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Assessment of the Effect of Remittance on the Economic Growth of Nepal: A Time Series Analysis

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ABSTRACT

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This study examines the impact of remittance on the economic growth of Nepal employing time series data. The analysis has incorporated the macroeconomic variables such as GDP, Remittance (REM), Balance of Payments (BOP), Private Consumption (PCO), and Private Investment (PIN), using 48 years observations. Unit root tests indicated that the variables are integrated at mixed levels of I (0) and I (1), justifying the use of ARDL model. A structural break in 2010 was incorporated using a dummy variable.

The long-run results indicated a significant negative relationship between remittance and GDP, where a percentage increase in remittance reduces GDP by 0.155 percent. BOP, PCO, and PIN exhibited positive but statistically insignificant long-run effects. In the short run, remittance has a significant negative effect in the current year but significant positive impacts in its first and second lags. The error correction term is -0.5972, suggesting that nearly 60 percent of the short-run disequilibrium adjusts back to long-run equilibrium annually. A significant positive time trend and structural break influence were also observed through the analysis of the data.

The model was approved through all the major diagnostic and stability tests, reflecting the reliable results. Findings suggest that while remittance may support short-term consumption, they do not have positive contribution in the long-term economic growth.

Keywords: ARDL, Economic Growth, Remittance, Structural Break, Time Series Analysis.

INTRODUCTION

Remittance has become very important for the sustainability of our nation. There are 908 thousand people actively pursuing work and also available to work whereas 39.3 percentage of workers who are employed have shown their intention and desire to work more hours (CBS, 2019). This data shows the inadequacy of the domestic market to provide enough employment opportunities for the available labour force which plays the push factor towards foreign employment and earnings for the equal level of working hours put in the market.

Although with the humongous level of remittance receipt by Nepal every year and not showing any sign of slowing down any sooner surprisingly there are minimal amount of empirical research related to the remittance and its effects in Nepalese research sector (Kaphle, 2018). The high usage of remittance in unproductive sector, slow progress from policy level for the productive utilization of remittance, unawareness of remittance receiving families for the long-term sustained utilization of the fund have led to the recurring of fund and foreign employment seeking behavior. Moreover, the major portion of this financial resource is going abroad in the form of import consumption as Nepal's trade deficit is Rs 1454.53 Arba (Billion) (Department of Customs, 2079.80).

Remittance has multi-dimensional effect on BOP, consumption, investment, foreign exchange reserve, trade and others directly and indirectly. However, the effect of remittance along with its dimensions towards economic growth of Nepal has been under looked and seriously undervalued which is justified by the fact that there are limited literatures based on the topic and not all are empirical as well. This provides us with clear grounds to do the research as little work has been done previously relating to the relationship between remittance and economic growth. Along with the significant macro-economic variables that are BOP, PCO and PIN are taken into consideration for the effect on economic growth as well.

Remittance in Nepal has been in average of 22.06% compared to GDP of the country consistently for the past two decade (WB, 2024). Having been in such high numbers certainly has its own positive and negative effect. Remittance although seems like a micro phenomenon as respective family receives transfer income sent by their family members. However, the macro policies, political agendas, migration behavior as well as the development activities are majorly affected by the remittance in country like Nepal which constantly is receiving remittance more than 20% compared to GDP in average for more than two decades. The major objective of this study is to assess the impact of the remittance on the economic growth.

Moreover, its findings is believed to assist policy makers by accessing the impact of remittance for the long and short term in relation with the economic growth of the country.

This study incorporates the long-term economic dynamics employing 48 annual time series dataset and also integrating the major macroeconomic variables such as Balance of Payment, Private Consumption, and Private Investment. Accordingly, this study tries to fill the research gap by employing the log-log econometric framework to enable the measurement of the elasticity as well and to find the causal impact of remittance on the economic growth controlling other important economic variables.

LITERATURE REVIEW

This study is based upon some relevant economic theories that provide the conceptual framework as well. Moreover, these theories have guided in the selection of the variables and supported the interpretation of the empirical findings.

Endogenous Growth Theory

Endogenous theory states that the investment creates positive externalities and spillover effect which will lead towards the increasing returns to scale.Accordingly, the economic growth emerges from within the economic system through investment in human capital, innovation and knowledge creation which is driven by deliberate investments in Research and Development, education and policies. It further argues by increasing productivity and creating positive feedback loop these elements helps to create sustained growth in the economy (Romer, 1994).

Dual Gap Model

The model also suggests that foreign aid, loans or FDI can address both gaps simultaneously as they enable economy with liquidity to invest in infrastructure, industry and overall development. The growth constraints in developing countries is due to two main reasons one saving investment gap and another foreign exchange gap. This gap interacts as low savings limits investment capacity while weak export revenues restrict access to foreign currency to import necessary capital goods (Chenery & Strout, 1966).

Thirlwall's Law

The Thirwall's Law states that the nation will have balance of payments issues and be forced to curtail growth if imports increase more quickly than exports. A nation's balance of payments, namely the correlation between export growth and import demand, limits its long-term

economic growth. Moreover, unless a nation can sustainably finance its deficits, it can only grow at a rate consistent with equilibrium in its external sector (Thirlwall, 1979). Therefore, two important factors that determine sustainable economic growth are import elasticity and export performance.

Keynesian Consumption Theory

Keynesian Consumption Theory states that the consumption drives short-run economic growth and aggregate demand, which serves as the foundation for fiscal policies meant to boost the economy during recessions. The main factor influencing consumption is present income. The marginal propensity to spend measures how much consumption rises in tandem with income, although at a slower rate (Keynes, 1936). The theory presents the idea of autonomous consumption, which happens even in the absence of income.

Solow–Swan Model

Solow- Swan Model describes the long-run economic growth as the result through exogenous technical advancement. According to this theory, declining returns to capital lead economies to a steady state where output per capita stabilizes. Only technological breakthroughs, viewed as an external element, can lead to sustained growth. It supports the idea of conditional convergence, which states that if weaker economies share comparable rates of population, savings, and technology with wealthier countries, they will grow more quickly (Solow & Swan, 1956).

The review of the empirical literatures in this section have provided evidence regarding the relationships between and among the variables under study. Moreover, these studies have also supported to identify the research gap as well.

Dutta and Saikia (2024) conducted the study based on panel of 17 remittance receiving selected Asian nations from the years 1993-2017. Using fully modified ordinary least square method researchers found that remittance has significant and positive long term relationship with the economic growth of the selected nations. The research concludes with productive use of remittance on public and private infrastructure should be the main objective of the government. Remittance can be the major factor of growth along with human capital, physical capital, trade and FDI.

Mohammed (2024) analysed short- and long-term dynamics of Saudi Arabian economy from 2000 to 2022 with the relationship between household consumption, government expenditure, investment, trade balance and GDP using co-integration techniques. The

empirical analysis revealed a long-term co-integration relationship between the variables. Granger Causality study demonstrated unidirectional causal linkages between consumption and investment towards economic growth. Research unveiled a positive correlation between household consumption and real GDP.

Monamodi (2024) investigated the impact of South Africa's current account balance on its economic growth. Using ARDL technique for period from Q1 2015 to Q4 2022 this result concluded with the current account deficit having significant impact on the economic growth both in the long and short run. This study also incorporated Covid-19 affect and concluded that its negative effect on current account thus having more deterioration. This study also incorporated negative relationship between South Africa's trade openness, financial openness, real interest rate and economic growth rate and concluded with promotion of import substitution with local products and promoting exports.

Mose and Fumey (2024) concluded using time series panel data from 1991 to 2022 of Kenya and Ghana that there exists long run relationship between private and public investment with economic growth using DLOS for cointegration. Public investment is significant in promoting growth compared to private investment. Public investment is more efficiently distributed and private investment should play a complementary role.

Chowdhury et al. (2023) using panel data from 1990 to 2019 of chosen three low-income Asian countries as Bangladesh, Sri Lanka and Vietnam found that the effect is different among the countries. They found that remittance had no relationship with growth in long or short term in terms of Bangladesh, whereas in Vietnam there was existence of only short term, and onto Sri Lanka there was bidirectional causality. The study incorporated VECM model and growth of remittance as independent variable and GDP per capita as dependent variable. Growth of capital formation, export, exchange rates, household consumption were taken as control variables.

Sinha (2023) concluded that public investment is the major factor that promote household consumption and national income which leads to economic growth decreasing unemployment in India. Inflation depresses economic performance as it results in low investment, low employment and low consumption. The paper recommends to increase government spending to boost aggregate demand and accelerate economic growth. OLS estimation was used on time series data ranging from 1990/91 to 2020/21.

Morina et al. (2023) concluded there is positive impact of domestic investments on economic growth along with long-term causality between GDP and gross fixed capital formation

in OECD countries. Capital investments on different sectors and assets help diversify risk and improve performance. Government should develop favourable conditions: fight corruption, promote stability, and reduce volatility. VAR model was used for 2000–2020 data.

Islam (2022) investigated the relationship between remittance and economic growth in four selected South Asian economies from the period 1986-2019 using trade openness and FDI as control variable. Generalized least square and fully modified ordinary least square estimations used by the study ensured the positive impact of remittance on economic growth and unidirectional causality from remittance to economic growth. The research concluded with FDI having negative relationship and trade openness having positive relationship. At last research concludes with implementation of migration friendly policies to augment more international remittance.

Kim (2022) researched to find out the effect of consumption on economic growth based on cross national comparative analysis using regression model between 222 countries and territories from 2012-2017 using fifteen variables. Researcher found mainly four patterns: consumption driven, saving based, oil-rich based and government spending. Consumption led economy contained globalization, economic freedom, knowledge economy, global competitiveness, less corruption, FDI and growth. Researchers concluded consumption-driven economy has universal effect.

Mutenyo et al. (2022) found private domestic investment is positive and significant on economic growth, while FDI is significant but negative. Using GMM approach for 1990 to 2019 for Sub-Saharan African countries with independent variables: human capital, infrastructure, consumption, inflation, trade, stability, financial development, FDI and private investment. The study also further clarifies that not all FDI are negative and further research should be carried out to bifurcate it onto positive and negative effects.

Saha (2021) carried out the study to find the relationship between remittance and economic growth in Bangladesh along with domestic investment for the period 1995-2016. Researcher concluded that in the long run overseas remittance has greater impact on the economic growth. Research also concluded that there exists unidirectional causality from GDP to remittance and domestic investment. Ending recommendations of the study posits government should review and scrutiny domestic investment while cautious use of remittance should be developed.

Rasasi et al. (2021) explore the causal relationship between household consumption and economic growth of Saudi Arabia from 1980-2017 using OLS method and integrating

real non-oil GDP and real private final consumption expenditure. Found a positive long run relationship as GDP increases by 0.7% with every unit percentage increase in consumption. Granger test concluded variation in consumption explains changes in economic growth. Researchers recommended promoting consumption via direct and indirect means.

Nguyen and Nguyen (2021) mentioned in the long run domestic private investment, foreign private investment, trade openness and labor have positive effect on economic growth, while public investment is negative. In the short run, only labor and trade openness have negative effect. Research was based on 63 Vietnamese provinces data from 2000 to 2020 using PMG regression method.

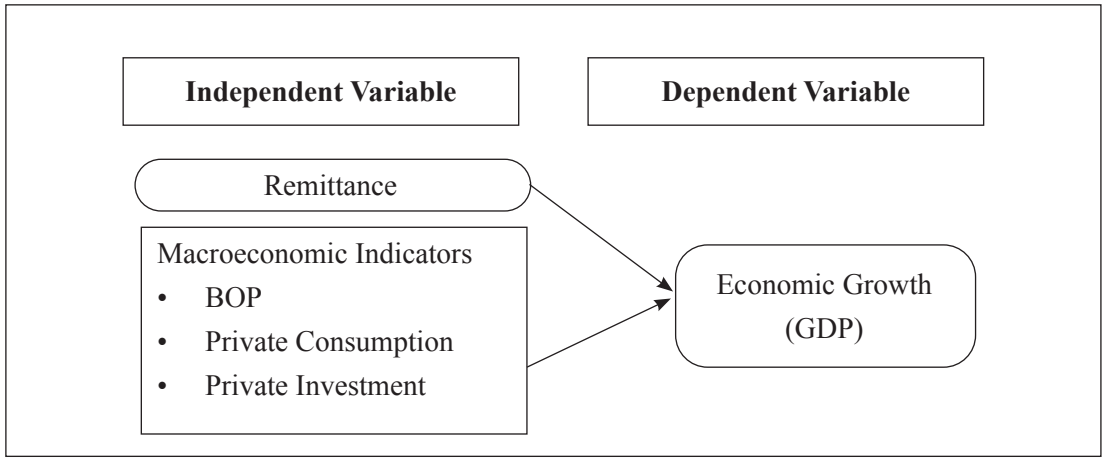
Cazachevici et al. (2020) conducted a meta-analysis which investigated the impact of remittances on economic growth by analysing 95 studies encompassing 538 regression equations. Around 40% of the studies indicated a positive and statistically significant effect of remittances, 20% reported a negative effect, and the remaining 40% found no significant impact. The result showed overall effect of remittances on growth is positive but modest, with some evidence of publication bias. Variations in results are influenced by control of financial inflows, endogeneity, time-series techniques, and regional disparities.

Conceptual/Operational Framework

In this study Remittance, BOP, Private Consumption and Private Investment are taken as Independent Variables whereas economic growth is taken as the dependent variable. GDP is used as the proxy for economic growth as shown in the figure.

Figure 1

Conceptual Framework



METHODS AND MATERIALS

This research study adopts a quantitative research design using econometric analysis of secondary time series data to explore the causal relationship between independent and dependent variable. To carry out the study about the effect of remittance on the economic growth of Nepal, this research is based on secondary data sourced from the official government's site i.e. Ministry of Finance (MoF). The research is engage upon the annual data ranging from 1974/75 to 2021/22 AD. All the data collected are in the form of Ten Million and are in NPR. There are a total of 48 observations for each variable and total of 240 observations. To carry out the study an empirical model of function between economic growth, remittance along with BOP, Private Consumption, and Private Investment can be presented as:

$$GDP = f(REM, BOP, PCO, PIN) \quad \text{……..(i)}$$

Based on the function, we develop following multiple regression model to show the relationship between independent and dependent variables:

$$Y = \beta_0 + \beta_1 Rem_t + \beta_2 BOP_t + \beta_3 PCO_t + \beta_4 PIN_t + \mu_t \quad \text{…….…(ii)}$$

A log-log econometric model will help to make data more homoscedastic and direct interpretation of elasticity so we will transform equation (ii) and develop a log-log econometric model as below:

$$\ln Y_t = \beta_0 + \beta_1 \ln Rem_t + \beta_2 \ln BOP_t + \beta_3 \ln PCO_t + \beta_4 \ln PIN_t + \mu_t \quad \text{……..(iii)}$$

Here, in the equation(iii) "ln" represents natural log, "Y" stands for GDP, "β_0" represents intercept, "REM" represents Remittance, "BOP" represents Balance of Payment, "PCO" represents Private Consumption, "PIN" represents Private Investment, "β_i" represent slope coefficient and "μ" represents error term and "t" represents time. After this we will conduct the data analysis part with the following tests.

RESULTS

Descriptive Analysis

In the Table 1, the descriptive analysis of the GDP variable shows it has a mean value of 73105.35 with maximum value of 252967.70 and minimum value of 13106.18, the REM variable shows it has a mean value of 19101.61 with maximum value of 100730.70 and minimum value of 20.43.

Central Tendencies and log form of data

Table 1

Descriptive analysis of the original variables

	GDP	REM	BOP	PCO	PIN
Mean	73105.35	19101.61	27141.59	76728.70	18910.29
Median	37397.00	865.12	25525.05	24816.80	4210.20
Maximum	252967.70	100730.70	53767.91	391856.40	104104.90
Minimum	13106.18	20.43	1.00	1365.20	171.80
Observations	48	48	48	48	48

Source:EViews 12 Student version lite

The descriptive analysis of the BOP variable shows it has a mean value of 27141.59 with maximum value of 53767.91 and minimum value of 1.00, however it should be taken into consideration that to transform the variable into logged form minimum value of BOP which was negative ie -25525.91 with 1 extra value was added to the whole variable. The descriptive analysis of the PCO variable shows it has a mean value of 76728.70 along with maximum value of 391856.40 and minimum value of 1365.20, the descriptive analysis of the PIN variable shows it has a mean value of 18910.29 along with maximum value of 104104.90 and minimum value of 171.80.

Determining the log form of the variables

Logged form of data also helps to improve homoscedastic nature of the data and at last improve the quality of the interpretation by introducing the elastic nature of the coefficient. Making the data normal and also reducing the multicollinearity are the other benefits of transforming the data into their logged form. Granger and Newbold (1976) also suggests to transform variable if the forecast function of the variable increases.

The Table 2 shows the descriptive analysis of the logged form of the variables. LGDP is moderately skewed with a kurtosis of less than three, indicating a platykurtic distribution with low height and fewer extreme values. LREM displays near-normal distribution with skewness of 0.07 and kurtosis of 1.52. LBOP, though showing a close mean and median suggesting normality, is highly skewed and leptokurtic, indicating an unstable pattern and presence of extreme values. LPCO shows skewness close to 0 and kurtosis within the ideal range, indicating a normal distribution. LPIN also follows a normal distribution with skewness of -0.04 and kurtosis of 1.76.

Table 2

Descriptive analysis of variables in logged form

	LGDP	LREM	LBOP	LPCO	LPIN
Mean	10.71	7.27	10.00	10.04	8.31
Median	10.53	6.74	10.15	10.12	8.35
Maximum	12.44	11.52	10.89	12.88	11.55
Minimum	9.48	3.02	0.00	7.22	5.15
Std. Dev.	0.96	2.93	1.48	1.78	2.05
Skewness	0.60	0.07	-6.56	-0.05	-0.04
Kurtosis	2.03	1.52	44.71	1.79	1.76
Jarque-Bera	4.75	4.44	3822.61	2.95	3.10
Probability	0.09	0.11	0.00	0.23	0.21
Observations	48	48	48	48	48

Source: EViews 12 Student version lite

The distribution of the data is further supported by the Jarque-Bera test, where LGDP (0.09), LREM (0.11), LPCO (0.23), and LPIN (0.21) show probabilities greater than 0.05, confirming normality. However, LBOP with a value of 0.00 does not meet the normality threshold. Despite this, Razali and Yap (2011) noted that non-normality does not invalidate meaningful insights from data, especially when sample size influences test outcomes.

Statistical Tests

Multiple Breakpoint Test

A structural break is an abrupt rise or decrease in an economic time series that can be caused by a number of factors, including changes in the regime, the direction of policy, and outside shocks (Chow, 1960). The data pattern of GDP shows abnormal rise in some point of time so to disclose the exact date on which the structural break occurs this test is conducted.

Table 3

Multiple breakpoint test of the variables

Sequential F-statistic determined breaks:			1
Break Test	F-Statistics	Scaled F	Critical Value**
0 vs. 1 *	1552.501	7762.503	18.230
1 vs. 2	3.671	18.356	19.910
Break Dates	Sequential	Repartition	
1	2010	2010	

Source:EViews 12 Student version lite

In the Table 3 sequential F-statistics test evaluated the presence of structural break in the model. In the break test of 0 vs 1 the F-statistics is 1552.501 and the scaled F statistics is 7762.503 which exceeds the critical value of 18.230 rejecting the null hypothesis of no break to ensure that there is at least one break.

Similarly in 1 vs 2 with the F-statistics is 3.671 and the scaled F-statistics of 18.356 which is lower than the critical value of 19.910 we accept the null hypothesis of no second break. This provides us with 1 break date as indicated which is 2010.

Chow Break Point Test

In order to assess whether the regression coefficients vary significantly across two groups or time periods, the Chow test is commonly used as a formal statistical procedure (Chow, 1960). Accordingly, the table provide us the result of Chow Break Point Test where the year 2010 is considered to signify the break.

Table 4

Chow breakpoint test

F-statistic	1482.389	Prob. F(5,38)	0.000
Log likelihood ratio	253.362	Prob. Chi-Square(5)	0.000
Wald Statistic	7411.943	Prob. Chi-Square(5)	0.000

Source:EViews 12 Student version lite

The Table 4, indicates that the probability of F-statistics with less than 0.05 level of significance leads us to reject null hypothesis concluding there is presence of break in the model. The probability value of log likelihood ratio and Wald Statistics at 0.000 also leads us to reject the null hypothesis and insure there is significant event of break.

Creating a dummy variable

As mentioned earlier to adjust and account the structural break a dummy variable is created which contains value 0 for the period ahead of the break point year and value 1 for the years from the breakpoint.

Finding the Unit root of the variables

As mentioned earlier to test the variables with unit root, we first test them using Augumented Dickey-Fuller(ADF) test proposed by (Dickey & Fuller, 1979) and Break Point unit root test.

Augmented Dickey Fuller test

Table 5

ADF unit root test

Variables	Level		First Difference		Remarks
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	
LGDP	0.976	0.608	0.000	0.000	I(1)
LREM	0.922	0.568	0.000	0.000	I(1)
LBOP	0.000	0.001	---	---	I(0)
LPCO	0.952	0.390	0.003	0.015	I(1)
LPIN	0.948	0.188	0.000	0.000	I(1)

Source:EViews 12 Student version lite

The Table 5 shows, LBOP p-value in level under intercept and intercept and trend is less than 0.05 level of significance so we reject the null hypothesis of variable having unit root and accept the variable is stationary. With the first difference all the remaining variables p-value is less than 0.05 level of significance so we reject the null hypothesis and accept that variables are not present with unit root under the first difference. The ADF test provides us with the level of differentiation of variables as I(0) and I(1).

Break point Unit Root Test

Table 6

Breakpoint unit root test

Variables	Level				First Difference			
	Inter-cept	Trend and Intercept			Inter-cept	Trend and Intercept		
	I	I	T and I	T	I	I	T and I	T
LGDP	0.693	0.010	0.010	0.685	0.010	0.010	0.010	0.010
LREM	0.908	0.010	0.011	0.812	0.010	0.010	0.010	0.010
LBOP	0.010	0.010	0.026	0.010	---	---	---	---
LPCO	0.990	0.667	0.379	0.390	0.010	0.010	0.010	0.010
LPIN	0.990	0.052	0.219	0.430	0.010	0.010	0.010	0.010

Source:EViews 12 Student version lite

As the Table 6 shows, LBOP p-value is less than 0.05 level of significance in level under all the parameter of Intercept and Trend and Intercept due to which we reject the null hypothesis of variable having a unit root and conclude LBOP is stationary at level. Similarly other variables p-value is less that 0.05 level of significance in the first difference under all the Intercept and Trend and Intercept parameter so we reject the null hypothesis and accept the remaining

variables are stationary at first difference. So break point unit root test concluded us with the similar result as ADF with variables having mixed order of integration at I(0) and I(1). Here "I" represents Intercept only "T and I" represents Trend and Intercept and "T" represents Trend only.

Determination of the lag structure of the variables

Table 7

Lag determination of the model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-62.585	NA	0.000	3.118	3.361	3.208
1	191.334	427.045	0.000	-6.788	-5.084*	-6.156
2	232.636	58.199	0.000	-7.029	-3.866	-5.856
3	282.328	56.468	0.000	-7.651	-3.029	-5.937
4	357.104	64.579*	8.25e-12*	-9.413*	-3.331	-7.158*

Source:EViews 12 Student version lite

Here in the Table 7,

LR	:	Sequential modified LR test statistic(each test at 5% level)
FPE	:	Final Prediction Error
AIC	:	Akaike Information Criterion
SC	:	Schwarz Information Criterion
HQ	:	Hannan-Quinn Information Criterion

The above table shows AIC, LR and HQ showing 4 lag length as appropriate as well as SIC showing 1 lag length. So based on the AIC we choose four lag for the model which is also the substantial criteria suggested by other criterion in majority (Neupane, 2023).

ARDL model

As the data set contains variables with integrated level of I(0) and I(1), we are bound to choose the ARDL function. The ARDL model is constructed on the basis of equation (iv). It is based on the AIC model selection method and dynamic regressors are LREM LBOP LPCO LPIN DUM where as fixed regressor is C. The model is based on four lags for the dependent variable and four for the independent as well as suggested by the lag length criteria. So the model is free to carry out its result which is based as ARDL(4, 4, 3, 4, 1, 4).

Long run form and Bound Test

To check weather the variables under the ARDL model are co-integrated in the long run or not Long run form and bound test is performed.

Table 8

Bound test f-statistics

Test Statistics	Value	Significance	I(0)	I(1)
F-Statistics	7.863	10%	2.750	3.790
		5%	3.120	4.250
		2.50%	3.490	4.670
		1%	3.930	5.230

Source: EViews 12 Student version lite

In the Table 8 the result of Bound test is presented. As the F-statistics value of 7.863 is higher than the value in the upper bound that is I(1) at the 5% level of significance we reject the null hypothesis of no relationship and conclude that there exists cointegration among the variables.

Table 9

Bound test long run coefficient of the variables

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LREM	-0.155	0.073	-2.130	0.048
LBOP	0.270	0.213	1.272	0.221
LPCO	0.060	0.127	0.470	0.645
LPIN	0.006	0.041	0.134	0.895
DUM	0.868	0.049	17.782	0.000

Source:EViews 12 Student version lite

Long Run Result

From the Table 9 which shows Bound test long run coefficient following result is extracted and interpreted. In the long run, remittance has a significant negative relationship with GDP, where a one percent increase in remittance leads to a 0.155 percent decrease in GDP. BOP, PCO, and PIN all exhibit positive relationships with GDP, with coefficients of 0.270, 0.060, and 0.006 respectively, but these relationships are not statistically significant. Conversely, the dummy variable (DUM) shows a significant positive relationship with GDP, indicating that a major policy or political change has increased GDP by 138.26 percent in the long run.

Results of Error Correction Model

Table 10

Error correction model of the variables

Variable	Coefficient	Std. Error	t-statistics	Prob.
C	3.957	0.499	7.926	0.000
@TREND	0.041	0.005	7.798	0.000
D(LGDP(-1))	-0.397	0.105	-3.769	0.002
D(LGDP(-2))	-0.313	0.101	-3.087	0.007
D(LGDP(-3))	-0.146	0.095	-1.541	0.142
D(LREM)	-0.043	0.008	-5.349	0.000
D(LREM(-1))	0.045	0.011	4.100	0.001
D(LREM(-2))	0.041	0.011	3.575	0.002
D(LREM(-3))	0.019	0.010	2.038	0.058
D(LBOP)	-0.003	0.002	-1.157	0.263
D(LBOP(-1))	-0.154	0.022	-7.075	0.000
D(LBOP(-2))	-0.142	0.028	-5.153	0.000
D(LPCO)	0.202	0.046	4.390	0.000
D(LPCO(-1))	-0.124	0.057	-2.156	0.046
D(LPCO(-2))	-0.116	0.049	-2.372	0.030
D(LPCO(-3))	0.082	0.045	1.827	0.085
D(LPIN)	0.061	0.016	3.851	0.001
D(DUM)	0.929	0.017	55.185	0.000
D(DUM(-1))	0.466	0.096	4.849	0.000
D(DUM(-2))	0.379	0.097	3.901	0.001
D(DUM(-3))	0.187	0.093	2.024	0.059
CointEq(-1)*	-0.597	0.076	-7.814	0.000

Source: EViews 12 Student version lite

The Table 10, Error Correction Model of the variable shows the relationship of variables in the short run with the lagged value as well. There is also Error Correction Factor which shows what percentage of the deviation in the model is corrected while moving towards long term. The equation of the ECF is as below:

EC = LGDP - (-0.155*LREM + 0.270*LBOP + 0.06*LPCO + 0.006*LPIN + 0.868*DUM)

F-statistics with value 458.224 and its probability value of 0.000 shows the model in overall is significant. The above equation of the error correction shows how the model is corrected per unit time moving towards the long run equilibrium.

Short run result

CointEq(-1)* with a coefficient of -0.597 shows that deviations from long-run equilibrium are corrected at a speed of 59.72% annually. The constant term "C" with a coefficient of 3.957 and a significance level of 0.000 indicates the baseline logarithmic value of GDP when all other variables are zero in equilibrium. The trend variable "@Trend" suggests GDP increases by 4.10% per year. The lagged values of LGDP, D(LGDP(-1)) and D(LGDP(-2)), are negative and significant, reducing current GDP by 0.397% and 0.313% respectively, while the third lag is not significant. Remittance has a significant negative short-run impact on GDP by 0.043%, but the first and second lags have significant positive effects of 0.045% and 0.041% respectively; the third lag is not significant. BOP has a negative short-run impact through its lagged values, with first and second lags reducing GDP by 0.154% and 0.142%, while the immediate effect is not significant. PCO has a significant positive immediate effect on GDP, increasing it by 0.202%, but its first and second lags reduce GDP by 0.124% and 0.116% respectively; the third lag is insignificant. PIN significantly increases GDP by 0.061%. The dummy variable DUM shows a strong short-run impact on GDP: the current year's effect is 153.17%, while the first and second lags contribute 59.36% and 46.14%, respectively; the third lag is not significant.

Serial Correlation Test

Table 11

Correlation test

F-statistic	0.906	Prob. F(4,13)	0.488

Source: EViews 12 Student version lite

Breusch-Godfrey serial correlation LM was carried out to find if there are any serially correlated residuals in the series. With the probability value greater than 0.05 we accept the null hypothesis that there is no serial correlation among the residuals.

Heteroscedasticity Test

Now Breusch-Pagan-Godfrey test is carried out to test whether the residuals are homoskedastic or heteroskedastic.

Table 12

Heteroskedasticity test

F-statistic	0.582	Prob. F(26,17)	0.896
Obs*R-squared	20.725	Prob. Chi-Square(26)	0.756
Scaled explained SS	3.720	Prob. Chi-Square(26)	1.000

Source: EViews 12 Student version lite

With the probability values of the F-statistics greater than 0.05 we accept the null hypothesis of the test as the residuals are homoskedasticity in nature. The probability value of Obs* R-squared and Scaled explained SS with more than 0.05 level of significance also suggests that the residuals are homoscedastic.

Normality Test

Table 13

Normality test

Skewness	Kurtosis	Jarque-Bera	Probability
0.083	3.405	0.352	0.839

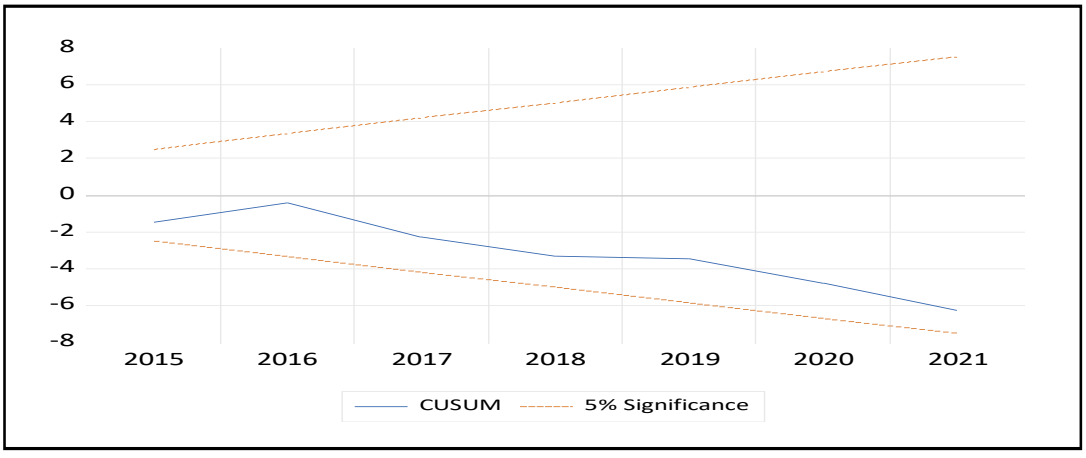
Source: EViews 12 Student version lite

The above Table 12 shows the result of normality test on the residuals. With the probability value of 0.839 greater than 0.05 level of significance we accept the null hypothesis that the residuals are normally distributed.

Stability Test CUSUM Test

Figure 2

CUSUM test



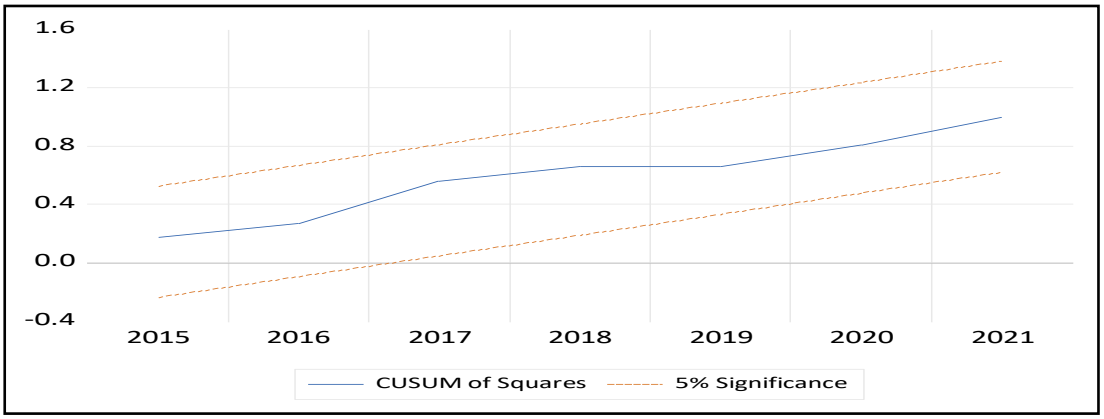
Source: EViews 12 Student version lite

The Figure 2 represents the CUSUM test which test the parameter stability of the model based on the recursive residuals from the model. Here X-axis represents the fiscal year and Y-axis represents the cumulative sum of recursive residuals. The CUSUM line inside the 5% level of significance suggests that the model is stable.

Stability Tests CUSUMsq Test

Figure 3

CUSUM of squares test



Source: EViews 12 Student version lite

The Figure 3 of the CUSUM of Square tests the variance stability of the model. The X-axis represents fiscal year and Y-axis represents the cumulative sum of squared recursive residuals. As it calculates the cumulative sum of the squares of recursive residuals the CUSUM of squares line inside the 5% level of significance suggests that the variance is stable of the model.

Major Findings

The descriptive analysis shows GDP, REM, PCO, and PIN were normally distributed in logged form, with GDP having a mean of 73105.35, REM at 19101.61, PCO at 76728.70, and PIN at 18910.29. BOP, with a mean of 27141.59, included a transformation adjustment due to a minimum value of -25525.91. The dataset consists of 240 observations, with 48 for each variable. Unit root tests (ADF and Break Point) showed LGDP, LREM, LPCO, and LPIN were stationary at first difference, while LBOP was stationary at level. Given the mixed order of integration, the ARDL model was employed, using four lags based on AIC. A structural break was identified in 2010 through the Multiple Break Point Test and Chow Test, and addressed with a dummy variable. The long-run analysis revealed a significant negative relationship between REM and GDP (-0.155%), while BOP, PCO, and PIN had positive but insignificant relationships. DUM had a significant positive long-run effect of 138.26% on GDP.

In the short run, the Error Correction Term (ECT) of -0.5972 indicates that 59.72% of disequilibrium is corrected annually. The constant term coefficient was 3.957, and the @trend variable suggested a 4.10% annual increase in GDP. Lagged values of GDP had significant

negative impacts (-0.397% and -0.313%), while REM showed a significant negative impact in the current year (-0.043%) and significant positive effects in the first and second lags (0.045% and 0.041%). BOP had significant negative effects in the first and second lags (-0.154% and -0.142%). PCO had a significant immediate positive effect (0.202%) and significant negative lagged effects (-0.124% and -0.116%). PIN had a significant positive effect (0.061%). DUM had significant positive effects in the current (153.17%), first (59.36%), and second (46.14%) years. Diagnostic tests showed no serial correlation or heteroskedasticity, and the model passed the CUSUM and CUSUM of Squares stability tests. Residuals were normally distributed with a p-value above 0.05.

DISCUSSION AND CONCLUSION

The results show that remittance has a significant negative impact on GDP in the long run indicating that a one percent increase in remittance reduces the GDP by about 0.155 percent. Remittance, in the short run shows the negative effect on GDP, while it's lagged values up to two years have positive impact on the economic growth. This indicates the delayed transmission through savings, human capital formation and indirect investment channels.

These findings contrast with the studies of Dutta and Saikia (2024); Islam (2022) and Saha (2021) representing the positive long-run growth effect of remittance but are consistent with evidence of mixed and country-specific outcomes of Chowdhury et al., (2023) and Cazachevici et al., (2020). From the theoretical perspective, the results are in contrast to the predictions of Endogenous Growth Theory, indicating the limited productive use of remittance in Nepal. Moreover, in consistent with the Dual Gap Model, where remittance facilities the short-term liquidity constraints without closing the savings–investment gap.

The balance of payments exhibits an insignificant long-run relationship with GDP but a significant negative effect in lagged periods, supporting Thirlwall's Law that external sector constraints can limit long-term growth. The private consumption shows an insignificant positive contemporaneous effect but a negative lagged impact, suggesting that consumption-led growth without productivity enhancement may weaken long-run performance, consistent with Keynesian insights in the short run.

The private investment shows the positive but insignificant relationship with GDP in the long run where as significant positive relation in the short run in line with neoclassical growth theories emphasizing capital accumulation subject to diminishing returns.

Moreover, the GDP shows the significant negative relationship with its own lagged values, reflecting adjustment dynamics, while structural change contributes positively to the growth in both the short and long run. The error correction term indicates that about 59.7 percent of deviations from long-run equilibrium are corrected annually, alongside an average annual GDP growth of 4.08 percent.

Therefore, the findings suggest that though the remittances provide short-term support and delayed growth benefits, their long-run impact on Nepal's economic growth remains unfavorable due to weak productive absorption and external sector pressures. As such, the policy efforts should therefore focus on the channeling remittance inflows toward the productive investment, human capital development and export-oriented activities to enhance their growth contribution for the long-term sustainability.

IMPLICATIONS

The remittance inflows have been considered as an important contributing factor to the economy of Nepal. The results indicated the long-run and negative effect on the economic growth, which shows that the current pattern of the utilization of the remittance is limited only to the household consumption and may not be supportive to the sustainable economic growth of Nepal. Therefore, in order to encourage and channelize the productive use of the remittance and attain the long-term economic growth, there is the necessity of designing the effective policies. Strategies such as generating the manageable investment opportunities for remittance receiving households. Moreover, infrastructural and institutional support in the agriculture, manufacturing, health and education sectors which have the higher growth possibilities, also helps in the proper and productive utilization of the remittances. The important role of structural changes, as indicated by the 2010 break, also highlights on the importance of macroeconomic stability. Moreover, sustainable economic growth requires not only receiving the high volume of remittance more effectively but also ensuring the social and economic wellbeing as well.

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