

# **THE EFFECT OF FOREIGN AID ON TRADE BALANCE IN RWANDA**

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A research project submitted to the Department of Applied Economics in partial fulfillment of the requirement for the award of the degree of Master of Economics (International Trade and Finance) of Kenyatta University

September, 2014

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**DECLARATION**

This project is my original work and has not been presented for any award in any other University or any other degree.

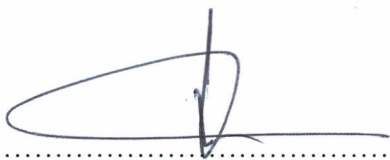
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**DEDICATION**

*To my Heavenly Father.*

## ACKNOWLEDGEMENTS

It is with heartfelt gratitude that I first thank God, I believe that He is always with me, lead my paths and help me achieve my goals.

I would also like to thank Kenyatta University for the knowledge we have acquired. I would like to thank many people who helped me to make my studies successfully progressive. I would like to express my heartfelt appreciation to my supervisors Dr Steve MAKORI and Dr Paul GACHANJA for their supervision, support, guidance, assistance and encouragement. I would like to deeply thank all my lecturers who passed before me. These have adequately guided and equipped me with both theoretical and practical skills.

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**ABBREVIATIONS**

- ADF:** Augmented Dickey Fuller
- AfDB:** African Development Bank
- ARDL:** Autoregressive Distributed Lag
- BNR:** Banque Nationale du Rwanda
- BSHG:** Budget Support Harmonization Group
- DPCG:** Development Partners Coordination Group
- EDPRS:** Economic Development and Poverty Reduction Strategy
- ER:** Exchange Rate
- FA:** Foreign Aid
- FDIs:** Foreign Direct Investments
- GDP:** Gross Domestic Product
- GoR:** Government of Rwanda
- IMF:** International Monetary Fund
- MINECOFIN:** Ministry of Finance and Economic Development
- MINICOM:** Ministry of Commerce and industry
- NISR:** National Institute of Statistics of Rwanda
- ODA:** Official Development Assistance
- OECD:** Organization of Economic Community for Development
- RWF:** Rwandan Franc
- TB:** Trade Balance
- UN:** United Nations
- US\$:** United States Dollar
- US:** United States

**USA:** United States of America

**USAID:** United States Agency for International Development

**VAR:** Vector Autoregressive

**VECM:** Vector Error Correction Model

**WTO:** World Trade Organization

**ABSTRACT**

Rwanda is seen as a good macroeconomic performer and has achieved high rate of growth and macroeconomic stability. Due to the low level of saving, capital inflow was necessary to keep the economy buoyant. The inflow of capital was not only important for investment and job creation but also used for capital imports. Production is not satisfying as the country's imports continue to exceed the exports. The trade gap keeps expanding and necessitates more foreign aid inflow. Increase in foreign aid strengthens domestic currency in the short run. As result of appreciation of domestic currency, it is expected that imports will increase and exports decrease in the short run and the country will experience trade balance deficit. It is also expected in the long run that foreign aid increases the income of population which increase the imports and domestic currency is expected to depreciate. This makes the imports expensive and exports cheaper, therefore trade balance improvement in the long run due to the fact that domestic currency depreciates and capital imports are producing substitute and competitive goods. However the situation is controversial in Rwanda, the more foreign aid inflow, the more trade balance deteriorates while the domestic currency continuously depreciates. The study intended to determine the effects of foreign aid on trade balance in Rwanda and specific objectives of the study were to determine the effect of foreign aid on trade balance in Rwanda, to determine the effect of exchange rate on trade balance in Rwanda and also to determine the causal relationship between foreign aid and trade balance in Rwanda. The study used time series data spanning from 1982 to 2012 and descriptive and econometric analysis were carried out based on Vector Autoregressive (VAR). Cointegration and causality tests were used to test the relationship exist between foreign aid and trade balance. Vector error correction model (VECM) was applied to determine the speed of adjustment from the short run to the long run economic equilibrium. The study revealed that there is a negative effect of foreign aid on trade balance in Rwanda and a positive effect of exchange rate on trade balance in Rwanda. The study also denoted that there is a bi-directional causality between foreign aid and trade balance in Rwanda and a long run relationship between trade balance, Exchange rate and Foreign aid. The test for VECM presented that the speed of adjustment from short run to the long run equilibrium was faster at 1.43 or 143 percent. It is advised that the republic of Rwanda should implement import substitution policy in order to reduce the quantity of imports which widens the trade balance deficit for many years. Export promotion policy should be important in order to gain enough foreign earnings instead of relying on uncertain foreign aid. To achieve these GoR should be wisely prepared to tear down all trade barriers Rwandan exports faced on global market. It is expected that the study is useful to the macroeconomic policymakers of government of Rwanda towards the effects of foreign aid on trade balance in Rwanda.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background

##### 1.1.1 Brief history of foreign aid in Rwanda

Rwanda is one of Africa's landlocked countries, densely populated, limited in natural resources and rain-fed agricultural based economy. For many years Rwanda has obtained considerable amount of foreign aid proportionate to the volume of its inhabitants and economy. However the huge quantity of aid offered has been to keep the Rwandan economy afloat, to refute the effects of external shocks namely the deterioration in world prices for its exports, and to assist the regime to endure an episode of structural adjustment. The Official Development Assistance Average annual receipts from 1985 to 1991 totaled to \$238 million. Between 1988 and 1991, the total bilateral and multilateral Official Development Assistance from OECD member countries expanded by 50%. Immediately after the genocide, Official Development Assistance from OECD members increased twofold in 1994 from \$353 million to 713.6 million US\$ (Baaré *et al*, 1999). At that time most of assistance to Rwanda was in the type of emergency humanitarian assistance, reacting to Rwanda's most urgent necessity as result of the gravity of destruction generated by the civil war and genocide. From that time, the United Nations and donor organizations have assisted broad collection of projects and programs in various sectors and areas across the country (Kumar, 1996). Aid to Rwanda augmented very quickly post 1995 because of rebuilding action and then declined just before the end of the decade, and rose again from 2001 straight on. Since then there have been continuous rise in aid flows with significant growth of aid of 1700

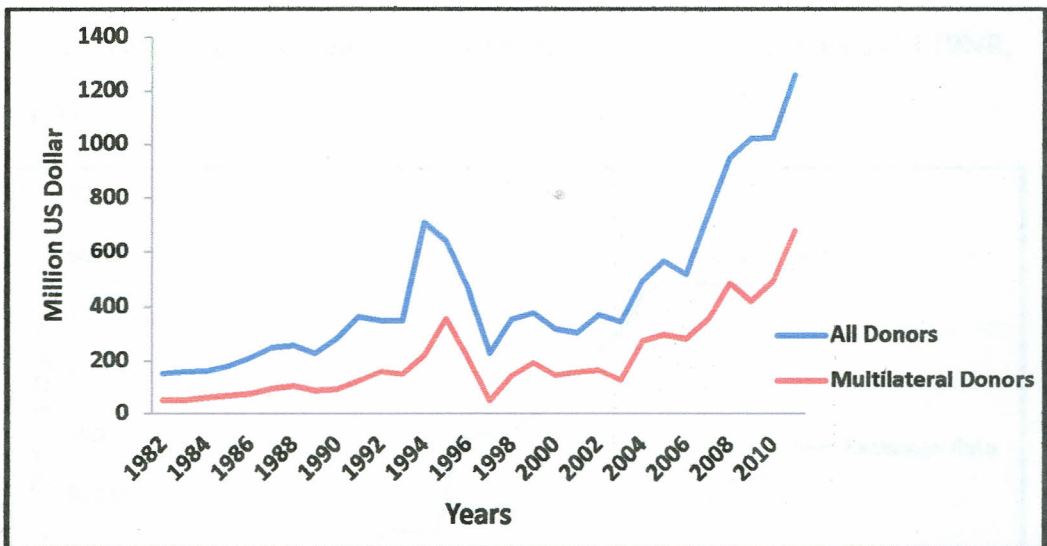
million US\$ experienced between 2006 and 2008 (AfDB, 2011). At present most aid is directed via the Government of Rwanda (GoR) in backing of the Rwandan national poverty reduction strategy, the Economic Development and Poverty Reduction Strategy (EDPRS) and Poverty Reduction Strategy Support Program I,II, and III (AfDB, 2011).

### **1.1.2 Foreign aid and trade balance.**

Foreign aid is one of main sources of fund for government expenditure. This foreign aid comes in form of foreign currencies and is spent on domestic and foreign goods and services. The behavior of foreign aid affects the trade balance through the mediation of exchange rate. Increase in foreign aid is expected to strengthen the domestic currency in the short run; this will increase the quantity of imports and decrease the quantity of exports which trigger the trade balance deficit that is expected to be in the short run. Lloyd *et al*, (2001) stated that trade determines aid, it is proven that deterioration of trade balance necessitates more foreign aid inflow as demonstrated by the trade (import-export) gap approach theory which asserts that foreign aid should fill the gap between the required import expenditures and the actual export earnings (Qubria, 2005). In the long run, it is expected that foreign aid will increase the income of population which is used to import hence the exchange rate depreciation. As Keshab *et al* (2005) stated that exchange rate affect trade balance, the depreciation of domestic currency encourages exports and discourages imports and the country experiences the trade balance improvement (Hallwood *et al*, 2000). It is also expected that imported capitals have to generate the production in the long run which substitutes the

imports and exported for income generation, therefore the country will shift from the trade balance deficit.

In Rwanda, foreign aid keeps increasing over time and its increase accelerated from 1990 when the civil war broke in the country and scaling up in 1994 due to genocide effect. The foreign aid was cut in 1997 when the RPF invaded Congo to remove the Mobutu regime and it increased significantly from 2004. As shown in the figure 1.1, the trend in foreign aid since 1980s has continued to grow.

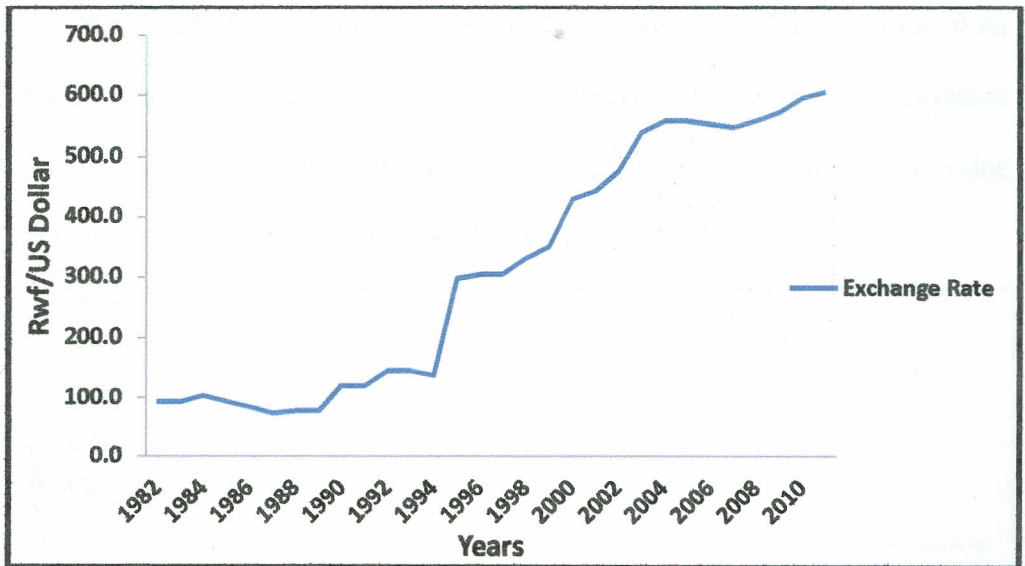


**Figure 1.1:** Trend of foreign aid in Rwanda from 1982 to 2011 in million US dollar.

Source: *Stats.oecd.org*

The foreign aid trend can be attributed to number of factors including the civil war started in 1990, the atrocity of 1994 genocide where the foreign aid almost doubled from US\$ 347.7 million in 1993 to US\$ 706.83 million in 1994. There was a fall to US\$ 228.94 million in 1997 due to the cut in aid from donor funding countries and agencies caused by Rwandan invasion in Congo. Most of foreign

currencies to Rwanda come in form of foreign aid whose increase result to domestic currency appreciation. However through the years the Rwandan franc has been depreciating against US dollar, between January and December 2004, BNR (2004) reported that the exchange rate dropped by about 2.58%. The volume of foreign currency sold in 2008 converted into Rwf amounted to 208.48 billion compared to 153.79 billion Rwf sold in 2007. After a depreciation of the Rwf by 4.5% against US dallor at the end 2012 due to uncertainties around donor support, the Rwf has regained its stability in the first half of 2013 depreciating by only 1.8%. The Rwf depreciated by 4.9% between June 2012 and June 2013 (BNR, 2013).



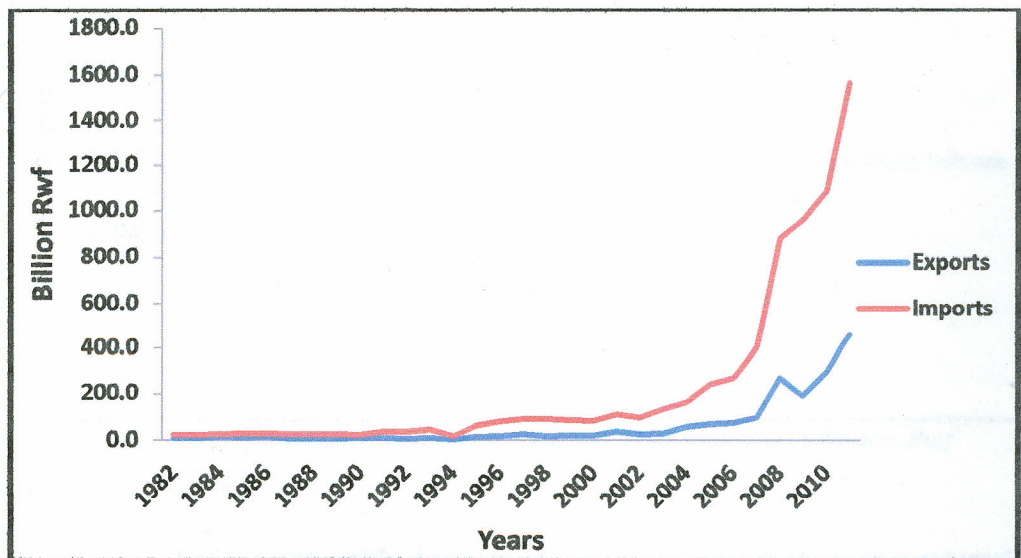
**Table 1.2** Trend of Exchange rate of Rwandan franc against US dollar 1982-2012

Source: BNR, 2013

In table 1.2 the exchange rate of Rwandan franc against US dollar had been bit stable from 1982 to 1994. Since then exchange rate rose continuously up to 2012.

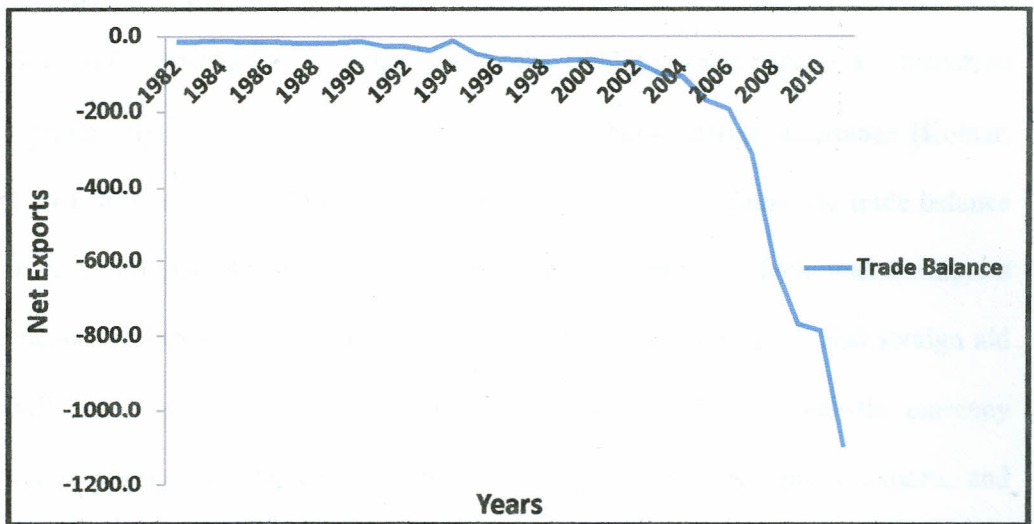
### 1.1.3 Rwanda's external trade

Shifting from aid dependence to self-reliance, the country implemented the export promotion strategy. Rwanda's exports of goods rose considerably in the recent past, increasing to \$254 million in 2010 from \$62 million in 2003. Export earnings are extremely condensed in a few goods, with coffee, tea and minerals jointly making up 79 per cent of exports apart from re-export. However, imports to Rwanda have increased faster, from \$325 million in 2003 to \$1,389 million in 2010. Rwanda's trade deficit in goods exceed more than \$1 billion and represents around 20 per cent of Rwanda's GDP (Minicom, 2011). Despite such increase in exports, imports are still greater than exports at least from 1998 to 2012, exports rose from US\$54.1 million to US\$590.0 million while imports rose from US\$233.6 million to US\$1967.0 million. Exports and imports have increased significantly reflecting the level of economic activity although the imports value has been larger than export value (BNR, 2012).



**Figure 1.3** Trend of Exports and Imports in Rwanda from 1982-2012 billion Rwf  
Source: BNR, 2013

Figure 1.3 indicates that Rwanda is a net importer. Despite the political unrest that influenced the trade deficit during the civil war and genocide, the deficit continues to emerge up to date. This difference between imports and exports is nailed on a number of factors. These factors include Rwanda being a landlocked country, inadequate export structure attributed to the low quality products made from ineffective industrial sector that utilize undeveloped technology, high transport costs, poor road networks particularly in the villages and catchments which create a grave transport difficulties to rural produced commodities, high production costs which have immediate effect on prices, insufficient production, scarcity of electricity instigates most industries to work under capacity, insignificant production technology, small size of the local production units, poor quality and incapability to reach international standards (Minicom, 2006).



**Figure 1.4:** Trend of external balance in Rwanda from 1998-2011 billion Rwf

Source: BNR, 2013

The figure 1.4 above noticeably demonstrates a clear image of Rwanda's external trade balance.

Foreign aid depreciates exchange rate because is operating as money supply in the economy. By the increase of foreign aid, the income will increase and the increased income will in turn increase the quantity of imports hence the exchange rate appreciation due to the high demand of foreign currencies. Since independence, Rwandan franc keeps depreciating and it does not reduce the trade balance deficit rather it deeply widens. In view of the fact that the main fraction of foreign aid is spent on capital imports, the trade balance deficit is supposed to be of the short run but improve in long run due to the production output from capital output. However the trade balance of Rwanda keeps deteriorating year after year.

### **1.2 Statement of the Problem**

Since independence in 1962, Rwanda has been a foreign aid dependent country. Foreign aid represents 40% of government budget and is main source of capital flow and financing for investment. After the 1994 genocide, foreign aid increased significantly and much of it being in form of humanitarian assistance (Kumar, 1996). It is expected in the short run that foreign aid will cause the trade balance deficit, through the strengthening of domestic currency which makes imports cheaper and exports expensive. It is also expected in the long run that foreign aid will increase income of population which will result in domestic currency depreciation. The depreciation of domestic currency encourages exports and discourages imports hence trade balance surplus (Hallwood *et al*, 2000). The capital imports are also expected to generate production in the long run which will improve the trade balance. However that's not the case in Rwanda, the more foreign aid continuously increases, the more domestic currency continuously

depreciates and the more imports increase greater than exports hence trade balance deficit continuously persists. However other trade factors contributed such as Rwanda being a landlocked country, low quality products, low level of production and lack of modern technology. The government tried to develop and promote trade through encouraging FDIs, exports promotion, integration in regional and global bodies, establishment of export industries, and production of quality and quantity exports (Minicom, 2006). Due to the political instability in Eastern Congo, foreign aid has been cut by the donor countries that have accused Rwanda of playing a role in the conflict in Congo. The government of Rwanda initiated Agaciro development fund which intended to substitute for aid but still far inefficient to solve the problem.

Some studies have been done such as Uneze (2011), Cerra *et al* (2008) that argued that foreign aid led to exchange rate appreciation while Ouattara *et al* (2005) found that foreign aid led to exchange rate depreciation. Akiko *et al*, (2007), Nowak-Lehmann *et al* (2012) found bidirectional causality between trade and aid. All these studies had been carried out on different countries and some years have gone since the studies were made. In this globalized and competitive world, international trade is importantly an increasing pillar of a country's economy. However the ability of country to manage and control the effect of foreign aid on imports and exports will be helpful to achieve balance of trade. This study took account of following variable foreign aid in form Official Development Assistance, trade balance and exchange rate with the purpose of determining the effect of foreign aid on trade balance in Rwanda.

### **1.3 Research Questions**

- i. What is the effect of foreign aid on trade balance in Rwanda?
- ii. What is the effect of exchange rate on trade balance in Rwanda?
- iii. What is the causal relationship between Foreign aid and trade balance in Rwanda?

### **1.4 Research Objectives**

#### **1.4.1 General objective**

To determine the effect of foreign aid on trade balance in Rwanda

#### **1.4.2 Specific objectives:**

- i. To determine the effect of foreign aid on trade balance in Rwanda.
- ii. To determine the effect of exchange rate on trade balance in Rwanda.
- iii. To determine causality between foreign aid and trade balance in Rwanda.

### **1.5 Significance of the study**

In modern world, foreign aid has become a macroeconomic tool, where donor countries use it to manipulate their international political and economic relations. The North-South aid based economic relations is rooted from the colonial era with an aim of gaining trusteeship for imperial and dominance purposes. Most of the foreign aid is tied with conditions which favor donating countries especially in matters trade. Developing countries are habitually consumers of imports from

developed countries. Rwanda is persistently importing than it exports, its deteriorating trade balance keeps increasing as the received foreign aid grows up.

This study will therefore be helpful to policy makers, researchers and scholars to understand the effect of foreign aid on trade balance in Rwanda and to comprehend the effect of foreign aid on exchange rate in Rwanda. Once the link between foreign aid, exchange rate and trade balance is established, policy makers will be well positioned to formulate effective policy that can handle the problem. This study is also helpful for further researches and it formulates a new theory for Rwanda.

### **1.6 Organization of the study**

This research project is structured such that chapter one shows introduction where background, statement of problem, research questions and objectives of the study are presented, chapter two presents the theoretical and empirical literature and chapter three presents the methodology. Chapter four deals with the data analysis while chapter five presents the summary, conclusion and policy implications.

### **1.7 Limitation of the study**

This study deals with macroeconomic aspect, where it analyzes effect of foreign aid on trade balance in Rwanda, used data spanning from 1982 to 2012 and was collected from Central Bank of Rwanda.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

Many scholars and researchers both from developing and developed countries have spent a lot of time studying the effect of foreign aid on economic growth, economic development and foreign aid effectiveness on recipient countries around the world. Despite the efforts made, there is hardly a consensus in literature regarding the effect of foreign aid on recipient countries. This chapter provides theoretical literature and later reviews of past theories so as to recognize the value of what has been achieved. Empirical literature is taken to consider the effect of foreign aid on trade balance. Later a critical overview of the literature is provided while highlighting the strength and weakness and relevance to the study.

#### 2.2 Theoretical literature

After the Second World War, much of Western Europe was in ruin; the US government launched its first major foreign aid initiative which was a big foreign aid success story never equaled before (Sogge, 2002). Since then the foreign aid was justified as substitute of capital inflow, and many models were developed.

##### 2.2.1 Harrod-Domar model

In the Harrod-Domar model output depends upon the investment rate, and on the productivity of that investment. Investment is financed by savings, and in an open economy total savings equal the sum of domestic and foreign savings (Snowdon *et*

al, 2005). A major strength of the Harrod–Domar model is its simplicity. The model assumes an exogenous rate of labor force growth ( $n$ ), a given technology exhibiting fixed factor proportions (constant capital–labor ratio,  $K/L$ ) and a fixed capital–output ratio ( $K/Y$ ). Assuming a two-sector economy (households and firms), the model writes the simple national income equation as

$$Y_t = C_t + S_t \quad (2.1)$$

where  $Y_t$  = GDP,  $C_t$  = consumption and  $S_t$  = saving. Equilibrium in this simple

$$\text{economy requires: } I_t = S_t \quad (2.2)$$

Substituting (2.1) into (2.2) yields (2.3):

$$Y_t = C_t + I_t \quad (2.3)$$

Within the Harrod–Domar framework the growth of real GDP is assumed to be proportional to the share of investment spending ( $I$ ) in GDP and for an economy to grow, net additions to the capital stock are required. The evolution of the capital stock over time is given in equation (3.4):

$$K_{t+1} = (1-\delta) K_t + I_t \quad (2.4)$$

Where  $\delta$  is the rate of depreciation of the capital stock. The relationship between the size of the total capital stock ( $K$ ) and total GDP ( $Y$ ) is known as the capital–output ratio ( $K/Y = v$ ) and is assumed fixed. Given that we have defined  $v = K/Y$ , it also follows that  $v = \Delta K/\Delta Y$  (where  $\Delta K/\Delta Y$  is the incremental capital–output ratio, or ICOR). If the model assumes that total new investment is determined by total savings, then the essence of the Harrod–Domar model can be set out as follows. Assume that total saving is some proportion ( $s$ ) of GDP ( $Y$ ), as shown in equation (2.5):

$$S_t = sY_t \quad (2.5)$$

Since  $K = vY$  and  $I_t = S_t$ , it follows that rewrite equation (2.4) as equation (2.6):

$$vY_{t+1} = (1-\delta)vY_t + sY_t \quad (2.6)$$

Dividing through by  $v$ , simplifying, and subtracting  $Y_t$  from both sides of equation (2.6) yields equation (2.7):

$$Y_{t+1} - Y_t = [s/v-\delta]Y_t \quad (2.7)$$

Dividing through by  $Y_t$  gives us equation (2.8):

$$[Y_{t+1} - Y_t]/Y_t = (s/v)-\delta \quad (2.8)$$

Here  $[Y_{t+1} - Y_t]/Y_t$  is the growth rate of GDP. Letting  $G = [Y_{t+1} - Y_t]/Y_t$ , we can write the Harrod–Domar growth equation as (2.9):

$$G = s/v - \delta \quad (2.9)$$

This simply states that the growth rate ( $G$ ) of GDP is jointly determined by the savings ratio ( $s$ ) divided by the capital–output ratio ( $v$ ). The higher the savings ratio and the lower the capital–output ratio and depreciation rate, the faster will an economy grow. Ignoring the depreciation rate and consider the Harrod–Domar model as being represented by the equation (2.10):

$$G = s/v \quad (2.10)$$

Snowdon (2005) stated that many international organizations are still employ Harrod-Domar model to calculate the investment and aid requirements needed in order for specific countries to achieve their growth target. Being criticized of simplicity due to the fixed labor assumption, Solow model applauded by a number of researchers because it took into account of labor force (Romer,1996).

### 2.2.2 Solow Growth Model

The Solow model highlights the impact on growth of saving, population growth and technological progress in a closed economy. Three key relationships in the Solow model, namely, the production function, the consumption function and the capital accumulation process. The Solow growth model is built around the neoclassical aggregate production Function

$$Y = A_t F(K, L) \quad (2.11)$$

Where  $Y$  is real output,  $K$  is capital;  $L$  is the labor input and  $A_t$  is a measure of technology which is exogenous and taken simply to depend on time.

$$Y = F(K, L) \quad (2.12)$$

The equation (2.12) satisfies Inada condition, First, for all values of  $K > 0$  and  $L > 0$ ,  $F(\cdot)$  exhibits positive but diminishing marginal returns with respect to both capital and labor; that is,  $\partial F/\partial K > 0$ ,  $\partial^2 F/\partial K^2 < 0$ ,  $\partial F/\partial L > 0$ , and  $\partial^2 F/\partial L^2 < 0$ . Second, the production function exhibits constant returns to scale such that  $F(\lambda K, \lambda L) = \lambda Y$ ; that is, raising inputs by  $\lambda$  will also increase aggregate output by  $\lambda$ . Letting  $\lambda = 1/L$  yields  $Y/L = F(K/L)$ . This assumption allows (2.12) to be written down in intensive form as (2.13), where  $y =$  output per worker ( $Y/L$ ) and  $k =$  capital per worker ( $K/L$ ):

$$y = f(k), \text{ where } f'(k) > 0, \text{ and } f''(k) < 0 \text{ for all } k \quad (2.13)$$

Equation (2.13) states that output per worker is a positive function of the capital-labor ratio and exhibits diminishing returns. In a closed economy aggregate output = aggregate income and comprises two components, namely, consumption ( $C$ ) and

investment ( $I$ ) = Savings ( $S$ ). Therefore we can write equation (11.19) for income as:

$$Y = C + I \text{ or } Y = C + S \quad (2.14)$$

Here  $S = sY$  is a simple savings function where  $s$  is the fraction of income saved and  $1 > s > 0$ . We can rewrite (2.14) as (2.15):

$$Y = C + sY \quad (2.15)$$

Given the assumption of a closed economy, private domestic saving ( $sY$ ) must equal domestic investment ( $I$ ). A country's capital stock ( $K_t$ ) at a point in time consists of plant, machinery and infrastructure,  $\delta$  is depreciation and  $I_t$  is investment.

$$K_{t+1} = I_t + (1-\delta)K_t = sY_t + K_t - \delta K_t \quad (2.16)$$

Rewriting (11.21) in per worker terms yields equation (2.17):

$$K_{t+1}/L = sY_t/L + K_t/L - \delta K_t/L \quad (2.17)$$

Deducting  $K_t/L$  from both sides of (2.17) gives us (2.18):

$$K_{t+1}/L - K_t/L = sY_t/L - \delta K_t/L \quad (2.18)$$

In the neoclassical theory of growth the accumulation of capital evolves according to (2.19), which is the fundamental differential equation of the Solow model:

$$k' = sf(k) - \delta k \quad (2.19)$$

where  $k = K_{t+1}/L - K_t/L$  is the change of the capital input per worker, and  $sf(k) = sy = sY_t/L$  is saving (investment) per worker. The  $\delta k = \delta K_t/L$  term represents the 'investment requirements' per worker in order to keep the capital-labor ratio constant. The steady-state condition in the Solow model is given in equation (2.20):

$$sf(k^*) - \delta k^* = 0 \quad (2.20)$$

Thus, in the steady state  $sf(k^*) = \delta k^*$ ; that is, investment per worker is just sufficient to cover depreciation per worker, leaving capital per worker constant. We need to modify (2.19) to reflect the influence of population growth. The fundamental differential equation now becomes:

$$k' = sf(k) - (n + \delta)k \quad (2.21)$$

The expression  $(n + \delta)k$  as the 'required' or 'break-even' investment necessary to keep the capital stock per unit of labor ( $k$ ) constant. From Solow model (2.21) when savings are insufficient, foreign capital inflow (Foreign Aid) is required (necessary) to prevent capital ( $k$ ) from falling, to offset depreciation  $(\delta)k$  of existing capital and to cope up with the growth of quantity of labor  $(n)k$ . Hence the capital stock must grow at rate  $(n + \delta)$  just to hold  $k$  steady. Meier (1968) using absorption approach argued that if gross domestic product is less than absorption, the difference is financed by capital inflow which is measured by the difference between the recipient country's absorption capacity and its saving capacity.

In Rwanda, a densely populated country, with high demographic growth rate, few resources and low rate of savings, foreign aid is crucial for its economic growth and development. Kabete (2008), Hjertholm et al (1998), Quibria (2005) stated three basic approaches to estimate the foreign resources requirements of a developing country; firstly the savings-Investment gap approach secondly the export-Import (Foreign Exchange) gap approach and thirdly Capital absorption approach.

### 2.2.3 Saving-investment gap approach

Saving-Investment gap approach states that foreign resource requirement of a country to sustain a target rate of growth should be measured by the difference between domestic savings and the rate of investment necessitated by the growth goal of the society. It assumes a linearly relationship between savings and income with the marginal saving ( $s$ ) being higher than the average saving rate ( $s'$ ), a constant capital-output ratio ( $k$ ) in production, this formulation ignores the role of labor and other factors of production and there is a pre-specified target of growth ( $r$ ) for the economy. Thus the given target rate of growth ( $r$ ) and the foreign resources requirement of the country at the base year can be stated as:

$$F_{(0)} = I_{(0)} - S_{(0)} = Y_{(0)} \times k \times r - Y_{(0)} \times S = Y_{(0)}(k \times r - s) \quad (2.22)$$

Where  $I_{(0)}$ ,  $S_{(0)}$  and  $Y_{(0)}$  are Investment, Saving and GNP at the base year. Now saving at the year  $t$  is given by  $S_{(t)} = sY_{(t)} + s'(Y_{(t)} - Y_{(0)})$  similarly to Investment in year  $t$  is given by:  $I_{(t)} = Y_{(t)} \times k \times r$

Thus the net inflow of foreign resources required at time  $t$  is given by;

$$\begin{aligned} F_{(t)} &= Y_{(t)} \times k \times r - (s - s')Y_{(0)} + s'Y_{(t)} \\ &= (kr - s')Y_{(t)} + (s' - s)Y_{(0)} \end{aligned} \quad (2.23)$$

Further from the above equation (2.4) and (2.5) one can obtain

$$F_{(t)} - F_{(0)} = (kr - s')(Y_{(t)} - Y_{(0)}) \quad (2.24)$$

It can easily be seen from above that foreign resource requirements will be declined with time if the following condition holds  $kr < s'$ , implying that the marginal saving rate be greater than product of the capital-output ratio and the

target rate of growth. Again, manipulating the above relationship, the study derives the rate of growth that will be sustained with a given flow of aid.

$$r(t) = (F(t)/Y(t) + (s-s') \times Y_{(0)}/Y(t) + s')(1/k) \quad (2.25)$$

Now taking the derivative of  $r(t)$  with respect to  $F(t)$  one can easily see that  $\partial r(t)/\partial F(t) > 0$ , implying that with a larger inflow of the foreign aid the rate of growth increases, given of course that  $k$  is constant. From relationship (2.25), the study can derive further insight with respect to the date of termination of foreign aid and necessary analytical conditions. In order for  $F(t)$  to become zero, the following must hold;

$$(kr-s')Y(t) - (s-s')Y_{(0)} = 0 \quad (2.26)$$

$$\text{Implying } Y(t) = (s-s')Y_{(0)}/(kr-s') \quad (2.27)$$

But  $Y(t) = Y_{(0)} \times (1+r)^t$  substituting this in above relation, one can deduce

$$(1+r)^t = (s-s')/(kr-s') \quad (2.28)$$

$$\text{Which yields } t = \ln(s-kr)/\ln(1+r) \quad (2.29)$$

Thus from relationship (2.29) one can derive the termination date of foreign resource requirements. One can see that  $t$  depends negatively on  $s$  and positively on  $r$ . This means that the increase of foreign aid will increase the economic growth while reduction in savings requires the incremental of foreign aid. Since the majority of Rwandans depend on subsistence economic activities, they have a little to save and hence the foreign aid inflow is required.

### 2.2.4 Export-import (foreign exchange) gap approach

This approach focuses on foreign exchange earnings as the principal constraint on domestic investment and growth. It states that foreign aid should fill in the gap between the required import expenditures and the actual export earnings (trade gap). This approach assumes that imports are linearly dependent on income, exports are linearly dependent on income and there is a target rate of growth of income given by  $r$ . Given the above assumptions, the foreign exchange gap in the base year is given by

$$F_{(0)} = M_{(0)} - X_{(0)} = Y_{(0)} \times m - Y_{(0)} \times e \quad (2.30)$$

Where  $m$  and  $e$  denote the average rate of import and the average rate of export respectively import in  $t$ -th year is given by;

$$M_{(t)} = m \times Y_{(0)} + m' (Y_{(t)} - Y_{(0)}) \quad (2.31)$$

Where  $m'$  is the marginal rate of import similarly export in  $t$ -th year is given by;

$$E_{(t)} = e \times Y_{(0)} + e' (Y_{(t)} - Y_{(0)}) \quad (2.32)$$

Where  $e'$  is the marginal rate of export, the foreign exchange requirements in year  $t$  can be defined as follows:

$$F_{(t)} = m \times Y_{(0)} + (Y_{(t)} - Y_{(0)}) \times m' - e \times Y_{(0)} - e' (Y_{(t)} - Y_{(0)}) \quad (2.33)$$

$$= (m - e) \times Y_{(0)} + (m' - e') (Y_{(t)} - Y_{(0)})$$

$$= F_{(0)} + (m' - e') (Y_{(t)} - Y_{(0)}) \quad (2.34)$$

One can easily see that  $F_{(t)} < F_{(0)}$  if and only if  $m' < e'$  that is the marginal import is less than the marginal export. Rwanda's imports are inelastic and  $m' > e'$ , this is the root that bring about trade gap that necessitate foreign aid inflow.

### 2.2.5 Capital-Absorption approach

From national income accounting identity

$$Y = C + I + G + (X-M) \quad (2.35)$$

$$\text{Domestic absorption: } A = C + I + G \quad (2.36)$$

Where A is absorption, defining the current account balance "B" as:

$$B = X - M \quad (2.37)$$

$$\text{Given (2.35) as } Y = A + B \quad (2.38)$$

$$\text{And upon rearranging; } B = Y - A = -I_f \quad (2.39)$$

Equation (2.39) shows that a current account surplus arises if gross domestic product is greater than absorption and that the difference shows up as capital outflow ( $-I_f$ ), alternatively a payment deficit is due to the domestic absorption being greater than gross domestic product. The difference is financed by capital inflow ( $I_f$ ). Since the absorption is always greater than gross domestic product for Rwanda, the difference is covered by foreign aid inflow.

### 2.3 Empirical literature

In different periods, many studies were done but still there is a hardly consensus in findings.

Arvin *et al* (2000), performed causality analysis of untied foreign assistance and export performance where causality and cointegration tests were done. The study found that a very immediate and clear relationship between aid and trade is formal tying, where the delivery of assistance is contingent upon the beneficiary buying products from the donor. As this is usually done by obtaining aid in the form of

products procured by the donor, aid is itself trade. As is clear, the causal relationship between aid flows and trade flows is bi-directional. The current study borrows causality and cointegration techniques to determine the relationship exists between foreign aid and trade balance in Rwanda. Since many years have gone since this study is done, the current study used new data of recent years.

Lloyd *et al* (2001), carried a study on problems with pooling in panel data analysis for developing countries where aid and trade relationships were investigated by the means of causality test. The result from the study found that the direction of the causality depends on the pair of (donor, recipient) countries. On a sample of Official Development Assistance commitments between four EU donors and 26 African recipients over the period 1969–95, they found that trade determines aid for only 15 pairs out of 87 (that is 17 per cent), aid determines trade for 13 per cent of the sample, and the causality runs both ways for 7 per cent. The study used panel data where the specific country's heterogeneity is hard addressed. The causality test was borrowed and used to the current study and it addressed on Rwanda

Ouattara *et al* (2004) conducted an empirical analysis of the relationship between foreign aid inflows and the real exchange rate in 12 countries of the CFA Franc zone. Using dynamic panel analysis they found that foreign aid inflows do not generate Dutch disease effects in these countries. Since the panel data analysis was used, the study was inconclusive to a specific country. This study used time series

to specific country of Rwanda to determine the effect of foreign aid on exchange rate.

Keshab *et al* (2005), examined the effects of exchange rate on the trade balance of Ghana. The study first derived the real exchange rate as a function of preferences and technology of two trading economies and then applied using annual time series data from 1970-2000 to estimate trade balance as a function of the real exchange rate, domestic and foreign incomes. The study applied Cointegration analysis of both single equation models and VAR-Error correction models confirmed a stable long-run relationship between both exports and imports and the real exchange rate. The short-run elasticity of imports and exports indicated contractionary effects of devaluation in terms of the Marshall-Lerner-Robinson conditions though these elasticity add up to almost 1 in the long-run estimates. Furthermore the study showed that it is the exchange rate that is the significant factor in the short term. In the long run however, the study revealed that only the real exchange rate significantly affects the trade balance.

Ouattara *et al* (2005), used time series data from Syria for the period 1965 to 1997 to test the hypothesis that foreign aid flows generate "Dutch disease" in the recipient country, using the newly developed technique to cointegration, the Auto Regressive Distributed Lag (ARDL). The study found no support for this hypothesis neither in the long run nor in the short run. On the contrary, the results indicate that foreign aid flows are associated with depreciation of the real exchange rate. Aid inflows lead to real depreciation rather than appreciation, both in the short and long run. Consequently, the hypothesis that aid inflows lead to

“Dutch disease” is rejected in the context of Syria. The result from this study is positive resemblance with exchange rate and foreign aid trends in Rwanda.

Cerra *et al* (2008), A dynamic dependent-economy model is developed to investigate the role of the real exchange rate in determining the effects of foreign aid. If capital is perfectly mobile between sectors, untied aid has no long run impact on the real exchange rate. A decline in the traded sector occurs because aid, being denominated in traded output, substitutes for exports in financing imports. While untied aid causes short-run real exchange appreciation, this response is very temporary and negligibly small.

Uneze (2011) examined the relationship between foreign aid and the real exchange rate, using multivariate econometric approach and recent econometric methods developed for non-stationary dynamic panels, and an estimator that imposes a weaker homogeneity assumption on the slope coefficients. The investigation showed that foreign aid led to an appreciation of the real exchange over the period 1975-2005. The study found also that other variables, such as labor productivity, terms of trade improvement, and government consumption of non-tradable goods are also associated with an appreciation of the real exchange rate. The situation is different for Rwanda since the foreign aid keeps increasing the exchange rate keeps depreciating over time.

Nowak-Lehmann *et al* (2012) based on gravity model of trade to investigate the link between foreign aid and exports in recipient countries. The model was

estimated by means of panel dynamic feasible generalized least squares (DFGLS) and dynamic ordinary least square (DOLS). This estimation method indicated quite a high, positive impact of bilateral aid on recipient exports. The study found that there is a long term association between aid and trade, and found that recipient countries' exports are inter-linked (bi-directional) meaning that either more aid is provided to countries with a poor export performance because donors want to foster development in beneficiary countries or that more aid is provided to successful exporters because donors wish to reward beneficiary countries' export efforts of the past. The study took account three different types of aid: first, bilateral aid of a single donor-recipient pair, second, bilateral aid of the rest of the donors to a single recipient, and third, multilateral aid to a single recipient. The study findings jointly suggested that aid tends to be unsuccessful as immediate promoter of exports. Seeming foreign aid tends to increase import consumption, exchange rate and its effect on exports seems to be insignificant. The causality test was borrowed to determine the causality between foreign aid and trade balance in Rwanda but only the Official Development Assistance type of aid was used.

#### **2.4 Overview of literature**

The past studies were conducted on number of countries; the cross-country studies are inconclusive to a specific country. Due to the specific heterogeneity between countries, the results may differ for each country when case by case study is taken into account. These studies used panel data for analysis, in panel data most of data are unbalanced and the estimation methods are designed for short time. The studies confirmed that foreign aid increases exports in the recipient countries. This means

that if exports have increased the trade balance should be improved. The past studies revealed that the causality analysis between foreign aid and trade run both ways which means a bi-directional causality from trade to foreign aid and from foreign aid to trade. The past studies also showed that foreign aid led to real exchange rate appreciation in the recipient countries. The studies proved that there is a long run relationship between exchange rate and trade balance.

The past studies provided a basic literature of this study to better understand the effect of foreign aid on trade balance in Rwanda as well as clarifying the effect of foreign aid. This study was therefore built on existing literature by bridging the gaps mentioned in this study. Focusing on Rwanda, the use of recent data spanning from 1982 to 2012 to apprehend the current change and inclusion of mediating variable to capture its role as well as avoid bias that may result from omission of variables and generate invalid result.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Introduction**

This chapter discusses how the methodology employed in the study. It starts with the research design, theoretical model and empirical model for the trade balance while highlighting the justification of model used. The chapter discusses the data type and also describes variables and the type of econometric analysis to be carried out.

#### **3.2 Research design**

This study adopted non experimental research design, specifically time series data which applies the quantitative approach where the required data on variables under the study was used. Since the control on variables was impossible, the non experimental research design was appropriate. Time series are secondary data which provided numerical data. The quantitative approach was employed to data spanning from 1982 to 2012. The research examined strong evidence from the data that was relevant to the research problem.

#### **3.3 Theoretical Model**

Many theories of trade have been developed and among the famous ones is the gravity model of international trade which is massively used in international trade.

It states that there is a strong empirical relationship between the size of a country's economy and the volume of both its imports and its exports. Looking at the world

trade as a whole, Tinbergen (1962) has found that an equation of the following form predicts the volume of trade between any two countries fairly accurately,

$$T_{ij} = A \cdot \frac{Y_i Y_j}{D_{ij}} \quad (3.1)$$

Where  $A$  is a constant term,  $T_{ij}$  is the value of trade between country  $i$  and country  $j$ ,  $Y_j$  is country  $i$ 's GDP,  $Y_i$  is country  $j$ 's GDP, and  $D_{ij}$  is the distance between the two countries. That is, the value of trade between any two countries is proportional. An equation (3.1) is known as a gravity model of world trade. The reason for the name is the analogy to Newton's law of gravity: Just as the gravitational attraction between any two objects is proportional to the product of their masses and diminishes with distance, trade between any two countries is, other things equal, proportional to the product of their GDPs and diminishes with distance.

### 3.4 Empirical Model

The real modern world trade is more complex and it cannot be entirely justified and illuminated by the gravity model. The equation (3.1) does not capture all factors that influence trade between countries. Particular geographical location, economic group or system and other more country features can result in affecting trade. The equation (3.1) is transformed to capture the country's trade balance. It is assumed that trade balance depends on foreign aid and exchange rate. A good model is presumed to connect a dependent (explained) variable (TB) to one or a set of independent (explanatory) variables FA, and ER, and their respective parameters  $\alpha$ ,  $\beta$ ,  $\delta$ , and an unobservable error term  $\mu$  through function  $f$ .

$$TB = f(FA, ER) \quad (3.2)$$

Such that the equation is written as;

$$TB = \delta ER_t + \beta FA_t + \mu_t \quad (3.3)$$

In time series, the TB may depend on its previous lag, then the model becomes

$$TB = \sum_{i=1}^t \alpha TB(t-i) + \sum_{i=1}^t \beta FA(t-i) + \sum_{i=1}^t \delta ER(t-i) + \mu(t) \quad (3.4)$$

The equation (3.4) is a Vector Autoregressive (VAR) model which gives better forecasts than those obtained from other methods while it assesses the relative contribution of different shocks to fluctuations in variables and it shows the proportion of the movements in the endogenous variable sequence as a result of its own shocks against shocks to other variables.

### 3.5 Definition and measurement of variables.

**Table 3.1: Variables, definitions, measurement and data source of variable**

No	Variable	Definition	Measurement	Data source
1	Trade balance (TB)	The difference between country's exports and imports.	Trade Balance will be used in absolute term.	National Institute of Statistics of Rwanda and National Bank of Rwanda
2	Foreign Aid (FA)	Amount of money, that country received from all donors outside (in form Official Development Assistance (ODA) flows)	Foreign aid will be used in US dollar.	National Bank of Rwanda and National Institute of Statistics of Rwanda.
3	Exchange rate (ER)	This is the value country's currency against the foreign currencies	The average annual exchange rate will be used Rwf against US dollar	National Bank of Rwanda and National Institute of Statistics of Rwanda

### **3.6 Type of data and source.**

The study used secondary data; Annual time series spanning from 1982 to 2012 which was collected from National Institute of Statistics of Rwanda, National Bank of Rwanda and World economic Outlook Database. Trade balance and foreign aid were used in absolute value while exchange rate was used as average annual exchange rate.

### **3.7 Data Analysis**

The data underwent through descriptive and econometric analysis by the use of E-views. Before conducting econometric test, the section starts with descriptive analysis where the mean, median, standard deviation, skewness and kurtosis were estimated and it is important to conduct basic correlation analysis of variables.

The study pursued a number of empirical tests based on time series econometric techniques. This section presented a set of econometric modeling approaches and tests. The study checked if variables are stationary and test for causality where Engel Granger causality test was employed to explain the direction of causality between the variables. The test for co-integration in which Johansen Multivariate cointegration test was applied necessary step to check if one modeling empirically is meaningful with long run relationship, trace and maximum eigenvalue were taken into account. The study also tested the short-run relationship between variables using a Vector Error Correction Model (VECM).

Since the variables share the right hand side (RHS), the equation become a system of equations and each variable has its own equation. The first objective and second of this study were determined by the following equation

$$TB = \sum_{i=1}^t \alpha TB(t) - i + \sum_{i=1}^t \beta FA(t) + \sum_{i=1}^t \delta ER(t) + \mu(t) \quad (3.5)$$

According to the two gap model, increase in trade balance deficit induce the increase in foreign aid in order to cover the gap, and the increase in trade balance surplus will induce the decrease in foreign aid as the country will have enough capital inflow.

$$ER = \sum_{i=1}^t \delta ER(t) - i + \sum_{i=1}^t \beta FA(t) + \sum_{i=1}^t \alpha TB(t) + \mu(t) \quad (3.6)$$

Foreign exchange rate as mediating variable between trade balance and foreign aid, its increase will positively affect trade balance and foreign aid. Since all variables are considered to be endogenous and share the right hand side of the equation, then trade balance may have an effect on foreign aid.

$$FA = \sum_{i=1}^t \beta FA(t) - i + \sum_{i=1}^t \alpha TB(t) + \sum_{i=1}^t \delta ER(t) + \mu(t) \quad (3.7)$$

The Akaike information criterion (AIC) was used to determine the optimal lag length. The data was non stationary at level and were differenced to make them stationary. Cointegration test relies on the relationship between the rank of a matrix and its eigenvalues  $r$  (cointegrating vectors), The Johansen test was center of an examination of the matrix  $\Phi$  which is a long-run coefficient matrix.

$$\Delta X_t = (\lambda - I)X_{t-1} + \mu_t \quad (3.8)$$

$$\Delta X = \phi X_{t-1} + \mu_t \quad (3.9)$$

Where  $\lambda = g \times g$  matrix,  $I = g \times 1$  matrix and  $X$  stands for all variables TB, ER and FA.

The equation becomes where  $\phi = (\lambda - I)$ . The study will also perform causality test by the use of Engle Granger, Granger causality between FA and ER

$$FA = \beta_0 + \sum_{i=1}^t \beta FA_{t-1} + \sum_{i=1}^t \delta ER_t + \mu_{t1} \quad (3.10)$$

$$ER = \delta_0 + \sum_{i=1}^t \delta ER_{t-1} + \sum_{i=1}^t \beta FA_t + \mu_{t2} \quad (3.11)$$

Granger causality between FA and TB

$$FA = \beta_0 + \sum_{i=1}^t \beta FA_{t-1} + \sum_{i=1}^t \alpha TB_t + \mu_{t1} \quad (3.12)$$

$$TB = \alpha_0 + \sum_{i=1}^t \alpha TB_{t-1} + \sum_{i=1}^t \beta FA_t + \mu_{t2} \quad (3.13)$$

Granger causality between ER and TB

$$ER = \delta_0 + \sum_{i=1}^t \delta ER_{t-1} + \sum_{i=1}^t \alpha TB_t + \mu_{t1} \quad (3.14)$$

$$TB = \alpha_0 + \sum_{i=1}^t \alpha TB_{t-1} + \sum_{i=1}^t \delta ER_t + \mu_{t2} \quad (3.15)$$

## CHAPTER FOUR

### EMPIRICAL FINDINGS

#### 4.1 Introduction

This chapter presents the data analysis where descriptive analysis was performed to reveal cumulative, central tendency and dispersion from the mean of the variables. The econometric analysis was also presented; test for unit root to avoid the spurious results. Test for normality and test for cointegration to find out the long run relationship of variables. The vector error correction model was done to measure the speed of adjustment from short run to the long run equilibrium. Then test for causality was done by the use of Granger causality test.

#### 4.2 Descriptive Analysis

Before commencing the econometric analysis, the study starts by performing the descriptive analysis where mean, median as measure of central tendency were estimate. The standard deviation, skewness and kurtosis were measured representing the dispersion from the mean.

**Table 4.1 descriptive analysis**

variable	Obs	Mean	Median	Std Dev	Skewness	Kurtosis	Jacque-Bera
<b>FA</b>	31	467.3342	353.9100	294.3722	1.057526	3.187248	5.823487
<b>ER</b>	31	322.4742	304.6700	207.3948	0.087131	1.336029	3.615589
<b>TB</b>	31	-187.0927	-62.0650	301.0602	-1.88505	5.132866	24.23525

Table 4.1 shows that 31 observations were taken into account with three variables FA, ER and TB. The mean of variable is greater than standard deviation for foreign aid and exchange rate except on trade balance.

### 4.3 Test for unit root.

Augmented Dickey Fuller (ADF) of unit root test was used because it is the easiest and most commonly used in many econometrics time series data to test for stationary and it encounters the problem of autocorrelation used to be found in Dickey Fuller (DF) test. Even though the use of ADF has problem with structural breaks, the data used are free from structural breaks. For trade balance, the Null Hypothesis states that Trade balance has a unit root. If in absolute value Test Statistics is greater than Critical Value in absolute term, then the study can reject null hypothesis and accept the Alternative which states that Trade balance has no unit root. If the critical value is greater than Test statistics the opposite decision rule will be applied. The following equations (4.1), (4.2) and (4.3) are differenced form of variables when are not stationary at level.

$$\Delta TB_t = \varphi TB_{t-1} + \varphi t + \mu_t \quad (4.1)$$

$$\Delta ER_t = \delta_0 + ER_{t-1} + \mu_t \quad (4.2)$$

$$\Delta FA_t = FA_{t-1} + \mu_t \quad (4.3)$$

Where  $\varphi t$  stands for a trend of trade balance series,  $\delta_0$  stands for a constant in Exchange rate series and Foreign aid has neither trend nor constant.

**Table 4.2 Results of Augmented Dickey-Fuller Unit Root Test**

Variable	ADF unit root test at level			ADF unit root test after first difference		
	ADF		Critical Value	ADF		Critical Value
	t-statistic	Prob		t-statistic	Prob	
TB	-4.820940	0.0033	-4.33933*** -3.587527** -3.229230*	-4.820940	0.0033	-4.33930*** -3.587527** -3.229230 *
Trend	-3.116320	0.0052		-3.116320	0.0052	
ER	-2.252554	0.4453	-4.29672*** -3.568379**	-5.526602	0.0001	-3.67932*** -2.967767**
C			-3.218382	2.589797	0.0153	-2.622989*
FA	-2.255993	0.4436	-4.29672*** -3.568379** -3.218382*	-4.528308	0.0001	-2.64712*** -1.952910** -1.610011*

Note: ADF is the augmented Dickey Fuller test. The null hypothesis is that the series have unit root (non-stationary). The asterisks (\*\*\*) Significant at 99% confidence level, (\*\*) Significant at 95% confidence level and (\*) Significant at 90% confidence level.

The table 4.2 at level, the Trade balance is stationary without a constant but with a linear trend since the Test Statistics in absolute value is greater than the Critical Value at 5 percent and the P value is less than 5 percent. T-Stat = [-4.820940] > Critical value = [-3.587527] and P value = 0.33 % < 5% at 5 percent of significance. Critical value of a linear Trend = [-3.116320] < T-Stat = [-4.820940] and its P value 0.5 % < 5% at 5 percent.

The ADF test of unit root of Exchange rate, the same decision rule is also applied which express that Null Hypothesis, Exchange rate has a unit root while Alternative hypothesis says that Exchange rate has no unit root.

Table 4.2 at level, the study fails to reject null hypothesis due to fact that in absolute value T-stat = [-2.252554] < Critical Value = [-3.568379] and the P value = 44% > 5% at 5 percent of significance. This means that Exchange Rate series

has unit root and requires to be differenced to make them stationary. At the first difference, the Exchange Rate is stationary with a constant, the Test Statistics in absolute value is greater than the Critical Value at 5 percent and the P value is less than 5 percent. T-Stat= [-5.526602] > Critical value = [-2.967767] and P value=0.01 % < 5% at 5 percent of significance.

The ADF unit root test is also applied to the third variable of the model which is the Foreign aid to see if variable is stationary or not and if it is not stationary the differencing method will be employed to make it stationary. Table 4.2 at level, the study fails to reject null hypothesis because in absolute value T-stat = [-2.255993] < Critical Value = [-3.568379] and the P value = 44% > 5% at 5 percent of significance. This means that Foreign aid series has a unit root and requires to be differenced to make them stationary. At the first difference is stationary with a constant, the Test Statistics in absolute value is greater than the Critical Value at 5 percent and the P value is less than 5 percent. T-Stat = [-4.528308] > Critical value = [-1.952910] and P value = 0.01 % < 5% at 5 percent of significance.

The three variables to be used in this study have been checked for the unit root, where Trade balance appeared to be stationary at level with the linear trend, Exchange rate has not been stationary at level but becomes stationary after first difference with a constant and Foreign aid has been not stationary at level but becomes stationary after differencing them once. The above transformed data will be used along with the analysis of this study since they guarantee none spurious

result because all variables data are integrated of order one  $I(1)$ , therefore the variables are now stationary and use for estimation.

#### 4.4 Test for Cointegration

As it is known, most macroeconomic variables are non stationary. In this study the variables used were differenced once to make them stationary. The data were used with intercept and deterministic trend in VAR model environment and lag length selection based on AIC with max lag of four to test for cointegration as shown in following table.

**Table 4.3 VAR Lag Order selection criteria**

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	-534.9409	NA	4.06e+13	39.84747	39.99145	39.89029
1	-453.7160	138.3831	1.94e+11	34.49748	35.07341*	34.66874
2	-446.9550	10.01633	2.36e+11	34.66333	35.67121	34.96303
3	-439.5522	9.321990	2.86e+11	34.78165	36.22147	35.20978
4	-411.7411	28.84116*	8.24e+10*	33.38823*	35.25999	33.94480*

Note: \* indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level, FPE: Final prediction error, AIC: Akaike information criterion, SIC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Since much of lag order selection criteria, among of them LR, FPE, AIC and HQ advise lag of four, the study used four lag. Before cointegration test, the test for

normality were made without destroying white noise assumptions, test for autocorrelation and multicollinearity were also done.

$$\Delta X_t = (\lambda - I)X_{t-1} + \mu_t \quad (4.4)$$

Where  $\lambda = g \times g$  matrix,  $I = g \times 1$  matrix and  $X$  stands for TB, ER and FA. The

$$\text{equation becomes } \Delta X = \phi X_{t-1} + \mu_t \quad (4.5)$$

Where  $\phi = (\lambda - I)$ . The cointegration test determines rank ( $r$ ) of matrix ( $\phi$ ) and results are represented in the following table:

**Table 4.4: Test for Cointegration.**

	Hypothesis		Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
	Null	Alt				
Rank Test (Trace)	H0:r =0 vs H1:r ≥1		0.570447	46.90752	35.01090*	0.0018
	H0:r ≤1 vs H1:r ≥2		0.443971	24.93723	18.39771*	0.0053
	H0:r ≤2 vs H1:r =3		0.310776	9.676928	3.841466*	0.0019
Rank Test (Maximum Eigenvalue)				<b>Max-Eigen Statistic</b>		
	H0:r =0 vs H1:r =1		0.570447	21.97029	24.25202	0.0973
	H0:r =1 vs H1:r =2		0.443971	15.26030	17.14769	0.0922
	H0:r =2 vs H1:r =3		0.310776	9.676928	3.841466*	0.0019

Note: Trace test indicates 3 cointegrating equations at the 0.05 level. \* denotes rejection of the null hypothesis at the 5% level of significance.

The test for cointegration in table 4.5 shows that there is a long run relationship between the variables with lag interval of 4. Since the Trace Stat > Critical Value, the Null hypothesis  $H_0 = r = 0$  and Alternative  $H_1 = r \geq 1$  was rejected because Trace Stat.[46.90752] > [35.01090] and P-value= 0.18% < 5%. The second Null hypothesis  $H_0 = r \leq 1$  and Alternative  $H_1 = r \geq 2$  was rejected because Trace Stat [24.93723] > [18.39771] at 5 percent and the P-value=0.53% < 5%. The third Null

hypothesis  $H_0 = r \leq 2$  and Alternative  $H_1 = r = 3$  was rejected in favor of alternative because Trace Stat [9.676928] > [3.841466] at 5 percent and the P-value=0.19% < 5%. The trace statistics denotes that there are three cointegrating vectors, which means that all used variable have a long run relationship.

Under the maximum eigenvalue the first and second sequences failed to reject Null hypothesis  $H_0 = r = 0$  against  $H_1 = r = 1$  and  $H_0 = r = 1$  against  $H_1 = 2$  but the third one rejects the Null hypothesis and accept the Alternative which states that  $H_0 = r = 2$  while  $H_1 = 3$  whose Max Eigenvalue is greater than Critical Value, Max Eigenvalue [9.676928] > [3.841466] at 5 percent and its P-value 0.19% < 5%. Both Trace and Maximum Eigenvalue confirm that all variables have long run economic relationship.

**Table 4.5 OLS regression of Trade Balance.**

**Dependent variable TB**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER	0.116003	0.232924	0.498029	0.6222
FA	-0.614280	0.161668	-3.799630	0.0007
R-squared	0.609244	Durbin-Watson stat		0.208825
Adjusted R-squared	0.595770	Log likelihood		-205.8405

Table 4.5 shows the results from regression where signs and coefficients denote that Exchange rate has positive effect on trade balance and one unit of franc

increase in exchange rate generates 0.1 million Rwf change in trade balance holding other factors constant. Foreign aid has negative effect on trade balance and one unit of US dollar increase in foreign aid generates a reduction of 0.6 million Rwf in trade balance holding other factors constant. The  $R^2$  of 0.609244 shows that the exchange rate and foreign aid explain 60% change in trade balance. The results from the table 4.5 explain the reason why the more foreign aid inflow the more trade balance deteriorates.

#### 4.5 Vector Error Correction Model (VECM)

Since there is a long run economic equilibrium among variables, it follows that there must exist a short run equilibrium. The Vector Error Correction Model (VECM) is used to investigate the presence of equilibrium or disequilibrium between the short run dynamics of variables and long run equilibrium. The following equation is used:

$$\Delta X_t = \varphi_0 + \Sigma \phi \Delta X_{t-1} - \omega \varepsilon_{t-1} + V_t \quad (4.6)$$

Where  $\Delta$  denotes first difference,  $X$  stands for all variables  $\varphi$  stands for a constant,  $\varepsilon_t$  is error correction term and  $\omega$  is coefficient of Error Correction Term (ECT) which theoretically must be negative.  $\varepsilon_{t-1}$  is residuals from cointegration vector. The ECT captures the adjustment towards the long run equilibrium and its coefficient ( $\omega$ ) measures the speed of adjustment toward that long run equilibrium.

**Table 4.6: Test of Vector Error Correction Model**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\epsilon_t$	<b>-1.437278</b>	0.292950	-4.906223	0.0004
DTB(-1)	1.415342	0.244118	5.797771	0.0001
DTB(-2)	0.711963	0.341534	2.084605	0.0591
DTB(-3)	2.409275	0.301342	7.995153	0.0000
DTB(-4)	0.178667	0.579642	0.308237	0.7632
DER(-1)	0.616287	0.335737	1.835626	0.0913
DER(-2)	1.281156	0.384595	3.331178	0.0060
DER(-3)	1.502996	0.436254	3.445229	0.0048
DER(-4)	1.101210	0.395202	2.786451	0.0165
DFA(-1)	0.175017	0.142173	1.231013	0.2419
DFA(-2)	0.429665	0.123736	3.472444	0.0046
DFA(-3)	-0.102895	0.121014	-0.850275	0.4118
DFA(-4)	0.023262	0.121890	0.190846	0.8518
Constant	17.51282	17.06107	1.026479	0.3249
R-squared	0.916349	Mean dependent var		-33.63623
Adjusted R-squared	0.825728	S.E. of regression		41.93083
F-statistic	10.11182	Durbin-Watson stat		1.882103

The guideline in VECM is that the coefficient ( $\omega$ ) of ECT ( $\epsilon_{t-1}$ ) must be negative and significant, which means that there is a causality running between from short run to the long run between FA, ER and TB. The result of estimate in table 4.6 shows that coefficient of ECT  $\omega = -1.437278$  with its P-value = 0.04%. This confirms that is negative and significant which signifies that it adjust at 143% from disequilibrium towards long run equilibrium, this means also that the speed of adjustment is so faster. DTB(-1) to DTB(-4) are lagged TB, DER(-1) to DER(-4)

are lagged ER, DFA(-1) to DFA(-4) are lagged FA and a constant and their coefficient are short run coefficients. Under the use of Wald Test the Null Hypothesis was  $DTB(1\sim4) = 0$  against Alternative  $DTB(1\sim4) \neq 0$ . The secondly for ER the Null Hypothesis was  $DER(1\sim4) = 0$  against Alternative  $DER(1\sim4) \neq 0$  and thirdly for FA the Null Hypothesis was  $DFA(1\sim4) = 0$  against Alternative  $DFA(1\sim4) \neq 0$ . The results of Wald Test reject Null hypothesis and accept the Alternative Hypothesis meaning that both TB lags jointly can influence the TB as the same ER lags can jointly influence TB and FA lags can jointly influence TB but constant is found equal to zero which means that the constant cannot influence TB.

#### **4.6 Test for causality**

The study performs a causality test using granger causality test in VAR model environment to see the direction of causality between the Trade Balance, Exchange Rate and Foreign Aid. The data was to be used in differenced form since the test for stationarity showed that the data of Exchange rate and Foreign aid are not stationary at level and were differenced once to make them stationary, whereas Trade balance data were stationary at level. Therefore, the data must be transformed in compatible form where all data will be first differenced so that they can be used for causality test.

The system of equations which enables to determine the direction of causality between Trade balance, Exchange rate and Foreign aid in VAR model

environment, where every variable depends on its own lags and lags of other variables in equation and it appears to be

### Granger causality between FA and ER

$$FA = \beta_0 + \sum_{i=1}^t \beta FA_{t-1} + \sum_{i=1}^t \delta ER_t + \mu_{t1} \quad (4.7)$$

$$ER = \delta_0 + \sum_{i=1}^t \delta ER_{t-1} + \sum_{i=1}^t \beta FA_t + \mu_{t2} \quad (4.8)$$

### Granger causality between FA and TB

$$FA = \beta_0 + \sum_{i=1}^t \beta FA_{t-1} + \sum_{i=1}^t \alpha TB_t + \mu_{t1} \quad (4.9)$$

$$TB = \alpha_0 + \sum_{i=1}^t \alpha TB_{t-1} + \sum_{i=1}^t \beta FA_t + \mu_{t2} \quad (4.10)$$

### Granger causality between ER and TB

$$ER = \delta_0 + \sum_{i=1}^t \delta ER_{t-1} + \sum_{i=1}^t \alpha TB_t + \mu_{t1} \quad (4.11)$$

$$TB = \alpha_0 + \sum_{i=1}^t \alpha TB_{t-1} + \sum_{i=1}^t \delta ER_t + \mu_{t2} \quad (4.12)$$

**Table 4.7 Granger causality Test**

Null Hypothesis:	Obs	F-Statistic	Prob.
DFA does not Granger Cause DER	26	2.42618	0.0880
DER does not Granger Cause DFA		1.39298	0.2784
DTB does not Granger Cause DER	26	0.37521	0.8231
DER does not Granger Cause DTB		0.45772	0.7656

DTB does not Granger Cause DFA	26	5.99738	0.0034*
DFA does not Granger Cause DTB		3.46857	0.0302*

Note: \* indicates P-value significance at 5 percent. Obs = observations.

For variables DFA and DER, the study fails to reject null hypothesis ( $H_0 = \delta$  and  $\beta = 0$ ) which states that FA (lag1 to 4) jointly do not granger cause ER and at the same time ER (lag 1 to 4) jointly do not granger cause FA this indicates that the coefficients  $\delta$  and  $\beta$  equal to zero.

For variables DTB and DER, the study fails to reject null hypothesis ( $H_0 = \delta$  and  $\alpha = 0$ ) which states that TB (lag1 to 4) jointly do not granger cause ER and at the same time ER (lag 1 to 4) jointly do not granger cause TB this indicates that the coefficients  $\alpha$  and  $\delta$  equal to zero.

For variables DFA and DTB, the study rejects the null hypothesis ( $H_0 = \beta$  and  $\alpha = 0$ ) which states that FA (lag1 to 4) jointly do not granger cause TB and at the same time TB (lag 1 to 4) jointly do not granger cause FA and accept the Alternative hypothesis which states that FA (lag1 to 4) jointly do granger cause TB and at the same time TB (lag 1 to 4) jointly do granger cause FA this indicates that the coefficients  $\alpha$  and  $\beta$  are different from zero. This bidirectional causality demonstrates that Foreign aid cause trade balance and trade balance also cause foreign aid, this is in agreement of with Trade gap theory (Quibria, 2005), where foreign aid is required to fill the export-import gap and this gap is daily expanding in Rwandan economy. This is also in accord with Arvin *et al* (2000) findings. The study has found that there is no causality between Exchange rate and Trade balance.

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND POLICY IMPLICATION

#### 5.1 SUMMARY

Rwanda is aid dependent country and more populated, due to the low level of natural resources, the main foreign earnings is in form of foreign aid which contributes up to 40 percent of government budget. Foreign aid inflow strengthens domestic currency in short run and depreciation it in long run through the exchange rate and people income. Trade balance is expected to deteriorate in short run but improves in long run. Trade balance is a main component of Balance of payment; therefore trade balance deterioration or improvement affects the Rwanda's balance of payment and economy as whole. The study was carried out to determine the effect of Foreign Aid on Trade Balance in Rwanda. The objectives of the study were to find out the effect of the foreign aid on trade balance as well as on exchange rate in Rwanda and to determine the causal relationship between foreign aid and trade balance in Rwanda. The data used in the study were collected from the national Bank of Rwanda and from Organization of Economic Community and Development (OECD) database spanning from 1982 to 2012. The annual average exchange rate was used while Trade balance and foreign aid were used in absolute term.

The data has undergone under the numerous tests to ensure the validity of the results, unit root test by the use of Augmented Dickey Fuller (ADF) was done to avoid the spurious results and first difference was performed to stationarize them.

Normality test was done to check the normal distribution of residuals, Johansen Multivariate cointegration test was employed to check long run relationship between the variables, Vector Error Correction Model (VECM) was done to measure the degree of adjustment from the disequilibrium towards long run equilibrium and finally causality test was applied by the use of Engel Granger causality test to see the direction of causality between the variables.

The study found out that: Trade balance, Exchange rate and Foreign aid have a long run relationship, The Vector Error Correction Model (VECM) showed that the variables adjust faster from disequilibrium towards long run equilibrium at 1.43 or 143 percent. OLS regression results showed that Foreign aid has negative effect on trade balance in Rwanda and Exchange rate has positive effect on trade balance in Rwanda. The study also revealed that Foreign aid does not granger cause Exchange rate and also Exchange rate does not granger cause Foreign aid. The findings denoted that Trade balance does not granger cause Exchange rate and also Exchange rate does not granger cause Trade balance but there is bi-directional causality between trade balance and Foreign aid.

## **5.2 CONCLUSION**

Rwanda has done great achievement for possible economic recovery following the 1994 genocide. The large sum of foreign support to Rwanda has accomplished the necessary recovery and feasible economic growth. However, high foreign assistance can have some possible negative effect of aid dependence. This can be possible if foreign aid has a negative effect on Rwandan economy. The study was

undertaken to find out the effect of foreign aid on Trade balance in Rwanda. The findings from the study disclosed that foreign aid has a negative effect on trade balance in Rwanda. All variables have long run relationship which means that when foreign aid increases, the exchange rate depreciates which in turn increases the exports while reducing the imports hence is the trade balance improvement. The causality test showed also bi-directional causality between Foreign aid and Trade balance which is in agreement with the theoretical literature of trade gap, where the low exports exceeded by high imports create the trade gap whose covering necessitates the foreign aid inflows, briefly in Rwanda, it is the trade balance deficit one of the cause of the inflow of foreign aid. At the same time the study found that there is no causality found Trade balance and Exchange rate as well as Foreign aid and Exchange rate.

The study also wanted to find out the effect of Exchange rate on Trade balance in Rwanda. The findings from the study showed that Exchange rate has a positive effect on and trade balance in Rwanda and there is a long run relationship between Exchange rate and Trade balance. The increase in exchange rate signifies depreciation of domestic currency due to increased of foreign aid inflow, therefore the trade balance will improve because exports will exceed imports. The causality test showed that there is no causality from foreign aid to exchange rate.

The study found that there is a bi-directional between Foreign aid and Trade balance and long run relationship between trade balance and foreign aid but causality test showed no causal relationship between Exchange rate and trade balance and foreign aid and trade balance. The Coefficient of Error Correction

Term showed that there is a high speed of adjustment from short run to long run equilibrium at 1.43 or 143 percent.

### **5.3 POLICY IMPLICATIONS**

The importance of foreign aid to Rwanda stands to be a core source of capital flow, funding for investment and main source of finance for the budget Kene *et al* (2008). However the foreign aid has been long time used by the donors mostly Western powers and Americans as political tool to advance their political will and opinions over a country of total sovereignty and against the welfare of its citizens. The government of Rwanda needs sharpened, accurate and effective policies to handle out the issue of aid dependence since the donors uses it as stumbling block against Rwandan dreams and destiny. The Economic independence will enable the country to walk in optimistic route of economic liberty and leave the aid dependence as history behind.

Given the results from the study, the Republic of Rwanda to achieve its desired economic recovery and total economic independence by shifting from dependence on foreign aid must reduce its Trade balance deficit which deteriorating year after year because the findings from the study have proved that Trade balance granger cause foreign aid and foreign aid has negative effect on trade balance. It is normally agreed with the economic theory of the two gap model where foreign aid inflow come as a result of trade gap means imports exceed exports. Import substitutions and exports promotion could be enhanced while planning ways to break down the barriers for their outcome on global market. Foreign aid should

also be reduced since the findings proved a causal relationship where foreign aid cause trade balance deficit. Since exchange rate has a positive effect on trade balance and long run relationship with both trade balance and foreign aid, being a monetary tool gives Central Bank a right stand to manipulate it and tackle the Trade balance deterioration problem especially in short run and mitigate the Foreign aid effect. If these policies are well implemented, the result will be trade balance improvement which in turn will reduce the amount of foreign aid required resulting hence political and economic independence.

This study has tried but still a lot to do about the effect of foreign aid in various areas of Rwandan economy. The researcher advises further researches on foreign aid on balance of payment in Rwanda, foreign aid on economic growth in Rwanda, foreign aid fungibility in Rwanda etc.

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