IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

Impact of Health Expenditure on the Economic Performance of the BIMARU States

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1 Abstract

Improvement in health status has become a foremost priority for the reason that health is an indispensable component of an individual's well-being. It greatly enhances the productivity, efficiency and abilities of an individual, enabling him in leading a quality life. This study has been carried out to analyze the influence of health expenditure on the economic performance of BIMARU states. Numerous studies have concluded that the performance of BIMARU states is negatively impacting the GDP growth rate. Because better health opportunities strengthen human capital, which contributes to economic performance, it is critical to assess health spending in these states. The ARDL bound test model is applied in this paper to look into the relationship from 2004 to 2019. The empirical findings suggest that there is a positive long-run relationship between health expenditure and economic growth of BIMARU states.

Keywords: *Health Expenditure, Economic performance, BIMARU states, ARDL model*

2 Introduction

Health isn't just a priority goal within itself, but it is also an essential factor in sustaining economic growth and development. It is an important aspect of a person's well-being and way of living. The significant factor that influences how human capabilities and behaviour are moulded is an illness, poor health, and the threat of death. As a result, there is a compelling case for increasing healthcare spending because it has a direct impact on human well-being and happiness. The health market is unique, and making health accessible frequently necessitates a significant level of government involvement [5].Moreover, Mushkin's health-led growth hypothesis proposes that healthcare spending is instrumental in boosting economic growth. Health, according to this hypothesis, seems to be a form of asset; thus, investing in health could indeed raise revenue and result in economic expansion in general. Matter of fact, health can have an impact on economic growth by influencing human and physical capital accumulation [4].

The most efficient strategies for enhancing health in low-income countries require the engagement of the public sector. Infectious diseases account for the majority of illnesses and premature death in developing countries. These can be successfully dealt with by providing safe drinking water and sanitation systems, as well as large-scale vaccination campaigns. These precautionary measures can have a major effect on infectious disease transmission, leading to disease elimination in many cases. However, emerging economies have smaller resources, and there are multiple sectors where government spending is needed. There is a strong argument to be made that developing nations should focus their government spending on investment that generates economic growth rather than current consumption, which may result in welfare gains today but does nothing to address the long-term poverty-related issues [5].

In India, state governments are primarily responsible for providing healthcare services. The item ”Pubic health and sanitation, hospitals and dispensaries” is listed in the 7th Schedule to the Indian Constitution under the State List. However, the central government can intervene directly in the foundation of major hospitals to support training and development in medical field. The central government can also intervene in the health sector by initiating central sector and centrally sponsored schemes, but these must be implemented by state governments [7].

BIMARU States:

The term BIMARU was given by demographer Ashish Bose in a paper he wrote in the early 1980s. The four states, that is, Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh represent this term. BIMARU has a reference to the Hindi term b¯ım¯ar meaning ”sick”. This was used to highlight the poor economic conditions in these states. These states are viewed as backward and underdeveloped because of a variety of socioeconomic issues that contribute to high rates of poverty. These states have made some progress in the last decade, but much more work is needed to remove the BIMARU label.

The research conducted by IIM Ahmedabad has discovered wide disparities in the medical care offered by the BIMARU states’ government. The outcome of the study has shown a considerable crisis of health practitioners in the states’ rural areas. In addition to that, severe misallocation of medical specialists, lack of skilled labour, and improper infrastructure in the system pose a challenge in making the specialized facilities available and accessible to maternity care. It also stated that the government’s efforts to offer employment support for these amenities are not yielding the intended outcomes. The Rajasthan (11.52) and MP (4.36) outperformed the national average of 3.98 specialist doctors per million people in CHCs. The accessibility of all four specialists, including Gynaecologists, Paediatricians, Surgeons, and Physicians, in community health centers (CHCs) or district hospitals (DHs) is one area where BIMARU states fall behind significantly.

3 Literature Review

There have been several related studies which have been conducted by major scholars. Some of them are mentioned below:

Emre Atilgan, Dilek Kilic and Hasan Murat Ertugrul (2016) in their study titled “The dynamic relationship between health expenditure and economic growth: is the health-led growth hypothesis valid for Turkey?” [3], concluded the presence of long run relationship between health spending and GDP in Turkey. In addition to that, they also explored the reforms responsible for the rise in health expenditure such as Health Transformation Program (HTP), family medicine model, performance-based supplementary payment system (PBSPS) etc.

Viju Raghupathi and Wullianallur Raghupathi (2020) published their research paper titled ”Healthcare Expenditure and Economic Performance: Insights From the United States Data” in which they analyzed the relationship between healthcare expenditure and economic performance in the United States. The study came to the conclusion that there is a positive link between healthcare spending and the economic indicators like labor productivity, personal income, per capita GDP, and other spending. However it revealed healthcare spending is not associated with change in multifactor productivity (MFP) or working hours. The study also summarized how the government can disburse expenses in main aspects that will boost the economy while also enhancing population well-being. It is additionally vital that policymakers take into account economic policies directed at public health spending and economic development.

• The study conducted by **Abdulkarim K. Alhowaish** in 2014 which is titled as "Healthcare Spending and Economic Growth in Saudi Arabia: A Granger Causality Approach" [1]suggested a unidirectional causal association running from economic growth to healthcare spending, while healthcare has no impact on Saudi economic growth.

4 Objective of the Study

1.To study the impact of health expenditure on the per capita income of BIMARU states. 2.To analyze the factors responsible for increase in health expenditure of BIMARU states.

5 Data and Methodology

5.1 Data Source

The data set includes annual health expenditure and Per capita Net State Domestic Product(Per capita NSDP) figures for the BIMARU states (Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh) from 2004-05 to 2019-20. Per capita NSDP shows the per capita income of the states which is one of the best criteria to assess the economic performance of states. Data on health expenditure is taken from the respective states' finance accounts, and data on per capita net state domestic product at constant prices with the base year 2011-12 is obtained from the Reserve Bank of India's (RBI) Handbook of Statistics on Indian States. The entire dataset is converted to log format for analysis, and the relationship is investigated using the Auto-regressive Distributed Lag (ARDL) Model.

5.2 Tools and Technique

Various tests have been conducted to analyze the study using E-views software. These are:

5.2.1 Unit Root Test

To check the stationarity of data unit root tests have been conducted for which we have used the Augmented Dickey-Fuller(ADF) and Phillips-Perron(PP) tests. At first, we check the stationarity of the variables at the level form and if they are found to be non-stationary, we proceed on to their first difference form.

5.2.2 ARDL Bound Test

ARDL Cointegration technique proposed by Pesaron et al. (2001) is applied to explore the long-run relationship between Health expenditure and Per capita Net State Domestic Product (NSDP) of BIMARU States. The ARDL model has certain advantages over other typical cointegration methods. The ARDL framework's main advantage is that it is applicable regardless of the order of integration. The model has been selected because it delivers effective outcomes for a small sample size, which is preferable for our study.

In addition to unit root and ARDL bound test, the diagnostic tests like, Breusch-Pagan-Godfrey (BPG) test for heteroscedasticity and LM test for serial correlation, are also used.

5.3 Econometric Model

Symbolically,

$$PCI = f(HE)$$

Now, writing the function mathematically for BIMARU states

Bihar (BI)

$$PCI\ BI = \beta_0 + \beta_1 HE\ BI + u_i$$

Rewriting in the log form:

$$LnPCI\ BI = \beta_0 + \beta_1 LnHE\ BI + u_i$$

Where,
β_0 and β_1 are the parameters
LnPCI _BI is the log value of the per capita income of Bihar
LnHE BI is the log value of the health expenditure of Bihar

The ARDL model is given below:

$$LnPCI\_BI_t = \alpha_1 + \alpha_2 LnPCI\_BI_{t-1} + \alpha_3 LnHE\_BI_{t-1} + \beta_1 \sum_{i=1}^{k} \Delta LnPCI\_BI_{t-1} + \beta_2 \sum_{i=1}^{k} \Delta LnHE\_BI_{t-1} + e_t$$

Madhya Pradesh (MP)

$$PCI\ MP = \beta_0 + \beta_1 HE\ MP + u_i$$

Rewriting in the log form:

$$LnPCI\ MP = \beta_0 + \beta_1 LnHE\ MP + u_i$$

Where,
β_0 and β_1 are the parameters
LnPCI _MP is the log value of the per capita income of Madhya Pradesh *LnHE MP* is the log value of the health expenditure of Madhya Pradesh The ARDL model is given below:

$$LnPCI\_MP_t = \alpha_1 + \alpha_2 LnPCI\_MP_{t-1} + \alpha_3 LnHE\_MP_{t-1} + \beta_1 \sum_{i=1}^{k} \Delta LnPCI\_MP_{t-1} + \beta_2 \sum_{i=1}^{k} \Delta LnHE\_MP_{t-1} + e_t$$

Rajasthan (R)

$$PCI\ R = \beta_0 + \beta_1 HE\ R + u_i$$

Rewriting in the log form:

$$LnPCI\ R = \beta_0 + \beta_1 LnHE\ R + u_i$$

Where,
β_0 and β_1 are the parameters
LnPCI _R is the log value of the per capita income of Rajasthan *LnHE R* is the log value of the health expenditure of Rajasthan The ARDL model is given below:

$$LnPCI\_R_t = \alpha_1 + \alpha_2 LnPCI\_R_{t-1} + \alpha_3 LnHE\_R_{t-1} + \beta_1 \sum_{i=1}^{k} \Delta LnPCI\_R_{t-1} + \beta_2 \sum_{i=1}^{k} \Delta LnHE\_R_{t-1} + e_t$$

Uttar Pradesh (MP)

$$PCI\ UP = \beta_0 + \beta_1 HE\ UP + u_i$$

Rewriting in the log form:

$$LnPCI\ UP = \beta_0 + \beta_1 LnHE\ UP + u_i$$

Where, β_0 and β_1 are the parameters *LnPCI _UP* is the log value of the per capita income of Uttar Pradesh *LnHE UP* is the log value of the health expenditure of Uttar Pradesh The ARDL model is given below:

$$LnPCI\_UP_t = \alpha_1 + \alpha_2 LnPCI\_UP_{t-1} + \alpha_3 LnHE\_UP_{t-1} + \beta_1 \sum_{i=1}^{k} \Delta LnPCI\_UP_{t-1} + \beta_2 \sum_{i=1}^{k} \Delta LnHE\_UP_{t-1} + e_t$$

6 Data Analysis

6.1 Results of Unit Root Test

We rely on unit root tests to investigate the whether the variables are stationary or non-stationary. Unit root test is done by applying Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test.

Null Hypothesis (H0): Unit root is present
Alternative Hypothesis (H1): Unit root is not present.

The outcomes of the unit root test performed on the variables of each of the BIMARU states are presented in the following tables:

Bihar (BI)

VARIABLES	ADF		PP	
	AT LEVEL	AT FD	AT LEVEL	AT FD
LnPCI _BI	-0.5375	-6.1513***	-0.51609	-5.4634***
LnHE _BI	-0.3107	-4.6111***	-0.3107	-4.6111***

Table 1: **Test for Stationarity of Bihar**

Note: *,**, and *** indicates 10%, 5% and 1% level of significance respectively.

The results of the unit root test on Per capita income and Health Expenditure of Bihar reveal that the data for *LnPCI BI* and *LnHE BI* are non-stationary at the level and stationary at the first difference in the ADF and PP tests. The calculated outcomes are statistically significant at 1%, rejecting the null hypothesis.

Madhya Pradesh (MP)

VARIABLES	ADF		PP	
	AT LEVEL	AT FD	AT LEVEL	AT FD
LnPCI MP	0.2575	-4.1173***	1.7323	-7.7671***
LnHE MP	-0.0233	-4.7683***	0.2502	-4.7564***

Table 2: **Test for Stationarity of Madhya Pradesh** Note: *,**, and *** indicates 10%, 5% and 1% level of significance respectively.

The table displays the unit root test on Madhya Pradesh's per capita income and health expenditure. We can see from the table that the variables are stationary at the first difference in the ADF and PP tests. The variables are statistically significant at a 1% level; therefore the null hypothesis is rejected.

Rajasthan (R)

VARIABLES	ADF		PP	
	AT LEVEL	AT FD	AT LEVEL	AT FD
LnPCI _R	-1.5551	-3.5558**	-2.3523	-3.5583**
LnHE R	-0.4969	-3.4047**	-0.0872	-6.3952***

Table 3: **Test for Stationarity of Rajasthan**

Note: *,**, and *** indicates 10%, 5% and 1% level of significance respectively.

Based on the ADF and PP test results in Table 3: , we can conclude that the data for *LnPCI R* and *LnHE R* is stationary at first difference. The calculated findings are statistically significant at the 5% and 1% levels. As a result, the null hypothesis is rejected.

Uttar Pradesh (UP)

VARIABLES	ADF		PP	
	AT LEVEL	AT FD	AT LEVEL	AT FD
LnPCI UP	-0.5472	-3.4393**	-0.5893	-3.3885**
LnHE UP	-1.4493	-3.5029**	-2.2768	-12.4473***

Table 4: **Test for Stationarity of Uttar Pradesh**

Note: *,**, and *** indicates 10%, 5% and 1% level of significance respectively.

The result in the table implies that both variables are stationary at the first difference in ADF and PP tests. The variables are significant at 5% and 1% levels. It means null hypothesis is rejected Because the variables have a mixed order of integration, the ARDL model is appropriate for testing cointegration between them.

6.2 Results of ARDL Bound Test

The ARDL bound test is applied to examine the cointegration between the variables The first step in the ARDL model is to conduct an F test to see if there is a long-run relationship between the Per capita income and Health expenditure of BIMARU states. If the computed F statistic is less than the lower bound critical value, the null hypothesis is not rejected. When calculating F statistics, however, if the computed F statistic is greater than the upper bound critical values, the null hypothesis of no cointegration is rejected, and the variables are said to have a long-run relationship. Furthermore, the inference is inconclusive if the calculated value falls between the lower and upper bound critical values. Besides that, the optimal lag length is found using the Akaike information criteria (AIC). The bound technique is used to investigate cointegration after determining the optimal lag length of the ARDL model. If cointegration between the variables is demonstrated, the error correction technique is included in the model. The error correction mechanism (ECM) aids in the study of the short-term dynamics. The ECM reunites the short-run and long-run behavior of the per capita income after proving the cointegration between per capita income and health expenditure by applying the bound test.

Null Hypothesis (H0): There is no cointegration between the variables. Alternative Hypothesis (H1): There is cointegration between the variables.

The results of the ARDL bound test conducted on each of the BIMARU states are given in the following tables:

Bihar(BI)

ARDL Function	**Optimum Lag Length**	**F-Statistic**	**Inference**
$F_{LnPCI\ BI}(LnPCI\ BI/LnHE\ \_BI)$	2,2	7.9437***	Cointegration
Significance Level	Critical Bound Values		
	Lower	Upper	
10%	3.02	3.51	
5%	3.62	4.16	
2.5%	4.18	4.79	
1%	4.94	5.58	

Table 5: **ARDL Bound Test Results (Bihar)**

Note:*** indicates significance at 1% level

The above table demonstrates that, at a 1% level of significance, the estimated F-statistics 7.9437 is greater than the upper bound critical value, implying that the null hypothesis of no cointegrati between the variables is rejected. It means the variables do have long-run relationship.

Variable	**LnHE BI**	**Intercept**
Coefficient	0.276516 (0.0036)	7.064575 (0.0001)

Table 6: **Long Run Parameters (Bihar)**

Note: p-values in the brackets are based on t-statistics.

The positive sign of coefficient and its p-value indicates that health expenditure in Bihar produces a positive and significant effect on its per capita income.

Estimated Model

$$LnPCI\ BI = \beta_0 + \beta_1 LnHE\ BI + u_i$$

Substituting the coefficient values, we get the following equation-

$$LnPCI\ BI = 7.064575 + 0.276516 LnHE\ BI + u_i$$

This shows that a 1% increase in health expenditure in Bihar will increase its per capita income by 27% .

Error correction model (ECM) is utilized to check the short term behavior of the variables in Bihar and how much they are deviated from the equilibrium. The outcome shows that the coefficient of error correction technique is significant and negative. The coefficient of ECM is -0.234 which shows that adjustment in the short rum takes place at the speed of 23%.

Madhya Pradesh (MP)

ARDL Function	**Optimum Lag Length**	**F-Statistic**	**Inference**
$F_{LnPCI\ MP}(LnPCI\ MP/LnHE\ MP)$	1,0	23.7260***	Cointegration
Significance Level	Critical Bound Values		
	Lower	Upper	
10%	3.02	3.51	
5%	3.62	4.16	
2.5%	4.18	4.79	
1%	4.94	5.58	

Table 7: **ARDL Bound Test Results (Madhya Pradesh)**

Note:*** indicates significance at 1% level

In the above table, we can see that the estimated F statistics that is, 23.7260 is larger than the upper bound critical value at a 1% significance level. It means the null hypothesis is rejected and cointegration between the variables is proved.

Variable	**LnHE MP**	**Intercept**
Coefficient	0.369882 (0.0002)	6.333034 (0.0000)

Table 8: **Long Run Parameters (Madhya Pradesh)**

Note:: p-values in the brackets are based on t-statistics.

The positive sign of the coefficient and its p-value reflect that Madhya Pradesh's health expenditure has a positive and significant effect on per capita income.

Estimated Model

$$LnPCI\ MP = \beta_0 + \beta_1 LnHE\ MP + u_i$$

Substituting the coefficient values, we get the following equation-

$$LnPCI\ MP = 6.333034 + 0.369882 LnHE\ MP + u_i$$

This means that a 1% increase in health spending in Madhya Pradesh raises per capita income by 36%.

To examine the short run behavior and divergence of variable from the equilibrium, error correction model (ECM) is incorporated in the study. The coefficient of ECM is -0.154 which is negative and significant. It means that short run adjustment in per capita income of Madhya Pradesh occurs at the speed of 15%.

Rajasthan (R)

ARDL Function	**Optimum Lag Length**	**F-Statistic**	**Inference**
$F_{LnPCI\ R}(LnPCI\ R/LnHE\ R)$	1,2	7.4832***	Cointegration
Significance Level	Critical Bound Values		
	Lower	Upper	
10%	3.02	3.51	
5%	3.62	4.16	
2.5%	4.18	4.79	
1%	4.94	5.58	

Table 9: **ARDL Bound Test Results (Rajasthan)**

Note:*** indicates significance at 1% level

The calculated F statistic, 7.4832, is more than the upper bound critical value at a 1% significance level, as shown in the table. Hence, the null hypothesis is rejected and cointegration between the variables is proved.

Variable	**LnHE R**	**Intercept**
Coefficient	0.308204 (0.0000)	7.302175 (0.0000)

Table 10: **Long Run Parameters (Rajasthan)**

Note:: p-values in the brackets are based on t-statistics.

The coefficient's positive sign and p-value imply that health spending in Rajasthan has a positive and significant effect on per capita income.

Estimated Model

$$LnPCI\ R = \beta_0 + \beta_1 LnHE\ R + u_i$$

Substituting the coefficient values, we get the following equation-

$$LnPCI\ R = 7.302175 + 0.308204 LnHE\ R + u_i$$

This tends to mean that a 1% increase in health spending in Rajasthan results in a 30% rise in the per capita income.

The outcome of the error correction technique performed on the variables of Rajasthan reveals that the estimated coefficient is -0.37. As the value is negative and significant as it should be, it means that short run adjustment in per capita income of Rajasthan takes place at a speed of 37%.

Uttar Pradesh (UP)

ARDL Function	**Optimum Lag Length**	**F-Statistic**	**Inference**
$F_{LnPCI\ UP}(LnPCI\ UP/LnHE\ UP)$	1,0	27.8397***	Cointegration
Significance Level	Critical Bound Values		
	Lower	Upper	
10%	3.02	3.51	
5%	3.62	4.16	
2.5%	4.18	4.79	
1%	4.94	5.58	

Table 11: **ARDL Bound Test Results (Uttar Pradesh)**

Note:*** indicates significance at 1% level

At a significance level of 1%, the calculated F-statistics is 27.8397, which is larger than the upper bound critical values. Therefore, the null hypothesis that there is no relationship between the variables is rejected. Hence, the long-run relationship exists between the variables.

Variable	**LnHE _UP**	**Intercept**
Coefficient	0.366447 (0.0000)	5.614997 (0.0000)

Table 12: **Long Run Parameters (Uttar Pradesh)**

Note:: p-values in the brackets are based on t-statistics.

The positive sign of the coefficient and its p-value demonstrate that Uttar Pradesh's health expenditure has a significant and favorable impact on its per capita income.

Estimated Model

$$LnPCI\ UP = \beta_0 + \beta_1 LnHE\ UP + u_i$$

Substituting the coefficient values, we get the following equation-

$$LnPCI\ \_UP = 5.6149974 + 0.366447 LnHE\ UP + u_i$$

This signifies that a 1% increase in health expenditure in Uttar Pradesh raises per capita income by 36%.

The ECM model is carried out on the variables of Uttar Pradesh to analyze their short run behavior and deviation from the equilibrium. The value of the coefficient is -0.782 which indicates that the adjustment occurs at the speed of 78%.

Test	**Bihar (p-value)**	**Madhya Pradesh (p-value)**	**Rajasthan (p-value)**	**Uttar Pradesh (p-value)**
BPG test for Heteroskedasticity	0.32	0.76	0.25	0.40
LM test for Serial Correlation	0.14	0.16	0.07	0.74

Table 13: **Diagnostic Tests**

The p- values of the BPG and LM test for all the four states shows that no evidence of Heteroskedasticity and autocorrelation is found in our model.

7 Conclusion and Discussion

The present study analyses the relationship between health expenditure and per capita income of the BIMARU states for the period 2004 to 2019 using ARDL technique. Based on the empirical results, we conclude that there is evidence of positive cointegration between per capita income and health expenditure of BIMARU states. The increase in health expenditure by the state government has led to a rise in per capita income of that state. Thus it becomes vital for the government to utilize investment in health as a strategy to boost the underperforming states as differences in the health outcomes of these states noticeably explain the differences in economic performance of these states and demonstrates that such investment can stimulate the growth.

These states have been hindering the achievements of the country since decades. The Indian government decided to put extra emphasis on these states about 15 years ago, particularly in the highly underserved field of reproductive health. The rise in health expenditure of these states has been due to certain reforms introduced by the Indian government. One such reform was the launch of National Rural Health Mission (NRHM) in 2005. It is the largest-ever health campaign in India. The programme began injecting resources to these states. A trained health activist was assigned to contact families, monitor pregnancies, and give access to treatment. Other measures included encouraging health center-based deliveries, improving access to emergency obstetric care, and renovating rural health infrastructure. However, only making strategy is not sufficient. The policymakers should also ensure that the strategies are executed effectively and the policies and reforms introduced are implemented successfully and the desired health outcomes are attained.

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9 Appendix

Data of Bihar

YEAR	LnPCI BI	LnHE _BI
2004	9.4796	10.8959
2005	9.4375	11.2387
2006	9.5811	11.3478
2007	9.6159	11.5096
2008	9.7428	11.5412
2009	9.7751	11.6728
2010	9.9034	11.7405
2011	9.9873	11.9209
2012	10.0078	11.9261
2013	10.0334	12.0740
2014	10.0528	12.5829
2015	10.0884	12.6493
2016	10.1446	12.9454
2017	10.1931	13.1351
2018	10.2782	13.2043
2019	10.3294	13.3241

Data of Madhya pradesh

YEAR	LnPCI MP	LnHE MP
2004	10.1481	11.2135
2005	10.1791	11.3241
2006	10.2485	11.4053
2007	10.2773	11.4908
2008	10.3795	11.6509
2009	10.4536	11.8356
2010	10.4886	12.0917
2011	10.5583	12.2635
2012	10.6247	12.5347
2013	10.6583	12.5751
2014	10.6925	12.9222
2015	10.7653	13.0913
2016	10.8739	13.1229
2017	10.9119	13.3056
2018	10.9578	13.3098
2019	11.0386	13.5864

Data of Rajasthan

YEAR	LnPCI R	LnHE R
2004	10.4872	11.3996
2005	10.5335	11.4922
2006	10.6266	11.5897
2007	10.6534	11.6773
2008	10.7168	12.0334
2009	10.7566	12.1578
2010	10.8802	12.2295
2011	10.9541	12.4340
2012	10.9757	12.5850
2013	11.0195	12.7558
2014	11.0743	12.8876
2015	11.1355	13.0688
2016	11.1749	13.2092
2017	11.1997	13.4145
2018	11.2326	13.3098
2019	11.2694	13.6242

Data of Uttar Pradesh

YEAR	LnPCI UP	LnHE _ UP
2004	10.0435	12.0021
2005	10.0810	12.2803
2006	10.1385	12.3750
2007	10.1820	12.4745
2008	10.2368	12.5692
2009	10.2790	12.7750
2010	10.3381	12.9176
2011	10.3735	12.9879
2012	10.4014	13.1359
2013	10.4354	13.2123
2014	10.4511	13.3275
2015	10.5179	13.4195
2016	10.6175	13.5795
2017	10.6414	13.7641
2018	10.6844	13.8522
2019	10.7058	13.9295

Unit Test Results

Bihar

Null Hypothesis: LNPCI BI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.537534	0.8575
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPCI BI)
Method: Least Squares
Date: 01/03/23 Time: 21:31
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPCI BI(-1)	-0.027312	0.050809	-0.537534	0.6000
C	0.326713	0.502578	0.650075	0.5270

R-squared	0.021743	Mean dependent var	0.056652
Adjusted R-squared	-0.053507	S.D. dependent var	0.049399
S.E. of regression	0.050704	Akaike info criterion	-3.002070
Sum squared resid	0.033421	Schwarz criterion	-2.907663
Log likelihood	24.51552	Hannan-Quinn criter.	-3.003075
F-statistic	0.288943	Durbin-Watson stat	2.392783
Prob(F-statistic)	0.599980		

Null Hypothesis: D(LNPCI BI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.151383	0.0003
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPCI BI,2)
Method: Least Squares
Date: 01/03/23 Time: 21:31
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPCI BI(-1))	-1.346491	0.218892	-6.151383	0.0000
C	0.083467	0.016514	5.054392	0.0003

R-squared	0.759227	Mean dependent var	0.006663
Adjusted R-squared	0.739163	S.D. dependent var	0.079183
S.E. of regression	0.040440	Akaike info criterion	-3.446415
Sum squared resid	0.019625	Schwarz criterion	-3.355121
Log likelihood	26.12491	Hannan-Quinn criter.	-3.454866
F-statistic	37.83952	Durbin-Watson stat	1.118896
Prob(F-statistic)	0.000049		

Null Hypothesis: LNPCI_BI has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.516093	0.8623
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Residual variance (no correction)	0.002228
HAC corrected variance (Bartlett kernel)	0.001592

Phillips-Perron Test Equation
Dependent Variable: D(LNPCI_BI)
Method: Least Squares
Date: 01/03/23 Time: 21:30
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPCI_BI(-1)	-0.027312	0.050809	-0.537534	0.6000
C	0.326713	0.502578	0.650075	0.5270

R-squared	0.021743	Mean dependent var	0.056652
Adjusted R-squared	-0.053507	S.D. dependent var	0.049399
S.E. of regression	0.050704	Akaike info criterion	-3.002070
Sum squared resid	0.033421	Schwarz criterion	-2.907663
Log likelihood	24.51552	Hannan-Quinn criter.	-3.003075
F-statistic	0.288943	Durbin-Watson stat	2.392783
Prob(F-statistic)	0.599980		

Null Hypothesis: D(LNPCI_BI) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.463492	0.0008
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Residual variance (no correction)	0.001402
HAC corrected variance (Bartlett kernel)	0.002427

Phillips-Perron Test Equation
Dependent Variable: D(LNPCI_BI,2)
Method: Least Squares
Date: 01/03/23 Time: 21:27
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPCI_BI(-1))	-1.346491	0.218892	-6.151383	0.0000
C	0.083467	0.016514	5.054392	0.0003

R-squared	0.759227	Mean dependent var	0.006663
Adjusted R-squared	0.739163	S.D. dependent var	0.079183
S.E. of regression	0.040440	Akaike info criterion	-3.446415
Sum squared resid	0.019625	Schwarz criterion	-3.355121
Log likelihood	26.12491	Hannan-Quinn criter.	-3.454866
F-statistic	37.83952	Durbin-Watson stat	1.118896
Prob(F-statistic)	0.000049		

Null Hypothesis: LNHE_BI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.310727	0.9019
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNHE_BI)
Method: Least Squares
Date: 12/06/22 Time: 02:30
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE_BI(-1)	-0.015816	0.050901	-0.310727	0.7609
C	0.352082	0.613139	0.574229	0.5756

R-squared	0.007372	Mean dependent var	0.161881
Adjusted R-squared	-0.068984	S.D. dependent var	0.132562
S.E. of regression	0.137058	Akaike info criterion	-1.013258
Sum squared resid	0.244204	Schwarz criterion	-0.918851
Log likelihood	9.599433	Hannan-Quinn criter.	-1.014263
F-statistic	0.096551	Durbin-Watson stat	2.248405
Prob(F-statistic)	0.760934		

Null Hypothesis: D(LNHE_BI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.611161	0.0034
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNHE_BI,2)
Method: Least Squares
Date: 12/06/22 Time: 02:30
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNHE_BI(-1))	-1.206429	0.261632	-4.611161	0.0006
C	0.182992	0.055268	3.310960	0.0062

R-squared	0.639237	Mean dependent var	-0.015930
Adjusted R-squared	0.609173	S.D. dependent var	0.206777
S.E. of regression	0.129269	Akaike info criterion	-1.122274
Sum squared resid	0.200527	Schwarz criterion	-1.030980
Log likelihood	9.855921	Hannan-Quinn criter.	-1.130725
F-statistic	21.26281	Durbin-Watson stat	1.980452
Prob(F-statistic)	0.000599		

Null Hypothesis: LNHE BI has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.310727	0.9019
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Residual variance (no correction)	0.016280
HAC corrected variance (Bartlett kernel)	0.016280

Phillips-Perron Test Equation
Dependent Variable: D(LNHE BI)
Method: Least Squares
Date: 12/06/22 Time: 02:31
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE BI(-1)	-0.015816	0.050901	-0.310727	0.7609
C	0.352082	0.613139	0.574229	0.5756

R-squared	0.007372	Mean dependent var	0.161881
Adjusted R-squared	-0.068984	S.D. dependent var	0.132562
S.E. of regression	0.137058	Akaike info criterion	-1.013258
Sum squared resid	0.244204	Schwarz criterion	-0.918851
Log likelihood	9.599433	Hannan-Quinn criter.	-1.014263
F-statistic	0.096551	Durbin-Watson stat	2.248405
Prob(F-statistic)	0.760934		

Null Hypothesis: D(LNHE BI) has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.611161	0.0034
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Residual variance (no correction)	0.014323
HAC corrected variance (Bartlett kernel)	0.014323

Phillips-Perron Test Equation
Dependent Variable: D(LNHE BI,2)
Method: Least Squares
Date: 12/06/22 Time: 02:31
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNHE BI(-1))	-1.206429	0.261632	-4.611161	0.0006
C	0.182992	0.055268	3.310960	0.0062

R-squared	0.639237	Mean dependent var	-0.015930
Adjusted R-squared	0.609173	S.D. dependent var	0.206777
S.E. of regression	0.129269	Akaike info criterion	-1.122274
Sum squared resid	0.200527	Schwarz criterion	-1.030980
Log likelihood	9.855921	Hannan-Quinn criter.	-1.130725
F-statistic	21.26281	Durbin-Watson stat	1.980452
Prob(F-statistic)	0.000599		

Madhya Pradesh

Null Hypothesis: LNPCI MP has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.257565	0.9652
Test critical values:	1% level	-4.057910	
	5% level	-3.119910	
	10% level	-2.701103	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 13

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPCI MP)
Method: Least Squares
Date: 01/03/23 Time: 22:11
Sample (adjusted): 2007 2019
Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPCI MP(-1)	0.008617	0.033457	0.257565	0.8025
D(LNPCI MP(-1))	-0.313592	0.297772	-1.053129	0.3197
D(LNPCI MP(-2))	-0.478333	0.290765	-1.645085	0.1344
C	0.016261	0.353360	0.046018	0.9643

R-squared	0.265195	Mean dependent var	0.060777
Adjusted R-squared	0.020260	S.D. dependent var	0.026935
S.E. of regression	0.026660	Akaike info criterion	-4.163615
Sum squared resid	0.006397	Schwarz criterion	-3.989785
Log likelihood	31.06350	Hannan-Quinn criter.	-4.199345
F-statistic	1.082716	Durbin-Watson stat	1.913136
Prob(F-statistic)	0.404640		

Null Hypothesis: D(LNPCI MP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.117378	0.0090
Test critical values:	1% level	-4.057910	
	5% level	-3.119910	
	10% level	-2.701103	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 13

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPCI MP,2)
Method: Least Squares
Date: 01/03/23 Time: 22:12
Sample (adjusted): 2007 2019
Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPCI MP(-1))	-1.780407	0.432413	-4.117378	0.0021
D(LNPCI MP(-1),2)	0.466706	0.273502	1.706411	0.1187
C	0.106989	0.026610	4.020566	0.0024

R-squared	0.688142	Mean dependent var	0.000876
Adjusted R-squared	0.625771	S.D. dependent var	0.041497
S.E. of regression	0.025385	Akaike info criterion	-4.310117
Sum squared resid	0.006444	Schwarz criterion	-4.179744
Log likelihood	31.01576	Hannan-Quinn criter.	-4.336915
F-statistic	11.03296	Durbin-Watson stat	1.889857
Prob(F-statistic)	0.002950		

Null Hypothesis: LNPCI MP has a unit root
Exogenous: Constant
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		1.732347	0.9990
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Residual variance (no correction)	0.000637
HAC corrected variance (Bartlett kernel)	5.69E-05

Phillips-Perron Test Equation
Dependent Variable: D(LNPCI MP)
Method: Least Squares
Date: 12/06/22 Time: 02:25
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPCI MP(-1)	0.009376	0.027213	0.344546	0.7359
C	-0.039529	0.287120	-0.137675	0.8926

R-squared	0.009049	Mean dependent var	0.059368
Adjusted R-squared	-0.067178	S.D. dependent var	0.026245
S.E. of regression	0.027112	Akaike info criterion	-4.254136
Sum squared resid	0.009556	Schwarz criterion	-4.159729
Log likelihood	33.90602	Hannan-Quinn criter.	-4.255141
F-statistic	0.118712	Durbin-Watson stat	2.335886
Prob(F-statistic)	0.735946		

Null Hypothesis: D(LNPCI MP) has a unit root
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.767152	0.0000
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Residual variance (no correction)	0.000595
HAC corrected variance (Bartlett kernel)	8.29E-05

Phillips-Perron Test Equation
Dependent Variable: D(LNPCI MP,2)
Method: Least Squares
Date: 12/06/22 Time: 02:25
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPCI MP(-1))	-1.221855	0.275407	-4.436544	0.0008
C	0.074229	0.017414	4.262719	0.0011

R-squared	0.621247	Mean dependent var	0.003568
Adjusted R-squared	0.589684	S.D. dependent var	0.041121
S.E. of regression	0.026340	Akaike info criterion	-4.303858
Sum squared resid	0.008326	Schwarz criterion	-4.212564
Log likelihood	32.12701	Hannan-Quinn criter.	-4.312309
F-statistic	19.68292	Durbin-Watson stat	2.165104
Prob(F-statistic)	0.000812		

Null Hypothesis: LNHE MP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.023306	0.9407
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNHE MP)
Method: Least Squares
Date: 01/03/23 Time: 22:13
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE MP(-1)	-0.000936	0.040145	-0.023306	0.9818
D(LNHE MP(-1))	-0.357201	0.297491	-1.200714	0.2551
C	0.226635	0.497173	0.455846	0.6574

R-squared	0.116163	Mean dependent var	0.161593
Adjusted R-squared	-0.044534	S.D. dependent var	0.103153
S.E. of regression	0.105425	Akaike info criterion	-1.474222
Sum squared resid	0.122259	Schwarz criterion	-1.337282
Log likelihood	13.31956	Hannan-Quinn criter.	-1.486899
F-statistic	0.722870	Durbin-Watson stat	1.847926
Prob(F-statistic)	0.507044		

Null Hypothesis: D(LNHE MP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.768380	0.0026
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNHE MP,2)
Method: Least Squares
Date: 01/03/23 Time: 22:13
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNHE MP(-1))	-1.357433	0.284674	-4.768380	0.0005
C	0.215113	0.050445	4.264310	0.0011

R-squared	0.654552	Mean dependent var	0.011859
Adjusted R-squared	0.625764	S.D. dependent var	0.165001
S.E. of regression	0.100939	Akaike info criterion	-1.617030
Sum squared resid	0.122265	Schwarz criterion	-1.525736
Log likelihood	13.31921	Hannan-Quinn criter.	-1.625481
F-statistic	22.73745	Durbin-Watson stat	1.848784
Prob(F-statistic)	0.000458		

Null Hypothesis: LNHE MP has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.250214	0.9663
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Residual variance (no correction)	0.009373
HAC corrected variance (Bartlett kernel)	0.006345

Phillips-Perron Test Equation
Dependent Variable: D(LNHE MP)
Method: Least Squares
Date: 12/06/22 Time: 02:22
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE MP(-1)	0.004510	0.036510	0.123538	0.9036
C	0.102825	0.448993	0.229013	0.8224

R-squared	0.001173	Mean dependent var	0.158194
Adjusted R-squared	-0.075660	S.D. dependent var	0.100269
S.E. of regression	0.103993	Akaike info criterion	-1.565419
Sum squared resid	0.140589	Schwarz criterion	-1.471012
Log likelihood	13.74064	Hannan-Quinn criter.	-1.566425
F-statistic	0.015262	Durbin-Watson stat	2.540908
Prob(F-statistic)	0.903571		

Null Hypothesis: D(LNHE MP) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.756462	0.0027
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Residual variance (no correction)	0.008733
HAC corrected variance (Bartlett kernel)	0.008933

Phillips-Perron Test Equation
Dependent Variable: D(LNHE MP,2)
Method: Least Squares
Date: 12/06/22 Time: 02:23
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNHE MP(-1))	-1.357433	0.284674	-4.768380	0.0005
C	0.215113	0.050445	4.264310	0.0011

R-squared	0.654552	Mean dependent var	0.011859
Adjusted R-squared	0.625764	S.D. dependent var	0.165001
S.E. of regression	0.100939	Akaike info criterion	-1.617030
Sum squared resid	0.122265	Schwarz criterion	-1.525736
Log likelihood	13.31921	Hannan-Quinn criter.	-1.625481
F-statistic	22.73745	Durbin-Watson stat	1.848784
Prob(F-statistic)	0.000458		

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Null Hypothesis: LNPCI R has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.555121	0.4796
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPCI R)
Method: Least Squares
Date: 01/03/23 Time: 22:17
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPCI R(-1)	-0.043945	0.028258	-1.555121	0.1439
C	0.530919	0.307945	1.724071	0.1084

R-squared	0.156852	Mean dependent var	0.052146
Adjusted R-squared	0.091994	S.D. dependent var	0.027805
S.E. of regression	0.026495	Akaike info criterion	-4.300157
Sum squared resid	0.009126	Schwarz criterion	-4.205750
Log likelihood	34.25118	Hannan-Quinn criter.	-4.301163
F-statistic	2.418401	Durbin-Watson stat	2.325389
Prob(F-statistic)	0.143918		

Null Hypothesis: D(LNPCI R) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.555883	0.0223
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPCI R,2)
Method: Least Squares
Date: 01/03/23 Time: 22:17
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPCI R(-1))	-1.036198	0.291404	-3.555883	0.0040
C	0.054489	0.017459	3.121012	0.0088

R-squared	0.513072	Mean dependent var	-0.000677
Adjusted R-squared	0.472495	S.D. dependent var	0.041254
S.E. of regression	0.029963	Akaike info criterion	-4.046164
Sum squared resid	0.010773	Schwarz criterion	-3.954870
Log likelihood	30.32315	Hannan-Quinn criter.	-4.054615
F-statistic	12.64430	Durbin-Watson stat	1.782166
Prob(F-statistic)	0.003954		

Null Hypothesis: LNPCI_R has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.352375	0.1699
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Residual variance (no correction)	0.000608
HAC corrected variance (Bartlett kernel)	0.000225

Phillips-Perron Test Equation
Dependent Variable: D(LNPCI_R)
Method: Least Squares
Date: 12/13/22 Time: 21:27
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPCI_R(-1)	-0.043945	0.028258	-1.555121	0.1439
C	0.530919	0.307945	1.724071	0.1084

R-squared	0.156852	Mean dependent var	0.052146
Adjusted R-squared	0.091994	S.D. dependent var	0.027805
S.E. of regression	0.026495	Akaike info criterion	-4.300157
Sum squared resid	0.009126	Schwarz criterion	-4.205750
Log likelihood	34.25118	Hannan-Quinn criter.	-4.301163
F-statistic	2.418401	Durbin-Watson stat	2.325389
Prob(F-statistic)	0.143918		

Null Hypothesis: D(LNPCI_R) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.558380	0.0223
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Residual variance (no correction)	0.000770
HAC corrected variance (Bartlett kernel)	0.000786

Phillips-Perron Test Equation
Dependent Variable: D(LNPCI_R,2)
Method: Least Squares
Date: 12/13/22 Time: 21:29
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPCI_R(-1))	-1.036198	0.291404	-3.555883	0.0040
C	0.054489	0.017459	3.121012	0.0088

R-squared	0.513072	Mean dependent var	-0.000677
Adjusted R-squared	0.472495	S.D. dependent var	0.041254
S.E. of regression	0.029963	Akaike info criterion	-4.046164
Sum squared resid	0.010773	Schwarz criterion	-3.954870
Log likelihood	30.32315	Hannan-Quinn criter.	-4.054615
F-statistic	12.64430	Durbin-Watson stat	1.782166
Prob(F-statistic)	0.003954		

Null Hypothesis: LNHE R has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.496947	0.8600
Test critical values:	1% level	-4.121990	
	5% level	-3.144920	
	10% level	-2.713751	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNHE R)
Method: Least Squares
Date: 01/03/23 Time: 22:16
Sample (adjusted): 2008 2019
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE R(-1)	-0.018005	0.036232	-0.496947	0.6345
D(LNHE R(-1))	-0.919450	0.315779	-2.911688	0.0226
D(LNHE R(-2))	-0.894650	0.306626	-2.917725	0.0224
D(LNHE R(-3))	-0.401792	0.309034	-1.300152	0.2347
C	0.752996	0.424288	1.774728	0.1192

R-squared	0.696767	Mean dependent var	0.162244
Adjusted R-squared	0.523491	S.D. dependent var	0.094815
S.E. of regression	0.065450	Akaike info criterion	-2.320720
Sum squared resid	0.029986	Schwarz criterion	-2.118675
Log likelihood	18.92432	Hannan-Quinn criter.	-2.395524
F-statistic	4.021143	Durbin-Watson stat	2.055553
Prob(F-statistic)	0.052797		

Null Hypothesis: D(LNHE R) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.404707	0.0349
Test critical values:	1% level	-4.200056	
	5% level	-3.175352	
	10% level	-2.728985	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 11

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNHE R,2)
Method: Least Squares
Date: 01/03/23 Time: 22:16
Sample (adjusted): 2009 2019
Included observations: 11 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNHE R(-1))	-4.595113	1.349635	-3.404707	0.0144
D(LNHE R(-1),2)	2.458129	1.012650	2.427423	0.0513
D(LNHE R(-2),2)	1.221258	0.646445	1.889190	0.1078
D(LNHE R(-3),2)	0.503589	0.302774	1.663253	0.1473
C	0.743163	0.222797	3.335602	0.0157

R-squared	0.869022	Mean dependent var	-0.035613
Adjusted R-squared	0.781703	S.D. dependent var	0.124021
S.E. of regression	0.057945	Akaike info criterion	-2.555675
Sum squared resid	0.020146	Schwarz criterion	-2.374813
Log likelihood	19.05621	Hannan-Quinn criter.	-2.669683
F-statistic	9.952292	Durbin-Watson stat	2.132136
Prob(F-statistic)	0.008105		

Null Hypothesis: LNHE_R has a unit root
Exogenous: Constant
Bandwidth: 14 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.087292	0.9343
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Residual variance (no correction)	0.007341
HAC corrected variance (Bartlett kernel)	0.000924

Phillips-Perron Test Equation
Dependent Variable: D(LNHE_R)
Method: Least Squares
Date: 12/13/22 Time: 21:06
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE_R(-1)	-0.008115	0.034015	-0.238579	0.8152
C	0.249258	0.423807	0.588141	0.5665

R-squared	0.004359	Mean dependent var	0.148306
Adjusted R-squared	-0.072228	S.D. dependent var	0.088880
S.E. of regression	0.092034	Akaike info criterion	-1.809759
Sum squared resid	0.110113	Schwarz criterion	-1.715352
Log likelihood	15.57319	Hannan-Quinn criter.	-1.810765
F-statistic	0.056920	Durbin-Watson stat	2.161785
Prob(F-statistic)	0.815151		

Null Hypothesis: D(LNHE_R) has a unit root
Exogenous: Constant
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.395240	0.0002
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Residual variance (no correction)	0.006875
HAC corrected variance (Bartlett kernel)	0.000955

Phillips-Perron Test Equation
Dependent Variable: D(LNHE_R,2)
Method: Least Squares
Date: 12/13/22 Time: 21:07
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNHE_R(-1))	-1.384915	0.328477	-4.216170	0.0012
C	0.214427	0.058183	3.685410	0.0031

R-squared	0.596992	Mean dependent var	-0.009160
Adjusted R-squared	0.563408	S.D. dependent var	0.135545
S.E. of regression	0.089562	Akaike info criterion	-1.856213
Sum squared resid	0.096256	Schwarz criterion	-1.764919
Log likelihood	14.99349	Hannan-Quinn criter.	-1.864664
F-statistic	17.77609	Durbin-Watson stat	2.070057
Prob(F-statistic)	0.001197		

Uttar Pradesh

Null Hypothesis: LNPCI_UP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.547264	0.8554
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPCI_UP)
Method: Least Squares
Date: 01/03/23 Time: 22:04
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPCI_UP(-1)	-0.015793	0.028858	-0.547264	0.5935
C	0.207795	0.299060	0.694827	0.4994

R-squared	0.022519	Mean dependent var	0.044159
Adjusted R-squared	-0.052671	S.D. dependent var	0.021281
S.E. of regression	0.021834	Akaike info criterion	-4.687086
Sum squared resid	0.006198	Schwarz criterion	-4.592679
Log likelihood	37.15314	Hannan-Quinn criter.	-4.688091
F-statistic	0.299498	Durbin-Watson stat	1.972031
Prob(F-statistic)	0.593469		

Null Hypothesis: D(LNPCI_UP) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.439353	0.0330
Test critical values:	1% level	-4.200056	
	5% level	-3.175352	
	10% level	-2.728985	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 11

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPCI_UP,2)
Method: Least Squares
Date: 01/03/23 Time: 22:05
Sample (adjusted): 2009 2019
Included observations: 11 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPCI_UP(-1))	-3.016805	0.877143	-3.439353	0.0138
D(LNPCI_UP(-1),2)	1.860888	0.757506	2.456599	0.0493
D(LNPCI_UP(-2),2)	1.283586	0.558670	2.297574	0.0613
D(LNPCI_UP(-3),2)	1.116158	0.543215	2.054725	0.0857
C	0.132457	0.040022	3.309586	0.0162

R-squared	0.743746	Mean dependent var	-0.003030
Adjusted R-squared	0.572909	S.D. dependent var	0.034061
S.E. of regression	0.022260	Akaike info criterion	-4.469114
Sum squared resid	0.002973	Schwarz criterion	-4.288253
Log likelihood	29.58013	Hannan-Quinn criter.	-4.583122
F-statistic	4.353557	Durbin-Watson stat	2.267607
Prob(F-statistic)	0.054373		

Null Hypothesis: LNPCI_UP has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.589229	0.8456
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Residual variance (no correction)	0.000413
HAC corrected variance (Bartlett kernel)	0.000273

Phillips-Perron Test Equation
Dependent Variable: D(LNPCI_UP)
Method: Least Squares
Date: 01/03/23 Time: 22:06
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPCI_UP(-1)	-0.015793	0.028858	-0.547264	0.5935
C	0.207795	0.299060	0.694827	0.4994

R-squared	0.022519	Mean dependent var	0.044159
Adjusted R-squared	-0.052671	S.D. dependent var	0.021281
S.E. of regression	0.021834	Akaike info criterion	-4.687086
Sum squared resid	0.006198	Schwarz criterion	-4.592679
Log likelihood	37.15314	Hannan-Quinn criter.	-4.688091
F-statistic	0.299498	Durbin-Watson stat	1.972031
Prob(F-statistic)	0.593469		

Null Hypothesis: D(LNPCI_UP) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.388592	0.0301
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Residual variance (no correction)	0.000449
HAC corrected variance (Bartlett kernel)	0.000299

Phillips-Perron Test Equation
Dependent Variable: D(LNPCI_UP,2)
Method: Least Squares
Date: 01/03/23 Time: 22:06
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPCI_UP(-1))	-1.027962	0.300869	-3.416643	0.0051
C	0.045914	0.015071	3.046462	0.0102

R-squared	0.493103	Mean dependent var	-0.001145
Adjusted R-squared	0.450862	S.D. dependent var	0.030892
S.E. of regression	0.022892	Akaike info criterion	-4.584484
Sum squared resid	0.006289	Schwarz criterion	-4.493190
Log likelihood	34.09139	Hannan-Quinn criter.	-4.592935
F-statistic	11.67345	Durbin-Watson stat	1.871037
Prob(F-statistic)	0.005110		

Null Hypothesis: LNHE UP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.449360	0.5304
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNHE UP)
Method: Least Squares
Date: 01/03/23 Time: 22:07
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE UP(-1)	-0.038940	0.026867	-1.449360	0.1709
C	0.633862	0.348992	1.816269	0.0925

R-squared	0.139110	Mean dependent var	0.128489
Adjusted R-squared	0.072887	S.D. dependent var	0.058592
S.E. of regression	0.056416	Akaike info criterion	-2.788548
Sum squared resid	0.041377	Schwarz criterion	-2.694142
Log likelihood	22.91411	Hannan-Quinn criter.	-2.789554
F-statistic	2.100643	Durbin-Watson stat	1.872841
Prob(F-statistic)	0.170929		

Null Hypothesis: D(LNHE UP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on AIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.502974	0.0260
Test critical values:	1% level	-4.057910	
	5% level	-3.119910	
	10% level	-2.701103	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 13

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNHE UP,2)
Method: Least Squares
Date: 01/03/23 Time: 22:08
Sample (adjusted): 2007 2019
Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNHE UP(-1))	-1.467927	0.419052	-3.502974	0.0057
D(LNHE UP(-1),2)	0.291029	0.220964	1.317091	0.2172
C	0.180410	0.054410	3.315751	0.0078

R-squared	0.597218	Mean dependent var	-0.001340
Adjusted R-squared	0.516662	S.D. dependent var	0.064148
S.E. of regression	0.044597	Akaike info criterion	-3.183117
Sum squared resid	0.019889	Schwarz criterion	-3.052744
Log likelihood	23.69026	Hannan-Quinn criter.	-3.209914
F-statistic	7.413673	Durbin-Watson stat	2.246741
Prob(F-statistic)	0.010601		

Null Hypothesis: LNHE UP has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.276882	0.1907
Test critical values:	1% level	-3.959148	
	5% level	-3.081002	
	10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Residual variance (no correction)	0.002758
HAC corrected variance (Bartlett kernel)	0.000935

Phillips-Perron Test Equation
Dependent Variable: D(LNHE UP)
Method: Least Squares
Date: 01/03/23 Time: 22:09
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE UP(-1)	-0.038940	0.026867	-1.449360	0.1709
C	0.633862	0.348992	1.816269	0.0925

R-squared	0.139110	Mean dependent var	0.128489
Adjusted R-squared	0.072887	S.D. dependent var	0.058592
S.E. of regression	0.056416	Akaike info criterion	-2.788548
Sum squared resid	0.041377	Schwarz criterion	-2.694142
Log likelihood	22.91411	Hannan-Quinn criter.	-2.789554
F-statistic	2.100643	Durbin-Watson stat	1.872841
Prob(F-statistic)	0.170929		

Null Hypothesis: D(LNHE UP) has a unit root
Exogenous: Constant
Bandwidth: 13 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-12.44737	0.0000
Test critical values:	1% level	-4.004425	
	5% level	-3.098896	
	10% level	-2.690439	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

Residual variance (no correction)	0.001672
HAC corrected variance (Bartlett kernel)	0.000191

Phillips-Perron Test Equation
Dependent Variable: D(LNHE UP,2)
Method: Least Squares
Date: 01/03/23 Time: 22:08
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNHE UP(-1))	-1.120145	0.207621	-5.395145	0.0002
C	0.133675	0.029868	4.475516	0.0008

R-squared	0.708083	Mean dependent var	-0.014350
Adjusted R-squared	0.683757	S.D. dependent var	0.078537
S.E. of regression	0.044166	Akaike info criterion	-3.270176
Sum squared resid	0.023407	Schwarz criterion	-3.178882
Log likelihood	24.89123	Hannan-Quinn criter.	-3.278627
F-statistic	29.10759	Durbin-Watson stat	1.957076
Prob(F-statistic)	0.000161		

ARDL Bound Test and ECM Results

Bihar

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNPCI BI)
Selected Model: ARDL(2, 2)
Case 2: Restricted Constant and No Trend
Date: 01/04/23 Time: 20:23
Sample: 2004 2019
Included observations: 14

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.656500	0.637419	2.598763	0.0317
LNPCI BI(-1)*	-0.234480	0.107756	-2.176030	0.0612
LNHE BI(-1)	0.064838	0.039996	1.621101	0.1437
D(LNPCI BI(-1))	-0.381545	0.211212	-1.806462	0.1085
D(LNHE BI)	-0.089782	0.078526	-1.143337	0.2860
D(LNHE BI(-1))	-0.104310	0.086307	-1.208595	0.2613

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE BI	0.276516	0.067908	4.071927	0.0036
C	7.064575	0.945600	7.470997	0.0001

EC = LNPCI BI - (0.2765*LNHE BI + 7.0646)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.943703	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58
Actual Sample Size	14		Finite Sample: n=35	
		10%	3.223	3.757
		5%	3.957	4.53
		1%	5.763	6.48
			Finite Sample: n=30	
		10%	3.303	3.797
		5%	4.09	4.663
		1%	6.027	6.76

ARDL Error Correction Regression
Dependent Variable: D(LNPCI BI)
Selected Model: ARDL(2, 2)
Case 2: Restricted Constant and No Trend
Date: 01/04/23 Time: 20:38
Sample: 2004 2019
Included observations: 14

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNPCI BI(-1))	-0.381545	0.166366	-2.293407	0.0510
D(LNHE BI)	-0.089782	0.059207	-1.516414	0.1679
D(LNHE BI(-1))	-0.104310	0.071994	-1.448858	0.1854
CointEq(-1)*	-0.234480	0.042961	-5.457920	0.0006

R-squared	0.630610	Mean dependent var	0.063704
Adjusted R-squared	0.519793	S.D. dependent var	0.042718
S.E. of regression	0.029602	Akaike info criterion	-3.966972
Sum squared resid	0.008763	Schwarz criterion	-3.784384
Log likelihood	31.76880	Hannan-Quinn criter.	-3.983874
Durbin-Watson stat	1.938819		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	7.943703	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58

Madhya Pradesh

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNPCI MP)
Selected Model: ARDL(1, 0)
Case 2: Restricted Constant and No Trend
Date: 12/06/22 Time: 02:27
Sample: 2004 2019
Included observations: 15

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.978396	1.238385	0.790059	0.4448
LNPCI MP(-1)*	-0.154491	0.195745	-0.789248	0.4453
LNHE MP**	0.057143	0.067582	0.845542	0.4144

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE MP	0.369882	0.071027	5.207634	0.0002
C	6.333034	0.767288	8.253794	0.0000

EC = LNPCI MP - (0.3699*LNHE MP + 6.3330)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	23.72606	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58
Actual Sample Size	15		Finite Sample: n=30	
		10%	3.303	3.797
		5%	4.09	4.663
		1%	6.027	6.76

ARDL Error Correction Regression
Dependent Variable: D(LNPCI MP)
Selected Model: ARDL(1, 0)
Case 2: Restricted Constant and No Trend
Date: 12/06/22 Time: 02:28
Sample: 2004 2019
Included observations: 15

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)*	-0.154491	0.016953	-9.112696	0.0000

R-squared	0.064769	Mean dependent var	0.059368
Adjusted R-squared	0.064769	S.D. dependent var	0.026245
S.E. of regression	0.025380	Akaike info criterion	-4.445340
Sum squared resid	0.009018	Schwarz criterion	-4.398137
Log likelihood	34.34005	Hannan-Quinn criter.	-4.445843
Durbin-Watson stat	2.188632		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	23.72606	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58

Rajasthan

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNPCI R)
Selected Model: ARDL(1, 2)
Case 2: Restricted Constant and No Trend
Date: 01/04/23 Time: 22:04
Sample: 2004 2019
Included observations: 14

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.732067	1.338469	2.041187	0.0716
LNPCI R(-1)*	-0.374144	0.200903	-1.862309	0.0955
LNHE R(-1)	0.115313	0.069650	1.655596	0.1322
D(LNHE R)	-0.006614	0.087530	-0.075565	0.9414
D(LNHE R(-1))	-0.213170	0.105253	-2.025314	0.0735

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE R	0.308204	0.033686	9.149357	0.0000
C	7.302175	0.497647	14.67342	0.0000

EC = LNPCI R - (0.3082*LNHE R + 7.3022)

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.483232	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58
Actual Sample Size	14		Finite Sample: n=35	
		10%	3.223	3.757
		5%	3.957	4.53
		1%	5.763	6.48
			Finite Sample: n=30	
		10%	3.303	3.797
		5%	4.09	4.663
		1%	6.027	6.76

ARDL Error Correction Regression
Dependent Variable: D(LNPCI_R)
Selected Model: ARDL(1, 2)
Case 2: Restricted Constant and No Trend
Date: 01/04/23 Time: 22:04
Sample: 2004 2019
Included observations: 14

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNHE_R)	-0.006614	0.057821	-0.114391	0.9114
D(LNHE_R(-1))	-0.213170	0.080770	-2.639221	0.0269
CointEq(-1)*	-0.374144	0.071426	-5.238179	0.0005

R-squared	0.511999	Mean dependent var	0.052562
Adjusted R-squared	0.423272	S.D. dependent var	0.028806
S.E. of regression	0.021876	Akaike info criterion	-4.619460
Sum squared resid	0.005264	Schwarz criterion	-4.482519
Log likelihood	35.33622	Hannan-Quinn criter.	-4.632136
Durbin-Watson stat	1.195811		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	7.483232	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58

Uttar Pradesh

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNPCI_UP)
Selected Model: ARDL(1, 0)
Case 2: Restricted Constant and No Trend
Date: 01/04/23 Time: 22:23
Sample: 2004 2019
Included observations: 15

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.394287	1.962840	2.238739	0.0449
LNPCI_UP(-1)*	-0.782598	0.357153	-2.191211	0.0489
LNHE_UP**	0.286781	0.133232	2.152491	0.0524

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNHE_UP	0.366447	0.012430	29.48084	0.0000
C	5.614997	0.170243	32.98233	0.0000

EC = LNPCI_UP - (0.3664*LNHE_UP + 5.6150)

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	27.83979	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58
Actual Sample Size	15		Finite Sample: n=30	
		10%	3.303	3.797
		5%	4.09	4.663
		1%	6.027	6.76

ARDL Error Correction Regression
Dependent Variable: D(LNPCI_UP)
Selected Model: ARDL(1, 0)
Case 2: Restricted Constant and No Trend
Date: 01/04/23 Time: 22:23
Sample: 2004 2019
Included observations: 15

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)*	-0.782598	0.079281	-9.871133	0.0000

R-squared	0.294799	Mean dependent var	0.044159
Adjusted R-squared	0.294799	S.D. dependent var	0.021281
S.E. of regression	0.017871	Akaike info criterion	-5.146914
Sum squared resid	0.004471	Schwarz criterion	-5.099711
Log likelihood	39.60185	Hannan-Quinn criter.	-5.147417
Durbin-Watson stat	1.929341		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	27.83979	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58