AGRICULTURE-LED GROWTH IN SOUTH ASIA COUNTRIES AND THE EFFECTS OF MACROECONOMIC VARIABLES ON ECONOMIC DEVELOPMENT

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Abstract

This paper adopts an empirical approach, concentrating on the influence of agriculture and macroeconomic variables on economic development in South Asian countries. Given the historical significance of agriculture in the region, this study explores its substantial impact on economic development. To substantiate these observations empirically, the research analyzes the long-run relationship between key time-series variables. Co-integration and error correction models are applied individually for each country, utilizing annual agricultural and economic data sourced from FAO and World Bank statistics spanning the period 1990-2020. Despite some skepticism regarding agriculture's contribution to economic growth, the findings indicate a demonstrable long-run relationship between economic growth and agricultural production in the majority of South Asian economies. Consequently, the results bear crucial implications for both agricultural and economic policy considerations.

Keywords: Agriculture, Macroeconomic indicators, Economic development, South Asia, Long-run relationship

Introduction

Agriculture holds a central position in the economies of South Asian countries. Intensive agricultural practices in this region have emerged as a consequence of the Green Revolution (Atapattu and Kodituwakku, 2009). In nations where agricultural employment constitutes a substantial portion of the labor force, the progress of the agricultural sector is vital for overall economic growth (Oyakhilomen and Zibah, 2014). Throughout various Asian nations, growth driven by agriculture has played a crucial role in poverty reduction and economic transformation (Diao et al., 2010). The development of agriculture has led to an augmentation of food supplies (Johnston and Mellor, 1961). However, developing countries have faced challenges such as rapid population growth, climatic uncertainties, and economic obstacles that have not been conducive to the agricultural sector. The agricultural landscape in the region has been significantly influenced by factors such as price policies, infrastructure development, urbanization, and technological advancements (Joshi et al., 2003). The expansion of the agricultural sector not only increases food supplies but also contributes to poverty reduction and the transformation of primary industries into secondary and service sectors.

South Asian countries share a common economic structure characterized by a prominent public sector and a nationalized financial sector (Mallika and Chowdhury, 2001). Agricultural production plays a pivotal role in the economic development of these nations (Awokuse and Xie, 2015). Despite economic growth being observed in most South Asian countries in recent years, the majority of this growth has been driven by India (World 101). The current study aims to fill gaps in the existing empirical literature by investigating the relationship between agricultural production and economic growth in South Asian countries.

A comprehensive understanding of this relationship is crucial for formulating effective economic and agricultural policies that can foster regional economic growth. Furthermore, insights from this research can assist policymakers in allocating resources more effectively by recognizing the role of investments in agriculture (Awokuse and Xie, 2015). The objective of the current study is to empirically examine the long-run and short-run relations between economic growth and agricultural production in the South Asian region, utilizing the autoregressive

distributed lag (ARDL) bounds testing approach. Time-series data for South Asian countries, including Sri Lanka, Bangladesh, Bhutan, India, Maldives, Nepal, and Pakistan, were employed to assess agriculture's impact on economic growth.

Literature Review

The impact of agriculture on economic growth in developing countries has been a subject of considerable interest among economists. While numerous studies have delineated the theoretical connection between agriculture and economic growth, the causal impact remains a crucial aspect warranting further investigation. An early study by Johnston and Mellor (1961) delves into the role of agriculture in economic development through intersectoral linkages. Awokuse and Xie (2015) examine the role of agriculture in promoting economic growth in nine developing countries across Asia (China, Indonesia, and Thailand), Latin America (Brazil, Chile, and Mexico), and Sub-Saharan Africa (Cameroon, Kenya, and South Africa). The findings suggest that agriculture could serve as an engine of economic growth, although the impacts vary among countries, supporting the argument of the agriculture-led growth hypothesis.

Recent studies present mixed results on the effect of agriculture on economic growth. Some researchers argue that agricultural development is a prerequisite for industrialization and overall economic growth. Schultz (1964) and Gollin, Parente, and Rogerson (2002) support the notion that economic growth hinges on the development of the agricultural sector. Gollin, Parente, and Rogerson (2002) further contend that the growth in agricultural productivity is pivotal to economic development and can substantially delay industrialization. Oyinbo and Rekwot (2014) reveal a causal relationship between economic growth and agriculture, modernizing the economic system in Nigeria. In certain countries, the agricultural sector is the primary contributor to economic development due to its centrality in people's livelihoods (Dube et al., 2019). Additionally, poor agricultural technologies can hinder economic growth, and improvements in agricultural productivity can positively impact income.

In contrast to agricultural development and economic growth, Diao et al. (2010) find little evidence of economic transformation and agricultural development in African countries, unlike in Asian nations. Gardner (2003) confirms this finding using a cross-sectional panel of 52 developing countries. Ashley and Maxwell (2001) suggest that rural populations should focus on income diversification away from agriculture, although this strategy may not be positive if driven by stagnant agricultural growth (Haggblade, Hazell, and Reardon, 2002). However, Tiffin and Irz (2006) find strong evidence of causality between agricultural value added and general economic growth using Granger-causality tests, consistent with the agricultural productivity paradigm and economic growth.

Chebbi (2010) employs Johansen's multivariate approach to study the cointegration of different sectors of the Tunisian economy, emphasizing the non-causal relationship between agriculture and economic growth. The results suggest that Tunisian economic sectors cointegrate, and agriculture seems to partially drive the growth of other sectors. In a comprehensive study, Tsakok and Gardner (2007) discuss methodological issues in assessing the relationship between agriculture and economic growth, exploring two polar views: the necessity of agricultural development for economic growth versus bypassing agricultural development and investing in building an industrial base.

The present study evaluates the role of agricultural production in the economic growth process in South Asian countries, where agriculture holds a central position in the economy. This paper aims to provide evidence regarding the existence of a long-run relationship between agricultural production and the economic growth rate. To estimate this relationship, the study applies cointegration tests and a vector error correlation model, controlling for essential macroeconomic variables such as inflation, exchange rate, foreign direct investment (net inflows), and the growth rate of broad money (M3). Through time series analysis, this research examines whether the development of agriculture should be an effective macroeconomic policy in South Asian countries. To our knowledge, this study marks the first attempt to investigate the role of agriculture in economic development in the South Asian economies after significant economic turmoil in the region.

Table 1: Summary statistics

Country	Variables	Mean	Standard Dev.	Min.	Max.
Sri Lanka	Economic growth (%)	7.90	7.09	-4.52	25.85
	Agricultural production (1000 US$)	3,925,600.00	772,128.90	3,035,596.00	5,999,018.00
	Exchange rate	102.88	44.20	40.06	198.76
	Inflation rate	8.89	4.95	2.14	22.56
	Foreign Direct Investment net inflows (% of GDP)	1.19	0.50	0.43	2.85
	Broad Money Growth (annual %)	17.69	7.92	8.32	49.98
Bangladesh	Economic growth (%)	8.53	5.24	-0.08	21.42
	Agricultural production (1000 US$)	15,800,000.00	5,021,078.00	9,450,046.00	24,200,000.00
	Exchange rate	62.23	16.911	34.57	85.08
	Inflation rate	6.010	2.21	2.01	11.40
	Foreign Direct Investment net inflows (% of GDP)	0.61	0.51	0.01	1.74
	Broad Money Growth (annual %)	15.62	5.96	9.74	43.00
Bhutan	Economic growth (%)	8.02	9.29	-14.79	33.52
	Agricultural production (1000 US$)	370,660.70	39,666.03	283,036.00	443,445.00
	Exchange rate	47.52	14.87	17.50	74.10
	Inflation rate	6.77	3.26	2.46	15.98
	Foreign Direct Investment net inflows (% of GDP)	0.97	1.50	-0.68	6.32
	Broad Money Growth (annual %)	18.78	12.54	3.75	58.94
India	Economic growth (%)	7.57	8.45	-11.53	26.95
	Agricultural production (1000 US$)	255,000,000.00	70,400,000.00	164,000,000.00	388,000,000.00
	Exchange rate	47.52	14.87	17.50	74.10
	Inflation rate	7.20	3.14	3.33	13.87
	Foreign Direct Investment net inflows (% of GDP)	1.26	0.85	0.03	3.63
	Broad Money Growth (annual %)	15.36	3.83	6.80	22.27
Maldives	Economic growth (%)	9.77	10.93	-33.26	35.40
	Agricultural production (1000 US$)	17,368.00	10,508.71	3,305.00	48,391.00
	Exchange rate	13.10	1.80	9.55	15.39
	Inflation rate	4.55	5.58	-1.69	20.13
	Foreign Direct Investment net inflows (% of GDP)	6.12	4.18	1.81	17.13
	Broad Money Growth (annual %)	16.00	8.72	-0.18	35.90

Country	Variables	Mean	Standard Dev.	Min.	Max.
Nepal	Economic growth (%)	7.78	8.16	-8.24	29.52
	Agricultural production (1000 US$)	6,040,716.00	1,833,526.00	3,631,993.00	9,431,589.00
	Exchange rate	76.10	23.57	29.37	118.35
	Inflation rate	7.33	3.55	2.27	17.15
	Foreign Direct Investment net inflows (% of GDP)	0.22	0.22	-0.10	0.68
	Broad Money Growth (annual %)	18.09	7.04	2.66	38.84
Pakistan	Economic growth (%)	5.75	7.40	-10.93	21.30
	Agricultural production (1000 US$)	33,700,000.00	8,528,844.00	20,700,000.00	48,400,000.00
	Exchange rate	72.93	39.30	21.71	162.91
	Inflation rate	8.49	3.95	2.53	20.29
	Foreign Direct Investment net inflows (% of GDP)	1.05	0.81	0.38	3.67
	Broad Money Growth (annual %)	15.66	6.96	4.31	42.91

Sources: Agricultural Production is from Food and Agriculture Organization Statistics. Economic Growth, Exchange Rate, Inflation Rate, Foreign Direct Investment, and Broad Money Growth is from World Bank Open Data.

Data

Data from South Asian countries, namely Sri Lanka, Bangladesh, Bhutan, India, Maldives, Nepal, and Pakistan, have been utilized to evaluate the impact of agricultural production on economic growth. The study leverages time series data covering the period from 1990 to 2020, encompassing variables such as agricultural production, economic growth rate, exchange rate, inflation, foreign direct investments, and broad money growth. The Food and Agriculture Organization statistics (FAO STAT) serve as the data source for agricultural production, while data on Economic Growth, Exchange Rate, Inflation Rate, Foreign Direct Investment (Net inflow, % of GDP), and Broad Money Growth are sourced from the World Bank Open Data. Table 1 provides a summary of the statistical characteristics of the variables employed in this study.

Methodology: Autogressive Distributed Lag Model (ARDL) with Bounds Test:

The Autoregressive Distributed Lag (ARDL) model is employed to examine both long-run and short-run relationships within economic time series. The autoregressive model typically includes lagged values of the dependent variable, and as a result, using Ordinary Least Squares (OLS) techniques can lead to biased coefficient estimation. In cases where the error term is correlated, OLS estimates become inconsistent (Giles, 2013). Notably, the ARDL approach can be applied to series regardless of their order of integration, whether they are I(0), I(1), or mutually cointegrated (Sari, Ewing, Soytas, 2008).

The integration of the error correction term into the ARDL model allows for the estimation of long-run effects between variables. Moreover, the ARDL model demonstrates greater effectiveness in estimating small samples compared to other time series methodologies (Pesaran and Shin 1999; Latif et al., 2015). Nkoro and Uko (2016) ascertain that the ARDL model maintains its robustness even in situations with a small sample size when a single long-run relationship between variables exists.

Bounds test for long-run relationships

Several conventional approaches exist for testing the presence of long-run relationships. The Engle and Granger (1987) approach, the maximum likelihood-based Johansen and Juselius (1990) method, and the Phillips and

Hansen (1990) fully modified OLS estimator are among the techniques employed to estimate long-run relationships (Muhammad and Faridul, 2011). The ARDL bounds testing methodology, introduced by Pesaran and Shin (1999) and further developed by Pesaran et al. (2001), has gained popularity due to its advantages over traditional cointegration testing methods (Giles, 2013). The ARDL bounds testing approach is particularly well-suited for small sample sizes (Haug, 2002; Muhammad and Faridul, 2011).

To examine both long-run and short-run relationships, the unrestricted error correction method (UECM) is employed. The modification of the order of the ARDL model is appropriately conducted to simultaneously address residual serial correlation, as proposed by Pesaran and Shin (1999).

$$\Delta lnEGR_{it} = \alpha + \sum_{k=1}^{p} \delta_1 \Delta lnEGR_{i(t-k)} + \sum_{k=0}^{q} \delta_2 \Delta lnAGP_{i(t-k)} + \sum_{k=0}^{q} \delta_3 \Delta lnEXGR_{i(t-k)} +$$

$$\sum_{k=0}^{q} \delta_4 \Delta lnIF_{i(t-k)} + \sum_{k=0}^{q} \delta_5 \Delta FDI_{i(t-k)} + \sum_{k=0}^{q} \delta_6 \Delta MGP_{i(t-k)} + \gamma_1 \, lnEGR_{i(t-k)} + \gamma_2 lnAGP_{i(t-k)} + \quad (1)$$

$$\gamma_3 lnEXGR_{i(t-k)} + \gamma_4 lnIF_{i(t-k)} + \gamma_5 FDI_{i(t-k)} + \gamma_6 MGP_{i(t-k)} + \varepsilon_{it}$$

where: EGR is the economic growth, AGP is the agricultural production, $EXGR$ is the exchange rate, IF is the inflation rate, FDI is foreign direct investment and MGP is broad money growth. i denotes the country, t represents the time, k is he number of time lags (annual). p and q are the maximum number of dependent and independent variable lags respectively. The optimal lag length can be selected using BIC values. Δ indicates the first difference of the variables and ln indicates the natural logarithm. Exchange rate, inflation rate, foreign direct investment and broad money growth are the indicators that determine the economy growth.

To determine the order of the series, augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests are used. Although the ADF test is widely used in time-series data analysis, it is affected by serial correlation (DeJong et al., 1992). The results of unit root test can be found in the appendix. The δs refer to the short-run relationship and γs to the long-run relationships. The null hypothesis of no cointegration is: $\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0$. The alternate hypothesis is: $\gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq 0$. If the calculated F-statistics exceed the upper bound critical value, the null hypothesis of no cointegration is rejected. If it is below the lower bound, then the null cannot be rejected. If the calculated F-statistics fall between the lower and upper bound, then cointegration is inconclusive.

Empirical Results and Discussion

Unit Root and Bounds Tests:

This section outlines the estimation of an ARDL model as given in Equation (1). The ADF and PP unit root test statistics results are presented in Appendix Table A1 and A2. These tests indicate that all variables are nonstationary in levels but become stationary after taking the first difference. While the ARDL approach does not necessitate testing for the stationarity of time-series, higher-order integration (i.e., I(2) or more) may yield unreliable estimates when using the ARDL model (Ouattara, 2004). Therefore, unit root testing confirms the appropriateness of the ARDL model for South Asian economic time-series data.

The F-statistics results for the bounds testing are detailed in Table 2. For all countries in the South Asian region, except Bhutan, the F-statistics fall outside the upper bound and are statistically significant at the 5% level. These results imply the presence of a long-run relationship between agricultural production and economic growth. If such long-run relationships exist, information on agricultural production can be utilized to predict economic growth.

Table 2: ARDL bound test for cointegration

Country	Computed F-statistics	Lower bound value	Upper bound value	Decision
Sri Lanka	11.737	3.420	5.053	Reject the null
Bangladesh	13.166	3.261	4.805	Reject the null
Bhutan	5.817	4.066	5.995	Cannot reject the null
India	7.489	3.493	5.207	Reject the null
Maldives	8.095	3.867	5.669	Reject the null
Nepal	10.679	3.970	5.816	Reject the null
Pakistan	11.405	3.943	5.824	Reject the null

Note: Lower and upper values on ARDL bounds test are calculated by the critical value at 5% significant level.

Table 3: Estimated Long Run and Short Run Relationships

	ΔLn_ economic growth rate	Sri Lanka	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan
LR	ln_ag_production	-1.633	-1.553	3.148	-0.377	-1.652**	8.800*	6.074**
		(1.170)	(1.338)	(1.697)	(2.270)	(0.565)	(1.215)	(2.532)
	ln_exchange_rate	0.519	3.566*	-1.241	-0.756	-1.585	-10.077*	-3.311**
		(0.418)	(1.772)	(1.218)	(2.588)	(2.933)	(1.268)	(1.262)
	ln_inflation	1.030***	0.537**	0.067	0.435	0.182	-1.084*	1.049***
		(0.256)	(0.195)	(0.556)	(0.649)	(0.290)	(0.206)	(0.313)
	ln_foreign_DI	0.000	-0.218**	-0.583**	0.330	-0.629	-0.124	-0.318
		(0.235)	(0.083)	(0.198)	(0.338)	(0.506)	(0.094)	(0.227)
	ln_broad_money growth_percent	0.526*	0.375	-0.155	-0.540	1.782*	-0.560	0.514
		(0.263)	(0.341)	(0.244)	(0.543)	(0.979)	(0.438)	(0.381)
SR	Δln_ag_production	-1.616	-1.638	3.971	-0.285	-1.666*	-4.079	5.479**
		(1.204)	(1.350)	(2.237)	(1.719)	(0.742)	(3.650)	(1.983)
	Δln_exchange_rate	-9.303***	-6.930**	-23.744***	-14.063***	-12.326*	-8.422	-28.539***
		(2.386)	(2.598)	(3.772)	(1.812)	(5.921)	(3.826)	(4.190)
	Δln_inflation	1.019***	0.566**	0.085	-0.347	0.456	-1.355*	0.946***
		(0.218)	(0.199)	(0.699)	(0.379)	(0.309)	(0.239)	(0.261)
	Δln_foreign_DI	0.000	-0.230**	-0.735**	0.257	0.892	0.011	-0.287
		(0.233)	(0.083)	(0.292)	(0.261)	(0.689)	(0.079)	(0.204)
	Δln_broad_money growth_percent	0.521*	0.395	-0.195	-0.419	0.549	-0.700	0.463
		(0.268)	(0.353)	(0.319)	(0.425)	(0.668)	(0.517)	(0.381)
	Cons	21.027	11.795	-41.767	10.160	17.914*	-109.899*	-83.113**
		(17.129)	(15.722)	(25.873)	(25.537)	(11.065)	(24.265)	(30.895)
	Error correction term	-0.990***	-1.055***	-1.14395	-0.777***	-1.009***	-1.250*	-0.902***
		(0.146)	(0.142)	(0.222)	(0.177)	(0.219)	(0.107)	(0.152)
R^2		0.86	0.83	0.995	0.91	0.92	0.99	0.89

*Note: ***, **, and * denote the 1%, 5%, and 10% significant levels, respectively. Standard errors are presented in the numbers in parentheses.*

Long-run relationships

The results of the estimated long-run relationships among variables are detailed in Table 3. According to the ARDL model, Nepal exhibits the highest recorded economic growth associated with agricultural production. Specifically, a 1% increase in Nepal's agricultural production leads to an average 8.8% increase in economic growth, all else being equal. Pakistan follows as the second-largest contributor to economic growth through agricultural production compared to other South Asian countries. In contrast, Maldives displays an inverse relationship between agricultural production and economic growth. One plausible explanation is the geographical constraint of being an island, making it challenging to expand the scale of the agricultural economy to support its population. Consequently, Maldives relies on importing agricultural products from foreign countries, weakening its domestic agriculture industry.

For Sri Lanka, Bangladesh, and Pakistan, the inflation rate is positively correlated with economic growth. However, in Nepal, inflation is negatively related. The relationship between inflation and economic growth remains contentious both in theory and empirical analysis (Mallika and Chowdhury, 2001). Studies involving 70 countries from 1960 to 1989 found no causal relationship between inflation and economic growth in 40% of the countries (Paul et al., 1997). Furthermore, some studies report a positive relationship, while others find a negative correlation between inflation and economic growth (Barro, 1996; Bruno and Easterly, 1998; Fischer, 1993). In essence, the relationship between inflation and economic growth appears inconclusive.

The exchange rate, representing a currency peg, is explored in connection with economic growth. Developing countries often fix their exchange rates to another country's currency (e.g., the U.S. dollar) to reduce exchange rate risk and promote economies through trade. The results indicate that only Bangladesh experiences a positive impact of the exchange rate on economic development, while Nepal and Pakistan undergo significant depreciation, hindering economic growth.

Foreign direct investment (FDI) is commonly believed to have a positive impact on economic growth (Athukorala, 2003). However, our findings reveal that Bangladesh and Bhutan's economic performances are negatively affected by FDI, consistent with the dependency theory suggesting that nations heavily reliant on FDI may experience negative impacts on economic growth (Saqib et al., 2013). Additionally, prior literature indicates a significant negative effect of FDI on the host country in the long run (Hermes and Lensink, 2003; Kogid et al., 2010), warranting further research to understand why these economies exhibit adverse effects from FDI, although this inquiry extends beyond the scope of the current study.

The broad money growth rate, indicating liquidity in a country, shows a positive and significant long-run relationship with economic growth in Sri Lanka and Maldives. Enhanced liquidity from broad money is expected to stimulate private sector investment, thereby accelerating economic growth (Rana and Barua, 2015). However, the insignificant broad money growth rate in other countries suggests a need for proper channeling of funds into the economy for economic activities (Rana and Barua, 2015). Notably, none of the variables are statistically significant in the Indian economy, a finding that may warrant further investigation.

Short-run relationships

In the short run, an increase in the exchange rate appears to be associated with decreased economic growth in most countries in the South Asian region. Additionally, the inflation rate is positively linked with economic growth in Sri Lanka, Bangladesh, and Pakistan. Notably, foreign direct investment is inversely correlated with economic growth for Bangladesh and Bhutan.

The error correction term serves as an indicator of the speed of adjustment to restore long-run equilibrium in the dynamic economic growth model for the South Asian region. As anticipated, we expect a negative and significant sign for the error correction term, as shown in Table 3. The coefficient of the error correction term provides insight into how quickly variables converge to equilibrium.

Conclusions

Even though the South Asian region's economy is predominantly based on agricultural production, the performance varies significantly from country to country. Many South Asian economies have undergone economic reforms, driven mainly by trade liberalization and globalization (Joshi et al., 2003). This study reveals that only Nepal and Pakistan possess a robust agricultural production sector supporting their long-term economic growth. As highlighted by Johnston and Mellor (1961), agriculture contributes to economic growth through increased demand for agricultural products, expanded agricultural exports, capital for investment, rising net cash incomes, and the transfer of labor from agriculture to non-agricultural sectors. These findings suggest potential implications for Nepal's and Pakistan's agricultural policies, emphasizing the importance of stimulating growth and development through agricultural expansion, along with investments in agricultural research and extension programs.

On the contrary, there is limited evidence supporting the notion that the economic growth of Sri Lanka, Bhutan, Bangladesh, Maldives, and India is significantly dependent on agricultural production. Factors such as the influx of subsidized cheap products through imports, slow technological advances in staple crops, and declining investment in agriculture seem to have a notable impact on the diminishing role of agricultural production in driving economic growth in these countries (Joshi et al., 2003). Additionally, the study suggests that the significance of agricultural production for economic growth is likely to be observed in countries with favorable agroecological conditions, limited prospects for export earnings from industrial goods, and a dominance of small farms in the agriculture sector (Diao et al., 2010).

The study's findings hold crucial policy implications. The positive impact of inflation on the economic growth of Sri Lanka, Bangladesh, and Pakistan suggests that, in these cases, inflation is conducive to economic growth rather than detrimental. This aligns with previous research indicating a positive relationship between inflation and economic growth (Mallik and Chowdhury, 2001) and supports the structuralist argument that inflation is essential for economic growth. However, caution is advised in interpreting larger elasticities, as higher inflation may lead to inflationary spirals beyond a sustainable level (Mallik and Chowdhury, 2001).
The transformation of South Asian countries from agricultural economies to manufacturing and export-oriented economies might explain the observed weak correlation between agricultural production and economic growth. The success of these countries appears to be rooted in the industrial and trade sectors, reflecting a shift from low-value-added goods and commodity marketing to high-value-added goods (Ito et al., 1999).

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Appendix
Table A1: Results of augmented Dickey Fuller test

Country	Variable	ADF Statistics	Test Critical Value (5%)	Decision
Sri Lanka	Ln_Econ. Growth	-2.287	-1.721	Stationary
	Ln_Ag Production	-2.585	-1.714	Stationary
	Ln Exchange Rate	-1.491	-1.714	Non-stationary
	Ln Inflation Rate	-0.508	-1.714	Non-stationary
	Ln Foreign Direct Investment	1.116	-1.717	Non-stationary
	Ln Broad money growth rate	0.702	-1.771	Non-stationary
	ΔLn_Econ. Growth	-7.040	-3.000	Stationary
	ΔLn_Ag Production	-7.226	-2.989	Stationary
	ΔLn Exchange Rate	-5.077	-2.986	Stationary
	ΔLn Inflation Rate	-7.478	-2.986	Stationary
	ΔLn Foreign Direct Investment	-5.355	-2.986	Stationary
	ΔLn Broad money growth rate	-9.356	-2.992	Stationary
Bangladesh	Ln_Econ. Growth	-1.089	-1.740	Non-stationary
	Ln_Ag Production	-0.654	-1.717	Non-stationary
	Ln Exchange Rate	-2.120	-1.714	Stationary
	Ln Inflation Rate	-1.888	-1.714	Stationary
	Ln Foreign Direct Investment	-2.026	-1.714	Stationary
	Ln Broad money growth rate	-2.831	-1.717	Stationary
	ΔLn_Econ. Growth	-7.330	-2.997	Stationary
	ΔLn_Ag Production	-6.026	-2.989	Stationary
	ΔLn Exchange Rate	-3.982	-2.986	Stationary
	ΔLn Inflation Rate	-6.285	-2.986	Stationary
	ΔLn Foreign Direct Investment	-5.129	-2.986	Stationary
	ΔLn Broad money growth rate	-7.239	-2.989	Stationary
Bhutan	Ln_Econ. Growth	-1.080	-1.812	Non-stationary
	Ln_Ag Production	-1.977	-1.717	
	Ln Exchange Rate	-0.462	-1.714	Non-stationary
	Ln Inflation Rate	-2.918	-1.714	
	Ln Foreign Direct Investment	-1.087	-1.943	Non-stationary
	Ln Broad money growth rate	-1.970	-1.717	Stationary
	ΔLn_Econ. Growth	-5.285	-3.000	Stationary
	ΔLn_Ag Production	-5.243	-2.989	Stationary
	ΔLn Exchange Rate	-4.983	-2.986	Stationary
	ΔLn Inflation Rate	-6.065	-2.986	Stationary
	ΔLn Foreign Direct Investment	-6.045	-3.000	Stationary
	ΔLn Broad money growth rate	-12.510	-2.989	Stationary
India	Ln_Econ. Growth	-1.535	-1.782	
	Ln_Ag Production	0.596	-1.717	Non-stationary
	Ln Exchange Rate	-0.464	-1.714	Non-stationary

	Ln Inflation Rate	-1.953	-1.714	Stationary
	Ln Foreign Direct Investment	-2.617	-1.714	Stationary
	Ln Broad money growth rate	-1.465	-1.717	Non-stationary
	ΔLn_Econ. Growth	-7.390	-3.000	Stationary
	ΔLn_Ag Production	-7.855	-2.989	Stationary
	ΔLn Exchange Rate	-4.982	-2.986	Stationary
	ΔLn Inflation Rate	-7.003	-2.989	Stationary
	ΔLn Foreign Direct Investment	-4.982	-2.986	Stationary
	ΔLn Broad money growth rate	-7.003	-2.986	Stationary
Maldives	Ln_Econ. Growth	-1.948	-1.746	Stationary
	Ln_Ag Production	-0.879	-1.717	Non-stationary
	Ln Exchange Rate	-1.107	-1.714	Non-stationary
	Ln Inflation Rate	-0.920	-1.860	Non-stationary
	Ln Foreign Direct Investment	-0.701	-1.714	Non-stationary
	Ln Broad money growth rate	-2.395	-1.740	Stationary
	ΔLn_Econ. Growth	-6.387	-3.000	Stationary
	ΔLn_Ag Production	-4.705	-2.989	Stationary
	ΔLn Exchange Rate	-4.105	-2.986	Stationary
	ΔLn Inflation Rate	-3.741	-3.000	Stationary
	ΔLn Foreign Direct Investment	-7.736	-2.986	Stationary
	ΔLn Broad money growth rate	-7.056	-2.997	Stationary
Nepal	Ln_Econ. Growth	-2.958	-1.833	Stationary
	Ln_Ag Production	-0.083	-1.717	Non-stationary
	Ln Exchange Rate	-0.499	-1.714	Non-stationary
	Ln Inflation Rate	-1.971	-1.714	
	Ln Foreign Direct Investment	-1.894	-1.943	Non-stationary
	Ln Broad money growth rate	-2.434	-1.717	Stationary
	ΔLn_Econ. Growth	-8.796	-3.000	Stationary
	ΔLn_Ag Production	-8.465	-2.989	Stationary
	ΔLn Exchange Rate	-4.819	-2.986	Stationary
	ΔLn Inflation Rate	-8.027	-2.986	Stationary
	ΔLn Foreign Direct Investment	-5.238	-3.000	Stationary
	ΔLn Broad money growth rate	-8.655	-2.989	Stationary
Pakistan	Ln_Econ. Growth	-1.187	-2.920	Stationary
	Ln_Ag Production	-0.866	-1.717	Non-stationary
	Ln Exchange Rate	-0.496	-1.714	Non-stationary
	Ln Inflation Rate	-2.931	-1.714	Stationary
	Ln Foreign Direct Investment	-3.699	-1.714	Stationary
	Ln Broad money growth rate	-2.684	-1.717	Stationary
	ΔLn_Econ. Growth	-4.373	-3.000	Stationary
	ΔLn_Ag Production	-7.844	-2.989	Stationary
	ΔLn Exchange Rate	-3.676	-2.986	Stationary
	ΔLn Inflation Rate	-5.798	-2.986	Stationary
	ΔLn Foreign Direct Investment	-4.911	-2.986	Stationary
	ΔLn Broad money growth rate	-6.230	-2.625	Stationary

Country	Variable	Test Statistics	Test Critical Value (5%)	Decision
Sri Lanka	Ln_Econ. Growth	-2.121	-3.000	Non-stationary
	Ln_Ag Production	-1.333	-2.986	Non-stationary
	Ln Exchange Rate	-0.909	-2.983	Non-stationary
	Ln Inflation Rate	-3.757	-2.983	Stationary
	Ln Foreign Direct Investment	-3.946	-2.983	Stationary
	Ln Broad money growth rate	-4.263	-2.989	Stationary
	ΔLn_Econ. Growth	-8.834	-3.000	Stationary
	ΔLn_Ag Production	-7.650	-2.989	Stationary
	ΔLn Exchange Rate	-5.134	-2.986	Stationary
	ΔLn Inflation Rate	-9.622	-2.986	Stationary
	ΔLn Foreign Direct Investment	-6.043	-2.986	Stationary
	ΔLn Broad money growth rate	-10.492	-2.992	Stationary
Bangladesh	Ln_Econ. Growth	-2.952	-2.992	Non-stationary
	Ln_Ag Production	-0.169	-2.986	Non-stationary
	Ln Exchange Rate	-2.339	-2.983	Non-stationary
	Ln Inflation Rate	-3.581	-2.983	Stationary
	Ln Foreign Direct Investment	-2.037	-2.983	Non-stationary
	Ln Broad money growth rate	-3.814	-2.986	Stationary
	ΔLn_Econ. Growth	-8.090	-2.997	Stationary
	ΔLn_Ag Production	-6.056	-2.989	Stationary
	ΔLn Exchange Rate	-3.852	-2.986	Stationary
	ΔLn Inflation Rate	-7.470	-2.986	Stationary
	ΔLn Foreign Direct Investment	-5.208	-2.986	Stationary
	ΔLn Broad money growth rate	-8.151	-2.989	Stationary

Table A2: Results of Phillips–Perron unit-root test

Country	Variable	Test Statistics	Test Critical Value (5%)	Decision
Bhutan	Ln_Econ. Growth	-4.170	-3.000	Stationary
	Ln_Ag Production	-3.395	-2.986	Stationary
	Ln Exchange Rate	-3.238	-2.983	Stationary
	Ln Inflation Rate	-2.388	-2.983	Non-stationary
	Ln Foreign Direct Investment	-5.753	-3.000	Stationary
	Ln Broad money growth rate	-6.193	-2.986	Stationary
	ΔLn_Econ. Growth	-6.150	-3.000	Stationary
	ΔLn_Ag Production	-5.414	-2.989	Stationary
	ΔLn Exchange Rate	-5.082	-2.986	Stationary
	ΔLn Inflation Rate	-6.105	-2.986	Stationary
	ΔLn Foreign Direct Investment	-8.187	-3.000	Stationary
	ΔLn Broad money growth rate	-15.852	-2.989	Stationary
India	Ln_Econ. Growth	-3.751	-3.000	Non-stationary
	Ln_Ag Production	0.319	-2.986	Non-stationary
	Ln Exchange Rate	-3.239	-2.983	Stationary
	Ln Inflation Rate	-2.289	-2.983	Non-stationary
	Ln Foreign Direct Investment	-2.466	-2.983	Non-stationary
	Ln Broad money growth rate	-2.615	-2.986	Non-stationary
	ΔLn_Econ. Growth	-7.900	-3.000	Stationary
	ΔLn_Ag Production	-8.117	-2.989	Stationary
	ΔLn Exchange Rate	-5.082	-2.986	Stationary
	ΔLn Inflation Rate	-6.981	-2.986	Stationary
	ΔLn Foreign Direct Investment	-6.082	-2.986	Stationary
	ΔLn Broad money growth rate	-9.734	-2.989	Stationary

Maldives	Ln_Econ. Growth	-3.832	-2.994	Stationary
	Ln_Ag Production	-0.911	-2.986	Non-stationary
	Ln Exchange Rate	-2.092	-2.983	Non-stationary
	Ln Inflation Rate	-3.037	-3.000	Stationary
	Ln Foreign Direct Investment	-1.026	-2.983	Non-stationary
	Ln Broad money growth rate	-3.625	-2.992	Stationary
	ΔLn_Econ. Growth	-6.832	-3.000	Stationary
	ΔLn_Ag Production	-4.708	-2.989	Stationary
	ΔLn Exchange Rate	-4.049	-2.986	Stationary
	ΔLn Inflation Rate	-3.712	-3.000	Stationary
	ΔLn Foreign Direct Investment	-8.203	-2.986	Stationary
	ΔLn Broad money growth rate	-7.263	-2.997	Stationary
Nepal	Ln_Econ. Growth	-4.477	-3.000	Stationary
	Ln_Ag Production	0.389	-2.986	Non-stationary
	Ln Exchange Rate	-3.053	-2.983	Stationary
	Ln Inflation Rate	-3.502	-2.983	Stationary
	Ln Foreign Direct Investment	-2.352	-3.000	Non-stationary
	Ln Broad money growth rate	-4.630	-2.986	Stationary
	ΔLn_Econ. Growth	-10.739	-3.000	Stationary
	ΔLn_Ag Production	-8.830	-2.989	Stationary
	ΔLn Exchange Rate	-4.894	-2.986	Stationary
	ΔLn Inflation Rate	-9.548	-2.986	Stationary
	ΔLn Foreign Direct Investment	-5.045	-3.000	Stationary
	ΔLn Broad money growth rate	-10.299	-2.989	Stationary
Pakistan	Ln_Econ. Growth	-1.841	-3.000	Non-stationary
	Ln_Ag Production	-0.992	-2.986	Non-stationary
	Ln Exchange Rate	-0.923	-2.983	Non-stationary
	Ln Inflation Rate	-2.380	-2.983	Non-stationary
	Ln Foreign Direct Investment	-2.352	-2.983	Non-stationary
	Ln Broad money growth rate	-3.855	-2.986	Stationary
	ΔLn_Econ. Growth	-5.681	-3.000	Stationary
	ΔLn_Ag Production	-9.244	-2.989	Stationary
	ΔLn Exchange Rate	-3.542	-2.986	Stationary
	ΔLn Inflation Rate	-5.786	-2.986	Stationary
	ΔLn Foreign Direct Investment	-4.930	-2.986	Stationary
	ΔLn Broad money growth rate	-7.213	-2.989	Stationary