

# Impact of Trade, Remittance and BOP on the Economic Growth of Nepal. An Autoregressive Distributed Lagged (ARDL) Bound Testing Model

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## ABSTRACT

*This article explores the impact of trade openness, remittance, and BOP on the real GDP in Nepal. This research uses the ARDL Bound Testing model, considering the secondary data collected from the Ministry of Finance, which ranges from 1990 to 2022. This research aims to identify the impact of the external sector on the country's economic growth. The result establishes that BOP has adverse short and long-term effects on the country's economic growth, which indicates the variable's sensitivity. The trade openness rate also has a negative impact; however, remittance positively affects the long run. Hence, the government of Nepal should focus more on rationalising the remittance for the country's economic growth. However, on the other hand, working on trade policy should be a broad discussion to mitigate the negative impact on the country's economic growth.*

**Keywords:** Real GDP, Remittance, Import, Export, BOP and ARDL model

## 1. Introduction

Economic growth remains the top priority of every country. Developing and least developing countries are especially interested in promoting the development and well-being of their citizens. These countries widen their economic activities to achieve these goals by introducing and enacting numerous policies within and beyond the border. Lowering tariffs is one of the key policy initiatives they started (IMF, 2001). Economic growth, hence, is linked with the concept of trade openness of every country and is leveraging it with liberalisation and privatisation,

which started at the beginning of the 1990s. These policy shifts breed the flow of goods, capital and human resources within and between the countries.

Nepal started its journey of globalisation in the 1990s. Then, the country harmonised its economic development priorities with the external sector. In this course, Nepal began working with the International Monetary Fund (IMF), the United Nations Conference of Trade and Development (UNCTAD), and the World Trade Organization (WTO). It started lowering tariffs, developing institutional capacity, and policy harmonisation, among other things. Further, the country experienced the expansion of economic activities when they signed bilateral and multilateral trade agreements.

Different research has considered several factors that affect the country's growth, such as trade, remittance, exchange, and foreign aid. Panta et al. (2022) explain the impact of import-led growth on the short-term economy. However, growth-led imports have long-term effects on the Nepalese economy. Furthermore, they concluded without evidence that foreign trade supports the country's economic growth. Another study indicates that Nepal's imports significantly impact economic growth (Bhandari, 2024). Even a survey about the impact of financial development in Nepal shows a positive effect on the growth of the Nepalese economy (Paudel and Acharya, 2020). Mishra and Aithal (2021) established that trade positively impacts economic growth. Nepal has practised an open economy for around 35 years. Few studies have conducted; however, the effect on economic growth has not been evaluated due to the lack of representative external variables. This research addresses the gap and analyses external sectors' impact on the Nepalese economy's growth.

This research aims to identify how the external sector plays a role in Nepal's economic growth. Further, this paper explores how the selected variables perform in the long and short term in the Nepalese economy.

## **Literature Review**

Monamodi (2024) analysed the impact of South Africa's current account balance on its economic growth from 2015 to 2022 in quarterly data considering the variables – current account balance/deficit, real effective interest rate, real interest rate, trade openness and financial openness. This research employed the ADL model and concluded that the country's current account deficit impacted its long-term and short-term economic growth.

Mawutor et al. (2023) studied the Ghanaian economy using secondary data from 1980 to 2018, considering the variables gross domestic product, foreign direct investment, real exchange rate, remittance, import and gross capital formation. Using the ARDL model in their research, they concluded that foreign direct investment, import, and gross capital formation are important variables for the country's economic growth. Furthermore, remittance positively and significantly affects economic growth

in the short and long run. Likewise, foreign direct investment, real exchange rate, and imports negatively and significantly affect the growth process in both the short and long run.

Bucevska (2022) considered Southeast European countries and aimed to evaluate the relevance of remittance for economic growth. This research included six countries in the sample, and quarterly data was used from 2008 to 2020 using panel regression with the fixed effect model. The author concludes that remittance has a significant positive impact on the country's economic growth.

Usman (2023) investigated to identify the nexus between economic growth, trade openness, remittances, exchange rate and agricultural output in E7 countries. This study covers the period from 1990 to 2020 using frequency domain analysis. The authors concluded that the undervalued exchange rate motivates economic growth through remittance. Further, he concluded that there is bi-directional and unidirectional causality between economic growth and remittances.

Lawal et al. (2022) analysed the impact of external sectors (exchange rate, remittances, trade, and agricultural output) using the frequency domain causality test in 10 African selected countries. They used the frequency-domain-panel-causality test and concluded a bi-directional causality exists between economic growth and exchange rate and trade. Furthermore, the result stated that no significant relationship exists between economic growth, remittance, and agriculture, emphasising the relevance of devalued exchange rates in economic growth.

Carrasco and Tovar-García (2020) assessed 191 developing countries and, using the dynamic panel data model, concluded that export composition and diversification are insignificant in the economic growth of these countries. On the contrary, importing high-tech and capital goods positively impacts the countries' economic growth. This improves the country's export capacity as it boosts domestic production later.

This study analysed the impact of trade openness on the economic growth of the 19 Asian countries using the secondary data ranges from 1985 to 2017 using the fully modified ordinary least square (FMOLS) and dynamic ordinary least square (DOLS) models. They concluded that trade openness and economic growth have bi-directional causality in Western Asia and unidirectional causality in South Asia.

Hye et al. (2016) aimed to measure the impact of trade openness on economic growth in Africa using pooled ordinary least squares, fixed effects, and the system-generalised methods of moment estimation approaches. The data from 2000 to 2018 from 52 African countries suggest that imports hinder growth; however, exports boost Africa's growth. They indicated that export expansion should be a strategy for countries to promote growth..

Daly and Abdouli (2023) explored the relationship between CO2 emission, trade and economic growth using the VAR model to the impulse response function for Saudi

Arabia. This paper analysed the secondary data from 1990 to 2017 and concluded that trade openness promotes economic growth, which later reduces international trade.

Kong et al. (2020) examined the relationship between trade openness and economic growth using the ARDL model. This paper considers the data from 1994 to 2018 and concludes that trade openness can significantly impact the quality of economic growth in both the short and long term.

Blavasciunaite et al. (2020) aim to investigate the impact of the trade balance on economic growth. This research used 28 countries' panel data analysed using the OSL method of multivariate regression analysis. They conclude that economic growth has a negative effect on the trade balance.

Bastola and Sapkota (2015) studied the causality between trade and economic growth in Nepal using export and import as independent variables. They employed the ARDL approach and the Trivariate Johansen approach, which consistently shows that both in the long- and short-term support for export-led growth, imports negatively impact GDP.

Ghimire et al. (2020) implemented multiple linear regression to estimate how the macroeconomic variables determine the economic growth of a country. They considered the six Asian countries and concluded that Nepal has a positive impact on imports but a negative impact on the exchange rate with the US. On the other hand, exports, FDI and inflation do not have any statistical relationship with economic growth.

The literature does not identify a specific model that evaluates the impact of the external sector on the economic growth of the country. There are differences in selecting empirical constructs representing the developing countries to explain the implications for economic growth. This paper selected remittance, trade openness (which represents the import and export) and BOP to be more representative. The paper uses the ARDL model to establish the long- and short-term relationships between the selected variables.

## **Methodology**

### **Model Specification**

This research considered GDP at a constant price (rgdp) as a dependent variable. The trade openness rate (topenr) is proxied by adding the exports and imports and divided by the real GDP; remittance (rem) and balance of payment (bop) are the independent variables. The trade openness rate is in percentage, and other variables are measured Rs in ten million. These data collected from the Ministry of Finance, Nepal website. The period ranges from 1990/91 to 2022/23 . These variables represent the following mathematical representation.

$$\text{rgdp} = f(\text{topenr}, \text{bop and rem}) \dots\dots\dots (1)$$

### ARDL Model to Bound Test

This model evaluates the following equation based on the lag length selection for this model (Elhassan & Braima, 2020).

$$\Delta(\text{RGDP}_t) = \beta_0 + \sum_{i=1}^m \beta_{1i} \Delta(\text{RGDP}_{t-i}) + \sum_{i=1}^m \beta_{2i} \Delta(\text{TOPENR}_{t-i}) + \sum_{i=1}^n \beta_{3i} \Delta(\text{BOPT}_{t-i}) + \sum_{i=1}^m \beta_{4i} \Delta(\text{REMT}_{t-i}) + \beta_5 \text{RGDP}_{t-1} + \beta_6 \text{TOPENR}_{t-1} + \beta_7 \text{BOP}_{t-1} + \beta_8 \text{REMT}_{t-1} + u_t \quad \dots\dots(2)$$

### ECM Estimation Model

When we get a long-term association between variables, the error correction model (ECM) is applied to identify the short-term relationship between the variables.

$$\Delta(\text{RGDP}_t) = \beta_0 + \sum_{i=1}^m \beta_{1i} \Delta(\text{RGDP}_{t-i}) + \sum_{i=1}^m \beta_{2i} \Delta(\text{TOPENR}_{t-i}) + \sum_{i=1}^n \beta_{3i} \Delta(\text{BOPT}_{t-i}) + \sum_{i=1}^m \beta_{4i} \Delta(\text{REMT}_{t-i}) + \beta_5 \text{ECT}_{t-1} + u_t \quad \dots\dots\dots(3)$$

Interpretation of the ECM depends on the value and sign of the ECM coefficient. The expected sign of the ECM coefficient is negative, with a statistically significant value between 0 and 1. The ECM shows how quickly variables converge to equilibrium. If the value lies beyond the range, the model is out of equilibrium. This model starts with a unit root test of the given data.

### Unit Root Test

This research paper has adopted AIC criteria as a default selection using the EViews 12 applied to all four variables in this research work. This test's null hypothesis(H0) is there is no stationarity, and the alternative hypothesis (H1) is there is stationary. The ARDL bound test expects not to have unit root rest in the first difference.

### Diagnostic Check

In this paper, the ARDL bound test conducts three diagnostic tests to determine whether the data are normally distributed, whether a serial correlation or homoskedasticity exists.

Normality Histogram Test run with Null Hypothesis (H0), which is that the data is normally distributed, and Alternative Hypothesis (H1), which is that the data is normally not distributed.

Furthermore, the Serial Correlation LM Test evaluates the Null Hypothesis (H0) that there is no serial correlation with the Alternative Hypothesis (H1) there is a serial correlation.

Likewise, the Heteroskedasticity Test estimated the Null Hypothesis (H0) as the error term with homoskedasticity and the Alternative Hypothesis (H1) as the error term with heteroskedasticity.

This research depends on the p-value of the outcome. If the test p-value is greater than the significant level (0.05), the null hypothesis is accepted; otherwise, it rejects H0.

### Stability Analysis

Two model stability tests are used, i.e., Cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests. CUSUM and CUSUMSQ check the stability of short-run and long-run coefficients in the ARDL.

The null hypothesis of these stability tests is that all the coefficients in the given regression are stable. If the plots of CUSUM and CUSUMSQ statistics stay within the critical bounds, it is significant at 5%, and the researcher will accept the null hypothesis.

**Results and Discussion**

**Unit Root Test**

The unit root test of every variable at the level shows that their p-value is more than 5%. It indicates that the null hypothesis is accepted. With the 1st difference, the p-value of each variable is less than 5% (at trend and intercept), indicating that the given data series are stationary (McLeod et al., 2012). The summary of the result is in table 1.

**Table 1: ADF Unit Root Test**

<b>Augmented Dickey-Fuller Unit Root Test</b>						
Level						
	t-Stat	P-Val	t-Stat	P-Val	t-Stat	P-Val
	Intercept		Trend & Intercept		None	
<b>RGDP</b>	0.4851	0.9835	-1.7524	0.7038	2.0938	0.9897
<b>TOPENR</b>	-2.0472	0.2663	-3.3510	0.0763	0.9361	0.9028
<b>BOP</b>	-1.6944	0.4238	-2.0547	0.5489	-1.2387	0.1930
<b>REM</b>	4.6964	1.0000	0.4370	0.9986	7.1998	1.0000
1st difference						
	Intercept		Trend & Intercept		None	
<b>RGDP1</b>	-5.3555	0.0001	-5.5597	0.0004	-4.6760	0.0000
<b>TOPENR1</b>	-5.5769	0.0001	-5.4664	0.0006	-5.3016	0.0000
<b>BOP1</b>	-11.9300	0.0000	-11.6442	0.0000	-12.1721	0.0000
<b>REM1</b>	-0.8085	0.8022	-5.3284	0.0008	0.1849	0.7329

Source: Author's calculation using Eviews12, 2024. Note 1: variables ending with 1 (e.g. Rgdp1) indicate the first difference. 2. Lag length is Akaike Info Criterion (AIC)

selected as a default outcome.

### Bound Test

Table 2: Bound Test

F-Bounds Test				
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	80.71336	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.50%	3.15	4.08
		1%	3.65	4.66

Source: Author's estimation using Eviews12, 2024.

Table 2 is an outcome of the bound test, which indicates that the value of F-statistics is 80.7134 and lies above the upper bound, i.e. I (1). This rejects the null hypothesis that the variables have no long-run relationship. This test allows researchers to work through the ARDL model of the selected variables.

### Estimation of long-term coefficients

Table 2: ARDL Output

ARDL(1, 0, 1, 0) with AIC Lag Selection Method				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDP1(-1)	0.0780	0.0732	1.0665	0.2964
TOPENR1	-1712.9110	125.3777	-13.6620	0.0000
BOP1	-0.9314	0.1065	-8.7477	0.0000
BOP1(-1)	-0.1784	0.1285	-1.3886	0.1772
REM1	0.9666	0.2740	3.5282	0.0016
C	6675.0960	1537.7570	4.3408	0.0002
R-squared	0.8890	Mean dependent var		7426.4360
Adjusted R-square	0.8668	S.D. dependent var		17842.2600
S.E. of regression	6511.5620	Akaike info criterion		20.5725
Sum squared resid	1060000000.0000	Schwarz criterion		20.8501
Log likelihood	-312.8742	Hannan-Quinn criter.		20.6630
F-statistic	40.0485	Durbin-Watson stat		1.8779
Prob(F-statistic)	0.0000			

Source: Author's estimation using Eviews12, 2024.

Table 2 is an outcome of the ARDL model considering the AIC criterion. The p-value of 0.2964 of the RGDP1 (-1) is statistically insignificant in this model. This result implies that last year's growth has not impacted the lag of the current real GDP. Likewise, BOP is statistically significant to the current real GDP at 1% with a negative impact. This outcome suggests that a one-unit increase in BOP leads to a decrease in real GDP of 0.9314 units. However, the first lag of BOP is statistically insignificant in the model, implying that one lag of BOP does not affect the current real GDP. Furthermore, the TOPENR coefficient negatively impacts real GDP, which is significant at 1%. This result suggests that a one per cent increase in TOPENR leads to a decrease in real GDP of 1712.911 units.

Moreover, REM1 has a positive coefficient with a 1% significance level. This finding implies that a one-unit increase in remittance adds value to real GDP by 0.9666 units. The F-statistics of the model are significant at 1%. This result uncovers the model we considered best fits the selected variables.

**Error Correction Model (ECM)**

**Table 3: Error Correction Model**

ARDL Error Correction Regression				
Dependent Variable: D(RGDP1)				
Selected Model: ARDL(1, 0, 1, 0)				
ECM Regression -Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BOP1)	-0.9314	0.0613	-15.1949	0.0000
CointEq(-1)*	-0.9220	0.0426	-21.6365	0.0000
R-squared	0.9442	Mean dependent var		117.6552
Adjusted R-squared	0.9423	S.D. dependent var		25162.62
S.E. of regression	6045.8330	Akaike info criterion		20.31447
Sum squared resid	1060000000.0000	Schwarz criterion		20.40698
Log likelihood	-312.8742	Hannan-Quinn criter.		20.34462
Durbin-Watson stat	1.8779			

Source: Author's estimation using Eviews12, 2024.

Table 3 shows that the only bop is significant at 1%. The negative coefficient implies that one unit increase in bop leads to a decrease in real GDP by 0.9423 units in the short run.

The EC coefficient is negative with a value of 0.9220 and significant at 1%. This result indicates that the speed of adjustment to equilibrium following short-run shocks is about 92.2% of the disequilibrium caused by previous period shocks, which converges back to the long-run equilibrium in one period.

## Wald Test

The null hypothesis of the Wald test is there is no long-run relationship among the variables. This test also indicates that all these variables do not have a joint effect on the dependent variable. F-statistics are 40.0485 with a significant level at 1%. This outcome indicates that all the selected variables significantly impact dependent variables in the long run.

**Table 4: Wald Test**

Wald Test Result			
Test Statistic	Value	df	Probability
F-statistic	40.0485	(5, 25)	0.0000
Chi-square	200.2426	5	0.0000
<b>Null Hypothesis: C(1) = C(2)=C(3)=C(4)=C(5)=0</b>			
Normalized Restriction	Value	Std. Err.	
C(1)	0.0780	0.0732	
C(2)	-1712.9110	125.3777	
C(3)	-0.9314	0.1065	
C(4)	-0.1784	0.1285	
C(5)	0.9666	0.2740	

Source: Author's estimation using Eviews12, 2024.

## Diagnostic Check

This histogram normality test result shows that the p-value is 0.9584, greater than the significance level (0.05). Hence, it implies the data are normally distributed.

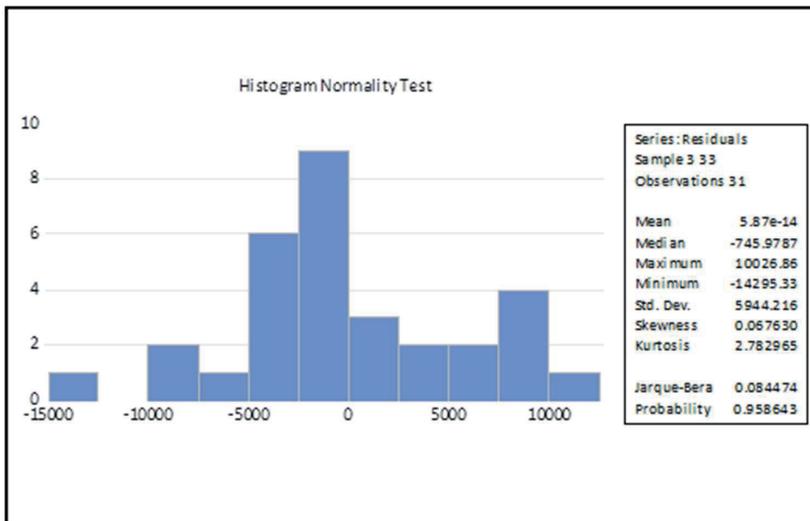


Figure 1: Histogram Normality Test

Source: Author's estimate using Eviews12

Table-5 shows the serial correlation test, i.e. Breusch-Godfrey Serial Correlation LM Test, with a p-value of 0.2011 greater than the significance level (0.05), indicating no serial correlation.

Similarly, the Breusch-Pagan-Godfrey Heteroskedasticity Test have a p-value of 0.8954, which is greater than the significant level ( $p=0.05$ ) and shows homoskedasticity with the given data.

**Table 5: Diagnostic Analysis**

Summary of Diagnostic Analysis		
Statistics	Estimated Value	Prob
Breusch-Godfrey Serial Correlation LM Test:	1.7210	0.2011
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.3212	0.8954

Source: Author's estimate using Eviews12

### Stability Analysis

The graphical representation of the CUSUM plots lies between the given bound, indicating the stability of the model function. However, the CUSUM sum of the square graph has crossed the lower bound line, indicating parameter instability in the selected data. Then, after reviewing the selected data pattern in the given period, in 2008/09 real GDP's base year has changed. This shift in based year could cause deviation from the given bound to the CUSUM sum of the square graph. These graphs are in the following Figures 2 and 3.

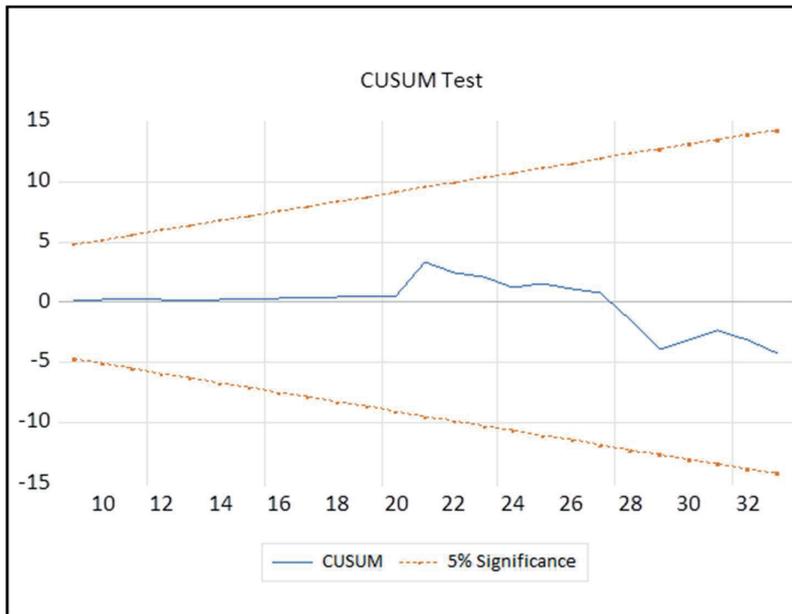


Figure 2: Plot of Cumulative Sum

Source: Author's estimate using Eviews12

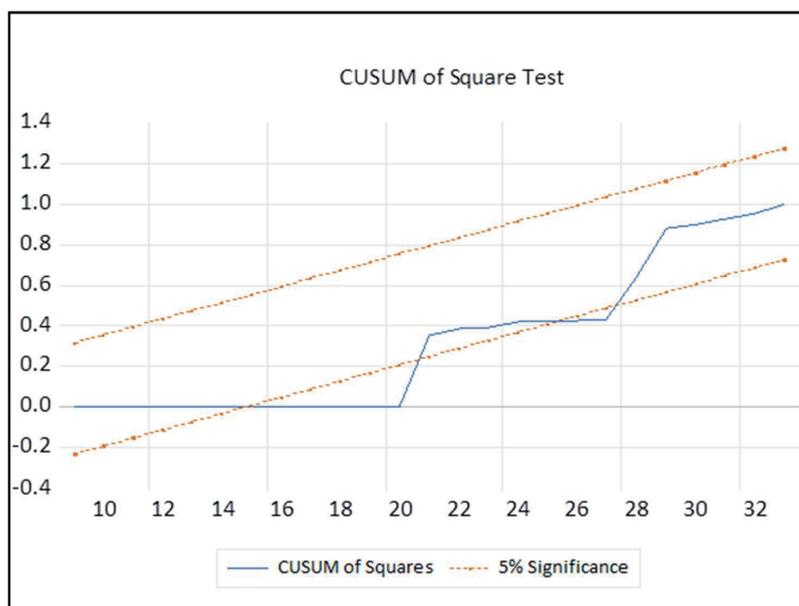


Figure 3: Cumulative Sum of Square

Source: Author's estimate using Eviews12

## Conclusion

In this research, I examined the impact of external sectors (trade openness rate, bop and remittance) on the economic growth of Nepal. I have used the data from the period between 1990 to 2022. The empirical result shows that all the selected variables are stationary at 1st difference, allowing us to use the ARDL model. BOP has long-term and short-term adverse impacts on Nepal's real GDP. The trade openness rate also negatively impacts the country's real GDP in the long run. However, remittance is the only variable that has a positive and significant impact on real GDP in Nepal in the long run. This outcome is similar to the results of Mawutor et al. (2023) and Bucevska (2022). However, this research has not observed the short-run impact of trade openness and remittance.

The ECM negative coefficient and statistically significant result imply that a shock in the Nepalese economy will adjust by 92% by the selected variables. It means the sensitivity of the Nepalese economy's remittance, bop, and trade openness rate. Statistically, the selected ECM model is significant, and all tests indicate the stability and robustness of the considered equation.

The findings underscore the need to manage Nepal's remittance, bop and trade openness carefully. Policies should aim to reduce the negative impacts of trade openness and BOP, while remittances should be channelised effectively for productive purposes. The statistically significant ECM coefficient suggests that the external sector significantly influences Nepal's economic stability. This result further indicates the need for strategic

interventions to enhance the resilience and sustainability of the government.

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