Does Inflation affect Poverty in South Asia? Panel ARDL and NARDL Analysis from 2001-2021

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Abstract

Poverty is a global challenge that encompasses not only economic hardship but also limited access to basic necessities and opportunities for a better life. The study empirically investigates the impact of inflation on poverty in five Asian countries over a period 2001 to 2021 by using Panel ARDL and panel NARDL model, including various statistical techniques, such a panel unit root test and Pedroni cointegration tests. The analysis revealed, strong association among the variables. The other variables of the study include political instability, corruption, and GDP per capita. Findings of the study shown the significant role of effective governance, economic stability, and targeted policies in alleviating the negative impacts of inflation on well-being. The study suggests that focused on inflation in order to mitigate poverty and improve living standard of the masses through a comprehensive approach.

Keywords: Poverty, Inflation, South Asia, Non-Linear ARDL

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1. INTRODUCTION

Economists have different concepts and opinions about poverty. Poverty refers to a severe condition in which people lack basic facilities of life to survive and inflation acts as a catalyst to the scenario (Gul et al., 2022). Inflation indicates the increase in general price level of commodities or goods that are the requirements of day-to-day life. Remove poverty is one of the significant goals the United Nations developmental agenda (United Nations, 2015a). The 1st goal of SDGs

"Eradication of poverty in terms of extreme poverty rate." The United Nations' 17 SDGs aim to achieve universal well-being by 2030, ensuring a healthy life for all of humanity (Leal Filho et al, 2021). The pandemic exists in 2019 badly affected the entire world population, especially, the developing countries like Pakistan, India, Bangladesh. Up till now only three targets have been achieved out of 21 of the total targeted goal of SGDs (Butt, 2022). Poverty is the deprivation

from economic resources. (Gul et al., 2022). Poverty is multidimensional and multifaced phenomenon. Nevertheless, according to the UN definition, poverty is the extreme or severe lack or deficiency the basic economic resources and is entitled as severe poverty (Gul et al., 2020; Jafari et al., 2022). Poverty and inflation are strongly correlated. Inflation has a great impact on poverty. The rapid increase in price may make any economy powerless and therefore generates socio-economic problems. In 2019, the UN report forecasted, about 6 percent of total population will be living under poverty line or severe poverty in 2030. When COVID-19 pandemic effected the world from one side, the also pushed extra more than 70 million people into poverty (Gul et al., 2020). The inflexibility of the political and social outcomes entirely dependent increasing general price level. The practical examples of how inflation has percussed are Germany in 1920s and Brazil in 1960s where the uncontrolled price hike has severely collapsed the political and economic system of both the countries. There is inverse relation between inflation and inequality. If inflation is getting higher, inequality decreases and vice versa. Inflation is normally directly related with poverty while negatively correlated with income inequality (Amin et al., 2022).

1.1 Poverty and Inflation in Asian countries

Many developing countries of the world faces inflation as the root cause to create poverty in Asian countries. The people of such poor countries have no economic security. The World Bank has reported that Asia is home to over 320 million individuals enduring extreme poverty, meaning they live on less than $1.90 per day. The region facing a significant hunger crisis due to income inequality, lack of access to healthcare, absence of proper sanitation, insufficient nutrition, and inadequate educational opportunities (Li et al., 2021). According to the Food and Agricultural Organization of the UN, more than 60% of the world's malnourished children are located in Asia. If extreme poverty declines below 3% by 2030, the first one goal is considered to be achieved. Whereas the second goal will be attained if there is increase in average welfare of the people at 40% earning scale in each country (Kraay et al. 2023). In the first decade of 21st century, Pakistan economic growth showed the positive trend with single digit inflation rate and reduction in the ratio poverty was also observed (Abbott, 2012). Extreme poverty is concentrated predominantly in South Asia and Sub-Saharan Africa on a global scale. On average, 12.6 percent of the world's entire population resides in conditions of extreme poverty. Notably, South Asia ranks second with a substantial proportion of its population, approximately 33.4 percent, living in extreme poverty. Some of the South Asian countries mainly Pakistan and India confronted double-digit inflation rates. To determine the primary causes of high inflation in South Asian countries are classified as the categories of demand and supply. The earlier includes domestic and non-domestic demands, fiscal policies, and monetary policies whereas the later one includes price shock and Government interventions (Islam et al., 2021; Ahme at al., 2022)

Table 1: Inflation and Poverty in Asian countries

| Countries	Inflation Rate (%), (2001-2021)					Poverty Rate (%), (2001-2021)				
Year	2001	2005	2010	2015	2020-21	2001	2005	2010	2015	2020-21
Pakistan	3.15	9.06	12.9	2.53	9.74/.9	93.70	88.50	85.1	75.9	39.3
India	3.78	4.25	11.9	4.91	6.62/5.5	26	41.6	29.6	13.4	14.3
Bangladesh	1.91	7.04	9.3	6.41	5.65/5.6	34.2	25.1	19.2	31.5	14
Sri Lanka	14.1	11.60	6.20	3.77	5.12	22.7	25.7	8.9	4.1	10.9
Nepal	2.69	6.84	9.33	7.87	5.05	25.2	11.8	15	25	17.4

Source: World Bank (2021)

Table 1 shows the inflation rate and poverty rate in percentage from 2001 to 2021. In 2001 the inflation rate in Pakistan was 3.51%, in India it was 3.78% followed by Bangladesh, Sri Lanka and Maldives 1.91%, 14.16% and 0.67% respectively. Whereas poverty rate in 2001 was 93.70%, 26%, 34.2%, 22.7% and 57.2% in Pakistan, India, Sri Lanka, Bangladesh and Nepal respectively. Inflation is one of the major elements in making poverty even more severe but there are other socio-economic and political factors that create poverty too. These factors may be of corruption, political instability, changes in exchange rates, government policies, international crisis and many more to count. Price stability is necessary for economic stability, because, inflation has negative impact on low income people. Ravallian and Datt (2002) revealed that inflation has adverse effects on Indian lower-class families. About 40% of total population are living in deprived conditions (Rana and Rana, 2016) and about 25 million children under the age of 16 are lacking the basic facility of education (UNICEF, 2015). Similarly, about 31.5 of total population of Bangladesh are living

below the poverty line (HIES, 2010). Since 2000, Bangladesh has been undergone a high rate of inflation specifically in food items due to global price increase in food items. Pakistan economy contracted by 0.47% in 2019-2020 during the COVID-19 pandemic which shattered the economy very badly and hence triggered poverty in the nation. In 2020, as reported by the World Bank, Pakistan's poverty rate increased from 4.4 percent to 5.4 percent, leading to approximately 2 million individuals living in poverty. The WB also estimated that Pakistan's poverty ration would remain at 39.3% in the year 2020-21 and projected to remain at 39.2% in 2021-22. Pakistan inflation rate hit 9% in the year 2022 according to Pakistan Bureau of Statistics. The figure 2.1 represents the inflation rate in Pakistan from 2015 to 2021. Similarly, in Bangladesh the inflation rate remained at 5.6% in 2020. According to the WB report, the poverty rate in Bangladesh would remain at 11.2% in the fiscal year 2022-23 that would be lower from pre-pandemic levels. Following India where inflation rate reached to 6.1% in January 2022 and are expected to rise. If we talk about Sri Lanka, it's

going through its tough time of the economy. Sri Lanka has even cancelled the examination of students due to lack of papers for conducting examination. The graph below shows the drastic changes in the economy of Sri Lanka that has given a death blow to the economy of Sri Lanka and also experienced severe poverty (Deyshappriya, 2020; Rasul et al., 2021; Afesorgbor and Lim, 2022; Laborde et al., 2020).

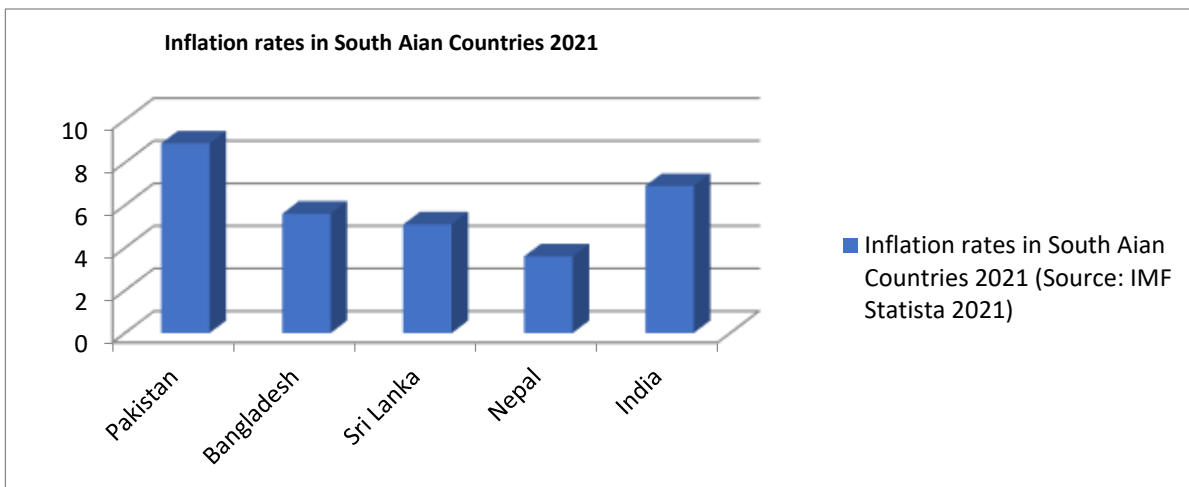**Figure1:** Inflation rate in Sri Lanka from April 2021 to January 2022
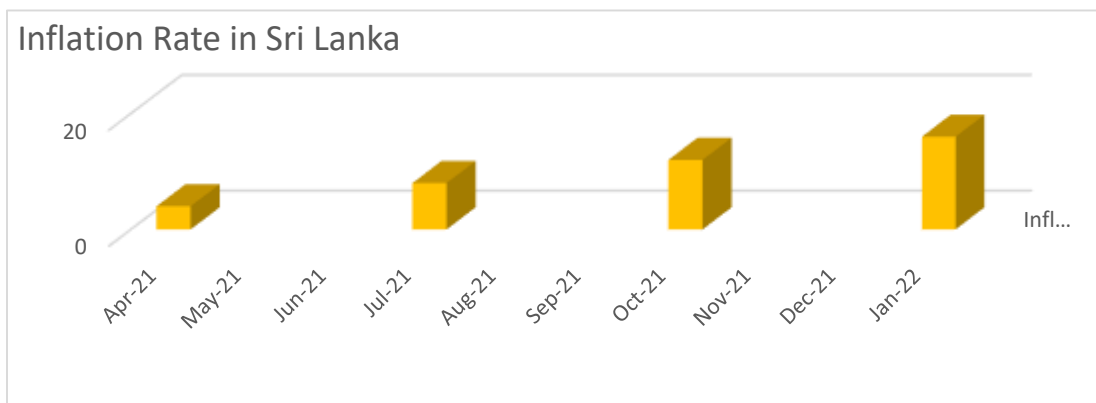
Source: World Bank 2022

Figure 1 representing the inflation rate in Sri Lanka from April 2021 to January 2022 where inflation rates reached to 18-19% in January 2022.

Figure 2: Inflation rates in South Aian Countries 2021

Source: IMF STATISTA 2021

The graph 2.2 shows the rampant inflation rates in selected Asian countries like Sri Lanka, Nepal, Pakistan, India and Bangladesh for the year 2021.

Pakistan experienced much inflation rate as compared to other countries that is 8.9%. the reason for such high inflation is the political instability in the country, lack of good

governance, corruption, illiteracy, the pandemic COVID-19 and the conditions imposed by IMF while applying for loans and debts. According to the IMF report 2021, Pakistan has taken loan of 52.366 USD bn in the month of February 2021. Similarly, India is the second with 6.9% inflation rate, Bangladesh with 5.6%, Sri Lanka with 5.1% and Nepal reached to 3.6% inflation rate in 2021(IMF Statista, 2021)

2. LITERATURE REVIEW

This section has discussed theoretical and empirical studies related to the hypothesis. Many theories and studies are discussed in favor or against of inflation and poverty. According to UN poverty signifies the abandonment of opportunities and choices, a blow to human self-esteem, and the inability to actively engage in society. It encompasses insufficient access to basic necessities like food, clothing, education, healthcare, property for sustenance, and employment. Poverty encompasses restricted access to safe drinking water and sanitation, insufficient physical security, a lack of participation in decision-making processes, and limited potential and opportunities for personal improvement." (World Bank, 2000;2020a; Varga, 2020). Although there are so many factors that are responsible for poverty, inflation is one of the utmost important issues that drive poverty. The problem of poverty gets immense when general price level of basic necessities or commodities increase. There are several arguments that support the concept that inflation rises poverty. Their finding revealed that unemployment is the major factor responsible for inflation in United States despite of inflation.

2.1 Theoretical and empirical studies

The different economics schools of thought presented diverse economic views on poverty and inflation. Classical economists believed that individuals were primarily responsible for causing poverty, forming the basis for laissez-faire policies. In contrast, Neoclassical economists argued that poverty had a more multifaceted origin, with additional explanations such as market failures that were beyond individuals' control. Both schools focused on the role of individuals productivity in creating poverty but also laid emphasized on the monetary aspects and limited role of government, The Keynesians in contrast emphasized on macroeconomic variables especially the role of government for economic stabilization. According to them, poverty is measured as involuntary and mostly caused by unemployment. Marxian opinions on poverty are different. According to them the role of class and group discrimination, which are mainly political matters, are the basis of poverty.

The problem of poverty gets immense when general price level of basic necessities or commodities increase. There are several arguments that support the concept that inflation rises poverty (Mawutor et al., 2023). However, Headey et al.,2023 studied different macroeconomic variables such as unemployment, growth, inflation, poverty and business cycle in the United States. Their finding revealed that unemployment is the major factor responsible for inflation in United States despite of inflation. Kundurthi et al (2023) investigates

Indian inflation dynamics, highlighting the persistent influence of supply-side factors, particularly agricultural production shortages and administered prices. The findings underscore that managing inflation, primarily driven by food items, requires more than interest rate adjustments; governments should play a crucial role through short-term logistics management and long-term structural reforms. Similarly, Shabnum et al., 2023 assess the impact of rising food prices on poverty in Pakistan, analyzing income and calorie-based poverty in rural and urban areas using HIES data from 2005–06 to 2010–11. Results highlight the distinctive role of wheat, rice, milk, meat, fruit, and pulses in household status. Urban households are more adversely affected in the calorie-poverty model. Overall, the study emphasizes that the negative impact on net consumers outweighs benefits to producers, necessitating effective strategies and targeted government policies to alleviate food price pressures on the poor in Pakistan.

The investigation of Bhawmick et al., 2023 for Bangladesh examines the impact of inflation and unemployment on GDP, from 1991 to 2021. Utilizing unit root tests, ARDL Bound test, and Error Correction Model, results reveal that GDP and inflation are stationary, while unemployment is stationary at the first difference. The ARDL Bound test demonstrates the detrimental effect of both inflation and unemployment on GDP growth, supported by consistent F-statistics. The Error Correction Model underscores a substantial correlation in both short- and long-term, emphasizing the significance of monitoring inflation and unemployment levels for sustainable GDP growth

in Bangladesh. Morover, Padmakanthi et al (2023) underscores the potential of social protection as a powerful policy tool for achieving zero poverty. In Sri Lanka, a significant proportion of households still grapple with poverty due to the inadequacies of the current social protection system in addressing the diverse nature of poverty. The research emphasizes the need for a reformulated system that considers spatial factors, diverse poverty categories, and adjusts for inflation, aiming to enhance outreach and impact by meticulously selecting beneficiaries based on district-level poverty lines. Recently, Pokhrel et al., 2023 explores the non-linear relationship between remittance inflow and inflation in Nepal, employing Zivot unit-root testing, NARDL cointegration analysis, and examining long-run asymmetry connections. Findings reveal a long-term asymmetric cointegrating link, with positive inflation shocks subsequently increasing remittance inflow. The study suggests that positive shocks have a greater impact on the inflation multiplier over time than negative shocks. The findings underscore the need for Nepal's government to formulate effective policies for the efficient use of remittances, aiding in the development of strategies to mitigate inflationary pressures.

The existing literature highlights the multifaceted nature of inflation and poverty dynamics in South Asian countries. Studies on Indian inflation, rising food prices in Pakistan, and the impact of inflation and unemployment on GDP in Bangladesh underscore the need for targeted interventions and a nuanced understanding of supply-side factors. The focus on social protection in Sri Lanka emphasizes diverse

poverty dimensions. Aligning with these insights, our study, utilizing ARDL and NARDL models, contributes to a comprehensive analysis of the intricate relationship between inflation and poverty in the region, complemented by a consideration of non-linearities.

2.2 Research Gap

A number of social scholars and economists have investigated to find the association between inflation and poverty. Mostly studies conducted for developing countries, there found a negative association between inflation and poverty. Besides, no comprehensive empirical study has been conducted to find the projected association between inflation and poverty in this region by using both the model ARDL and NARDL. To fill this vacuum a study conducted to observe empirical and theoretical assessment of inflation and poverty for this region. This is our contribution to the existing literature and it provide a significant direction to policymakers and researchers.

3. METHODOLOGY

This chapter is consisted on the following essentials, data and data sources, theoretical framework, a conceptual framework, empirical models, variables, and estimation techniques.

3.1. Data and Data Sources

In order to understand how inflation affects poverty, a panel of five South Asian countries Pakistan, India, Bangladesh, Sri Lanka and Nepal was selected, spanning a time period from 2001 to 2021. Although these countries have many differences, such as differences in income, consumption patterns, inflation, poverty, health, education, living standards, and political

scenarios, Despite all these factors, a general relationship between inflation and poverty is being developed that shows what type of relationship exists between both variables in these selected Asian countries. As well, study six variables: poverty is a dependent variable, while population growth, GDP per capita, political instability, consumer price index, and corruption are dependent variables. First, we check the stationary of a variable, and second, we estimate the panel cointegration and whether there is a long-term connection among the series. The data was taken from the WDI, ICRG, WGI), OWD. Finally, long-term coefficients are estimated using appropriate methods, i.e., panel ARDL and non-linear ARDL, to better understand these economic relationships.

Table 2: GDP Per Capita Income of the selected Asian countries
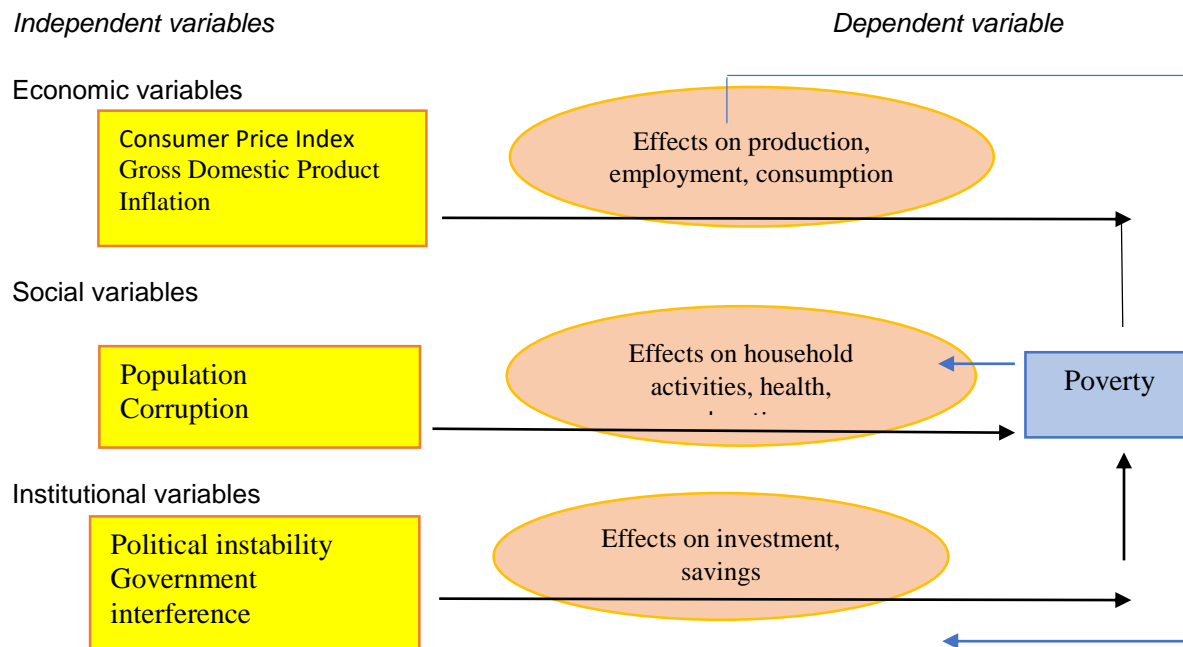
S. no	Countries	GDP Per Capita income $
1	India	2388.6 $
2	Bangladesh	2688.3 $
3	Srilanka	3554.4 $
4	Pakistan	1596.7 $
5	Nepal	1336.5 $

Source: World Bank, 2023

Figure 3: Theoretical framework

3.2 Theoretical framework

Although there are many other socio-economic and political factors that are responsible for causing poverty, such as lack of jobs, lack of good education, population, corruption, government interference, social injustice, etc., inflation is one of the most influential factors in determining poverty. The problem of poverty intensifies when the general price level of day-to-day commodities increases, like food, clothing, and shelter (housing rent). Draw a conceptual Framework that how inflation affect poverty through different channels.

Independent variables　　　　　　　　*Dependent variable*

Economic variables

Consumer Price Index
Gross Domestic Product
Inflation

Effects on production, employment, consumption

Social variables

Population
Corruption

Effects on household activities, health,

Poverty

Institutional variables

Political instability
Government interference

Effects on investment, savings

Source: Authors construction

The right side of the conceptual framework possesses independent variables, including economic, social, and institutional variables affecting different sectors like households, consumption, production, savings, investments, education, health, etc. Economic variables include the consumer price index, gross domestic product, and inflation. Social variables include corruption and population, whereas institutional factors include political instability and government interference. The left side of the framework consists of poverty, which is a dependent variable. These indicators are taken for selected Asian countries, including Pakistan, India, Bangladesh, Sri Lanka, and Nepal.

3.3 Using of ARDL and NARDL estimation technique

The utilization of ARDL and Nonlinear NARDL models in the investigation of the impact of inflation on poverty is justified for its ability to offer a comprehensive understanding of both short-term and long-term dynamics. ARDL models enable the examination of cointegration, ensuring the exploration of a stable long-term relationship between inflation and poverty (Padmakanthi, N. D. (2023). Meanwhile, NARDL models accommodate potential nonlinearities in this relationship, capturing nuanced effects that may vary across different economic conditions or

$$poverty = f(population\ grwoth,\quad GDP\ per\ capita\ ,\quad political\ instability,\quad consumer\ price\ index,$$
$$corruption)$$

The equation that shows the relationship between poverty and inflation is given below as equation 1. There are some other variables, either social, economic, or political, that are responsible for causing poverty in any country. These factors are the growing population, the

income groups (Meo et al., 2023). This methodological approach enhances the robustness of the analysis, allowing for a more thorough exploration of the complex interaction between inflation and poverty in the South Asian context.

3.4 Econometric Model

The empirical model represented in this analysis shows the connection between dependent and independent variables. Poverty is the dependent variable, whereas CPI, GDP per capita income, political instability, population growth, and corruption are independent variables.

consumer price index, the political instability of the country, corruption, and GDP per capita. These are the factors that are side-by-side responsible for causing and giving birth to poverty.

$$Poverty = a_{it} + \beta_1 POPG_{it} + \beta_2 GDPPC_{it} + \beta_3 PINST_{it} + \beta_4 CPI_{it} + \beta_5 CORR_{it} + \varepsilon_{it} \dots (1)$$

Where,

Poverty = population living below poverty line; POPG = Population growth; CP I= Consumer Price Index GDPpc = Gross Domestic Product

per capita; PINST = Political instability; CORR = corruption, μ= error term and α, $\beta_1\ to\ \beta_5$ are intercept and coefficients to be estimated respectively.

3.5 Panel Unit

Before to implementing cointegration techniques, it is crucial to ascertain the order of integration for each variable. One method to accomplish this is by utilizing the panel unit root

test developed by Im, Pesaran, and Shin in 2003, commonly referred to as the IPS test. This test is considered to be less restrictive and more powerful when compared to alternative tests introduced by Levin and Lin (1993), Levin et al. (2002), and Breitung (2000). One of its strengths

lies in its ability to account for heterogeneity in the autoregressive coefficient among units. The

fundamental equation for the panel unit root test as per IPS is expressed as follows:

$$\Delta Y_{it} = \delta_{it} + \beta_i + \sum \gamma_{ij}\,\Delta y_{i,t-j} + \varepsilon_{it}; i = 1,2,3 \dots, N, t = 1,2,3, \dots T \dots (2)$$

Y_{it} represent each variable under attention in the specific model, δ_{it} is use for individual fixed effect and γ_i is residuals uncorrelated over time. The H0 is that $\gamma_i = 0 \ \forall$ i versus the HA is that $\gamma_i <0$, i=1,2,3… N1 and $\gamma_i = 0$ for i=N1+1, …., N.

The IPS statistic is derived by averaging individual ADF statistics across the units in a panel dataset. This statistic is used to test for the occurrence of unit roots in a panel dataset while accounting for potential heterogeneity among the units. The formula for the IPS statistic is as follows:

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_{iT}, \dots (3)$$

$\bar{t}$ is the panel unit root test statistic, N, the total number of units or entities in the panel dataset, i the individual ADF statistic for each unit i. $Therefore, \ t_{iT},$ is the ADF t-statistics for country as equation (1). The $\bar{t}$ statistic, used in statistical testing, is known to follow a normal distribution when specific values provided for sample size (N) and degrees of freedom (T). These critical values for the $\bar{t}$ statistic can be found in the work of Im et al. (2003). It indicates the conditions under which the t statistic can be appropriately applied in statistical analysis. The first-generation panel unit root tests, including IPS tests, assume that cross-sections are independent.

3.6 Cointegration

Panel cointegration tests, similar to panel unit root tests, exhibit greater statistical power compared to conventional time series cointegration tests. In the context of this study, the Pedroni test is utilized to determine whether a long-term relationship exists among the variables. Pedroni has devised a range of tests to evaluate the null hypothesis of no cointegration within a panel data model, with a noteworthy feature being their ability to accommodate significant heterogeneity among the units in the panel. The Pedroni cointegration test can be broadly categorized into two groups: average test statistics and piecewise averages. These tests employ a regression model to assess the presence of a long-term relationship among the variables under scrutiny (Pedroni, 1999).

$$Y_{it} = a_{it} + \vartheta_{it} + \beta_1 x_{1,it} + \beta_2 x_{2,it} + \cdots \beta_{ki} x_{kit} + \varepsilon_{it}; t = 1,2,3 \dots, T, i = 1,2,3, \dots. k \dots (4)$$

In this analysis y and x are supposed to be integrated of order 1 i.e., 1(1). The parameters

a_{it} and ϑ_{it} represent individual entity (cross-sectional) and time effects, respectively, in the

analysis. These effects can be set to zero if needed. Pedroni employed various cointegration statistics to assess cointegration in the study. These statistics include, Panel v-Statistics, Panel p Statistics, Panel t e Statistic (Non-parametric), Panel t e Statistic (Parametric), Group r e Statistics, Group t e Statistics (Non-parametric), and Group Statistics (Parametric). To conclude

that, Pedroni used a range of cointegration statistics to examine whether there are long-term relationships among the variables in the panel dataset. These statistics can be categorized into within-panel and between-group tests, and they help assess cointegration while considering individual entity and time effects in the analysis (Lau & Baharumshah, 2006)

3.7 Panel ARDL

The study uses ARDL bounds test method which is introduced by Pesaran et al. To analysis the linear relationships among the variables of interest. Specifically, the analysis aims to investigate the connection between poverty and explanatory determinants (da Silva et al., 2018; Fatima et al., 2023). The study formulates six different model specifications, each one consisting of the following significant variables poverty, population growth, GDP per

capita, political instability, consumer price index and corruption. This method allows the scholars to exclusively calculate the impact of each variable on poverty. The linear representation of these models allows scholars to express the relationships between poverty various explanatory factors in a mathematical form. By analysis these models, the study aims to provide insights into how different factors influence poverty, with a focus on both individual and combined effects.

$$
\begin{aligned}
\Delta POVERTYG + a_i &+ \sum_{f=1}^{m-1} \beta_{ij}\Delta POVERTY_{i,t-j} + \sum_{g=0}^{n-1} \eta_{ij}\Delta POPG_{i,t-j} + \sum_{h=1}^{0-1} \varphi_{ij}\Delta GDPpc_{i,t-j} \\
&+ \sum_{i=1}^{p-1} \Omega_{ij}\Delta PINST_{i,t-j} + \sum_{j=1}^{q-1} \tau_{ij}\Delta CPI_{i,t-j} + \sum_{k=1}^{r-1} \vartheta_{ij}\Delta CORR_{i,t-j} + \emptyset_{ij}POVERTY_{i,t-j} \\
&+ \partial_{ij} POPG_{i,t-j} + \gamma_{ij}GDPpc_{i,t-j} + \mu_{ij}PINST_{i,t-j} +, \tau_{ij}CPI_{i,t-j} + \omega_1 CORR_{i,t-j} + \varepsilon_{it} \dots (5)
\end{aligned}
$$

Here, $\beta_{ij}\Delta POVERTY_{i,t-j}$, $\eta_{ij}\Delta POGG_{i,t-j}$, $\varphi_{ij}\Delta GDPpc_{i,t-j}$, $\Omega_{ij}\Delta PINST_{i,t-j}$, $\tau_{ij}\Delta CPI_{i,t-j}$ and $\vartheta_{ij}\Delta CORR_{i,t-j}$ are the dependent variables while ai is the coefficient of the specific country. Therefore, $\emptyset_{ij}, \partial_{ij}, \gamma_{ij}, \mu_{ij}, \tau_{ij}$ and ω_1 shows the short run dynamic coefficient of comparative to each country, and ε_{it} is error term.

3.8 Panel NARDL

The ARDL method lacks consideration for the possibility of asymmetric relationships between variables. The effect of positive and negative variations in the decomposed series on the dependent variable is preserved equal. Given the limitations of the ARDL model in capturing asymmetric connections between variables, the study opts for the Nonlinear ARDL (NARDL) model, a nonlinear extension offering a more nuanced exploration of asymmetric relationships, particularly focusing on long-run associations. Utilizing the nonlinear ARDL approach developed

by Shin et al. (2014), the study investigates asymmetric responses associated with public debt accumulation and its impact on economic growth. Building on the groundwork laid by Eberhardt and Presbitero (2015), the research aims to discern how economic growth responds differently to changes in public debt. The methodology involves dividing a variable into positive and negative sub-components, creating

(V+) and (V-) variables, enabling a detailed analysis of the asymmetric effects (Qamruzzaman & Jianguo, 2020; Basri & Kongcharoen, 2021). This division allows researchers to separately analyze the impact of positive and negative changes in independent variables on the variable of interest, enabling a more detailed examination of asymmetric effects.

$$y_{it} + a_i + \sum_{l=1}^{p} \beta_0 y_{i,t-1} + \sum_{l=0}^{q-1} (\beta_1 V_{i,t-1}^+ + \beta_2 V_{i,t-1}^-) + \sum_{l=0}^{q} \beta_3 x_{xi,t-1} + \mu_{it} \dots (6)$$

where $V_{i,t}^- = \sum_{j=1}^{t} V_{i,t}^- = \sum_{j=1}^{t} max(\Delta Vij, 0)$ and $V_{i,t}^+ = \sum_{j=1}^{t} V_{i,t}^+ = \sum_{j=1}^{t} max(\Delta Vij, 0)$.

By reparametrizing eq. (6) we obtain:

$$\Delta y_{it} + a_i + \emptyset(y_{i,t-1} - \emptyset 1 V_{i,t-1}^+ - \emptyset 2 V_{i,t-1}^+ - \emptyset 3 x_{i,t-1}^+) + \sum_{l=1}^{p-1} \eta_1 \Delta y_{i,t-1} + \sum_{l=0}^{q-1} (\eta_2 \Delta V_{i,t-1}^+ + \beta_3 \Delta V_{i,t-1}^-)$$

$$+ \sum_{l=0}^{q-1} \beta \eta_4 \Delta x_{i,t-1} + \mu_{it} \dots (7)$$

4. RESULTS

Table 3: Cross-sectional Dependency (CD) Tests

Tests	Variables					
	POVERTY	POPG	GDPpc	PINST	CPI	CORR
Breusch-Pagan LM	103.62*	68.668*	51.58*	47.67*	27.10*	44.32*
Pesaran Scaled LM	20.936*	13.118*	9.298*	8.423*	3.825*	7.899*
Bias-corrected Scaled LM	20.839*	13.022*	9.202*	8.327*	3.729*	7.802*
Pesaran CD	2.9586*	6.4133*	6.810*	4.120*	2.160**	3.235

Table 3 shows the outcomes of the CD tests of the projected variables such Poverty, POPG, GDPpc, PINST, CPI, and CORR. The Breusch-Pagan LM test, Pesaran Scaled LM test, and Bias-corrected Scaled LM test all indicate the

presence of cross-sectional dependence, with statistically significant. However, it's significant that the CORR variable does not shown significant cross-sectional dependency according to the Pesaran CD test.

Table 4: Descriptive statistics

	POVERTY	POPG	GDPpc	PINST	CPI	CORR
Mean	16.56995	1.386481	4.997741	-1.208227	3.427162	2.408881
Median	15.04318	1.258440	5.099285	-1.124410	2.184140	2.500000
Maximum	55.20000	3.092080	9.050280	0.090368	13.23080	4.000000
Minimum	-1.419088	0.112773	-5.831050	-2.810030	0.185922	1.000000
Std. Dev.	11.33446	0.648458	2.486553	0.658605	3.058843	0.622438

Table 4 presents descriptive statistics for key variables, illustrating central tendencies and variability. The mean poverty rate over the observed period is 16.57%, with a median of 15.04%, indicating a diverse distribution. The mean population growth rate is 1.39%, and the GDP per capita averages 1.39 USD per year. Political instability has a mean score of approximately -1.21, while the mean values for the consumer price index and corruption are 3.43 and 2.41, respectively. The median values for poverty rate, population, and GDP per capita are 15.04%, 1.26 US$, and 5.10 US$, respectively, providing insights into the dataset's central tendencies. Standard deviations range from 0.62 to 11.33, reflecting variable degrees of variability or stability across population growth, GDP per capita, political instability, consumer price index, and corruption.

Table 5: Correlation

	POVERTY	POPG	GDPpc	PINST	CPI	CORR
POVERTY	1					
POPG	0.276783	1				
GDPpc	-0.056571	-0.087394	1			
PINST	-0.129449	-0.394197	0.092923	1		
CPI	0.063691	0.230676	0.275358	0.015359	1	
CORR	-0.101555	-0.329197	0.090973	0.174686	0.018863	1

Table 5 correlation coefficients help understand the relationships between pairs of variables. The correlation coefficient's magnitude serves as an indicator of the relationship's strength, where values nearing 1 or -1 signify a robust correlation, while values approaching 0 suggest a weaker or negligible correlation. Consequently, the values found along the diagonal (running from the top-left to the bottom-right) represent each variable's correlation with

itself, which always equals 1. (perfect correlation). The correlation between poverty and population growth is 0.2768. Poverty is weakly correlated with GDP per capita and CPI. Similarly, poverty is negatively correlated with political instability and corruption.

Table 6: Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-995.2101	NA	114.2261	21.76544	21.92990	21.83182
1	-624.1530	685.6490	0.078559*	14.48159*	15.63284*	14.94624*
2	-589.1757	60.06964	0.081104	14.50382	16.64186	15.36675
3	-564.4151	39.29404	0.106146	14.74815	17.87298	16.00936

Table 6 shows the outcomes of lag selection criteria. The aforementioned criteria help select the appropriate number of lags in a time series model. The asterisk (*) indicates the optimal number of lags for this model. Based on the criteria, it suggests that lag 1 is the optimal choice for this model. Because it has the lowest values for AIC, SC, and HQ, it indicates a good trade-off between model complexity and goodness of fit. In this study, select AIC criteria based on conditions. As a principle rule, we use AIC when T<60.

Table 7: Panel Unit Root Tests

Variable		At Level		At 1st Difference		Outcomes
		II***	II & T**	II***	II & T**	
POVERTY	LL & C	-0.16 (0.4)	-0.51 (0.3)	-5.20 (0.0)	-3.47 (0.0)	LLC I (1)
	IPS	-0.14 (0.4)	-2.55 (0.0)	-7.31 (0.0)	-5.7(0.0)	IPS I (0)
POPG	LL & C	1.84 (0.9)	2.38 (0.9)	-0.73 (0.2)	-1.68 (0.0)	I (1)
	IPS	1.99 (0.9)	1.56 (0.9)	-2.27 (0.0)	-1.75 (0.0)	
GDPpc	LL & C	-4.37 (0.0)	-3.66 (0.0)	-4.14 (0.0)	-1.94 (0.0)	I (0)
	IPS	-4.28 (0.0)	-3.43 (0.0)	-8.53 (0.0)	-7.14 (0.0)	
PINST	LL & C	-0.40 (0.3)	0.07 (0.5)	-5.64 (0.0)	-5.21 (0.0)	I (1)
	IPS	0.28 (0.6)	1.37 (0.9)	-4.68 (0.0)	-4.58 (0.0)	
CPI	LL & C	-0.46 (0.3)	2.64 (0.9)	-4.11 (0.0)	-4.86 (0.0)	I (1)
	IPS	-0.93 (0.1)	1.69 (0.9)	-5.33 (0.0)	-4.81 (0.0)	
CORR	LL & C	-0.30 (0.3)	0.09 (0.5)	-6.22 (0.0)	-5.17 (0.0)	I (1)
	IPS	0.69 (0.2)	-7.72 (0.2)	-6.12 (0.0)	-4.87 (0.0)	

Note: II II& T** represent individual intercept and intercept and trend respectively.*

In time series analysis, stationarity is a crucial concept. A stationary time series is characterized by the fact that its statistical characteristics, including mean and variance, remain constant and do not undergo changes over time. Panel unit root tests are statistical methods used to assess the stationarity of variables in panel data, which involves observing multiple entities (such as individuals, countries, or firms) over time. The goal is to determine whether

the variables are stationary or non-stationary. Table 7 shows the outcomes of LLC and IPS. The variable poverty is stationary at level in IPS while stationary at first difference in LLC. Similarly, GDP per capita is also stationary at this level.

Besides, population growth, corruption, consumer price index, and political instability are non-stationary at level while stationary at first difference. Now that our variables are stationary in mixed order, ARDL will use.

Table 8: Pedroni Cointegration test

Tests	II	II & IT
P-v-S	0.538055 (0.7047)	-8.15890 (0.7927)
P-rho-S	-4.939812 (0.0000)	-1.648038 (0.0497)
P-PP-S	-5.457949 (0.0000)	-2.07785 (0.0189)
P-ADF-S	-5.130589 (0.0000)	-2.297260 (0.0108)
G-rho-S	1.620223 (0.9474)	-0.606063 (0.2722)
G-PP-S	-7.334780 (0.0000)	-1.829986 (0.0336)
G-ADF-S	-3.916134 (0.0000)	-2.909066 (0.0018)

Note: In this table, P, G and S indicate panel, group and statistic. Therefore, II and IT shows individual intercept and trend respectively.

Cointegration pertains to the long run connection between two or more time series variables that are non-stationary or integrated. Table 8 presents the results of Pedroni cointegration analysis., and the results suggest strong evidence of cointegration among the variables in both cases, "II and II and IT.

Table 9: Long run Panel ARDL and NARDL Results ARDL (1, 1, 1, 1, 1, 1)

	(a) PANEL ARDL		(b) PANEL NARDL	
Variable	Coefficient [SD]	t. stat (prob.*)	Coefficient [SD]	t. stat (prob.*)
POPG	1.1938 [0.686]	1.7394 (0.085)		
POPG			5.0010 [1.462]	3.4196 (0.00)
GDPpc	-0.1930 [0.032]	-5.8554 (0.00)		
GDPpc$^+$			-0.4087 [0.286]	-1.4289 (0.15)
GDPpc$^-$			1.8369 [0.280]	6.5556 (0.00)
PINST	0.9119 [0.270]	3.3751 (0.00)		
PINST$^+$			7.0006 [1.842]	3.8000 (0.00)
PINST$^-$			2.3970 [1.513]	1.5834 (0.11)
CPI	0.5495 [0.224]	2.4435 (0.01)		
CPI$^+$			4.2494 [0.665]	6.3839 (0.00)
CPI$^-$			1.5897 [0.739]	2.1507 (0.03)
CORR	1.5717 [0.421]	3.7298 (0.00)		
CORR$^+$			1.2090 [1.461]	0.8270 (0.41)
CORR$^-$			-6.4203 [1.030]	-6.2313 (0.00)

Table 9 illustrates the outcomes of the long-run panels (ARDL and NARDL). The part (a) in the above table describes the panel ARDL results. The relationship between population growth and poverty is complex and can vary depending on various factors, including economic development, government policies, and social conditions. The population growth has a significant (at 10% level) impact on poverty. Political instability, which can encompass factors like civil unrest, government instability, conflict, or uncertainty about governance, tends to disrupt economic activities in several ways, such as investment uncertainty, disruption of supply chains, reduced government effectiveness, and labour market impact. Additionally, efforts to reduce poverty and promote economic stability often involve addressing both economic and political factors, as they are closely intertwined. Effective governance, conflict resolution, and the establishment of the rule of law are often crucial components of poverty reduction strategies in regions experiencing political instability. While inflation itself does not directly cause poverty, its effects on income, purchasing power, and economic stability can contribute to an increase in poverty rates, particularly among low-income and vulnerable populations. Effective economic and fiscal policies can play a crucial role in managing inflation and reducing its impact on poverty.

Table 10: Short run Panel ARDL and NARDL results ARDL (1, 1, 1, 1, 1, 1, 1, 1, 1, 1)

Variable	Part (a) PANEL ARDL		Part (b) PANEL NARDL	
	Coefficient [SD]	t. stat (prob.*)	Coefficient [SD]	t. stat (prob.*)
COINTEQ01	-0.9282 [0.150]	-6.1704 (0.00)		
COINTEQ01			-0.7000 [0.280]	-2.4998 (0.01)
D(POPG)	2.3594 [25.63]	0.9204 (0.35)		
D(POPG)			-0.6954 [5.174]	-0.1343 (0.89)
D(GDPpc)	0.1856 [0.129]	1.4283 (0.15)		
D(GDPpc$^+$)			1.1410 [0.398]	2.8629 (0.00)
D(GDPpc$^-$)			-1.2933 [0.591]	-2.1849 (0.03)
D(PINST)	-1.5988 [2.107]	-0.7588 (0.45)		
D(PINST$^+$)			-11.021 [6.257]	-1.7612 (0.08)
D(PINST$^-$)			-1.1859 [0.594]	-1.9935 (0.05)
D(CPI)	-1.2678 [1.666]	-0.7610 (0.44)		
D(CPI$^+$)			0.5839 [4.177]	0.1397 (0.88)
D(CPI$^-$)			-20.371 [16.75]	-1.2161 (0.22)
D(CORR)	3.1022 [3.527]	0.8793 (0.38)		
D(CORR$^+$)			7.9530 [7.335]	1.0841 (0.28)
D(CORR$^-$)			-0.3317 [0.540]	-0.6133 (0.54)
C	15.497 [4.924]	3.1467 (0.00)		
C			7.3318 [5.696]	20)

Table 10 display the result of the short-run Panel ARDL and NARDL. In same table, part (a), shows the Panel ARDL results. The ECM coefficient -0.9282 is statistically significant. This coefficient measures the adjustment towards the long-run equilibrium or short run converge to long run equilibrium. Similarly, in part (b) Panel NARDL, ECM value is -0.92 is statistically significant. The negative value indicates the short-run converge to long run equilibrium. The Panel ARDL short run results are mostly significant. While panel NARDL results are mostly significant.

Table 11: Granger causality

Null hypothesis	Directional Uni-directional	Bi-directional	F-statistic	Prob
POPG ←→ POVERTY			2.50787	0.0121
			2.26820	0.0233
GDPpc ←→ POVERTY			8.56524	0.0000
			2.82509	0.0047
PINST ←→ POVERTY			3.48399	0.0005
			2.62225	0.0768
CPI ----- POVERTY	X		0.18136	0.8344
			0.15143	0.8596
POVERTY ----- CORR	X		1.22578	0.2972
			0.23046	0.7945
GDPpc ←→ POPG			3.41044	0.0363
			3.08108	0.0021
PINST ----- POPG	X		2.34016	0.2658
POPG ⟶ PINST			8.53806	0.0003
CPI ----- POPG	X		0.28205	0.7547
			0.49960	0.6081
CORR ----- POPG	X		0.00618	0.9938
			2.03541	0.1352
PINST ⟶ GDPpc			3.35456	0.0382
GDPpc ----- PINST	X		0.15206	0.8591
CPI ⟶ GDPpc			2.46039	0.0139
GDPpc ----- CPI	X		1.38038	0.2554
CORR ----- GDPpc	X		0.23022	0.7947
			1.76540	0.1755
CPI ←→ PINST			2.43862	0.0147
			2.32204	0.0202
CORR ----- PINST	X		0.37819	0.6859
			1.76567	0.1755
CORR ----- CPI	X		0.99572	0.3725
			1.22231	0.2982

Notes: →, ↔, and ---- denote unidirectional causality, bidirectional causality, and no causality respectively.

Table 11 shows the results of a Granger causality test for various pairs of panel data variables. Granger causality tests are used to determine whether one variable can predict another variable based on their historical values. The analysis has found bidirectional causality between population growth, GDP per capita, political instability, and poverty. Bidirectional causality means that there is evidence to suggest that these variables influence each other in both directions. The lack of causality between CPI (Consumer Price Index) and corruption suggests that there is no statistically significant evidence to support a causal connection between these two variables in your analysis. Similarly, the no causality between corruption and GDP per capita as well as Corruption and political instability. It suggests that changes in corruption levels do not

seem to be causing or being caused by changes in political instability and GDP per capital in the selected countries. The political instability and

CPI has unidirectional with GDP per capita. To conclude that, mostly variables are cause of the other variables.

5. DISCUSSIONS

In the dominion of economic dynamics, Amendola et al. (2023) find that a 1 percent increase in inflation corresponds to a 0.54 percent increase in poverty, while a 1 unit rise in corruption results in a 1.56 percent increase in poverty. Conversely, Nkwatoh and Mallum (2023) reveal that a 1 unit increase in GDP per capita leads to a significant 5.00 percent decrease in poverty, highlighting the critical role of economic growth in poverty reduction. Political instability, as studied by Rosado and Samy (2023) and Maldonado (2023), shows a strong positive correlation with poverty, with a 1 unit increase leading to a 7.00 percent rise in poverty.

Interestingly, CPI-positive shocks and corruption-positive shocks both contribute to increased poverty, while negative shocks have varying impacts across South Asian economies. Notably, Lipton (2023) and Nawaz et al. (2023) emphasize the inverse relationship between GDP per capita and poverty, suggesting that higher average income correlates with a reduction in poverty rates. Finally, the impact of political instability on poverty is nuanced, as a 1 unit increase results in a 0.91 percent increase in poverty, revealing a complex interplay between political stability and economic welfare.

Figure 3: Stability Tests
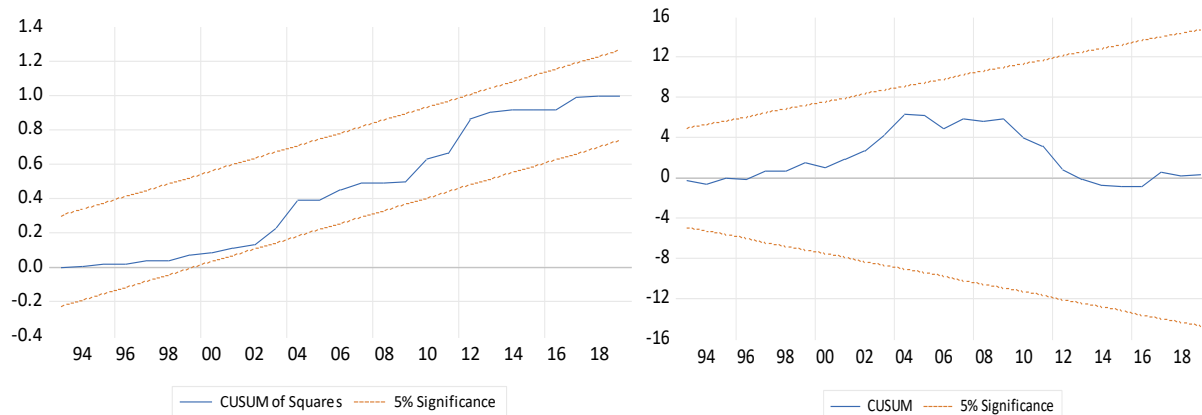
CUSUM and CUSUM Square charts are valuable tools for quality control and process monitoring, allowing for early detection of process shifts or changes so that corrective actions can be taken promptly to maintain product or service quality.

The figure 1 and 2 shows, the outcomes of CUSUM and CUSUM-Square. The blue line lies between the red line its stability exist of the specific model and long run association holds.

5. CONCLUSION

The study empirically investigates into the complex relationship between inflation and poverty across selected Asian countries, specifically Pakistan, India, Sri Lanka, Bangladesh, and Nepal over a period from 2001 to 2020. Through a comprehensive analysis, we've uncovered compelling evidence that, although inflation itself doesn't serve as a direct driver of poverty, its effect on income, purchasing power, and economic stability can contribute to elevated poverty rates, particularly among the most vulnerable segments of society. Our research also underscores the substantial influence of additional factors, such as political instability, corruption, and GDP per capita, in shaping poverty levels within these nations. The study has identified bidirectional causality between population growth, GDP per capita, political instability, and poverty, highlighting the complex nature of these relationships. However, the study has not found significant causal links between corruption, the Consumer Price Index (CPI), and GDP per capita within this context.

6. RECOMMENDATION AND FUTURE STUDY

In addressing the poverty in selected Asian countries, policymakers should adopt a multifaceted strategy to address poverty, with a particular focus on mitigating the impact of inflation. Prioritizing effective governance, economic stability, and targeted policies is essential to reduce poverty and achieve sustainable development goals, particularly those related to poverty reduction and well-being improvement. Practical measures should include managing inflation effectively, reducing political instability and corruption, and promoting strategies to increase GDP per capita, as these factors play significant roles in poverty dynamics. The analysis provides a deeper understanding of the complex elements that contribute to poverty in Asian nations and presents valuable guidance for policymakers determined to address poverty and promote sustainable development in the region. The present study should consider additional variables and diverse regional contexts. It would be valuable to investigate the impact of specific inflationary factors, such as food price increases, on poverty rates, as well as the role of social safety nets and targeted interventions in mitigating these effects.

7. LIMITATIONS

This study has several limitations, including the use of secondary data sources, which may have inherent biases or inaccuracies. The focus on a select of projected of Asian countries may not fully represent the diversity of economic and social conditions across the continent.

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