RELATIONSHIP BETWEEN REAL EFFECTIVE EXCHANGE RATE AND TRADE BALANCE IN NEPAL

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By

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February 2021

DECLARATION

I, **Sakila Gautam**, declare that this is my original work except where otherwise indicated or acknowledged in the thesis. The thesis doesn't contain materials that have been accepted or submitted for any other degree at the university or other institution.

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RECOMMENDATION LETTER

This thesis entitled "**Relationship between Real Effective Exchange Rate and Trade Balance in Nepal**" has been prepared by **Mrs. Sakila Gautam** under my guidance and supervision. I hereby recommend this thesis for the final examination to the thesis committee as partial fulfillment of the requirements for the Degree of **Master of Arts in Economics**.

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Date: January 25, 2021

(2077/10/12)

APPROVAL LETTER

We certify that this thesis entitled "**Relationship between Real Effective Exchange Rate and Trade Balance in Nepal**" submitted by **Mrs. Sakila Gautam** to the Central Department of Economics, Faculty of Humanities and Social Sciences, Tribhuvan University, in partial fulfillment of the requirements for the degree of Master of Arts in Economics has been found satisfactory in scope and quality. Therefore, we accept this thesis as a part of the Degree.

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I take sole responsibility for any errors and discrepancies that might have been occurred in this study.

Sakila Gautam

February, 2021

ABSTRACT

This study investigates the relationship between real effective exchange rate and trade balance in the context of Nepal using the Engle-Granger cointegration test and Error correction model based on annual data from 1979 to 2019 and suggests that the variables are cointegrated and shows that real effective exchange rate and real GDP have a significant positive role in increasing trade deficit in the long-run but remittance has been found to have negative impact. The result of the Error Correction Model further indicates that in the short-run, the real effective exchange rate and the real gross domestic product have a positive effect but, the remittance has a negative and significant effect on the trade deficit. The Error correction term ECM(-1) being negative and significant indicates that the variables get converged into long-run equilibrium.

Key Words: *Real Exchange Rate, Trade Balance, Co-integration, ECM*

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ABBREVIATIONS

ADF	: Augmented Dickey-Fuller
ARDL	: Autoregressive Distributed Lag
BOP	: Balance of Payment
BRM	: Bickerdike-Robinson-Metzler
CMES	: Current Macroeconomic and Financial Situation
CUSUM	: Cumulative Sums
ECM	: Error Correction Model
FER	: Foreign Exchange Reserve
GDP	: Gross Domestic Product
MoF	: Ministry of Finance
NRB	: Nepal Rastra Bank
OLS	: Ordinary Least Squares
REER	: Real Effective Exchange Rate
RGDP	: Real Gross Domestic Product
RLS	: Robust Least Square
RTB	: Trade Balance in Real Term
RRMT	: Remittance in Real Term
VECM	: Vector Error Correction Model

CHAPTER-I
INTRODUCTION

1.1 Background of the Study

The trade balance is a major constituent in the current account and so to the balance of payment in macroeconomic management. The progress of trade in a country enhances international mutual benefits among regions and countries in promoting the global development process. The adoption of exchange rate mechanisms among countries helps in enhancing financial transactions hence the inter-country(s) trading process in enhancing economic growth and improving the welfare of the people.

The theory Marshall-Lerner Condition states that devaluation of a currency will improve a country's trade balance in the long-run (Mahmud, Ullah, & Yucel, 2004). Similarly, the monetary approach considers excess money demand and money supply as affecting factors for the trade balance. Moreover, the two countries' imperfect substitute model stipulates that depreciation of the real exchange rate improves the trade balance (Rose & Yellen, 1989).

Most of the studies on the relationship between real exchange rate and trade balance in both developed and developing economies have not been conclusive in establishing the relationships that may be uniform in most of the economies (Duasa, 2007). Various econometric techniques have been applied but the results have been different.

The trade balances in the developed and developing economies may either be in surpluses or deficits. The two natures of the trade balance may be a trade surplus and a trade deficit. A trade surplus occurs as a result of more exports of the domestic economy than imports while a trade deficit arises when there are more imports as compared to the exports of goods and services. Therefore, as noted by the presence of trade surplus or deficit may be favorable or unfavorable with the nature and state of the economy. However, a trade deficit may be harmful to the economy if it persists as it may lead to an increase in the current account deficit, which could in turn reduce the external competitiveness of the economy.

So, trade balance determines the economic progress of the economy among other macroeconomic factors.

Consequently, exchange rate adjustments help in changing the nature of trade balance by improving the level of competitiveness of the economy (Bahmani-Oskooee, 2001; Collier and Joshi, 1989). Besides, the real exchange rate needs to be more competitive as it is one of the important elements of the "outward-oriented" macroeconomic policy which increases export as compared to import hence better position of the trade balance (Williamson, 1990). Also, increased export may rely on the confidence of the private sector which enhances the investment option in the export sector. However, currency depreciation may lead to inflation and impact unfavorably to trade balance. This inflationary effect may justify the use of the real exchange rate which takes into consideration the relative prices and hence its adjustment may lead to increased competitiveness in the foreign market by the domestic economy.

In the case of Nepal, the exchange rate depreciation can improve the trade balance and foreign exchange reserve of Nepal while the domestic price level plays a major role in increasing the deficit. Moreover, the price stability could reduce the trade deficit besides making it sustainable (Adhikari, 2018). Foreign exchange is the major backbone for developing countries like Nepal. This helps to manage the imports and other types of obligations like the payment of government debt, expenses of government, and other general peoples. In Nepal, the foreign exchange reserve is facing persistent pressure due to the increasing trend of payments for goods and services imports from abroad.

1.2 Statement of the Problem

The trade balance in the economy helps to determine the macroeconomic performance of the economy such as the balance of payment, investments, and savings in both the developed as well as developing economies. Nepal has experienced a trade deficit for a long time and increasing continuously. On the other hand, the real exchange rate is also increasing every year. As a result, a continued deficit in trade balance and real exchange rate depreciation in Nepal may erode the country's external competitiveness. Besides, increased deficit hampers the economic growth of the country even though government policy stipulated economic growth.

Nepal has adopted both a fixed exchange rate with India and a flexible exchange rate regime with the rest of the world. There is an increasing deficit in the trade balance.

In 1993 as Nepali Rupees were pegged with Indian currency at the rate of 1 IC = 1.6 NPR. During the same period, 1 USD = 49.59 NPR. The current value of 1 USD is equal to 119.26 NPR (exchange rate between Nepal and the USA on Nov 4, 2020). The growth rate of NPR to USD from 1993 to the present is 140.49 percent but IC is neutral during this period.

On this note, there is a necessity of understanding the effects of the real exchange rate on the trade balance in the case of Nepal. Also, the consideration of other variables like remittance and real GDP, would help to give more information about the increasing deficit on the trade balance. Therefore, this study raises the following research questions to address the above-mentioned issue;

i. What is the nature and trend of the real effective exchange rate, trade balance, remittance, and real GDP in Nepal?
ii. How real effective exchange rate and trade balance are correlated in the case of Nepal?

1.3 Objectives of the Study

The general objective of this study is to examine the relationship between the real effective exchange rate and trade balance in the case of Nepal. The specific objectives are;

i. To analyze the nature and trend of the real effective exchange rate, trade balance, remittance, and real GDP in Nepal.
ii. To examine the relationship between the real effective exchange rate and trade balance in Nepal.

1.4 Significance of the Study

This study attempts to examine the effects of exchange rates on the trade balance. This study could be helpful to policymakers, researchers, and other people to know about the relationship between exchange rate and trade balance. This information may help the government to consider policies that would improve the trade balance in Nepal.

1.6 Limitations of the Study

The study is confined to the relationship between the real effective exchange rate and trade balance together with real GDP and remittance is examined. Other determinants of trade balance like government budget deficit, interest rate, money supply, etc. are not included in this study.

Though more than half of the trade is with India and over the period the real exchange rate between INR and NPR has changed despite the fixed exchange rate it has not been considered in this study.

1.7 Organization of the Study

This study is organized into five chapters. Chapter one provides a general introduction of the study which contains the background of the study, statement of the problem, objectives of the study, significance of the study, limitations of the study, and organization of the study. Similarly, chapter two is related to the review of literature which includes a theoretical and empirical review of national and international context as well as the research gap. Likewise, the third chapter is about the research methodology with research design, data and study period, model specification, and required econometric tools and techniques. Moreover, chapter four is data presentation and analysis. And finally, chapter five consists of the summary of major findings, conclusion, and recommendations.

CHAPTER-II

LITERATURE REVIEW

This chapter reviews the relevant literature which consists of theoretical and empirical literature reviews. The empirical literature is reviewed classifying into the international and Nepalese context.

2.1 Theoretical Review

The relationship of the exchange rate and trade balance is explained by various theoretical approaches like the elasticity approach, absorption approach, monetary approach, and the two countries' imperfect substitute model.

2.1.1 The Elasticity Approach

The elasticity approach is also called the Bickerdike-Robinson-Metzler (BRM) approach to the trade balance. This approach is based on the effects brought about by consumption and production and the substitution effect that is a result of the adjustment in the exchange rate. The model is a partial equilibrium of the two countries and the two goods model and it assumes the existence of perfect competition in the foreign market in the analysis of the effect of exchange rate adjustments on trade balance (Shao, 2008) The elasticity approach is analyzed by the separation of the markets for imports and exports; besides considering the income of both the foreign and domestic economy (Shao, 2008). However, in this model, the real exchange rate is measured by the terms of trade and also domestic and foreign prices are assumed to be constant or exogenously determined. Consequently, the devaluation is expected to increase the volume of the home country’s exports and lower the imports by the home country hence improve on trade balance (Jha, 2003).

2.1.2 The Marshall-Lerner Condition

The Marshall-Lerner Condition states that devaluation of a currency will improve a country’s trade balance in the long run if the sum of absolute values of imports and export demand price elasticities exceeds unity (Mahmud, Ullah, & Yucel, 2004). This approach assumes that a stable exchange rate could improve the trade balance. However, the exchange rate is prone to external shocks and may fail to be stable. This study does not

focus on the Marshall-Lerner condition as it focuses on the relationship between exchange rate and trade balance by adopting a linear model. Also, imports and exports are not considered separate in the analysis.

2.1.3 The Absorption Approach

The absorption approach was developed by Alexander in 1952 and was elaborated further by Johnson, who defined trade balance as the difference between aggregate domestic income and aggregate domestic expenditure (Johnson, 1972). Further, the approach highlights that devaluation or depreciation improves trade balance if the economy is not at full employment and conversely, if the economy is at full employment, then devaluation or currency depreciation may not improve trade balance (Mankiw, 2003). The approach also takes into account the Keynesian income-expenditure assumption that volumes of exports are independent of the national income and that national income affects positively the level of imports. However, the approach treats devaluation as a single policy that could be implemented without incorporating other policies that may be relevant to achieve the desired effect of improving trade balance (Johnson, 1972). The approach also considers the economy from the aggregate expenditure side; especially it stipulates that the exchange rate has a direct effect not only on relative prices, absorption, and income but also on trade balance (Duasa, 2007). Therefore, the study considers the level of real GDP, real effective exchange rate, and remittance in finding its relationship and effect on the trade balance in Nepal.

2.1.4 The Monetary Approach

The monetary approach explains trade balance by looking at the supply and demand for money, where the supply of money is managed by the government through the central bank. If there is more domestic demand for money more than what the central bank can supply, then there would be a need for the money from the foreign countries to fill the gap of the excess demand and as a result, trade balance may be favorable (Duasa, 2007). On the contrary, in the situation of having more money supply in the domestic economy by the monetary authority than is demanded, then there would be the excess money supply and this may result in the outflow of money outside the economy and hence there may be a

decline in the trade balance. Therefore, this approach considers excess money demand and money supply as affecting factors for the trade balance.

2.1.5 The J-Curve Approach

The J-Curve effect to trade balance stipulates that a country's trade balance measured in home currency units may be expected to deteriorate in the short run after the depreciation of the home currency and then, in the long run, trade balance may improve (Isard, 1995; Jha, 2003). The theory assumes that in the short run, import prices in the home currency would rise more rapidly than the export prices, whereas trade volume would only respond with a time lag which makes the J-curve approach different from other approaches. This is because, when the currency is devalued, imports tend to be expensive assuming that imports and exports change immediately hence leading to a negative effect on the trade balance. After a short while, the volume of exports may begin to rise because of their lower competitive prices in the foreign market and the local consumers purchase fewer imports. Consequently, the trade balance improves as the devaluation occurs. Also, foreign consumers may opt to buy the goods that are exported to their home country as they become cheaper in the foreign currency as compared to their domestically produced goods (Hacker & Hatemi, 2004). However, devaluation may lead to low investment hence reduced economic growth (Weeks, 2001). Therefore, this study may analyze if the J-curve exists in the Nepalese economy though it is not the main focus of the study.

2.1.6 The Two Country Imperfect Substitute Model

This approach shows the nature and relationship of the real exchange rate on the trade balance in both the short and long run. It stipulates that depreciation of the real exchange rate improves the trade balance. Besides, the model assumes that there are no perfect substitutes in the imports and exports for the locally produced goods and services (Rose & Yellen, 1989). This model is expressed as the partial reduced form domestic trade balance which is a function of the real exchange rate, domestic and foreign income. The reduced form equation was derived from the incorporation of the relative price of imports which was a function of real foreign price, real income, and the real exchange rate. By the adoption of this model by Rose and Yellen (1989), it was concluded that foreign income and the real exchange rate have positive effects on trade balance while on the other hand,

domestic income harms the trade balance. The advantages of this model are that a single equation is adopted in the analysis process. Also, there is no need for the structural parameters and as a result, it is likely to give the desired or undesired relationship /effect of the real exchange rate on the trade balance (Rose, 1990). However, the model incorporates variables from other approaches and hence is not a 'standalone' model. These variables as outlined are RER, domestic income, and foreign income.

Therefore, the different theoretical approaches discussed show various effects of the real exchange rate and other variables like money supply, domestic and foreign income on the trade balance. According to Bahmani-Oskooee (1992), the real exchange rate was identified by the elasticity approach as having a major effect on the trade balance and hence supports the policy of currency devaluation to improve the trade balance. Besides, the monetary approach stipulates that money supply may be used as a tool to improve trade balance but excess money supply may lead to the trade deficit. Also, Bahmani-Oskooee (1992) highlighted that domestic income is advocated by the Keynesian approach to affect the trade balance and advised that contractionary fiscal policy was favorable to improve the trade balance. On the other hand, the two countries' imperfect substitute model relates the real exchange rate between two bilateral countries/trading partners and the trade balance of the home country. However, the model adopts variables from other approaches to establish the relationship and effects, and hence it is not a 'standalone' model. It follows that within this model, the elasticity, absorption, and the monetary approaches to trade balance are tested and hence favorable in this study. Consequently, the real exchange rate, income, and broad money supply are incorporated. The model also allows the incorporation of other variables and in this study, the shift in the exchange rate regime was included to find the effect it has on the trade balance. Thus the study adopts two countries' imperfect substitute model by Rose and Yellen (1989) to find out the relationship between the real exchange rate on the trade balance in Kenya.

2.2 Empirical Review

The empirical literature review in this study focuses on the empirical studies undertaken to establish the relationship of the exchange rate on the trade balance in an international as well as Nepalese context.

2.2.1 International Context

Rajkovic et al., (2020) examined the impact of the exchange rate on the foreign trade imbalance during the economic crisis in the new EU member states and the Western Balkan countries. The study takes a different time for different countries during the period from 1990 to 2016. The study employed different theoretical and empirical studies for the empirical models. Results found that during the global economic crisis, the Western Balkan and the Central and Eastern European countries attempted to accommodate the economic shocks and pressure caused by the deteriorated business conditions. The balance of trade disequilibrium imposed itself as a serious problem for sustainable economic growth. These results demonstrate that during the global economic crisis the real exchange rate impact on the current account was reduced, which consequently limited the applicability of devaluation as an appropriate instrument for the reduction of external imbalances. Those countries that applied a fixed exchange rate recorded faster adjustments in the aftermath of the economic crisis, while their trade balance was also considerably improved. The trade balance improvements were primarily achieved by increased exports and not by import restrictions.

Manual (2019) investigated the dynamic relationship between trade balance and macroeconomic elements in Malaysia. The study uses time-series data from 2000 to 2015. Paper employed the ARDL model to examine the short-run and long-run relationship between the variables. Results found that money supply is insignificant to trade balance in Malaysia and the inflation rate has a positive relationship with the trade balance in both the short-run and long-run. The author suggested that increases in inflation rates lead to an improvement in the trade deficit in Malaysia.

Kurtovic (2017) studied on effects of the depreciation of the exchange rate on the trade balance in Albania. The study uses quarterly data from 1994 to 2015 and tested the bounds testing approach to co-integration, vector error correction model (VECM), and impulse response was used for empirical analysis. The author found that there exists a long-term co-integration between the real effective exchange rate depreciation and the trade balance. Specifically, the real effective exchange rate depreciation positively affects the trade balance of Albania in both the long-run and short-run indicating the weak presence of the

J-curve effect. And, the author argued that exchange rate depreciation and macroeconomic policies can improve the competitiveness of an economy.

Begovic and Kreso (2017) investigate the adverse effect of the real effective exchange rate change on the trade balance in European transition countries. The study uses a dataset from 2000 to 2015. The result founds that there is an adverse effect of the REER on the trade balance in European transition countries over the study period. Namely, depreciation of REER deteriorates trade balance in European transition countries, which could be explained by high import dependence and low export capacity. This implies that policymakers in European transition countries should not use exchange rate policy to improve the trade balance.

Muge (2016) examined the effect of the real exchange rate on the trade balance in the case of Turkey. The study uses monthly basis data from the period 2002 to 2014. The author employed the co-integration technique and error correction model. A study found that there exists no single pattern relationship between exchange rate and trade balance. The result supports the existence of a j-curve effect in 20 out of 96 commodity groups and 54 commodity groups exchange rate carried a statistically significant negative sign and implying that the long-run effect of a real depreciation has been positive for industries.

Ogutu (2014) studied the effect of real exchange rate on the trade balance in Kenya using annual time series datasets from the period of 1963-2013. The study uses the Johansen co-integration test and found a long-run relationship between real exchange rate and trade balance. Similarly, the study uses a VECM approach and found that appreciation of the real exchange rate has a positive and significant effect on the trade balance. Moreover, the study also observed that the exchange rate regime has no effect in the long run and hence change of the regime could not affect the level of exports and imports. Thus, the study suggested to the government for maintaining a flexible exchange rate with necessary intervention through the central bank to stabilize the Kenyan currency.

Ogundipe, et al. (2013) estimated the long-run effects of exchange rate devaluation on the trade balance in Nigeria. The study uses time-series data from 1970 to 2010 and applied the Johansen co-integration test and variance decomposition analysis. Results found that there exists an inelastic and significant relationship between trade balance and its

determinants in the long run and no causality from the exchange rate to trade balance and money supply to the short run.

Wang et al., (2012) examined the short-run and long-run effects of exchange rate changes on the trade balance in China and its trading partners. The study uses the panel dataset from 2005-2009. The author applied the J-curve hypothesis and error correction model. Results found that real appreciation of RMB has a decreasing long-run effect on China's trade balance in only three of the eighteen trading partners, while it has an increasing long-run effect in five of the eighteen trading partners.

Shahbaz et al., (2010) conducted a study on the relationship between real exchange rate and trade balance (measured in terms of trade) in Pakistan. The study uses quarterly time-series data from the period 1980-2006 using the autoregressive distributed lag (ARDL) model. The long-run relationship was established between the real exchange rate and the trade balance and there exists a negative and significant effect of currency devaluation on the trade balance. Similarly, VECM was carried out to check the existence of the J-curve effect, which failed to exist such an effect in the case of Pakistan's economy.

Yuen-Ling et al., (2008) identified the relationship between real exchange rate and trade balance in Malaysia. The study uses annual data from 1955 to 2006. The study applied Unit root tests, the Co-integration test, the Engle-Granger test, and Vector Error Correction Model. The author found in the long run real exchange rate has an important variable to the trade balance and devaluation improved the trade balance.

Shao (2008) investigated the relationship between exchange rate changes and the trade balance in Japan. The study uses time-series data from the period 1980 to 2006. The author employed the BRM model. Results found that the final effect of the exchange rate changes on the trade balance is undetermined and appreciation can reduced trade surplus in the short run, however, in the long run, there is no stable relationship between them.

Qiao (2007) examines the impact of the exchange rate on the trade balance of China. This study shows that an increase in the exchange rate (depreciation) would lead to an increase in the trade balance of a debtor country. However, a decrease in the exchange rate (appreciation) may or may not decrease the trade balance of a creditor country. Moreover, the study shows that it is important to consider other effects such as wealth effect,

investment effect, and indirect investment effect when examining the elasticity approach of the exchange rate determination. The appreciation of the renminbi is not able to reduce the trade balance of China, but it motivates the inflow of hot money to speculate on further appreciation, which creates more problems for domestic monetary control.

Narayan (2006) examined the relationship between trade balance and exchange rate on China's trade with the USA. A study has taken a sample period from 1979 to 2002. The study uses the J-curve approach, unit root test, co-integration test, and autoregressive distributed lag model. The author found China's trade balance and real exchange rate are co-integrated, short-run and long-run real devaluation of the Chinese RMB improved the trade balance and there is no evidence of a J-curve adjustment.

Sugema (2005) investigated the determinants of trade balance and adjustment to the crisis in Indonesia. The study uses quarterly data from 1984 to 1997. The study applied the ADF test and unit root test. Results found that real exchange rate depreciation can improve the trade balance through an increase in exports and a decline in imports.

Rincon (2004) investigated the effect of the real depreciation of the exchange rate on the trade balance of Colombia. The study applied a co-integration analysis and used monthly data from 1979 to 1995. The results showed that depreciation has a positive effect in the long term on the trade balance, reduced money supply, and increased income.

Singh (2004) analyzed the effect of conditional exchange rate volatility on the balance of trade in India. The study uses quarterly data from 1975 to 1996. The author estimated the error correction model to test the J-curve hypothesis and analyze the effect of exchange rate volatility on the balance of trade in India. This study does not find any evidence for the presence of the J-curve effect in the balance of trade. The study found the presence of weak ARCH but strong GARCH effects in the exchange rate series. But this exchange rate volatility does not play any significant role in affecting the balance of trade in India.

Liew et al., (2003) examined the relationship between the exchange rate and the trade balance of Asian countries. The study has taken a sample period from 1986 to 1999. The study found that the role of exchange rate changes, initiating changes in the trade balance has exaggerated.

Singh (2002) examined the role of income and exchange rates on the Indian trade balance. The study has taken a sample period from 1960 to 1995. The study applied the Johansen test and co-integration test. Johansen test showed the presence of long-run co-integrating relationships among the variables. World income is not to play any significant role in affecting the trade balance.

Lal and Lowinger (2002) examined the relationship between the exchange rate and trade balance in South Asian Countries. The study uses quarterly data from 1985 to 1998. The author applied the J-curve approach. Results found that Firstly, depreciation of a South Asian Country's currency can lead to an improvement in its trade balance in the long run. Secondly, the study captures the short-run dynamics of exchange rate changes and in particular their feedback effects. Thirdly, the impulse response function confirms the existence of the J-Curve phenomenon for each of the countries in their sample, although the speed of trade balance adjustment varied across countries. Fourthly, their result points to the potential role of FERCs in influencing the trade balance i.e. other things being equal, higher FERCs may sustain a trade deficit longer, although the potential contribution of FERCs in sustained trade deficits appears to be relatively small. Fifthly, an increase in aggregate income of India, Nepal, and Sri Lanka's top 10 trading partners can lead to an improvement in their respective trade balances. While an increase in Bangladesh, Pakistan, and Sri Lanka's GDP is likely to improve their respective trade balance.

Upadhyaya and Dhakal (1996) estimated the long-run effect of devaluation and trade balance in eight developing countries from Asia, Europe, Africa, and Latin America. The study uses annual data from 1967 to 1992. The study applied a distributed lag model to findings the result. The author found that devaluation improved the long-run trade balance in Mexico, negative effect in Cyprus Greece & Morocco, and neutral in Colombia, Guatemala, Singapore & Thailand.

Rose (1990) examined the relationship between exchange rates and trade balance in thirty developing countries. The author addresses the annual data from 1970 to 1988. The study tested the ADF test, Unit root test, and OLS regression test. Study unable to found the strong stable effect of the exchange rate on the trade balance. There has little empirical evidence on real exchange rates of developing countries that affected the trade balance.

Spitaller (1980) examined the short-run effect of exchange rate changes on terms of trade and trade balance. Paper addressed the monthly data from 1973 to 1978. The study uses a J-curve approach. And the study found that changes in competitiveness attributable to a given movement in the exchange rate tend to be offset in amount and over some time differ among countries.

2.2.2 Nepalese Context

Thapa (2002) analyzed the impact of the real effective exchange rate on economic activities in Nepal. The study takes 12 months of data and uses GDP as a dependent variable and exchange rate and money supply as explanatory variables. Results found that the depreciation of the real exchange rate enhances the international competitiveness of domestic goods, boosts net exports, and eventually enlarges the GDP.

Bhatta (2013) examined the remittance and trade deficit nexus in Nepal using monthly datasets from the 2001 to 2011 period. The study uses the co-integration technique and vector error correction model (VECM) using variables merchandise import, worker's remittance, and trade deficit. The author found that there is long-run positive unidirectional causality from remittance to import as well as remittance to trade deficit.

Panday (2014) investigated the exchange rate misalignment in Nepal. The study uses annual time-series data from the period 1975-2008. The author applied the VAR test and bound-testing approach to cointegration. Results found that currency depreciation has no effective way of improving the trade balance.

Adhikari (2018) explored the impact of the exchange rate on the trade deficit and foreign exchange reserve in Nepal. This study uses quarterly time series data from FY 1974/75 to 2014/15. Variables such as CPI, trade deficit, foreign exchange reserve, real GDP, nominal exchange rate of Nepalese rupee with US dollar (annual average) are employed. Paper uses the OLS method by making data stationery. A study found that there is a positive and significant relationship between the nominal exchange rate of the Nepalese rupee with the US dollar and trade deficit. Specifically, a 1 percent depreciation in NPR with USD improves the trade deficit of Nepal by 0.75 percent. The study raises the view that maintaining NPR undervalued with the US dollar can improve the trade deficit in Nepal.

2.3 Research Gap

By analyzing the empirical studies from international as well as Nepalese contexts, it becomes clear that there is a diverse relationship between exchange rate and trade balance. Therefore, in developing countries like Nepal, it is necessary to study and establish empirical evidence on the relationship between the real effective exchange rate and trade balance.

However, only a few studies have been conducted in Nepal. Adhikari (2018) found 1 percent depreciation in NPR with USD improves the trade deficit by 0.75 percent. Likewise, Panday (2014) found that currency depreciation is not an effective way of improving the trade balance. Similarly, Thapa (2002) found that the depreciation of the real exchange rate enhances the international competitiveness of domestic goods, boosts net exports, and eventually enlarges the GDP.

Although, most of the studies focus on the appreciation or depreciation of the currency. Sugema (2005) Results found that real exchange rate depreciation can improve the trade balance through an increase in exports and a decline in imports. Kurtovic (2017) found real effective exchange rate depreciation positively affects the trade balance of Albania. Singh (2004) exchange rate volatility does not play any significant role in affecting the balance of trade in India. Manual (2019) results found that the inflation rate has a positive relationship with the trade balance in both the short run and long run in Malaysia.

Examining the results found in both Nepalese and international literature, we have found mixed results between these two. In this regard, the present study focused on estimating the relationship between the real effective exchange rate and trade balance by including new control variables as remittance and recent data which can give the updated results.

CHAPTER-III

RESEARCH METHODOLOGY

This chapter discusses the research methodology that has been used in this research. The major heading and this chapter data, sample period, model specification, and method of data analysis.

3.1 Research Design

The design of this study is descriptive as well as an analytical approach. The descriptive design for analyzing the nature and trends of trade balance and other explanatory variables while an analytical design for examining the empirical relationship between the real exchange rate and trade balance for Nepal. This study analyzed the trend of trade balance and exchange rate by using tables and graphs. Similarly, different econometrics tools and techniques have been used. The Augmented Dickey-Fuller (ADF) test has been employed to test the stationary of the variables, Engle-Granger co-integration test is used to examine the co-integrating relationship among the variables, error correction model (ECM) is used to estimate the short-run relationship between the trade balance and other explanatory variables. Finally, diagnostic tests such as the LM test for serial autocorrelation, the Breusch-Pagan-Godfrey test for heteroscedasticity, and Ramsey's RESET test for stability of the model are examined.

3.2 Nature and Sources of Data

This study is based on secondary data and information. The secondary time series data have been collected from the current macroeconomic and financial situation and the quarterly economic bulletin of Nepal Rastra Bank (NRB).

Table-3.2.1: Sources of Data and Measurement

Variable Description	Unit	Sources
Trade balance	In Rs. Million	Current Macroeconomic and Financial Situation(CMES) 2019/20, NRB
Real effective exchange rate (REER)	Index	Bhatta(2020), Nepal Rastra Bank
Remittance	In Rs. Million	Macroeconomics dashboard, MoF
Nominal GDP	In Rs. Million	Current Macroeconomic and Financial Situation (CMES) 2019/20, NRB
GDP deflator	Index	Authors calculation using data available in Current Macroeconomic and Financial Situation (CMES) 2019/20, NRB

3.3 Study Period Covered

This study covers the annual data of 41 years from 1979 to 2019. This period is chosen due to the unavailability of data of all variables before this period.

3.4 Tools and Methods of Data Collection

The required data and information were collected by the researcher from various published documents like the current macroeconomic and financial situation, quarterly economic bulletin released by Nepal Rastra Bank (NRB).

3.5 Data Organization and Processing

The collected data and information were organized into different groups and sub-groups and processed as per the objectives and hypothesis of the study. The nominal GDP, trade balance (TB) in a nominal term and remittance were converted into real terms by dividing the value of GDP deflator with the base year 2001 constant prices. Similarly, REER is calculated based on the base year price in 2001.

3.6 Model Specification

Based on Adhikari (2018) and Ogutu (2014), the following model has been considered to empirically examine the relationship between the trade balance and real effective exchange rate for the Nepalese economy;

$$RTB = f(REER, RGDP, RRMT) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where,

RTB = Trade balance in real term,

REER = Real effective exchange rate and it is expected to have a positive sign as an increase in REER increases trade balance.

RGDP = Real gross domestic product and it is expected to have a positive sign as an increase in RGDP increases trade balance.

RRMT = Remittance in the real term and it is expected to have a positive sign as an increase in RRMT increases trade balance.

The linear transformation of equation (1) is expressed as in equation (2).

$$\mathrm{LnRTB} = \beta_0 + \beta_1 \mathrm{LnREER} + \beta_2 \mathrm{LnRGDP} + \beta_3 \mathrm{LnRRMT} + U_t \ldots\ldots\ldots\ldots (2)$$

Here,

Ln=Natural logarithm,

β_0= Intercept

β_1, β_2 & β_3 are respective coefficients,

U_t= Error term.

3.7 Tools and Techniques of Data Analysis

The study has used different statistical tools such as mean, median, standard deviation skewness, and kurtosis to analyze the trend of trade deficit and exchange rate. The Augmented Dickey-Fuller (ADF) test was applied to test the stationarity of the variables. Engle-Granger co-integration test, long-run multiple regression model, error correction

model (ECM) have been used. Similarly, diagnostic tests by using the Breusch-Godfrey LM test for serial correction. The study used EViews-9 for data analysis.

3.7.1 Unit Root Test

This empirical analysis is based on time-series data, assume that the underlying time series should be stationary. Time series data is said to be stationary if its mean, variance, and covariance do not vary over time (Gujarati, 1995). But it is now a well-known fact that most of the macroeconomics time series are non-stationary (Dickey-Fuller, 1979). If we apply the regression models in the non-stationary data it gives a spurious relationship which makes hypothetical test results unreliable. Hence, to avoid a spurious relationship, detecting the stationary or non-stationary time series is crucial. There are several methods to test stationary such as the Dickey-Fuller test, the Augmented Dickey-Fuller test, the Phillips-Peron test, and the KPSS test. However, this study discusses the unit root test using the augmented Dickey-Fuller test.

Augmented Dickey-Fuller Test (ADF)

This test was developed by Dickey and Fuller in 1970 and named after them as the Dickey-Fuller test. The Augmented Dickey-Fuller test as follows:

The equation for no intercept and no trend is,

$$\Delta Y_t = \gamma_i Y_{t-1} + \sum_{i=1}^{k} c_i \, \Delta Y_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The equation for the only intercept and no trend is,

$$\Delta Y_t = \alpha_1 + \gamma_i Y_{t-1} + \sum_{i=1}^{k} c_i \, \Delta Y_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The equation is both intercept and trend is,

$$\Delta Y_t = \alpha_1 + \gamma_i Y_{t-1} + at + \sum_{i=1}^{k} c_i \, \Delta Y_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where ΔY_t = First difference

The null hypothesis of ADF is $\gamma_i = 0$ against the alternative hypothesis of $\gamma_i < 0$. If we do not reject the null, the series is non-stationary whereas rejection means the series is stationary. If the series is stationary without any differencing, it is said to be I (0) or integrated with

order 0. Similarly, if the series is stationary after a first difference is said to be I (1) or integrated of order 1.

3.7.2 Engle-Granger Cointegration Test

The Engle-Granger test is a cointegration test. It constructs residuals (errors) based on the static regression. This test is used to perform the co-integration between the variables when the variables are non-stationary at level but stationary at first difference. Engle and Granger (1987) suggested to cointegration test, which consists of estimating the cointegration regression using OLS, obtaining the residual U_t, and applying the unit root test for U_t. According to this test, the following hypothesis is tested:

Null Hypothesis (H_0): I_t has a unit root at level i.e. U_t is non-stationary at a level.
Alternative Hypothesis (H_1): U_t has no unit root at level i.e. Ut is stationary at level.

If the Augmented Dickey-Fuller test statistic is greater than Engle-Granger's critical value then we reject the null hypothesis and accept the alternative hypothesis i.e. U_t is stationary at level. If U_t is stationary at level then the variables are co-integrated and exist a long-run relationship between them. Similarly, the regression model will not be spurious or nonsense when U_t is stationary at a level.

To test the Engle-Granger Cointegration, we use equation (2) to derive the long-run model using the OLS method. After checking the cointegration among the variables, the Error Correction term is calculated as given below:

$$\mathrm{ECM_t} = (\mathrm{U_t}) = \mathrm{LnRTB} - (\beta_0 + \beta_1 \mathrm{LnREER} + \beta_2 \mathrm{LnRGDP} + \beta_3 \mathrm{LnRMT}) \ldots \ldots \ldots (6)$$

After calculating the values of ECM for different periods then this study tested the stationary of ECM. If the error correction term or residual is stationary at level then the variables in equation (2) are cointegrated and exist a long-run model is spurious or not. The symptom of spurious regression if the R-squared value is less than Durbin-Watson Statistics. But the model is not spurious when the residual (ECM) is stationary at a level even R-squared is greater than Durbin-Watson Statistics.

3.7.3 Error Correction Model (ECM)

When all variables are stationary only after the first difference and cointegrated into each other then we estimate the error correction model to account for the short-run dynamics of the model and estimate the speed of adjustment short-run disequilibrium to long-run equilibrium. The ECM model is given below:

$$\Delta LnRTB = \beta_0 + \beta_1 \Delta LnREER + \beta_2 \Delta LnRGDP + \beta_3 \Delta LnRRMT + \beta_4 ECM(t-1) + V_t \ldots\ldots\ldots (7)$$

Where,

ΔLnRTB = First difference of natural log trade balance in the real term.

ΔLnREER = First difference of natural log of the real effective exchange rate.

ΔLnRGDP = First difference of Natural log of real GDP.

ΔLnRMT = First difference of natural log of remittance.

β_0=Constant

$\beta_1, \beta_2, \beta_3, \beta_4$ are short-run coefficients.

V= white noise error term.

ECM_{t-1} is a one-period lag residual of equation (2). The coefficient of ECM_{t-1} provides the speed of adjustment which should be negative and significant.

3.8 Definition of the Variables

In this study, various variables have been used for both descriptive and quantitative study. That is defined as below:

Trade Balance: The trade balance is the net sum of a country's exports and imports of goods without taking into account all financial transfers, investments, and other financial components. A countries trade balance is either surplus (country's exports exceed its imports during a given period) or, deficit (when a country's imports exceed its exports during a given period). In this study, the trade balance is used as a core dependent variable and the nominal form of data is converted into real-term by using the following formula:

$$\text{RTB} = \frac{\text{Trade Balance}}{\text{GDP Deflator}} * 100$$

This was measured in terms of Rs. in million.

a. **Real Effective Exchange Rate:** REER is the inflation-adjusted nominal exchange rate. The real effective exchange rate measures the value of a domestic currency against a weighted average of several foreign currencies and is divided by a price deflator or index of costs. In this study it is used as a core independent variable and expected to have a positive sign as an increase in REER increases the trade balance. It is calculated by using the following formula:

$$\text{REER} = \frac{\text{Domestic Price Level}}{\text{Weighted Geometric Mean of Foreign price Level}} * \text{NEER}$$

Where,

NEER is the weighted average of the nominal exchange rate.

b. **Real GDP:** Inflation-adjusted output of the economy or annual gross domestic product of the country at the base year 2001 constant prices. This study used the real GDP as an independent variable and expected to have a positive sign as an increase in RGDP increases trade balance. The real GDP is calculated using the following formula:

$$\text{RGDP} = \frac{\text{Nominal GDP}}{\text{GDP Deflator}} * 100$$

c. **Remittance:** Remittance is the transfer of money from residents of one country to residents of another country and is often associated with migrants sending money to families and communities. In this study, it is used as an independent variable and is expected to have a positive sign as an increase in RRMT increases the trade balance.

The nominal term of remittance is converted into the real term.

$$\text{RRMT} = \frac{\text{Nominal Remittance}}{\text{GDP Deflator}} * 100$$

CHAPTER-IV

PRESENTATION AND ANALYSIS OF DATA

4.1 Trend of Exchange Rate and Trade Balance: Descriptive Analysis

In this section, the nature and trend of REER, trade balance, remittance as well as real GDP is briefly analyzed.

4.1.1: Trend of Exchange Rate (1979-2019)

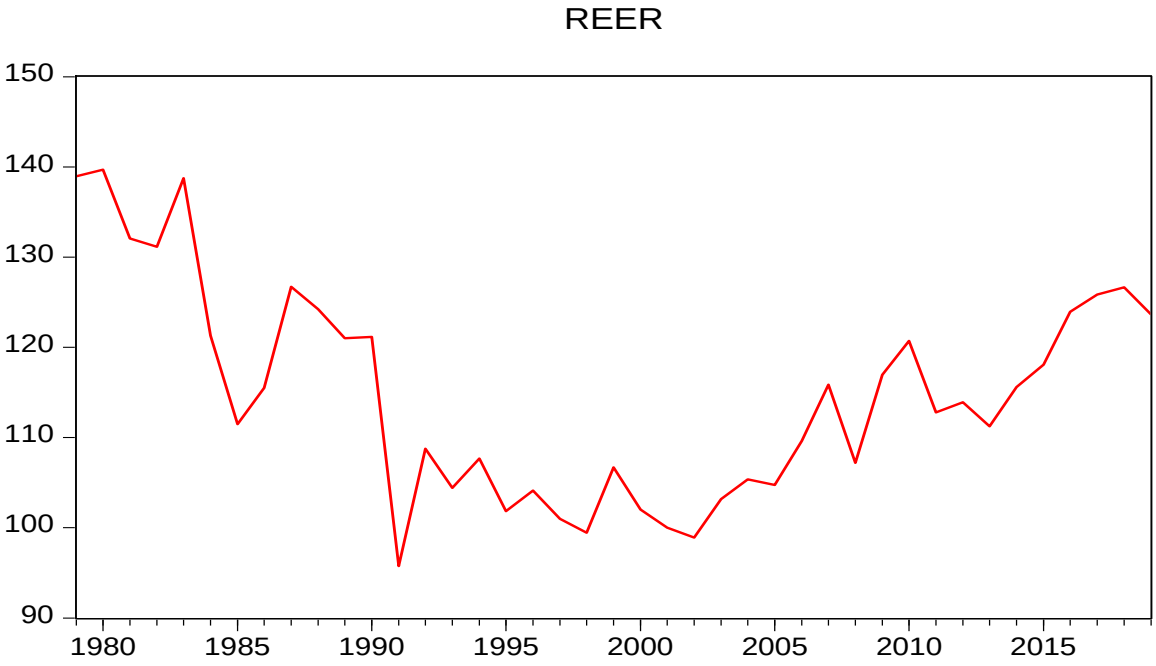
Nepal has adopted the conventional fixed peg exchange rate with Indian currency (IC) and a flexible exchange rate with the rest of the currencies. Nepal has an open market exchange rate for US Dollar, Canadian Dollar, Swiss Franc, Chinese Yuan, Japanese Yen, Saudi Arabian Riyal, Singapore Dollar, European Euro, UK Pound Sterling, Australian Dollar, Qatari Riyal, Thai Baht, UAE Dirham, Malaysian Ringgit, Bahrain Dinar, Kuwaiti Dinar, Hong Kong Dollar, Swedish Kroner, South Korean Won, and Danish Kroner. Whereas, only for Indian Rupees, exchange rates are fixed by Nepal Rastra Bank for Nepalese Rupees, and all other currencies have open market exchange rates. The open market exchange rate quoted by different banks in Nepal may differ from the central bank that is Nepal Rastra Bank.

Currently, the exchange rate of NC with IC is Rs 1.60 per unit of IC, which was fixed in 1993. To maintain the pegged exchange rate with IC, the Nepal Rastra Bank stands ready to purchase/sell foreign exchange at the predetermined rate. Due to this, the pegged exchange rate is the nominal anchor of the monetary policy of Nepal. In 1993 as Nepali Rupees were pegged with Indian currency at the rate of 1 INR = 1.6 NPR. During the same period, 1 USD = 49.59 NPR. The current value of 1 USD is equal to 119.26 NPR (exchange rate between Nepal and the USA on Nov 4, 2020). The growth rate of NPR to USD from 1993 to the present is 140.49 percent.

In figure 4.1.1(a) describes the trend of the effective exchange rate in Nepal since 1979. This value is included in the real term. In 1979, the real effective exchange rate is 138.95 which is the highest rate during the entire study period. This figure shows that the real

effective exchange rate fluctuates every year. In 1991, address the minimum level of REER and increases continuously. At last in 2019, it picks the value is 123.63.

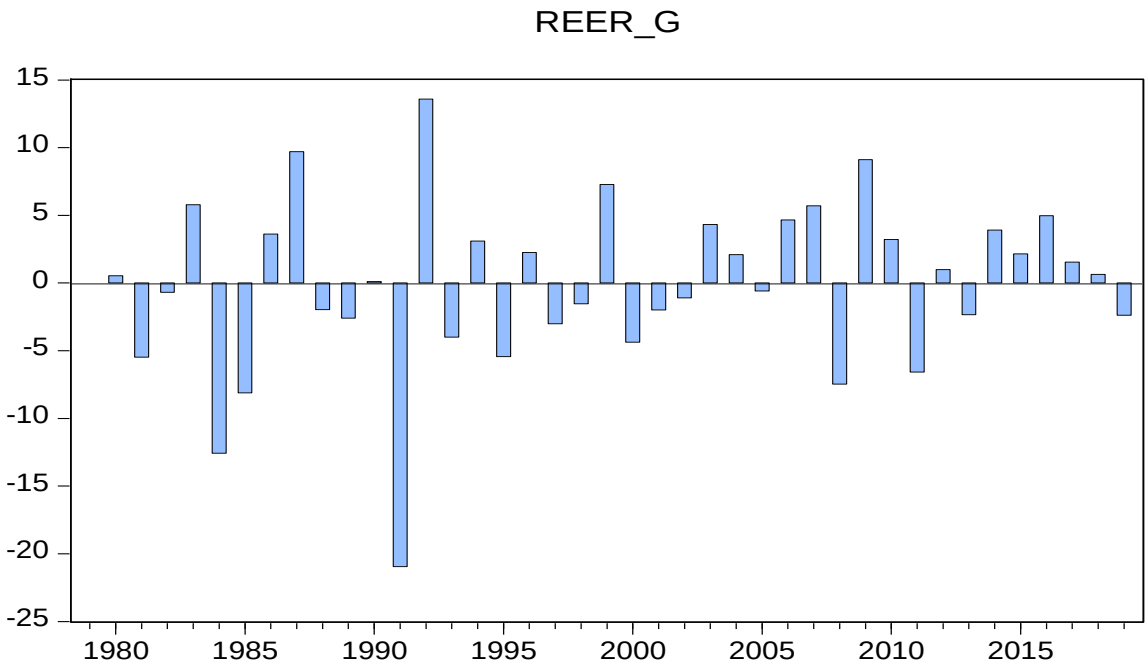
Figure-4.1.1(a): Trend of the real effective exchange rate (1979-2019)



Source: Appendix-I

Figure 4.1.1(b) explains the annual growth rate of the real effective exchange rate since 1980. At the beginning of 1980, the growth rate of REER is 0.53 percent it is the minimum value of growth rate in this study period. Similarly, in 1991, it covers the highest value of the negative growth rate in REER which takes the value is -20.95. At this time political movements in Nepal so, it may the cause to decline REER. Furthermore, in 1992 it catches the maximum point of growth rate which takes the value is 13.58. Therefore this figure shows the volatility of REER in this nation.

Figure-4.1.1(b): Annual growth rate of REER



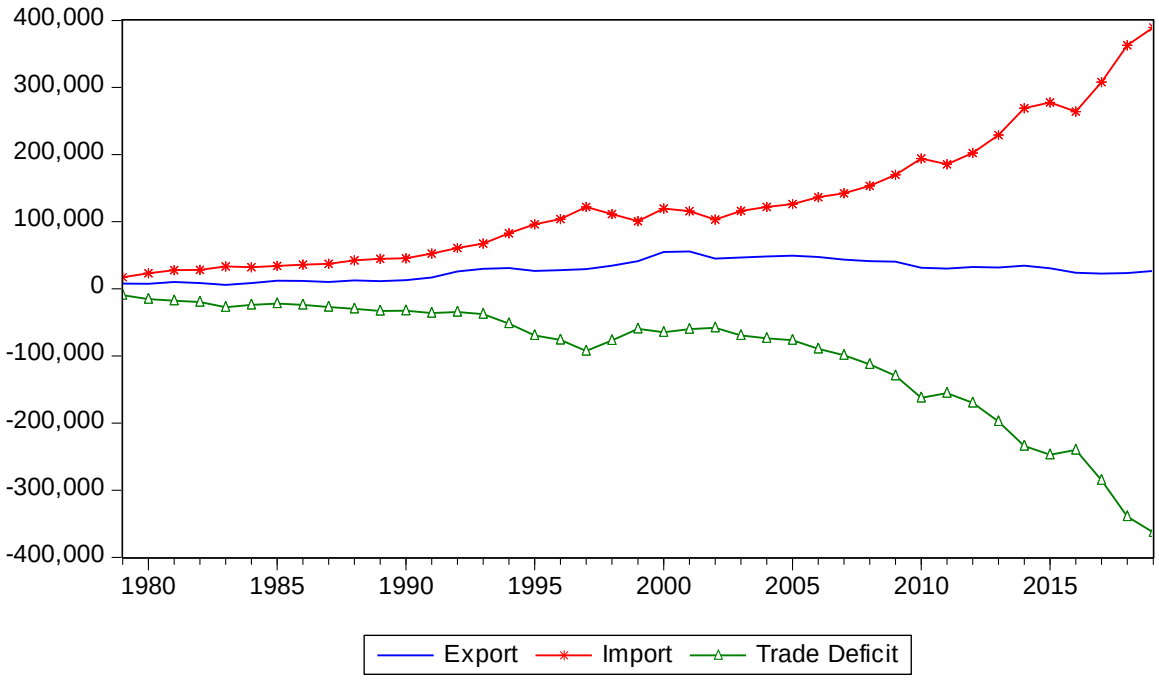
Source: Appendix-I

4.1.2 Nature and Trend of Trade balance in Nepal

Nepal started expanding trade with foreign countries before the arrival of democracy in 1950. By now it has expanded trade with more than 150 countries on all continents. But the trade balance is negative and growing every year. Such a trend can't sustain for a long time. Until a decade ago Nepal's import is 9 times bigger than export (Ghimire, 2016).

In Nepal, the trade balance is always negative and it is continuously increasing because of very few goods to export. External shocks, budget deficit, the direction of economic growth, landlocked, trade competitiveness, and political instability are responsible for the ongoing trade balance. The major causes of increasing trade deficit are low export, and high import, low-quality products, improper trade policy, higher cost of production, lack of publicity and advertisement, low production, slow industrial development, lack of trade diversification, etc. (Acharya, 2019). Nepal's trade balance is frequently responsive to external demand and price shocks. Nevertheless, these shocks are not the sole forces in determining the magnitude and direction of the Nepalese trade balance but the internal forces are also influential (Silwal, 2008).

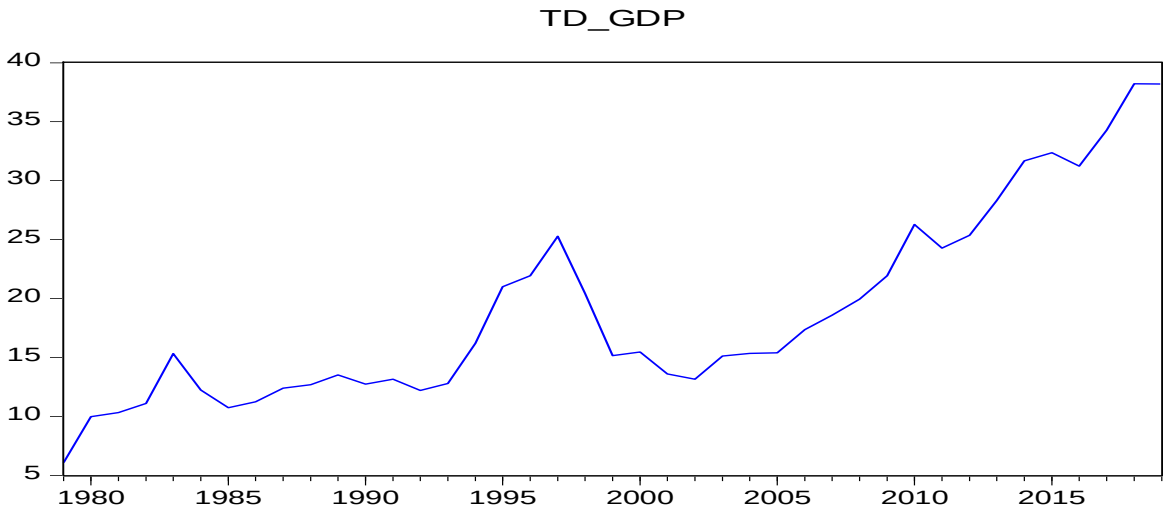
Figure-4.1.2(a): Trend of the trade balance in Nepal (1979-2019)



Source: Appendix-I

In figure 4.1.2(a) described the trend of the trade balance in Nepal since 1979. This value of trade balance is included in the real term. In 1979, export was equivalent to Rs.7817.13 million, the import was equivalent to Rs. 17389.01 million and the trade deficit was 9571.88 million. Furthermore, in 2019 the total export was equivalent to Rs. 26669.12 million, the total import was equivalent to Rs. 389571.34 million and the total trade deficit was Rs. 362902.22 million. This shows that Nepal's export, import, and trade deficit are increasing rapidly. But the rate of increase in imports is higher than the rate of increase in export. Consequently, Nepal's trade deficit is very high and increasing rapidly every year. The persistent deficit in foreign trade is due to the low production of export-oriented goods and higher import of consumer goods. To reduce this deficit, the production of competitive goods should be increased, which is helpful to increase exports and reduce imports.

Figure-4.1.2(b): Trade deficit as a share of GDP (1979-2019)

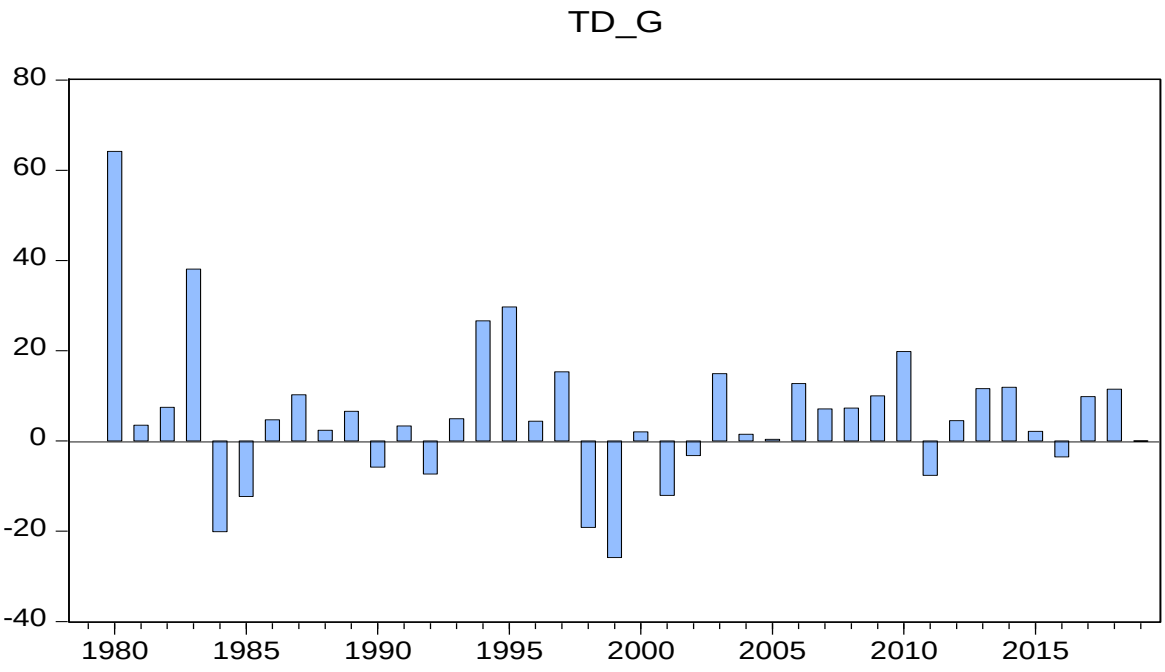


Source: Appendix-I

Figure-4.1.2(b) describes the share of the trade deficit in terms of GDP. In 1979, the total share of the trade deficit to GDP is 6.08 percent. Similarly, in 1983, the share of trade deficit to GDP is 15.3 and thereafter decreasing slowly until 1985. In 1997, it is found 25.28 percent. And after this again decreasing until 2002. Again, the ratio falls to a lower level in 2003 and increased continuously. At last, in 2019 addressed the 38.20 percent share of GDP which is the maximum share during the entire study period. Hence, it can be concluded that the trend of trade deficit to GDP is increasing with some fluctuations. The average ratio of this share is found at 18.84 percent.

Figure-4.1.2(c) presents the annual growth rate of the trade deficit. The overall growth rate of the trade deficit is volatile. The maximum growth rate of trade deficit is recorded as 64.16 percent in 1980. At this time Nepal adopted the principle of liberalization. Nepal has started international trade with the rest of the world. Which may cause an increased trade deficit in Nepal. Similarly, the minimum growth rate is found negative 26 percent in 1999. At this time Nepal has faced the Maoist movement so the country has not able to trade on the international market. It may cause a decline in the trade deficit. The average growth rate of trade deficit during this study period is found at 5.64 percent.

Figure-4.1.2(c): Annual growth rate of trade deficit (1979-2019)



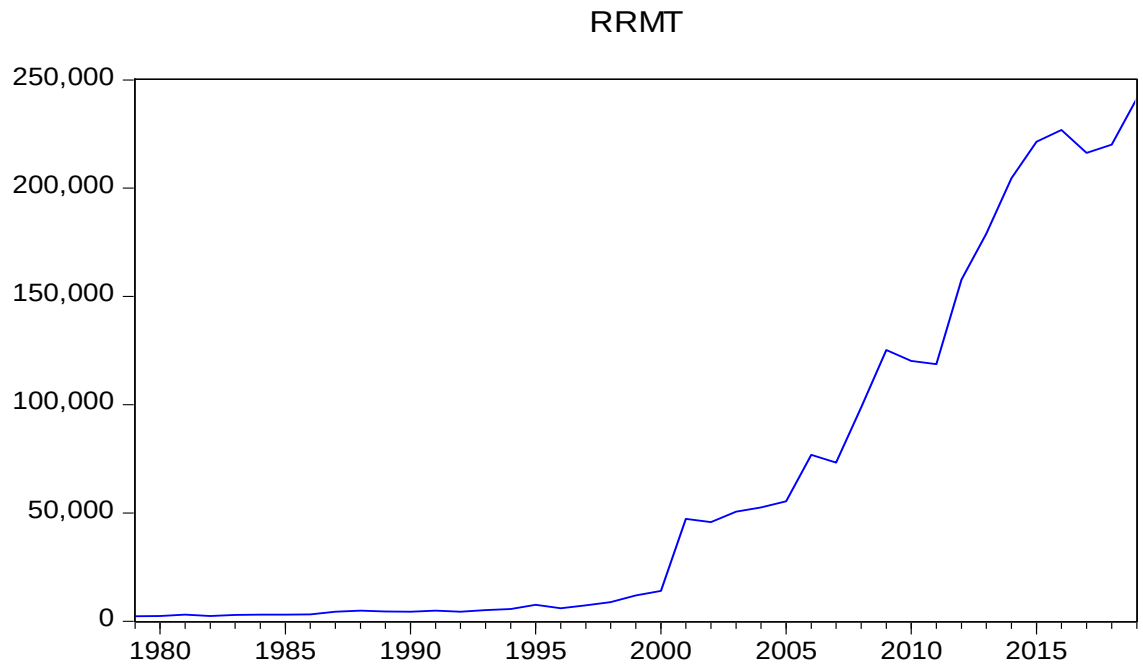
Source: Appendix-I

4.1.3 Nature and Trend of Remittance in Nepal

Remittance is the transfer of money from residents of one country to residents of another country and is often associated with migrants sending money to families and communities. Since remittance helps people improve their living standards, it has been observed as a good contributor to the poverty reduction in Nepal.

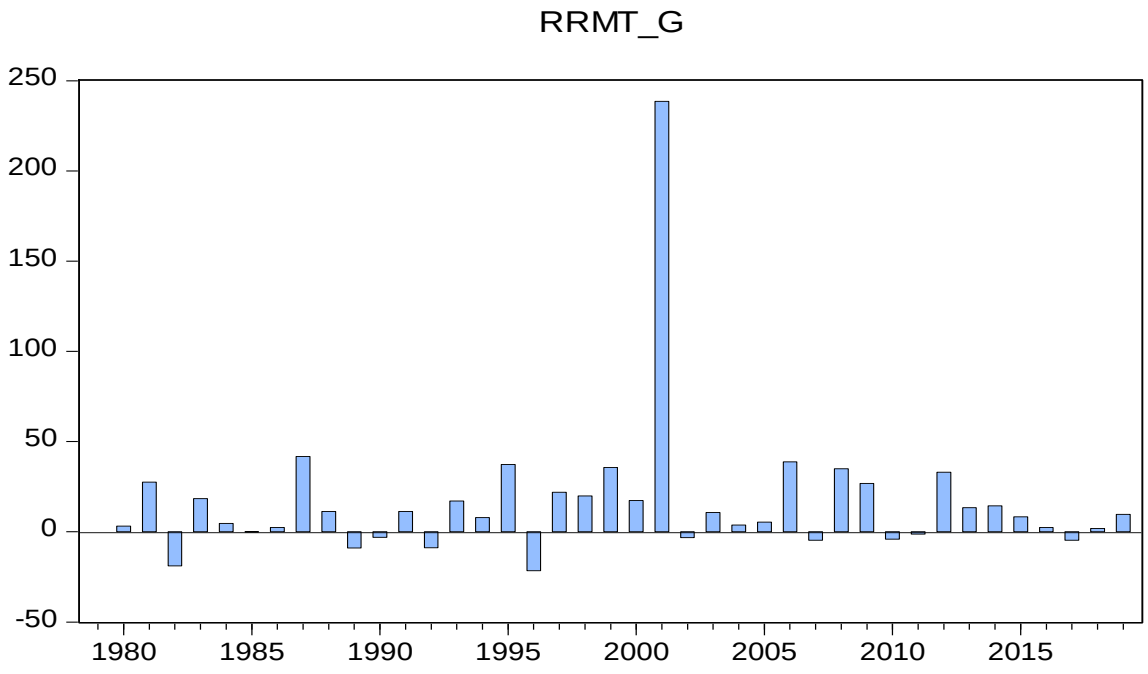
Figure 4.1.3(a) describes the trend of remittance in Nepal since 1979. This value of remittance is included in the real term. In 1979, total remittance is Rs. 2299.69 in million. Similarly, every year remittance is increases smoothly since 2000. Furthermore, after 2000 remittances is increases in increasing ratio. In 2016 pick the higher level of remittance and decreases the next two years. And at last, in 2019, total remittances take the highest level in the studying period which is Rs 241473.64 million. The nature of remittance in Nepal is increasing over the study period. The reason for the growth in remittance is more and more people go abroad for foreign employment.

Figure 4.1.3(a): Trend of remittances in Nepal



Source: Appendix-I

Figure 4.1.3(b): Annual growth rate of remittance



Source: Appendix-I

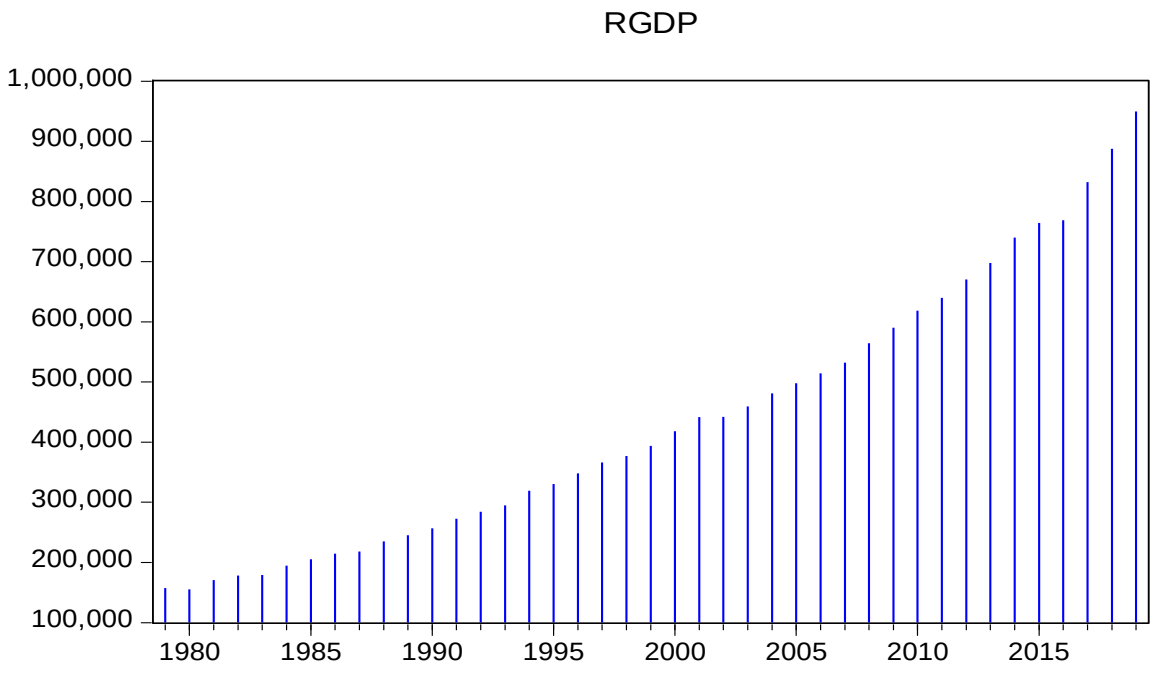
In figure 4.1.3(b) described the annual growth rate of remittance since 1980. In 1980, The growth rate of remittance is 3.21 percent from 1979. This figure describes that the growth rate of remittance is volatile. In 2001 the growth rate of remittance is 238 percent which is the maximum change in the growth rate. In this time Nepal has suffered from the Maoist movement and large size of people are gone abroad for employment it may the one cause of increases in remittance.

4.1.4: Nature and trend of Real GDP in Nepal

GDP is the market value of final goods and services produced within the geographical boundary of the economy during the specified period.

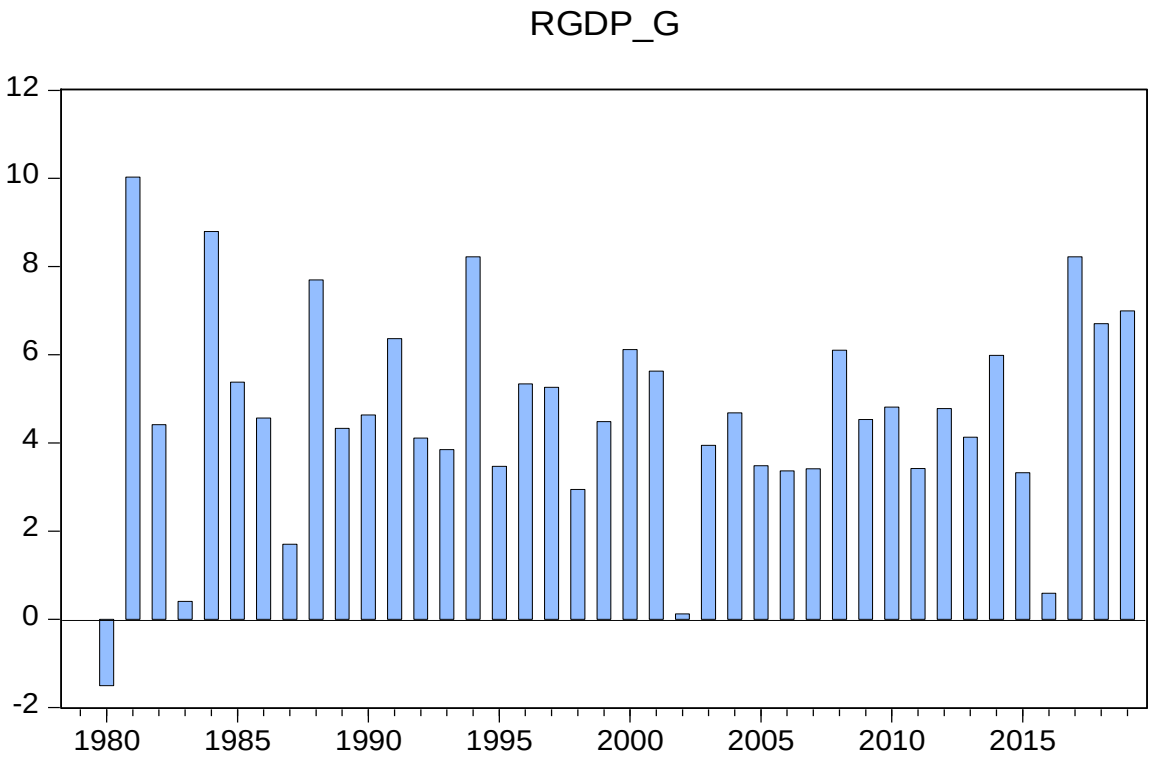
Figure 4.1.4(a) described the trend of GDP in Nepal since 1979. In 1979, the total GDP is 157499.97 million. The trend of GDP is increasing at an increasing ratio. Every year GDP is increasing. The highest value of GDP is captured with 949885.81million in 2019.

Figure 4.1.4(a): Trend of GDP in Nepal



Source: Appendix-I

Figure 4.1.4(b): Annual growth rate of GDP



Source: Appendix-I

Figure 4.1.4(b) described the annual growth rate of GDP since 1980. In 1980, the growth rate of real GDP is negative 1.5 percent. At this time economic policy was changed it may the cause of the negative growth rate in Nepal. The highest growth rate of GDP is 10 percent in 1981. Similarly, the lowest growth rate of GDP is 0.1 percent in 2002. At this time economy faces a global economic crisis so it may the cause of the small growth rate of RGDP. The growth rate of GDP is volatile. It may be the cause of political instability in Nepal after the 1980s to 2016/17.

4.2 Descriptive Statistics of the Variables

The descriptive statistics of the trade balance in the real term (RTB), real effective exchange rate (REER), real gross domestic income (RGDP), and remittance in real term(RRMT) include mean, median, maximum value, minimum value, standard deviation, kurtosis, and standard error are presented in the table-4.2.1.

Table-4.2.1: Descriptive statistics of the variables

	RTB	REER	RGDP	RRMT
Mean	98664.42	114.8280	436737.0	64580.61
Median	69381.54	113.9041	393902.9	11878.72
Maximum	362902.2	139.6889	949885.8	241473.6
Minimum	9571.885	95.76185	155131.2	2299.688
Std. Dev.	91968.90	11.80599	222786.9	80722.11
Skewness	1.396859	0.432417	0.593154	1.055880
Kurtosis	4.041315	2.315556	2.310127	2.617418
Jarque-Bera	15.18571	2.078019	3.217221	7.868414
Probability	0.000504	0.353805	0.200166	0.019561
Observations	41	41	41	41

Source: Appendix-I

Table-4.2.1 shows the mean value of the trade balance in the real term is Rs.98664.42 million (which is a deficit value) with a standard deviation of 91968.90. Its maximum and the minimum values are Rs.362902.2 and Rs.9571.885 million respectively. Similarly, the mean value of REER is 114.8280 with a standard deviation of 11.80599. Its maximum and the minimum value is 139.6889 and 95.76185. Likewise, the mean value of real GDP is Rs.436737.0 million with a standard deviation of 222786.9. Its maximum and the minimum values are Rs.949885.8 and Rs.155131.2 respectively. Therefore the mean value of remittance in the real term is Rs.64580.61 million with a standard deviation of 80722.11. Its maximum and the minimum value is Rs.241473.6 and Rs.2299.688 million. The values of standard deviation indicate that these variables are highly volatile during the study period of 41 years. The skewness of the variables shows that all variables are positively skewed.

4.3 Correlation Matrix

The correlation matrix helps to identify the direction and degree of relationships between variables in the model. Table-4.3.1 shows the correlation matrix for the variables at levels and first differences respectively.

Table-4.3.1: Correlation Matrix at Level and First Difference

Level				
	LnRTB	LnREER	LnRGDP	LnRRMT
LnRTB	1			
LnREER	-0.202	1		
LnRGDP	0.976	-0.266	1	
LnRRMT	0.922	-0.125	0.964	1
First Difference				
	D(LnRTD)	D(LnREER)	D(LnRGDP)	D(LnRRMT)
D(LnRTB)	1			
D(LnREER)	0.113	1		
D(LnRGDP)	-0.126	-0.360	1	
D(LnRRMT)	-0.107	-0.044	0.058	1

Source: Authors' computation using EViews-9

As shown in the table-4.3.1, on average, the correlation between the variables with level and first difference form looks moderate in strength. From this, it can be concluded that there is no possibility of perfect multicollinearity in the model.

4.4 Unit Root Test

To check the stationary property of the variables used in the study, the Augmented Dickey-Fuller test is used. Table-4.4.1 shows the ADF test results.

Table-4.4.1: ADF test for Unit root

Variables		Level		First Difference		Order of Integration
		Intercept	Intercept & Trend	Intercept	Intercept & Trend	
LnRTB	t-statistic	-1.029	-2.473	-5.825	-5.717	I(1)
	p-value	0.7333	0.3385	0.0000	0.0002	
LnREER	t-statistic	-2.528	-1.833	-8.265	-8.708	I(1)
	p-value	0.1166	0.6692	0.0000	0.0000	
LnRGDP	t-statistic	0.1406	-2.817	-9.207	-9.117	I(1)
	p-value	0.9650	0.1998	0.0000	0.0000	
LnRRMT	t-statistic	-0.129	-2.086	-6.999	-6.920	I(1)
	p-value	0.9391	0.5372	0.0000	0.0000	

Source: Authors' computation using EViews-9

The table-4.4.1 shows that the result of the ADF test statistics of concerned variables used in this study. If the variables are stationary in level then those variables are known as I(0) and if variables are stationary only after the first difference then it is called I(1). The results of the ADF test shows that all variables are non-stationary at level but stationary only after the first difference. So these all variables are called I(1). In the above table-4.3.1, all variables LnRTB, LnREER, LnRGDP, and LnRRMT are stationary at first difference. Since all variables are stationary at the first difference so this study applies the Engel-Granger approach to the long-run cointegration of the variables.

4.5 Engle-Granger Cointegration Test

According to the Engle-Granger cointegration test, the long-run cointegration of the variables is tested by testing the stationary of the residual term or error correction term in

the long-run model. So, before testing the stationary of residual term, the long-run model has derived by using OLS methods as below in table-4.4.1

Table-4.5.1: Long-run model using OLS Method: Where LnRTB is the dependent variable.

Dependent Variable: LnRTB Method: Least Squares Sample: 1979-2019 Included observations: 41				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LnREER	1.2602	0.3070	4.1037	0.0002
LnRGDP	2.6627	0.2207	12.0628	0.0000
LnRRMT	-0.2906	0.0668	-4.3448	0.0001
C	-26.2231	3.2468	-8.0764	0.0000
R-squared	0.9714	Mean dependent var		11.0977
Adjusted R-squared	0.9691	S.D. dependent var		0.92505
S.E. of regression	0.1624	Akaike info criterion		-0.70448
Sum squared resid	0.9763	Schwarz criterion		-0.53730
Log-likelihood	18.441	Hannan-Quinn criterion		-0.64360
F-statistic	420.04	Durbin-Watson stat.		1.121822
Prob(F-statistic)	0.0000			

Source: Authors' computation using Eviews-9

Table-4.5.1 is the long-run model, and coefficients are called a long-run coefficient. To test the long-run cointegration among the variables, first of all, the stationary of the residual is tested. If the residual of the long-run model is stationary at level then the variables are cointegrated and exist in a long-run relationship, and the model is not spurious. The stationary test of residual is presented in table-4.5.2.

Table-4.5.2: ADF Test for Residual

Null Hypothesis: ECM has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, max lag=9)			
		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-4.957857	0.0002
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	
*MacKinnon (1996) one-sided p-values.			

Source: Authors' computation using EViews-9

As reported in Table-4.5.2, a stationary test of the residual indicates that the absolute value of the Augmented Dickey-Fuller test statistic 4.957857 is greater than the absolute value of Engle-Granger critical value 3.605 at a 1 percent level of significance. So, the null hypothesis that the ECM has unit root is rejected, that is, ECM is stationary at level. Thus, being the residual term is stationary at level form so this can be concluded that there exists cointegration among the variables and the long-run model is not spurious.

While entering the diagnostic tests of the model, the value of the Durbin-Watson statistic is found at 1.12. By using this value, it is difficult to conclude about the autocorrelation. So, this study used the Breusch-Godfrey serial correction LM test to check the serial correlation, and the result obtained is presented in Appendix-III. Similarly, the Breusch-Pagan-Godfrey test for heteroscedasticity shows that there is no heteroscedasticity problem in the model (see Appendix-IV). Moreover, the results of Ramsey's RESET test for stability of the variables in the model show that there is an absence of instability in the model (see Appendix-V). Hence, it can be concluded that the model passes all the diagnostic tests and the result obtained does not suffer from any outliers.

As the LM test shows the presence of autocorrelation in the model, we use the robust least square method to remove the issue of serial autocorrelation from the model and the result obtained is presented in the table-4.5.3 given below;

Table-4.5.3: Long-run Coefficients using Robust Least Square

Dependent Variable: LnRTB Method: Robust Least Squares Sample: 1979-2019 Included observations: 41 Method: M-estimation M settings: weight=Bisquare, tuning=4.685, scale=MAD (median centered) Huber Type I Standard Errors & Covariance				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
LnREER	1.714*	0.2024	8.4698	0.0000
LnRGDP	2.157*	0.1455	14.824	0.0000
LnRRMT	-0.127*	0.0440	-2.8956	0.0038
C	-23.526*	2.1401	-10.9927	0.0000
Robust Statistics				
R-squared	0.699474	Adjusted R-squared		0.675107
Rw-squared	0.992587	Adjust Rw-squared		0.992587
Akaike info criterion	77.80671	Schwarz criterion		86.24300
Deviance	0.514340	Scale		0.084881
Rn-squared statistic	2838.078	Prob(Rn-squared stat.)		0.000000
Non-robust Statistics				
Mean dependent var	11.09776	S.D. dependent var		0.925055
S.E. of regression	0.199347	Sum squared resid		1.470355

Source: Authors' computation using EViews-9

Note: An asterisk * indicates the significance of coefficients at the 1 percent level.

Table-4.5.3 shows the results of the long-run model using RLS and the coefficient gives the long-run coefficient. The results imply that real effective exchange rate and real GDP have a significant positive role in increasing trade deficit in the long run but remittance has a significant negative effect on the trade deficit.

The coefficient of LnREER is 1.714 and it depicts that a one percent increase in real effective exchange rate increases the trade deficit by 1.714 percent, in the long run, keeping other variables constant. This coefficient is significant at the 1 percent level.

Similarly, the coefficient of LnRGDP is 2.15 and significant at the one percent level. It indicates that when real GDP in increases by one percent then the trade deficit will increases by 2.15 percent, in the long run, keeping other things remaining the same. As expected, this coefficient is positive which could be due to the import-based structure of the Nepalese economy.

The coefficient of LnRRMT is -0.127 and significant at the one percent level. That means when the remittance increases by one percent trade deficit will decrease by 0.127 percent in the long-run assuming other variables constant. This coefficient is negative as per expectation. The reason behind this could be an increase in remittance inflow increases the level of income and hence improve the living standard of the peoples. This in turn reduces the external deficit of the economy.

4.6 Error Correction Model

To test the short-run relationship between the trade deficit and other explanatory variables the study used Error Correction Model. The results of the error correction model are presented in table-4.5.1.

Table-4.6.1 is the short-run error correction model and the coefficient of the short-run model shows the short-run dynamics of the variables concerning trade deficit. In the short-run, a real effective exchange rate (ΔLnREER) has a positive effect on the trade deficit as per expectation. However, it is statistically insignificant.

Table-4.6.1: ECM: Dependent Variable is ΔLnRTB

Dependent Variable: ΔLnRTB Method: Least Squares Sample (adjusted): 1980-2019 Included observations: 40 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.091673	0.046532	1.970100	0.0568
ΔLnREER	0.370722	0.327408	1.132296	0.2652
ΔLnRGDP	0.476536	0.955987	0.498476	0.6213
ΔLnRRMT	-0.170344	0.089583	-1.901531	0.0655
ECM(-1)	-0.522285	0.134422	-3.885415	0.0004

R-squared	0.323095	Mean dependent var	0.090883
Adjusted R-squared	0.245735	S.D. dependent var	0.139184
S.E. of regression	0.120879	Akaike info criterion	-1.271589
Sum squared resid	0.511409	Schwarz criterion	-1.060479
Log likelihood	30.43177	Hannan-Quinn criter.	-1.195258
F-statistic	4.176483	Durbin-Watson stat	1.282319
Prob(F-statistic)	0.007200		

Source: Authors' computation using EViews-9

Similarly, real gross domestic product (RGDP) has a positive effect on the trade deficit. Quantitatively, the coefficient of ΔLnRGDP is 0.47 and it indicates that a one percent increase in RGDP will increase the trade deficit by 0.47 percent in the short run with the assumption that other variables are constant. However, it is not statistically significant.

Moreover, remittance (RRMT) has a negative and significant effect on the trade balance in the short-run as well. Specifically, the coefficient of ΔLnRRMT is -0.17, indicating that a 1 percent increase in remittance decreases the trade deficit by 0.17 percent in the short-run keeping other variables the same. It is statistically significant at the 10 percent level.

As can be seen from table-4.6.1, the results of the error correction model indicate that the coefficient of the speed of adjustment (ECM_{t-1}) is -0.522 with t-statistic -3.88 and a corresponding probability of 0.0004. This coefficient implies that 52.2 percent of the error being corrected every year. The coefficient is found to have the correct sign and statistically significant at the 1 percent level explaining the fact that trade deficit and other explanatory variables are converging in the long run.

In table-4.6.1, the value of R-squared is 0.32. This means in the short-run 32 percent in total variation in trade deficit is explained by explanatory variables and the remaining 68 percent is due to error. Likewise, the probability value of the F-statistic is less than 1 percent that shows that there is an overall significance of the short-run model.

CHAPTER-V

MAJOR FINDINGS AND CONCLUSION

5.1 Summary of Major Findings

The main objective of this study was to examine the relationship between the trade balance and the real effective exchange rate in Nepal. To fulfill this objective, this study uses an annual dataset of 41 years from the period 1979-2019. To analyze the trend of trade balance, exchange rate, gross domestic product, and remittance so this study was used to trend line, table, and histogram. The ADF test was applied to test the stationary of the time series data and the Engle-Granger cointegration test was performed to test the cointegration among the variables. The long-run model was estimated by using the RLS method. Similarly, the ECM model was applied for the short-run dynamics of the model. Finally, a serial correction LM test was performed. The major findings of this study are listed as given below:

1) The trend of the real effective exchange rate shows a fluctuating trend during the entire study period. The maximum value of REER is 138.95 in 1979 and the minimum value of REER is 95.76 in 1991. Similarly, the average growth rate of REER is -0.09.
2) The trade deficit is increasing continuously during this study period. The maximum level of trade deficit is 362902.22 million in 2019 and the minimum value is 9571.88 in 1979. Similarly, the maximum share of trade deficit to GDP is 38.22 percent in 2018 and the minimum share of trade deficit to GDP is 6.08 percent in 1979. The average share of the trade deficit to GDP is 18.84 percent. Moreover, the maximum growth rate of trade deficit is 64.16 percent in 1980 and the minimum growth rate is negative 26 percent in 1999. The average growth rate of trade deficit during this study period is found at 5.64 percent.
3) The result of the ADF test shows that all the variables are stationary only after the first difference i.e. all variables used in this study are I (1).

4) The Engle-Granger cointegration test indicates that all the variables included in this study are cointegrated among each other and the long-run model is free from spurious regression.
5) The long-run model shows that real effective exchange rate and real GDP have a significant positive role in increasing trade balance in the long run but remittance has a significant negative effect on the trade balance. For instance, a one percent increase in the real effective exchange rate and GDP leads to a 1.714 and 2.15 percent increase in the trade deficit. However, a one percent increase in remittance decreases the trade deficit by 0.127 percent.
6) The result of the Error Correction Model indicates that in the short-run, the real effective exchange rate and the real gross domestic product have a positive effect and it is statistically insignificant. But, remittance has a negative and significant effect on the trade balance. When a one percent increase in remittance trade deficit is decreased by 0.17 percent in the short run.
7) The Error correction term ECM(-1) is negative and statistically significant at a one percent level. It indicates that the trade balance and other explanatory variables are converging into long-run equilibrium. Specifically, the coefficient of ECM(-1) is -0.522 indicating that 52.2 percent of the error being corrected every year.

5.2 Conclusion

The trend of the real effective exchange rate and the trade balance is volatile and increasing respectively. This may cause a macroeconomic imbalance in the economy. In this regard, examining the relationship between these two variables is essential. So, the central focus of this study is to examine the relationship between the real effective exchange rate and the trade balance in Nepal. Also, other determinants of trade balance like real gross domestic product and remittance were adopted and in finding out their effects on the trade balance.

The study found that the real effective exchange rate has a positive and significant effect on the trade balance in the long run. A one percent increase in the real effective exchange rate changes a 1.714 percent increase in the trade deficit. And one percent increase in the RGDP leads to a 2.15 percent trade deficit. However, a one percent increase in remittance decreases the trade deficit by 0.127 percent.

To correct the trade balance in Nepal, we should increase the export by mobilizing the domestic resources which cartel imports on one hand and should decrease imports by using the fiscal tools, by increasing the efficiency of tax administration, by establishing the import substitution type of industries, etc. on the other hand. In order to decrease the trade deficit, the policies should focus on increasing domestic production and thereby increasing exports.

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APPENDICES

Appendix-I: Datasheet used for the descriptive study (1979-2019)

Year	REER (2001=100)	REER_G	Trade Balance	TD to GDP	TD_G	RRMT	RGDP	RRMT_G	RGDP_G
1979	138.95	.	-9571.88	-6.08	.	2299.69	157499.97		
1980	139.69	0.53	-15476.6	-9.98	64.16	2373.70	155131.16	3.218542	-1.50401
1981	132.05	-5.47	-17624.4	-10.33	3.5	3026.67	170692.69	27.5085	10.03121
1982	131.16	-0.67	-19777.7	-11.1	7.48	2456.40	178222.74	-18.8416	4.411467
1983	138.75	5.79	-27418.3	-15.32	38.07	2908.50	178948.95	18.4048	0.40747
1984	121.31	-12.57	-23836.8	-12.24	-20.09	3043.02	194692.03	4.62532	8.797526
1985	111.47	-8.12	-22026.7	-10.74	-12.31	3041.86	205170.12	-0.03831	5.381883
1986	115.5	3.61	-24109	-11.24	4.67	3114.48	214537.68	2.387451	4.565749
1987	126.71	9.71	-27036.6	-12.39	10.27	4416.02	218184.28	41.79011	1.699752
1988	124.23	-1.96	-29805.6	-12.68	2.36	4914.28	234977.18	11.28279	7.696655
1989	121.01	-2.59	-33141.3	-13.52	6.58	4472.33	245146.28	-8.99302	4.327698
1990	121.14	0.11	-32663.1	-12.73	-5.81	4335.42	256508.90	-3.06133	4.635036
1991	95.76	-20.95	-35901.8	-13.16	3.34	4824.16	272839.36	11.27313	6.36643
1992	108.77	13.58	-34646.4	-12.2	-7.3	4401.70	284047.83	-8.75717	4.108085
1993	104.43	-3.99	-37740.3	-12.79	4.89	5150.88	294974.44	17.02026	3.84675
1994	107.68	3.11	-51706	-16.2	26.6	5557.24	319219.10	7.889203	8.219239
1995	101.83	-5.42	-69381.5	-21.01	29.69	7630.71	330291.04	37.31114	3.468447
1996	104.13	2.26	-76280.5	-21.92	4.37	5987.45	347920.70	-21.5349	5.337613
1997	101	-3.01	-92585.8	-25.28	15.31	7304.57	366224.70	21.99812	5.260967
1998	99.45	-1.53	-77053.4	-20.44	-19.15	8756.65	376999.32	19.87911	2.942081
1999	106.69	7.28	-59711.5	-15.16	-25.83	11878.72	393902.92	35.65366	4.48372
2000	102.03	-4.37	-64636.3	-15.46	2.01	13947.06	417992.09	17.4121	6.11551
2001	100	-1.99	-60033	-13.6	-12.07	47216.05	441518.49	238.5377	5.628431
2002	98.91	-1.09	-58155.9	-13.16	-3.24	45736.67	442048.99	-3.1332	0.120154
2003	103.18	4.32	-69471.1	-15.12	14.92	50597.78	459488.31	10.62846	3.945112
2004	105.35	2.1	-73812.1	-15.35	1.5	52502.91	481004.32	3.765256	4.682601
2005	104.74	-0.58	-76650.5	-15.4	0.35	55347.41	497738.96	5.417787	3.479104
2006	109.61	4.65	-89312.5	-17.36	12.73	76839.24	514485.63	38.83079	3.36455
2007	115.85	5.7	-98912.1	-18.59	7.09	73205.39	532038.16	-4.72917	3.411664
2008	107.19	-7.47	-112585	-19.94	7.27	98750.67	564516.90	34.89536	6.104589
2009	116.96	9.11	-129437	-21.93	9.98	125213.15	590107.20	26.79727	4.533133
2010	120.72	3.22	-162576	-26.28	19.83	120164.34	618529.15	-4.03217	4.816404
2011	112.79	-6.57	-155290	-24.28	-7.64	118654.65	639694.08	-1.25636	3.421817
2012	113.9	0.99	-170015	-25.36	4.49	157791.54	670279.36	32.98386	4.781235
2013	111.24	-2.34	-197577	-28.31	11.6	178947.58	697954.23	13.40759	4.128857

2014	115.58	3.9	-234357	-31.68	11.91	204579.32	739754.36	14.3236	5.988949
2015	118.07	2.16	-247357	-32.36	2.15	221490.65	764335.70	8.266392	3.322905
2016	123.95	4.97	-240046	-31.22	-3.52	226936.45	768835.18	2.458701	0.588679
2017	125.85	1.54	-285307	-34.29	9.82	216361.91	832060.33	-4.65969	8.223499
2018	126.66	0.64	-339315	-38.22	11.46	220154.24	887816.66	1.75277	6.700995
2019	123.63	-2.39	-362902	-38.2	-0.04	241473.64	949885.81	9.683851	6.991212

Source: Bhatta (2020) and CMES-2019/20, NRB

Appendix-II: Data sheet used for empirical analysis (1979-2019)

Year	NGDP	RGDP (2001=100)	GDP Deflator (2001=100)	REER (2001=100)	TB	RMT
1979	26128.00	157499.97	16.59	138.95	-1587.90	381.50
1980	23351.00	155131.16	15.05	139.69	-2329.60	357.30
1981	27307.00	170692.69	16.00	132.05	-2819.50	484.20
1982	30988.00	178222.74	17.39	131.16	-3438.80	427.10
1983	33821.00	178948.95	18.90	138.75	-5182.00	549.70
1984	39290.00	194692.03	20.18	121.31	-4810.40	614.10
1985	46587.00	205170.12	22.71	111.47	-5001.50	690.70
1986	55734.00	214537.68	25.98	115.50	-6263.20	809.10
1987	63864.00	218184.28	29.27	126.71	-7913.80	1292.60
1988	76906.00	234977.18	32.73	124.23	-9755.10	1608.40
1989	89270.00	245146.28	36.41	121.01	-12068.40	1628.60
1990	103416.00	256508.90	40.32	121.14	-13168.70	1747.90
1991	120370.00	272839.36	44.12	95.76	-15839.00	2128.30
1992	149487.00	284047.83	52.63	108.77	-18233.50	2316.50
1993	171474.00	294974.44	58.13	104.43	-21939.10	2994.30
1994	199272.00	319219.10	62.42	107.68	-32277.40	3469.10
1995	219175.00	330291.04	66.36	101.83	-46040.30	5063.60
1996	248913.00	347920.70	71.54	104.13	-54573.40	4283.60
1997	280513.00	366224.70	76.60	101.00	-70916.90	5595.00
1998	300845.00	376999.32	79.80	99.45	-61488.50	6987.80
1999	342036.00	393902.92	86.83	106.69	-51849.00	10314.60
2000	379488.00	417992.09	90.79	102.03	-58682.20	12662.30
2001	441519.00	441518.49	100.00	100.00	-60033.10	47216.10
2002	459442.55	442048.99	103.93	98.91	-60444.20	47536.30
2003	492230.78	459488.31	107.13	103.18	-74421.50	54203.30
2004	536749.05	481004.32	111.59	105.35	-82366.40	58587.60
2005	589411.67	497738.96	118.42	104.74	-90767.90	65541.20

2006	654084.13	514485.63	127.13	109.61	-113546.20	97688.50
2007	727826.97	532038.16	136.80	115.85	-135311.50	100144.80
2008	815658.20	564516.90	144.49	107.19	-162671.20	142682.70
2009	988271.53	590107.20	167.47	116.96	-216772.10	209698.50
2010	1192773.57	618529.15	192.84	120.72	-313511.20	231725.30
2011	1366954.07	639694.08	213.69	112.79	-331837.00	253551.60
2012	1527343.57	670279.36	227.87	113.90	-387406.70	359554.40
2013	1695011.10	697954.23	242.85	111.24	-479822.76	434581.70
2014	1964539.58	739754.36	265.57	115.58	-622374.41	543294.10
2015	2130149.57	764335.70	278.69	118.07	-689365.08	617278.80
2016	2253163.10	768835.18	293.06	123.95	-703481.97	665064.30
2017	2674492.75	832060.33	321.43	125.85	-917064.15	695452.40
2018	3044927.12	887816.66	342.97	126.66	-1163743.43	755058.60
2019	3458792.91	949885.81	364.13	123.63	-1321425.82	879271.30

Source: Bhatta (2020) and CMES-2019/20, NRB

Appendix-III: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	4.924630	Prob. F(1,36)	0.0329
Obs*R-squared	4.933700	Prob. Chi-Square(1)	0.0263

Source: Authors' calculation using EViews-9

Appendix-IV: Breusch-Pagan-Godfrey test for Heteroscedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.898878	Prob. F(3,37)	0.1467
Obs*R-squared	5.470266	Prob. Chi-Square(3)	0.1404
Scaled explained SS	5.967505	Prob. Chi-Square(3)	0.1132

Source: Authors' calculation using EViews-9

Appendix-V: Ramsey's RESET Test for Stability Test

Ramsey RESET Test Specification: LNRTD LNREER LNRGDP LNRRMT C Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	0.377096	36	0.7083
F-statistic	0.142201	(1, 36)	0.7083
Likelihood ratio	0.161633	1	0.6877

Source: Authors' calculation using EViews-9