



# Urbanization, Household Savings, and Environmental Sustainability: Investigating the cointegrating relation in Indian Context

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**Abstract:** The study makes an attempt to understand the dynamic relation between urbanization, household savings, and environment in Indian context using popular co-integration model, ARDL. The study collects data for fifty years [1975-2024] on three variables viz. ecological footprint per capita, urban population as a % of total population and gross domestic savings which is then log transformed for subsequent analysis. Furthermore, the study incorporated single structural break in the ARDL model thus making the same as quasi linear. To strengthen the results, the study carried out additional test for long run; Dynamic OLS [DOLS]. The study results showed both Urbanization and Domestic Savings were impacting EFP significantly, besides all the three variables were found to be co-integrated with variables showing fast correction while moving towards long run equilibrium. The dummy incorporated for detecting structural breaks identified 2002 as the year of break. Further, all the model pre-requisites including serial correlation, variable redundancy and model stability were examined, and these were found to be within limits. The results of the study have a number of implications, first the proving of a long-term relation suggests that the process of urbanization and the patterns of household savings for India are not isolated hence requires a joint action, second the policy makers aiming to target environmental issues may instead focus on other variables included as a part of co-integration chain i.e. urbanization and domestic savings. For urbanization, smoother finance for housing with concentration on green buildings must be the key drivers while for domestic savings, the same must be redirected towards measures focused towards urban development.

**Keywords:** Environmental Sustainability, ARDL Co-integration, Structural Breaks, Dynamic OLS, Error Correction, Wald Statistics.

## 1 Introduction

Urbanization in simple words is a process by which a society transforms from a predominantly rural and agricultural economy to one that is urban, industrial, and service-oriented. Many people link the term to the growth of cities, the migration of

people from rural to urban and a shift in employment and lifestyle patterns toward non-agricultural activities. [1] [2].

Even though urbanization generates a wide range of socio-economic benefits, including enhanced employment opportunities, higher income levels, and improved standard of living, it also brings a range of challenges such as inadequate sanitation, housing shortages, and growing pressure on the environment. Urbanization is often accompanied by rising energy consumption, increased carbon emissions, and intensified pressure on scarce resources, all of which contribute to environmental degradation and therefore globally a need is strongly felt for urbanization which could be sustainable.

Again, urbanization shall be sustainable when it is able to meet the demands of existing city dwellers in terms of housing, transport, infrastructure, social equity and environmental health. Environmental health is further achieved through quality air, clean water, solid waste management through recycling and other measures and meeting energy requirements by switching to renewable energy sources. Furthermore, sustainability must ensure that while meeting these demands of existing city dwellers, the needs of future generations are not compromised. The term, sustainable urbanization is of recent origin, and this was first mentioned in Agenda 21; Chapter 7 which talked about promotion of Sustainable Human Settlements [3].

Further, Urbanization is also closely related to consumption and savings of the people living in urban areas. Urbanization is known to alter domestic savings patterns, with a significant portion being directed toward urban infrastructure and housing. In fact, housing demand and ownership absorb most domestic savings in urbanized economies, which also plays an important role in influencing the environmental landscape.

Thus, there appears to be a strong linkage between urbanization, domestic savings, and environmental sustainability, however as seen later under literature review, the area has not been fully explored by the researchers. Considering the above, the present study therefore seeks to investigate this interrelationship by applying select econometric tools to provide a deeper insight into the underlying mechanism of such a relation.

The study collects data for fifty years [1975-2024] on three variables viz. ecological footprint per capita [a proxy for environment], urban population as a % of total population [a proxy for urbanization] and gross domestic savings [a proxy for household savings] from India which is then log transformed to take care of outliers and skewness in raw data. Furthermore, among the various environmental proxies such as CO<sub>2</sub>, SO<sub>2</sub>, and other single point indicators, the study adopts ecological footprint as it encompasses multiple dimensions of environmental pressures, ranging from carbon emissions and land use to resource consumption, thereby providing a more comprehensive assessment indicator of sustainability. The sources of data include world development indicators [<https://databank.worldbank.org>] and global footprints

network. Table 1 provides summary information on the variables along with their unit of measurement.

**Table 1.** Summary Information of the Variables included and their sources of data

Sr No.	Name of the Indicator/ Notation used	Unit of Measurement	Source of Data
1	Ecological Footprint [EFP]	Global Hectares per capita	Global Footprints Network GFN [2025]
2.	Urbanization [URB]	Urban population [% of total population]	World Development Indicators
3.	Gross Domestic Savings [DS]	Gross Domestic Savings [in US \$]	World Development Indicators

The econometric model considered under the study is popular co-integration model, ARDL with single structural break. The need to consider such a model is because of the advantages it offers in terms of single equation modelling which is applied after selecting the appropriate lags. Moreover, the model works at both I [0] and I [1] and is most suitable when working on annualized data [4]. Further, incorporating a break in the ARDL model was felt as some studies [5] [6] had shown that the relation between environment, urbanization and domestic savings was non-linear and therefore the same was taken care of under the study by including a structural break, details of the same are discussed under methodology section.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature. Section 3 details the research methodology and presents the equations used for empirical testing. Section 4 discusses the empirical results, accompanied by the corresponding tables and their interpretations. Section 5 concludes the study by summarizing the key findings and providing policy implications. The paper ends with a list of references.

## 2 Literature Review

Under the literature review, we examine existing studies that explore the relationship amongst Urbanization, Savings, and the Environment. Upon reviewing the available literature, it becomes evident that the existing studies can be broadly categorized into two groups: the first focuses on the relationship between Urbanization and the Environment, while the second explores the link between Savings and the Environment.

### 2.1 Urbanization and Environment

Studies examining the relation between urbanization and environment include a paper by [7] where they showed that for China [period 1996 to 2012] there was unidirectional causal-effect relation moving from urbanization to emissions. Further their research also proved that for 1 % increase in urbanization, there was a rise of 2.9 % direct and

1.1 % indirect carbon dioxide emissions of households. In another study, [8] took a sample of West African countries for the period 1991–2018, and their results showed that there were bi-directional causal effects between urbanization and environmental degradation. Similarly, [9] in their study also showed a positive relation existed between emissions and urbanization for Malaysia.

On the other hand, studies from some of the developed economies have shown variable urbanization also does have a favourable impact of environment and one such study was carried out by [10] which was restricted to US markets and study found that population density played an important role in emissions and their study showed that the same was responsible for per capita emissions in urban areas to be lower by 20 % as compared to rural emissions. Their study also showed that emissions were also strongly related to number of household family members and there was an incremental fall in emissions with the addition of additional members to a household which according to their study was a fall of approximately 6%. Again, [11] in their study applied panel regression with generalized least squares on OECD nations to evaluate effect of urbanization on emissions and results showed that inverted U-shaped relation [EKC Curve] could be seen between urbanization and carbon emissions. Then a study by [12] picked up 100 US cities and showed that urban environmental sustainability was being enhanced in many of these cities through efficient waste management, sustainable means of transport and efficiency in energy utilization and shift towards renewable energy. The study also found that the metrics developed for sustainable cities played an important role in enhancing the sustainable efforts of each city.

Some studies have shown that Urbanization also results in income inequalities which in turn increase carbon footprints and one such study was carried out by [13] where they tried to identify reasons which could ensure the rise in average global temperature to remain within 1.5 degrees Celsius as compared to the same during beginning of industrial revolution [around 1900]. Their study showed that income inequalities, household size and socio-economic conditions impacted time use by households and were the key contributors to increased carbon footprints especially in urban areas. The study recommended strict monitoring with targeted interventions and also specially designed policy measures like flexibility in work patterns, planning reforms for urban areas, collaborative consumption amongst others for long term reduction in carbon footprints. Again, in another study by [14], the researchers showed that rise in incomes results in more life satisfaction and higher energy consumption. The same study also tried to develop a relation between purchase of energy savings devices due to income rise to GHG reduction. The study was based upon an online survey across 37 countries and results which were based upon OLS and logit model techniques and results failed to establish any direct linkages between purchase of energy savings devices and GHG reduction, however the results could prove that people with increased incomes were ready to follow energy curtailment behavior.

## 2.2 Savings and Environment

The second part of the literature review examines studies on the relation between savings and environment, and our research revealed that very few studies have explored this dimension with most studies considering spending and consumption rather than savings as a variable and testing its relation against environment degradation.

The few studies available have tried to answer the following questions: first, whether savings lead to less or more environmental degradation. The studies exploring this aspect have shown that higher household savings are typically associated with lower emissions and the reason for this is income-savings relation, which translates to lower consumption, resulting in less spending on energy and transport leading to lower environmental degradation. A study by [15] which was carried out on developing economies revealed how savings were linked to emissions and their results revealed that national savings was associated with mitigation of environmental degradation in these countries especially in the long run. On the other hand, some researchers have, however, found the contrary to be true. i.e. savings increase environmental degradation as households use the money saved for leisure, buying vehicles and energy intensive houses thereby generating higher environment load.

The second question answered in research studies is: Does risk of future environmental degradation cause any change in behaviour of people towards savings? The studies exploring this dimension have focused on the fear factor of worsening environmental degradation which induces people to save more for future health benefits and such studies include [16] where they showed a positive relation exists between household savings and air pollution in cities of China. Their findings pointed out that to overcome increased risks and costs of urban air pollution, households save more and the nature of savings was precautionary savings. Then, in an interesting survey carried out by [17] households in nine OECD countries revealed that decisions made by the households with respect to environment are based upon three simple principles viz. convenience, availability and affordability.

Thus, the literature review tells us that although previous studies have examined the relationship between urbanization and environmental quality, and separately between savings and environmental outcomes, the combined interaction of these three variables has received limited attention. This creates a research gap in understanding how urbanization and savings jointly influence by having a compounded effect on environmental sustainability.

The study therefore plans to answer the following research questions

- (i) What is the nature and direction of relation between urbanization, savings, and environmental quality?
- (ii) Do both variables, urbanization and domestic savings impact environment in India?
- (iii) Is there evidence of a long-run cointegrating relationship among urbanization, savings, and environmental quality?

- (iv) Do structural breaks affect the stability of this relationship over time?
- (v) What policy insights can be derived from empirical findings?

### 3 Methodology

Keeping into consideration, the research questions listed above we develop the methodology under the study. We first outline the methodology for testing cointegration, followed by the alternate approach for identifying long term relation, identifying the structural breaks in model, and finally, we discuss the model diagnostic procedures

#### 3.1 Model Representation [ARDL with Single Structural Break]

The section discusses the ARDL Co-integration Model with single structural break and for the variable EFP, model representation for the same is given as eq.[i] below.

$$\Delta \ln.EFP_t = \beta_1 + \beta_1^\# D_t + \beta_{2,i} \ln.EFP_{t-1} + \beta_{3,i} \ln.URB_{t-1} + \beta_4 \ln.DS_{t-1} + \sum_{m=1}^{r_1} (\beta_5 \Delta \ln.EFP_{t-m}) + \sum_{m=0}^{n_1} (\beta_6 \Delta \ln.URB_{t-m}) + \sum_{m=0}^{n_1} (\beta_7 \Delta \ln.DS_{t-m}) + u_{1,t} \dots(i)$$

For eq. [i];  $\Delta \ln.EFP_t$  is the logarithms change in variable EFP which has been considered as the dependent variable, with ‘t’ being the time period, ‘ $\beta_1$ ’ as the intercept while ‘ $[\beta_1]^\#$ ’ is the slope coefficient of Intercept Dummy [ $D_t$ ] reflecting structural break of the Dependent Variable, EFP. The break incorporation converts our ARDL to a nonlinear model which supports a proven relation between environment, urbanization and domestic savings as discussed earlier. To identify the break, study applies [18] methodology, details of the same given under subsequent sections. The Dummy Variable representing the break is [ $D_t$ ] and takes the value as {1 if  $t \geq BD$  0 if  $t < BD$ ;  $BD$  being Break Date as identified for dependent variable EFP.

Moving to coefficient ‘ $\beta_2$ ’ which represents the slope coefficient of first lag of EFP, while ‘ $\beta_3$ ’, and ‘ $\beta_4$ ’ are the slope coefficient of first lag of two independent variables Urbanization (URB) and Domestic Savings (DS). All independent variables at first lag together with dependent variable EFP make up the long-term relation under ARDL. The next term in eq.(i) is  $\sum_{m=1}^{r_1} (\beta_5 \Delta \ln.EFP_{t-m})$  which depicts log change in dependent variable EFP and has been included as a regressor. The term sums up till ‘ $r_1$ ’ where ‘ $r_1$ ’ is the number of lags determined by lag selection criteria SC. Similarly, we do the same for urbanization and domestic savings; the two independent variables; for urbanization the term is  $\sum_{m=0}^{n_1} (\beta_{6,i} \Delta \ln.URB_{i,t-m})$  ‘ $n_1$ ’ being the SC determined lags for Urbanization. Further since no. of observations are 50, the study placed a restriction of Max ‘2’ lags for both dependent and independent variables. All log change terms collectively make up the short run relation with the dependent variable. Finally, the  $u_{1,t}$  is the stochastic error term of eq. (i).

**3.2 Error Correction under ARDL**

The error correcting equation under ARDL shows the adjustment mechanism when short run disequilibrium gets corrected in long run. The equation for the same is given as eq [ii] below.

$$\Delta \ln EFP_t = \gamma_1 + \gamma_2 \ln ECM_{t-1} + \sum_{i=1}^n (\gamma_{3,i} \Delta EFP_{t-i}) + \sum_{i=0}^n (\gamma_{4,i} \Delta URB_{t-i}) + \sum_{i=0}^n (\gamma_{5,i} \Delta DS_{t-i}) + u_{2,t} \dots \dots [ii]$$

In eq [ii] above,  $ECM_{t-1}$  is the first lag coefficient of residuals obtained by running equation of long run variables, while rest of the variables are the same as included in eq [i]. The term  $ECM_{t-1}$  assumes importance as it reflects speed at which short run disequilibrium gets corrected in long run and this coefficient must be negative and statistically significant.

**3.3 Identification of Structural Break through Zivot and Andrews [1992] test**

The structural break was incorporated in our ARDL Model by applying Zivot and Andrews [ZA] [1992] methodology on raw prices. Additionally, the same test also provides whether the variable is stationary at I [0] or I [1], an important consideration for ARDL Model. Out of the three variants given by ZA, we consider the mean variant which detects break at the intercept level and the equation for the same for our dependent variable EFP is given as eq.[iii]

$$\Delta EFP_t = \alpha_1 + \alpha_1 * D_{1t} + [\alpha_2 - 1] EFP_{t-1} + \sum_{i=1}^m \alpha_{3,i} \Delta EFP_{t-i} + \alpha_4 t + u_{3,t} \dots \dots [iii]$$

In eq.[iii], break is represented by intercept Dummy  $D_{1t}$ ,  $[\alpha_2 - 1]$  is the coefficient which follows the ADF logic of testing the variable stationarity, while the coefficient  $\sum_{i=1}^m \alpha_{3,i}$  is the augmented term which removes serial correlation,  $\alpha_4$  being the trend variable and finally  $u_{3,t}$  is the stochastic error term for eq.[iii].

**3.4 The Dynamic OLS Model [Stock and Watson, 1993]**

Based upon study results which showed all variables as I [1] integrated and with co-integration also being proved as revealed by results of ARDL Model, it was decided to test for the long run relation amongst the variable for which we apply Dynamic OLS [DOLS] technique. The technique provides robust long run estimates, corrects the simultaneity bias and is used primarily where the size of the sample is small and

therefore considered ideal econometric tool for present analysis. The following equation [iv] was estimated.

$$\ln. EFP_t = X\beta + \sum_{i=-K}^{+K} \lambda_{2i} \Delta URB_{t-i} + \sum_{i=-K}^{+K} \lambda_{3i} \Delta DS_{t-i} + u_{4t} \dots [iv]$$

In eq.[iv]  $X = [1, URB, DS]$  &  $\beta =$  Vector of long run coefficients  $[\beta_1, \beta_2, \beta_3]$ , the model also included a no. of lags and leads for each independent variable which were determined using SC criteria.

### 3.5 Model Diagnostics

Model Diagnostics serve as model pre-requisites and ensure that the results obtained are reliable and within the limits. The section discusses three diagnostics: serial correlation, model redundancy and model stability. The fourth diagnostics; stationarity of variables has already been discussed under section 3.3 while discussing structural break test.

#### BG-LM Test for autocorrelation

The test involves constructing an auxiliary equation where error term  $[u_{EFP}]$  is regressed against lagged terms of a variable and also lagged error terms and the same is stated as eq.[v] below: -

$$u_{EFP} = \theta_1 + \theta_2 EFP_{t-1} + \theta_3 EFP_{t-2} + \dots + \theta_p EFP_{t-p} + \rho_1 u_{EFP_{t-1}} + \rho_2 u_{EFP_{t-2}} + \dots + \rho_m u_{EFP_{t-m}} + e_t \dots [v]$$

In eq.[v],  $p'$  and 'm' are the no. of lags of the regression and error term respectively. We define Null Hypothesis as No Serial Correlation:  $\rho_1 = \rho_2 = \dots = \rho_m = 0$  and compute Model  $R^2$  and if  $R^2[n-p] > \chi^2_m$ , Null gets rejected.

#### Redundant Variable Test through Wald Statistics

The test checks whether each of the independent variables has contributed significantly to the regression. The test computes  $R^2$  of two regressions, first one is restricted model and has only one independent variable while second is unrestricted which has two independent variables.

We state Null Hypothesis as additional independent variable that makes no contribution to regression; Null gets rejected if computed 'F' Statistics  $>$  Table F The applicable formula shall

$$\text{be } F = \frac{R_{unres}^2 - R_{res}^2 / df(res) - df(unres)}{1 - R_{unres}^2 / df(unres)}$$

### CUSUM and CUSUMSQ Plots for Parameter Stability

The CUSUM plot is graphical diagnostic tools to test whether regression relationships remain stable over time and under the present study we apply the plot on our ARDL Model. On the other hand, CUSUMSQ plots would test whether the Model suffers from heteroscedasticity. Both these plots are displayed under the results section.

## 4 Results Discussion

The section discusses the study results which are presented in tabular format [tables 2-5]. We start with the results that explore the interrelationships among the variables under study. The results [Table 2] revealed that for India, both Urbanization at level prices and Lag 1 Urbanization were impacting environment proxy variable EFP significantly. The same was also true with Domestic Savings but the variable was found to be significant only at levels [the insignificant coefficient and their corresponding 'p' values are ignored]. Further, the Dummy included for structural break pertaining to the time series of dependent variable EFP, identified 2002 as the year of break [Table 3].

This Dummy and was found to be significant justifying its inclusion in the model. For identifying the Structural Break, we had applied [18] test, which although is a test of stationarity of a variable but also identifies the break in time series. The stationarity test revealed all the variables were I [1] stationary. The 2002 as the year of break identified under the study assumes importance as India faced several pressing environmental challenges during the year which were primarily driven by rapid urbanization and population growth.

Major cities including Delhi, India's Capital witnessed critical levels of air pollution largely due to vehicular emissions, use of fossil fuels and uncontrolled industrial activities. Urban areas were the worst sufferers and had to additionally struggle with problems like poor waste management and declining green spaces. Adding to this, the country witnessed severe drought conditions in 2002, a clear indication of India's growing vulnerability to climate variability. [19] [20] [21].

Moving to the next set of results which pertain to co-integration for which the study had employed ARDL Model. The co-integration was proved from 'F' Bounds test results [Table 3] a computed 'F' value of 12.47 far exceeding the upper critical value of 7.52 at 1 % level of significance, thereby confirming establishment of co-integration. In terms of adjustment mechanism, ECM [-1] coefficient was significant and had a

value of - 0.762 showing adjustment towards long run equilibrium @ 76 % approximately in a year’s time [Table 3A].

The next set of results pertain to long term relation amongst the variables for which the study employed Dynamic OLS[DOLS] Model. The DOLS model could be considered as additional test for establishing long run relation and has been included under the study due to the advantages it offers. The results from DOLS [Table 4] confirmed the establishment of long-term relation amongst the variables.

The last table is on Model Diagnostics [Annexure 1]. Annexure 1 has six sub parts; [A] to [F], each part discusses one aspect of diagnostics namely stationarity, serial correlation, variable redundancy, stability plot, heteroscedasticity plot and Model Lag length criteria. The first part [A] discusses the test results for stationarity of variables and results clearly reveal that all variables were I [1] stationary. Part [B] shows redundancy of variables results and Wald Restricted –Unrestricted approach confirmed that both variables were positively contributing to regression as Null Hypothesis of variable redundancy was not accepted.

Amongst other test results, BGLM test results [Part [C]] for serial correlation showed no serial correlation amongst the residuals of the model. Then, CUSUM plots [Part [D]] constructed for ARDL Model stability and the same were found to be within limits. Also, CUSUMSQ plots [Part[E]] reflecting sudden variance shifts or heteroscedasticity in data were also found to be within limits. Finally, Part [F] shows the lag length criteria results and these are based upon SC methodology and results reveal that most appropriate model for ARDL was [1,1,0]

**Table 2.** Regression Results: ln EFP as a f [ln URB, ln DS at level and at lags]

Regressor	Coefficient	‘p’ statistics	Inference
<b>ln. URB<sub>t</sub></b>	13.49069	0.0001	URB impacting EFP at level and lag 1
<b>ln. URB<sub>t-1</sub></b>	11.61803	0.0004	
<b>ln. DS<sub>t</sub></b>	0.075395	0.0085	DS impacting EFP at levels

*Source: Author’s Own compilation*

**Table 3.** Results of Partial ‘F’ Bounds Test using ARDL (with single structural break)

Model Specification	Dummy Date & ‘p’ value in parenthesis	‘F’ Bounds (Computed Value)	Critical Table Value at 5%* and 1 % **		Inference
			Lower Bound I(0)	Upper Bound I(1)	
F:ln. EFP as f( ln. URB and ln. DS)	2002 (0.0102)	12.47	4.87* 6.34**	5.85* 7.52**	Cointegration is established at 1 % level

*Source: Author’s Own compilation*

**Table 3A.** Results of Error Correction and Long run Adjustment Mechanism

Variable	Coefficient $\gamma_2$	'p' value	Inference
<b>In. ECM<sub>t-1</sub></b>	- 0.762	0.0000	Negative but significant coefficient with a 76 % adjustment towards long run equilibrium in a year

Source: Author's Own compilation

**Table 4.** Result of Dynamic OLS (DOLS) confirming long term relation amongst variables: Dependent Variable: ln EFP

Variable	Coefficient	'p' value obtained	Long term relation
1. ln. Urbanization	2.241387	0.0001	Confirmed
2. ln.Domestic Savings	0.033519	0.0276	Confirmed

Note: All lags and lead terms have been avoided for convenience

Source: Author's Own compilation

## 5 Conclusion and Implications

To conclude, the present study made an attempt to understand the interlinkages between urbanization, household savings, and environment in Indian context using popular co-integration model, ARDL. Furthermore, the model was made quasi linear by incorporating a single structural break. Also, the long run relation amongst the variables was tested using a Dynamic OLS [DOLS] technique. The results showed both Urbanization and Domestic Savings were impacting EFP significantly and all the three variables were found to be co-integrated with variables showing fast correction while moving towards long run equilibrium. The study also checked for model pre-requisites including serial correlation, variable redundancy and stability and all these were within limits.

The study results have a number of implications , first the existence of a long-term relation between urbanization, domestic savings, and environmental degradation suggests that the process of urban expansion and the patterns of household savings are not isolated but are structurally linked to environmental outcomes, second the policy makers aiming to target environmental issues may focus on other variables included as a part of co-integration chain i.e. urbanization and domestic savings. For urbanization, the long run objective must be to achieve sustainable urbanization and model employed must depend upon type of urbanization the country is encountering i.e. whether it is urban pull or rural push. Many countries modelling urban pull have progressed significantly towards achieving sustainable urbanization e.g. UK has focused on carbon emissions and massive investment in organic farming, Japan's strategy was reduction in generation of wastes and protection of its coastlines.

On the other hand, the model to be adopted for sustainable urbanization for a country like India must be rural push as urbanization is due to migration of rural poor and also has a special character, it starts from rural poverty and ends up with urban poverty [22]. To this end, the biggest challenge for a country like India becomes urban housing and

hence policy makers should ensure smoother finance for housing with concentration on green buildings. On the other hand, with respect to another variable of interest; domestic savings, efforts must be made to ensure that these are redirected towards development of mass transport, alternative energy, restoring green spaces and biodiversity lost due to urbanization all aiming towards urban development.

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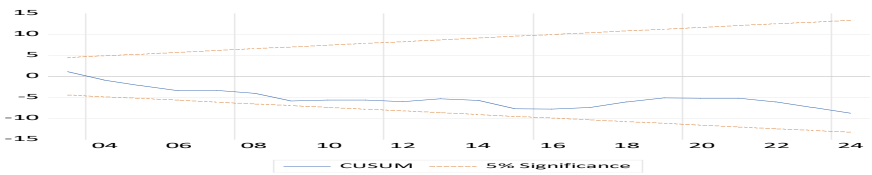
Annexure 1 : Model Diagnostics

(A) ZA Unit root with break point	EFP		Urbanization		Domestic Savings	
	Level	1 <sup>st</sup> Diff	Level	1 <sup>st</sup> Diff	Level	1 <sup>st</sup> Diff
1. Coefficient 'p' values	0.315	0.000	0.983	0.010	0.997	0.001
2. Table result Null (Accepted/Rejected)	44	0	1	4	8	6
3. Break Date (Raw Data)	Accept	Reject	Accept	Reject	Accept	Reject
	2002	-	2009	-	2000	-

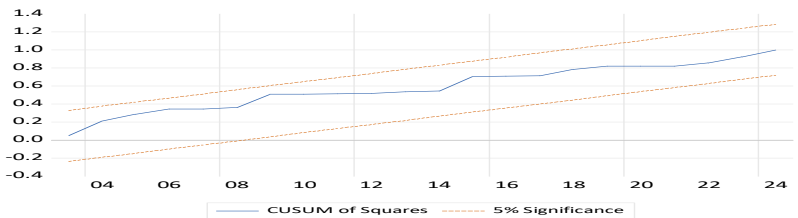
(B) Redundancy Test	In. EFP	In. URB	In. DS
1. F (Wald) Statistics	-	18.10575	7.621768
2. 'p' values of F (Wald) Stat	-	0.0001	0.0085

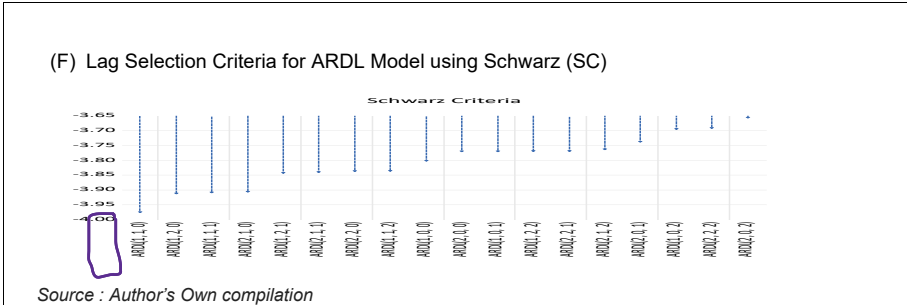
(C) BGLM Serial Corr. test	
1. F Statistics	0.505131
2. Prob F (2,40)	0.6072

(D) Model Stability : CUSUSM



(E) CUSUMSQ plots





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