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Research Article

Modeling Foreign Exchange Reserves: A Study of Remittance, Trade Deficit, and Credit to the Private Sector in Nepal

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Abstract

The purpose of this research was to determine how Nepal's remittances, trade imbalance, and private sector loans affected the country's foreign currency reserve. The study's foundation is secondary data collected over a quarter of a century, from January 2000 to October 2025. From January 2000 through October 2025, the study makes use of Nepal's annual time-series data. This study uses foreign exchange reserve as its dependent variable and remittance, trade deficit, and private sector credit as its independent factors. Annual data is the type of secondary data that is utilized. Nepal Rastra Bank (NRB) publications and the Economic Survey provide the secondary data. Various statistical tools such as the unit root test, cointegration test, Granger causality test, and Vector Error Correction Model (VECM) are employed in the study. According to the research, the trade imbalance and remittance inflows are the two main factors that keep Nepal's external sector stable. Remittances are a key component in maintaining foreign exchange reserves in the face of a long-term and substantial trade deficit, as confirmed by the Johansen cointegration test and the Vector Error Correction Model (VECM). But in the near term, changes in domestic money and historical patterns in foreign currency reserves have a greater impact on the dynamics of external stability. In the near term, reserve depletion is accelerated by private sector lending, which drives up demand for imports. Additionally, the results of the Granger causality test show that the link is unidirectional, meaning that reserves and credit flows affect remittances and the trade deficit but not the other way around.

Keywords

External Sector Stability, Remittance, Trade Deficit, Private Sector Credit, Foreign Exchange Reserve

1. Introduction

To a considerable extent, the stability of Nepal's external sector depends on the movement of the country's foreign exchange reserves, which both protect the economy from macroeconomic shocks and keep the rupee pegged to the Nepalese currency. Nepal has a tiny and concentrated export base, which causes its trade deficit to persist and expand, and the country is landlocked and developing, so it must rely on imports for necessities like food, fuel, and machinery. Foreign currency outflows are continuously pressured by this fundamental mismatch. Contrarily, remittances from migrant workers have become a stabilizing factor, helping to finance the

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trade deficit, increase household consumption, alleviate poverty, and facilitate small-scale investments. Credit to the private sector has a double-edged impact on reserve levels in Nepal's import-driven economy. On one hand, it can boost economic activity, exports, and import substitution. On the other hand, it mostly fuels consumption of foreign goods, which increases demand for foreign currency and could lead to a decline in reserves. In order to craft policies that guarantee external resilience without sacrificing economic prospects, it is crucial to understand the interplay between remittance inflows, trade imbalance, and private sector lending and how these impact foreign exchange reserves.

The effect of macroeconomic variables on Indonesia's foreign exchange reserves was investigated by Nabilah et al [8]. The stability of macroeconomic variables has an inherent relationship with the accumulation of foreign currency reserves. Foreign exchange reserves are negatively impacted by imports, inflation, and the exchange rate, according to the research findings. When these three variables continue to rise, foreign exchange reserves will fall. Exchange rates are positively impacted by changes in the money supply. Because it faithfully follows classical principles, the OLS approach produces BLUE regression. Based on the findings, the government should implement an expansionary fiscal policy that boosts spending, encourages exports, and keeps the value of the rupiah relative to the dollar stable. Increases in foreign exchange reserves are conditional on domestic economic stability. The effect of inflation, FDI, exchange rates, economic growth, exports, and other variables on the quantity of foreign exchange reserves in ASEAN-5 nations from 2000 to 2022 was examined by Pebriyanti and Khoirudin [12]. Foreign exchange reserves of the ASEAN-5 nations are significantly impacted negatively by inflation, FDI, exchange rate, and economic growth, according to the data processing results. The opposite is true for the independent variable Exports, which shows a strong positive correlation with Foreign Exchange Reserves among the ASEAN-5 countries. Between 2000 and 2019, the variables impacting the foreign exchange reserves of nineteen Sub-Saharan African nations were examined by Thabana and Fasanya [14]. According to the data, trade openness, wide money relative to GDP, the CPI, and the exchange rate are the main factors that determine foreign exchange reserves in Sub-Saharan Africa. Surprisingly, we find that short-term influences on reserves are from regulatory quality and control of corruption, while long-term influences come from institutional factors like political stability, lack of terrorism, government effectiveness, voice and accountability. Based on these results, policymakers need to keep a close eye on institutional factors and other macroeconomic occurrences.

Within the context of Pakistan's economic problems, Ullah et al [15] examined the association among foreign exchange rates, exports, inflation, external debt, and foreign currency reserves. Information was gathered between the years 1999 and 2022. According to the findings, there is a negative relationship between FX reserves and the FX rate. A negative correlation between foreign currency reserves and external debt is shown by both the standard cointegrating regression model and the fully modified ordinary least squares model. On the other hand, a positive association between foreign exchange reserves and external debt is revealed by the dynamic ordinary least squares model. According to the findings, there is a positive relationship between exports and foreign exchange reserves. According to the results, foreign exchange reserves tend to fall as domestic inflation rates rise. Foreign currency reserves and the other independent variables are cointegrated, according to the Johansen cointegration results, which show two vectors at the 5% significance level. The complexity of these linkages is shown by the variances shown by different models, which emphasizes the need for comprehensive policy responses. Constantly keeping an eye on key indicators and being prepared to adjust policies as needed are essential responsibilities of the government. To keep up with the changing economic landscape, it may be necessary to regularly review debt management strategies, export promotion activities, and currency rate policies. Using data from 1981 to 2017, Gereziher and Nuru [4] analyzed the variables impacting Ethiopia's foreign currency reserve accumulation as an example of a country with a foreign exchange constrained economy. According to the ARDL model's results, the inflation rate and the exchange rate have a negative and significant impact on Ethiopia's foreign exchange reserve accumulation in the near future. There is a positive and substantial long-term relationship between the inflation rate and foreign currency reserves. Furthermore, foreign exchange reserves are positively affected by external debt over the long run. Both the short- and long-term effects of the exchange rate on foreign exchange reserves are negative.

Using a generalized linear model (OLS) regression to examine the impact of a number of macroeconomic variables on foreign exchange reserves, Naima et al [9] considers exports, imports, GDP growth, trade balance, remittances, external debt, FDI, broad money, real interest rates, exchange rates, and trade openness. There is a positive relationship between reserves and variables like exports, imports, economic growth, remittances, foreign debt, FDI, and wide money, but a negative relationship between trade openness, real interest rates, and trade balance. The selected variables almost completely explain the variance in foreign exchange reserves, indicating that the model has a strong explanatory power with an R^2 value of 0.9877. Diagnostic tests validate the model's resilience when there is no indication of heteroscedasticity, multicollinearity, or autocorrelation. The results highlight the need of promoting exports, remittances, and foreign direct investment while keeping trade policies balanced. This will help Bangladesh consistently accumulate foreign exchange reserves, which will protect its economy from shocks and fluctuations. The impact of several macroeconomic factors on Nigeria's foreign exchange reserves was examined by Mohammad and Aruna [7]. Inflation had a negative but insignificant

impact on Nigeria's foreign reserves before democracy, according to the statistics. In contrast, the currency rate, oil exports, oil prices, and non-oil exports all had a favorable impact. During the democratic era, similar results were observed, with the oil price, interest rate, and exchange rate impacting Nigeria's foreign reserves. Both before and after democracy, the study shows that GDP, oil and non-oil exports, currency rate, and oil price fluctuations were the most important elements affecting Nigeria's foreign reserves. From 2004–2023, Ridwan [13] looked at the South Asian countries of Sri Lanka, Pakistan, Bangladesh, and India to see what factors affected their foreign currency reserves. The results of the Pooled Mean Group Autoregressive Distributed Lag model show that reserves are positively impacted by remittances and foreign direct investment (FDI) in the long run, and negatively impacted by GDP growth, real interest rates, and inflation. Although short-term volatility breaks the link between exchange rates and reserves, they share a stable long-run equilibrium. According to Dumitrescu-Hurlin causality tests, there is a one-way connection between foreign direct investment and reserves, and a two-way causality between reserves and remittances.

From 1960 to 2018, Jena and Sethi [6] examine the variables impacting Brazil's foreign currency reserves. To determine what factors affect Brazil's foreign exchange reserves, this study uses a secure auto-regressive distributed lag (ARDL) bounds testing methodology. There is a long-term relationship between the following variables: real interest rate, exchange rate, inflation, per capita GDP, debt-to-GDP ratio, domestic lending to the private sector as a percentage of GDP, and foreign exchange reserves. However, we find that the variables in question show short-run causation in just one direction. In their analysis of Azerbaijan and Turkey's total foreign exchange reserves, Jamalzade et al [5] pinpointed numerous elements that influence their sufficiency. Following the ideal reserve ratios recommended by the International Monetary Fund, the study determined whether or not the Central Banks of Azerbaijan and Turkey have sufficient gross foreign exchange reserves. After a thorough examination of theoretical and conceptual literature, this study aims to assess the sufficiency of the CBAR and CBRT's Gross Foreign Exchange Reserves. We use the proposed ideal reserve ratios to shed light on these countries' reserve sufficiency, all the while considering the theoretical association between the variables. To do this, we used logit regression analysis with data from 2012–2022. The results show that interest rates and the total sufficiency of foreign exchange reserves are positively and statistically significantly correlated. The effect of interest rates on monetary policy and corporate profitability makes this outcome predictable. In addition, there was a statistically significant negative impact of the exchange rate variable on the previous period.

Without addressing their interdependent dynamics within a unified analytical framework, existing research frequently handle these variables independently, concentrating on either the stabilizing role of remittances or the harmful effects of trade imbalances. Also, although it's common knowledge that private sector loans drive import-led consumption in Nepal's modest manufacturing economy, no one has looked at how these loans affect the country's foreign exchange reserves, either by driving up demand for foreign currency or by boosting export capacity in the long run. As a result, our knowledge of how these three important macroeconomic factors influence the development of Nepal's foreign reserves is severely lacking. Thus, this investigation has been carried out to provide credence to one side or the other. The purpose of this research is to examine how Nepal's remittances, trade imbalance, and private sector loans affect the country's foreign currency reserves.

2. Research Methodology

The study is based on secondary data which are gathered for the period of 25 years from 2000 January to 2025 October. The study uses annual time-series data of Nepal from 2000 January to 2025 October. The independent variables used in the study are remittance, trade deficit and private sector credit and dependent variable is foreign exchange reserve. The secondary data used are of annual in nature. The secondary data are collected from Economic Survey and reports published by Nepal Rastra Bank (NRB). Descriptive, correlation and regression methods unit root test, cointegration test, Vector Error Correction Model (VECM) and Granger causality test of analysis are used in the study.

For the data analysis purpose, the following time series analysis is made.

2.1. Stationarity Test

According to Nelson and Plosser [10], Chowdhury [1] there exists unit roots in most macroeconomic time series. While dealings with time series, it is necessary to analyze whether the series are stationary or not. Since regression of non-stationary series on other non-stationary series leads to what is known is spurious regression causing inconsistency of parameter estimate, Engle and Yoo [3]. The hypothesis behind it is that random shocks in economy have long lasting effects, Engle & Granger [2]. The Augmented Dickey–Fuller (ADF) test is the most common method for testing unit root. Suppose, we have a series Y_t for testing unit root. Then, ADF model tests unit root as follows:

$$\Delta y_t = \mu + \delta y_{t-1} + \sum_{i=1}^{k} \beta \Delta y_{t-i} + e_t$$

Where,

$\delta = \alpha - 1$

α = coefficient of y_{t-1}

Δy_t = first difference of y_t, i.e. $y_t - y_{t-1}$

The null hypothesis of ADF is $\delta = 0$ against the alternative hypothesis of $\delta = 0$. If we do not reject null, the series is non-stationary whereas rejection means the series is stationary.

2.2. Cointegration Test

Cointegration test is performed to identify the existence of a long-run relationship. According to Engle and Granger (1987), the stationarity of the residuals of the regression implies that the series are cointegrated.

$$Y_t = \beta X_t + \varepsilon_t$$

Where, both Yt and Xt are non-stationary variables and integrated of order 1 (i.e. $Y_t \sim I(1)$ and $X_t \sim I(1)$). In order for Y_t and X_t to be cointegrated, the necessary condition is that the estimated residuals from above equation should be stationary (i.e. $\varepsilon_t \sim I(0)$). The cointegration implies the existence of a long-run or equilibrium relationship among variables.

2.3. Vector Error Correction Model (VECM)

VECM is a limited VAR model designed to be used in non-stationary time series but has a cointegration relationship between variables. VECM is very useful because it can estimate the short-term effects between variables and the long-term effects of time series data. The general form of VECM (p) where p is the lag of endogenous variables with cointegration rank $r \leq k$ is as follows:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + D_t + e_t$$

Where,

Δ = operator differencing, where $\Delta y_t = y_t - y_{t-1}$,

y_{t-1} = vector variable endogenous with lag 1,

ε_t = kx1 vector residuals,

D_t = kx1 vector constant,

Π = matrix coefficient of cointegration ($\Pi = \alpha\beta^t$; α = vector adjustment, kxr matrix and β = matrix cointegration (long-run parameter) (k × r)).

Γ_i = kxk matrix coefficient the i^{th} variable endogenous.

2.4. Causality Test

If two variables Y and X is cointegrated, then there may exist any of the 3 relationships: a) X affects Y, b) Y affects X and c) X and Y affect each other. The first two show unidirectional relationship while the third shows bidirectional relationship. If two variables are not cointegrated, then one does not affect the other and are independent. To determine the pattern of such relationship, Granger has developed causality test method. If current and lagged values of X improve the prediction of the future value of Y, then it is said that X 'Granger causes' Y. The simple model of Granger causality is as follows:

$$\Delta y_t = \sum_{i=1}^{n} a_i \Delta y_{t-i} + \sum_{j=1}^{n} \beta_j \Delta X_{t-j} + u_{1t}$$

$$\Delta X_t = \sum_{i=1}^{n} \lambda_i \Delta X_{t-i} + \sum_{j=1}^{n} \beta\sigma_j \Delta Y_{t-j} + u_{2t}$$

The equations show that the current value of ΔY is related to the past values of itself and the past values of ΔY and ΔX is related to the past values of itself and that of ΔY. The null hypothesis in first equation is $\beta_j = 0$ which means, "ΔX does not Granger cause ΔY". Similarly, the null hypothesis in second equation is $\delta_j = 0$, and states "ΔY does not Granger cause ΔX." The rejection or non-rejection of the null hypothesis is based on the F-statistics.

3. Results and Discussions

3.1. Descriptive Analysis

The descriptive statistics of the variables foreign exchange reserve, remittance, trade deficit and private sector credit can be tabulated as in Table 1. All the amounts in the table are in millions.

Table 1. *Descriptive Statistics.*

Statistics	FOREXR	REM	TRDEF	PSC
Mean	654644.43	269863.30	-338149.98	1599388.40
Standard Deviation	519116.11	288530.09	379116.65	1611686.27
Minimum	103511.80	2361.10	-1770092.90	125930.30
Maximum	2041102.70	1445315.10	-3434.00	5227616.67
Count	276	276	276	276

3.2. Unit Root Test

It is not uncommon for the test statistics to reveal a statistically significant association between the regression model's variables while in fact no such relationship exists. "Spurious regression" describes this sort of data analysis, Patterson [11]. When working with time series data, false regression is a common occurrence. The main source of spurious regression is when the time series is not stationary. In order to work with time series, one must determine if they are stationary, Chowdhury [1]. The unit root test of Dickey-Fuller (ADF) test is used to assess if the time series is stable in order to solve the spurious regression problem.

Table 2. *Augmented Dickey-Fuller (ADF) test for foreign exchange reserve, remittance, trade deficit and private sector credit.*

Variables	Augmented Dickey–Fuller (Constant only)				
	Level		First Difference		Order of integration
	T-stat.	P-value	T–stat.	P-value	
lnFOREXR	0.3592	0.9809	-8.2380**	0.0000	I(1)
lnREM	-0.8580	0.8003	-4.6267**	0.0001	I(1)
lnTRDEF	-1.9139	0.3256	-3.7474**	0.0039	I(1)
lnPSC	-0.9094	0.7845	-17.8605**	0.0000	I(1)

Note(s): The sign ** and * indicates significant at 1 percent and 5 percent level of significance respectively.

The result indicates that natural logarithm of foreign exchange reserve has unit root (non-stationary) at level and stationary at first difference i.e. I(1). Similarly, natural logarithm of remittance has unit root (non-stationary) at level and stationary at first difference i.e. I(1). Likewise, trade deficit has unit root (non-stationary) at level and stationary at first difference i.e. I(1). Similarly, natural logarithm of private sector credit has unit root (non-stationary) at level and stationary at first difference i.e. I(1).

3.3. Co-Integration Test

After analyzing the stationary test, the co-integration analysis is used to investigate long-term relationship between foreign exchange reserve, remittance, trade deficit and private sector credit.

Table 3. *Johansen's Cointegration test for foreign exchange reserve, remittance, trade deficit and private sector credit.*

Hypothesis	Trace statistic	0.05 critical value	P value	Max-Eigen statistic	0.05 critical value	P value
At most 0	155.0555	47.8561	0.0000	95.0327	27.5843	0.0000
At most 1	60.0227	29.7970	0.0000	50.4922	21.1316	0.0000
At most 2	9.5304	15.4947	0.3186	9.4810	14.2646	0.2483
At most 3	0.0494	3.8414	0.8241	0.0494	3.8414	0.8241

Note(s): 1) Trend assumption: Linear deterministic trend(restricted). 2) Lags interval (in first differences): 1 to 1.

The Johansen cointegration test for foreign exchange reserves, remittance, trade deficit, and private sector credit indicates that there are two long-run equilibrium relationships among these four variables. Both the Trace and Max-Eigen statistics reject the null hypotheses of zero and one cointegrating relationship but fail to reject at two, confirming exactly two cointegrating vectors. This implies that, despite short-term fluctuations, these variables are interconnected and move together in the long run, reflecting stable long-term relationships in the Nepalese economy.

3.4. Vector Error Correlation Model (Vecm)

Having indicated the presence of cointegration among the variables, the relationship and impact of independent variables is examined using Vector Error Correction Model (VECM) in

the short-run and long-run model.

3.5. Long-Run Estimates on Foreign Exchange Reserves

Upon establishing the presence of cointegration among the variables, the relationship and impact of independent variables on foreign exchange reserves is examined using VECM. More specifically, the relationship and impact of independent variables on foreign exchange reserves is presented in Table 4.

Table 4. *Long-run estimates on foreign exchange reserves.*

Cointegrating eq:	**CointEq1**
$lnFOREXR_{(t-1)}$	1.0000
	-0.020203
$lnPSC_{(t-1)}$	(0.09566)
	[-0.21220]
	-2.114282
$lnREM_{(t-1)}$	(0.32219)
	[-6.56230]
	1.222751
$lnTRDEF_{(t-1)}$	(0.32070)
	[3.81277]
C	-2.399742

This result is based on time series data of 310 observations for the period from January 2000 to October 2025 by using Vector Error Correction Model (VECM). The dependent variable is FOREXR (Foreign exchange reserves) and the independent variables are PSC (Private sector credit), REM (Remittance), TRDEF (Trade deficit) and ln is natural logarithm.

Note(s): Standard errors in () and t-statistics in [].

The Vector Error Correction Model results indicate the existence of a stable long-run cointegrating relationship among foreign exchange reserves, private sector credit, remittance, and trade deficit, with the equation normalized on foreign exchange reserves. The estimates show that remittance and trade deficit are the key long-run determinants of foreign exchange reserves, while private sector credit does not have a statistically significant long-run effect. Remittance exhibits a strong and highly significant relationship, highlighting its crucial role in sustaining foreign exchange reserves in the long run, whereas the trade deficit is also statistically significant, indicating that external trade imbalances are closely linked to movements in reserves. In contrast, the coefficient of private sector credit is small and insignificant, suggesting that credit expansion does not meaningfully influence foreign exchange reserves over the long term.

3.6. Short-Term Estimates on Foreign Exchange Reserves

The Error Correction Model (ECM) has been carried out to examine the impact of remittance, trade deficit and private sector credit on foreign exchange reserves in the short-run. Table 5 presents the results of the parsimonious ECM test on foreign exchange reserves.

Table 5. *Short-term estimates on foreign exchange reserves.*

Cointegrating eq:	**CointEq1**
	-0.00604
CointEq1	(0.00263)
	[-2.30237]
	0.193208
$\Delta FOREXR_{(t-1)}$	(0.06150)
	[3.14147]
	-0.185738
$\Delta PSC_{(t-1)}$	(0.08865)
	[-2.09516]
	0.024785
$\Delta REM_{(t-1)}$	(0.01787)
	[1.38731]
	-0.025948
$\Delta TRDEF_{(t-1)}$	(0.01821)
	[-1.142515]
	0.011338
C	(0.00204)
	[5.54984]
Adjusted R-square	0.09114
S.E. equation	0.02514
Fstatistic	6.495448

This result is based on time series data of 310 observations for the period from January 2000 to October 2025 by using Vector Error Correction Model (VECM). The dependent variable is FOREXR (Foreign exchange reserves) and the independent variables are PSC (Private sector credit), REM (Remittance), TRDEF (Trade deficit) and ln is natural logarithm. Δ is first difference. ECTt-1 is error correction term at lag 1. The results demonstrate the short-term dynamics of VECM foreign cur-

rency reserves, illuminating the impact of changes in explanatory variables and departures from long-run equilibrium on these reserves. A negative and statistically significant coefficient (-0.00604, t = -2.30) for the error correction term (CointEq1) confirms the existence of a long-run causal relationship between foreign exchange reserves, private sector credit, remittances, and trade deficit. If the sign is negative, then any short-term imbalance in foreign exchange reserves will be repaired over time. In one period, around 0.6% of the shortfall from long-term equilibrium will be adjusted, suggesting a steady but sluggish adjustment. A considerable short-run persistence is indicated by the positive and highly significant effect of the lagged change in foreign exchange reserves ΔFOREXR(t-1) (0.1932, t = 3.14), which means that changes in reserves in the past have a large influence on changes in the present. The negative and statistically significant coefficient (-0.1857, t = -2.10) in the lagged change in private sector credit ΔPSC(t-1) suggests that, in the short run, foreign exchange reserves are reduced when there was an increase in credit expansion in the previous period. This could be because of increased demand for imports and outflows of foreign currency. While remittance inflows and trade deficit are crucial in the long run, they do not have an immediate short-term influence on foreign exchange reserves, as the coefficients of ΔREM(t-1) and ΔTRDEF(t-1) are not statistically significant. A positive and statistically significant constant term indicates that reserves have an underlying tendency to develop. Finally, a significant F-statistic (6.49) indicates that the model is statistically valid. However, an adjusted R-squared value of 0.091 indicates that factors other than those included in the model influence short-run movements in foreign exchange reserves.

3.7. Causality Test

After indicating the cointegration test, the study used the Granger Causality test to look for links between remittances, trade deficits, private sector loans, and foreign currency reserves. If one time-series variable's previous values can be used to forecast another variable, beyond what is already known from the first variable's past values, then the Granger causality test has been successful. To be more precise, Table 6 displays the Granger causality relationships among remittances, trade deficit, private sector loans, and foreign currency reserves.

Table 6. *Granger Causality analysis between remittance, trade deficit, private sector credit and foreign exchange reserves.*

Null Hypothesis	Observations	F-Statistic	Probability (p-value)	Causality
Private sector credit does not Granger Cause foreign exchange reserves	288	2.95967	0.0534	Yes but weak
foreign exchange reserves does not Granger Cause private sector credit	288	1.59746	0.2042	No
Remittance does not Granger Cause foreign exchange reserves	274	1.15730	0.3159	No
Foreign exchange reserves does not Granger Cause remittance	274	32.8494	2E-13	Yes
Trade deficit does not Granger Cause foreign exchange reserves	274	0.33212	0.7177	No
Foreign exchange reserves does not Granger Cause trade deficit	274	30.9948	8E-13	Yes
Remittance does not Granger Cause private sector credit	286	1.25284	0.2873	No
Private sector credit does not Granger Cause remittance	286	39.1166	1E-15	Yes
Trade deficit does not Granger Cause private sector credit	286	0.89825	0.4084	No
Private sector credit does not Granger Cause trade deficit	286	36.7468	7E-15	Yes
Trade deficit does not Granger Cause remittance	286	0.46410	0.6292	No
Remittance does not Granger Cause trade deficit	286	0.23600	0.7899	No

The findings of the paired Granger causality test show that there is more of a one-way than a two-way relationship between trade deficit, private sector credit, remittances, and foreign exchange reserves. At the 10% level of significance, the results suggest a weak relationship between private sector credit Granger and foreign exchange reserves (p = 0.053), but no such relationship in the other way around. This suggests that credit growth may slightly aid in predicting changes in reserves, but reserves have no effect on credit expansion. There is limited short-term predictive power for foreign exchange reserves from remittances and trade deficits because they do not Granger cause reserves. However, changes in reserves have a significant impact on future remittance inflows and trade balance dynamics because reserves strongly

Granger cause both remittances and trade deficits. Similar to how domestic credit conditions mostly determine external sector variables, private sector credit significantly Granger causes remittance and trade deficit but neither remittance nor trade deficit Granger causes private sector credit. Furthermore, there is no proof that remittances cause a rise or fall in the trade deficit. The results support the VECM findings that long-run relationships exist, but short-run causal interactions are asymmetric. Private sector credit and foreign exchange reserves are the driving variables in the system, while remittance and trade deficit are the responding variables.

4. Conclusion

The study found that remittance inflow and trade imbalance are the main pillars of Nepal's external sector stability. Foreign exchange reserve and remittance are determined to be stationary variables in the long run according to the Johansen cointegration test and the Vector Error Correction Model (VECM). Despite a massive trade deficit, remittances remain a vital source of foreign currency for Nepal. But domestic monetary circumstances and the trajectory of foreign exchange reserves are more important in the near run for determining the dynamics of external stability. There will be a temporary spike in demand for imports, spurred on by private sector borrowing, which will lead to a drain on foreign exchange reserves. Reserves and credit flow impact remittance and trade deficit, according to the Granger causality conclusion, which shows a unidirectional flow.

Abbreviations

ADF	Augmented Dickey–Fuller
ARDL	Autoregressive Distributed Lag
ECM	Error Correction Model
FDI	Foreign Direct Investment
FOREXR	Foreign Exchange Reserves
GDP	Gross Domestic Product
NRB	Nepal Rastra Bank
OLS	Ordinary Least Squares
PSC	Private Sector Credit
REM	Remittance
TRDEF	Trade Deficit
VAR	Vector Auto Regression
VECM	Vector Error Correction Model

Author Contributions

Sumit Pradhan: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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