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Nepal's Import Demand Sensitivity to Exchange Rate Fluctuations: An ARDL Co-integration Approach

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ABSTRACT

This study investigates the import demand function for Nepal using a time series econometric approach over 34 years (1990–2023). The analysis employs the ARDL model to estimate the relationship between the import demand of Nepal and key determinants such as remittances, real exchange rate, exchange rate volatility, and Indian inflation. The results show that Nepal's import demand is income-elastic for remittances and price-elastic for exchange rates, with a significant J-curve effect observed for exchange rate depreciation. Exchange rate volatility positively affects imports, suggesting speculative behavior by importers. Indian inflation has a modest positive impact on imports, reflecting Nepal's dependence on Indian goods. Diagnostic tests confirm the robustness of the model, with no issues of autocorrelation, multicollinearity, or heteroskedasticity. The study's policy implications emphasize the need for exchange rate stability, managing remittance flows for productive use, controlling domestic inflation, and diversifying trade partnerships to reduce reliance on Indian imports. These measures could help mitigate external shocks and foster long-term economic stability.

Keywords: Import demand, ARDL, exchange rate, volatility, remittance

INTRODUCTION

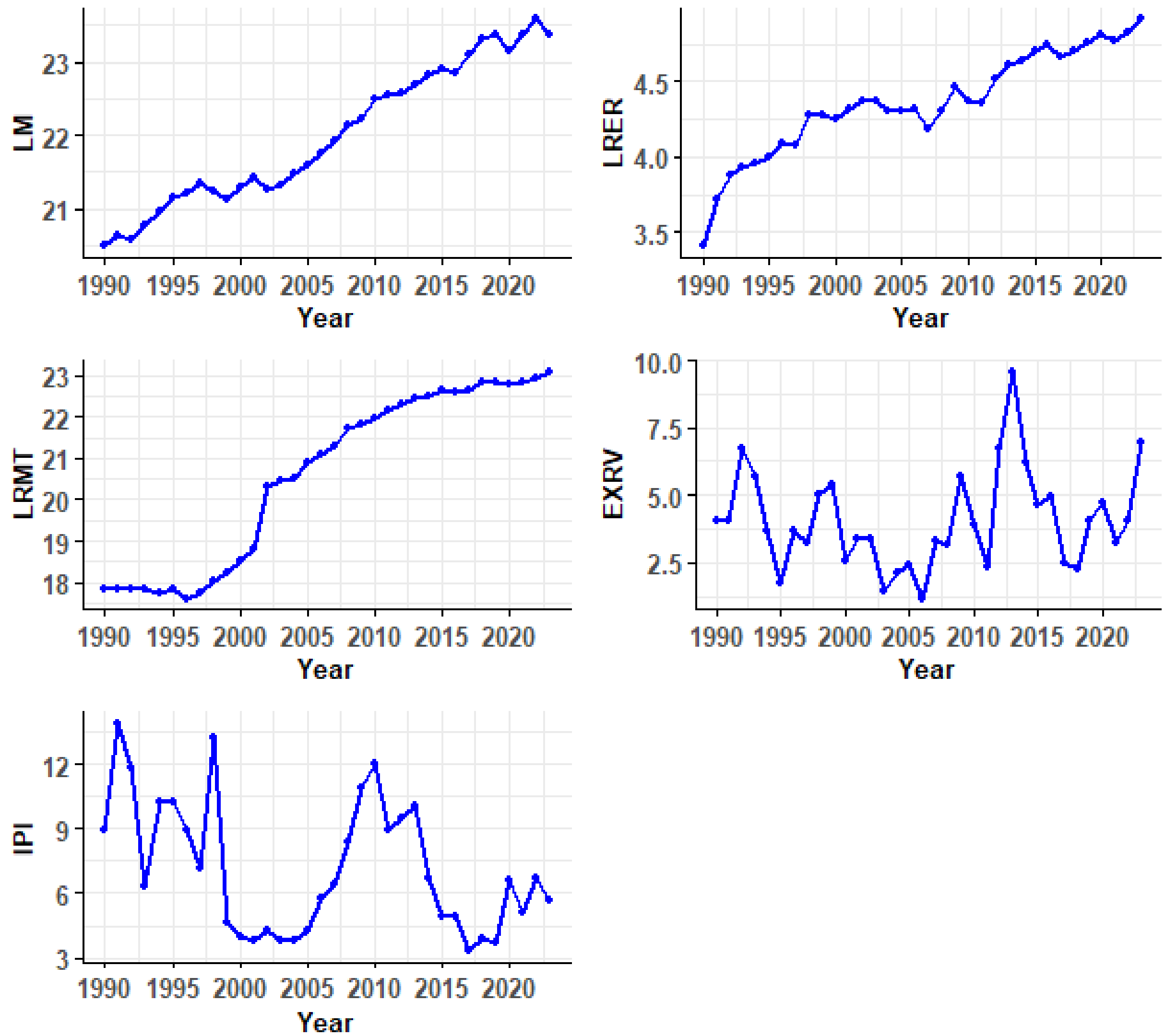
Imports are a fundamental component of international trade, enabling countries to acquire goods and services that their domestic production cannot supply. The structure of imports is heavily influenced by a country's level of economic development (Simionescu et al., 2017; Wiedmann et al., 2015). Import demand depends on income (Hummels & Lee, 2018), relative import price (Gopinath, 2020), real effective exchange rate (Arize et al., 2018), population (Balsvik et al., 2015), exchange rate volatility (Bahmani-Oskooee & Hegerty, 2007) and foreign exchange reserve (Al Abri et al., 2023). In advanced economies, imports primarily complement sophisticated industrial systems, providing inputs such as raw materials, capital goods, and specialized consumer goods that meet specific market demands. In contrast, developing economies rely more on imports to satisfy essential needs, including energy (Kaygusuz, 2012), machinery (Szirmai, 2012), and basic agricultural goods (Fader, 2013). In the context of Nepal, the import landscape is shaped by the country's landlocked geography, limited industrial base, and heavy dependence on remittances. It is particularly reliant on imports of key goods such as petroleum products, construction materials, machinery, and consumer goods, which are necessary to support domestic consumption and production activities (NRB, 2023).

From 1990 to 2023, Nepal's import has grown substantially. In 1990, the total imports were USD 785.78 million, and by 2023, they had surged to USD 14.19 billion. The imports increased at an average annual rate of around 10.2 percent, outstripping the growth of Nepal's GDP during many periods. The trend in imports is closely linked to key factors such as the country's growing population, rising income levels, urbanization, and infrastructure development. In the early 2000s, the import of capital goods, which include machinery, transport equipment, and petroleum products accounted for a large share of total imports, as the country sought to modernize its infrastructure and energy sectors. The import of petroleum alone increased from USD 243 million in 2000 to USD 2.5 billion by 2020. The exchange rate of the Nepalese Rupee against the US Dollar also plays a pivotal role in influencing import patterns. From 1990 to 2023, the NPR has depreciated from around NPR 29.37 per USD to approximately NPR 132.12 per USD. In 1990, the cost of imports was lower due to a more favorable exchange rate, whereas by 2023, the weakening of the NPR had significantly increased the price of imported goods, thereby contributing to inflationary pressures in the domestic economy.

The growth of imports in Nepal has been the substantial inflow of remittances, which have acted as a major source of foreign exchange reserves. Remittances increased from USD 202 million in 1990 to USD 10.72 billion by 2023, accounting for over 20 percent of Nepal’s GDP in recent years. This influx has provided a buffer for Nepal's balance of payments, enabling the country to finance its growing import needs without facing immediate liquidity crises. However, the strong reliance on remittances to support import growth has created a structural dependence that poses risks to long-term sustainability. While remittances have contributed to a rise in domestic consumption, they have also fueled the demand for imported consumer goods, further exacerbating the trade deficit. An overreliance on imports can expose developing economies to external shocks, including fluctuations in exchange rates, global price volatility, and inflationary pressures, which can lead to economic instability.

This paper aims to examine the import demand function of Nepal, in reference to exchange rates with a combination of selective macroeconomic variables like remittance, and Indian inflation.

Figure 1: Trend line of LM, LRMT, LRER, EXRV and IPI, 1990-2023



LITERATURE REVIEW

Dutta and Ahmed (1999) examine the long-run aggregate merchandise import demand function for Bangladesh between 1974 and 1994, using cointegration and error correction modeling approaches. The study finds a significant long-run equilibrium relationship between real imports, import prices, GDP, and foreign exchange reserves. Key determinants of the import demand function include real import prices, lagged real GDP, lagged real imports, and a dummy variable for import liberalization policies. Durmaz and Lee (2015) examine the long-run and short-run elasticities of Turkey's disaggregated import demand using data from 1980 to 2011. In the long run, the model's independent variables exhibit inelastic effects on imports, except for total consumption. The relative price variable has a positive short-run impact, suggesting importers struggle to adjust to price changes, leading to higher import costs. As a result, if imports exceed exports, Turkey's trade balance may worsen. Englama (2013) uses the ARDL technique with quarterly data from 1970 to 2011 to examine the aggregate import demand function for Nigeria. The results show that external reserves, domestic consumer prices, income levels, and the exchange rate are statistically significant, suggesting their importance in determining import levels. The short-run elasticity indicates that Nigeria's aggregate demand for imports is both price and income-elastic, meaning imports increase with higher economic activity and domestic prices.

Chen (2008) applies the bounds test to examine the long-run effect on Taiwan's real import demand function by real domestic income and relative prices. The results confirm the existence of a long-run relationship between aggregate import quantities and their determinants. The study also reveals that both short-run and long-run income elasticities are elastic, with short-run income elasticity being significantly higher than its long-run counterpart.

Wang and Lee (2012) estimate the import demand elasticity for China using fully efficient cointegrating regressions and the ARDL method. The study finds that real imports are cointegrated with domestic economic activity, the real effective exchange rate, and global risk perceptions. Domestic income is shown to have a significantly positive effect on imports, while the real effective exchange rate harms China. Abrishamii and Mehrara (2000) develop a model to estimate the beef import demand in Indonesia, using annual secondary data from 1990 to 2019, using the ARDL and the ECM model to analyze the long-run and short-run relationships, considering factors like income growth, domestic production, relative price, and exchange rate. The bounds test indicates that in the long run, GDP growth per capita, domestic beef production, and exchange rates do not significantly impact beef import demand, while the relative beef price between local and international markets has a significant effect. In the short run, GDP growth per capita and domestic beef production significantly affect import demand.

Hoque et al. (2010) investigate the impact of trade liberalization on aggregate import demand in Bangladesh, using the ARDL bounds test with annual data from 1972 to 2005. The study finds that trade liberalization through a reduction in import duties significantly increases imports in the short run, but has an insignificant effect in the long run. The simplification of non-tariff measures shows a modest positive long-run impact on imports. The interaction of liberalization with price slightly reduces imports, improving the trade balance, while interaction with income increases imports, worsening the trade balance. The paper concludes that income has greater elasticity than price, suggesting that increasing import duties to control imports may be ineffective, and a broader policy to promote domestic production, investment, and backward linkages is necessary to improve Bangladesh's trade balance and GDP growth.

Najafi (2020) estimates the demand for Iranian sugar imports, applying the ARDL model, focusing on Brazil and the UAE as major suppliers, using time series data from 1992 to 2016. The results show that a 1 percent increase in GDP raises the demand for sugar imports by 4.73 percent, while a 1 percent increase in relative prices and the exchange rate reduces the demand by 28 percent. Additionally, a 1 percent increase in Brazilian export rates leads to a 0.8 percent rise in sugar imports from Brazil compared to the UAE. The ECM reveals that 0.68 percent of the deviation in sugar imports from the long-term path is corrected in the subsequent period. The study concludes that policymakers should prioritize the exchange rate as a key factor influencing sugar imports.

RESEARCH METHODOLOGY

This study uses a time series econometric model to estimate Nepal's import demand function. The dependent variable, import expenditure, is analyzed with key independent variables: remittance, real exchange rate, exchange rate volatility, and Indian inflation. Previous studies, such as Mawutor et al. (2023) have examined the impact of remittance and the real exchange rate in Ghana, while Asteriou et al. (2016) analyzed the role of exchange rate volatility in MINT countries. Dhungel (2018) also explored Nepal's import demand, incorporating remittance, GDP, and CPI. Given that India is Nepal's primary import partner, including Indian inflation in the model is essential. Thus, Nepal's import demand function combines remittance, real exchange rate, exchange rate volatility, and Indian inflation.

Mathematically, the import demand function of Nepal can be framed as

$LM = f(RMT, RER, EXRV, IPI)$

Econometric model

$LM_t = \alpha + \beta_1 RMT_t + \beta_2 RER_t + \beta_3 EXRV_t + \beta_4 IPI_t + \mu$

Similarly, the log transformation of the above equation is

$LM_t = \alpha + \beta_1 LRMT_t + \beta_2 LRER_t + \beta_3 EXRV_t + \beta_4 IPI_t + \mu$

Where,

LM_t = *Logarithm of Import of Nepal at a time 't'*

$LRMT_t$ = *Logarithm of Remittance inflow to Nepal at a time 't'*

$LRER_t$ = *Logarithm of the Real exchange rate of Nepal to USD at time 't'*

$EXRV_t$ = *Logarithm of Exchange rate volatility of Nepal at a time 't'*

IPI_t = *Indian Inflation at a time 't'*

Nature and source of data

This study uses 34 years of annual data spanning from 1990 to 2023 obtained from the world development indicators of the World Bank. Data on remittance and Indian inflation can be used as it is, but the real exchange rate and exchange rate volatility have to be calculated separately. The real exchange rate reflects the true purchasing power of Nepal’s currency against foreign currencies after adjusting for inflation, calculated by the formula,

$$RER = EXR * \frac{\left(1 + \frac{NPI}{100}\right)}{\left(1 + \frac{USI}{100}\right)}$$

Where RER is the real exchange rate of Nepal, EXR is the nominal exchange rate, NPI is Nepal’s price index and USI is the US price index.

Similarly, the authors calculate the exchange rate volatility using a rolling window of 3 years. The data set spans 34 years. The volatility for each year is computed as the standard deviation of exchange rates over the preceding 3 years and is expressed by the formula,

$$EXRV_t - \sqrt{\frac{1}{W} \sum_{i=t-W+t}^{t} (EXR_i - \overline{EXR_t})^2}$$

$$Average\, EXRV = \frac{1}{T-2} \sum_{t=3}^{T} EXRV_t$$

Where $EXRV_t$ is the exchange rate volatility at the time ‘t’, ‘W’ is the rolling period, $\overline{EXR}$ is the mean exchange rate over the period W, and ‘T’ is the total number of periods in the data.

Stationary test

The selection of an appropriate time series model depends on the stationary level of parameters. For this, it is essential to conduct a unit root test. This paper incorporates the Augmented Dickey-Fuller test (Dickey & Fuller, 1979) and the Philips-Pearson test (Phillips & Perron, 1988) for the unit root test.

Autoregressive Distributed Lag (ARDL) Model

As long as the dependent variable is stationary at the first difference, the ARDL model is suitable for the independent variable being stationary at the level, at the first difference, or the combination of both as suggested by (Pesaran, 1996 & 1997). Then, the ARDL bound test is employed to examine the existence of long-run relationship, or co-integration in the model.

$$\Delta LM_t = \alpha_0 + \sum_{i=0}^{k1} \beta_1 \Delta LM_{t-i} + \sum_{i=0}^{k2} \beta_2 \Delta LRMT_{t-i} + + \sum_{i=0}^{k3} \beta_3 \Delta LRER_{t-i} + \sum_{i=0}^{k4} \beta_4 \Delta EXRV_{t-i} + \sum_{i=0}^{k5} \beta_5 \Delta IPI_{t-i} + \gamma_1 LM_{t-1} + \gamma_2 LRMT_{t-1} + \gamma_3 LRER_{t-1} + \gamma_4 EXRV_{t-1} + \gamma_5 IPI_{t-1} + \epsilon_t$$

Where,

= difference operator, α_0 is the intercept term, 'k' is the maximum lag length, 'i' is the number of lags, 'β' denotes short-run coefficients of the variables, 'γ' denotes long-run coefficients of the variables and 'ε_t' denotes the white noise error term.

The authors set up the hypothesis for testing long-run existence among variables as follows:

Null hypothesis:

H0: $\gamma_I = 0$ (Existence of no co-integration)

Alternative hypothesis:

H1:$\gamma_I \neq 0$ (Existence of co-integration)

The F-statistic determines whether a long-run relationship exists among the variables by comparing its value to critical bounds. Based on this comparison, there are three possible outcomes. If the F-statistic exceeds the upper bound of the critical value, the null hypothesis of no long-run relationship is rejected, indicating the presence of a long-run relationship between the variables. If the F-statistic is below the lower bound, it suggests no long-run relationship exists among the variables. And if the F-statistic falls between the critical bounds, no definitive conclusion can be drawn about the existence of a long-run relationship.

Once evidence of a long-run relationship is found, the Error Correction Model (ECM) is employed to analyze the short-run dynamics. The ECM allows for the estimation of short-run coefficients and the measurement of the lagged error correction term (ECM_{t-1}) which indicates how quickly the system returns to long-run equilibrium after a short-run deviation.

Hence, the short-run model of Nepal's import demand becomes:

$$\Delta LM_t = \theta_0 + \sum_{i=0}^{n} \theta_1 \Delta LM_{t-i} + \sum_{i=0}^{n} \theta_2 \Delta LRMT_{t-i} + + \sum_{i=0}^{n} \theta_3 \Delta LRER_{t-i} + \sum_{i=0}^{n} \theta_4 \Delta EXRV_{t-i} + \sum_{i=0}^{n} \theta_5 \Delta IPI_{t-i} + \gamma ECM_{t-1} + \epsilon_t$$

Where γ is the error correction mechanism or the speed of the adjustment parameter. The ECM is used to measure the speed of short-run disequilibrium towards long-run equilibrium (Narayan & Narayan 2005).

$$ECM_{t-1} = \gamma_1 LM_{t-1} + \gamma_2 LRMT_{t-1} + \gamma_3 LRER_{t-1} + \gamma_4 EXRV_{t-1} + \gamma_5 IPI_{t-1} + \epsilon_t$$

Diagnostic tests

The authors perform several statistical tests such as serial correlation test, autocorrelation test, heteroskedasticity test, multicollinearity test, normality test, the RAMSEY test, and the CUSUM and CUSUM square tests.

RESULTS AND FINDINGS

Descriptive statistics

The descriptive statistics for the variables LM, LRMT, LRER, EXRV, and IPI highlight key aspects of their distributions and variability as shown in Table 1.

Table 1: Descriptive statistics of the variables

Variable	LM	LRMT	LRER	EXRV	IPI
Mean	22.00	20.60	4.35	4.05	7.14
Median	21.83	21.18	4.34	3.81	6.49
Maximum	23.58	23.09	4.91	9.58	13.87
Minimum	20.48	17.60	3.40	1.16	3.32
S.D.	0.95	2.09	0.34	1.82	3.05
Skewness	0.12	-0.33	-0.56	0.84	0.58
Kurtosis	1.64	1.42	3.12	3.80	2.19
Jarque-Berra	2.67	4.18	1.82	4.96	2.84
Sum	748.02	700.56	148.18	138.00	242.79
Sum Sq. Dev	30.27	145.52	3.95	109.59	308.11
Observations	34	34	34	34	34

Unit root test

According to Pesaran et al. (2001), the first step before proceeding with the ARDL bounds testing is the determination of the order of integration to ensure that the time series are either I (0) or I (1) but not I (2). The Augmented Dickey-Fuller test and Philips-Pearson for the unit root test as shown in Tables 2 and 3 suggest that all the variables are of order I (1), meaning that they are non-stationary at the level but become stationary after the first difference. However, making variables stationary by differencing is unnecessary because the ARDL model can be performed at I (1) (Pesaran, Shin, & Smith, 2001).

Table 2: Augmented Dickey-Fuller (ADF) unit root test

Variable	At level			At first difference			Order
	None	Drift	Trend	None	Drift	Trend	
LM	3.03	-0.52	-2.20	-3.17***	-5.59***	-5.46***	I (1)
LRMT	2.34	-0.77	-1.20	-2.39***	-3.27***	-3.28***	I (1)
LRER	2.18	-1.37	2.18	-4.63 ***	-5.95***	-5.81***	I (1)
EXRV	-0.80	-3.39	-3.41	-6.44***	-6.32***	-6.31***	I (1)
IPI	-1.47	-2.59	-2.47	-5.60***	-5.59***	-5.59***	I (1)

Note: *** p<.01, ** p<.05, * p<.1

Table 3: Philips-Pearson (PP) unit root test

Variable	At level		At first difference		Order
	Constant	Trend	Constant	Trend	
LM	-0.6	-2.21	-5.53***	-5.39***	I (1)
LRMT	-0.65	-0.96	-4.88***	-4.78***	I (1)
LRER	-2.85	-4.87	-6.59***	-6.33***	I (1)
EXRV	-3.15	-3.14	-6.04***	-5.97***	I (1)
IPI	-2.74	-3.09	-8.22 ***	-8.22***	I (1)

Note: *** p<.01, ** p<.05, * p<.1

Lag length selection criteria

Ng and Perron (2001) and Liew (2004) discuss various criteria for selecting the optimal lag length in time series models. One of the most commonly used methods is the Akaike Information Criterion (AIC), which helps determine the ideal lag length for models such as autoregressive (AR) models. In addition to AIC, other widely recognized lag length selection criteria include the Hannan-Quinn Criterion (HQ), the Schwarz Criterion (SC), and the Final Prediction Error (FPE). Thus, the optimal lag length for LM, LRMT, LRER, EXRV, and IPI are 5, 1, 3, 4, and 9 given that the authors rely on AIC. The details of the lag length selection criteria are shown in Table 4.

Table 4: Lag length selection criteria for the variables

Variable	Criteria			
	AIC	HQ	SC	FPE
LM	5	5	5	5
LRMT	1	1	1	1

LRER	3	3	3	3
EXRV	4	1	1	4
IPI	9	5	1	5

ARDL bound test

The next step is to examine the existence of the long-run relationships between model variables by applying the bounds-testing approach to cointegration. The results of the F-test indicate the presence of cointegration between the variables. The calculated F-value is 10.32, which is significant at the 10% level, 5% level, and 1% level when compared to the critical values for both the I (0) and I (1) series. Since the F-value exceeds the critical values for both the I (0) and I (1) cases at the 5% and 1% significance levels, it is concluded that there is evidence of cointegration between the variables. The ARDL co-integration result is shown in Table 5.

Table 5: Pesaran, Shin, and Smith (2001) cointegration test

		F-test		
F-value	10.32***	**Critical value**	**I (0)**	**I (1)**
		10%	2.46	3.46
Observation	33	5%	2.947	4.088
K	4	1%	4.093	5.532
Case	2			

Note: *** p<.01, ** p<.05, * p<.1

Short-run and long-run estimates of the ARDL model

The error correction term is negative and highly significant, indicating that approximately 34% of any deviation from the long-run equilibrium is corrected in each period.

A 1% increase in the real exchange rate decreases imports by 0.59% in the current period. However, in the subsequent period, a 1% increase in the real exchange rate increases imports by 0.57%. Exchange rate volatility positively and significantly impacts imports in both the current period and with a lag. A 1 unit increase in exchange rate volatility increases imports by 5% in the current period and by 4.2% two periods later. Surprisingly, Indian inflation has a mixed effect on Nepal's imports. In the current period, higher Indian inflation slightly increases Nepalese imports, a 1 unit increase in Indian inflation leads to a 0.01% increase in Nepal's imports. However, lagged inflation reduces imports, and the effect turns negative in the subsequent periods, reducing imports by 0.07% and 0.04%, respectively. Similarly, for remittance, a 1% increase in remittance inflows raises imports by 0.11% in the current period, reflecting higher disposable income for households. In the next two periods, the effect turns negative, with a 1% increase in remittances reducing imports by 0.31% and 0.18%, respectively.

Meanwhile, a 1% increase in imports in the previous period reduces imports in the current period by 0.49%, and this effect becomes stronger in subsequent periods, reaching 0.66% after three lags.

Table 6: Short-run coefficients using ARDL (Autoregressive order: 4 and p-orders: 2 3 3 3)

Variable	Estimate	Std. Error	t-value	p-value
ECM (-1)	-0.34	0.02	-14.72	0.00***
dLRER (t)	-0.59	0.11	-5.43	0.00***
dLRER (-1)	0.57	0.10	5.63	0.00***
dEXRV (t)	0.05	0.00	7.90	0.00***
dEXRV (-1)	0.00	0.00	1.31	0.22
dEXRV (-2)	0.042	0.00	8.92	0.00 ***
dIPI (t)	0.01	0.00	4.92	0.00 **
dIPI (-1)	-0.07	0.00	-12.67	0.00 ***
dIPI (-2)	-0.04	0.00	-13.70	0.00 ***
dLRMT (t)	0.11	0.02	4.46	0.00 **
dLRMT (-1)	-0.31	0.02	-11.43	0.00 ***
dLRMT (-2)	-0.18	0.03	-5.46	0.00 ***
dLM (1)	-0.49	0.06	-7.32	0.00***
dLM (2)	-0.54	0.06	-8.53	0.00 ***
dLM (3)	-0.66	0.09	-6.97	0.00 ***
R-squared	0.99	Adj. R-squared	0.96	
S.E. of residuals	0.02	F-statistic	47.68 (0.00)	

Note: *** p<.01, ** p<.05, * p<.1

Similarly, in the long run, the coefficient for the real exchange rate is -2.53 suggesting a 1% increase in real exchange rate reduces imports by approximately 2.53%. Similarly, the coefficient for exchange rate volatility is 0.05 indicating a positive long-run relationship with imports. A 1% increase in exchange rate volatility results in a 5% increase in import demand. This counterintuitive result may reflect precautionary behavior among importers, who stockpile goods in response to anticipated future instability in exchange rates. Meanwhile, the long-run coefficient for Indian inflation is 0.12 suggesting that a 1% increase in India's inflation rate is associated with a 0.12% increase in Nepal's imports. This modest positive relationship could be due to Nepal's heavy reliance on Indian goods, which may still be competitive despite rising costs, owing to geographic proximity and established trade agreements. Regarding the remittance, the coefficient is 0.54% demonstrating a positive and substantial long-run elasticity of imports to remittances. A 1% increase in remittances results in a 0.54% increase in imports, underscoring the pivotal role of remittances in driving import demand in Nepal.

Table 6: Long-run coefficients using ARDL

Variable	Estimate
LM	-0.34
LRER	-2.53
EXRV	0.05
IPI	0.12
LRMT	0.54

DISCUSSION

The Error Correction Term (ECT) in the model is negative and highly significant indicating that short-run deviations from equilibrium are adjusted over time.

In the short run, the real exchange rate has a mixed impact on imports, initially showing a negative effect, followed by a positive impact in the subsequent period which is consistent with the J-Curve effect. Initially, imports decline due to higher costs, but over time, contracts and consumption habits adjust, restoring import levels. This result supports previous studies that have documented the J-curve phenomenon, such as Narayan and Narayan (2004). However, in the long run, the real exchange rate reduces imports making the imported goods more expensive which supports the findings of Matlasedi (2017). Similarly, the exchange rate volatility is found to significantly impact imports in both the current and subsequent periods. This positive relationship does not align with the previous studies by Alam (2012) and Sharma and Pal (2019) who argue that greater volatility in exchange rates reduces import. This counterintuitive result may suggest speculative behavior. It may cause firms to stockpile imports to mitigate future risks, which can lead to higher import demand in the short run in response to uncertain exchange rate conditions. Volatility might encourage importers to front-load imports to avoid potential future cost increases.

Indian inflation shows a positive impact in the current, but a negative impact in the subsequent periods, particularly in the short-run. Given Nepal's heavy reliance on Indian imports due to geographic proximity and trade agreements, even with inflationary pressure, these goods may still be preferred in the immediate term due to limited substitutes in the long run.

Similarly, current remittance inflows positively influence imports, as higher remittances increase disposable income and demand for imported goods. However, lagged negative effects suggest a saturation point: as households allocate remittances to savings or investments, their propensity to consume imported goods declines over time. In the long run, remittance induces import demand which aligns with the previous findings of Bashier (2018), Jaupllari and Zoto (2013), and Mishra et al. (2022). Similarly, the previous period's imports have a significant negative effect on current-period imports. This suggests that increased imports in the past may result in a reduction in current imports, possibly due to inventory adjustments or changes in the overall demand for imported goods.

Diagnostic test

The results of the diagnostic tests suggest that the model performs well across various assumptions. The Breusch-Godfrey test for autocorrelation returned a value of 1.20 with a p-value of 0.47, indicating no evidence of serial autocorrelation. Similarly, the Ljung-Box test yielded a value of 0.27 and a p-value of 0.59, further confirming the absence of autocorrelation. The Variance Inflation Factor (VIF) test for multicollinearity reported a value of 4.08, suggesting no multicollinearity issues. The Breusch-Pagan test for homoskedasticity showed a value of 18.78 and a p-value of 0.47, supporting the assumption of homoskedasticity. The Shapiro-Wilk test for normality of residuals returned a statistic of 0.97 with a p-value of 0.77, indicating that the residuals follow a normal distribution. Lastly, Ramsey's RESET test for model specification produced a value of 0.55 and a p-value of 0.60, suggesting no model misspecification. Overall, the diagnostic tests indicate that the model meets the required assumptions for reliable inference.

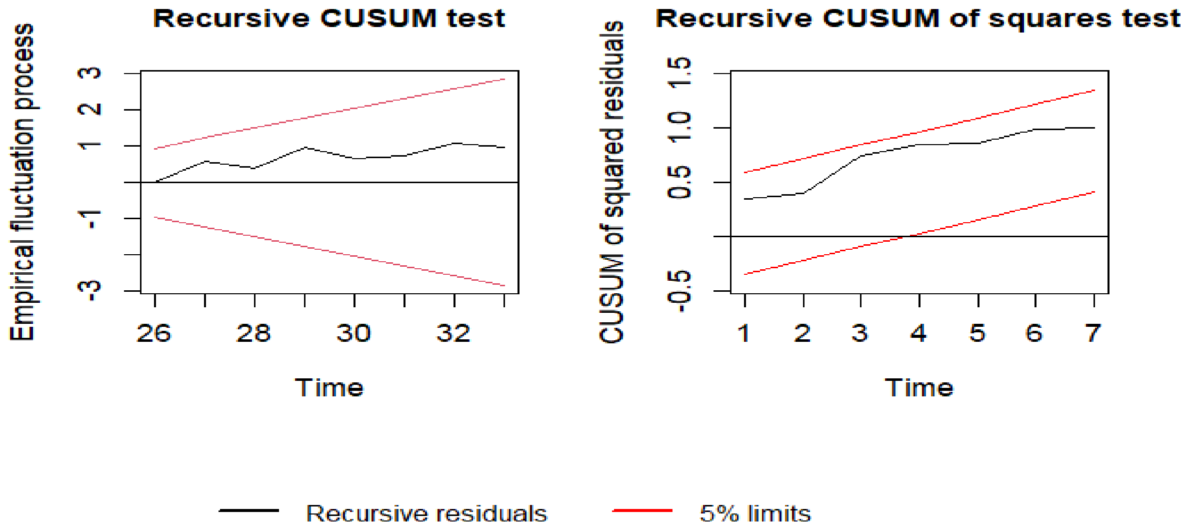
Table 8: Diagnostic test results

Diagnostic test	Value	p-value	Result
Breusch-Godfrey test for the autocorrelation	1.20	0.47	No serial autocorrelation
Ljung-Box test for the autocorrelation	0.27	0.59	No autocorrelation
VIF test of multicollinearity	4.08		No multicollinearity
Breusch-Pagan test for the homoskedasticity	18.78	0.47	Homoskedasticity
Shapiro-Wilk test of normality	0.97	0.77	Normality of residuals
Ramsey's RESET test for model specification	0.55	0.60	No model misspecification

Structural break test

The stability of the model was evaluated using CUSUM and CUSUM of Square. The results showed that the values of the recursive residuals and CUSUMSQ stayed within the 5% critical limits, represented by two red lines as shown in Figure 2. This indicates that both the long-run and short-run parameters of the model are stable, meaning the model's structure does not change significantly during the analysis period.

Figure 2: CUSUM test and CUSUM of square test for stability of the coefficients



CONCLUSION

This study examines the import demand function for Nepal over 34 years (1990–2023) using a time series econometric model, analyzing the effects of key determinants such as remittances, real exchange rate, exchange rate volatility, and Indian inflation on imports. The study shows that Nepal's import demand is income-elastic concerning remittances. This suggests that imports are responsive to changes in income, and remittances significantly boost household purchasing power, thereby increasing demand for imported goods. Policymakers should focus on leveraging remittances to boost domestic investments and savings. And, policy should encourage the productive use of remittances in sectors such as domestic industry could reduce reliance on imports and promote more sustainable economic growth. On the other hand, the price elasticity of imports concerning exchange rates is negative and significant. This indicates that Nepal's import demand is price-elastic, meaning that imports are highly responsive to changes in the exchange rate, particularly when the prices of imported goods rise due to currency depreciation.

The study also identifies the J-curve effect, where the immediate impact of exchange rate depreciation is negative, causing a reduction in imports due to higher prices. However, in subsequent periods, the effect turns positive as the adjustment in consumption and trade volumes takes place, showing that over time, imports may stabilize or even increase as importers adjust to the new price levels. Exchange rate volatility, though counterintuitive, also has a positive relationship with imports, suggesting that importers may increase imports in anticipation of future exchange rate fluctuations, possibly to hedge against uncertainty. So, it becomes increasingly important for policymakers should focus on reducing exchange rate uncertainty by enhancing market transparency, strengthening financial infrastructure, and improving currency management to mitigate inefficiencies and stabilize trade.

Indian inflation has a modest positive effect on Nepal’s imports, indicating that despite rising inflation in India, Nepal continues to rely heavily on Indian imports, owing to geographic proximity, insufficient domestic production, and trade agreements. It increases the import cost of Nepal. Policymakers should control domestic inflation and reduce reliance on a single import source by diversifying trade partnerships and exploring new markets, while pursuing trade agreements to mitigate vulnerability to external inflation shocks, especially from India.

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