Nexus between Remittances and Economic Growth in Nepal: An ARDL Bound Test Cointegration Approach

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Abstract

This paper aims to investigate the nexus between remittances and economic growth in Nepal from 1993 to 2023, employing an Auto-Regressive Distributed Lag (ARDL) bound test cointegration model with time series data analysis techniques . The empirical findings reveal that both long-run and short-run coefficients indicate statistically significant and positively impact remittances on the Nepalese economic growth during the investigation period . This study's findings suggest that remittances play a pivotal role in improving living standards, economic development, and reducing poverty in Nepal . Moreover, this study found that government expenditures and labor variables have a positive influence on economic growth in the country . These results underscore the critical importance of remittances as a driver of sustainable development . The study results emphasize the need for targeted improvements in the management and effective utilization of remittances, positioning it as a strategic catalyst for promoting economic advancement in Nepal.

Keywords: *ARDL, Economic growth, Labor, Nepal, Remittances*

1. Introduction

Remittances have emerged as a vital source of external finance for developing countries, contributing significantly to economic stability and growth . For countries like Nepal, where domestic employment opportunities are limited, migration has

become a common strategy to secure livelihoods . This has led to a surge in remittance inflows, which play a pivotal role in boosting household incomes, reducing poverty, and supporting economic development (Shrestha, 2008) . According to the Nepal Rastra Bank, remittances have been instrumental in alleviating poverty, as they serve as a primary source of income for many households, enabling them to meet their daily consumption needs (NRB, 2021).

Nepal has witnessed a remarkable increase in remittance inflows over the past two decades . According to an economic survey, remittances to Nepal have been growing rapidly and constitute a substantial share of Nepal's GDP, accounting for 25.3 per cent, reaching Rs . 794.32 billion (MOF, 2023) . This growth began in the early 2000s as migration to Gulf countries, Malaysia, and other labor markets became more prominent . As remittances grew, they provided a reliable source of foreign exchange earnings and economic support particularly, in developing economies where remittance inflows constitute a significant portion of GDP . Nepal, as a remittance-dependent economy, provides an intriguing case for evaluating the impact of these financial flows on macroeconomic performance (Sapkota, 2013).

Over the past three decades, a significant body of research has explored the relationship between remittances and economic growth across different countries, utilizing a range of methodological approaches (e.g., Taylor, 1999; Gupta, 2006; Ratha, 2007; Aggarwal et al., 2011; Khatalan, 2012; Kumar and Vu, 2014; Meyer and Shera, 2017; Makun, 2018; Kadozi, 2019; Sutradhar, 2020; Abdulai, 2023) . These previous empirical studies on remittances and economic growth present mixed findings, while some research suggests a negative impact, others highlight a positive influence . Recent studies have focused on time-series analyses investigating the link between remittances and economic growth in various nations . Khatalan (2012) examined the relationship between remittances and economic growth in Pakistan over the period from 1980 to 2015 . The author employed the ARDL test and the error correction model techniques and found a significant and positive correlation between remittance and economic growth . Tolcha and Rao (2016) employed the ARDL model to analyse the relationship between remittances and economic growth from 1981 to 2012 . Their results found a positive and significant impact of remittances on economic growth in the short run, while in the long run, this effect turns negative . Makun (2018) investigated the impact of external factors on economic growth in the Republic of the Fiji Islands . The study found that remittances have a positive influence on economic growth in both the short run and the long run . Kadozi (2019) analyzed the impact of remittance inflows on economic growth in Sub-Saharan African countries, with a focus on Rwanda . The study found a positive and significant impact of remittances on economic growth in Rwanda.

In the Nepalese context, until now, there has been a limited amount of empirical research that has focused on the relationship between remittances and economic growth . Dhungel (2018) applied an ARDL-bound testing method for the period spanning 1990-2017, and his study found a significant positive relationship between remittances and economic growth in Nepal . Likewise, Adhikari and Sapkota (2018) found that remittances positively influence GDP growth by increasing household consumption and investment. Shakya and Gonpu (2021) investigated the impact of remittances on economic growth in Nepal using the regression model, and the result found that remittances have no significant effects on economic growth . On the other hand, Adhikari (2023) analyzed the relationship between remittances and gross domestic savings in Nepal using the ARDL model over the period from 1978 to 2021 . The author found that remittances harm gross domestic savings in the long run.

Broadly speaking, recent literature on remittances-economic has produced mixed findings, largely due to variations in the selection of variables, differences in the periods analyzed, and the use of diverse methodological approaches . Therefore, this study aims to investigate the relationship between remittances and economic growth in Nepal over the period from 1993 to 2023 . To address a gap in the remittances-economics literature, the study employs the Autoregressive Distributed Lag (ARDL) bound test cointegration approach, as developed by Pesaran et al . (2001), along with time series data analysis techniques.

The structure of this paper is organized as follows: Section 2 describes a brief overview of the data sources, variables description and methods employed in this study . Section 3 presents the empirical findings and discussion . Finally, Section 4 outlines the conclusions of the study.

2. Data and Methods

2.1 Variables Description

This study utilizes yearly data from Nepal spanning the period from 1993 to 2023 to investigate the relationship between remittances, economic growth, and other key macroeconomic indicators, including labor force, government expenditure, and inflation . The data employed in this analysis was sourced from the World Bank (WB, 2024) . In this study, gross domestic product (GDP) in current U.S . dollars is used as a proxy for economic growth (Y) variable . Similarly, the remittances (RIM) variable is represented by personal remittances received, also measured in current U.S . dollars.

In addition to these primary variables (remittances and economic growth), this research incorporates three control variables: labour force (L), government expenditure (GOV),

and inflation (*INF*) . Government expenditure is expressed as a percentage of GDP and used as a proxy for Nepal's fiscal policy . The labor variable represents the total labor force, while inflation is measured as the annual percentage change in consumer price inflation . All selected variables are transformed into natural logarithms to enhance analytical robustness . The study period from 1993 to 2023 is determined by the availability of data for the chosen variables.

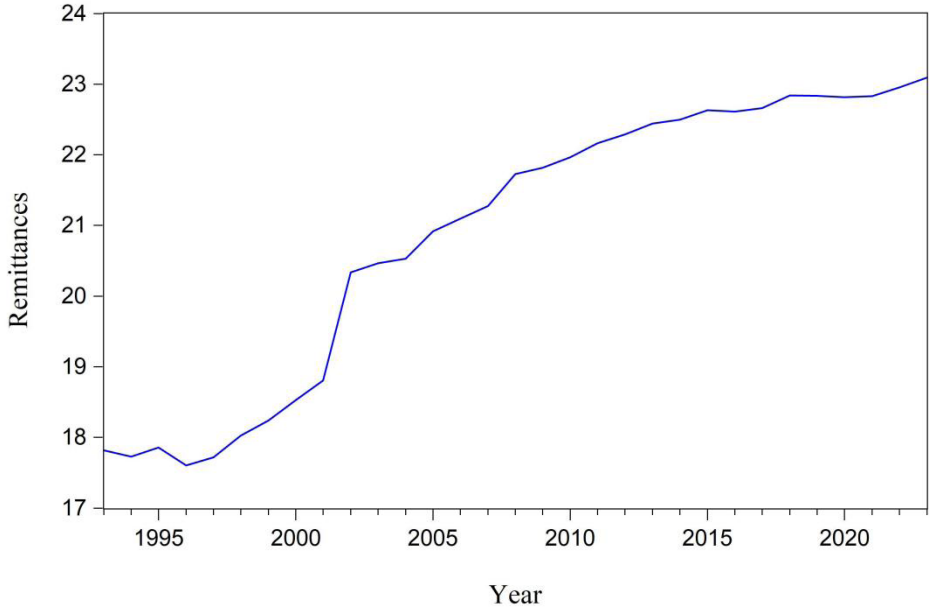

Figure 1

Personal Remittances Received as Current U.S . Dollars during the Study Period (1993-2023)

Figure 1 above displays the trend of remittances in Nepal from 1993 to 2023 . The figure shows that the remittances have been slightly declining during the period between 1993 to 1997 and afterwards it has seen a growing trend for the period from 1998 and 2023 . In sum, throughout the research period from 1993 to 2023, remittances in Nepal have exhibited an upward tendency, indicating that remittances are a fundamental driver of the nation's economic progress.

2.2 Methods

The paper initially used the Phillips-Perron (PP) unit root test to ascertain the integration order of the variables . Subsequently, this paper employs the autoregressive distributed lag (ARDL) bound test cointegration approach developed by Pesaran et

al . (2021) to examine the nexus between remittances and economic growth in Nepal . In the remittance-economics literature, the ARDL bound test approach has become more popular recently than the earlier cointegration approaches, like those of Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990) . Due to the limited sample size of this research, the ARDL bounds testing approach is considered a statistically more robust approach for identifying the co-integrating relationship.

The ARDL model incorporating remittances, economic growth, and other macroeconomic variables can be specified in equation (1) as follows:

$$\Delta \ln Y_t = a_0 + \sum_{i=0}^{k} \theta_i \Delta \ln Y_{t-i} + \sum_{i=0}^{k} \varphi_i \Delta \ln RIM_{t-i} + \sum_{i=0}^{k} \pi_i \Delta \ln L_{t-i} + \sum_{i=0}^{k} \eta_i \Delta \ln GOV_{t-i} + \sum_{i=0}^{k} \gamma_i \Delta \ln INF_{t-i} + \beta_1 \ln Y_{t-1} + \beta_2 lnRIM_{t-1} + \beta_3 lnL_{t-1} + \beta_4 lnGOV_{t-i} + \beta_5 lnINF_{t-i} + u_t \quad (1)$$

In the above equations (1) Δ represents the first difference operator, α_0 denotes the drift component, *Y* is economic growth (dependent variable), *RIM* is the remittances (key independent variable), other macroeconomic variables (such as *L* is the labour, *GOV* is the government expenditure, and *INF* is the inflation), ln signifies the natural logarithms, t denotes the period, μ refers to the error term and k indicates the lag length . The parameters of θ, φ, π, η and γ represent the short-run coefficients, whereas $\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 correspond to the long-run coefficients.

The initial phase of the ARDL bounds test approach involves testing the existence of a long-term link among the variables of economic growth, remittances, labour, government expenditure, and inflation using the F-test . The null hypothesis in the equation is defined as H_0: $\beta_1 = \beta 2 = \beta_3 = \beta_4 = \beta_5 = 0$, indicating the absence of a long-run link among the variables, whereas the alternative hypothesis in the equation is expressed as H_1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$, suggesting the presence of a long-term relationship among the variables.

After establishing the long-run connection among variables, the short-run dynamic parameters may be derived by estimating an error correction model (ECM) related to the long-run estimates of the ARDL model proposed by Pesaran et al . (2001), as delineated in the following equation (2) below:

$$\Delta \ln Y_t = a_0 + \sum_{i=0}^{k} \theta_i \Delta \ln Y_{t-i} + \sum_{i=0}^{k} \phi_i \Delta \ln RIM_{t-i} + \sum_{i=0}^{k} \pi_i \Delta \ln L_{t-i} + \sum_{i=0}^{k} \eta_i \Delta \ln GOV_{t-i}$$

$$+ \sum_{i=0}^{k} \gamma_i \Delta \ln INF_{t-i} + \delta_i ECT_{t-i} + u_t \qquad (2)$$

In this context, ECT_{t-1} refers to error-correction terms, while δ signifies the speed of adjustment . All other notations have been previously defined in Equation (2).

To assess the goodness of fit of the ARDL model, this study conducts stability tests using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSMSQ) which was developed by Brown et al . (1975) . These tests are employed to evaluate the stability of long-run estimators based on recursive residual estimates

3. Results and Discussion

Before executing the ARDL model, it is essential to conduct unit root tests, such as the Phillips-Perron (PP) tests, to determine whether the sample data variables are stationary or non-stationary.

Table 1

Results of the Unit Root Test

Variables	With trend and intercept	
	Level	First difference
lnY	1.7267	-4.3098***
lnRIM	-0.9975	-4.9933***
lnL	-1.5123	-2.1992
lnGOV	-1.5046	-4.9831***
lnINF	-3.9326**	-7.8635***

Source: Eviews 12 output

*Note: *, **, and *** refer to the statistical significance at the 10%, 5%, and 1% levels, respectively.*

The outcomes of the PP unit root test for each variable are presented in Table 1 above . This test examines both the level and the first difference of variables, including economic growth, remittances, labor, government expenditure, and inflation . At their levels, the null hypothesis of the PP unit root test cannot be rejected for all variables except inflation . However, when the first difference is applied, the null hypothesis can be rejected for all variables except labor . Therefore, the study concludes that the PP unit root test indicates stationarity and integration of order one *(I(1))*, justifying the selection of the ARDL cointegration model for this research.

Table 2

ARDL Bounds Test Results

*C*alculated *F*-Statistics	Significance level	Critical value	
		I(0) lower bound	*I*(1) upper bounds
22.9306	1%	4.40	5.72
	5%	3.47	4.57
	10%	3.03	4.06

Source: Eviews 12 output

Table 2 presents the results of the ARDL bounds test for cointegration, along with the critical values for the upper and lower bounds . The findings reveal that the calculated F-statistic (22.9306) exceeds the critical upper bound value (5.72) at the 1% significance level . This indicates that, during the period from 1993 to 2023, the variables of economic growth, remittances, labor, government expenditure, and inflation exhibit a cointegrating relationship . Following the confirmation of this long-term relationship, the study proceeds to estimate the long-run coefficients.

Table 3

Long-run Coefficients Estimated Through the ARDL Model

Dependent Variable(lnY)				
Variables	Coefficient	Standard Error	*T*-statistics	Probability
lnRIM	0.2022	0.0319	6.3329***	0.0001
lnL	0.5087	0.6607	0.7699	0.4591
lnGOV	0.8917	0.1568	5.7215***	0.0002
lnINF	0.1487	0.0444	3.3434***	0.0074
C	-5.3039	11.4589	-0.4628	0.6534

Source: Eviews 12 output

*Note: *, **, and *** refer to the statistical significance at the 10%, 5%, and 1% levels, respectively.*

The estimated long-run coefficients obtained from the ARDL model are shown in Table 3 . The results indicate that a 1% increase in remittances leads to a 0.22% increase in economic growth . This coefficient is highly statistically significant at the 1% level and positively associated with economic growth during the investigation period from 1993 to 2023 . The results provide compelling evidence that remittances have served as a major driver of economic growth in the country . The findings of this study align with prior research conducted in various countries, including Pakistan, Fiji, Rwanda, and India, as reported by Ahmed et al . (2011), Chen and Jayaraman (2016), and Kadozi (2019), respectively . However, these results contrast with those of Achouak and Zaiem (2013), who observed a negative impact of remittances expansion on Tunisia's economic growth . Similar outcomes were also reported by Karagoz (2009) for Turkey.

With the long-run estimations of the ARDL model, this study found that government expenditure, inflation, and labor variables exhibit the expected signs in relation to the coefficients of the control variables . Among these variables, inflation and government expenditure are statistically significant at the 1% level . Notably, all estimated coefficients for labor, inflation, and government expenditure demonstrate a positive relationship with economic growth . Specifically, a 1% increase in labor leads to a 0.50% rise in economic growth . In terms of inflation, a 1% increase in inflation is associated with a 0.14% rise in economic growth, suggesting that inflation acts as a crucial driver of growth in the Nepalese economy . This finding contrasts with the results of Hassan et al . (2011), who concluded that inflation harms economic growth.

Regarding government expenditure, a 1% rise reduces economic growth by 0.89% . This conclusion is consistent with recent findings by Bittencourt (2012) and Ductor and Grechyna (2015), who revealed that government expenditures had a beneficial influence on economic growth.

Table 4

Short-run Coefficients Estimated through the ECM Results of the ARDL Model

Depndent Variable (ΔY)				
Variables	Coefficients	Standard Error	*T*-statistics	Probability
ΔRIM	0.0545	0.0163	3.3430***	0.0075
ΔL	3.4564	0.9245	3.7383***	0.0038
ΔGOV	0.2327	0.0523	4.4467***	0.0009
ΔINF	-0.01843	0.0099	-1.8481*	0.0943
ECT_{t-1}	-1.0949	0.0864	-12.6694***	0.0000

Source: Eviews 12 output

Note: **, **, and *** refer to the statistical significance at the 10%, 5%, and 1% levels, respectively.*

Table 4 displays the estimated results of the short-run coefficients as well as the Error Correction Term (*ECT*) obtained from the ARDL model . Over the yearly research period from 1993 to 2023, the calculated short-run coefficients of government expenditure, labour, and remittances are positively correlated with economic growth and are statistically significant at the 1% level . This outcome indicates that these short-run coefficients play a fundamental role in the growth performance of the Nepalese economy . On the other hand, the calculated short-run coefficient for inflation is statistically significant at the 5% level and inversely correlated with economic growth . Furthermore, as anticipated, the calculated coefficient of the error correction term (ECT_{t-1}) has a negative sign and is statistically significant at the 1% level . This result confirms that the expected convergence process is the existence of a stable long-run relationship among economic growth, remittances, labor, inflation, and government expenditure entire the study period.

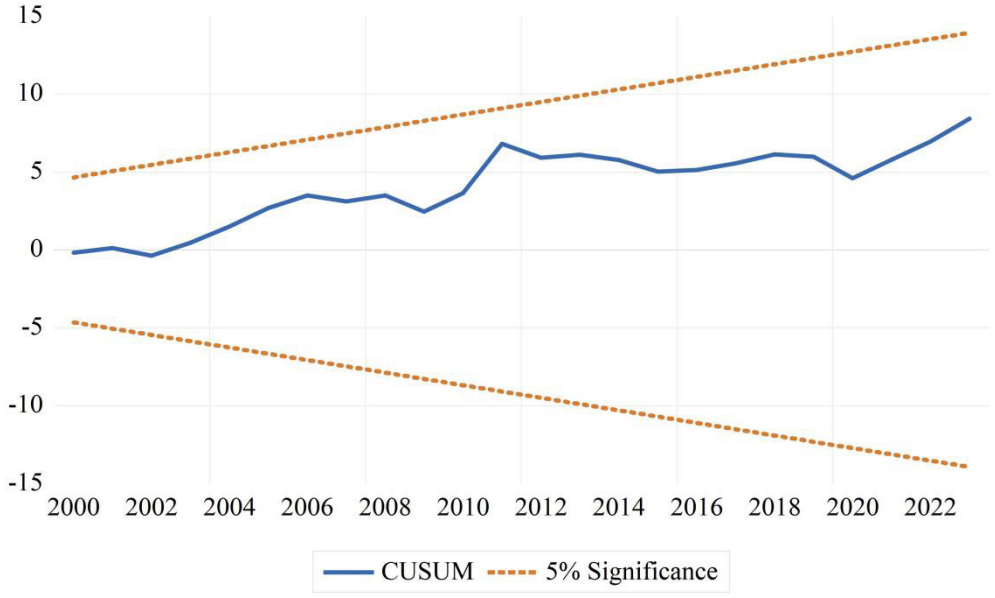

Figure 2

Plot of the CUSUM Statistic

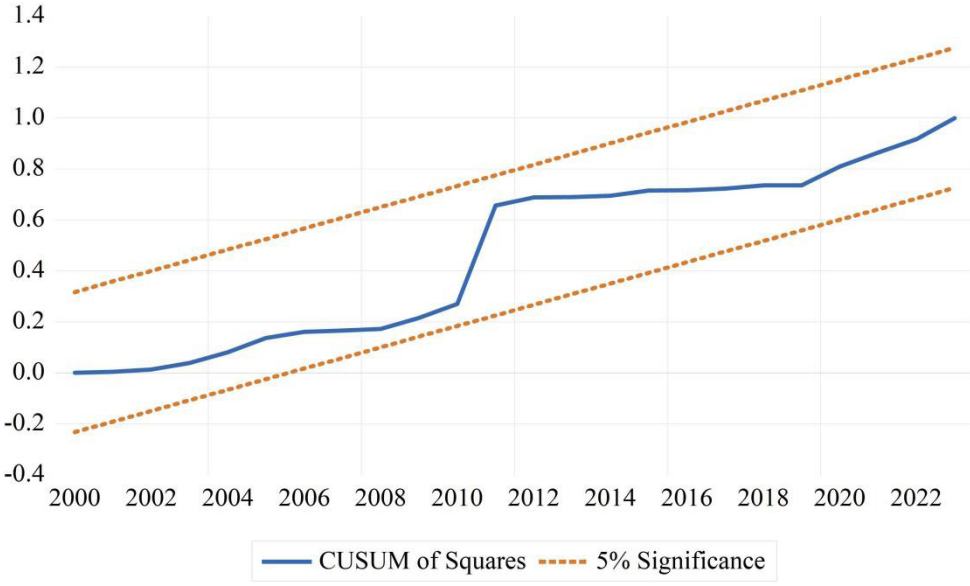

Figure 3

Plot of the CUSUMSQ Statistic

The graphical representations of the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMQ) statistics are shown in Figures 2 and 3 . The plots indicate that both CUSUM and CUSUMSQ statistics remain within the 5% critical bounds, suggesting that all computed coefficients remained stable throughout the research period from 1993 to 2023.

4. Conclusion

This study used an ARDL bound test cointegration technique to investigate the nexus between remittances and economic growth in Nepal spanning from 1993 to 2023 . The results of the PP unit root test indicated that all variables, including economic growth, remittances, labor, and government expenditure, were stationary and exhibited an integration of order one at the first difference . Additionally, throughout the 1993-2023 research period, the ARDL bounds test verified the presence of a cointegrating link between economic growth, remittances, labour, inflation, and government expenditure.

The analysis of both long-run and short-run coefficients indicates that remittances have

a positive impact on economic growth . This finding suggests that remittances have played a crucial role in fostering economic growth in Nepal . The estimated coefficients for both the long-run and short-run indicate that government expenditure and labor have a positive impact on economic growth, which indicates that these variables contribute substantially to the overall performance of the Nepalese economy . To boot, the estimated long-run coefficient results demonstrate that inflation negatively influences economic growth, whereas the short-run coefficient estimates indicate a positive relationship between inflation and economic growth .

From a policy perspective, remittances serve as a vital driver of Nepal's economic development by reducing poverty, increasing household incomes, and contributing to economic stability . To optimize the benefits of remittances, policymakers should prioritize strategies that encourage productive investments, foster skill development, strengthen bilateral agreements, and enhance financial inclusion . Additionally, promoting economic diversification through initiatives such as entrepreneurship and human capital development could further amplify their positive impact on economic growth .

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