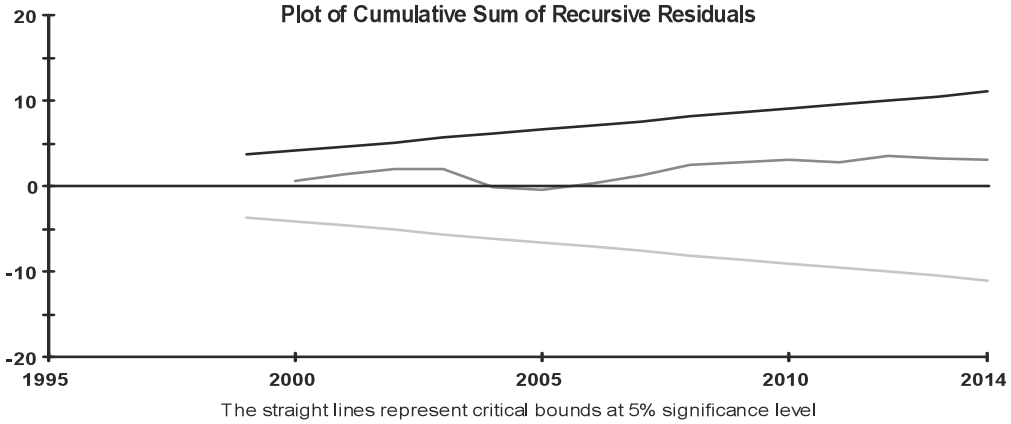

Figure 2: CUSUM graph

Source: Author's calculation using Microfit Ver. 5 software

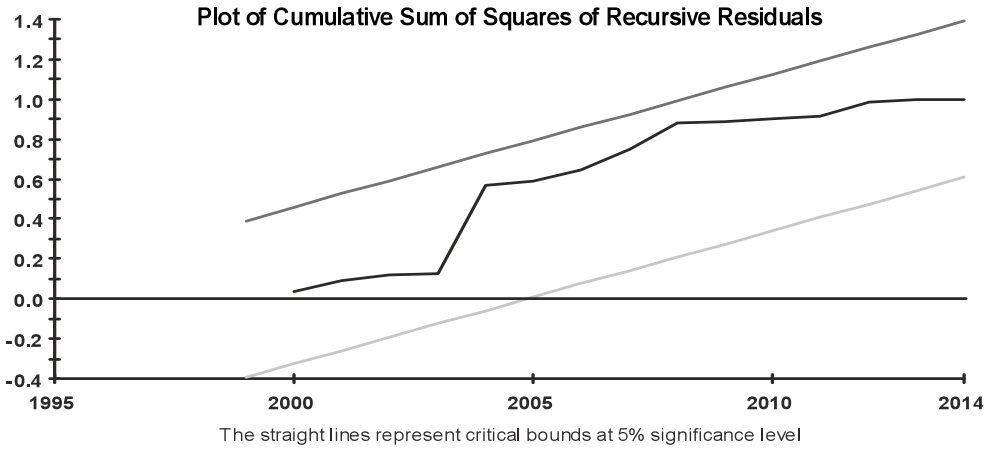

Figure 3: CUSUM of Squares graph

Source: Author's calculation using Microfit Ver. 5 software

The results of long run relationship reveal that t-statistic is 138.94 which is significant at 1 percent level of significance and hence, the null hypothesis of no co-integration in the long run is rejected. Hence, there exists co-integration in the long run between the variables GDP and consumption, and the model is a good fit. The result can be written as follows:

$$\Delta Ly_t = .3669 + 0.9529\ \Delta Lx_t \qquad (4)$$

t values 4.53 138.94

prob. .0007 .0000

Here Δ and L represent the first difference operator and log respectively. On the other hand, the stability of the long-run coefficient is tested by the short-run dynamics which is estimated using error correction model.

The results are in line with those found by Mishra (2011). The author has applied causality test of error correction model; the result indicated a long run relationship between real private consumption expenditure and economic growth; however, there was no short-run relation between these variables. Further, Amin (2011) has examined the relation between income and consumption for Bangladesh. The results of ARDL and granger causality tests indicated that a long run unidirectional causal relationship, running from economic growth to consumption expenditure, exists for Bangladesh.

Short Run Analysis

According to Damane (2018), the Error Correction Model (ECM) captures the speed of adjustment necessary to restore equilibrium in the dynamic model given a shock to the system in the previous period. The coefficient for this term should be of negative sign and statistically significant. According to Bannerjee et al. (1998), the highly significant error correction term further confirms the existence of a stable long-run relationship. For this study, from eq. (5), the value of ECM(-1) is negative and significant at 1 percent level of significance. The coefficient of ECM = -.80, implying that deviation from the long-term growth in consumption is corrected by 80% by the following year. As ECM is significant with t = -22.39 and

$$\Delta Ly_t = 0.76\Delta Lx_t + 0.0016\Delta t - 0.80ECM(-1) \quad (5)$$

t values	22.5	1.45	- 22.39
prob	0.001	0.167	0.001

The estimated model reflects a fairly high level of goodness of fit, as shown in the adjusted R^2 value 0.99. The results of the study confirm that there exists both long run and short run relationship between income and consumption. It can be clearly seen that the data which has been analysed in this study involves fairly longer period of almost 20 years.

This study highlights that the marginal propensity to consume in context of India is very high at 0.95 indicating that Indian consumption expenditure like a developed country in the long run is growing very fast, but it might also create some problems in the economy. The results clearly indicate that consumption is increasing, which means that savings are falling. This can be problematic for the country since it is still in the phase of economic development. To sustain growth in the long run, we need to promote the habit of saving, which can be used to fund investments required for growth. This raises an important policy implication - the Government should not promote only consumption but also focus on savings which is the base for investment and necessary capital formation in the country. This study thus adds value to the existing literature in terms of new technique, that is, use of the ARDL method and also provides robust results as the standard error for the coefficient marginal propensity to consume is quite less and the model chosen satisfies all the four model selection criteria - Log likelihood, AIC, BIC and Adjusted R^2 (Refer detailed results in Annexure). The study of Aggregate Consumption function is significant because changes in the parameters, especially Marginal propensity to consume, have important policy implications.

Conclusion

The objective of this study is to examine the relationship between GDP and consumption for India for the period from 1995 to 2016. The relationship between these variables has been explored by different researchers in different ways using varied statistical and econometrical tools. This study is based on the technique called Autoregressive Distributed Lag (ARDL) for India. To check the stability of coefficients in mean and variance, CUSUM and CUSUMSQ of Squares stability test was applied and the result indicates that all coefficients in the ARDL model are stable. It has also been revealed that India's consumption was significantly affected by the increase in GDP in the long run as well as in the short run. Thus, it can be seen that India's marginal consumption propensity has crossed the 0.9 mark and has reached a new high of 0.95. This means that the savings rate has fallen considerably. Thus, India needs to promote savings to further investments and achieve capital formation and GDP growth.

Limitations

This study assumed that consumption only depends on GDP; further, the time period covered was 1994 to 2016 to analyse the relationship between variables. In reality, consumption is likely to be affected by other factors also. Thus, the limitation of the variables and the country specification can hopefully be further explored by considering other variables, which are likely to affect consumption. Research on the relationship between GDP and consumption can be extended and compared with other countries; other factors can also be added to further research the consumption function. The consumption function can be estimated for other developing countries so that the varying MPC hypothesis can be further examined as well. And hopefully, new and more important results can be achieved.

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Annexure

Dependent Variable: LOG_CUNSM_
Method: ARDL
Date: 07/07/18 Time: 16:43
Sample (adjusted): 1999 2016
Included observations: 18 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LOG_GDP_
Fixed regressors: C
Number of models evalulated: 20
Selected Model: ARDL(4, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG_CUNSM_(-1)	-0.019779	0.062356	-0.317190	0.7566
LOG_CUNSM_(-2)	0.057303	0.061073	0.938258	0.3666
LOG_CUNSM_(-3)	0.044381	0.061870	0.717332	0.4869
LOG_CUNSM_(-4)	0.117801	0.046133	2.553512	0.0253
LOG_GDP_	0.762674	0.034274	22.25220	0.0000
C	0.293687	0.066386	4.423937	0.0008
R-squared	0.999659	Mean dependent var		11.79486
Adjusted R-squared	0.999517	S.D. dependent var		0.237681
S.E. of regression	0.005225	Akaike info criterion		-7.409424
Sum squared resid	0.000328	Schwarz criterion		-7.112633
Log likelihood	72.68482	Hannan-Quinn criter.		-7.368501
F-statistic	7032.428	Durbin-Watson stat		1.544307
Prob(F-statistic)	0.000000			

**Note: p-values and any subsequent tests do not account for model selection.*

ARDL Bounds Test
Date: 07/07/18 Time: 16:51
Sample: 1999 2016
Included observations: 18
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	12.06781	1

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	4.04	4.78
5%	4.94	5.73
2.5%	5.77	6.68
1%	6.84	7.84

Test Equation:

Dependent Variable: D(LOG_CUNSM_)

Method: Least Squares

Date: 07/07/18 Time: 16:51

Sample: 1999 2016

Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_CUNSM_(-1))	-0.935973	0.253935	-3.685874	0.0031
D(LOG_CUNSM_(-2))	-0.891688	0.244809	-3.642383	0.0034
D(LOG_CUNSM_(-3))	-0.515023	0.223528	-2.304068	0.0399
C	2.094011	0.461296	4.539407	0.0007
LOG_GDP_(-1)	3.638736	0.748436	4.861785	0.0004
LOG_CUNSM_(1)	-3.877118	0.794627	-4.879166	0.0004

R-squared	0.681552	Mean dependent var	0.038960
Adjusted R-squared	0.548865	S.D. dependent var	0.029348
S.E. of regression	0.019712	Akaike info criterion	-4.753980
Sum squared resid	0.004663	Schwarz criterion	-4.457189
Log likelihood	48.78582	Hannan-Quinn criter.	-4.713056
F-statistic	5.136548	Durbin-Watson stat	2.265160
Prob(F-statistic)	0.009490		

ARDL Cointegrating And Long Run Form

Dependent Variable: LOG_CUNSM_

Selected Model: ARDL(4, 0)

Date: 07/07/18 Time: 16:44

Sample: 1995 2016

Included observations: 18

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_CUNSM_(-1))	-0.219485	0.043620	-5.031753	0.0003
D(LOG_CUNSM_(-2))	-0.162182	0.044323	-3.659086	0.0033
D(LOG_CUNSM_(-3))	-0.117801	0.046133	-2.553512	0.0253
D(LOG_GDP_)	0.762674	0.034274	22.252198	0.0000
CointEq(-1)	-0.800294	0.035741	-22.391742	0.0000

*Cointeq = LOG_CUNSM_-(0.9530*LOG_GDP_ + 0.3670)*

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_GDP_	0.952993	0.006859	138.938635	0.0000
C	0.366974	0.081008	4.530083	0.0007

Model Selection Criteria Table
Dependent Variable: LOG_CUNSM_
Date: 07/07/18 Time: 16:52
Sample: 1995 2016
Included observations: 18

Model	LogL	AIC*	BIC	HQ	Adj. R-sq	Specification
5	72.684816	-7.409424	-7.112633	-7.368501	0.999517	ARDL(4, 0)
16	73.676557	-7.408506	-7.062251	-7.360762	0.999528	ARDL(1, 4)
11	73.723485	-7.302609	-6.906889	-7.248045	0.999483	ARDL(2, 4)
4	72.684820	-7.298313	-6.952058	-7.250569	0.999473	ARDL(4, 1)
3	73.291899	-7.254655	-6.858935	-7.200091	0.999458	ARDL(4, 2)
14	70.093622	-7.232625	-6.985299	-7.198522	0.999405	ARDL(2, 1)
18	69.980972	-7.220108	-6.972782	-7.186005	0.999398	ARDL(1, 2)
2	73.971982	-7.219109	-6.773923	-7.157724	0.999441	ARDL(4, 3)
19	68.924466	-7.213830	-7.015969	-7.186547	0.999371	ARDL(1, 1)
6	73.855412	-7.206157	-6.760971	-7.144772	0.999434	ARDL(3, 4)
9	70.624276	-7.180475	-6.883684	-7.139552	0.999392	ARDL(3, 1)
17	70.589289	-7.176588	-6.879797	-7.135664	0.999390	ARDL(1, 3)
13	70.113178	-7.123686	-6.826896	-7.082763	0.999357	ARDL(2, 2)
1	74.003495	-7.111499	-6.616848	-7.043294	0.999374	ARDL(4, 4)
12	70.826453	-7.091828	-6.745572	-7.044084	0.999352	ARDL(2, 3)
10	68.779108	-7.086568	-6.839242	-7.052465	0.999311	ARDL(3, 0)
8	70.655119	-7.072791	-6.726535	-7.025047	0.999339	ARDL(3, 2)
7	70.956180	-6.995131	-6.599410	-6.940567	0.999297	ARDL(3, 3)
15	64.207947	-6.689772	-6.491911	-6.662490	0.998937	ARDL(2, 0)
20	59.499595	-6.277733	-6.129338	-6.257271	0.998327	ARDL(1, 0)

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