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An Empirical Investigation for the Twin Deficit Hypothesis in Nepal

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Abstract

The debate over the validity of Twin Deficit Hypothesis which advocates in favor of long run causal relationship between budget deficit and trade deficit has lasted for several decades. However, in opposition to this hypothesis is Ricardian Equivalence Theory which argues that budget deficits don't lead to trade deficit in the economy. Hence, this study intends to test the validity of Twin Deficit Hypothesis for Nepalese economy. The major objective of this study is to examine the relationship between budget deficit and trade deficit in case of Nepal. ARDL technique of cointegration, bound testing, error correction model and Granger causality test have been employed to examine the relationship between the budget deficit and trade deficit using the time series data from 1987/88 to 2017/18 collected from secondary sources. Apart from budget deficit and trade deficit, other variables included in the model are real exchange rate, openness of trade and inflation. It is found that trade deficit has an increasing trend over time whereas budget deficit has increasing trend with periodic fluctuations. ARDL model estimates and bound test discard any cointegration between budget deficit and trade deficit which indicate no long run relationship among the variables. Error correction model suggests the absence of short run relationship between budget deficit and trade deficit. Furthermore, Granger causality test also shows that there doesn't exist any significant causal relationship between budget deficit and trade deficit in any direction. Twin Deficit Hypothesis is not found to be valid for Nepal during the study period and thus, Ricardian Equivalence Theory is found to be valid.

Keywords: Twin Deficit; Ricardian Equivalence; Trade Deficit; Budget Deficit; Inflation.

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1. Introduction

A national budget is the financial statement of the proposed expenditure and anticipated revenue of the government for the achievement of certain economic objectives of the nation. Budgets can be surplus, balanced or deficit. Budget deficit is a situation where the expenditures of the country exceed its revenues, earned from taxes and other sources. Generally, such budget deficit is financed through external borrowing, internal borrowing, and accumulated cash balance in Nepal.

Trade is one of the crucial means to achieve growth, employment, and welfare in the economy. In many countries, trade has played a major role to bring rapid economic growth and development. However, a persistent and high trade deficit in international trade is less likely to resemble the good health of an economy and tend to hamper the overall macroeconomic health of the country. In general, the budget deficit and the trade and/or current account deficit are considered as the major macroeconomic concerns in any economy. So, the large external deficits tend to threat the macroeconomic stability of the nation.

According to open economy macroeconomics, a government budget deficit leads to a current account deficit and this phenomenon is termed the twin deficit hypothesis (TDH)). Accordingly, TDH asserts that there exists a strong and positive relationship among government budget balance and the balance of economy's current account. The theoretical explanation for the TDH is based on the well-known Mundell-Fleming (Fleming, 1962; Mundell, 1963) framework. This model provides a detailed explanation regarding how budget deficit leads to trade deficit. An increase in budget deficit imposes upward pressure on interest rates. As most countries adopt a free capital movement policy, foreign investors become attracted to invest in that country. This leads to an appreciation in the country's currency following the raised demand in the country's currency. Increased exchange rates make imports cheaper and export more expensive in comparison to foreign goods which further widens trade deficit of the economy. In this manner, budget deficits are responsible for increased import and decreased export creating a trade deficit and ultimately a current account imbalance. [30]

Basically, two contrasting views dominate the debate regarding the relationship between the budget deficit and trade deficit viz. Keynesian absorption theory and Ricardian equivalence theory. Keynesian theory advocates that there exists positive relationship between budget deficit and trade deficit whereas Ricardian theory discards any impact of budget deficit on trade deficit. Hence, twin deficit hypothesis has garnered tremendous amount of attention from the economists all around the globe. According to [25], the twin deficit hypothesis was first tested in United States because the US economy was experiencing concurrent trade deficit and budget deficit in 1980s. According to [7], most of the developed countries, such as Sweden and Germany, also started to investigate the validity of the twin deficits hypothesis in the 1980s. The issue of twin deficit hypothesis then spread to developing nations.

Nepal has been continuously facing trade deficit and budget deficit since past few decades. Thus, the persistence of the budget deficit and trade deficit show the need for a proper investigation of their relationship for the case of Nepal, thereby this study attempts to provide such an empirical analysis. It's of paramount importance to investigate the causality between the government budget deficit and trade deficit. If it is the case that deficit

budget causes predicted change in trade balance, then fiscal policy should be more prudent. However, if no causal role of budget deficit on trade deficit is ascertained, then mere reductions in budget deficits may be of no effectiveness to resolve trade imbalances. In this context, establishing and understanding the relationship between twin deficits would help to formulate appropriate macroeconomic policies for a country. To that end, investigating the relationship between these two deficits appears to be much important.

2. Literature Review

The phenomenon of 'Twin Deficits' is a recent development in macroeconomics which came into light in 1980s when fixed exchange rate system was immensely replaced with flexible exchange rate system. The decade of 1980s witnessed a simultaneous upsurge in both budget deficit and trade (current account) deficit in significantly huge number of countries. That observed correlation between these two deficits is popularly known as 'Twin Deficits'. Hence, 'Twin Deficits' basically refer to the existence of long run relationship between budget deficit and trade deficit wherein budget deficit is argued to be a remarkable cause of trade deficit. However, some economists even argue that causality runs from trade deficit to budget deficit. Therefore, the direction of causality between these two macroeconomic variables appears to be a subject of contention among the economists [14].

In economic literature, multiple approaches are known to have explored the relationship between the trade deficit and budget deficit of a country: the conventional Keynesian preposition, the Ricardian Equivalence and Mundell-Fleming framework.

Mundell-Fleming framework

Based on the Mundell-Fleming framework, economists argue in favor of notable impact of budget deficit on current account deficit. Owing to the deficit budget, governments resort to borrowing funds from private sector or from other bilateral and multilateral sources to finance government expenditure. This enhanced borrowing from private sector leads to decreased national saving which is the sum of private saving plus government fiscal balance. Consequently, the interest rates will increase leading to growth in foreign capital inflows and appreciation of exchange rates. The appreciation of domestic currency will make exports less attractive and imports more attractive, subsequently worsening the trade balance, which is the major component in the current account deficit [21].

Keynesian absorption theory

Keynesian absorption theory suggests that an increase in budget deficit would induce domestic absorption and import expansion causing an increase or worsening in current account [21].

The Keynesian absorption theory states that a constant rise in the budget deficit would increase domestic absorption, particularly domestic income. An increase in domestic income will perhaps induce a rise in imports, thereby causing a trade balance deficit. If government expenditure is more than tax revenue, the economy records the budget deficit. Assuming that output remains constant, and if the deficit increases and the savings

remain the same, either investment or net export should decrease. This would result in the trade balance deficit, consequently twin deficits hypothesis [6].

Ricardian equivalence theory

According to [10], Ricardian equivalence theory states that trade deficit wouldn't be caused by budget deficit. This theory asserts that financing government expenditure with debt instead of taxes doesn't have any impact on aggregate demand or interest rates. If the government expenditures remain altered, a tax cut now means a tax increase in future. Consumers fully anticipate the increase in future taxes for repaying debts and don't consider the current tax reductions as being permanent. Hence, they react by increasing their savings not the expenditures. They may invest in newly issued government bonds to be prepared with the resources to pay for the increased future taxes. Hence, private saving which increases by same amount as budget deficit results in national saving being unaltered. Since desired national saving does not change, the real interest rate does not have to rise in a closed economy to maintain balance between desired national saving and investment demand. Subsequently, the budget deficit doesn't lead to trade deficit as proposed by the Keynesian Proposition.

Relationship from national income accounting

According to [11], following the well-known macroeconomic framework of national income identity, we can get the link between the budget deficit and trade deficit as follows:

To clarify the relationship between fiscal deficits and the balance of trade, it is helpful to begin with some national income accounting identities. First, individuals dispose of income(Y) as consumption (C) , savings (S) , or taxes (T):

$$Y = C+ S+ T \ldots\ldots\ldots\ldots (1)$$

Second, income must arise from either the domestic sale of consumption goods (C), Investment goods(I), governmental goods (G), or the net sale of goods to foreign agents (exports, X, minus imports, M):

$$Y=C+I+G+(X-M) \ldots\ldots (2)$$

Combining equations (1) and (2), we obtain,

C+S+T=C+I+G+(X-M), which simplifies to

$$T-G=(X-M) +(I-S) \ldots.(3)$$

In words, equation (3) states that the government budget surplus is equal to the trade surplus plus the excess of investment over private saving. Suppose that the government fixes spending (G), and cuts taxes(T), thereby creating a budget deficit. Equation (3) indicates that, as a result, either the trade surplus (X-M) must decline or the excess of investment over saving (I-S) must decline, or both. Hence, the twin deficit relationship is valid if only the gap between sectoral investment and saving (I-S) are assumed constant.

Empirical Studies:

Table 1: International Context

Authors	Study Period	Major Findings
[39] Tufail and his colleagues (2014)	1972-2011	In this study, Johansen Co-integration test found that budget deficit has positive effect on trade deficit in long-run in Pakistan. Granger causality test indicated that there is bi-directional causality between the variables. Finally, the researchers suggested that the Pakistani government should reduce budget deficit to decrease trade deficit.
[27] Onafowora and Owuye (2006)	1970-2001	Positive relationship between trade and budget deficits in both the short and long-run was ascertained in Nigerian Economy. It revealed that there exists unidirectional causality running from trade deficits to budget deficits. It found that attempts to reduce budget deficits must begin with reductions in trade deficits through indirect monetary channels.
[34] Selliah and Balamurali (2011)	1960-2010	The study found statistically significant long-run positive relationship between the variables. The Granger casuality test found the presence of bi-directional causality between trade deficit and budget deficit. Hence, the researchers concluded that Keynesian theory is valid for Sri Lankan economy and Ricardian equivalence theory is invalid.
[15] EL-Moussawi and Awdeh (2013)	1975-2011	The empirical results suggested that the budget deficit, the trade balance, the interest rate, and the exchange rate are cointegrated, suggesting the existence of an equilibrium relationship binding all these variables together. Besides, and most importantly, a bi-directional causality between budget deficit and trade deficit was detected, giving support to the "twin deficit" hypothesis.
[9] Banday and Aneja (2019)	1985-2016	The results of ARDL bound testing supported the existence of long run and short run relationship among the variables, thus validating the Keynesian hypothesis and rejecting the Ricardian proposition. They found bidirectional causality among the two deficits in China.
[22] Kuncahyo (2016)	1981-2012	Granger Causality test was conducted to assess the significant relationship of twin deficits in Indonesia and found a positive relationship of causality. Early Warning System (EWS) model was used to detect the early warning signals. The result of a signal extraction calculation from the chosen indicator variable trend showed a positive signal of twin deficits in Indonesia.
[33] Sadiku and his colleagues (2018)	1998-2017	Though VAR revealed short run relationship, the study concluded that there doesn't exist any causal relationship from budget deficit to trade deficit. There exists only unidirectional causality from trade deficit to budget deficit in Macedonia. Hence, they suggested that the government should target more on export-oriented firms and import substitution industry.
[17] Ganchev (2010)	2000-2010	The Granger causality tests resulted in conformance of fiscal deficit having a significant impact on current account deficit, in accordance with the twin deficit hypothesis. However, VAR analysis and VECM both rejected the twin deficit hypothesis in the short run but indicate that it might be valid in the long run in Bulgaria.
[5] Asrafuzzaman and his colleagues (2013)	1972-2012	The authors concluded that although there exists short run bidirectional causality between budget deficit and trade deficit, the long run dynamic relationship between the variables cannot be established. However, they suggest- Bangladeshi Government should reduce budget deficit to improve the trade account balance as Granger causality relationship showed the significance of causal relationship.
[8] Banday and Aneja (2015)	1990-2013	Johansen co-integration test provided evidence of cointegration among current account deficit and budget deficit. VECM didn't show any short run relationship among the variables. The Granger causality test showed a bi-directional causality flowing among the variables. Hence, the study concluded that there exists a long-run relationship between the variables but not in short-run in India.
[19] Kaufmann and his	1976-1988	The research employed the econometric technique of Augmented Dickey Fuller test, maximum likelihood estimation of Vector Error Correction Model (VECM)

colleagues (2002)		and impulse response function. The budget deficit was found to have no substantial part in affecting trade deficit. The conclusion is then reinforced by the impulse response function. Hence, the evidence presented in the paper rejected the twin deficit hypothesis for Austria during the two decades of study period.
[23] Miller and Russek (1989)	1946-1986	. Based on the deterministic technique and a stochastic procedure, they found evidence of a positive secular relationship between twin deficits only under flexible exchange rates. However, the findings based on the cointegration analysis indicated absence of any long run cointegrating relationship between the two deficits thus rejecting the twin deficit hypothesis in US.
[35] Sen and Kaya (2016)	1994-2012	The research concludes that there doesn't exist any Granger causality running from budget deficit and private saving-investment deficit to trade deficit in a panel of six post-communistcountries. Hence, the study rejects both the twin deficit hypothesis and triple deficit hypothesis for the countries in consideration and accept Ricardian equivalence proposition over the observation period.
[25] Ncanywa and Letsoalo (2019)	1994-2016	The cointegration test displayed that budget deficit and trade deficit don't display significant long-run relationship. Hence, the results of the research showed that the twin deficits or twin divergence do not hold in the long run, thus confirming the Ricardian Equivalence hypothesis in South Africa.
[36] Senadza and Aloryito (2016)	1980-2014	The error correction model finds an insignificant effect of the BD on the CAD both in the short and long runs. The ECM results are however significant for both the long run and short run regarding the effect of CAD on BD. Even Granger Causality tests conclude that there doesn't exist any significant causality from BD to CAD. They find evidence in favor of reverse causality from CAD to BD which rejects twin-deficit hypothesis in case of Ghana.

Table 2: Nepalese Context

Authors	**Study Period**	**Major Findings**
[20] Kharel and Kharel (2020)	2003-2020	Correlation analysis found positive correlation between budget deficit and trade deficit in Nepal. The simple linear regression also found the significant relationship between these two deficits. Hence, the authors concluded that budget deficit is a significant predictor of trade deficit in Nepal.
[37] Silwal (2008)	1976-2004	Contrary to the conventional theories and experiences, this paper hasn't found strong and convincing relationships of budget deficit, excess money supply, real exchange rate, and economic growth with trade deficit in the context of Nepal.
[29] Paudyal (2013)	1988-2011	The data analysis shows that budget deficit do not affect interest rates significantly in Nepal both in short run and long run i.e. budget deficits are interest rates neutral in Nepal. Hence, the researcher concludes that budget deficit doesn't crowd out private investment through the rise of interest rates in Nepal.
[3] Acharya (2004)	1964-2004	The results of Granger causality test suggested unidirectional causality from budget deficit to trade deficit. Furthermore, the causality has been reinforced by the vector autoregressive (VAR) modeling and intervention analysis (impulse function and variance decomposition). The study has provided valuable policy suggestions regarding efficient public expenditure management, export-led growth and strategic capital formation with the help of revised fiscal, monetary and financial policies.

There have been various studies and researches all around the world in the topic of twin deficit hypothesis for the economies of different countries. However, there are limited research conducted in Nepalese context. Out of the studies conducted in context of Nepal, there are mostly descriptive studies and research based on the data that are decades old. Furthermore, the studies are not found to be using the time series analysis tools like unit root test, cointegration analysis, error correction model, Granger causality test etc. The short run relationship, long run relationship and causality relationship between budget deficit and trade deficit have not been captured in context of Nepalese economy in recent times. Hence, this study will try to overcome such shortcomings in the

available literature and test the validity of twin deficit hypothesis for Nepal.

3. Research Methodology

The research is based on time series analysis employing various techniques like unit root test, cointegration test, Bound Test (F-version), error correction model (ECM) and Granger causality test. Economic model is based on the ARDL model as specified in the relationship between budget deficit and trade deficit. The diagnostic tests used in the study are CUSUM Test, CUSUMSQ Test, LM Test for Serial Correlation, Heteroscedasticity Test, and JB Test for Normality. Basically, the data have been collected from the publication of Ministry of Finance, Nepal Rastra Bank and World Bank. Data set for the period 1987/88-2017/18 has been taken into consideration for research. Hence, the population of the data is the time series data of government budget deficit, Nepal's trade deficit, inflation, real exchange rate and openness of trade; and the sample of the data will be the data sets of these variables between the fiscal year 1987/88 to 2017/18. Here, Budget deficit, Openness of Trade, Real Exchange Rate and Inflation are considered as independent variable while Trade Deficit is dependent variable. The conceptual framework of the study is mentioned below.

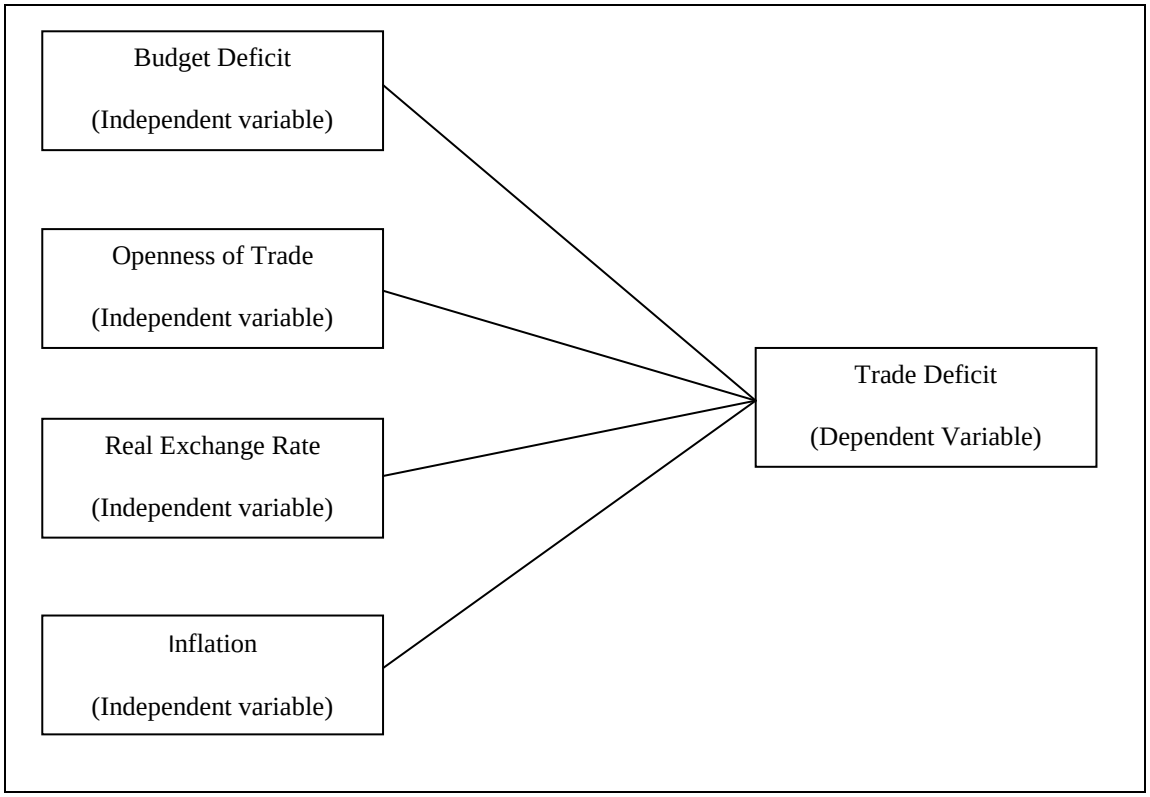


Figure 1: Conceptual Framework

Relationship between budget deficit and trade deficit

The general objective of the research is to find out the relationship between budget deficit and trade deficit in Nepal. However, there exist other variables too that determine the trade deficit of the country. For this thesis, other variables like openness of trade (OT), real exchange rate (RER) and inflation rate (INF) have been used as

the other independent variables. Hence, the general model that shows the relationship between budget deficit and trade deficit can be written as follows:

$$RTD = \beta_0 + \beta_1 RBD + \beta_2 OT + \beta_3 RER + \beta_4 INF + e_i \ldots\ldots\ldots (9)$$

Where,

RTD = Real Trade Deficit

RBD = Real Budget Deficit

OT = Openness of Trade

RER = Real Exchange Rate

INF = Inflation

e_i = stochastic error term

Since, the unit of the variables in the above equation are not same, it is necessary to take logarithm of the variables. Above equation can be written in the logarithm form as

$$LNRTD = \beta_0 + \beta_1 LN\ RBD + \beta_2 LN\ OT + \beta_3 LN\ RER + \beta_4\ LN\ INF + e_i \ldots\ldots\ldots (10)$$

The ardl formation of the above equation can be written as:

$$\Delta LN\ RTD_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\ \Delta LN\ RBD_{t-i} + \sum_{j=1}^{q} \beta_{2i}\ \Delta LN\ OT_{t-j} + \sum_{k=1}^{r} \beta_{3i}\ \Delta LN\ RER_{t-k} + \sum_{l=1}^{s} \beta_{4i}\ \Delta LN\ INF_{t-l} + \alpha_1 LN\ RBD_{t-1} + \alpha_2\ LN\ OT_{t-1} + \alpha_3\ LN\ RER_{t-1} + \alpha_4\ LN\ INF_{t-1} + \mu_t \ldots\ldots (11)$$

In the above equation, Δ is the first difference operator, β_0 is the drift component and μ_t is the white noise error; p, q, r and s are the number of lags. The coefficients β_{1i}, $\beta_{2i,}$ β_{3i} and β_{4i} represent the short-run dynamics of the model. The coefficients $\alpha_{1,}$ $\alpha_{2,}$ α_3 and α_4 represent the long-run relationship of the model.

Reference [31] have developed the bound testing approach to examine the existence of the long-run relationship between the variables in the model. The bound test is based on F-statistic and the null hypothesis for F-test is

Null Hypothesis ($H_{0)}$: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$

Alternative Hypothesis (H_1) : $\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq 0$

Reference [31] provides two sets of critical values called the lower critical bound and upper critical bound. The null hypothesis is accepted if the F-statistic is less than the lower critical bound which implies no co-integration. On the contrary, the null hypothesis is rejected if the F-statistic is above the upper critical bound

which implies the presence of cointegration. However, the study becomes inconclusive if the F-statistic lies between the two bounds.Error correction model based on the assumption made by Pesaran and his colleagues (2001) has also been employed for studying the short run dynamics of the model. Thus, the error correction version of the ARDL model pertaining to the equation (11) can be expressed as:

$$\Delta LN\ RTD_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\ \Delta LN\ RBD_{t-i} + \sum_{j=1}^{q} \beta_{2i}\ \Delta LN\ OT_{t-j} + \sum_{k=1}^{r} \beta_{3i}\ \Delta LN\ RER_{t-k} + \sum_{l=1}^{s} \beta_{4i}\ \Delta LN\ INF_{t-l} + \delta EC_{t-1} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Where δ is the speed of adjustment parameter and EC is the residuals that are obtained from the estimated cointegration model and other variables are same as in equation (11).

Causal relationship between budget deficit and trade deficit

In line to the third objective of the research i.e., to determine the presence of any causal relationship between the budget deficit and trade deficit, Granger Causality test has been employed in the thesis. The basic model applied for the Granger Causality test can be written as:

$$RTD = \alpha + \sum_{i}^{n} \beta_i RBD_{t-i} + \sum_{j}^{k} \gamma_j RTD_{t-j} + \mu_{i1} \ldots\ldots\ldots\ldots\ldots\ldots (13)$$

And

$$RBD = \delta + \sum_{i}^{n} \theta_i RTD_{t-i} + \sum_{j}^{k} \eta_j RBD_{t-j} + \mu_{i2} \ldots\ldots\ldots\ldots\ldots\ldots (14)$$

Where n and k are the lag length

The first set of hypotheses for the Granger Causality test are given as:

Null Hypothesis (H_0): If all $\beta_i = 0$, RBD doesn't has causality over RTD

Alternative Hypothesis (H_1):If at least $\beta_i \neq 0$, RBD Granger causes RTD

The second set of hypotheses for the Granger Causality test are given as:

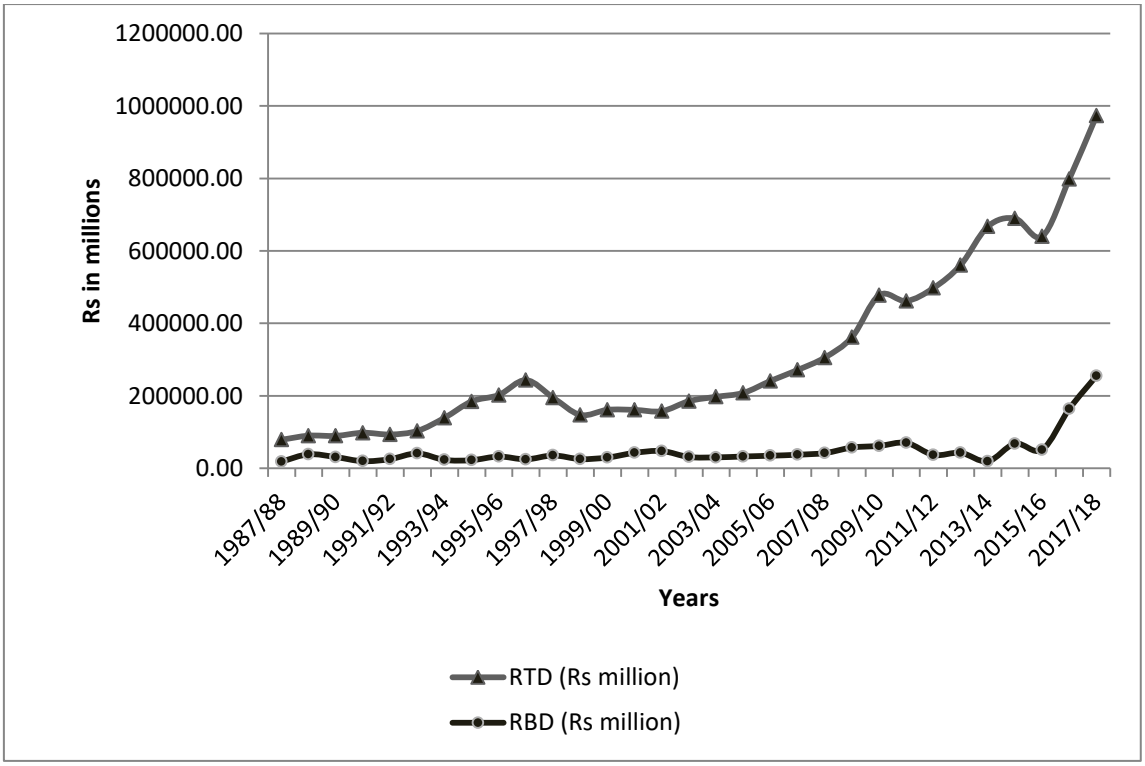
Null Hypothesis (H_0): If all $\theta_i = 0$, RTD doesn't Granger cause RBD

Alternative Hypothesis (H_1): If at least $\theta_i \neq 0$, RTD has causality over RBD

4. Results and Findings

4.1 Budget deficit and Trade deficit trend

Both budgets and trade balances of Nepal have been running in deficit over the study period.

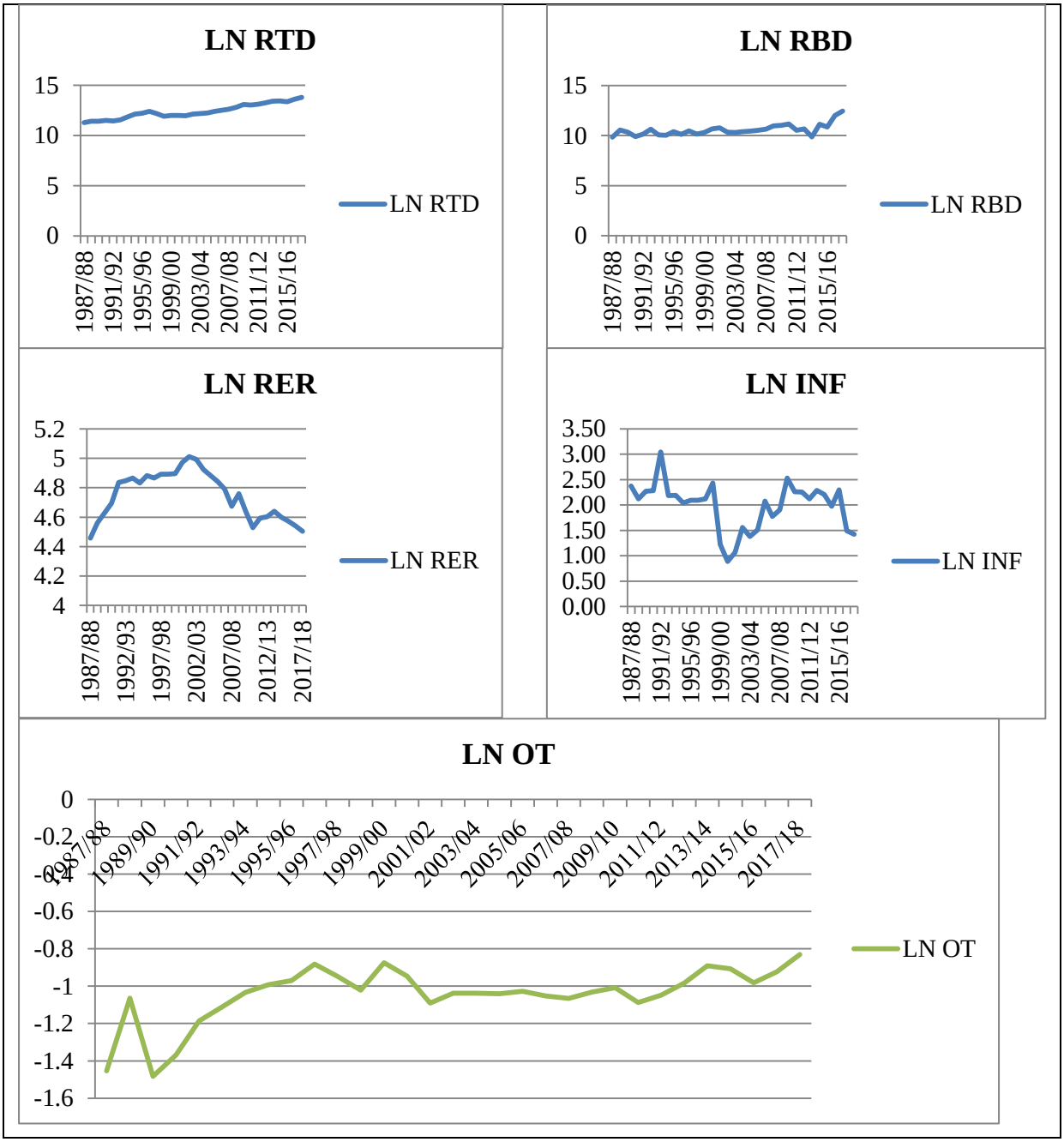


Source: Economic Bulletins, Nepal Rastra Bank.

Figure 2: Budget deficit and Trade deficit trend

4.2 Unit Root Test

Both budget deficit and trade deficit are the time series data. Hence, in order to examine the long run and short run relationship between budget deficit and trade deficit, it is first necessary to check the order of integration of the variable. Before testing the stationarity of data, it is better to see the nature of data.



Source: Authors Calculation

Figure 3: Variables of Study

Figure 3 shows the graphical representation of each variable in consideration. As seen in figure, LN RTD and LN RBD have increasing trend over time. LN RER seem to be initially trended upwards and then it is trending downwards. LN INF seems to be having irregular fluctuations over time with changing variances. Though LN OT is increasing for some period in beginning, it seems to be following stationary pattern in the latter years. However, it is necessary to test the stationarity of the variable with econometric tools. This study employs Augmented Dickey Fuller (ADF) test as a tool to ascertain the stationarity of the data. The outcome of the ADF test has been tabulated below:

Table 3: Augmented Dickey Fuller test

Variables	Level		First difference		Remarks
	Intercept	Intercept and trend	Intercept	Intercept and Trend	
LN TRD	0.213 (0.969)	-1.489 (0.811)	-4.042 (0.004)***	-4.055 (0.018)**	I(1)
LN RER	-1.353 (0.592)	-2.76 (0.222)	-4.438 (0.002)***	-5.296 (0.001)***	I(1)
LN RBD	1.114 (0.996)	-2.76 (0.222)	-4.438 (0.002)***	-5.296 (0.001)***	I(1)
LN OT	-.3.452 (0.017)**	-2.788 (0.214)	-6.154 (0.000)***	-6.41 (0.0001)***	I(0)
LN INF	-2.607 (0.103)	-2.642 (0.266)	-6.739 (0.000)***	-6.632 (0.000)***	I(1)

Source: Author's calculation

Note: ** and *** shows p-values with 5% and 1% level of significance respectively, the numeric values without parenthesis are the values of t-statistics, and the numeric value within the parenthesis express the corresponding p-values.From the table 3, we can see that the null hypothesis of the variables that the variables contain unit root are getting rejected at significance levels. As we know that absence of unit root means stationarity, the variables LNTRD, LNRER , LNRBD , LNINF are found to be stationary in their first difference including trend as well as trend and intercept. Hence, these variables are clearly I(1) variables. These variables are found to be stationary at first difference at 1% significance level as well except for LNTRD including trend and intercept which rejected null hypothesis at 5% significance level. However, the variable LNOT was found to be stationary in level form including only intercept. When, ADF test was conducted including both trend and intercept, it couldn't reject the null hypothesis. However, coefficient of trend was 0.003 with P-value of 0.144 which is not significant. Hence, LNOT can be concluded to be I(0). As all the variables are either I(0) or I(1) , we can proceed with ARDL bound test.

4.3 ARDL model

As data used in the thesis are annual data and there are only 31 observations, maximum lag order is set to 2 following Pesaran and Shin (1999). Selecting higher maximum lag order reduces degree of freedom which is not suitable for small sample annual data, so the maximum lag order is selected to be 2. According to Pesaran (1997), AIC and SBC perform relatively well in small samples (Bhattarai,2014).EViews software have been used to select the best ARDL model given the variables and lag selection criterion. Using the AIC criterion, EViews selected the ARDL (2,0,0,0,2) model out of 162 alternative model as shown in appendix. The lag selection of (2,0,0,0,2) represents LN RTD is regressed with two lags; LN BD, LN RER, LN OT are regressed

with zero lags; and LN INF is regressed with two lags. After ARDL estimation, bound test is performed to assess the presence of cointegration among the variables. The result of the bound test is given in Table 4.

Table 4: Estimation of bound test for ARDL (2,0,0,0,2) cointegration model

Level of Significance	F-statistics	Lower Bound	Upper Bound
1%	1.2416	3.74	5.06
5%		2.86	4.01
10%		2.45	3.52

Source: Author's Calculation through EViews

In Table 4, the calculated F-statistics is 1.2416 which is less than both the lower bound and upper bound values in all 1%, 5% and 10% level of significance. As the null hypothesis of bound test is that there is no long-term variables among the variables, F-statistics of value less than lower bound fails to reject the null hypothesis. In other words, there isn't any long run relationship or cointegration among the variables.

EViews provides us with the following estimation of the cointegrating equation

D(LNRTD) = 0.237945423720*D(LNRTD(-1)) – 2.035491148328*D(LNRER) – 0.35595520685*D(LN RBD) + 1.609414594402* D(LN OT) -0.018129491870*D(LN INF) + 0.197337109273*D(LN INF(-1)) – 0.484219013671*(LN RTD- (-4.20365804*LN RER(-1) – 0.07351120* LN RBD(-1) + 3.32373275* LN OT(-1) – 0.60321141 * LN INF(-1) + 37.95886135)) …….(15)

Based on the above cointegration equation, EViews provides the estimation of long run coefficients of the model which are mentioned in the table below:

Table 5: Coefficient of long run relationship in the ARDL (2,0,0,0,2) cointegration form

Dependent Variable: LN RTD

Regressors	Coefficient	Standard Error	T-ratio	P-value
LN RBD	-0.073511	0.111353	-0.660161	0.5167
LN RER	-4.203658	0.440831	-9.535763	0.0000
LN OT	3.323733	0.345259	9.626767	0.0000
LN INF	-0.603211	0.144841	-4.164655	0.0005
C	37.958861	3.371944	11.257264	0.0000
R^2=0.984	Adjusted R^2 = 0.978	SE = 0.103026 F-statistics= 155.347	AIC = -1.4585 SBC = -1.0342	DW = 1.623

Source: Author's Calculation with EViews.

Table 5 shows that LN RER, LN OT and LN INF have significant long run relationship with LN RTD. All these variables have significant long-run relationship at less than 1% level of significance. LN RER and LN INF have

negative or inverse relationship with LN RTD. LN OT has positive relationship with LN TRD in long run. However, we are more interested in the statistical significance of the key variable of our research i.e., LN RBD. As mentioned in the table, the long-run coefficient of LN RBD (-0.073511) was found to be statistically insignificant with p-value of 0.5167 at all 1%, 5% and 10% level of significance. This shows there isn't any long run relationship between budget deficit and trade deficit.

4.4 Error Correction Model (short-run dynamics)

Furthermore, we can also estimate the short-run relationship between the variables using the ECM model as provided by the cointegration form of the equation. As the bound test shows that there doesn't exist any cointegration among the variables, the ECM model without the error correction term has been estimated. The estimation of the short run coefficients of the variables are mentioned in the table as follows:

Table 6: Coefficient of short run relationship in the ARDL (2,0,0,0,2) cointegration form

Dependent Variable:D(LN RTD)

Regressors	**Coefficient**	**Standard Error**	**T-Statistics**	**P-value**
D(LN RTD(-1))	0.237945	0.161122	1.476804	0.1553
D(LN RBD)	-0.035596	0.053120	-0.670100	0.5105
D(LN RER)	-2.035491	0.470343	-4.327672	0.0003
D(LN OT)	1.609415	0.379344	4.242620	0.0004
D(LN INF)	-0.018129	0.063837	-0.283998	0.7793
D(LNINF(-1))	0.197337	0.062690	3.147837	0.0051
R^2=0.984	Adjusted R^2 = 0.978	SE = 0.103026 F-statistics= 155.347	AIC = -1.4585 SBC = -1.0342	DW = 1.623

Source: Author's calculation through EViews.

Table 6 presents the short run coefficients for the LN RTD as selected by EViews. From the table, we can see that the coefficients of difference of LN RER, LN OT and LN INF(-1) are statistically significant at less than 1% level of significance. LN RER was found to have negative relationship with LN RTD in short run whereas LN OT and LN INF(-1) were found to have positive relationship. 1% increase in LN RER decreases the trade deficit by 2.035%. It is because as the real exchange rate increases, domestic currency becomes devaluated. Hence, export becomes cheaper, and import becomes expensive which decreases trade deficit in the country. Regarding LN OT, 1% increase in OT causes in increase in trade deficit by 1.61%. The reason behind this may be that when the country becomes more and more open to trade without corresponding increase in trade competitiveness, it faces greater increase in import as compared to export. Such scenario leads to trade deficit in short run. The first lag of LN INF was found to have positive impacts in trade deficit of the current period. 1% increase in inflation in this period increases the trade deficit by 0.197% in the next period. Hence, the impact of inflation in short run is lagged by one period. The positive and significant coefficient of LNINF (-1) is because the increase in domestic inflation increases the prices of domestic goods and services. This results in domestic

production becoming less competitive in comparison to the imported goods and services as it is becoming more expensive in comparison to the foreign goods. These further increases trade deficit in the country as it promotes import and hampers export.

Apart from these, other variables selected by ARDL model such as D(LNRTD(-1)) and D(LNINF) weren't found to be statistically significant in the short run. As per the objective of the thesis, it is imperative to evaluate the short run relationship between budget deficit and trade deficit. It can be clearly seen from the above table that the coefficient -2.035491 of D (LN RBD) has the t-statistics of -0.6701 with p-value of 0.5105, is found to be statistically significant. Hence, there doesn't exist any significant relationship between budget deficit and trade deficit even in the short run.

4.5 Diagnostic Tests

The results of the diagnostic tests can be presented in the table below:

Table 7: Results of diagnostic tests

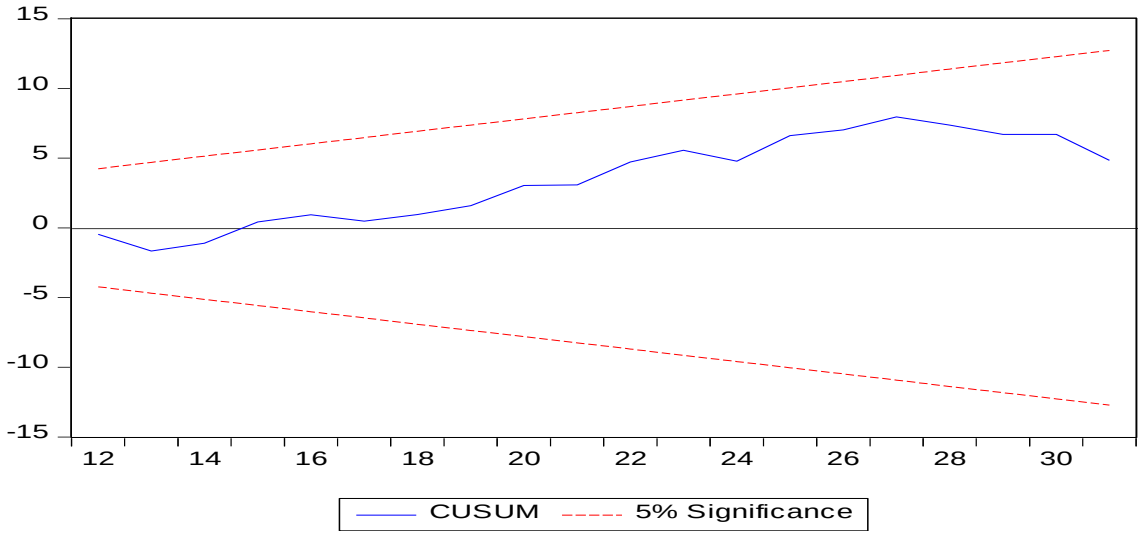
Diagnostic Tests	**F-statistics**	**Probability**
Serial Correlation (LM) test		
Lag length 1	1.509575	0.2342
Lag length 2	0.716336	0.5019
Lag length 3	0.464381	0.7109
Lag length 4	1.035345	0.4194
Heteroscedasticity test (Breush-Pagan-Godfrey test)	1.252879	0.321
Normality test (Jacque bara JB test)	0.814591	0.665

Source: Author's calculation with EViews.

The null hypothesis of LM test is that there is no serial correlation. As the p-value of LM correlation test is higher than 0.10 at all levels of significance, it fails to reject the null hypothesis of no serial correlation at all 1%, 5% and 10% level of significance. Hence, there is no serial correlation in data. The p-value of Breusch-Pagan-Godfrey heteroscedasticity test is 0.321 which fails to reject the null hypothesis of the test (ie. there is homoscedasticity). So, there is no heteroscedasticity in the data. Similarly, the null hypothesis of JB test is that the data are normally distributed. The p-value of 0.665 with F-statistics 0.814591 fails to reject the null hypothesis which shows that the data are normally distributed.

4.5.1 Stability tests: CUSUM and CUSUMSQ

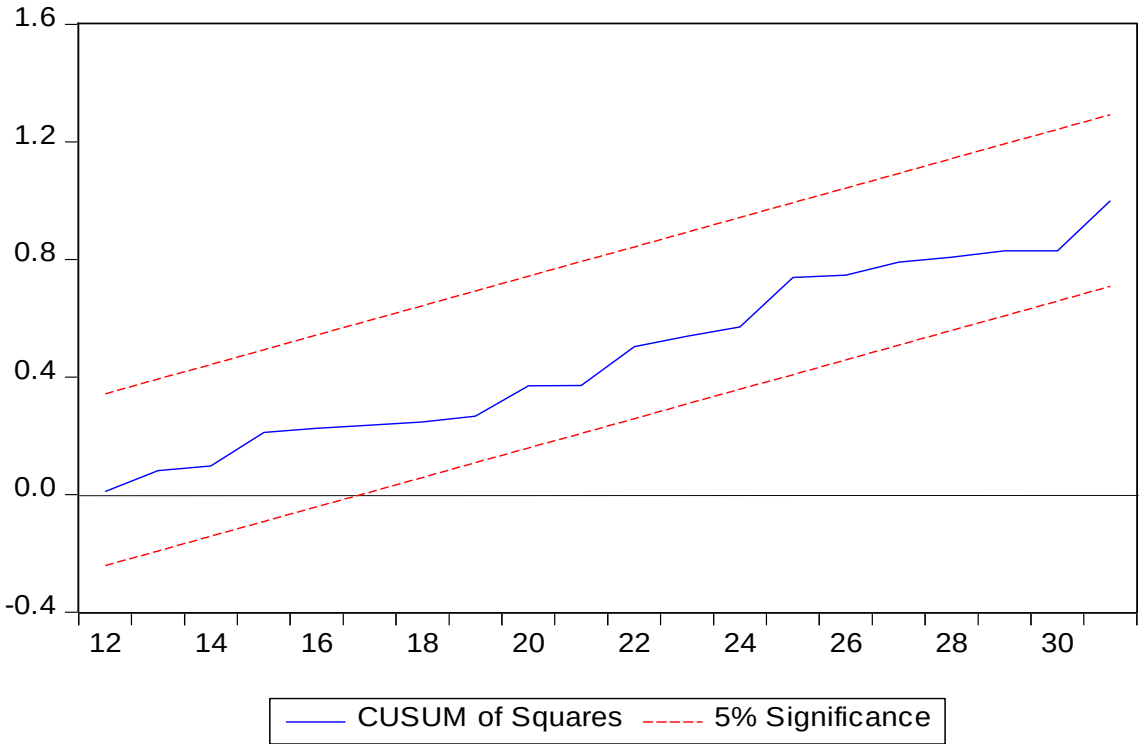
It is necessary to evaluate the stability of the long-run parameters as well as short run movements of the variables in the estimated model. This thesis employs cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) tests for measuring the stability of the equations. The graphical presentation of CUSUM test of the ARDL model is given in the figure ix.



Source: Authors Calculation through EViews.

Figure 4: Cumulative sum of recursive residuals (RTD)

The graph of the CUSUM statistic should fall between the 5% significance line for the stability of the coefficients. As the plots of CUSUM statistic for the LN RTD are within the lower and upper critical lines at 5% level of significance, we can ascertain that the long run coefficients of the ARDL equation are stable. Similarly, the graphical representation of the CUSUMSQ is given in figure x.



Source: Author's Calculation through EViews.

Figure 5: Cumulative sum of square of recursive residuals (RTD)

As the above graph shows the plots of CUSUMSQ statistic for the long run coefficient of ARDL model are within the critical lines at the 5% level of significance, the coefficients are stable.

4.6 Causal relationship between Budget deficit and Trade deficit

In accordance with the objective of the thesis to determine the presence of any causal relationship between trade deficit and budget deficit, Pair-wise Granger Causality test has been used to check the causality. Augmented Dickey Fuller test suggested, both LN RTD and LN RBD are I(1) variable. Granger Causality test requires the variables to be I(0). So, the causality relationship can only be tested in the first difference form of both variables. Table 4.6 shows the result for the pair-wise Granger Causality test between trade deficit and budget deficit.

Table 8: Results of pair-wise Granger causality test (data in first difference)

Sample: 31 (1987/88 -2017/18)

Lags: 1

Null Hypothesis	Observation	F-statistics	Probability	Decision
D(LNRBD) doesn't Granger Cause D(LNRTD)	29	0.01565*	0.9014	No Causality
D(LNRTD) doesn't Granger Cause D(LNRBD)	29	0.48511*	0.4923	No Causality

Source: Author's Calculation with EViews.

Note: *represents rejection of null hypothesis at 5% level of significance

Table 8 shows the result of pair wise Granger causality test between LN RBD and LN RTD in first difference. It can be concluded that budget deficit doesn't cause trade deficit as the null hypothesis cannot be rejected at all 1%, 5% and 10% level of significance. Similarly, there isn't any causality from trade deficit to budget deficit as the p-value of 0.4923 fails to reject the null hypothesis. Therefore, neither budget deficit Granger causes trade deficit nor trade deficit Granger causes budget deficit.

4.7 Findings

The study is based on ARDl model and bound test for assessing the presence of any long run relationship among the variables. In addition, error correction model has been used for assessing the short run relationship among the variables and Granger causality test has been used for examining the causality relationship. The ARDL test has failed to provide any cointegration between the variables as F-statistics (1.2416) is found to be less than the lower and upper bound at all 1%, 5% and 10% level of significance. The coefficient of budget deficit is also insignificant. It shows that there doesn't exist any long run relationship between budget deficit and trade deficit. In short run, the study shows a positive relation of trade deficit with openness of trade and first lag of inflation

whereas negative relation with real exchange rate. However, there isn't any significant short-run relationship between trade deficit and budget deficit. Granger Causality tests also confirms the absence of causality between trade deficit and budget deficit in any direction. This result discards the validity of Twin Deficit hypothesis in Nepal.

The results of the study are found to be in contradiction with [39, 27, 34, 15, 8, 22, 20, and 3]. However, the results are consistent to the outcome of [33, 19, 23, 35, 40, and 36] since no significant long run, short run and causal relationships are found between budget deficit and trade deficit.

In Nepalese context, the result of this study contradicts with the findings from [20]. But their study period takes into account data from 2003 to 2020 only. Also, the study only relies on correlation and simple linear regression, posing questions on the reliability of the study. Next, [3] also contradicts with results of this study, but it cannot be compared with the contemporary times, as the dimensions of trade and budget have significantly changed in the last 15 years. However,the results are in line with [29] which concludes that budget deficit doesn't affect interest rates significantly in short run and long run in Nepal. Hence, the results of bound test, ECM, and Granger causality test along with the diagnostic and stability tests using the time series data from 1987/88 to 2017/18 shows that Twin Deficit Hypothesis is not valid for Nepal.

4.8 Limitations of the Study

One of the major constraints of this study is unavailability of long-run data from the national archives. The macroeconomic data of only past 30 years have been collected from Nepal Rastra Bank (Central Bank of Nepal) official archives. However, the rigor of the study has been maintained using appropriate computational tools to compensate for small sample. Further, trade deficit and budget deficit have always been a genuine problem for Nepal. But, the scope of this study is limited to testing the twin deficit hypothesis, rather than deeply exploring the raison detre's of these two problems, namely trade deficit and budget deficit.

5. Conclusion and Recommendation

Although Nepal experiences persistent trade deficit and budget deficit, twin deficit hypothesis wasn't found to be valid in case of Nepal during the study period of 1987/88 to 2017/18. The results of ARDL estimation, error correction model and bound test show that no significant relationship between budget deficit and trade deficit can be found either in short run or in long run. Hence, making changes in budget deficit of the government doesn't seem to have any significant impact in improving trade balance of Nepal. One of the possible reasons behind absence of relationship between the two deficits is the pegged exchange rate system of Nepal. Mundell-Fleming framework describes changes in interest rates and exchange rates as a key factor carrying the impact of budget deficit to trade deficit. However, exchange rates of Nepal don't adjust in response to changes in interest rates due to the fixed exchange rate system. In addition, the absence of twin deficit relation can also exist due to corresponding adjustment in saving-investment balance as proposed by Ricardian Equivalence hypothesis i.e., any increment in budget deficit is offset by an improvement in saving-investment balance of private sector, thus leading to unaltered trade balance. So, it can be concluded that Twin deficit hypothesis isn't valid for the case of

Nepal. After observation of all data as mentioned above, this thesis accepts Ricardian Equivalence hypothesis. In line with this, Granger causality test also doesn't indicate any causal relationship between budget deficit and trade deficit in Nepal.

Based on the study, following policy recommendations are made.

i. There doesn't exist any significant long-run and short-run relationship between trade deficit and budget deficit. So, adjusting in budget deficit as a policy measure to control trade deficit doesn't seem to yield any result. Hence, government should look to fix other economic aspects.

ii. In short run, trade deficit is positively influenced by openness of trade and inflation whereas negatively influenced by real exchange rate. Hence, government should emphasize on controlling inflation and maintaining appropriate real exchange rate to minimize trade deficit in Nepal.

iii. Appropriate studies are necessary to determine the real causes of trade deficit. Once the major causes are determined, necessary steps and policies should be formulated and implemented to control those factors so as to maintain healthy trade balance of country.

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Appendix i: Variables in Nominal Form (BD and TD are in Rs Million, OT is Ratio and EXR is Nominal Exchange Rate in Rupee per Dollar)

Table i

YEAR (AD)	TD	BD	OT	EXR	INF
1987/88	9755.1	2320.7	0.23	22.21	10.76
1988/89	12068.4	5199.9	0.35	25.63	8.34
1989/90	13168.7	4563.5	0.23	28.64	9.72
1990/91	15839	3192.7	0.25	31.95	9.81
1991/92	18233.5	4983.4	0.31	42.69	21.03
1992/93	21939.1	8773.3	0.33	45.65	8.87
1993/94	32277.4	5401.3	0.36	49.25	8.95
1994/95	46040.3	5644.1	0.37	49.94	7.69
1995/96	54573.4	8810.7	0.38	55.21	8.11
1996/97	70916.9	7252.5	0.41	57.02	8.09
1997/98	61488.5	11262.4	0.39	61.95	8.34
1998/99	51849	8996.4	0.36	67.95	11.38
1999/00	58682.2	10908	0.42	69.07	3.39
2000/01	60033.1	15921.2	0.39	73.83	2.42
2001/02	60444.2	18340.1	0.34	76.88	2.90
2002/03	74421.5	12577	0.35	77.79	4.75
2003/04	82366.4	12662.8	0.35	73.79	3.96
2004/05	90767.9	14295.4	0.35	72.06	4.53
2005/06	113546.2	16427.8	0.36	72.32	7.96
2006/07	135311.5	18762.8	0.35	70.49	5.91
2007/08	162671.2	22475.8	0.34	65.02	6.70
2008/09	216772.1	34356.1	0.36	76.88	12.58
2009/10	313511.2	40731.8	0.36	74.54	9.57
2010/11	331837	50506.3	0.34	72.27	9.56
2011/12	387406.7	28904.8	0.35	81.02	8.32
2012/13	479822.8	36672.1	0.37	87.96	9.84
2013/14	622374.3	18170.2	0.41	98.25	9.07
2014/15	689364.9	68306.5	0.40	99.49	7.22
2015/16	703481.8	56682.2	0.37	106.35	9.94
2016/17	917064.1	188694.6	0.40	106.21	4.45
2017/18	1163743.4	305498.7	0.44	104.37	4.15

Source: Economic Survey 2020/21 and 2010/11; Nepal Rastra Bank Quarterly Economic Bulletin Mid-July 2020 and mid-April 2003; and Author's Calculation.

Appendix ii: Variables in Real Form (RTD and RBD are in Rs Millions)

Table ii

YEAR (AD)	CPI	RTD	RBD
1987/88	12.3532	78968.36	18786.26
1988/89	13.3803	90195.56	38862.48
1989/90	14.6784	89714.54	31089.8
1990/91	16.1187	98264.53	19807.39
1991/92	19.5123	93446.01	25539.74
1992/93	21.2417	103282.9	41302.15
1993/94	23.1429	139470.2	23338.94
1994/95	24.9151	184788.8	22653.34
1995/96	26.9418	202560.2	32702.7
1996/97	29.1217	243519.3	24904.13
1997/98	31.5462	194915.5	35701.25
1998/99	35.1359	147566.9	25604.56
1999/00	36.3280	161534.3	30026.42
2000/01	37.2125	161325	42784.52
2001/02	38.2879	157867.8	47900.56
2002/03	40.1063	185560.7	31359.18
2003/04	41.6957	197541.6	30369.55
2004/05	43.5882	208239.5	32796.48
2005/06	47.0589	241285.1	34908.99
2006/07	49.8354	271516.8	37649.53
2007/08	53.1766	305907.5	42266.34
2008/09	59.8672	362088.3	57387.19
2009/10	65.6002	477912.3	62091.01
2010/11	71.8711	461711	70273.4
2011/12	77.8472	497649.9	37130.15
2012/13	85.5061	561156.3	42888.29
2013/14	93.2708	667276.7	19481.12
2014/15	100.0002	689363.4	68306.34
2015/16	109.9383	639887.7	51558.18
2016/17	114.8300	798627.6	164325.2
2017/18	119.6000	973029.6	255433.7

Source: Economic Survey 2020/21 and 2010/11; Nepal Rastra Bank Quarterly Economic Bulletin Mid-July 2020 and mid-April 2003; and Author's Calculation.

Appendix iii: Calculation of Openness of Trade

Rs millions

Table iii

Year AD	Export	Import	Gdp (nominal)	OT
1987/88	4,114.5	13,869.6	76906	0.23
1988/89	4,195.3	16,263.7	59270	0.35
1989/90	5,156.2	18,324.9	103416	0.23
1990/91	7,387.5	23,226.5	120370	0.25
1991/92	13,706.5	31,940.0	149487	0.31
1992/93	17,266.5	39,205.6	171492	0.33
1993/94	19,293.4	51,570.8	199272	0.36
1994/95	17,639.2	63,679.5	219175	0.37
1995/96	19,881.1	74,454.5	248913	0.38
1996/97	22,636.5	93,553.4	280513	0.41
1997/98	27,513.5	89,002.0	300845	0.39
1998/99	35,676.3	87,525.3	342036	0.36
1999/00	49,822.7	108,504.9	379488	0.42
2000/01	55,654.1	115,687.2	441519	0.39
2001/02	46,944.8	107,389.0	459443	0.34
2002/03	49,930.6	124,352.1	492231	0.35
2003/04	53,910.7	136,277.1	536749	0.35
2004/05	58,705.7	149,473.6	589412	0.35
2005/06	60,234.1	173,780.3	654084	0.36
2006/07	59,383.1	194,694.6	727827	0.35
2007/08	59,266.5	221,937.7	815658	0.34
2008/09	67,697.5	284,469.6	988053	0.36
2009/10	60,824.0	374,335.2	1192774	0.36
2010/11	64,338.5	396,175.5	1366954	0.34
2011/12	74,261.0	461,667.7	1527344	0.35
2012/13	76,917.1	556,740.3	1695011	0.37
2013/14	91,991.4	714,365.8	1964540	0.41
2014/15	85,319.1	774,684.2	2130150	0.40
2015/16	70,117.2	773,599.1	2253163	0.37
2016/17	73,049.1	990,113.2	2674493	0.40
2017/18	81,359.8	1,245,103.2	3044927	0.44

Source: Economic Survey 2020/21 and 2010/11; Nepal Rastra Bank Quarterly Economic Bulletin Mid-July 2020 and mid-April 2003; and Author's Calculation.

Appendix iv: Calculation of Real Exchange Rate

Table iv

YEAR AD	EXR	CPI Nepal	CPI USA	RER
1987/88	22.21	12.35	48.00	86.31
1988/89	25.63	13.38	49.95	95.67
1989/90	28.64	14.68	52.36	102.17
1990/91	31.95	16.12	55.19	109.40
1991/92	42.69	19.51	57.53	125.87
1992/93	45.65	21.24	59.27	127.40
1993/94	49.25	23.14	61.02	129.88
1994/95	49.94	24.92	62.61	125.48
1995/96	55.21	26.94	64.37	131.91
1996/97	57.02	29.12	66.26	129.74
1997/98	61.95	31.55	67.80	133.14
1998/99	67.95	35.14	68.86	133.15
1999/00	69.07	36.33	70.36	133.76
2000/01	73.83	37.21	72.74	144.33
2001/02	76.88	38.29	74.79	150.18
2002/03	77.79	40.11	75.98	147.35
2003/04	73.79	41.7	77.71	137.51
2004/05	72.06	43.59	79.79	131.89
2005/06	72.32	47.06	82.49	126.78
2006/07	70.49	49.84	85.15	120.44
2007/08	65.02	53.18	87.58	107.08
2008/09	76.88	59.87	90.95	116.78
2009/10	74.54	65.6	90.62	102.97
2010/11	72.27	71.87	92.11	92.63
2011/12	81.02	77.85	95.02	98.89
2012/13	87.96	85.51	96.98	99.76
2013/14	98.25	93.27	98.40	103.66
2014/15	99.49	100	100.00	99.49
2015/16	106.35	109.94	100.12	96.85
2016/17	106.21	114.83	101.38	93.77
2017/18	104.37	119.6	103.54	90.36

Source: Author's calculation based on Nepal Rastra Bank and World Bank Data.

Appendix v: Normality Test of the ARDL(2,0,0,0,2) Cointegration Model

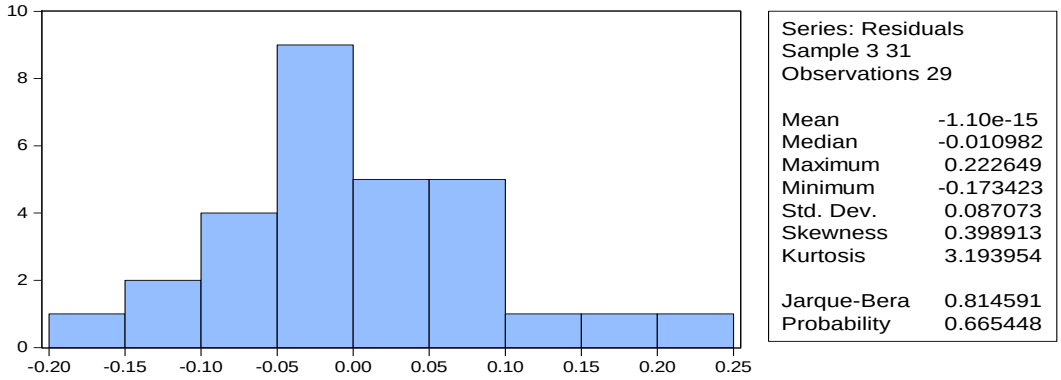

Figure v

Source: Author's Calculation through EViews

Appendix vi: Breusch-Godfrey Serial Correlation LM test for ARDL (2,0,0,0,2) Cointegration Form

Table vi

Lag Length	F-Statistics	Observed R-Squared	Probability	Chi-Square
1	1.509575	2.134500	0.2342	0.1440
2	0.716336	2.138021	0.5019	0.3433
3	0.464381	2.196534	0.7109	0.5326
4	1.035345	5.962850	0.4194	0.2019

Source: Author's Calculation through EViews.

Appendix vii: Heteroscedasticity Test Breusch-Pagan-Godfrey for ARDL (2,0,0,0,2) Model Cointegration Form

Table vii

F-statistics	Observed R-Squared	Scaled Explained SS	Probability F (8,20)	Prob. Chi-Square (8)	Prob. Chi-Square (8)
1.252879	9.681500	5.051313	0.3210	0.2881	0.7521

Source: Author's Calculation with EViews.

Appendix viii: ARDL Model Estimation with EViews

Dependent Variable: LNRTD

Method: ARDL

Date: 10/30/21 Time: 14:23

Sample (adjusted): 3 31

Included observations: 29 after adjustments

Maximum dependent lags: 2 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (2 lags, automatic): LNRBD LNRER LNOT LNINF

Fixed regressors: C

Number of models evalulated: 162

Selected Model: ARDL(2, 0, 0, 0, 2)

Table viii

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNRTD(-1)	0.753726	0.207077	3.639841	0.0016
LNRTD(-2)	-0.237945	0.161122	-1.476804	0.1553
LNRBD	-0.035596	0.053120	-0.670100	0.5105
LNRER	-2.035491	0.470343	-4.327672	0.0003
LNOT	1.609415	0.379344	4.242620	0.0004
LNINF	-0.018129	0.063837	-0.283998	0.7793
LNINF(-1)	-0.076620	0.075759	-1.011358	0.3239
LNINF(-2)	-0.197337	0.062690	-3.147837	0.0051
C	18.38040	4.176287	4.401134	0.0003

R-squared	0.984162	Mean dependent var	12.46567
Adjusted R-squared	0.977827	S.D. dependent var	0.691882
S.E. of regression	0.103026	Akaike info criterion	-1.458541
Sum squared resid	0.212288	Schwarz criterion	-1.034208
Log likelihood	30.14885	Hannan-Quinn criter.	-1.325645
F-statistic	155.3474	Durbin-Watson stat	1.622607
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Author's Calculation with EViews