DOI: https://doi.org/10.3126/ejdi.v34i1-2.63760

An Analysis of Implications of Remittances on The Economic Growth of Nepal

Sabitri Devi ACHARYA (ADHIKARI), PhD
Associate Professor of Economics, Department of Economics, Tri-Chandra Multiple Campus, T. U. Ghantaghar, Kathmandu.
Email: sabitri_adhikari@yahoo.com
ORCID: https://orcid.org/0009-0009-4764-822X.

Abstract

Migration and remittances are two themes that have received much attention among the policymakers in recent years in Nepal. The pressing need to understand the implication of this inflow of remittances on economic growth has become critical. Yet the existing literature produces inconclusive results. While some research reveals a favourable benefit, others show a negative implication on economic growth, creating the situation of policy uncertainty. This paper seeks to address this ambiguity by providing the fresh result into the implication of remittance from international migration on economic growth of Nepal. To examine this relationship, an ARDL model is employed for the yearly time series data of Nepal for the last 43 years. The analysis reveals cointegration among remittances, GDP, total consumption, and capital formation of private sector. The findings reveal a positive impact of remittances on the short-run economy, indicating an immediate boost to economic growth. However, in the long run, as the influence of remittances exhibits a negative trend. It could lead to an 11% decrease in real GDP of Nepal in the long run if there is an increase in remittances by 10 percent. This study contributes to the existing body of knowledge by offering updated empirical evidence on the relationship between remittances and economic growth in Nepal.

Keywords: *Remittances, Economic Growth, Nepal, Short-term, Long term*
JEL Classification: E24, F22, F24

1. INTRODUCTION

Migration and remittances are two themes that have received much attention among the policymakers in recent years in Nepal. Remittances are funds transferred by migrant workers abroad to their home country. The issue of relationship between remittances and economic growth is not a new one, but policymakers appear to be paying increasingly close attention to it. Remittance has become one of the key issues in the policy debates for over a decade because the flow of migrant resources to home country are believed to influence process of economic and social development. Remittance is an important source of foreign capital and the mobilization of these financial flows encourages policy makers to design relevant policies that will improve the living standard of the citizen in a sustainable way and support to economic growth.

Due to remittance inflows, it stimulates local market, monetization in rural areas, and increases household incomes that lead to higher consumer spending on goods and services. This effect can be found in sectors of the economy such as real estate, purchasing goods and services, clothing, electronics, and among others. These economic activities somehow support to the foundation for economic diversification and transformation (Thapa and Acharya, 2017). An addition to this, remittances can provide the support to foster entrepreneurship and innovation, as returning migrants may bring back new skills and ideas acquired abroad (Sherpa, 2010).

The influence of international remittances on household well-being or poverty reduction is found positive (Thapa and Acharya, 2017; Wagle and Devkota, 2018), however, debates are found in macroeconomic issues such as relationship between remittances and economic growth. Similarly, remittances might not serve as a capital source for driving economic development. The common argument is that significant inflow of remittances can lead to currency appreciation; a concept known as the "Dutch disease" (Hien et.al. 2020; Acosta et. al 2099; Basnet et al 2019). Some research suggests a negative association between remittances and economic growth, whereas contrasting studies suggest the opposite (Matuzeviciute and Butkus, 2016; Kaphle,2018 and Eggoh et. al 2019). These conflicting results highlight the necessity for a fresh investigation into the effects of remittances on economic growth, ultimately leading to more precise policy decisions. To understand the implications of remittances on the economic growth requires further investigation. Using time series data, the paper seeks to provide an in-depth understanding of the relationship between remittances and economic growth in this specific setting. The paper contributes to existing literature providing new findings.

The structures of the paper are as follows. The next section offers a literature review on remittances and their association with growth. The third section frameworks the research methodology used for this paper, encompassing the conceptual framework, data sources, model specification, and the data analysis among others. The fourth section presents the results and interpretation. The last section offers the conclusions.

2. LITERATURE REVIEW

Total factor productivity (TFP) is often included as a crucial determinant of long-term economic growth, as exemplified by Dzeha (2017) in the context of international migrants' remittances. TFP has only strengthened its role as the key driver of long-term economic growth. Barajas et al. (2009) thoroughly studied the mechanisms by which remittances influence GDP. Some studies have also examined the relationship between remittances and growth, specifically through the perspective of TFP growth, as illustrated by Senbeta (2013). Similarly, for the theoretical understanding of the study concerning remittances and economic growth, empirical investigations have frequently utilized the neoclassical model pioneered by Solow (1999).

On the other hand, Kyophilavong et al. (2013) examined that the connection between remittances, financial development, and economic growth exhibited variability across countries. This implies that the promotion of economic growth in developing countries through remittances and financial development can be contingent on specific country contexts. Jouini (2015) highlighted the positive impact of workers' remittances on economic growth. Bayar (2015) used causality tests to demonstrate a one-way causal relationship, establishing that remittances and foreign direct investment inflows contribute to economic growth in transition economies.

The cointegration relationship for both short and long-term effects was observed by Kumar and Stauvermann (2014). They used the data period from 1997 to 2012 to measure the causality connection between remittances and output while all variables are measured in per capita basis. Meanwhile, the Granger causality test was exploited by Siddique et al. (2010) to examine the causal relationship between remittances and economic performance in terms of economic growth. They incorporated three South Asian countries namely Bangladesh, India, and Sri Lanka for the research. As suggested by their findings, no causal relationship was observed for India, while Sri Lanka revealed a two-way directional causality. Chami et al. (2005) established a negative effect of international remittances on economic growth in their study spanning 113 countries from 1970 to 1998.

Identifying a reliable econometric technique for investigating the relationship between remittances and economic growth presents several challenges. The problem of reverse causation, endogeneity, linkages with domestic economic activities are some examples of challenges while measuring the long-term effects of remittances on economic performance of the country. Various underlying factors, including the level of financial development and the country's specific circumstances, context and contextual situation are the determinants of both positive and negative impact of remittances on economic growth while measuring the relationship between remittances and economic growth (World Bank 2006; Kapur 2003; De Soto, 2000; Taylor et al. 2006).

3. RESEARCH METHODOLOGY

Research design and Data sources

This paper uses a simple framework, concentrating on the role of remittances on economic growth of developing country. Time series data on remittances, gross domestic products, gross fixed capital formation from the private sector, and total consumption from FY 1974/75 to FY 2017/18 were collected from Quarterly Economic Bulletin, Volume 53 Mid-April, 2019 Number 3 published Nepal Rastra Bank (NRB, 2019) and world data set of world bank (World bank, 2019). The percentage of gross fixed capital formation made by the private sector out of GDP is used from World Bank. This percentage is used to estimate Gross fixed capital formation to nominal GDP of Nepal in Nepali rupees (NRs). The private investment covers gross expenditure by the private sector in additions to its fixed domestic assets.

Gross National Expenditure, based on Keynesian expenditure function, comprises the private consumption, government Consumption, and gross domestic investment. The percentage of GDP data was obtained from the World Bank, and this percentage was employed to calculate the volume in Nepali Rupees.

Model specification

An econometric model has been selected to assess the impact on GDP growth assuming that remittance is one of the main determinants of economic growth in both the short and long term. The independent variables encompass remittances, private sector gross capital formation, and gross national expenditure, with GDP serving as the dependent variable. The model is formulated as follows:

$$y = f\ (Rem, Kfom, Nexp) \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$y_t = \alpha + \beta(Rem)_t + \delta(Kfom)_t + \varphi(Tcons + \cup_t \quad \ldots\ldots..(2)$$

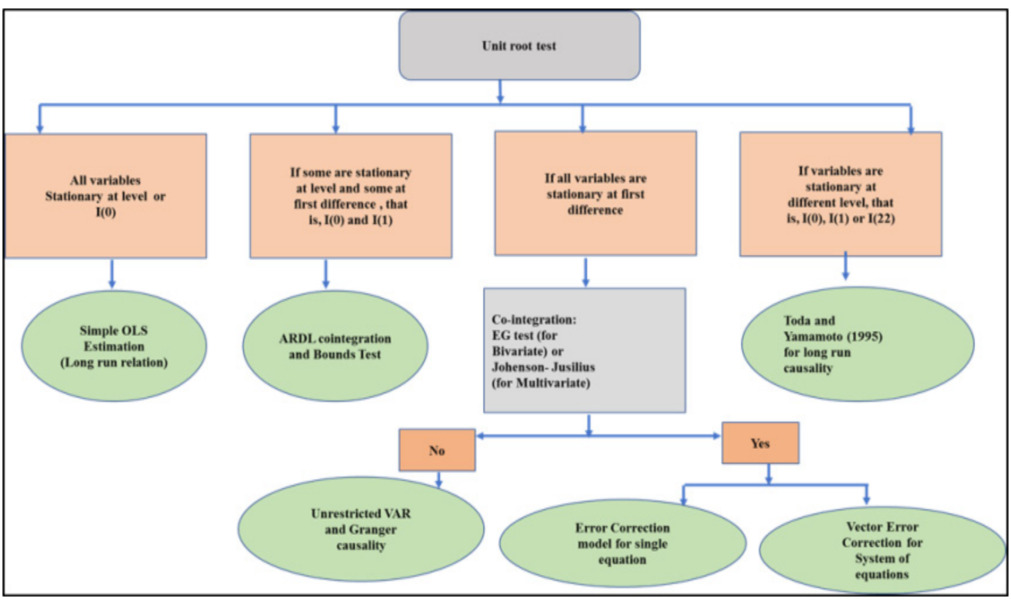
$$ly_t = \alpha + \beta l(Rem)_t + \delta l(Kfom)_t + \varphi l(Tcons + \cup_t \quad \ldots.(3)$$

Where, y_t = Gross Domestic Product, Rem_t = Remittance, $Kfom_t$ = gross capital formation made by private sector, $Tcons_t$ = total consumption, $\cup_t$ =error term or stochastic term, t=1,2,3, and so on until 39 (time series data ranging from 1975 to 2018), l is short form of natural log.

Time-series econometrics is largely concerned with the systematic gathering and thorough study of previous observations of variables. Economic variables often exhibit the possibility of being nonstationary, potentially leading to spurious regressions in the data series. Therefore, assessing stationarity is a fundamental step in time series analysis. In econometric analysis, parameters elucidate the "on average" relationships between dependent and independent variables. Consequently, determining the stationarity of the data is crucial for obtaining meaningful results from an econometric model. The Augmented Dickey-Fuller (ADF) test is to evaluate stationarity properties in time series data, as discussed in the preceding section.

Figure 1 illustrates the criteria for selecting a time series analysis methodology. The unit root test is instrumental in determining the stationarity or non-stationarity of the data related to time series. The result of unit root test shows stationary, that is integrated at level I (0). Conversely, for a nonstationary series, taking the difference of the series may render it stationary. If the first difference results in stationarity, it indicates as integrated at the first level, or I (1). Similarly, the data that become stationary at the second difference indicate as integrated at the second order, or I (2). When data series are integrated at I(0) and I(1), a time series model that is the Autoregressive Distributed Lag (ARDL) model is applied. The condition for this model is that all data should be integrated at the same level, particularly, at the first level (I(1)). On the other hand, for the bivariate relationship, the Engel-Granger cointegration test can be applied. Similarly, to know the multivariate relationships, the Johansen-Juselius cointegration test is suggested.

Figure 1: The Basic Framework of Time Series Analysis



Source: Jalil and Rao (2019)

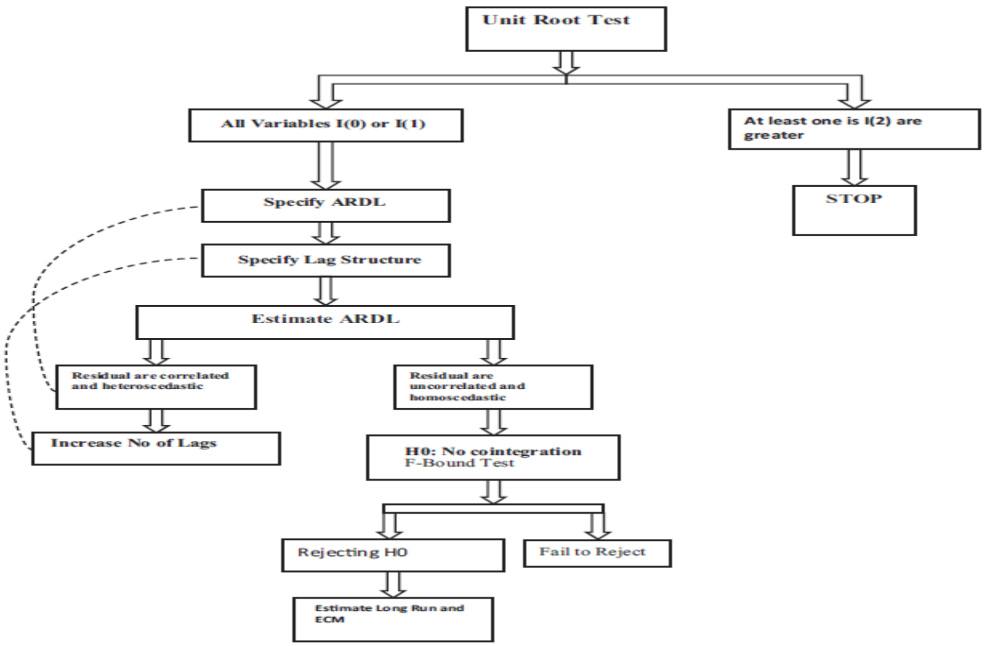
To empirically explore dynamic interactions among the variables of interest and the long-term relationships the model was estimated using bounds testing, also known as the Autoregressive Distributed Lag (ARDL) cointegration procedure developed by Pesaran et al. (2001). The decision to employ the ARDL procedure is based on three primary reasons. i) it allows for estimating the cointegration relationship using Ordinary Least Squares (OLS) once the lag order of the model is determined. It means the bounds test procedure is uncomplicated; unlike other multivariate cointegration techniques like Johansen & Juselius (1990 ii) The model can be applied if the variables in the model are purely I(0), purely I(1), or mutually cointegrated. It indicates that the bound testing procedure doesn't necessitate pre-testing the variables for unit roots, unlike other methods such as the Johansen approach. iii) The ARDL model exhibits greater robustness and produces better results if there is a small sample size (Pesaran & Shin 1999). This study, therefore, utilizes the following ARDL model:

The generalised ARDL model (p, q_1, q_2, q_3……qk) model is specified as

$$Y_t = \gamma_{oj} + \sum_{i=1}^{p} \delta_j Y_{jt-1} + \sum_{i=0}^{q} \beta'_j X_{t-1} + \varepsilon_{jt} \quad \dots\dots\dots\dots\dots\dots (4)$$

In the equation, Y'_t represents a vector, and the variables in $(X'_t)'$ can be exclusively I(0), I(1), or it indicates co-integrated. Here, β, δ and γ indicates two coefficients and constant term respectively, j indicates 1 to k values. Again, p and q present optimal lags, and ε_{it} indicates error terms. The outcome variable is influenced by its past values and the current and past values of other external variables included in the model. It's important to note that the lag lengths for p and q may not be identical. Specifically, p lags are applied for the dependent variable, while q lags are employed for the exogenous variables. The process of estimating the ARDL model involves several steps. The steps outlined in Figure 4 are followed to estimate the ARDL model.

Figure 2: ARDL Cointegration Procedure



Source: Jalil and Rao (2019)

The initial stage of the ARDL model involves testing for the unit root. While ARDL is adaptable to a combination of I(0), I(1), or fractionally co-integrated data series, it is not suitable for I(2) data due to various reasons, as elaborated shortly. Consequently, the first step is to conduct a unit root test, with all the procedures detailed in the preceding section. Following this, it is necessary to formulate an unrestricted error correction model, as depicted in equation (5).

Choosing appropriate lags is a crucial aspect of autoregressive models. The empirical literature on time series offers a range of criteria for this purpose. Notably, the Akaike Information Criteria, Schwartz-Bayesian Information Criteria, and LR criteria are extensively employed for lag selection.

Performing the bound test cointegration test in the context of ARDL is very important in ARDL estimation. Technically, it should perform F-test for the null hypothesis

To perform the bound test for cointegration, the conditional ARDL (p, q1, q2, q3) model with 4 variables is specified as:

Hypothesis:

$$H_0: b_{1j} = b_{2j} = b_{3j} = b_{4j} = 0$$

Where j = 1, 2, 3, 4

$$H_1: b_{1j} \neq b_{2j} \neq b_{3j} \neq b_{4j} \neq 0$$

Hence, this hypothesis test deviates from standard hypothesis testing by incorporating both upper and lower bounds of critical values, presenting three distinct cases. To ascertain whether to reject or accept the research hypothesis, we must consult the method and process outlined in Pesaran et al. (2001). If the calculated F-statistic exceeds the upper bound, the null hypothesis will be rejected, but it indicates the presence of a long-term equilibrium or relationship between the variables. The F-statistic if below the lower bound, the null hypothesis cannot be rejected, signifying that the presence of cointegration is not deemed significant. Conversely, if the F-statistic falls between the upper and lower bounds, the test is inconclusive, and additional work and information are required before reaching a conclusion, as outlined by Pesaran et al. (2001):

Fail to Reject H0 < Inconclusive < Reject H0

$$\Delta Y_t = \beta_0 + \underbrace{\sum_{i=1}^{n} \beta_i \Delta y_{t-i} + \sum_{i=0}^{n} \delta_i \Delta x_{t-i}}_{\text{Short-run}} + \underbrace{\varphi_1 y_{t-1} + \varphi_2 x_{t-1}}_{\text{Long-run}} + \mu_t \quad ..(5)$$

In defining an Error Correction Model (ECM), the second step in the ARDL approach necessitates a set of assumptions. If the F-bound test yields satisfactory outcomes, it becomes feasible to ascertain the long-run equilibrium relationship without encountering spurious regression. The ARDL method can be encapsulated in the following steps:

a. Stationarity Analysis: Given that ARDL is not suitable for I(2) variables, it is essential to examine whether the provided time series are either I(0) or I(1). The ADF test is employed to assess stationarity. If the time series are identified as either I(0) or I(1), the procedure can proceed.

b. Lag Determination: Optimal lag selection for the ARDL model is accomplished by employing the Schwarz Information Criteria (SIC) and adjusting for potential biases.

c. Model Execution: Implement the ARDL model based on the provided equation.

d. F-Bound Test: Examine the time series to determine the presence of a long-term relationship or equilibrium among the macroeconomic variables.

e. Coefficient Estimation: Calculate coefficients for both short-term and long-term scenarios, incorporating the Error Correction Model (ECM) term.

f. Verification Test: Confirm the results by examining potential biases, including but not limited to serial correlation and heteroscedasticity.

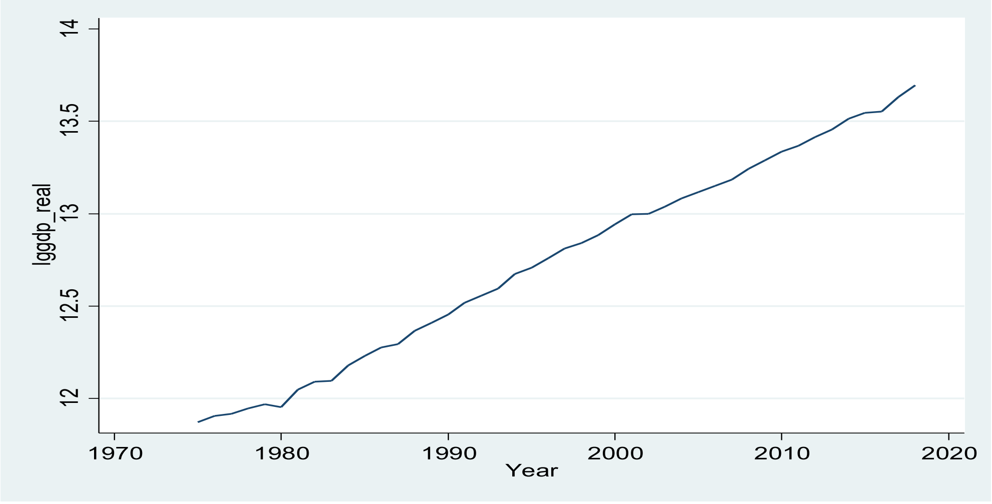
g. Stability Examination: Assess the stability of the estimated coefficients to ensure the presence of enduring long-run relationships.

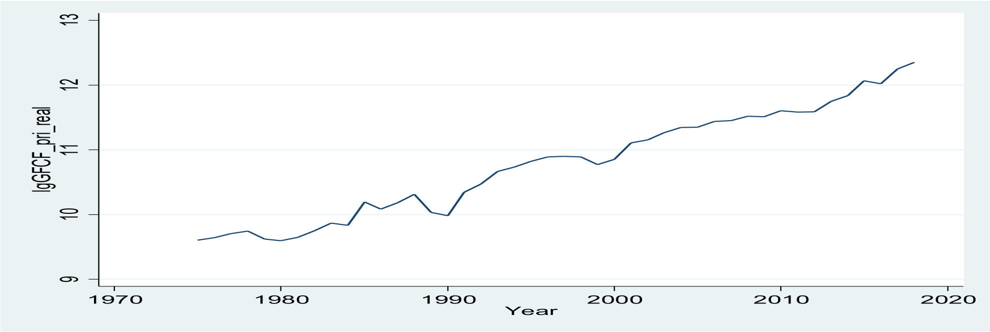
h. Results Analysis: Scrutinize the results to ascertain their logical plausibility.

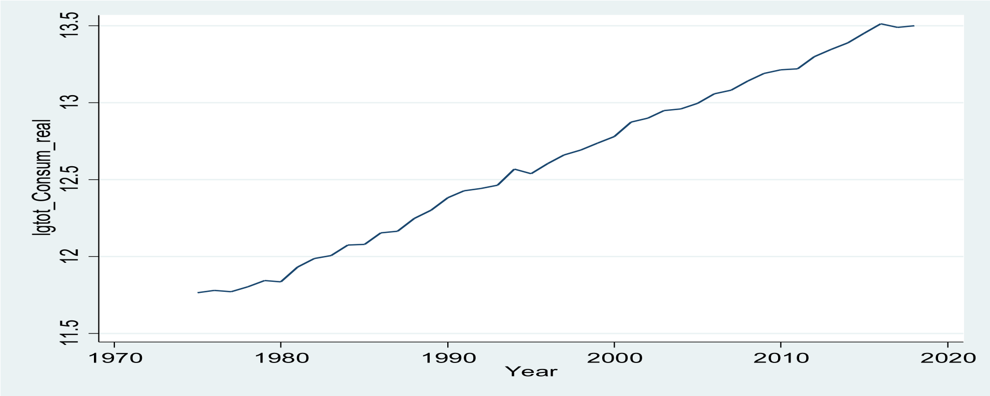
4. RESULTS

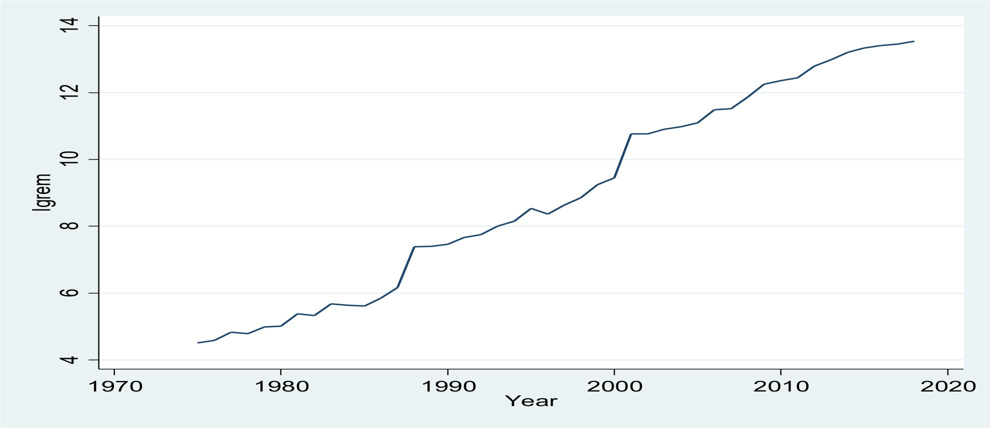
Prior to initiating the estimation process, graphs are plotted, and summary statistics are provided to comprehend the characteristics of the data. It is essential to evaluate the stationarity test. Subsequently, co-integration analysis and a unit root test are performed for the variables of interest. The line graphs are illustrated to portray the historical data.

Figure 3: Graphical Representation of Data on Their Level Form









Source: estimated

The graphs indicate minimal evidence suggesting the possibility of a structural break in the selected four macroeconomic variables. Nevertheless, it is worth mentioning that the logarithmic series graphs demonstrate a more uniform variance when contrasted with the fluctuations observed in the original series.

Summary statistics

Table 1 presents summary statistics for the variables employed in the research.

Table 1: Summary Statistics of Four Macroeconomic Variables

Macroeconomic variables	Total number of observations.	Mean value	Standard deviation	Minimum value	Maximum value
Log of real GDP	44	12.7479	0.5611	11.87	13.69
Log of Capital formation made by the private sector	44	10.7797	0.8300	9.59	12.35
Log of total consumption	44	12.627	0.5614	11.76	13.51
Log of remittances	44	8.96287	3.0417	4.51	13.54

Source: Estimated

Unit root test for the variables

Whenever unit root problems are addressed with ARDL models, pre-testing variables are no longer required. Nevertheless, to investigate the sequence of integration among the variables, unit root tests were carried out in this study. The ADF test was used to look at the time series' integration order. This is done to make sure that there are no false results and that the model's variables do not show I (2) stationarity. Table 2 displays the results of the unit root testing.

Table 2: Unit root test at level using Dicky-Fuller test

Variables			Interpolated Dicky- Fuller			
		Test Statistic	1% critical value	5% critical value	10% critical value	MacKinnon approximate p-value for Z(t)
Remittances	Z(t)	-2.937	- 4.214	-3.528	- 3.197	0.1506

Real GDP	Z(t)	-3.252	- 4.214	-3.528	- 3.197	0.0744
Capital formation	Z(t)	-3.328	- 4.214	-3.528	- 3.197	0.0618
Total consumption	Z(t)	- 4.324	- 4.214	- 3.528	- 3.197	0.0029

Source: estimated

The results showed that the ADF test statistic for remittances is greater than the respective critical values. The remittance variable is non-stationary at the level. GDP and capital formation are stationary at a 10 percent level; however, we generally accept at a 5 % level. Remittances, GDP, and capital formation variables thus became stationary following the first difference in our final evaluation. They are integrated of order I(I) as a result. At this level, the variable reflecting total consumption is stagnant.

Table 3: Unit root test at first difference

Variables			Interpolated Dicky- Fuller			
		Test Statistic	1% critical value	5% critical value	10% critical value	MacKinnon approximate p-value for Z(t)
Remittances	Z(t)	- 7.355	- 3.634	- 2.952	- 2.610	0.0000
Real GDP	Z(t)	- 7.640	- 3.634	- 2.952	- 2.610	0.0000
Capital formation	Z(t)	- 7.196	- 3.634	- 2.952	- 2.610	0.0000

Source: estimated

Bounds testing, or the Autoregressive Distributed Lag (ARDL) cointegration approach, was created by Pesaran et al. (2001) to estimate the model and investigate the long-term relationships and dynamic interactions between the variables of interest. The ARDL model specifically addresses single-equation modelling. This approach works as a co-integration technique, determining the long- and short-term associations between the variables that are being examined at the same time. Dynamic linear regressions, or ARDL models, are frequently used to examine the relationship between remittances and the nation's economic growth. Furthermore, as compared to conventional cointegration techniques, the ARDL model performs better and has increased robustness for small sample sizes. The investigation most importantly verified that none of the variables exhibit I(2) features.

The subsequent stage entails identifying the ARDL model with optimal lags. Prior to conducting cointegration analysis, the Akaike Information Criterion (AIC) and Bayes

Information Criterion (BIC) provided to support to establish lag order. The annual data is used for this study, the process was initiated with a maximum of four lags and subsequently iteratively reduced it to three, two, and then one.

Selection of optimal lags

The optimal lag orders, p and q, are determined by employing a suitable model selection criterion, such as AIC or BIC. In cases of uncertainty, higher lag orders are chosen for testing purposes. The details of the lag selection criterion are outlined in Table 4, with additional information provided in the appendix.

Table 4: Selection of lags

Criterion	Real GDP	Remittances	Capital formation	Total consumption
Akaike Information Criterion (AIC)	3	3	1	2
Bayes information criterion (BIC).	3	2	0	2
Final selection	**3**	**3**	**1**	**2**

Source: estimated

Estimating ARDL (p, q, . . . , q) model for a bound test

The model that is related to the ARDL serves as a methodology for concurrently estimating both coefficients that are related to the short-term and long-term. In order to analyse the relationships between economic growth and its focal variables in both the long and short run, I employ lag estimates (3 3 1 2). The results of the cointegration test based on the ARDL (3 3 1 2) bound testing approach are provided in the following table. The significance of the coefficient on the forcing variable is crucial in substantiating the long-term relationship between the variables being studied. The estimation of long-term coefficients on suppressors and the EC term is outlined below.

The results show the long-run cointegration relation between remittances, capital formation made by the private sector, total consumption and economic growth.

Tables 5 and 6 present the outcomes of the ARDL bounds cointegration tests, indicating the computed F-statistic in cases where the regression is normalized based on economic growth. The exploration for cointegrating relations has been confined to the growth variable as the dependent variable.

The result provides grounds for rejecting the null hypothesis that there is no cointegration at these significance levels for the growth model because the computed F-statistic (7.912) exceeds the upper critical bounds at significance levels of 1%, 2.5%, 5%, and 10%, as indicated in the table. Consequently, according to the ARDL bounds test, it helps to detect a long-run relationship among the selected variables for the model.

Table 5: Results of the bound test

F statistics	7.912	
Critical value	Lower bound value	Upper bound value
1 %	4.29	5.61
2.5%	3.69	4.89
5%	3.23	4.35
10%	2.72	3.77

Source: estimated

Table 6: Long run and short rum results

Sample: 1978 - 2018				Number of obs	=	41
				R-squared	=	0.7317
				Adj R-squared	=	0.6167
Log likelihood = 124.95514				Root MSE	=	0.0139

D.lggdp_real	Coef.	Std. Err.	t	P >| t |	[95% Conf. Interval]	
ADJ						
lggdp_real						
L1.	-.457516	.1327067	-3.45	0.002	-.7293534	-.1856786
LR						
lgrem	-.1103186	.0381565	-2.89	0.007	-.1884786	-.0321586
lgGFCF_pri_r~1	-.055463	.0628571	-0.88	0.385	-.1842199	.0732939
lgtot_consum~1	1.684353	.2672864	6.30	0.000	1.136842	2.231865
SR						
lggdp_real						
LD.	-.0448322	.1380738	-0.32	0.748	-.3276636	.2379992

L2D.	-.5627759	.1189332	-4.73	0.000	-.8063996	-.3191522
lgrem						
D1.	.0434649	.0117513	3.70	0.001	.0193934	.0675363
LD.	.0271462	.0106409	2.55	0.016	.0053493	.0489431
L2D	.013194	.0092129	1.43	0.163	-.0056778	.0320658
lgGFCF_pri_r~1						
D1.	.0327874	.0246198	1.33	0.194	-.0176439	.0832188
lgtot_consum~1						
D1.	-.3498502	.1559986	-2.24	0.033	-.6693989	-.0303015
LD.	-.4974126	.1181831	-4.21	0.000	-.7394997	-.2553256
_cons	-3.110042	.725427	-4.29	0.000	-4.596012	-1.624072

Source: estimated

In summary, when GDP serves as the dependent variable, the estimated bounds F-test yields an F-statistic of 7.912, exceeding the upper critical value of 5.61 at the one percent significance level. Consequently, the null hypothesis of zero cointegration is rejected, suggesting the presence of a singular cointegrating, long-term economic relationship between the variables when normalized on economic growth.

Again, the error correction term exhibits a noteworthy negative coefficient (-0.4575) and attains statistical significance, affirming the existence of a long-term equilibrium. The adverse speed-of-adjustment coefficient (-0.4575) is documented in the ADJ section on the left side of the table output. This coefficient measures how strongly the dependent variable reacts, over a given length of time, to a break in the equilibrium connection. Stated differently, it represents the pace at which an imbalance is corrected, which is 45% annually or every 5.4 months. This suggests a swift adjustment of deviations from independent variables to economic growth.

The LR output section on the left-hand side of the table displays the long-run coefficients, describing the equilibrium impacts of the independent variables on the dependent variable. In the context of cointegration, these coefficients align with the negative cointegration coefficients following the normalization of the dependent variable's coefficient to unity. All variables are in log form; therefore, it provides elasticity coefficients. There is a negative association between remittances and real GDP in the long-run model. If there is an increase in remittances by 10 percent, GDP will be reduced by 11%, all other things remaining the same. In the long-run model, the coefficient for capital formation lacks statistical significance.

The long-run model shows that real GDP and total consumption are positively correlated. The total consumption coefficient suggests GDP elasticity. Over time, the real GDP will rise by 16.84 percent if total consumption is increased by 10%. The SR section on the table's left side column provides specific information on the short-run coefficients. These coefficients capture transient fluctuations that have nothing to do with departures from the long-term mean.

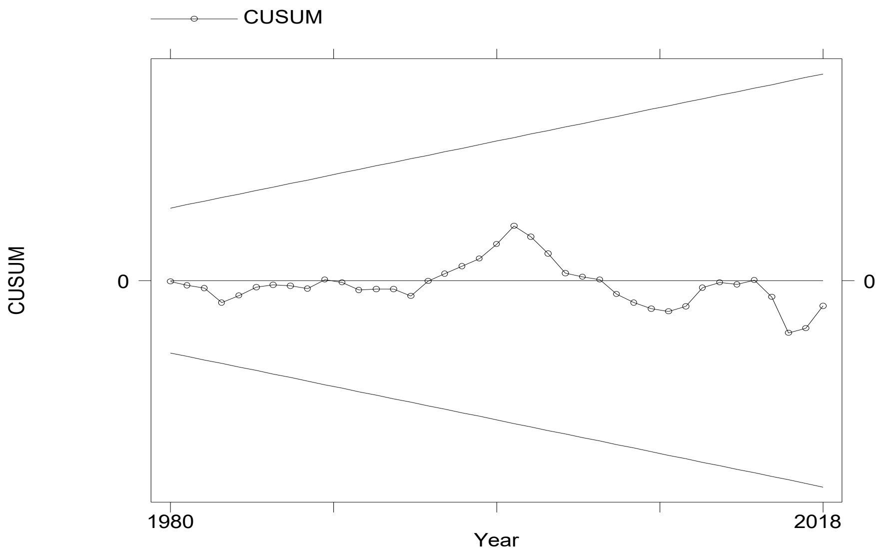
In the short run, there is a positive association between remittances and real GDP. In the first two lags of the remittances, the results suggest elasticities. If there is a 10 percent increase in remittances, it will lead to an increase of 4.34 percent in GDP. Remittance is variable of interest in this study. Other variables are treated as control variables.

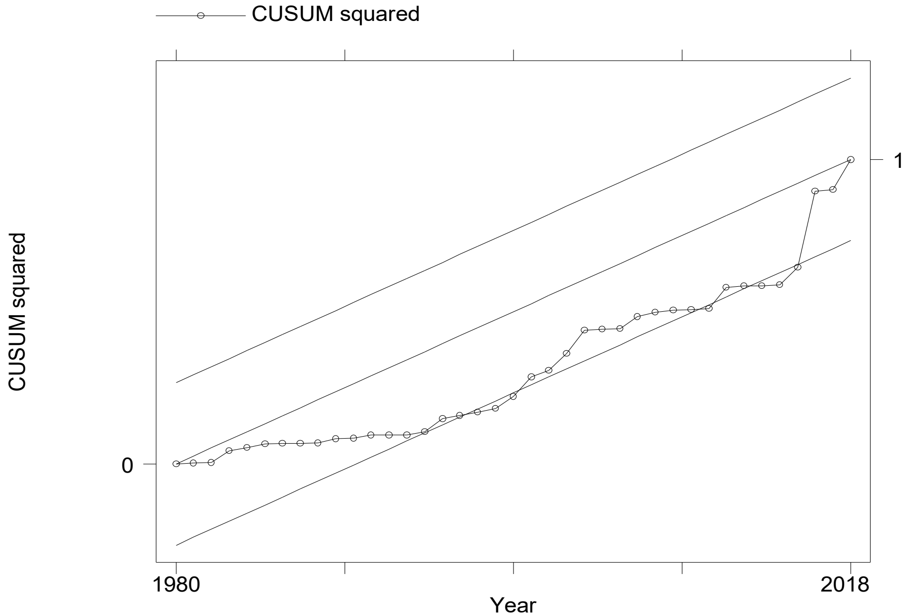
Estimated ARDL (3 3 1 2) Diagnostics

Following the empirical estimation of the ARDL model, various diagnostic and stability tests are conducted to bolster the model's credibility. These tests encompass assessments for autocorrelation, heteroskedasticity, normality, and other relevant factors. The outcomes of these diagnostic tests are provided in the appendix. In terms of normality in error term Jarque-Bera statistic was used, Lagrange multiplier (LM) for autocorrelation and the ARCH statistic for ARCH. All these results are shown in the appendix. Cumulative sum (CUSUM) and CUSUM of squares (CUSUMSQ) tests are used for checking the structural stability in the model and illustrated in Figure 12 Cumulative sum lines are within the two lines. This indicates models are stable.

Figure 4: Cumulative sum test for stability

Cumulative sum (CUSUM) and CUSUM square test for stability





Source: estimated

5. DISCUSSION AND CONCLUSIONS

The simple model has been utilized to measure the impact of remittances on economic growth. The capital formation and total consumption are also included as control variables while estimating the impact of remittances on the GDP of Nepal. Then it represents the Keynesian aggregate demand function. If there is an increase in remittances, there is a positive impact on the GDP of Nepal. Time series data, 1974/75 to 2017/18 are collected from World Bank, Nepal Rastra Bank, and CBS to measure the impact of remittances on the economy of the country.

The ARDL cointegration technique is to simultaneously estimate the short-run and long-run coefficients of our model. The findings of the long-run cointegration relation between remittances, the capital formation made by the private sector and total consumption, and economic growth are reported.

The ARDL bounds test has verified the existence of a long-term relationship among the variables. The error correction model measures the intensity of the dependent variable's response to a departure from the equilibrium relationship within a single period. Put differently, it measures how speedily such an equilibrium distortion is rectified, at a rate of 45% per year, equivalent to correction occurring every 5.4 months. This suggests a prompt adjustment of deviations from independent variables to economic growth. All variables are in log form; therefore, it provides elasticity coefficients. There is a negative association between remittances and real GDP in the long-run model. If there is an increase in remittances by 10 percent, GDP will be reduced by 11%, all other things remaining the same.

In the long-run model, the statistical significance of the capital formation coefficient is not observed. There is a positive association between total consumption and real GDP in the long-run model. The coefficient of the total consumption suggests elasticity with GDP. If total consumption is increased by 10 %, the real GDP will increase by 16.84 percent in the long run. In the short run, there is a positive association between remittances and real GDP. In the first two lags of the remittances, the results suggest elasticities. If there is a 10 percent increase in remittances, it will lead to an increase of 4.34 percent in GDP. After the estimation of the empirical ARDL model, there are a variety of diagnostic and stability tests which enhance the credibility of the model. Following the empirical estimation of the ARDL model, various diagnostic and stability tests are conducted to strengthen the model's reliability. Over the long term, remittances do not contribute to economic improvement. The findings indicate a negative correlation between remittances and GDP.

If there is an increase in remittances by 10 percent, GDP will be reduced by 11%, all other things remaining the same. In the long-run model, the capital formation coefficient lacks statistical significance. However, a positive correlation is observed between total consumption and real GDP in the long-run model. The coefficient of the total consumption suggests elasticity with GDP. If total consumption is increased by 10 %, the real GDP will increase by 16.84 percent in the long run.

References

Acosta, P. A., Lartey, E. K., & Mandelman, F. S. (2009). Remittances and the Dutch disease. *Journal of international economics*, *79*(1), 102-116.

Ahmed, M. S., (2010). Migrant Workers Remittance and Economic Growth: Evidence from Bangladesh. *ASA University Review*, Vol. 4 No. 1 (January-June),

Barajas, A., R. Chami, C. Fullenkamp, M. Gapen, & P. Montiel. (2009). *Do Workers' Remittances Promote Economic Growth?* IMF Working Paper, WP/09/153.

Barguellil, A., Zaiem, M. H., & Zmami, M., (2013). Remittances, Education and Economic Growth A Panel Data Analysis. *Journal of Business Studies Quarterly*, *Volume 4, Number 3, 129-139*

Barua, S., & Rafiq, F. (2020). Macroeconomic determinants of remittances and implications for economic growth: Evidence from Bangladesh. *Bangladesh's Macroeconomic Policy: Trends, Determinants and Impact*, 371-392.

Basnet, H. C., Donou-Adonsou, F., & Upadhyaya, K. (2019). Workers' remittances and the dutch disease: evidence from South Asian countries. *International Economic Journal*, *33*(4), 662-678.

Bayar, Y (2015). Impact of Remittances on the Economic Growth in the Transitional Economies of the European Union. *Economic Insights – Trends and Challenges*, Vol.IV(LXVII) No. 3, 1-10. http://www.upg-bulletin-se.ro/archive/2015-3/1

Chami, R., Fullenkamp, C. and Jahjah, S. (2005) *Are immigrant remittance flows a source of capital for development?* IMF Staff Paper 52, 1, International Monetary Fund, Washington, DC.

De Soto, H. (2000). *The mystery of capital*. London: Bantam Press.

Dzeha, G. C. (2017). *Remittances, Total Factor Productivity And Economic Development in Africa* (Doctoral dissertation, University of Ghana).

Eggoh, J., Bangake, C., & Semedo, G. (2019). Do remittances spur economic growth? Evidence from developing countries. *The Journal of International Trade & Economic Development*, *28*(4), 391-418.

Hien, N. P., Vinh, C. T. H., & Mai, V. T. P. (2020). Remittances, real exchange rate and the Dutch disease in Asian developing countries. *The Quarterly Review of Economics and Finance*, *77*, 131-143.

Jalil, A., & Rao, N. H. (2019). Time series analysis (stationarity, cointegration, and causality). *Environmental Kuznets Curve (EKC)* (pp. 85-99). Academic Press

Johansen, S. & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration-with application to the demand for money. *Oxford bulletin of economics and statistics*, 52: 169-210.

Jongwanich, J. (2007). *Worker's Remittances, Economic Growth and Poverty in Developing Asia and Pacific Countries*: UNESCAP *Working Paper* 07/01. Bangkok, Thailand: Economic and Social Commission for Asia and Pacific

Jouini, J. (2015). Economic growth and remittances in Tunisia: Bi-directional causal links. *Journal of Policy Modeling*, 37(2), 355-373.

Kaphle, R. R. (2018). Relationship between remittance and economic growth in Nepal. *Tribhuvan University Journal*, *32*(2), 249-266.

Kapur, D. (2003). *Remittances: The New Development Mantra*? United Nations Conference on Trade and Development, Geneva.

Kireyev, A. (2006). *The Macroeconomics of Remittances: The Case of Tajikistan.* International Monetary Fund, Washington, DC.

Kumar, R. R. (2013). Remittances and economic growth: A study of Guyana. *Economic Systems*, *37*(3), 462-472.

Kumar, R. R., & Stauvermann, P. J. (2014). Exploring the nexus between remittances and economic growth: a study of Bangladesh. *International Review of Economics*, *61*, 399-415.

Kyophilavong, P., Uddin, G. S., & Sjo, B., (2013). An examination of the remittance, financial development, and economic growth in developing countries. *Journal of Economic and Financial Modelling,* Vol.1 (1), pp.47-55.

Matuzeviciute, K., & Butkus, M. (2016). Remittances, development level, and long-run economic growth. *Economies*, *4*(4), 28.

Meyer, D., & Shera, A. (2017). The impact of remittances on economic growth: An econometric model. *EconomiA*, *18*(2), 147-155.

Nepal Rastra Bank (2019) *Quarterly Economic Bulletin* Report Volume 53 Mid-April, 2019 Number, NRB Kathmandu

Paul, B. P. & Das, A., (2011). The Remittance-GDP Relationship in the Liberalized Regime of Bangladesh: Cointegration and Innovation Accounting. *Theoretical and Applied Economics*, Vol. 18, No. (September), pp. 41-60; available at: http://store.ectap.ro/articole/636.pdf.

Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. In S. Strom (Ed.), *Econometrics and economic theory in the 20th century: The Ragnar Frisch centennial symposium.* Cambridge: Cambridge University Press.

Pesaran, M. H., Shin, Y., & Smith, R. (2001). Bounds testing approaches to the analysis of level relationship. *Journal of Applied Econometrics*, 16(3), 174e189.

Rahman, M. (2009). Contribution of Exports, FDI, and Expatriates' Remittances to Real GDP of Bangladesh, India, Pakistan and Sri Lanka. *Southwestern Economic Review*, Vol. 36, pp. 141-153;

Rahman, M., Mustafa, M., Islam, M., & Guru-Gharana, K. K., (2006). Growth and Employment Empirics of Bangladesh. *Journal of Developing Areas*, Vol. 40, No. 1, pp. 99-114.

Rajan, R. & Subramanian, A. (2005) *What undermines aid's impact on growth? National Bureau of Economic Research Paper 11657*, National Bureau of Economic Research, Cambridge, MA.

Senbeta, A. (2013). Remittances and the sources of growth. *Applied Economics Letters*, 20(6), 572–580.

Sherpa, D. (2010). Labour migration and remittances in Nepal. *Labour migration for development in the western Hindu Kush-Himalayas. International Center for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal*.

Siddique, A., Selvanathan, E. A., & Selvanathan, S. (2010). *Remittances and Economic Growth: Empirical Evidence from Bangladesh, India and Sri Lanka*, Discussion Study, University of Western Australia, No. 10.27.

Siddique, T., (2004). *Efficiency of Migrant Workers' Remittances: The Bangladesh Case*. Manila, The Philippines: Asian Development Bank

Sobiech, I. (2019). Remittances, finance and growth: Does financial development foster the impact of remittances on economic growth?. *World Development*, *113*, 44-59.

Solow, R. M. (1999). Neoclassical growth theory. *Handbook of macroeconomics*, *1*, 637-667.

Spatafora, N. (2005) Worker remittances and economic development, World Economic Outlook, April, pp. 69–94.

Stahl, Charles W. & Ahsanul Habib (1989). The Impact of Overseas Workers' Remittances on Indigenous Industries: Evidence from Bangladesh. *The Developing Economies*, Vol. 27, pp. 269-285.

Taylor, J.E.,Mora, J., Adams, Jr., R. & Lopez-Feldman, A. (2005) *Remittances, inequality and poverty: evidence from rural Mexico.* Working Paper 05–003. Department of Agricultural Economics, University of California, Davis, CA.

Thapa, S., & Acharya, S. (2017). Remittances and household expenditure in Nepal: Evidence from cross-section data. Economies, 5(2), 16.

Wagle, U. R., & Devkota, S. (2018). The impact of foreign remittances on poverty in Nepal: A panel study of household survey data, 1996–2011. *World Development*, *110*, 38-50.

World Bank (2018) *Nepal Development Update: Maximising Finance for Development*, World Bank

World Bank (2019) *World Bank world Data set*, World Bank

World Bank (2020), *Migration and remittances data* World bank

World Bank. (2006). *The Development Impact of Workers Remittances in Latin America, vol. 2, Detailed Findings, Report No. 37026*. Washington, DC: World Bank.