The Journal of Economic Concerns | Volume 16, Number 1-2, 2025
ISSN Print : 2091-0541 | ISSN Online : 2705-4802 | Published by NECS, NEPAL
 DOI: https://doi.org/10.3126/tjec.v16i1-2.90179

Macroeconomic Determinants of Foreign Trade in Nepal

Deepesh Lekhak[1], Sushma Shrestha[2]

Abstract

Nepal faces persistent challenges in its foreign trade, including weak infrastructures, limited productive capacity, and heavy reliance on imported raw materials. These challenges constrain export competitiveness and growth. Remittance inflows in Nepal have been increasing steadily each year. However, a significant portion of these inflows is primarily spent on consumption and non-productive investments. Furthermore, Population growth and exchange rate volatility also have impacts on foreign trade. It underscores the necessity to systematically analyze the impact of key macroeconomic determinants on Nepal's foreign trade. This study investigates the role of key macroeconomic variables on foreign trade of Nepal using post-liberalization data from 1991/92 to 2023/24 for empirical analysis. An Autoregressive Distributed Lag (ARDL) model is used to analyze the relationship between foreign trade and key macroeconomic determinants. This study found that economic growth positively affects total trade, including imports and exports. Similarly, population has positive effects on exports and total foreign trade, whereas population does not have significant effect on imports. Furthermore, remittance inflows have significant positive impacts on imports and total foreign trade. However, it is found that remittance inflows do not affect exports substantially. The exchange rate volatility has been found to disrupt trade. The autoregressive persistence of macroeconomic variables showed the critical need for stability and continuity in trade policies.

Keywords: *Foreign Trade, GDP, Population, Remittances, Exchange Rate Volatility, ARDL Model*

1. Introduction

Nepal encounters numerous challenges in its international trade sector, particularly regarding exports. Key obstacles comprise underdeveloped trade infrastructure, insufficient quality standards, limited productive capacity, narrow trade diversification, slow technological adoption, heavy reliance on imported raw materials and fuels, and weak integration into regional and global value chains. Additionally, complex rules of origin, stringent standards, and non-tariff trade barriers in destination markets further impede export growth. Although recent policy and legal reforms have taken serious steps to promote exports, Nepal struggles to capitalize on opportunities in trade in goods as well as in trade in services.

An analysis of macroeconomic determinants is essential for understanding the drivers of foreign trade. This analysis is particularly relevant in the case of Nepal, where persistent trade imbalances and limited export competitiveness are evident (Rajbanshi, 2022; Kadel, 2023; Batool & Rehman, 2024). The rationale for focusing on macroeconomic factors, including GDP, population, remittances, and exchange rate volatility, lies in their demonstrated influence on trade flows. Many studies from Nepal and other countries have highlighted the relationship between macroeconomic determinants

[1] Under Secretary, Government of Nepal, Email: deepeshlekhak@gmail.com (Corresponding Author)
[2] Information Technology Director, Government of Nepal, Email: sanushr7@gmail.com

and foreign trade (Ji et al., 2022; Edeme et al., 2019; Rojid & Rojid, 2024; Akçay & Akçay, 2023). Economic growth, measured by GDP, is widely recognized as a key determinant, positively affecting both exports and imports by stimulating domestic production and consumer demand (Batool & Rehman, 2024; Kadel, 2023). However, rapid GDP growth may also increase import dependency, potentially widening trade deficits (Kyer & Maggs, 2014; Bajona et al., 2007).

Population growth and remittances further complicate trade dynamics. A growing population can expand both production and consumption, thereby influencing trade volumes (Rajbanshi, 2022; Kadel, 2023; Batool & Rehman, 2024). Remittances, while injecting foreign currency and boosting domestic demand, may also increase import pressure and negatively affect export performance due to higher consumption of imported goods (Paudel & Bhusal, 2021; Lohani, 2024). Exchange rate volatility is another critical factor, with mixed findings: some studies report it can enhance export competitiveness, while others suggest it increases uncertainty and may hinder trade (Altintaş et al., 2011; Ouattara, 2023; Louati et al., 2022; Akçay & Akçay, 2023; Nepali, 2024).

This study addresses several critical research gaps identified in the existing empirical literature on Nepal's foreign trade. While a limited number of studies have examined macroeconomic determinants of foreign trade in Nepal, none have simultaneously investigated the impact of real GDP, population size, real remittance inflows, and exchange rate volatility on exports, imports, and total trade within the Nepalese context. Previous studies have not comprehensively analyzed all three aspects of foreign trade - exports, imports, and total foreign trade and their relationship with the above macroeconomic determinants. Furthermore, previous studies have not utilized data over the post-liberalization period from 1991/92 to 2023/24 while analyzing the relationship between foreign trade and macroeconomic determinants.

This study aims to fulfill these research gaps by conducting an empirical analysis. This study explores the impact of economic growth, population, remittances inflows, and exchange rate volatility on foreign trade of Nepal. The scope of this study is limited to empirically analyze the impacts of only four macroeconomic determinants on foreign trade of Nepal. This study only considers trade in goods in imports, exports and total trade.

2. Literature Review

2.1 *Theoretical Review*

David Ricardo's Comparative Advantage Theory (Ricardo, 1817) explains how nations benefit by specializing in the production and export of goods for which they have a lower opportunity cost compared to trading partners. Heckscher-Ohlin's Factor Endowment Theory (Heckscher & Ohlin, 1933) argued that export is based on the abundancy of production factors while countries import goods those having scarcity of production factors in the country. These models assume smooth trading relationships where the production structure and relative efficiencies shape export competitiveness. Macroeconomic determinants such as factor availability, productivity, and technology determine export potential, while consumption patterns and relative prices shape import demand.

The elasticity approach explains the adjustment of a country's trade balance through the responsiveness of export and import demand to changes in relative prices, particularly following an exchange rate depreciation. According to the Marshall-Lerner condition, a depreciation improves the trade balance only if the sum of the absolute price elasticities of exports and imports exceeds one, ensuring that quantity adjustments outweigh the higher cost of imports (Krugman et al., 2022; Magee, 1973).

Macroeconomic determinants play a critical role in shaping a country's trade performance, as shifts in national income, demographic dynamics, external financial inflows, and currency movements influence both import demand and export capacity. GDP is a central determinant because rising domestic income tends to increase import demand through higher consumption and investment needs, while foreign income growth drives export performance via global demand effects (Krugman et al., 2022). Population size is equally important, as larger and growing populations expand domestic market needs, often resulting in higher import dependence in countries with limited productive capacity (Todaro & Smith, 2020). Remittance inflows are included due to their significant macroeconomic impact. Remittance inflows raise household purchasing power, stimulate consumption-driven imports, and may reduce export competitiveness (Barajas et al., 2011). Exchange rate volatility is selected because fluctuations in currency value directly affect relative prices of imports and exports, influencing trade volumes, competitiveness, and market certainty (Clark et al., 2004). Together, these variables capture income effects, demographic demand pressures, external resource inflows, and price competitiveness.

2.2 *Empirical Review*

Zafar (2024) studied the determinants of international trade of Bangladesh. This study found that population growth, personal remittances, government spending on education, and macroeconomic management positively affected international trade. Conversely, tariff rate had a statistically significant negative effect on trade. Urgessa (2024) studied the impact of exchange rate fluctuations on exports of Ethiopia. The study found that an increase in exchange rate volatility negatively impacted export. Rojid and Rojid (2024) studied impact of exchange rate volatility on export of small economies. They analyzed the relationship between exchange rate volatility and export performance. The study found that the exchange rate volatility positively affected exports in small economies.

Batool and Rehman (2024) investigated the impact of exchange rate volatility on international trade in Pakistan. The study found exchange rate volatility has a negative and significant impact on international trade. Urgessa (2024) explored the effects of real effective exchange rate (REER) volatility on export. The study found REER volatility had both positive and negative impacts on different export categories. Akçay and Akçay (2023) studied the effects of exchange rate volatility on import. The study found a significant negative relationship between exchange rate volatility and imports, with a 1 percent increase in volatility leading to a 0.01 percent decrease in imports. Conversely, GDP showed a positive impact, with a 1 percent increase resulting in a 0.04 percent rise in imports.

Louati et al. (2022) studied the relationship between exchange rate volatility and Moroccan exports using data from first quarter of 2000 to the first quarter of 2017. They applied a Vector Error Correction Model (VECM) for analysis. The study found an increase in exchange rate volatility had a positive effect on the demand for Moroccan exports while the impact of world GDP was not significant in the short term. Parray et al. (2022) studied about the determinants of the Trade Balance in India using data from 1991 to 2020 and ARDL model. The study found positive effect of GDP on the trade balance. Conversely, an increase in inflation negatively impacted the trade balance. Upadhyay and Roy (2016) studied the impact of exchange rate movement and macro-economic factors on exports of software and services from India. The study found that depreciation of the Indian rupee had a positive and significant impact on software services exports. However, interest rates, inflation, and industrial production did not significantly influence exports. Altintaş et al. (2011) studied the relationships between Turkish exports and several economic factors. The study found that foreign income and real exchange rate volatility had positive and statistically significant impacts on Turkish exports.

Nepali and Adhikari (2024) studied impact of Exchange Rate on the Export of Nepal using data from 1990 to 2019. The study found that exchange rate fluctuations had a significant negative impact on Nepal's exports. Lohani (2024) studied relationship between remittances and imports of Nepal. The study found that remittances had a positive effect on imports. Kadel (2023) studied trade flow of Nepal using Gravity Model. The study found that the GDP of both Nepal and its trading partners had a positive and significant impact on Nepal's trade. The population of Nepal also showed a significant positive effect on trade. Rajbanshi (2022) studied the impact of remittance inflows on imports in Nepal using data from 1993 to 2018. The study found a significant positive impact of remittances on imports. Similarly, population growth had a positive impact on imports. Paudel and Bhusal (2021) studied the role of workers' remittances in export of Nepal using a gravity model and data from 1993 to 2018. The study found that remittances had a statistically significant negative impact on export performance.

Very few studies are found regarding macroeconomic determinants of foreign trade in Nepal. However, no study was found in the literature that simultaneously examines the impact of real GDP, population size, real remittance inflows, and exchange rate volatility on foreign trade. Very few studies have analyzed all three aspects of foreign trade i.e., exports, imports, and total trade in the context of Nepal. Moreover, the previous studies had not covered the time period from 1991/92 to 2023/24. This study aims to fulfil the above research gaps to some extent by conducting empirical analysis of the macroeconomic determinants of the foreign trade from 1991/92 to 2023/24 using ARDL modelling.

2.3 *Conceptual Framework*

Based on the literature review, a conceptual framework is developed for this study. Figure1 shows a schematic diagram of the conceptual framework of this study. In the diagram, it clearly picturized that foreign trade is dependent variable which includes exports, imports, and total foreign trade TFT) whereas Gross domestic product (GDP), Population size (Pop), remittances (Remit), and exchange rate volatility (ERV) are the independent variables.

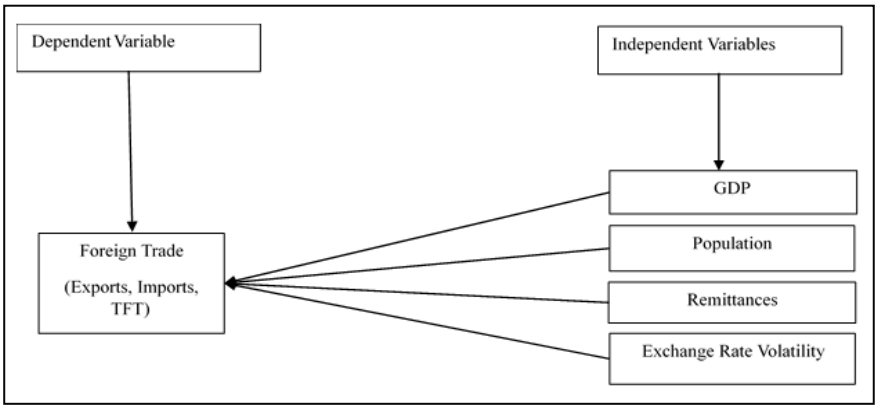


Figure 1: Schematic Diagram of Conceptual Framework

3. Methodology

3.1 *Research Design*

This study employed a descriptive and causal effect designs to examine the association between macroeconomic determinants and foreign trade in Nepal. Descriptive research design is employed to identify the trend of these variables over the study period. Similarly, this study examines the structure and growth of foreign trade over the period of 33 years. It also attempts to describe the structure and growth of average real GDP, population, real remittances, and exchange rate volatility.

From the literature review, it is reflected that there is a strong relationship of foreign trade with GDP, remittances, and exchange rate volatility. Thus, this study also used a causal effect research design. This design is adopted to examine the impact of the real GDP, population, real remittances and exchange rate volatility on foreign trade in Nepal. Time-series data are used for this analysis. According to nature of data, this study has applied ARDL model using EViews 12 software to get effect of microeconomic determinants on Nepal's foreign trade over the period.

3.2 *Sources of Data*

Time series data from fiscal year 1991/92 to 2023/24 are employed to identify the effect of macroeconomic determinates on foreign trade in Nepal. Only trade in goods is considered while collecting data for imports, exports and total foreign trade. The data for variables such as exports, imports, exchange rate (NPR/USD 1), population, and remittances are collected from secondary sources. The data for foreign trade (exports and imports) and GDP are obtained from the Economic Surveys published by the MoF. Similarly, the exchange rate and remittances are obtained from NRB's Quarterly Economic Bulletins and NRB's Trade and Balance of Payments respectively. The Population data is obtained from National Statistics Office (NSO). Other foreign trade supportive data are collected from different offices of GoN such as Department of Customs (DoC), and Trade and Export Promotion Centre (TEPC).

This study used new series of recent 33 years GDP data from 1991/92 to 2023/24 for data analysis. GDP deflator is used to convert the nominal value of data into real term at a base year (2010/11=100). Consumer price index (CPI) is also used to convert the nominal value into constant price. The CPI is converted into the base year (2010/11=100) has been used for this study. National Population and Housing Census (NPHC) 2021 is the first national census conducted after the country embarked into federal system of governance formally. Using exponential growth rate (g) formula, annual population from 2091/92 to 2023/24 has been estimated. Remittance inflows refer to money received in Nepal by the Nepali workers from the foreign countries. CPI is used to convert nominal value of remittances into real term at constant price with base year 2010/11. The moving average of the standard deviation of real effective exchange rate changes is used to calculate Exchange Rate Volatility (REV).

The exchange rate volatility (RERV) is calculated using the following formula (Altintaş et al., 2011).

$$ERV_t = \frac{1}{m}\left[\sum_{i=1}^{m}(\ln ER_{t+i-1} - \ln ER_{t+i-2})^2\right]^{\frac{1}{2}}$$

where,

ERV_t is the exchange rate volatility, lnRER is natural log of real exchange rate of Nepalese currency with US Dollar, m is maximum order of moving average, i is initial order of moving average (assuming 2 for this study) and t is current year.

3.3 *Model Specification*

The study examines the impact of key macroeconomic variables on foreign trade of Nepal. The functional relationship is expressed as:

$$Y_t = f(X_{1t}, X_{2t}, X_{3t}, X_{4t}) \quad \text{(i)}$$

where, Y_t is endogenous variable, which denotes real exports or real imports or total foreign trade while X_{1t}, X_{2t}, X_{3t}, and X_{4t} are the exogenous variables which represent real GDP, population, real remittances inflows and exchange rate volatility respectively.

In regression form,

$$Y_t = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \varepsilon \quad \text{(ii)}$$

To interpret the results in elasticity terms and to mitigate the problem of heteroskedasticity (non-constant variance), all variables except exchange rate volatility are transformed into their natural logarithms. This transformation allows us to interpret the coefficients from the regression model as percentages. The exchange rate volatility series, which is already a measure of dispersion, is typically used in its level form. The endogenous variable is natural log of real exports of goods (lnX), natural log of real imports of goods (lnM), or natural log of Real total foreign trade (lnTFT) in three different models. The exogenous variables are natural log of real gross domestic product (lnGDP), natural log of population (lnPop), natural log of real remittances inflows (lnRemit), and exchange rate volatility (ERV). Hence, taking three trade variables export, import and total foreign trade following three models are developed in this study.

Model 1: Impacts of Key Macroeconomic factors on Real Exports

Model 1 analyses the impacts of lnGDP, lnPop, lnRemit, and ERV on lnX (Real Exports). The regression relationship is given by:

$$lnX_t = \alpha + \beta_1 lnGDP_t + \beta_2 lnPop_t + \beta_3 lnRemit_t + \beta_4 ERV_t + \varepsilon \quad \text{(iii)}$$

Model 2: Impacts of Key Macroeconomic factors on Real Imports

Model 2 analyses the impacts of lnGDP, lnPop, lnRemit, and ERV on lnM (Real Imports). The regression relationship is given by:

$$lnM_t = \alpha + \beta_1 lnGDP_t + \beta_2 lnPop_t + \beta_3 lnRemit_t + \beta_4 ERV_t + \varepsilon \quad \text{(iv)}$$

Model 3: Impacts of Key Macroeconomic factors on Total Foreign Trade

Model 3 analyses the impacts of lnGDP, lnPop, lnRemit, and ERV on lnTFT (Total Foreign Trade). The regression relationship is given by:

$$lnTFT_t = \alpha + \beta_1 lnGDP_t + \beta_2 lnPop_t + \beta_3 lnRemit_t + \beta_4 ERV_t + \varepsilon \quad \text{(v)}$$

Stationarity (Unit Root) Test

Testing for stationarity is a critical pre-requisite for time-series analysis to avoid spurious regression results. A series is stationary if its mean, variance, and covariance are constant over time. The study employs the Augmented Dickey-Fuller (ADF) test to determine the order of integration of each variable. This test checks if variables are stationary at level [I(0)] or after first differencing [I(1)].

The ARDL model is uniquely advantageous as it can be applied regardless of whether the variables are I(0), I(1), or a mixture of both, but not I(2). Therefore, confirming that no variable is integrated of order two is an essential step before proceeding.

Lag Selection

Lag selection of the variables is conducted on the basis of Akaike Information Criterion (AIC) method for ARDL Model. This method is used to select lags for each variable because it balances model fit and complexity. This approach ensures robustness in cointegration and dynamic analysis, making it a standard practice in time-series econometrics for ARDL models.

Using AIC method for ARDL, lags for variables lnX, lnGDP, lnPop, $lnRemit_t$ and ERV_t are selected as 1,1,1,1,2 for Model 1. Similarly, lags for variables lnM, lnGDP, lnPop, $lnRemit_t$ and ERV_t are selected as 1, 1, 1, 0, 2 for Model 2 and lags for variables lnTFT, lnGDP, lnPop, $lnRemit_t$ and ERV_t are selected as 1, 1, 1, 0, 2 for Model 3.

Model Calculation

EViews 12 software was used to construct ARDL models and conduct various tests. First, time series data for each variable (lnX or lnM or lnTFT, lnGDP, lnPOP, lnRemitt, ERV) was entered into EViews as separate series. Using Augmented Dickey-Fuller (ADF) test in EViews 12, it was ensured that the time series data is stationary or appropriately differenced, as ARDL works with I(0) or I(1) variables. All variables are found to be are stationary at level [I(0)] or after first differencing [I(1)]. Thus, it was confirmed that ARDL modelling could be applied on the data set.

After importing data for each time series variables, the frequency of analysis was set to annual. Using EViews 12, the model is constructed using estimate equation menu. In the equation dialog box, dependent and independent variables were entered and ARDL (Autoregressive Distributed Lag Models) was selected as the method. Furthermore, lag selection criterion is chosen as AIC for the optimal lag structure. EViews 12 provided the coefficients for each independent variable, R^2, Adjusted R^2, S.E. (Standard Error), F-statistic, P-value, and Significance (Sig) in the regression output.

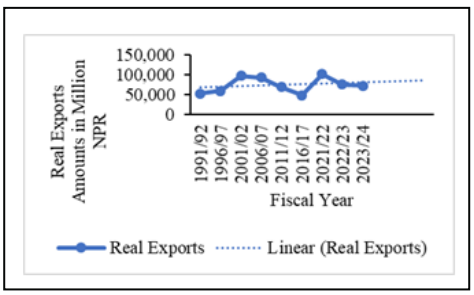
Diagnostic Tests

Diagnostic tests including residuals and stability is carried out using Residual Diagnostics features of the EViews 12. The robustness and reliability of the selected ARDL model is verified through a series of diagnostic tests. These include residual diagnostic for test of normality (Jarque-Bera test), test of serial correlation (Breusch-Godfrey LM test), and test of heteroskedasticity (Breusch-Pagan-Godfrey test) and The Ramsey RESET (Regression Equation Specification Error Test).

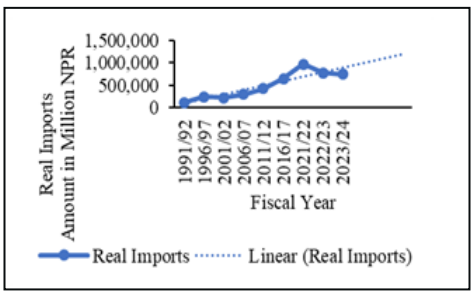
4. Result

4.1 Status of Foreign Trade and Key Macroeconomic Determinants

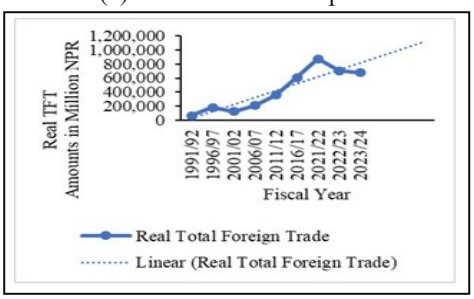
The trend of real exports, real imports, real total foreign trade, and real trade deficit and their growth under a five years interval 1991/92 to 2021/22 under a five-year interval along with 2022/23, and 2023/24 is shown in figure 2.



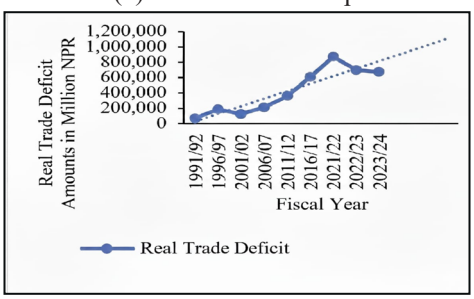
(a) Trends of Real Exports



(b) Trends of Real Imports



(c) Trends of Real Total Foreign Trade



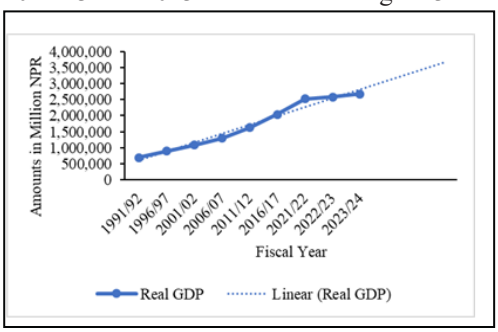
(d) Trends of Real Trade Deficit

Figure 2: Trends of Selected Trade Variables

Source: Author's Calculation based on data from Department of Customs

The trend of the real exports is moving slowly upward over the period, while the trend of the real imports is moving upward over the period. The trend line of the real total foreign trade is also moving upward over the period, while the trend line of the real trade deficit is also moving upward over the period.

The trend of Nepal's real GDP from 1991/92 to 2021/22 at five-year intervals, including the years 2022/23 and 2023/24 is shown in figure 3.



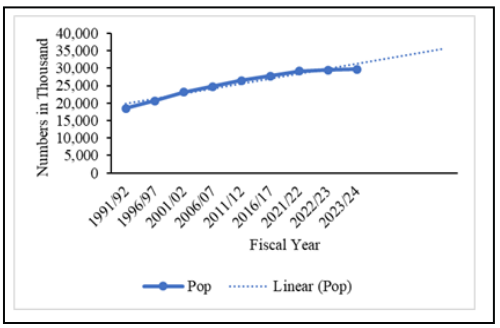


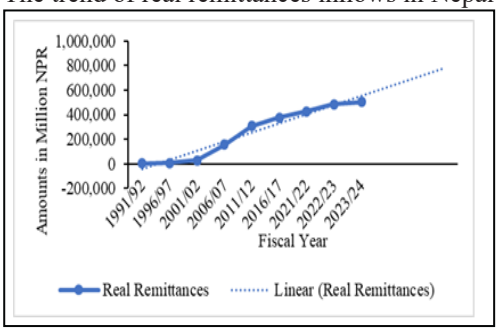
Figure 3(a): Trend of Real GDP in Nepal **Figure 3(b):** Trend of Population in Nepal

Source: Author's calculation using data from Nepal Rastra Bank, Ministry of Finance

It is clearly observed that the real GDP increased Fastly from 1991/92 to 2021/22 and the increase pattern is slow flow from 2021/22 to 2023/24. However, the trend line of the real GDP is seemed to be smooth and moving upward.

The trend of Nepal's real population size from 1991/92 to 2021/22 at five-year intervals, also including the years 2022/23 and 2023/24 in figure 4.3.The tendency of population is increasing from 1991/92 to 2021/22 with a smooth pattern. But increase pattern looks very slow from 2021/22 to 2023/24. However, the trend line is moving upwards but slow.

The trend of real remittances inflows in Nepal is shown in figure 4.



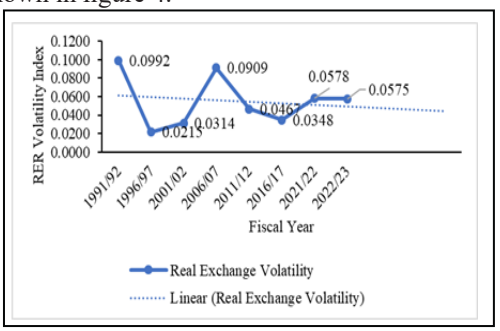


Figure 4(a): Trend of Real Remittances Inflows **Figure 4(b)**: Real Exchange Rate Volatility

Source: Author's Calculation based on data from Nepal Rastra Bank

The remittances inflows are very slowly increased from 1991/92 to 2001/02. Then highly increased up to 2011/12. After then the speed of increase little bit slow up to 2022/23, the trend of remittances inflow in Nepal is moving upward.

Figure 4(b) shows the trend of Nepal's real exchange rate volatility from 1991/92 to 2021/22 in five-year increments, which also includes the years 2022/23 and 2023/24. The real ERV goes down from 1991/92 to 1996/97, then slowly ups to 2001/02, again ups fast to 2006/07. But it moves downward upto 2016/17, but moves upward to 2021/22. However, it moves slowly downward. This indicates that the tendency of the ERV in Nepal over the period highly ups and down. Nevertheless, the trend line shows that the trend of the real exchange rate volatility is slowly moving downward over the period.

4.2 Regression Analysis

The stationarity (unit root) is carried out using the Augmented Dickey-Fuller (ADF). The results of the test are shown in table1.

Table 1: Augmented Dickey-Fuller (ADF) test

Variables		Level		First Difference		Integrated of order d
		ADF	Sig	ADF	Sig	
lnX	Intercept	-	-	-4.407	**	I(1)
lnM	Intercept	-	-	-6.423	***	I(1)
lnTFT	Intercept	-	-	-8.202	***	I(1)
lnGDP	Intercept+Trend	-3.587	*	-	-	I(0)
lnPop	Intercept	-2.641	.	-	-	I(0)
lnRemit	Intercept	-	-	-8.060	***	I(1)
ERV	Intercept	-3.016	*	-	-	I(0)

'***', '**', '*', and '.' indicate significant at 0.1, 1, 5, and 10 percent,
'ns' indicates no significant even at 10 percent
'd' indicates that how many times a series must be differenced to become stationary.
Source: Author's Calculation using EViews 12

Since, all the variable are integrated of order zero or one, the ARDL model could be applied.

4.2.1 Model 1: Impacts of Key Macroeconomic factors on Real Exports

ARDL Model 1 is computed on the basis of equation (iii) and AIC test, the calculated model is as shown in Table 2. In this Model, lnX_t is dependent variable whereas lnX_{t-1}, $lnGDP_t$, $lnGDP_{t-1}$, $lnPop_t$, $lnPop_{t-1}$, $lnRemit_t$, $lnRemit_{t-1}$, ERV_t, ERV_{t-1}, ERV_{t-2} are the independent variables.

Table 2: ARDL Model 1 (1,1,1,1,2)

$$lnX_t = 48.577 + 1.095lnX_{t-1} + 3.896lnGDP_t - 3.019lnGDP_{t-1} + 42.818lnPOP$$
$$-46.665lnPOP_{t-1} + 0.149lnRemit_t + 0.093lnRemit_{t-1} - 0.448ERV_t - 4.708ERV_{t-1} + 2.306ERV_{t-2} + \varepsilon_t$$

R^2	Adj.R^2	S.E.	F-Stat	P-value	Sig
0.852	0.774	0.125	10.905	0.000	***

'***' indicates significance at a 0.1% level (when p-value <0.001)

Note. Author's Calculation using EViews 12

The adjusted R^2 is significance at 0.001 (i.e. 0.1%) and the model fits. It confirms that 77.4 percent variation in lnX_t is explained by the independent variables

Regressing lnX_t on the independent variables (i.e., lnX_{t-1}, $lnGDP_t$, $lnGDP_{t-1}$, $lnPop_t$, $lnPop_{t-1}$, $lnRemit_t$, $lnRemit_{t-1}$, ERV_t, ERV_{t-1}, ERV_{t-2}), Table 3 shows the coefficient of independent variables, standard error, t-statistic, p-values and significance.

Table 3: Coefficients of Independent Variable in ARDL Model 1 (1,1,1,1,2)

Variable	Coef.	Se	t-Stat.	p-value	Sig
lnX_{t-1}	1.095	0.189	5.783	0.000	***
$lnGDP_t$	3.896	1.772	2.198	0.041	*
$lnGDP_{t-1}$	-3.019	1.390	-2.173	0.043	*
$lnPop_t$	42.818	17.279	2.478	0.023	*
$lnPop_{t-1}$	-46.665	19.109	-2.442	0.025	*
$lnRemit_t$	0.149	0.111	1.347	0.194	ns
$lnRemit_{t-1}$	0.093	0.074	1.243	0.229	ns
ERV_t	-0.448	1.600	-0.280	0.783	ns
ERV_{t-1}	-4.708	1.944	-2.422	0.026	*
ERV_{t-2}	2.306	1.552	1.486	0.154	ns
Constant	48.577	57.557	0.844	0.409	ns

Dependent Variable: lnX_t
Source: Author's Calculation using EViews 12

Table 3 shows that the coefficient of lnX_{t-1} is 1.095 and statistically significant. This indicates that a 1 percent increase in one-year lagged exports leads to a 1.10 percent increase in current year's exports (X). Similarly, the coefficient for $lnGDP_t$ is 3.896 and significant, implying that a 1 percent increase in the current year's GDP leads to a 3.90 percent increase in X. Conversely, the significant coefficient for $lnGDP_{t-1}$ is -3.019, meaning a 1 percent increase in one-year lagged GDP leads to a 3.02 percent decrease in X. Likewise, the coefficient for $lnPop_t$ is 42.818 and significant, implying that a 1 percent increase in the current year's population size leads to a 42.82 percent increase in X. Conversely, the significant coefficient for $lnPop_{t-1}$ is -46.665, meaning a 1 percent increase in one-year lagged population leads to a 46.82 percent decrease in X. Moreover, the coefficient for ERV_{t-1} is -4.708 and significant, showing that a 1 percent point increase in current year's exchange rate volatility leads to a 4.71 percent decrease in X.

Eventually, the coefficients for $lnRemit_t$, $lnRemit_{t-1}$, and ERV_t are 0.149, 0.093, and -0.448, respectively, which are statistically insignificant. This means that the current year's remittances inflows, one-year lagged remittances inflows, and current year's exchange rate volatility have no significant impact on the current year's exports of Nepal. Thus, X_{t-1}, $lnGDP_t$, $lnGDP_{t-1}$, $lnPop_t$, $lnPop_{t-1}$, and ERV_{t-1} have significant impact on X_t (exports) while $lnRemit_t$, $lnRemit_{t-1}$, and ERV_t have no significant impact on X_t (exports).

Residual Diagnostics Tests for Model 1 were carried out as stated in Appendix C. Normality test was done using Jarque-Bera statistic (JB), serial correlation test was done using Breusch-Godfrey LM Test (BGLM) and the Heteroskedasticity test was done using Breusch-Pagan-Godfrey (BPG). The model was found fit based on these tests. Furthermore, Ramsey RESET test for ARDL Model 1 is carried out as stated in Appendix B. The test showed that the model is correctly specified or there is a linearity in data.

4.2.2 Model 2: Impacts of Key Macroeconomic Factors on Real Imports

ARDL Model 2 is computed on the basis of equation (iv) and AIC test, the calculated model is as shown in Table 4.4 In this Model, lnM_t is dependent variable whereas lnM_{t-1}, $lnGDP_t$, $lnGDP_{t-1}$, $lnPop_t$, $lnPop_{t-1}$, $lnRemit_t$, $lnRemit_{t-1}$, ERV_t, ERV_{t-1}, ERV_{t-2} are the independent variables.

Table 4: ARDL Model 2 (1, 1, 1, 0, 2)

$$\ln M_t = 48.507 + 0.553\ln M_{t-1} + 3.835\ln GDP_t - 2.334\ln GDP_{t-1} + 6.035\ln POP_t - 9.898\ln POP_{t-1} + 0.132\ln Remit_t + 0.816ERV_t - 2.567ERV_{t-1} + 1.750ERV_{t-2} + \varepsilon_t$$

R^2	Adj.R^2	S.E.	F-Stat	P-value	Sig
0.993	0.990	0.052	335.390	0.000	***

'***' indicates significance at a 0.1% level (when p-value <0.001)

Note. Author's Calculation using EViews 12

As shown in ARDL Model 2, the value Adjusted R^2 is and 0.990 (i.e., 99%). It confirms that 99 percent variation in $\ln M_t$ is explained by the independent variables.

Regressing $\ln M_t$ on the independent variables (i.e., $\ln M_{t-1}$, $\ln GDP_t$, $\ln GDP_{t-1}$, $\ln Pop_t$, $\ln Pop_{t-1}$, $\ln Remit_t$, $\ln Remit_{t-1}$, ERV_t, ERV_{t-1}, ERV_{t-2}), Table 4 shows the coefficient of independent variables, standard error, t-statistic, p-values and significance.

Table 5: Coefficients of Independent Variable in ARDL Model 2 (1,1,1,0,2)

Variable	Coef.	Se	t-Stat.	p-value	Sig
$\ln M_{t-1}$	0.553	0.179	3.086	0.006	**
$\ln GDP_t$	3.835	0.510	7.527	0.000	***
$\ln GDP_{t-1}$	-2.334	0.650	-3.590	0.002	**
$\ln Pop_t$	6.035	6.801	0.887	0.385	ns
$\ln Pop_{t-1}$	-9.898	7.036	-1.407	0.175	ns
$\ln Remit_t$	0.132	0.037	3.539	0.002	**
ERV_t	0.816	0.630	1.295	0.210	ns
ERV_{t-1}	-2.567	0.825	-3.113	0.006	**
ERV_{t-2}	1.750	0.570	3.067	0.006	**
C	48.507	13.835	3.506	0.002	**

Dependent Variable: $\ln M_t$

Note. Author's Calculation Using EViews 12

Table 5 shows that the coefficient for $\ln M_{t-1}$ is 0.553 and statistically significant. This indicates that a 1 percent increase in one-year lagged imports leads to a 0.55 percent increase in current year's imports (M). Similarly, the coefficient for $\ln GDP_t$ is 3.835 and significant, implying that a 1 percent increase in the current year's GDP leads to a 3.86 percent increase in M. Conversely, the significant coefficient for $\ln GDP_{t-1}$ is -2.334, meaning a 1 percent increase in one-year lagged GDP leads to a 2.33 percent decrease in M.

Likewise, the coefficient for $\ln Remit_t$ is 0.132 and significant, showing that a 1 percent increase in current year's remittances inflows leads to an 0.13 percent increase in M. Moreover, the coefficient of ERV_{t-1} is -2.567 which is significant, indicating that a 1 percent point increase in the one-year lagged exchange rate volatility leads to a 2.57 percent decrease in M. However, the significant coefficient for ERV_{t-2} is 1.750, indicating that a 1 percent point increase in the two-year lagged exchange rate volatility leads to a 1.75 percent increase in M. Eventually, the coefficients for $\ln Pop_t$, $\ln Pop_{t-1}$, and ERV_t are 6.035, -9.898, and 0.816, respectively; however, these are statistically insignificant. This means that the current year's population size, one-year lagged population, and current year's exchange rate volatility have no significant impact on the current year's imports of Nepal. Thus, M_{t-1}, GDP_t, GDP_{t-1}, $Remit_t$, ERV_{t-1} and ERV_{t-2} have significant impact on M_t (imporst), while, Pop_t, Pop_{t-1}, ERV_t, and Pop_t have no significant impact on M_t (imports).

Residual Diagnostics Tests for Model 2 were carried out as stated in Appendix C. Normality test was done using Jarque-Bera statistic (JB), serial correlation test was done using Breusch-Godfrey LM Test (BGLM) and the Heteroskedasticity test was done using Breusch-Pagan-Godfrey (BPG). The model was found fit based on these tests. Furthermore, Ramsey RESET test for ARDL Model 2 is carried out as stated in Appendix B. The test showed that the model is correctly specified or there is a linearity in data.

4.2.3 Model 3: Impacts of Key Macroeconomic Factors on Real Total Foreign Trade

ARDL Model 3 is computed on the basis of equation (v) and AIC test, the calculated model is as shown in Table 6.

Table 6: ARDL Model 3 (1, 1, 1, 0, 2)

$$\ln TFT_t = 19.199 + 0.498\ln TFT_{t-1} + 3.303\ln GDP_t - 2.363\ln GDP_{t-1} + 11.579\ln PoP_t - 13.176\ln PoP_{t-1} + 0.087\ln REMIT_t + 0.683 ERV_t - 2.528 ERV_{t-1} + 1.030 ERV_{t-2} + \varepsilon_t$$

R^2	Adj.R^2	S.E.	F-Stat	P-value	Sig
0.993	0.989	0.045	302.213	0.000	***

'***' indicates significance at a 0.1% level (when p-value <0.001)

Note. Author's Calculation using EViews 12

The value Adjusted R^2 is and 0.989 (i.e., 98.9%). This implies that the adjusted R^2 is significance at 0.001 (i.e. 0.1%) and the model fits. It confirms that 98.9 percent variation in $\ln TFT_t$ is explained by the independent variables. The results of regression of $\ln TFT_t$ on the independent variables is show Table 7.

Table 7: Coefficients of Independent Variable in ARDL Model 3 (1,1,1,0,2)

Variable	Coef.	Se	t-Stat.	p-value	Sig
$\ln TFT_{t-1}$	0.498	0.273	1.825	0.083	.
$\ln GDP_t$	3.303	0.547	6.035	0.000	***
$\ln GDP_{t-1}$	-2.363	0.807	-2.927	0.008	**
$\ln Pop_t$	11.579	5.878	1.970	0.063	.
$\ln Pop_{t-1}$	-13.176	6.040	-2.182	0.041	*
$\ln Remit_t$	0.087	0.036	2.417	0.025	*
ERV_t	0.683	0.517	1.319	0.202	ns
ERV_{t-1}	-2.528	0.784	-3.223	0.004	**
ERV_{t-2}	1.030	0.714	1.442	0.165	ns
Constant	19.199	11.682	1.643	0.116	ns

Dependent Variable: $\ln TFT_t$

Note: Author's Calculation using EViews 12

Table 7 shows that the coefficient for $\ln TFT_{t-1}$ is 0.498 and statistically significant. This indicates that a 1 percent increase in one-year lagged total foreign trade leads to a 0.50 percent increase in current total foreign trade (TFT). The coefficient for $\ln GDP_t$ is 3.303 and significant, implying that a 1 percent increase in the current year's GDP leads to a 3.30 percent increase in TFT. Conversely, the significant coefficient for $\ln GDP_{t-1}$ is -2.363, meaning a 1 percent increase in one-year lagged GDP leads to a 2.36 percent decrease in TFT.

The coefficient for $lnPop_t$ is 11.579 and significant, showing that a 1 percent increase in population size leads to an 11.58 percent increase in TFT. In contrast, the significant coefficient for $lnPop_{t-1}$ is -13.176, indicating that a 1 percent increase in the one-year lagged population leads to a 13.18 percent decrease in TFT. Furthermore, a 1 percent increase in remittance inflows ($lnRemit_t$) leads to a 0.09 percent increase in TFT, with a significant coefficient of 0.087. Finally, a 1 percent point increase in one-year lagged exchange rate volatility (ERV_{t-1}) leads to a 2.53 percent decrease in TFT, as shown by its significant coefficient of -2.528. Eventually, the coefficients for ERV_t and ERV_{t-2} are 0.683 and 1.030, respectively; however, these are statistically insignificant. This means that the current year's exchange rate volatility and the two-year lagged exchange rate volatility have no significant impact on the current year's total foreign trade of Nepal. Thus, TFT_{t-1}, GDP_t, GDP_{t-1}, Pop_t, Pop_{t-1}, $Remit_t$, and EVR_{t-1} have significant impact on TFT_t (total foreign trade), while, ERV_t and ERV_{t-2} have no significant impact on TFT_t (total foreign trade).

Residual Diagnostics Tests for Model 3 were carried out as stated in Appendix C. Normality test was done using Jarque-Bera statistic (JB), serial correlation test was done using Breusch-Godfrey LM Test (BGLM) and the Heteroskedasticity test was done using Breusch-Pagan-Godfrey (BPG). The model was found fit based on these tests. Furthermore, Ramsey RESET test for ARDL Model 3 is carried out as stated in Appendix B. The test showed that the model is correctly specified or there is a linearity in data.

5. Discussion

This study found short- and long-term effects on foreign trade by key macroeconomic factors including GDP, population growth, remittances, and exchange rate volatility. These insights substantially address the research gaps noted in the literature. The simultaneous examination of the key macroeconomic factor over the 33 year (1991/92 to 2023/24) time period has been studied in this study in the Nepali context. This study found the substantial influence of current year GDP on Nepal's exports, imports, and total foreign trade. This finding confirms the findings of the prior research, such as Akçay and Akçay (2023), Parray et al. (2022), and Kadel (2023). These studies also showed that GDP is a key positive determinant of trade. Furthermore, this study found a significant negative impact of lagged GDP on foreign trade, which was not found in the referenced literature. This negative lag effect may suggest a short-term economic adjustment in trade performance in Nepal.

This study found that population size has a significant positive effect on current exports and total foreign trade which is consistent with the finding of the study by Zafar (2024) and Kadel (2023). Furthermore, this study found a negative impact of lagged population on trade. This behavior may reflect the effect of short-term demographics on trade dynamics in Nepal. This study found that exchange rate volatility (ERV) has significant negative effects on exports, imports, and total trade. The lagged ERV has even more negative effects. This finding is consistent with studies by Urgessa (2024), Batool and Rehman (2024), and Nepali and Adhikari (2024). However, Rojid and Rojid (2024) and Louati et al. (2022) showed positive effects of ERV on trade.

This study showed a positive and significant effect of remittance inflows on imports and total foreign trade but no significant impact on exports, possibly due to the use of remittances on consumption. This finding aligns with Zafar (2024) and Rajbanshi (2022). These studies have shown remittances have positive impacts on imports. However, Paudel and Bhusal (2021) found remittances negatively affected Nepal's export performance. On the other hand, this study found the positive and significant influence of lagged trade values of exports, imports, and total foreign trade on current trade figures, which validates the typical persistence effect observed in trade economics.

Nepal's demographic, labor market, and structural characteristics shape the asymmetric effects of population growth and remittances on trade flows. The finding that population growth increases exports but not imports can be linked to Nepal's labor-abundant economy. Nepal has a population dividend where a rising working-age population enlarges the supply of low-cost labor, supporting export-oriented sectors such as agriculture, carpets, garments, and handicrafts. These industries are labor-intensive and depend more on workforce availability than on capital or technological inputs. Thus, population growth can help expand export capacity. However, population growth does not significantly raise imports because Nepal's import basket is dominated by essential goods such as fuel, machinery, transport equipment, and processed products.

The strong effect of remittances on imports but not exports reflects Nepal's remittance-driven consumption structure. Remittances substantially raise disposable income, shifting household expenditure toward imported consumption goods, thereby expanding import demand. At the same time, remittances do little to boost exports because they are rarely channeled into productive investment. Remittance inflows contribute to a real exchange rate appreciation through higher spending, which can weaken export competitiveness. These findings underscore that Nepal's trade outcomes are closely shaped by its labor market dynamics, consumption patterns, and structural constraints. These findings highlight the importance of policies aimed at enhancing productive investment of remittances, diversifying exports, and strengthening supply capacity to leverage demographic trends for trade expansion.

These findings reveal Nepal's foreign trade is characterized by strong autoregressive components, clear short-run and long-run economic growth influences, demographic dynamics, and delayed adjustment mechanisms. The findings fill important empirical gaps by integrating key macroeconomic factors to foreign trade in Nepal.

6. Conclusion

This study concludes that macroeconomic determinants have both short- and long-term effects on foreign trade. This study provided empirical evidence of the relationship between economic growth, population, remittance inflows and exchange rate volatility on foreign trade of Nepal. Thus, this study fulfills the research objectives to assess the relationship between macroeconomic determinants and foreign trade of Nepal. The economic growth has positive effects on total trade, including imports and exports. Similarly, population has positive effects on exports and total foreign trade, whereas population does not have significant effect on imports. The remittance inflows have significant positive impacts on imports and total foreign trade. However, it is found that remittance inflows do not affect exports substantially. The exchange rate volatility has been found to disrupt trade.

The empirical evidence from this study reinforces the policies adopted by Nepal for export promotion and import management. The pertinent challenges faced in foreign trade of Nepal needs to addressed through policy reforms, building production capacity and enhancing productivity, strengthening market access and export competitiveness. Nepal needs to take benefit from demographic dividend to strengthen export competitiveness as well as utilize imports for integration in global and regional value chains. Labor market shall be reformed along with vocational training, and education initiatives should be strengthened to harness human capital. Similarly, remittance inflows need to be streamlined to productive investment to boost production and productivity. Financial and investment instruments should be developed so that remittance inflows could be challenged into productive sectors rather than consumption alone. Fiscal and monetary policies need to support export competitiveness through production linked incentives, prudent monetary policies and financial inclusion. Nepal Rastra Bank shall continue prudent monetary polices to stabilize exchange rate volatility. The pegged foreign exchange rate between Nepali Rupees and Indian Rupees should be continued as it provides stability in foreign exchange with the major trade partner of Nepal.

The policy implications derived from this study are consistent with the policies and strategies outlined in the Commerce Policy 2025 and Nepal Trade Integration Strategy (NTIS) 2023. Export competitiveness should be enhanced by diversifying both products and markets beyond traditional sectors. NTIS has identified 32 potential exportable goods and 5 potential exportable services. These products shall be developed and integrated in global value chains to promote export. Trade in services should also be promoted including IT services, clean energy, and tourism, with a focus on adding value and meeting quality standards. Government should provide support and incentives for MSMEs to reduce trade concentration risks and enhance competitiveness. Government shall provide production-based incentives to promote production and productivity.

Trade and logistics infrastructure including road and rail connectivity, logistics services, national quality infrastructure, and digital public infrastructure shall be strengthened. Logistics Masterplan of Nepal shall be developed and implemented to reduce overall costs of trade. Trade facilitation measures should be strengthened to reduce costs and improve efficiency. The provisions of WTO Trade Facilitation Agreements shall be implemented within the committed timeline. The market access of Nepali products should be enhanced through bilateral, regional and multilateral trade negotiations post LDC graduation in 2026. The existing unilateral preferential trade arrangements shall be continued and expanded with major trading partners. Nepal's participation in multilateral trading system (WTO) and regional frameworks such as SAFTA and BIMSTEC should be strengthened to improve market access and reduce tariff and non-tariff barriers. As this study shows persistence of past trade performance as a stabilizing factor, policy continuation is also deemed necessary.

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Appendices

Appendix A: Computation of Various Variables

Computation of Adjusted Nominal Gross Domestic Price (New Series)

Adj. N_GDP = Adjusted nominal GDP as a new series

New Series of Previous Year =

$$\frac{\text{New Sereis of Current Year}}{\text{Old Series of Current Year}} \times \text{Old Series of Previous Year}$$

Computation of Adjusted Real Gross Domestic Price at Constant Price (New Series)

Adj. R_GDP= Adjusted real GDP as a new series

New Series of Previous Year =

$$\frac{\text{New Sereis of Current Year}}{\text{Old Series of Current Year}} \times \text{Old Series of Previous Year}$$

Computation of GDP Deflator (Base Year 2010/11=100)

$$\text{GDP Deflator (GDP\_dftr) (Base Year 2010/11=100)} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

Computation of Consumer Price Index of USA (Base Year 2010=100) and Nepal (Base Year 2010/11=100)

- CPI of USA at Base Year 2010

$$= \frac{100}{\text{CPI}_U \text{ base year } 1982_{2010}} \times \text{CPI}_U \text{ base year } 1982_t$$

- CPI of Nepal at Base Year 2010

$$= \frac{100}{\text{CPI}_N \text{ base year } 2014\ 15_{2010\ 11}} \times \text{CPI}_N \text{ base year } 2014\ 15_t$$

Computation of Real Exchange Rate

- Nominal exchange rate (N_ER) is taken from annual average exchange of NPR per USD 1 (NPR/USD 1)

  [Source: https://www.nrb.org.np/category/economic-bulletin/?department=red]

- Real exchange rate with USD (R_ER) = $N_{ER_U} \times \frac{CPI_U}{CPI_N}$

  Where, = Nominal exchange rate with USD

  = Consumer price index of USA base year 2010=100

  [Source: https://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/]

  = Consumer price index (Overall) of Nepal base year 2010/11=100

  [Source: https://www.nrb.org.np/category/economic-bulletin/?department=red]

Computation of Exchange Rate Volatility

$$ERV_t = \frac{1}{m}\left[\sum_{i=1}^{m}(\ln ER_{t+i-1} - \ln ER_{t+i-2})^2\right]^{\frac{1}{2}}$$

Where,
ERV = Exchange rate volatility
R_ER = Real exchange rate of Nepalese currency with US Dollar
m = Maximum order of moving average (assuming m=2 for this study)
i = Initial order of moving average (i.e., 1, 2)
t = Current year

Estimation of Annual Population in Nepal

$$\text{Exponential growth rate (g)} = \text{Antilog}\left[\frac{1}{t} \times ln\left(\frac{P_t}{P_0}\right)\right] - 1$$

Where,
P_0 = Present value
P_n = Future value
t = Number of years
g= Exponential growth rate
$P_1 = P_0(1+g)^1$, $P_2 = P_0(1+g)^2$, $P_3 = P_0(1+g)^3$, …, $P_t = P_0(1+g)^t$

Computation of Real Exports, Real Imports, and Real Total Foreign Trade in Nepal

N_X = Nominal exports of goods
R_M = Real imports of goods
R_X = Real exports of goods
N_M = Nominal imports of goods
N_TFT = Nominal total foreign trade (N_X + N_M)
R_TFT = Real total foreign trade (R_X + R_M)
GDP dftr = GDP Deflator at base year 2010/11=100

Computation of Real Remittances Inflow in Nepal

Where,
R_Remit = Real Remittances inflows
N_Remit = Nominal remittances inflows
CPI_N = Consumer price index (overall) of Nepal with base year 2010/11

Appendix B - Ramsey RESET Test

Model 1

Coeff. of Fitted^2	df	t-stat.	p-value	Sig
-0.036	19	0.265	0.794	ns

Model 2

Coeff. Of Fitted^2	df	t-stat.	p-value	Sig
-0.096	19	0.790	0.439	ns

Model 3

Coeff. Of Fitted^2	df	t-stat.	p-value	Sig
-0.036	19	0.265	0.794	ns

'ns' refers to not significance even at 10% level (When p>0.10)
Note: Author's Calculation using EViews 12

Appendix C - Residual Diagnostic Tests

Model 1

Test of Normality	Test of Serial Correlation	Heteroskedasticity Test
Jarque-Bera (JB)	Breusch-Godfrey LM Test (BGLM)	Breusch-Pagan-Godfrey (BPG)
JB Stat.: 2.066	Obs R^2: 2.120	Obs R^2: 10.422
Prob.: 0.356 (p>0.10)	Prob. $\chi^2(2)$: 0.346 (p>0.10)	Prob. $\chi^2(10)$: 0.404 (p>0.10)

Model 2

Test of Normality	Test of Serial Correlation	Heteroskedasticity Test
Jarque-Bera (JB)	Breusch-Godfrey LM Test (BGLM)	Breusch-Pagan-Godfrey (BPG)
JB Stat.: 3.326	Obs R^2: 0.115	Obs R^2: 10.07
Prob.: 0.190 (p>0.10)	Prob. $\chi^2(1)$: 0.734 (p>0.10)	Prob. $\chi^2(9)$: 0.345 (p>0.10)

Model 3

Test of Normality	Test of Serial Correlation	Heteroskedasticity Test
Jarque-Bera (JB)	Breusch-Godfrey LM Test (BGLM)	Breusch-Pagan-Godfrey (BPG)
JB Stat.: 1.841	Obs R^2: 0.036	Obs R^2: 9.412
Prob.: 0.398 (p>0.10)	Prob. $\chi^2(1)$: 0.850 (p>0.10)	Prob. $\chi^2(9)$: 0.400 (p>0.10)

Note: Author's Calculation using EViews 12