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TWIN DEFICIT HYPOTHESIS: A CASE STUDY OF NEPAL

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ABSTRACT

This article explores the relationship between the budget deficit and trade deficit in Nepal based on the time series data from 1975 to 2021. The author used the econometric autoregressive distributive Lag (ARDL) model in this study. The study has empirically proven that Nepal's budget deficit has not contributed to the current speedily growing trade deficit in the long run, and the so-called twin deficit hypothesis does not exist. The reasons for the weak relationship between the trade deficit and budget deficit, in the long run, are strong revenue mobilization for government financing and less mobilization of fiscal deficit. Similarly, a significant proportion of the fiscal deficit is financed through external loans in Nepal, which is a reason not to directly affect the trade deficit by crowing out the effect of the private sector. Likewise, Nepal's twin deficit does not hold because of the fixed exchange rate regime with major trading partner India and capital control.

1. Introduction

The nexus between fiscal deficit and trade balance is an issue to be examined in the context of Nepal, as the economy has been facing retarded economic growth and a huge trade deficit despite the government's efforts through its fiscal policy instrument, among others. Fiscal policy refers to a fundamental government economic policy that positively intervenes in the economy through three key instruments: government revenue, public expenditure, and deficit financing. Most governments undertake deficit financing policies to fill the gap between revenue potential and expenditure needs through external and internal debt.

The trade balance is crucial for stabilizing the economy and forming conducive circumstances for economic development. The country's aggregate expenditure comprises consumption, investment, and government expenditure. If domestic expenditure is more than domestic production, there would be an external imbalance or trade deficit. The twin deficit hypothesis argues that actual budget deficits encourage higher domestic income and demand, eventually fostering imports and creating a trade deficit (Aslan et al., 2014). Moreover, fiscal measures are essential for the government to encourage exportable commodities, build trade infrastructures and logistics, and promote exports that eventually obtain a trade balance.

On the other hand, the neoclassical model, which is also called the intertemporal approach, incorporates the dynamic behavior of economic factors, including rational expectations, intergenerational altruism, the absence of credit constraints, and non-discretionary taxes. The neoclassical economist stated that there is no dependence between private actual spending and trade accounts with the means of government financing its expenditures.

Nepal remains a lower-middle-income country with a small economy around the globe, and it will graduate from the least developed countries (LDC) status in 2026[1]. The country has been facing an unstable economic growth rate primarily based on consumption rather than investment and production. Despite the fifteenth plan targeted an average 9.6 percent economic growth rate during the plan period from 2019 to 2023 (National Planning Commission Nepal, 2019), the growth rate of the last three years of the planning period indicates weak progress against the estimation.

The time series data show that the average annual economic growth rate during the last 10 years, 20 years, and 30 years is 4.4 percent, 4.1 percent, and 4.3 percent, respectively (The World Bank Group, 2022), which is retarding growth rate as many developing countries obtained a high growth rate during the short period. Similarly, the government is struggling with external sector stress due to poor export performance. The data show that the average annual export growth rate during the last 10 years, 20 years, and 30 years is 4.7 percent, 5.3 percent, and 6.6 percent, respectively(The World Bank Group, 2022). Likewise, the trade deficit in 2000 was around 15.5 percent of GDP, which was more than 35.5 percent in 2021(Department of Customs Nepal, 2022). Similarly, out of the total trade volume in Nepal in 2022, the exports contributed around 10.0 percent only. Similarly, due to this enormous trade deficit of around 35.0 percent of GDP and the negative balance of service receipt, the country's current account deficit is around 13.0 percent of GDP in 2022, which is also remarkably high (Nepal Rastra Bank, 2022).

Therefore, at the outset, the researcher in this study examines the role of fiscal policy on trade balance in the Nepalese context. The researcher examines whether the twin deficit hypothesis exists in Nepal and finds the proper channel to influence the trade balance positively through government fiscal policy measures.

2. Literature Review

The core functions of the fiscal policy are to provide public goods, distribute income and wealth, maintain high employment and stability, accelerate economic growth, and affect trade balance (Musgrave & Musgrave, 1989). Fiscal policy plays a vital role in expanding the economy's size by creating a conducive environment for private investment. In addition, the government also attempts to maintain economic stability through its fiscal measures, which are prerequisites for the economic prosperity of the particular economy.

Verma (2020) mentioned that fiscal deficit is a principal fiscal policy instrument to finance the deficit through internal and external debt when government expenditure transcends government revenue. As per the author, another way of deficit financing is the seigniorage monetary way of financing in which the central bank issues the new currencies against government securities; however, it creates inflationary pressure in the economy due to an increase in money supply through printing money. A fiscal deficit is a good policy instrument to create demand in the economy during a recession, and it can support capital creation if invested in productive expenditure.

Aslan et al. (2014) described the two major types of the relationship between foreign balance and fiscal policies. The first model is the traditional approach, which is in line with the Keynesian approach, and the second is an intertemporal approach, also called the neoclassical approach. As per the authors, the first approach argues that savings and investment do not vary in response to fiscal policy changes, which is called the twin deficit hypothesis. As per the traditional approach, the relationship between two deficits is determined through direct and indirect channels. The direct channel says that real budget deficits encourage higher domestic income and demand, eventually fostering imports and creating a trade deficit. The second channel is the exchange rate channel, in which budget deficits will foster interest rate and capital inflow, resulting in the appreciation of domestic currency and trade deficits. However, in a fixed exchange rate regime, fiscal expansion results in a price hike in the domestic market, but the price of foreign commodities remains the same. As a result, imports will be encouraged due to a real appreciation of the exchange rate. Therefore, as per the traditional approach, both direct and indirect channels conclude the occurrence of the twin deficit hypothesis.

Aslan et al. (2014), on the other hand, also argued about the neoclassical model, also called the intertemporal approach, which incorporates the dynamic behavior of the economic factors, including the rational expectations, intergenerational altruism, absence of credit constraints, and non-discretionary taxes. The neoclassical economist

[1] United Nations, General Assembly resolution (2021), https://www.un.org/ldcportal/content/nepal-graduation-status.

stated that there is no dependence between private real spending and trade accounts and the means by which the government finances its expenditures.

Other research papers also align with the relationship between fiscal policy and trade balance. Keynesian absorption approach mentions that an increase in the budget deficit increases domestic absorption and import (Baldacci et al., 2004). Similarly, the Ricardian Equivalence Hypothesis argues that the fiscal deficit or taxes do not affect external sector performance. If the government increases expenditure, consumers save and pay expected future taxes (Bernheim, 1988). The twin deficit hypothesis states that a rise in the government budget deficit increases the interest rate, which fosters inward capital movement, which eventually appreciates the exchange rate and escalates the current account (Banday & Aneja, 2019).

Sakyi and Opoku (2016) mentioned the theoretical framework of the two-deficit hypothesis differently, based on the national income identity in an open economy. The current account balance is the summation of net export and net factor income from abroad, whereas saving is decomposed into two parts: private and government savings. Furthermore, if we combine current account balance, private saving and government saving, It shows that the private saving deficit and fiscal deficit determine the current account deficit.

On the contrary, the twin divergence hypothesis had evolved instead of twin deficits in the 1990s. Kim and Roubini (2008) discussed that the twin divergence hypothesis occurred in the US economy due to the growing current account deficit and fiscal surplus, particularly after the IT and new economic bubble bursting in 2000-2002. The authors found that the government deficit shocks can improve the current account balance and depreciate the real exchange rate in the short run. This kind of improvement was mainly because of the increment in private savings and fall in private investment due to real interest rate hikes and depreciation of the real exchange rate due to nominal exchange rate depreciation. The authors finally said in this paper that twin divergence occurs only when considering exogenous shocks.

Lane (2013) explained that the standard intertemporal model in which government spending creates a current account deficit and a temporary increase in government consumption boosts domestic demand and generates a current account deficit and real appreciation in the new open economy macroeconomic model. In contrast, the author argued that an increase in government consumption permanently does not impact the current account but rather has a positive consequence on the current account in the standard intertemporal model. Moreover, the author argued about the role of fiscal policy in external adjustment and mentioned that the contraction of government spending on non-traded goods pushes a decline in the price of non-traded goods and depreciates the exchange rate. Similarly, a tax reduction is also a mechanism to depreciate the currency as it lowers the cost of domestic labor.

Ali Abbas et al. (2011) explained the Mundell- Fleming model under a flexible exchange rate regime in a small open economy in which the expansionary fiscal policy crowds out the net export as a rise in demand for home goods and money and an appreciation of the domestic currency. However, suppose the capital account is relatively closed, in that case, the rise in interest rate results in crowding out investment and raising private savings, and the impact on currency and trade will be softened. On the other hand, under the fixed exchange rate regime, the central bank policy to respond to the interest rate-seeking capital inflows would reinforce the output multiplier and mitigate the crowding-out effect on net exports.

Similarly, Ali Abbas et al. (2011) discussed the intertemporal response channel in which forward-looking agents consider future events in their current decisions. If the fiscal measure of the government is financed by the debt, the agents believe that the government must increase the future taxes to offset the current fiscal deficit, and therefore, the current value of future income will be lower. The agents thus induce lower private consumption and higher labor supply in the present, and both effects seek to improve the trade balance and push the economy towards the Ricardian outcome. Afonso and Coelho (2022) concluded that government balance has a stronger and more positive effect on the current account balance in high-budget deficit countries and low-export countries than in Eurozone countries, low-budget-deficit countries, and high-export countries. Kafle et al. (2022) proved a positive relationship between trade deficit with the openness of trade and inflation and an inverse relationship with the real exchange rate in the short run.

Teletar (2022) tested the long-run relationship between budget deficits and current account deficits in the Turkish economy with nonlinear time series analysis by using the period of 1994-2021. As per the co-integration result, the

current account and budget balance variables are co-integrated and move together in the long run. Moreover, the result showed that an increase in the current account deficit caused a decrease in the budget deficit in the Turkish case, which justified the reverse causal relationship. The key conclusion of this paper is that there is a negative reverse causality hypothesis of budget balance and current account balance in the Turkish economy and a reverse long-run and long-run relationship between the current account balance and the budget balance. Jackson and Jabbie (2020) examined the existence of the twin deficits hypothesis in Sierra Leone by applying the data from 1980 to 2018. The authors used Granger causality and fully modified ordinary least squares regression analysis. As per the result of both the correlation and Granger causality tests, there was a strong relationship and unidirectional causation between fiscal deficit and current account balance.

Gebremariam (2018) explored the connection between the government budget deficit and the current account deficit in Ethiopia by using data from 1976 to 2015. As per the result of the vector error correction model, the budget deficits are negatively related to the current account deficit. The conclusion of the paper is not consistent with the Ricardian Equivalence hypothesis. Badinger et al. (2017) investigated the association between fiscal balance and current account balance, emphasizing the role of fiscal rules. The study's key finding is that there is a positive association between the fiscal balance and the current account balance, which aligns with the twin deficit hypothesis. The authors found that there is no robust evidence for a direct effect on the current account.

Aloryito et al. (2016) tested the twin deficits hypothesis in Sub-Saharan Africa using data from 41 countries from 2000 to 2012. The key findings of this paper said that fiscal deficit could contribute to improving the current account only during slumps, and the interest rate would boost to crowd out private investment. However, it underpins the private savings and real depreciation of the exchange rate. Mumtaz and Munir (2016) examined the twin deficit hypothesis in South Asian countries, Bangladesh, India, Pakistan, and Sri Lanka using the data from 1981 to 2014. The empirical finding of this paper proved that there is no evidence of the relationship between budget deficit and current account deficit in South Asian countries, and the private savings-investment balance also does not influence the current account.

On the contrary, there are a number of studies that empirically proved the negative relationship between fiscal instruments and external sector balance.

Nautiyal et al. (2023) revisited the existence of the twin deficit hypothesis in the context of India and also covered the transmission process of fiscal variables to affect the external sector variables. The findings of this paper approved the twin deficit hypothesis in India and rejected the Ricardian equivalence hypothesis. The paper interpreted that the fiscal deficit underpins domestic consumption and import as well as discourages India's capital investment which is primarily funded by domestic savings. Kharel and Kharel (2020) examined the relationship between the trade deficit and budget deficits in the case of Nepal by using the time series data from 2003/04 to 2018/19, as both deficits have been an increasing trend for a long time. The result showed that there is a positive association between budget deficit and trade deficit.

Reed et al. (2019) analyzed the relationship between budget deficit, current account deficit, and government debt sustainability during the period of 1974 to 2015 in the Iranian economy by using the VAR model. The result showed that there is a relationship among the variables used in the model and found that there is a significant and long-term relationship between budget deficit, current account deficit, and government debt sustainability. Banday and Aneja (2016) examined the relationship between fiscal deficit and current account deficit in the Indian case when the Indian economy was affected by the balance of payment crisis, Asian crises, and financial crisis from 1990 to 2013. The models used in this paper said that budget deficits have a significant long-run effect on the current account deficit, and the current account deficit has a significant long-run impact on the budget deficit, which is also said to have bidirectional causality between each other.

Erdoğan and Yıldırım (2014) investigated the connection between budget deficit and current account deficit in Turkey by using time series quarterly data from 2001 to 2012. The statistical result showed that the budget deficit harms the current account deficit in the long term, and this effect is meaningful. Elhendawy (2014) showed the short-run and long-run association between budget deficit and current account balance in Egypt by using an error correction model (ECM) analysis. The empirical result of this paper clearly found that there is a long-run relationship between the budget balance and the explanatory variables.

Perera and Liyanage (2012) empirically investigated the relationship between budget deficits and current account deficits in Sri Lanka from 1960 to 2009. The empirical results proved that a long-run relationship and causality is running from budget deficits to current account deficits. Ratha (2012) tested the twin deficit hypothesis in India by using monthly and quarterly data from 1998 to 2009. The author found that both deficits are in the opposite direction, indicating no long-run co-movement between the two deficits as per the statistics. The author empirically proved from this paper that a twin deficit hypothesis exists in the Indian economy and suggested that the government of India can undertake a fiscal restraint policy to reduce the trade deficit in the short run.

This study has attempted to capture the effect of deficit financing the trade balance which is essential to explore based on experience and to seek possible solutions for future effective fiscal policy mobilization in Nepal.

3. Research Methodology

The model has been formed based on the traditional approach in which budget deficits directly result in higher domestic demand that stimulates import and boosts further trade deficit, also called the twin deficit hypothesis.

In this model, the trade deficit is the dependent variable, the budget deficit is the independent variable, and the real GDP growth rate, real exchange rate, and trade openness (total trade volume) are the other control variables. Theoretically, a country produces specialized goods and exports to partner countries, which helps to maintain the trade balance. Therefore, it is indispensable to incorporate real GDP as a control variable in the estimation process. Likewise, as exchange rate and trade openness are key determinants of international trade, these variables are used as control variables. The government's recurrent expenditure is used as an alternative to trade deficit in the estimation process to ensure a robust result. The real GDP growth rate has been taken as a proxy base of the economy's overall size, which influences the trade balance. The exchange rate represents the financial stability variable, and total trade volume represents the trade openness indicator that is the prerequisite for international trade.

3.1. Data and the source

The secondary source of data was collected from different government publications, such as the Central Bureau of Statistics, Ministry of Finance, and Nepal Rastra Bank, as well as data series from the World Bank and International Monetary Fund. The data has been used in the econometric models and other descriptive analyses. The annual time series data of different variables from 1975 to 2022 has been used for econometric analysis to test fiscal policy's consequences on trade balance and economic growth. Similarly, the relationship between fiscal policy and export performance was tested using the panel data series from 2009 to 2021. All the data series have been tested for stationary in time series to avoid the possibility of spurious relationships and have been cleaned before starting the econometric analysis.

3.2. Model Specification

The theoretical link between fiscal policy and trade balance could be postulated through simple macroeconomic identity. A country's aggregate expenditures consist of consumption, investment, and government expenditures. If domestic expenditures exceed domestic production, there would be an external imbalance or trade deficit (Aslan et al., 2014).

$$CAB= (S-I)+ (T-G) \text{ ……..(1)}$$

Where CAB= Current account balance, S= household saving, I= Investment, T= tax and G= government expenditure

Therefore, the current account balance can be defined as the sum of private savings over investment and the budget deficit. If we suppose investment and savings are identical, then

$$CAB_t = BD_t + \varepsilon_t \text{ ……..(2)}$$

In Which, ε_t is a vector of other variables that affect the current account balance, and BD is a budget deficit.

3.3. The model and variables

As the trade deficit is the larger component of the current account, the trade deficit has been taken as the dependent variable to examine the objective of this research. The model in this study is based on the theoretical model, which shows that budget deficits affect trade deficits through direct channels. The model is as follows,

$$TD_t = \alpha_1 + \beta_1 BD_t + \beta_2 RGDP_t + \beta_3 REER_t + \beta_4 TO_t + U_t ..(3)$$

In which, TD= Trade Deficit/ GDP ratio, RGDP= real Gross domestic product growth rate, BD= budget deficit/ GDP ratio, REER= Real Exchange rate, and TO= trade openness/ GDP growth rate, α= constant term, $\beta_1 \ldots . \beta_4$ = slope parameters and U= random error term.

Econometric method and tools

The Autoregressive Distributive Lag Model (ARDL) has been used to examine the long-run and short-run relationship between fiscal policy and trade balance. The classical least square theory may not be directly applicable to estimating the ARDL model due to the presence of stochastic explanatory variables and the possibility of serial correlation(Gujarati, 2022). There are several methods of conducting the cointegration test, and the OLS-based ARDL approach has become popular in recent years (Shrestha & Chowdhury, 2005).

ARDL model can be applied when the variables are of a different order of integration (Pesaran & Pesaran, 1997). It takes a sufficient number of lags to capture the data-generating process in general to specific modelling framework (Laurenceson & Chai, 2003) and a dynamic error correction model can also be derived from ARDL (Banerjee et al., 1993).

The short term ARDL model has been applied as follows,

$$\Delta TD_t = \alpha_0 + \sum_{i=1}^{m-1} \alpha_{1i} \Delta TD_{t-i} + \sum_{i=0}^{m-1} \alpha_{2i} \Delta BD_{t-i} - \theta EC_{t-1} + U_t \ldots\ldots(5)$$

The long term ARDL model has been applied as follows,

$$TD_t = \alpha_0 + \sum_{i=1}^{m-1} \alpha_{1i} TD_{t-i} + \sum_{i=0}^{m-1} \alpha_{2i} BD_{t-i} + U_t \ldots\ldots(6)$$

Where,

TD_t = Trade deficit in year t

TD_{t-i} = Trade deficit on certain lags

BD_{t-i}= Budget deficit on certain lags

EC_{t-1}= Error correction term

U_t= Error

The expected sign of the budget deficit was supposed to be negative as the budget deficit increases; the aggregate demand in the economy goes up, fostering import in Nepal due to the supply constraints domestically, which is based on the Keynesian approach and twin deficit hypothesis. Similarly, the sign of real GDP should be negative as domestic production reduces the reliance on imports and maintains the trade balance. In addition, the expected sign of the real exchange rate should be negative as currency depreciation will also discourage imports and help to maintain the current account balance. Likewise, the expected sign of trade openness is neither positive nor negative as it depends upon the ratio of imports and exports of the particular country. In the case of Nepal, trade volume positively influences the trade deficit as imports have almost 90 percent share, and therefore, the expected sign is positive.

4. Trends and Patterns of Trade Balance and Deficit Financing in Nepal

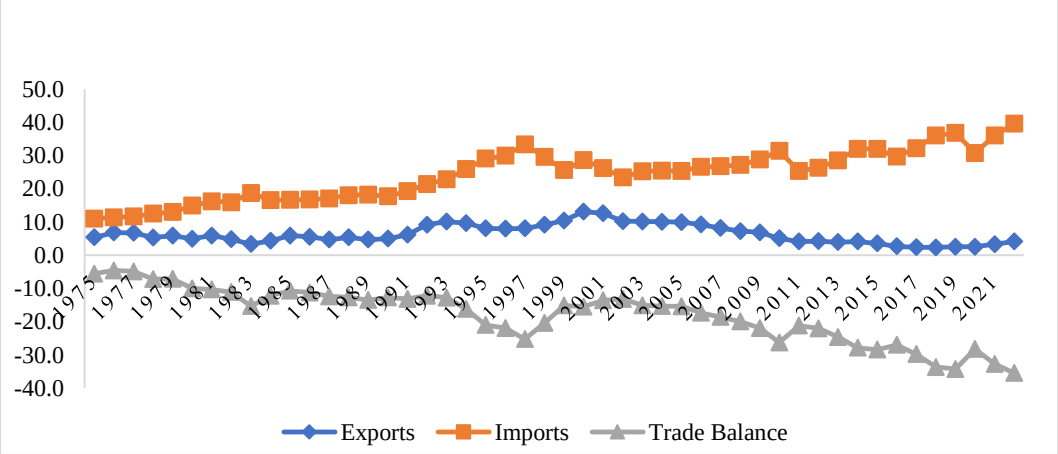
4.1 Trend and Pattern of External Sector

Figure 4.1 depicts the ratio of goods export, import, and trade balance with GDP from 1975 to 2021. The figure visibly indicates the serious structural problem of trade deficit that Nepal has been encountering for a long time. The figure shows that the trade imbalance worsened from the 1990s when the country adopted a trade liberalization policy. Nepal joined the World Trade Organization (WTO) as an observer in 1995 and became a member of WTO as the first least

developed country in 2004 (Sapkota & Cockburn, 2008). Nepal is also part of the regional trade mechanism as it joined the South Asia Free Trade Area in 2006 and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Co-operation (BIMSTEC) in 2006 (Bhattacharjee, 2018). Moreover, it has 17 bilateral trade agreements, including India (Trade and Export Promotion Centre), to promote trade liberalization, enhance cooperation in international trade, and expand the export market. Nevertheless, Nepal has failed to benefit from those agreements as the country is facing an acute trade deficit. The gap between import and export has significantly widened, especially after the quota system[2] was abolished in 2005. Nepal's trade volume in 2020 is almost 30 times bigger than the trade volume in 1993, whereas the import volume in the same period was 39 times bigger. In contrast, the export volume is just eight times higher than in 1993. Furthermore, the export and import ratio was 44 percent in 1993, which was 9.16 percent in 2020, and the trade deficit/ GDP ratio was 12.8 percent in 1993, whereas this ratio was 35.5 percent in 2021(Ministry of Finance, 2023).

Figure 4. 1

Export Import Gap (% of GDP)



Source: The researcher's calculation based on the Economic Survey, Ministry of Finance, Nepal

The foremost reasons for meager exports of Nepal are high production costs, poor international market access, and a weak basket of produced commodities for export. Moreover, the exported items are mainly non-processed agricultural products rather than manufactured items (Ghimire, 2016). Nepal has a natural disadvantage in international trade due to the landlocked. Being landlocked, Nepal should pay more attention to high-value-weight products to reduce transportation costs. Nepal should also focus on a bilateral trade agreement with its top trading partners that creates more comfortable and free market access to more advanced economies (Paudel, 2019).

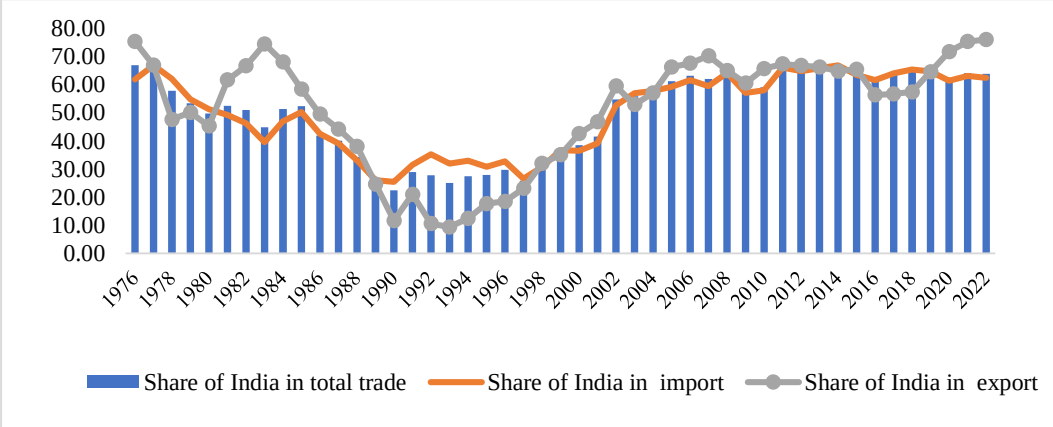
One of the key characteristics of Nepalese international trade is that India has had almost a two-thirds share in total trade and import and export volume. Figure 4.2 shows that Nepal's import volume from India was in a decreasing trend before the 1990s and reached only 20 percent of the total imports. However, after the liberalization policy was adopted, it started to grow and has been consistently growing by almost 60 percent for the last 20 years. In the global era, intra-regional trade in South Asia is very little compared to other regional trading blocks. One of the reasons for weak intra-regional trade in South Asia is that these countries are competitors in their export market in limited commodities such as textile and apparel exports. The total trade volume of South Asia is just 3 percent, which is very low compared to the European Union with 32 percent and Eastern Asia with 24 percent share. Even though the total population of South Asia is 24 percent of the total population (The World Bank Group, 2022), the trade volume is

[2] Nepal's readymade garments industry experienced rapid growth starting in the 1980s, mainly due to the quota facilities provided by industrialized countries. In the mid-1990s, it had a 29 percent share of the country's total exports and employed more than 50,000 workers. As per the World Trade Organization's rule to phase out all the textile and clothing quotas by the end of 2004, Nepal's garment industries faced huge challenges, which led to a remarkable reduction in exports and closed many industries.

still not so substantial. Additionally, the intra-regional trade in South Asia is lowest among the other regional trade arrangements, with just 6.3 percent of total trade, whereas the European Union has two-thirds of trade within the member countries and 22.5 percent of trade within the member countries in ASEAN. The intra-regional trade in South Asia is growing relatively slowly as intra-regional trade in South Asia was 3.3 percent in 1980-84 (Chaturvedi, 2007).

Figure 4. 2

International Trade of Nepal with India

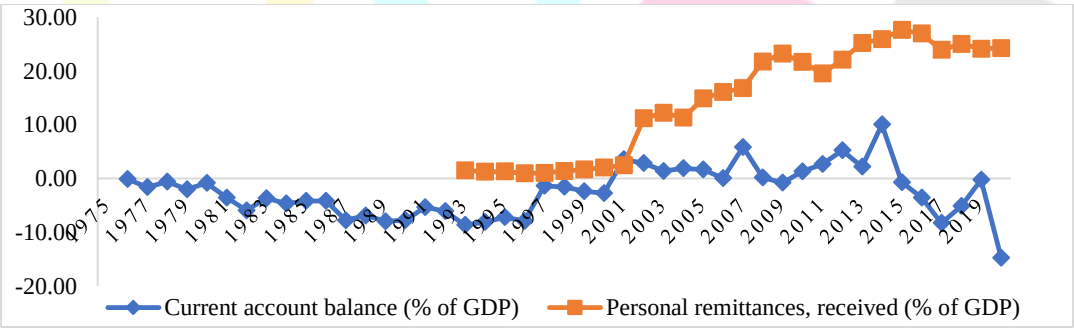


Source: The researcher's calculation based on the Economic Survey, Ministry of Finance, Nepal

Figure 4. 3 shows the ratio of remittance and current account balance with GDP in Nepal. It is seen that remittance dramatically contributes to maintaining the current account balance, particularly after 2000 onwards. Nepal is one of the top countries in the world, having a considerable ratio of remittance inflow to GDP and the most significant ratio in South Asia. The cross-border migration into India has been longstanding because of the more than 1000 km long open border and cultural proximity with India. However, foreign employment in other countries, mainly the Middle East and Malaysia, started in the late 1990s. Remittance is a crucial part of development in Nepal, as the remittance and GDP ratio is one-fourth.

Figure 4. 3

Remittance and Current Account Balance Ratio



Source: The researcher's calculation based on the Economic Survey, Ministry of Finance, Nepal.

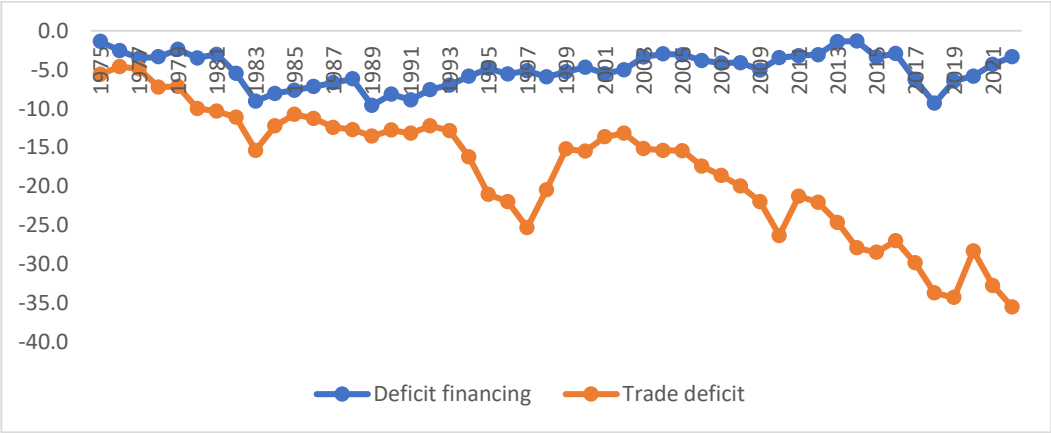
4.2 Trends and Patterns of Deficit Financing in Nepal

Figure 4.4 compares the trade deficit and fiscal deficit ratio with GDP, in which the trade deficit and GDP ratio deteriorated over time and reached more than 35 percent in 2021. On the other hand, the government is consistently using the fiscal deficit to upset the revenue and expenditure gap. The figure indicates that deficit financing does not support export promotion and import substitution in Nepal. The figure also signifies that fiscal deficit is not a key factor in this mounting trade deficit as fiscal deficit is less than 5 percent most of the study period, with some exceptions. One of the reasons for this situation is Nepal's fixed exchange rate system with India because the exchange

rate is a key factor that affects the relationship between fiscal deficit and trade deficit as per Mundell Fleming's framework (Kafle et al.).

Figure 4. 4

Trade Deficit and Fiscal Deficit/GDP Ratio in Nepal



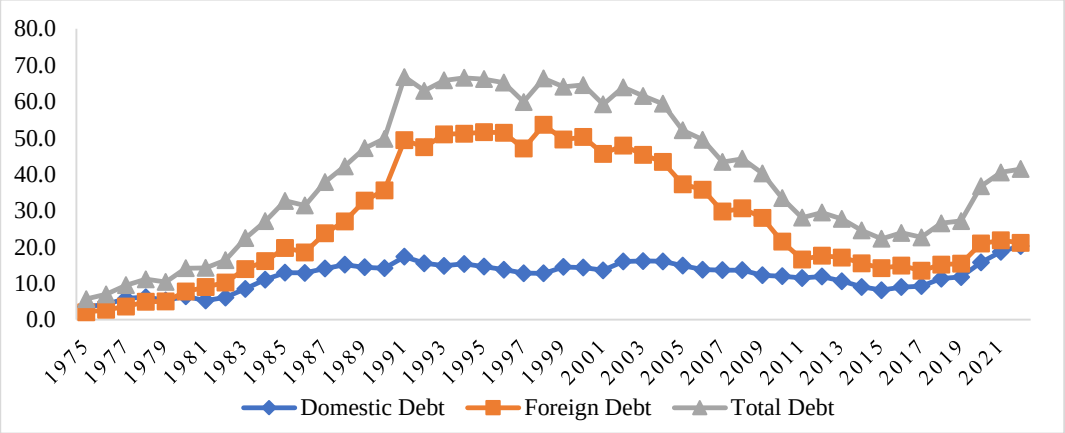
Source: The researcher's calculation based on the Economic Survey, Ministry of Finance, Nepal

Figure 4.5 shows the public debt and GDP ratio throughout 1975-2021. Nepal has already faced a huge trade deficit of more than 60 percent of GDP between 1991 to 2003. After 2003, the foreign debt went down and reached around 21 percent in 201, equivalent to the domestic debt and GDP ratio. From 2017 onwards, the debt to GDP ratio has increased remarkably and reached more than 40 percent in 2021, mainly due to the expenditure needed for reconstruction after the earthquake in 2015 and the COVID-19 pandemic (International Monetary Fund, 2023). Furthermore, domestic debt did not have a significant share in the past, but it is now growing and will reach 21 percent in 2021. Nepal has utilized short-term domestic debt such as treasury bills, development bonds, Citizens Saving Bonds, National Saving Bonds, and concessional international debt. Nepal had a high reliance on international debt due to its low base for taxation and domestic borrowing in the past, which is risky in terms of foreign exchange. Out of the internal debt portfolio, treasury bills cover around 35 percent of the share, which is a short-term loan in nature.

On the other hand, out of debt stock, the World Bank has the largest share at around 48 percent, and the Asian Development Bank has around 34 percent (2021). Most loans from the World Bank Group and Asian Development Bank are concessional loans with an average of 1 percent interest rate and long maturities with an average of 36 years. The growing rate of domestic debt is faster than external debt, and domestic debt is mainly held by domestic financial institutions(International Monetary Fund, 2023). The International Monetary Fund uses primary balance as an indicator to reduce the debt/ GDP ratio, which excludes interest payments from expenditures. As per the IMF estimation, debt- the stabilizing primary deficit is around 2.8 percent of GDP, based on the current debt dynamics of the existing debt stock and fiscal path, which is 3.2 percent in 2021. The composite indicators that comprise real GDP growth rate, remittance, foreign exchange reserve, and world growth found that the country's debt-carrying capacity is strong (International Monetary Fund, 2023).

Figure 4. 5

Public Debt to GDP Ratio in Nepal



Source: The researcher's calculation is based on the Economic Survey, Ministry of Finance, Nepal

5. Result and discussion

5.1 Descriptive Analysis of the Variables

Table 5. 1 demonstrates the descriptive statistics of the series and also the correlation matrix of the variables. As per the table, the maximum and minimum trade deficit to GDP ratio over the period was 34.23 percent and 4.75 percent, respectively. The mean of the trade deficit to GDP ratio was 17.71 percent. Similarly, the maximum, minimum, and mean budget deficit to GDP ratio was 9.57 percent, 1.31 percent, and 5.08 percent, respectively. Likewise, the mean of government recurrent expenditure to GDP is 9.51 percent. As per the correlation result, the trade deficit and budget deficit have a negative but not strong correlation, whereas real GDP, real exchange rate, and trade openness positively correlate with the trade deficit.

Table 5. 1

Descriptive Statistics and Correlation Analysis

	TD	BD	RGDP	REER	TO	GRE
Mean	17.710	5.089	4.290	88.362	30.549	9.513
Median	15.372	5.016	4.369	92.978	33.440	8.535
Maximum	34.243	9.575	10.031	119.525	41.721	20.170
Minimum	4.575	1.314	-2.369	41.584	16.003	3.7700
Std. Dev.	7.709	2.127	2.558	24.768	7.539	4.721
Skewness	0.451	0.377	-0.245	-0.482	-0.445	0.760
Kurtosis	2.355	2.322	3.497	1.756	1.748	2.577
Jarque-Bera	2.358	1.972	0.938	4.746	4.520	4.773
Probability	0.307	0.373	0.625	0.093*	0.104	0.091
Sum	814.660	234.097	197.361	4064.652	1405.262	437.640
Sum Sq. Dev.	2674.728	203.652	294.667	27607.24	2558.161	1003.195
Observations	46	46	46	46	46	46

Correlation matrix

	TD	BD	RGDP	REER	TO	GRE
TD	1					
BD	-0.047	1				
RGDP	0.139	0.201	1			
DREER	0.805	-0.229	0.012	1		
TO	0.722	-0.119	0.183	0.337	1	
GRE	0.888	-0.156	0.011	0.838	0.651	1

Source: Researcher's calculation

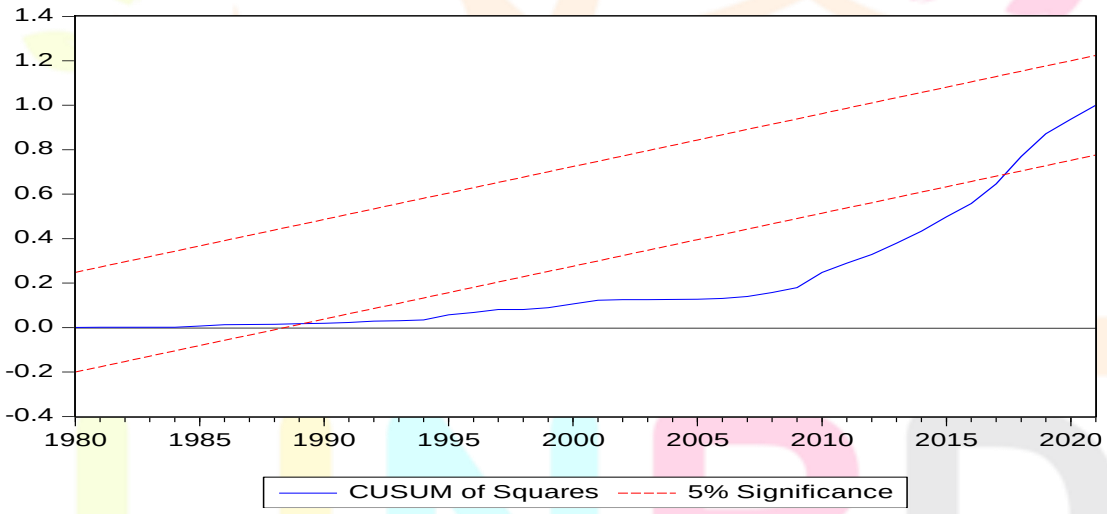
Note: TD, BD, RGDP, REER, TO, and GRE refer to trade deficit, budget deficit, real gross domestic product, real effective exchange rate, trade openness, and government recurrent expenditure, respectively.

5.2 CUSUM of Square Test for Structural Break

The CUSUM and CUSUM of Squares are popular tests for structural changes and do not require a prior determination of where the structural break occurs. If the structural break date is known, the Chow test will be more powerful. However, if the break is now unknown, the CUSUMSQ is more appropriate (Baltagi, 2011).

Figure 5. 1

CUSUM of Squares Test



Source: Researcher's calculation

**The CUSUM of squares test has been performed only in the twin deficit hypothesis model, where trade deficit is a key explanatory variable.*

Since Figure 5. 1 shows the blue line of CUSUM of the squares is beyond the line of 5% level of significance, that means this equation is not stable as the blue line has crossed the red line. We need to do a chow test to find the structural break date. The figure also says that the structural break date is from 2010 onwards, as it started to go upward. Therefore, we can do a chow test as the break date 2010.

5.2.1 Chow Breakpoint Test

The Chow test is the widely used method to know the structural break in the time series analysis. There are two methods in the Chow test: plot the graph of the series and the CUSUM of the square. Figure 5. 1 shows the CUSUM of the Squares test result and finds the structural break date 2010. We can then carry out F-statistics that show whether

there is a structural breakpoint. The null hypothesis is no break at specified breakpoints. The result shows that the probability value of F statistics is highly significant at 1%. Therefore, the structural break date is 2010.

Table 5. 2

Chow Breakpoint Test

	Value		
F-statistic	38.615	Prob. F(4,38)	0.000
Log likelihood ratio	74.626	Prob. Chi-Square(4)	0.000
Wald Statistic	154.463	Prob. Chi-Square(4)	0.000

Source: Researcher's calculation

5.2.2 Dummy Variable

Once we detect the structural break, it can be addressed by creating a dummy variable in the estimation process. Dummy variables can be used as a test for the stability of the estimated parameters in a regression equation. The model includes a dummy variable for the intercept and an interaction dummy variable for each explanatory variable, implying different underlying structures for the two conditions (0 and 1) associated with the dummy variable (Asteriou & Hall, 2011). As the Chow breakpoint test proved a structural break in 2010, a dummy variable was created to capture the structural break period and stabilize the model.

The new linear equation after using a dummy will be as follows;

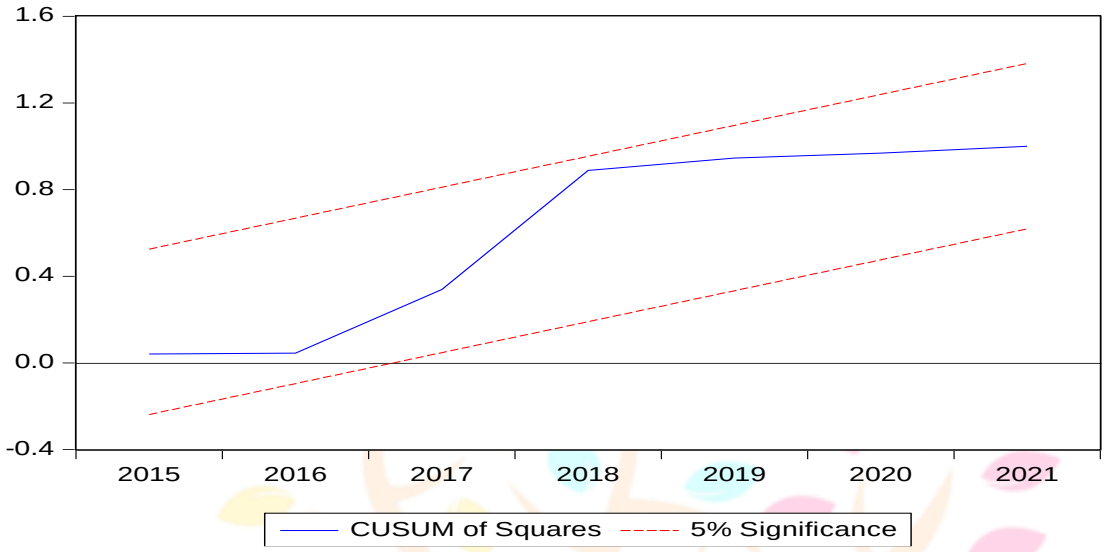
$$TD_t = \alpha_1 + \beta_1 BD_t + \beta_2 RGDP_t + \beta_3 REER_t + \beta_4 TO_t + \beta_5 Dummy_t + \beta_6 DBD_t + \beta_7 DRGDP_t + \beta_8 DREER_t + \beta_9 DTO_t + U_t \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

In which, TD= Trade Deficit/ GDP ratio, RGDP= real Gross domestic product growth rate, BD= budget deficit/ GDP ratio, REER= Real Exchange rate, and TO= trade openness/ GDP growth rate, α= constant term, $\beta_1 \ldots\ldots \beta_4$ = slope parameters and U= random error term. Dummy takes the value of 0 till 2009, and 1 in 2010 and afterward as the structural break date 2010 has been identified. DBD, DRGDP, DEER, and DTO are the interaction dummies with the independent variables.

To check the stability of the equation after using dummy and interaction dummies, CUSUM of squares test has been done in the figure.

Figure 5. 2

CUSUM of Squares Test



Source: Researcher's calculation

The result is displayed in Figure 5. 2 shows that the CUSUM of the square is now within the boundary of a 5 % significance level. Now the equation is stable.

5.3 Unit Root Test (Stationary Test)

In this study, Augmented Dickey-Fuller (ADF) test, and Phillips-Perron (PP) test were used to check stationarity.

5.3.1 Augmented Dickey-Fuller Test

Table 5. 3

Augmented Dickey-Fuller Test at Level

	With constant only		With constant and trend		Without constant and trend	
	t-statistics	P-value	t-statistics	P-value	t-statistics	P-value
TD	-0.738	0.826	-2.452	0.349	1.276	0.946
BD	-1.202	0.664	-4.06	0.013***	-0.467	0.506
RGDP	-4.527	0.000***	-4.41	0.005***	-0.458	0.51
REER	-0.974	0.754	-2.16	0.499	-0.245	0.592
TO	-1.294	0.624	-2.055	0.555	0.954	0.907
DUM	-0.589	0.862	-1.887	0.645	0	0.677
DBD	-1.341	0.601	-2.186	0.484	-1.051	0.259
DRGDP	-4.136	0.002***	-4.775	0.002***	-3.953	0.000***
DREER	-0.328	0.912	-1.657	0.753	0.273	0.761
DTO	0.369	0.905	-1.901	0.637	0.239	0.751
GRE	0.966	-2.334	0.407	2.028	0.988	0.966

Source: Researcher's calculation

Note: TD, BD, RGDP, REER, TO, GRE, and DUM refer to the trade deficit, budget deficit, real gross domestic product, real effective exchange rate, trade openness, government recurrent expenditure, and dummy variables, respectively.

Table 5. 3 has displayed the Dickey-Fuller test at level I(0). The null hypothesis is that the series is nonstationary or the series has a unit root. If ADF t-statistics is more than the critical values, the series is non-stationary, or if the P-value is more than 0.05 at a 5% significance level, we cannot reject the null hypothesis and vice versa. The result shows that the series of trade deficit, budget deficit, real exchange rate, trade openness, government recurrent expenditure, intercept dummy, and interaction variable of the dummy with the budget deficit, real exchange rate, and trade openness are non-stationary at the level. In contrast, the series of real GDP and interaction variable of the dummy with real GDP is stationary at level I(0).

Similarly, 5.4 illustrates the result of the Augmented Dickey-Fuller unit root test at the first difference I(1). The result shows that the trade deficit, budget deficit, real exchange rate, trade openness, government recurrent expenditure, intercept dummy, and interaction variable of the dummy with the budget deficit, real exchange rate, and trade openness are stationary at the first difference I (1).

Table 5. 4

Augmented Dickey-Fuller Test at First Difference

	With constant only		**With constant and trend**		**Without constant and trend**	
	t-statistics	P-value	t-statistics	P-value	t-statistics	P-value
TD	-6.56	0.000***	-6.495	0.000***	-6.226	0.000***
BD	-4.364	0.001***	-4.615	0.003***	-494	0.003***
REER	-5.62	0.000***	-6.075	0.000***	-5.687	0.000***
TO	-6.824	0.000***	-6.79	0.000***	6.399	0.000***
DUM	-6.708	0.000***	6.723	0.000***	6.633	0.000***
DBD	-4.528	0.0008***	-4.619	0.000***	-4.095	0.000***
DREER	-5.931	0.000***	5.981	0.000***	-5.839	0.000***
DTO	-8.044	0.000***	-8.201	0.000***	7.873	0.000***
GRE	-7.737	0.000***	-7.893	0.000***	-7.03	0.000***

Source: Researcher's calculation

Note: TD, BD, REER, TO, GRE, and DUM refer to the trade deficit, budget deficit, real effective exchange rate, trade openness, government recurrent expenditure, and dummy variables, respectively.

5.3.2 Phillips Perron (PP) Test

As per Table 5.5, the PP test shows that the series of trade deficit, budget deficit, real exchange rate, trade openness, government recurrent expenditure, intercept dummy, and interaction variable of the dummy with the budget deficit, real exchange rate, and trade openness are non-stationary at the level. In contrast, the series of real GDP and interaction variable of the dummy with real GDP is stationary at level I(0). The result is consistent with the ADF test of unit root.

Table 5. 5

Phillips Perron Test at Level

	With constant only		With constant and trend		Without constant and trend	
	t-statistics	P-value	t-statistics	P-value	t-statistics	P-value
TD	-0.573	0.866	-2.452	0.349	1.751	0.979
BD	-2.103	0.244	2.294	0.428	1.19	0.21
RGDP	-8.249	0.000***	8.187	0.000***	-2.532	0.012
REER	-1.254	0.642	-2.157	0.5	0.316	0.565
TO	-1.089	0.712	-2.055	0.555	1.245	0.943
DUM	-0.589	0.862	-1.887	0.645	0.000	0.677
DBD	-2.405	0.145	-2.319	0.415	-2.306	0.021**
DRGDP	-3.145	0.03**	-4.808	0.001***	-2.618	0.009***
DREER	-0.328	0.912	-1.657	0.753	0.273	0.761
DTO	-0.036	0.95	-1.768	0.703	0.689	0.861
GRE	0.515	0.985	-2.334	0.407	3.298	0.999

Source: Researcher's calculation

Note: TD, BD, RGDP, REER, TO, GRE, and DUM refer to the trade deficit, budget deficit, real gross domestic product, real effective exchange rate, trade openness, government recurrent expenditure, and dummy variables, respectively.

Table 5. 6

Phillips Perron Test at First Difference

	With constant only		With constant and trend		Without constant and trend	
	t-statistics	P-value	t-statistics	P-value	t-statistics	P-value
TD	-6.656	0.000***	6.587	0.000***	-6.228	0.000***
BD	-6.635	0.001***	6.613	0.003***	-6.714	0.003***
REER	-5.759	0.000***	-6.145	0.000***	-5.818	0.000***
TO	-6.874	0.000***	-6.776	0.000***	-6.614	0.000***
DUM	-6.708	0.000***	-6.724	0.000***	-6.663	0.000***
DBD	-6.233	0.0008***	-6.159	0.000***	-6.285	0.000***
DREER	-5.92	0.000***	-5.965	0.000***	-5.839	0.000***
DTO	-8.06	0.000***	-8.431	0.000***	-7.873	0.000***
GRE	7.734	0.000***	-8.654	0.000***	-7.02	0.000***

Source: Researcher's calculation

Note: TD, BD, RGDP, REER, TO, GRE, and DUM refer to the trade deficit, budget deficit, real gross domestic product, real effective exchange rate, trade openness, government recurrent expenditure, and dummy variables, respectively.

Similarly, Table 5. 6 illustrates the result of the PP unit root test at the first difference I(1). The result shows that the series of trade deficit, budget deficit, real exchange rate, trade openness, government recurrent expenditure, intercept dummy, and interaction variable of dummy with budget deficit, real exchange rate, and trade openness are stationary at the first difference I (1), which is consistent with the result of the ADF test at the first difference.

5.4 Autoregressive Distributed Lag (ARDL) Model

The regression model does not only include the current values of the explanatory variables but also the lagged values, which is called the distributed lag model, and if the model includes one or more lagged values of the dependent variable among its explanatory variables, it is called an autoregressive model (Gujarati, 2022).

Basic form of the ARDL model in twin deficit hypothesis is

$$TD_t = \beta_0 + \beta_1 TD_{t-1} + \cdots \ldots + \beta_p TD_{t-p} + \alpha_0 BD_t + \alpha_1 BD_{t-1} + \alpha_1 BD_{t-2} + \cdots + \alpha_p BD_{t-q} + \varepsilon_t \ldots (3)$$

Where,

TD= trade deficit
BD= Budget deficit
$\beta_0 + \beta_1 TD_{t-1} + \cdots \ldots + \beta_p TD_{t-p}$= Autoregressive form

$\alpha_0 BD_t + \alpha_1 BD_{t-1} + \alpha_1 BD_{t-2} + \cdots + \alpha_p BD_{t-q}$= Distributed lags

ε_t= Disturbance term

The classical least square theory may not be directly applicable to estimating the ARDL model due to the presence of stochastic explanatory variables and the possibility of serial correlation(Gujarati, 2022). There are several methods of conducting the cointegration test, and the OLS-based ARDL approach has become popular in recent years (Shrestha & Chowdhury, 2005).

ARDL model has some key advantages. It is flexible in that it can applied when the variables are of a different order of integration (Pesaran & Pesaran, 1997). It takes a sufficient number of lags to capture the data-generating process in general to specific modelling framework (Laurenceson & Chai, 2003) and a dynamic error correction model can also be derived from ARDL (Banerjee et al., 1993). The pre-condition of the ARDL model of study is all the variables in the model should be stationary at either I(0) or I(1) or a combination of I(0) or I (1), and no variables should be used at I(2). If the variables are found to be co-integrated with the help of a bound test, both short-run and long-run models have to be specified. If the variables are not cointegrated, we can only perform short-run ARDL. There should be an optimal lag in dependent and independent variables, and error correction terms should not be autocorrelated.

The unit root test results obtained from both ADF and PP unit root tests have found that variables are integrated both at the level I(0) and at their first difference I(1), which confirms the appropriateness of the ARDL model in this study. Therefore, the ARDL version of the equation in this model is presented below;

$$\Delta TD_t = \beta + \beta_1 TD_{t-1} + \beta_2 BD_{t-1} + \beta_3 RGDP_{t-1} + \beta_4 REER_{t-1} + \beta_5 TO_{t-1} + \beta_6 Dummy1_{t-1} + \beta_s IND * Dummy1_{t-1} + \sum_{i=1}^{47} \gamma_i \Delta TD_{t-i} + \sum_{i=1}^{47} \delta_i \Delta BD_{t-i} + \sum_{i=1}^{47} \theta_i \Delta RGDP_{t-i} + \sum_{i=1}^{47} \varphi_i \Delta REER_{t-i} + \sum_{i=1}^{47} \omega_i \Delta TO_{t-i} + \varepsilon_t \ldots \ldots \ldots (4)$$

Equation (4) captures the dynamic impact in the form of the Auto Regressive Distributed Lag Model of the twin deficit hypothesis. In this model, TD= Trade Deficit/ GDP ratio, RGDP= real Gross domestic product growth rate, BD= budget deficit/ GDP ratio, REER= Real Exchange rate, and TO= trade openness/ GDP growth and Δ stands for the first order differential variable. Similarly, β is intercept, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ *and* β_s are the coefficients of first order variables where β_s refers to the coefficients of each interaction term of dummy variable and independent variables. Similarly, $\gamma_i, \delta_i, \theta_i, \varphi_i$ *and* ω_i are the parameters of the error correction model, and ε_t is the vector of random error. The government's recurrent expenditure has been used instead of the budget deficit as an alternative model.

5.5 Co-integration Test

Cointegration test becomes a prerequisite for any economic model using non-stationary time series data, and the problem of spurious regression exists if the variables are not cointegrated that makes our econometric works meaningless (Asteriou & Hall, 2011). Before estimating the variables in the model as per equation (4), the co-integration test is required to see the existence of co-integration between variables to avoid spurious regression; ARDL

bound test has been used for the co-integration test. In order to see cointegration, we need to find out lag length criteria.

5.5.1 Lag Length Selection

After determining variable integration reflected by the stationary test, a bound test for co-integration between variables included in the ARDL model is conducted using appropriate lag length. The appropriate lag length must be selected to remove the problem of serial correlation in large observations and correct the problem of improperly overparameterizing the ECM in the limited number of observations (Bedhiye, 2020).

Table 5. 7

VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-651.087	NA	12315491	30.515	30.720	30.591
1	-484.038	287.480	16789.95	23.908	25.137*	24.361*
2	-452.690	46.656*	13124.64*	23.613*	25.866	24.444
3	-434.265	23.139	20282.28	23.919	27.195	25.127

Source: Researcher's calculation

** Indicates lag order selected by the criterion*

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

As per Table 5. 7, there are five criteria for selecting the VAR lag order. Akaike Information Criterion (AIC) has been used in this study because it is preferred for lag length selection due to the small sample size (Bedhiye, 2020). As per the result of AIC, the maximum lag in this model is two in the twin deficit hypothesis.

5.5.2 Bound Test for Co-integration

After testing the unit root and determining lag length, the existence requires a co-integration test of the twin deficit hypothesis is required in the ARDL model. Identification of co-integration between the variables using the ARDL model gives the association of the variables in the long run and short run dynamics(Bedhiye, 2020). Since the series are integrated in different orders, that is, a combination of I (0) and I (1) in the stationary test, the use of the Johansen cointegration test is not valid here. The appropriate cointegration test is the Bounds test proposed by Pesaran, Shin and Smith in 2011(Banday & Aneja, 2019).

Table 5. 8

Cointegration Test Results

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	6.291	10%	2.12	3.23
k	6	5%	2.45	3.61
		2.5%	2.75	3.99
		1%	3.15	4.43

Source: Researcher's calculation

Table 5. 8 depicts the result of the cointegration bound test. The interpretation of this test is if the calculated F-statistics is greater than the critical value for the upper bound I (1), we conclude that there is co-integration. We reject the null hypothesis, which means there is a long-run relationship. If F- statistics is less than the critical value of lower bound I(0), there is no integration equation. We do not reject the null hypothesis and estimate the ARDL model. If F statistics fall between the lower bound I (0) and upper bound I(1), the test is considered inconclusive. Here in our model, as F statistics (6.291) is greater than the critical value for the upper bound I (1), which is 3.23 at a 5 % significance level in the above test, we conclude that there is cointegration among the variables. Therefore, we estimate long-run model and error correction model (ECM)for short run.

5.5.3 Error Correction Model (ECM)

An error correction model (ECM) integrates short-run dynamics and long-run equilibrium without losing long-run information. If dependent (Yt) and independent variables (Xt) are cointegrated, we can express the relationship between Yt and Xt with an ECM specification.

For example,

$$\Delta Y_t = \alpha_0 + \beta_1 \Delta X_t - \pi \mu_{t-1} + e_t \ldots\ldots\ldots (5)$$

In which, β_1 is the impact multiplier (short-run effect) that measures the immediate impact of change in X to change in Y and π is the feedback effect or the adjustment effect that shows how much of the disequilibrium is being corrected. In equation (5),

$\mu_{t-1} = Y_{t-1} - \beta_1 - \beta_2 X_{t-1}$ in which β_2 is also the long-run response.

The key advantages of ECM are that it is an appropriate model measuring the correction from the disequilibrium of the previous period, as ECMs are formulated in terms of the first difference that eliminates trends from the variable involved, spurious regression problem is solved, In this study of the twin deficit hypothesis,

$$TD_t = \beta_0 + \sum_{i=1}^{47} \beta_1 TD_{t-i} + \sum_{i=1}^{47} \beta_2 BD_{t-i} + \sum_{i=1}^{47} \beta_3 RDGP_{t-i} + \sum_{i=1}^{47} \beta_4 REER_{t-i} + \sum_{i=1}^{47} \beta_5 TO_{t-i} + \sum_{i=1}^{47} \beta_6 Dum_{t-i} + \sum_{i=1}^{47} \beta_7 DBD_{t-i} + \sum_{i=1}^{47} \beta_8 DRGDP_{t-i} + \sum_{i=1}^{47} \beta_9 DREER_{t-i} + \sum_{i=1}^{47} \beta_{10} DTO_{t-i} + \varepsilon_t \ldots (6)$$

$$\Delta TD_t = \beta_0 + \beta_1 ECM_{t-1} + \sum_{i=1}^{47} \beta_2 TD_{t-i} + \sum_{i=1}^{47} \beta_3 BD_{t-i} + \sum_{i=1}^{47} \beta_4 RDGP_{t-i} + \sum_{i=1}^{47} \beta_5 REER_{t-i} + \sum_{i=1}^{47} \beta_6 TO_{t-i} + \sum_{i=1}^{47} \beta_7 Dum_{t-i} + \sum_{i=1}^{47} \beta_8 DBD_{t-i} + \sum_{i=1}^{47} \beta_9 DRGDP_{t-i} + \sum_{i=1}^{47} \beta_{10} DREER_{t-i} + \sum_{i=1}^{47} \beta_{11} DTO_{t-i} + \cdots (7)$$

Equations (6) and (7) of the ARDL model capture the short-run and long-run relationship among the variables, in which ECM is the error correction term. In the equation (6) and (7), TD= Trade Deficit/ GDP ratio, RGDP= real Gross domestic product growth rate, BD= budget deficit/ GDP ratio, REER= Real Exchange rate, and TO= trade openness/ GDP growth rate, $\beta_1 \ldots\ldots \beta_{11}$ = slope parameters and ε_t= random error term.

5.6 Long Run and Short Run Relationship

Table 5. 9

ARDL Model Long Run Coefficient Results

Dependent variable: Trade deficit (TD/GDP ratio)	(1)	(2)	(3)	(4)	(5)
Budget deficit (BD)	0.117 (0.295)	0.209 (0.195)	-0.329 (0.260)	0.117 (0.130)	
Government recurrent expenditure (GRE)					0.844*** (0.304)
Real GDP (RGDP)	0.799* (0.408)	0.399 (0.402)	1.468*** (0.414)	0.545** (0.294)	0.722 (0.427)
Real effective exchange rate (REER)	0.043** (0.020)	0.042** (0.016)	0.042*** (0.014)	0.042*** (0.014)	0.098* (0.053)
Trade openness (TO)	0.611*** (0.063)	0.630*** (0.048)	0.551*** (0.046)	0.614*** (0.037)	0.444*** (0.164)
Dummy	7.347*** (1.739)	1.852 (4.000)	-81.62*** (0.014)	1.919 (6.654)	
Dummy of budget deficit (DBD)	0.471 (0.389)				
Dummy of RGDP (DRGDP)		1.692* (0.911)			
Dummy of REER (DREER)			0.796*** (0.255)		
Dummy of TO (DTO)				0.214 (0.198)	
Included observations (after adjustment)	*42*	*42*	*42*	*42*	
R squared	*0.992*	*0.996*	*0.996*	*0.996*	
Adjusted R squared	*0.979*	*0.998*	*0.989*	*0.991*	
Log Likelihood	*-38.841*	*-24.035*	*-21.311*	*-22.015*	
Lag	*ARDL (3, 1, 2, 3, 4, 4, 3)*	*ARDL (3, 0, 4, 3, 4, 4, 4)*	*ARDL (3, 2, 3, 3, 4, 4, 3)*	*ARDL (3, 0, 4, 3, 4, 2, 3)*	*ARDL (2,0,1,2,4)*

Source: Researcher's calculation

*Note: ***, **, and * indicate that the statistics are significant at 1%,5%, and 10% significance level. The figures in the parenthesis are the standard error.*

Table 5. 9 displays the long-run ARDL estimates in which the interaction of the dummy with independent variables is estimated in four different models as there is a singularity matrix problem to estimate them in a single equation. As per the results in Table 5. 9, all the estimates of long-run ARDL models reflect no long-run significant relationship between the budget deficit and trade deficit in Nepal. This result strongly proved that the twin deficit hypothesis does not exist in Nepal in the long run. The result of this long-run relationship rejects the Keynesian approach (Banday &

Aneja, 2016). This finding is consistent with the empirical findings of Ratha (2012) in the case of India, in which a twin deficit exists only in the short run but not in the long run.

There are some key reasons for Nepal's non-existence of the twin deficit in the long run. In the case of Nepal, the government has undertaken different tax measures such as the implementation of VAT and a new income tax law that reflects tax to GDP ratio, which is also in the increasing trend that buttresses financing development expenditure needs through tax revenue rather than borrowing. Therefore, the budget deficit is at the limit, but growing government expenditure fosters a trade deficit as the government procures imported goods and services for its activities. The fifth column of Table 5. 10 shows that the government's recurrent expenditure has a positive and strong relationship with the trade deficit. Therefore, the government's recurrent expenditure policy variable has a contribution to fostering a trade deficit rather than a budget deficit

Similarly, the Ricardian equivalence theory argues that public or private investment both go for imports, and it is not necessarily that deficit financing only underpins trade deficits; private savings also push the importation of goods and services. This proposition also exists in Nepal that less mobilization of deficit encourages private savings, and that ultimately goes for import.

The fiscal policy most directly influences the trade balance as the government increases its expenditure on tradable goods or reduces the tax rates, creating fiscal expansion in the economy(Ali Abbas et al., 2011). Therefore, if the government finances its expenditure on tradable goods through deficit financing, it directly affects the trade balance. However, it is also not applicable in Nepal as most government expenditure is financed by tax rather than deficit financing.

Another reason for the weak relationship of the twin deficit in Nepal is the composition of the deficit financing. The countries where twin deficit exists are because of the intense domination of borrowing from the domestic market. As government securities are risk-free, commercial banks are more likely to lend to the government to minimize the risk that results in a crowd-out effect on the private sector and high-interest rates. However, a significant proportion of the fiscal deficit was financed through external loans in Nepal, which is a reason not to directly affect the trade deficit by crowing out the effect of the private sector.

Similarly, high-interest rates due to government borrowing in the domestic market also make the domestic currency expansive due to capital inflow in an open market economy that eventually makes exports expensive (Sakyi & Opoku, 2016). However, this situation does not exist in Nepal because of the fixed exchange rate regime with major trading partner India (two-thirds of trade volume) and the capital control regime. Therefore, the twin deficit through the exchange rate channel does not hold in Nepal, which is empirically proved in this study. One of the key factors of the existence of the twin deficit hypothesis is a change in the exchange rate as per the Mundell- Fleming framework (Kafle et al.), which is not applicable in Nepal due to the fixed exchange rate regime.

On the other hand, remittance inflow has been a key factor in Nepal's current account balance since 2000. Nepal is one of the countries with the highest remittance recipient rates in terms of the remittance/GDP ratio. As the manufacturing and agriculture sectors are not performing well, most of the remittance money goes to imports, causing the trade deficit to worsen further. However, this remittance inflow also helps banks maintain liquidity and interest rate stability. Therefore, remittance is a reason for a trade deficit rather than a fiscal deficit. Figure 4.4 indicates that remittance and trade deficit both have an increasing trend in almost the same pattern, which justifies the strong role of remittance in pushing the trade deficit up in Nepal.

With regard to the other control variables, real GDP has a positive and significant relationship with the trade deficit in the long run. This result indicates that as Nepal imports capital goods and raw materials from abroad, the trade deficit increases simultaneously. That means achieving a high economic growth rate in Nepal deteriorates the trade balance due to the reliance on the manufacturing sector for capital equipment, machinery, and raw materials on import. Moreover, the share of intermediate goods in the total trade is significant in Nepal. For instance, the importation of

intermediate goods had a 53.2% share, and capital goods had an 8.4% share in 2022 (Nepal Rastra Bank, 2022). Therefore, change in production structure is one of the key structural challenges in Nepal that contributes to reducing the trade deficit, as proved empirically in this study.

Similarly, real exchange rate depreciation also has a positive effect on the trade deficit, which means that the appreciation of foreign currency as compared to Nepalese currency fuels the increase in the trade deficit in the long run. As export-based economies benefit from the depreciation of their local currency by increasing exports, Nepal does not have the benefit of exports to reduce the trade deficit but rather increases the deficit due to huge imports and high prices. Likewise, trade openness has a positive and significant relationship with the trade deficit in the long run. As import has almost 90 percent proportion of trade volume, the estimates reflect that more trade volume contributes to more trade deficit in Nepal.

Similarly, Table 5. 10 depicts the short-run results specified in the error correction model in which a positive and significant relationship exists between budget and trade deficits. Similarly, real GDP and the real exchange rate also have a positive relationship with trade balance, consistent with the long-run relationship. In contrast, there is a significant negative relationship in the short run in one lag period. However, exchange rate depreciation also has a negative effect on the trade deficit in the short run. Likewise, trade openness has a positive relationship with the trade deficit and a negative relationship in one period lag in the short run.

Table 5. 10

Error Correction Model (ECM) Results

Dependent variable: TD (TD/GDP ratio)	(1)	(2)	(3)	(4)
DBD	0.485***		0.180*	
	(0.414)		(0.097)	
DRGDP	0.228***	0.083	0.158**	0.100**
	(0.060)	(0.059)	(0.054)	(0.044)
DRGDP(-1)	-0.192**	0.121	-0.642***	0.053
	(0.069)	(0.085)	(0.091)	(0.062)
REER	-0.088***	-0.102***	-0.085***	-0.098***
	(0.023)	(0.017)	(0.016)	(0.015)
REER (-1)	-0.144	-0.126***	-0.137***	-0.128***
	(0.029)	0.021	(0.021)	(0.018)
REER (-2)	-0.042	-0.065***		-0.062***
	(0.027)	(0.021)		(0.018)
TO	0.726***	0.626***	0.644***	0.615***
	(0.068)	(0.057)	(0.055)	(0.054)
TO(-1)	-0.401***	-0.295***	-0.195**	-0.273***
	0.091	(0.073)	(0.075)	(0.063)
Dummy	4.827 ***	2.852***	-61.454***	15.54***
	(1.390)	(0.815)	(12.342)	(3.310)
DBD	-0.058			
	(0.223)			
DRGDP		0.344***		
		(0.096)		
DREER			0.654***	
			(0.124)	
DTO				0.535***
				(0.091)
ECM(-1)	-0.886***	-0.876***	-0.929***	-0.877***
	(0.112)	(0.079)	(0.081)	(0.066)
Included observations (after adjustment)	*42*	*42*	*42*	*42*

R squared	*0.946*	*0.973*	*0.976*	*0.975*
Adjusted R squared	*0.894*	*0.942*	*0.949*	*0.954*
Log Likelihood	*-38.841*	*-24.035*	*-21.311*	*(-22.015)*
Lag	*ARDL (3, 1, 2, 3, 4, 4, 3)*	*ARDL (3, 0, 4, 3, 4, 4, 4)*	*ARDL (3, 2, 3, 3, 4, 4, 3)*	*ARDL (3, 0, 4, 3, 4, 2, 3)*

Source: Researcher's calculation

*Note: ***, **, and * indicate that the statistics are significant at the 1%,5%, and 10% levels of significance, respectively. The figures in parentheses are the standard errors. TD, BD, RGDP, REER, TO, GRE, and DUM refer to the trade deficit, budget deficit, real gross domestic product, real effective exchange rate, trade openness, government recurrent expenditure, and dummy variables, respectively.*

The lagged ECM (Error Correction Model) calculated in Table 5. 10 shows the high speed of adjustment (88.6%) that brings the long-run equilibrium. In other words, the Error correction coefficient is any speed of adjustment of any equilibrium towards the long-run equilibrium state. Here, the speed is 88.63%. The R- R-squared value is 94.6%, and the adjusted R-squared value is 89.4%. This implies that the budget deficit, real GDP, real exchange rate, and trade openness explain 89.4% of variations in the short-run trade balance.

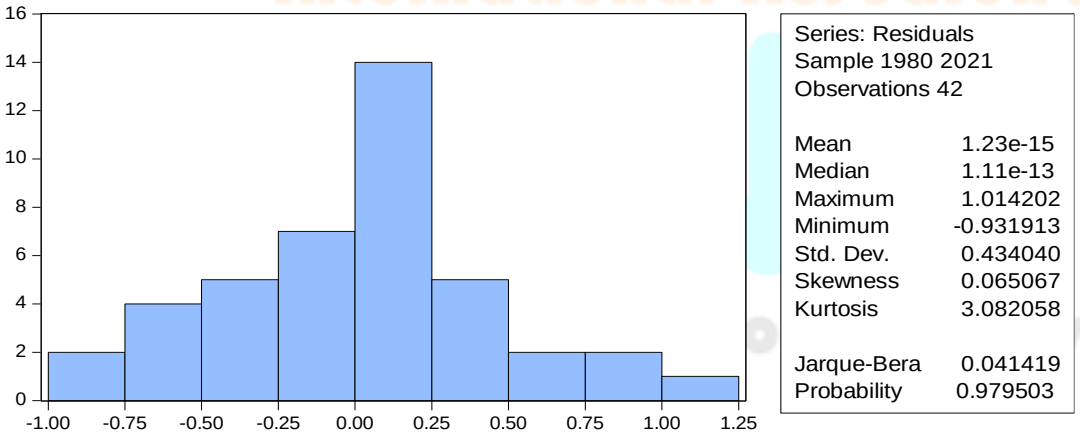
5.7 Residual Diagnostic Test

5.7.1 Normality Test

The classical normal linear regression models assume that the disturbance term is distributed with zero mean, constant variance, and no covariance between the disturbance terms. The assumption of a normal distribution can only give unbiased, consistent, and efficient estimates.

Figure 5. 3

Normality Test



Source: Researcher's calculation

The null hypothesis states that residuals are normally distributed. We fail to reject the null hypothesis because the probability is more than 0.05, which means the residuals are normally distributed.

5.7.2 Auto Correlation (Serial correlation LM Test)

Autocorrelation is most likely to occur in a time series framework. When data is ordered chronologically, the error in one period may affect the error in the next time period. If the interval of the series is short, there will be inter-correlation. In one period, the current error term contains the effect of current shocks and the carryover from the previous shocks. This carryover will be related to or correlated with the effect of earlier shocks.

Table 5. 11

Serial Correlation LM Test

	Value		P value
F-statistic	1.118	Prob. F(2,26)	0.342
Obs*R-squared	3.485	Prob. Chi-Square(2)	0.175

Source: Researcher's calculation

The null hypothesis is that there is no presence of serial correlation. Since the P values of the F statistics and Chi-square are more than 0.05, we fail to reject the null hypothesis. This means there is no serial correlation, or residuals are not serially correlated.

5.7.3 Heteroskedasticity Test

This test examines whether the error term in the model is constant over time. Heteroskedasticity deals with unequal variances, which violates the assumptions of a classical linear regression model. Heteroskedasticity makes the estimator inefficient, and the result will no longer be reliable. There are different ways to detect heteroskedasticity. The Breusch-Pagan—Godfrey test was used in this model to check heteroskedasticity.

Table 5. 12

Heteroskedasticity Test: Breusch- Pagan-Godfrey

F-statistic	0.601	Prob. F(28,13)	0.873
Obs*R-squared	23.702	Prob. Chi-Square(28)	0.697

Source: Researcher's calculation

The null hypothesis is that the residuals are homoscedastic. As the p-value of the chi-square test is more than 0.05, we fail to reject the null hypothesis, which means the residuals are homoscedastic.

5.7.4 Multicollinearity Test

Multicollinearity exists when at least some predictor variables are correlated among themselves. The reasons for the multicollinearity are methods of data collection, constraints in the model, constraints in the model specification, and an overdetermined model. Multicollinearity makes a significant variable insignificant by increasing its standard error. In the case of multicollinearity, standard error decreases, t-statistics decrease, and p-value increases, so the particular variable becomes insignificant. There are different ways to detect multicollinearity. The variance inflation factor (VIF) test was used to check multicollinearity.

Table 5. 13

Variance Inflation Factors

	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
C	20.748	143.404	NA
BD	0.097	20.529	2.997
RGDP	0.024	4.254	1.098
REER	0.000	42.866	3.059
TO	0.003	24.755	1.392
DUMMY1	4.345	7.834	5.790

Source: Researcher's calculation

Note: BD, RGDP, REER, TO, and DUM refer to the budget deficit, real gross domestic product, real effective exchange rate, trade openness, and dummy variables, respectively.

If the centered variance inflation factors value is less than 10, then we confirm that multicollinearity is absent. As the above result shows, it is absent.

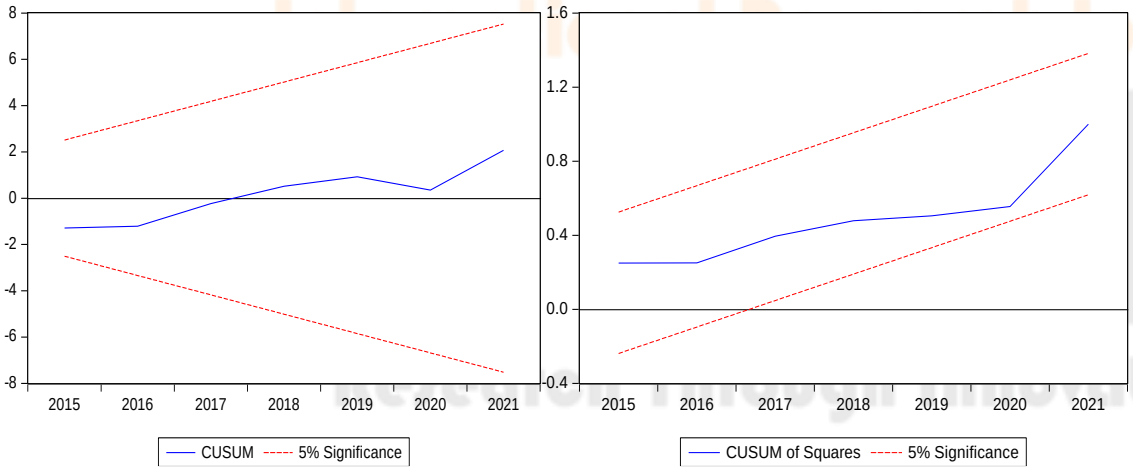
5.8 Stability Diagnostic Test

5.8.1 CUSUM and CUSUM Of Square Test

The cumulative sum (CUSUM) of recursive residuals and the CUSUM of square (CUSUMSQ) tests are applied to assess the parameter stability. The results indicate the absence of any instability of the coefficients because the plots of the CUSUM and CUSUMSQ statistics fall inside the critical bands of the 5 percent confidence intervals of parameter stability. This implies that the long-run estimate obtained from this model is stable.

Figure 5. 4

CUSUM and CUSUM Of Square Test



Source: Researcher's calculation

5.8.2 Ramsey RESET Test

A key issue in the econometric analysis is the model specification. One of the most commonly used tests for general misspecification is Ramsey's Regression Specification Error Test (RESET). This test is based on the fitted values of the dependent variable from the regression equation (Asteriou & Hall, 2011). This test finds if the specified model has any omitted variable bias.

Table 5. 14

Ramsey RESET Test Result

	Value	df	Probability
t-statistic	0.757	27	0.455
F-statistic	0.573	(1, 27)	0.455

Source: Researcher's calculation

Here, the model's null hypothesis is correctly specified. The p-value of the F-statistic is more than 0.05, which means we fail to reject the null hypothesis. Therefore, our model is correctly specified.

6. CONCLUSION AND POLICY RECOMMENDATION

6.1 Conclusion of the Study

The study assessed the relationship between budget deficit and trade deficit in Nepal. The result of the coefficient of the ARDL model based on the time series annual historical data has justified no significant long-run relationship between the budget deficit and trade deficit in Nepal. This result proved that the twin deficit hypothesis does not exist in Nepal in the long run. However, the short-run error correction estimation has proven the positive association between budget and trade deficits. Moreover, the result of this long-run relationship rejects the Keynesian approach. However, government recurrent expenditure has a positive and strong relationship with the trade deficit. Therefore, the government recurrent expenditure policy variable has a key contribution to fostering a trade deficit rather than a budget deficit.

The study has empirically proven that Nepal's budget deficit has not contributed to the current speedily growing trade deficit in the long run. In other words, the twin deficit situation has not existed in Nepal mainly due to the low ratio of government borrowing in terms of GDP. The composition of the deficit financing is a reason for the non-existence of the twin deficit in Nepal. Nepal has a dominant fiscal deficit financed through external loans that do not directly affect the trade deficit by crowing out the effect of the private sector. Likewise, the study has also proven that the fixed exchange rate regime with a large trading partner, India, dilutes the exchange rate channel of the twin deficit hypothesis in Nepal. However, government recurrent expenditure has fueled a further increase in trade deficit. Similarly, the study has clearly indicated that the increasing share of inflow remittance is one reason for the growing trade deficit. Most of the remittance money goes to imports due to weak domestic production, which causes the trade deficit to worsen further.

6.2 Policy Recommendation

Based on the findings of the study, the following policy measures have been suggested to effectively mobilize the government's fiscal policy tool to accelerate economic growth, maintain the trade balance, and improve the export performance of Nepal:

As per the study, the budget deficit is not a reason for the growing trade deficit in the long run, but government recurrent expenditure contributes to pushing the trade deficit up. Therefore, the study suggests that the government should curtail the recurrent expenditure that goes into consumption-related activities, and eventually, it fuels imports. As a chunk of deficit financing is spent on capital formation through different projects and is relatively low cost due to concessional external loans, deficit financing does not contribute to the increase in the trade deficit. Therefore, the government should be cautious to use deficit financing more on capital formation rather than consumption-related recurrent expenditure and be careful to create recurrent expenditure activities to maintain trade balance. The study has shown that the growing remittance inflow is a vital factor in the mounting trade deficit as it directly fosters consumption-related activities. Therefore, the study suggests that the government should channel the remittance for long-term capital formation through its fiscal policy tool.

6.3 Agenda of Further Research

This study has incorporated different macroeconomic variables and has not used micro-level statistics, which is one of its caveats. The study has left to answer the questions in the individual-level study regarding the association of fiscal policy and trade variables. The impact of fiscal policy instruments such as cash incentives on exporters could be done through case studies, which is also an area for future research.

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