American Journal of Theoretical and Applied Business
2023; 9(2): 57-69
http://www.sciencepublishinggroup.com/j/ajtab
doi: 10.11648/j.ajtab.20230902.15
ISSN: 2469-7834 (Print); ISSN: 2469-7842 (Online)

The Twin Deficits Hypothesis: An Empirical Analysis for Ethiopia

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To cite this article:
Abera Fekadu Hailemareiam. The Twin Deficits Hypothesis: An Empirical Analysis for Ethiopia. *American Journal of Theoretical and Applied Business*. Vol. 9, No. 2, 2023, pp. 57-69. doi: 10.11648/j.ajtab.20230902.15

Received: October 20, 2022; **Accepted**: November 10, 2022; **Published**: June 27, 2023

Abstract: The study investigated the link between current account deficit and budget deficit as the primary objective, and the impact of other control variables on current account deficit was also examined. In order to achieve the object, the time series data running from 1987 to 2021, collected from various sources, is employed by using the autoregressive distributive lag (ARDL) model. Accordingly, both long run and short-run estimations are undertaken to find out the possible link between the current account deficit and the budget deficit. The empirical finding of this paper supports the existence of a positive relationship between the current account deficit and the budget deficit in the long run, whereas the paper rejects the Keynesian proposition and fails to find a significant positive relationship between the two variables in the short run. In order to grant statistical trustworthiness to the findings of the research, all diagnostic tests are conducted with appropriate testing mechanisms, and the model is found to be statistically healthy. As the fiscal deficit is found to be a significant factor in the current account, the study recommends a reduction of non-development expenditure and enhancement of domestic revenue collection. Besides, economic growth is found to have a negative and significant impact on the current account deficit in the long run; hence, the government should adopt an appropriate macroeconomic policy to enhance economic growth. The policy measure may target improving infrastructure, the quality of human capital, and the efficiency of the factors of production. Finally, money supply and the real effective exchange rate are also found to be a significant determinant of the current account deficit, in the long run, suggesting the requirement of appropriate monetary policy by the central bank to have an optimum money supply and a stable exchange rate.

Keywords: Twin Deficit, ARDL, Keynesian Proposition, Ricardian Equivalence

1. Introduction

The relationship between the fiscal and current account balances has drawn a lot of attention in macroeconomics literature over the past few decades because it is crucial for an economy to run well that both are stable [65].

Additionally, with an open economy, the impact of ongoing fiscal and current account deficits may go beyond the domestic market and have an impact on other countries as well and they could act as a barrier to potential stakeholders like foreign investors, international donors, and international monetary institutions as they transcend strong signals about the status of an economy which consequently would affect its growth rate. Accordingly, researchers, academicians and policymakers have been investigating the possible relationship which exists between fiscal balance and current account balance. According to [55], the situation when both fiscal deficit and current account deficit exist simultaneously is termed a twin deficit.

Historically, the twin deficits hypothesis (TDH) was proposed in the 1980s and 1990s to explain the United States' current account deficit [1, 15]. The twin deficit hypothesis has since become one of the most contentious issues in the field of macroeconomic policy. However, the close relationship between current accounts and budget deficits is not unique to the United States. In Europe, Germany and Sweden faced similar problems in the early 1990s, when rising budget deficits were accompanied by a real appreciation of their national currencies, which harmed those countries' current accounts [65].

Developing nations are no exception. Most of them also had external debt problems in the early 1980s. A large body

of research has shown that the unsustainable budget deficit during this time period widened the current account deficit. Indeed, authors such as [38] argued that the link between these two variables is even stronger in developing economies. There are no common understandings or findings regarding the relationship between fiscal and current account balances. In terms of the relationship between the two balances, there are two distinct groups.

The first group is the Keynesian proposition, which holds that there is a significant relationship between the fiscal deficit and the current account deficit.

The main argument behind the Keynesian Proposition, which is based on the Mundell-Fleming framework, is that an increase in the budget deficit would cause interest rates to rise, causing capital inflows and exchange rates to rise, making exports less appealing and increasing the attractiveness of imports, thereby worsening the current account under a flexible exchange rate system [46]. The second group, known as the Ricardian equivalence proposition, contends that there is no such strong relationship between fiscal balance and current account balance due to consumer rational expectation behavior.

The main argument for the Ricardian Equivalence proposition (hereafter RE) is that changes in taxes and budget deficits have no effect on the real interest rate, the quantity of investment, or the current account balance due to economic agents' rational expectation behaviors. Because rational agents expect the current tax cut to become a tax burden in the future, the effect of the current tax cut or increase in government expenditure has had no effect on the mix of current consumption and investment since. As a result, they will increase their savings to cover future tax increases (intertemporal consumption decision) [55].

Ethiopia is one of the typical developing countries worth mentioning in terms of the persistent occurrence of twin deficits over a long period of time. The numerical evidence from various sources, such as the National Bank of Ethiopia, demonstrates that there is a huge negative gap between government expenditure and revenue; similarly, the country has a significant negative balance in its current account due to excess import bills over export revenue (Figure 1). Throughout the study period (1987-2021), the country recorded a negative balance in terms of fiscal and current account balance. As shown in Figure 1, the highest negative balance is recorded in the last ten years and on average fiscal deficit and current account deficit registered a growth rate of 24 and 35 per cent respectively in the last ten years.

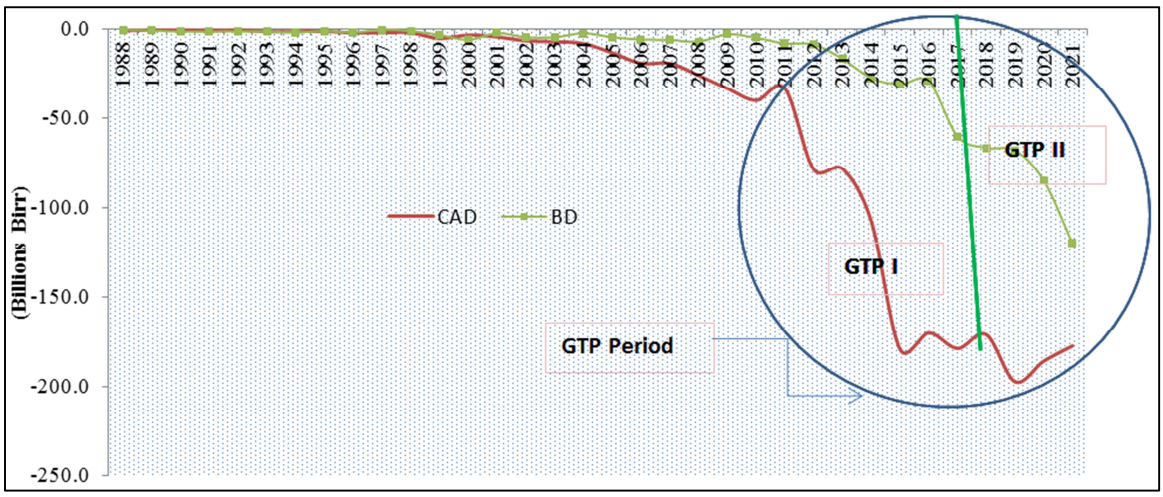

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Figure 1. *Fiscal and current account deficit trends (1997-2021).*

International rating agencies such as Standard and Poor's, Moody's, and Fitch have recently downgraded the country's credit rating due to the country's deteriorating fiscal and current account balances, as well as its massive debt. When considering the issue of Ethiopia's twin deficit, the most likely research question to ask is whether Ethiopia's fiscal deficit has made a significant contribution to its current account deficit or not. If so, what are the potential implications for such relationships, if any, for macrocosmic stability and long-term economic growth?

2. Literature Review

This section will review both theoretical and empirical literature on the twin deficit hypothesis. The first section is devoted to a review of theoretical literature, followed by empirical literature.

2.1. Theoretical Framework of the Twin Deficit Hypothesis

After a period of excessive fiscal expansion, Dollar depreciation, and an unusual current account deficit expansion throughout Ronald Wilson Reagan's regime, the notion of the dual deficit hypothesis is advanced to explain the current account deficit within the United States for the first time during the 1980s and 1990s [1, 15]. The dual deficit hypotheses derive their theoretical background from the National income identity for an open economy, which is

expressed as follows;

$$Y=C+I+G+ (X-M) \quad (1)$$

Where Y represents gross domestic product (GDP), C represents household consumption expenditure, I represents investment expenditure, G represents government expenditure, X represents total exports of goods and services, and M represents total imports of goods and services, and the current account balance is defined as

$$C = X - M + N \quad (2)$$

N is the net factor income from abroad. That is the difference between the country's foreign income and its foreign payments. National saving (S) can be expressed as follows in the National income identity for an open economy:

$$S = I + C\ A \quad (3)$$

We can divide national saving (S) into two categories: private saving (Sp) and government saving (G) (Sg). Private saving (Sp) is the amount of money left over after consumption (C) and taxation (T), and it can be expressed as Sp = Y-C-T. Similarly, government saving (Sg) is the difference between public (government) receipts from taxes (T), goods and services expenditure (G), and transfers (R). This can also be written as Sg=TGR. Equation (3) can be rewritten using Sp and Sg as

$$S = S\ p + S\ g = Y - T - C + (T - G - R) = I + CA \quad (4)$$

Equation (4) can rewritten as

$$I+CA = Sp + (T-G-R) \quad (5)$$

and it can further simplified as

$$C\ A = S\ p - I + (T - G - R) \quad (6)$$

According to Equation (6), CA is affected by the saving deficit (the difference between private saving and investment) and the fiscal deficit (represented by the difference between private saving and investment, and the difference between government revenue through taxes, and government expenditure on goods and services and transfers).

We can deduce two different scenarios from equation (6). The first is what might happen if the difference between Sp and I is assumed to be constant or stable over time. If this occurs, fluctuations in the fiscal side (T-G-R) can cause fluctuations in the current account (CA) in equation (6). As a result, the twin deficit hypothesis holds that a movement in fiscal balance results in a movement in current account balance, though whether the movement is pro-cyclical or anti-cyclical is left to empirical investigation.

Among those who argue the pro-cyclical relationship between fiscal balance and current account balance are [1, 7, 66, 16, 58], and [62]. As a result of the first scenario, we can understand that the relationship between fiscal and current account deficits is interrelated, regardless of the direction of their movement. The second conclusion that can be drawn from equation (6) is that the relationship between Sp and I is not as stable as previously assumed. In this case, changes in the fiscal side (i.e. TGR) of equation (6) could be offset by changes in the difference between Sp and I, and the twin deficit hypothesis assertions would be invalid.

As a result, changes in the fiscal and current account deficits will be unrelated [5, 55, 6].

As a result of this analysis, studies on the relationship between fiscal and current account deficits have been based on two major economic propositions: the Keynesian Proposition and the Ricardian Equivalence Proposition.

According to [55] the Mundell-Fleming model assumes that a fiscal deficit caused by excessive borrowing by the government to finance its spending crowds out the economy's available financial resources, and the fiscal deficit causes fluctuations in the current account through I the upward pressure on the domestic interest rate (as a result of the crowding out), (ii) the exchange rate, and (iii) the extent to which the government borrows [23, 3, 5, 16]. With free capital movement across the country, an increase in domestic interest rates attracts foreign investors to invest in the home country, putting upward pressure on demand for domestic currency and causing it to appreciate. As a result, the current account deficit widens as currency appreciation makes imports cheaper while exports become more expensive. The Ricardian Equivalence, derived from the seminal work of Barro, contradicts the Keynesian Proposition (1974). The RE refutes the correlation between fiscal and current account deficits, claiming that there is no such significant relationship and that the two deficits are separate of one another. The reason for this is that fiscal deficits have a knock-on effect on tax cuts, which would affect (decrease) only government savings and not private savings in terms of national saving. Because of the consumer's rational expectation behavior, tax cuts usually have a temporary effect because consumers save more during the period of the tax cuts in order to either pay for future tax increases or raise more financial resources to smooth consumption in the future following a tax increase [37]. Simply put, consumers make an intertemporal choice between current consumption and future savings As a result; a decrease in government savings raises the fiscal deficit but is offset by an increase in private savings, resulting in no effect on national savings. As a result, national saving is unaffected, and the current account balance is unaffected in equation (6). Aside from the Keynesian and Ricardian propositions, the Twin deficit divergence hypothesis asserts that there is a positive relationship between fiscal and current account deficits [12, 14, 34, 63]. The argument is that rising interest rates crowd out private savings and reduce aggregate demand, which in turn reduces import demand.

2.2. Empirical Review

In general, the concept of the twin deficits hypothesis is fraught with controversy. Even empirical studies examining the relationship between budget and current account deficits have yielded conflicting results. Several reasons for the disparity in results have been cited, including country

specificity, sample size, and methodology used [56, 45, 53, 60]. As a result of the twin deficits phenomenon, a number of testable hypotheses emerge. This section is entirely devoted to reviewing the empirical literature on the twin deficit hypothesis. Due to the aforementioned reasons, we can find five different perspectives on the twin deficit hypothesis in empirical literature. The first strand of the empirical literature finds support for the TDH [1, 29, 57, 58] whilst the second strand lends support to the RE [52, 67, 35, 10]. The third strand finds evidence to support the TD divergence [12, 13, 34, 17]. The fourth strand seeks unidirectional (one-way) causality that runs from current account deficits to fiscal deficits or from fiscal deficits to current account deficits [2, 21, 50, 39, 60]. In the final strand a bi-directional (two-way) causality is found between fiscal and current account deficits [9, 45, 26, 49, 51].

In terms of the first point, [1] was among the first to conduct an empirical examination of the relationship between fiscal and current account deficits. He discovered that fiscal deficits influence current account deficits in the United States by using quarterly data from 1979 to 1985 and the vector autoregressive model (VAR). Mehandhiran and Agalewatte, conduct an empirical analysis for Sri Lanka using the ARDL bounds test for cointegration on data spanning 1973-2003 and discover a significant relationship between fiscal and current account deficits, thereby supporting the Keynesian proposition. Using panel data from nine South East Asian Central Banks (SEACEN) countries from 1980 to 2001 and the dynamic OLS (DOLS) panel VAR methodology, [37] find that increase in fiscal deficits cause current account deficits to increase, thereby leaning support to the Keynesian proposition.

Bartolini and Lahiri investigated the twin deficit hypothesis for Organization for Economic Cooperation and Development member countries (OECD). The results of their study provide supportive evidence for Keynesian propositions by using two sets of datasets for the 1972-1998 and 1992-2003 periods, as well as the fixed effect panel estimation method [8]. Salvatore finds strong support for the Keynesian proposition for the G-7 countries using data from 1973 to 2005 [59].

Zamanzadeh and Mehrara find support for the Keynesian proposition in Iran using data from 1959 to 2007 and the Johansen cointegration method [68]. [41] Investigates the relationship between fiscal and current account deficits for 20 OECD countries using data from 1974 to 2008 and the Arellano-Bond GMM estimator, discovering that increasing fiscal deficits lead to higher current account deficits.

Anas discovered that fiscal deficits are the primary cause of Morocco's current account deficits using the impulse responses analysis of the VAR model and data from 1980 to 2012 [4].

Forte, F. and Magazzino, uses data from 1970 to 2010 and both the fixed effects and GMM estimation methods to find evidence supporting the premise that fiscal deficits generate current account deficits for 33 European countries [20].

Mudassar et. al examined the ARDL methodology and data for Pakistan from 1980 to 2011 and discovered evidence supporting the Keynesian Proposition. Evidence is also found for the Keynesian Proposition in India by [62, 49] using data for the 1975/76 to 2011/12 period and the VAR and the Structural VAR methodologies [44].

In relation to the second stand of empirical literature that finds support for the RE, [52, 61] used the Engle and Granger two-step cointegration methodology for the United States from 1946 to 1988 and found no long-run relationship between fiscal and current account deficits. Instead, their findings lend support to the RE. [67, 30] finds support for the RE using the VAR model and data from the United States between 1980 and 1990.

A number of empirical evidence including [40] for United States, [19] for United States, [23] for Canada; [67] for the United Sates, [43] for South Korea, Malaysia, Singapore and Thailand, [53] for India; [48] for South Africa; [52] for the United States conclude that there is no causal relationship between the two deficits and hence are supportive of the Ricardian equivalence.

A number of empirical studies have found support for the third empirical literature stand (i.e. Twin deficit divergence). Corsetti, and Muller, use the VAR methodology and data from 1980Q1 to 2004Q4 to find evidence for the Twin deficit divergence in Australia, Canada, the United Kingdom, and the United States [14]. Kim and Roubini use the VAR methodology and data from 1973 to 2004Q1 to find that fiscal deficits improve the US current account deficit [34]. Javid. and Arif, use the VAR methodology and data for the period 1960-2009 in Pakistan and find that fiscal deficit improves current account deficit [31].

Anoruo and Ramchander use the Granger causality test and different datasets to find that current account deficits cause fiscal deficits but not vice versa for five developing South-East Asian countries: India, Indonesia, Korea, Malaysia, and the Philippines [2]. Hatemi and Shukur, used quarterly data from 1975Q1 to 1998Q2 and the Rao's multivariate F-test combined with the bootstrap simulation technique to find that for the period 1975 to 1989, causality runs from fiscal deficits to current account deficits, but for the period 1990 to 1998, causality runs from current account deficits to fiscal deficits [21].

Regarding the final stand of the empirical literature, [15, 54] provides evidence of a bi-directional causality between fiscal deficits and current account deficits for the United States using the Granger causality test and data for the 1960–1984 period. Bidirectional causality is found between fiscal deficits and current account deficits in Malaysia [38] using data for the 1975–2010 periods.

For Ethiopia, we can barely find sufficient empirical findings on the twin deficit hypothesis except for [11, 22).

By employing the simple ordinary list square (OLS) method, [27], analyzed the twin deficit hypothesis concerning Ethiopia. The result of the study suggests that the budget deficit is negatively related to the current account deficit, though statistically insignificant. Besides, the Granger causality test of the study reveals the existence of bi-

directional causality between the current account deficit and the government budget deficit at the 5% level. Hence the empirical result of the study supports the Ricardian equivalence proposition. But, the major drawback of the study aforementioned is that it employs an inappropriate estimation technique.

The ADF unit test result from the paper reveals that the variables are stationary at a different level of significance and it's inappropriate to employ the ordinary least square method as it may counter the problem of biasedness and inefficiency of the parameters according to [28]. In this case of difference in the order of integration, the appropriate estimation method is the ARDL model as it avoids the problem of integration order (Johansen and Juselius 1990). Therefore, it would be misleading to accept the findings from Gebremariam (2012), as it has a problem with model selection.

By employing a cointegration approach [22] made an empirical investigation for Ethiopia by using a time series data running from 1982-to 2018 and found the existence of a positive and significant causality link running from current account deficit to government budget deficit with no feedback effect, against the Keynesian Twin Deficits Hypothesis.

With the framework of panel cointegration test, panel VAR Granger Causality analysis and a reduced-form consumption function, [27, 36], Evaluates the validity of the conventional (Keynesian) view and the Ricardian Equivalence Hypothesis in Sub-Saharan Africa economies. The study found a unidirectional causality that runs from current account deficits to budget deficits has been found for oil-importing Sub-Saharan African countries.

3. Methodology and Data

3.1. Model Specification

We saw in the theoretical framework section that current account balance is a function of private saving (Sp), investment (I), and fiscal balance (T-G-R), [CA=Sp -I + (T-G-R)]. According to economic theories, disposable income (y) and interest rates (r) have a positive impact on private saving (Keynes, 1936). Domestic investment (I), on the other hand, is a negative function of interest rate (r). We can rewrite equation (6) using this theoretical understanding:

$$CA = ((y, r) - (r)) + \text{FB} \quad (7)$$

Where, CA is a current account, y is a disposable income, r refers to interest rate and FB indicates a fiscal balance. We can express equation (7) in a functional form as,

$$CA = f(y, r, \text{FB}) \quad (8)$$

Although it's not included in the theoretical frameworks discussed under section two, empirical findings such as [46, 25] show that the exchange rate is an important variable to affects the current account movement. Theoretically, appreciation of domestic currency makes export cheaper and import expensive relatively and the reverse is true when the domestic currency depreciates against foreign currency. Therefore, excluding such a significant variable (at least theoretically) may affect the fitness of the model. With this understanding exchange rate proxy by real effective exchange index is introduced to the model.

Normandin, made an empirical investigation on the relationship between money supply and current account balance by employing the two-country DSGE model. According to the study, the money supply is found to have a significant impact on the current account balance through the price effect. Therefore, it is sound to include the money supply in our model to capture the possible monetary side impact on current account movement [47].

Therefore, based on the aforementioned premises, equation (8) can expressed in the following way:

$$CA = f(y, r, \text{FB}, \text{reer}, \text{ms}) \quad (9)$$

Accordingly, with the introduction of the natural logarithm, equation (8) can be specified in an econometric model as follows;

$$lnCA(t) = \beta 0 + \beta 1 l\,\text{ny}(t) + \beta 2 l\,n\,r(t) + \beta 3 l\,n\,\text{FB}(t) + \beta 4 l\,n\,r\,e\,\text{er}(t) + \beta 4 l\,n\,\text{ms}(t) + \text{et} \quad (10)$$

The method of regression technique depends on the statistical behavior of the variables included in the model. i.e. if the variables are stationary at level simple ordinary least square can be employed in order to get the estimation output, on the other hand if the variables are stationary at different level such as I (0) & I (1), the ordinary least square won't be an appropriate regression method rather we have to go for other model, ideally Autoregressive Distributive lag (ARDL) model [24, 32].

3.2. Estimation Technique

Table 4 shows the ADF unit root test results, which show that the variables are stationary at different levels. As a result, the study must use the Autoregressive Distributed Lag (ARDL)/bounds testing cointegration procedure to estimate the long run and short run relationships, as well as the dynamic interaction between the variables of interest. Pesaran et al. (2001) proposed an ARDL/Bounds Testing approach to investigate the existence of a cointegration relationship between variables with different integration orders. There are three distinct advantages to using this method:

1) It avoids the problem of the order of integration associated with the Johansen likelihood approach (Johansen and Juselius 1990).
2) It is suitable for small sample size study.
3) It provides unbiased estimates of the long-run model and valid t statistics even when some of the regressors are endogenous [18, 57].

The ARDL model provides us the above mentioned advantage over other multivariate approaches. As we have seen from the ADF test result, there exists a problem of order of integration, besides the sample size is not such big

although, it fulfills the minimum requirement for the time series analysis which is 35 year as a rule of thumb and finally as we haven't prove the absence of endogeneity in the model, we can't be sure that the model is free from the problem. Luckily, the ARDL model can solve all the potential shortcomings which may exist in the model.

For the purpose of this study, the following ARDL model is estimated in order to test the cointegration relationship between the variables: Current account deficit, Budget deficit, real effective exchange rate, Real GDP and Broad Money supply adopted from [65, 50].

$$\Delta lnCADt = \beta_0 + \beta_1 lnCAD_{t-1} + \beta_2 lnBD_{t-1} + \beta_3 lnRGDP_{t-1} + \beta_4 lnREER_{t-1} + \beta_5 lnMS_{t-1} + \sum_{t=1}^{p} \varphi_i \, \Delta lnCAD_{t-i} + \sum_{j=0}^{q1} \pi_j \, \Delta lnBD_{t-j} + \sum_{i=0}^{q2} \gamma_i \, \Delta lnRGDP_{t-i} + \sum_{k=0}^{q3} \vartheta_k \, \Delta lnREER_{t-k} + \sum_{p=0}^{q4} \delta_p \, \Delta \ln MS_{t-p} + \varepsilon_t \quad (11)$$

Where, β_i are the long run multipliers, β_0 is the intercept, and e_t is white noise errors.

Testing the existence of long run relationship among the variable in the model by estimating equation (10) with ordinary least square method is the first procedure in the ARDL bound testing approach. The F-test for joint significance is the appropriate testing mechanism for the existence of long run relationship in the model or not. The null hypothesis is $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ vs. the alternative hypothesis $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 \neq 0$.

The rule of thumb for accepting or rejecting the null hypothesis is that if the F-statistic is greater than the upper critical value, the null hypothesis of no long run relationship can be rejected regardless of the time series integration orders. The null hypothesis cannot be rejected if the test statistic falls below the lower critical value. Finally, the result is inconclusive if the statistic falls between the lower and upper critical values. The long run model for conditional ARDL (p, q1, q2, q3, q4) can be estimated with the following model once the cointegration is established. Accordingly, the following long run model is specified for current account deficit.

$$lnCAD_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \, lnCAD_{t-i} + \sum_{j=0}^{q1} \beta_2 \, lnBD_{j-i} + \sum_{k=0}^{q2} \beta_3 \, lnRGDP_{K-i} + \sum_{p=0}^{q3} \beta_4 \, lnREER_{P-i} + \sum_{y=0}^{q4} \beta_5 \, lnMS_{y-i} + \varepsilon_t \quad (12)$$

Once the long run model is estimated, the appropriate lag length should be selected.

The lag selection criterion is conducted by using Akaike Information Criteria (AIC). After selecting the appropriate lag length, the next step is to obtain the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. This is specified as follow;

$$\Delta lnCADt = \alpha_0 + \sum_{t=1}^{p} \varphi_i \, \Delta lnCAD_{t-i} + \sum_{j=0}^{q1} \pi_j \, \Delta lnBD_{t-j} + \sum_{i=0}^{q2} \gamma_i \, \Delta lnRGDP_{t-i} + \sum_{k=0}^{q3} \vartheta_k \, \Delta lnREER_{t-k} + \sum_{p=0}^{q4} \delta_p \, \Delta \ln MS_{t-p} + \rho ecm_{t-1} + \varepsilon_t \quad (13)$$

Here φ, π, γ, ϑ, and δ are the short-run dynamic coefficients of the model's convergence to equilibrium and ρ is the speed of adjustment.

3.3. Data Definition, Source and Prior Expectation

The econometric analysis used time series data from the National Bank of Ethiopia spanning the years 1987 to 2021. The availability of data is the reason for the study period's scope. For smoothness, the time series data of all variables are transformed into their natural logarithm form. The tables below summarize the definition, source, and prior expectation of each variable in our model.

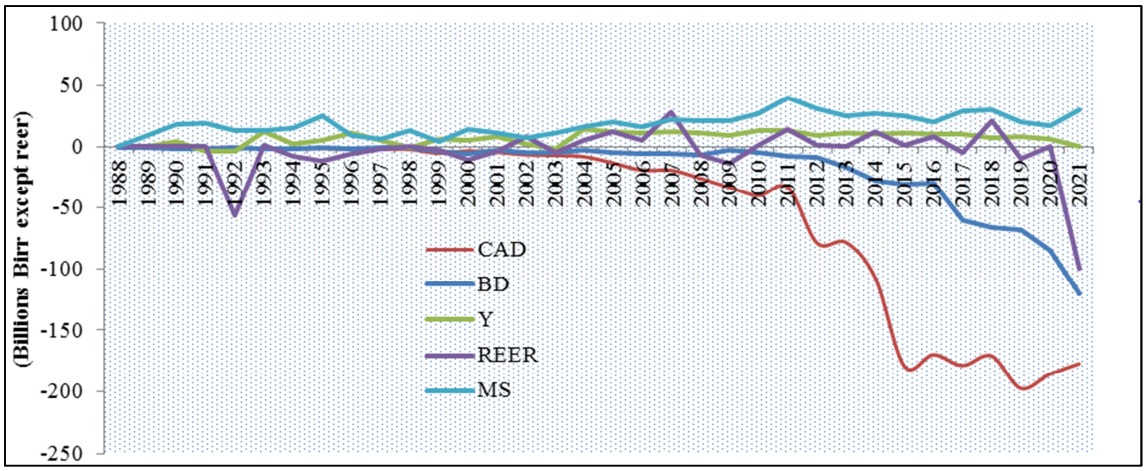
Table 1. *Data Definition, Source and Prior expectation.*

Variable	Prior Expectation	Definition	Source
CA		Current account deficit	NBE (EEAIRD)
FB	β 3>0	Fiscal Balance	NBE (DEAPD)
Y	β 1<0	Real Gross Domestic Product	NBE (DEAPD)
MS	β 2>0	Broad money supply	NBE (DEAPD)
Reer	β 4>0	Real effective exchange rate	NBE (EEAIRD

3.4. Trend Analysis

The bulk of this section is devoted to a brief trend analysis for the variables included in the study. The current account has registered a negative balance throughout the study period with a maximum of birr 197.3 billion in 2019 and the minimum negative current account balance is registered in01990 which amounts to birr 0.6 billion. The negative difference between a country's imports and export becomes wider and wider after the year 2010 which mainly attributed to the Growth and Transformation Plan (GTP I &GTP II). During the period under the study, the difference between government expenditure and government revenue has been negative as shown in figure 1. Real effective exchange rate and broad money supply has shown volatile trend during the period under analysis. An interesting conclusion can be drawn from the trend analysis is that current account balance and fiscal balance

has shown pro-cyclical movement in the study period. But whether there exist lagging and leading relationship between the two variables is left for statistical analysis.



Source, Authors compilation

Figure 2. *Trend of Variables included in the model (1987-2021).*

Table. 2. *Descriptive Statistics.*

	Observation	Mean	Std. Dev.	Min	Max
CAD	34	-51.	70.79263	-197.35	-65
BD	34	-17.	28.73308	-120	-1
RGDP	34	6.58	5.217207	-4	14
REER.	34	-3.7	21.57515	-1	28
MS	34	18.0	8.656291	0	39
Observations	34	34	34	34	34

Source, Authors compilation

Table 3. *Covariance Matrix.*

	LNCA	LNBD	LNGDP	LNREER	LNMS
LNCA	2.82802	0.2647	0.6061	0.1024	1.4560
LNBD	0.2647	0.2421	-0.2112	-0.0414	-0.5316
LNGDP	-0.6061	-0.2112	0.5094	0.0582	1.2634
LNREER	-0.1024	-0.0414	0.0582	0.0803	0.1248
MS	-1.4560	-0.5312	1.2634	0.1248	3.2135

Source, Authors compilation

Table 4. *Correlation Matrix.*

	LNCA	LNBD	LNGDP	LNREER	LNMS
LNCA	1	0.3199	-0.5050	-0.2149	-0.4829
LNBD	0.3199	1	-0.6013	-0.2968	-0.6022
LNGDP	-0.5050	-0.6013	1	0.2878	0.9874
LNREER	-0.2149	-0.2968	0.2878	1	0.2456
MS	-0.4829	-0.6022	0.9874	0.2456	1

Source, Authors compilation

Tables 3 and 4 show the covariance and correlation matrices for the system variables in levels and first differences, respectively. These correlation and covariance matrices clarify the direction and degree of the relationships between the system's variables. Covariance is an ad hoc version of correlation. It is also worth noting that the variance measures how far apart the data are from the mean. Similarly, the covariance matrix (Table 2) indicates the direction of the relationship between variables. Covariance calculations are used to discover relationships between dimensions in high-dimensional data sets that are difficult to visualize.

4. Unit Root Test

The variables were tested to determine their order of integration before beginning the ARDL bounds test. This was done to ensure that the variables were not I(2) stationary or of a higher order than I(1). According [33, 64] the computed F-statistics provided by Pesaran et al. (2001) are invalid in

the presence of I(2) variables because the bounds test is based on the assumption that the variables are I(0) or I(1). To avoid erroneous results, the time series must be tested to determine their data generation process. The ADF test results show that the variables are of mixed order, i.e., I (0) and I (1). This suggests that some variables are stationary at level and others are not. The very important conclusion from the ADF test result is that the appropriate model for estimation is ARDL. This suggests that some variables are stationary at level and some other not. The very important conclusion from the ADF test result is that the appropriate model for estimation is ARDL.

Table 5. *ADF Unit Root Test Result.*

Variables	At level			At first difference			Order of integration
	ADF/PP Statistics		Probability	ADF/PP Statistics		Probability	
LNCAD	-2.880189	PP	0.0566				I (0)
LNBD	-3.277659	ADF	0.0227				I (0)
LNRGDP	3.222780	PP	1.0000	-4.450636	PP	0.0010	I (1)
LNREER	-3.777343	ADF	0.0064				I (0)
LNMS	1.933105	ADF	0.9998	-2.673454	ADF	0.0877	I (1)

Source, Authors compilation

4.1. Cointegration Tests

A maximum lag order of 4 was chosen for the conditional ARDL model in equation using AIC as a guide (10). The F-statistic compares the joint null hypothesis that the coefficients of the lagged level variables are zero (i.e. there is no long run relationship between them) to the alternative hypothesis that the coefficients of the lagged level variables are not zero. Table 3 shows the calculated F-statistics when each variable is treated as the dependent variable in the ARDL regressions. The rule of thumb for accepting or rejecting the null hypothesis is that if the F-statistic is greater than the upper critical value, the null hypothesis of no long run relationship can be rejected regardless of the time series integration orders. The null hypothesis cannot be rejected if the test statistic falls below the lower critical value. Finally, the result is inconclusive if the statistic falls between the lower and upper critical values. As a result, the value of F-statistics is reported in the table below.

Table 6. *Bound Test F-Statistic.*

Test Statistic	Value	k
F-statistic	8.141506	4

Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

We can infer from Table 5 that the F-statistic is fall above the upper bound of the critical value at 5 and 10 percent significance level; the F-statistic is above the lower bound in 1%, 2.5%, 5% and 10% critical value. Therefore we can reject the null hypothesis of no long run relationship among the variables in the model. Following the establishment of a long-run cointegration relationship, the next step is estimating the long run estimation of equation (11). The result of the long run estimation is reported in Table 6.

4.2. Long Run Estimates

Table 7. *Long Run Estimation Coefficients using the ARDL Approach.*

Dependent Variable: LNCA				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LNCA(-1)	0.711517	0.163991	4.338746	0.0000***
LNBD	1.045293	0.51897	2.014168	0.0436*
LNGDP	-5.482642	2.112904	-2.59483	0.0094**
LNREER	0.952276	0.710714	1.339887	0.1982
LNMS	2.949455	0.956877	3.082376	0.0021**
C	2.6495	0.739277	3.584006	0.00037***
R-squared	0.858353	Mean dependent var		11.34653
Adjusted R-squared	0.757177	S. D. dependent var		1.782987
F-statistic	8.483737	Durbin-Watson stat		2.255599
Prob (F-statistic)	0.000008			
***(**)* denotes 1%(5%) 10% significance level.				

The long run estimation output can written as

$$lnCAD = 2.6 + 0.7lnCAD_{-1} + 1.04lnBD - 5.49lnRGDP + 0.95lnREER + 2.9lnMS + et.$$

The estimated coefficients of the long run relationship show that the variables are significant at 1 percent, 5 percent and 10 percent significance level. With regard to the direction and strength of the coefficients of the variable, budget deficit has a positive and significant impact on current account deficit with the coefficient of 1.04which suggests that a percentage change in budget deficit worsen the current account by 1.04 percent in the long run. The result is in line with the prior expectation that the coefficient of budget deficit is greater than zero and it validates the existence of Keynesian proposition and rejects the Ricardian equivalence hypothesis.

Given open capital flow, an increase in government expenditure results in increases in interest rate which attracts capital to inflow into the domestic economy. The capital inflow puts upward pressure on the domestic currency and results in appreciation which discourages export and encourages imports consequently, the current account deficit will widen up. But, as the macroeconomic policy of Ethiopia doesn't allow capital movement yet and hence the increase in interest rate won't affect the value of the domestic currency through appreciation. Besides, the interest rate itself is not a significant variable in the macroeconomic environment of Ethiopia. Therefore, the possible channel by which government expenditure affects the current account is that as expenditure increases government consumption or demand for goods increases which in turn partly increases the demand for imported goods unless meet domestically. Similarly, the movement in fiscal balance can transmit to the current account balance through the revenue side. When the government reduces taxation, household disposable income increases which results in the domestic demand increasing, and consequently the import demand will shift upward. Given export unchanged, an increase in import demand widens the current account deficit up.

The fact on the ground in Ethiopia seems is its trough expenditure by which fiscal deficit affects current account deficit.

Economic growth, as expected, has a negative and significant impact on the current account deficit. The explanation for the result is that economic growth tends to improve infrastructure, human capital quality, and the efficiency of production factors. As a result, production costs fall, allowing for increased output. The expansion or increase in production eventually improves the size of exports and thus reduces the country's current account deficit. On the contrary, increased economic growth may increase the income of the economic agent, causing domestic demand for imports to shift upward and increase the current account deficit. As a result, the overall impact of economic growth on current account balances is determined by the multiplier effect of economic growth on exports versus imports. The study's findings validate the impact of economic growth on export increment outweighing that of imports through improved infrastructure, human capital quality, and factor efficiency. The current account deficit shrinks by 5.5% for every percentage change in economic growth.

Real effective exchange rate is found to be non-significant to affect the current account deficit.

Theoretically, explanations of monetary policy transmission differ across schools of thought and identify a number of different channels of monetary policy transmission mechanism. According to the classical quantity theory of money, changes in monetary policy are directly transmitted into price movements. Monetarists, led by Milton Friedman, believe that money matters and that monetary policy is transmitted through an interest rate channel, an exchange rate channel, or both. While early Keynesians argued that monetary policy was ineffective, they believed that it worked through bank lending and the balance sheet channel. Again, the intermediary school (Real business cycle) views money as neutral, that is, they do not believe that money does not matter and do not deny the effectiveness of monetary policy on the economy. They contend, however, that there is reverse causation running from other important economic variables such as asset price to money supply [41]. The monetary policy transmission mechanism, according to [42], includes interest rates, exchange rates, asset prices, and credit channels.

The coefficient of money supply is significant at 5% level and positive suggesting a percentage increase in money supply results the current account deficit to expand by 2.9 percent.

According to the traditional LM curve approach, as the money supply increase, economic agent finds more money on their hand than they want which increase the cash flow to the bank and put down ward pressure on interest rate. The decrease in interest rate encourages investment and domestic production will expand. Consequently, export is expected to improve due to increase in domestic production capacity which shrinks the current account deficit. But, in the case of Ethiopia, the LM curve approach doesn't hold as interest rate is by far insignificant variable to affect other macroeconomic variable such as investment and economic agents saving behavior.

The possible scenario for Ethiopia among the aforementioned theories is likely Mishkin's transmission mechanism and monetarist's transmission mechanism of the money supply to the current account via credit channels and price.

The long-run model estimated in table 6 satisfies the Gauss Markov BLUE assumption. As reported in the table the value of Durbin Watson statics is 2.25 which is an indication that the model is free from Heteroskedasticity. In addition to the DW statistics, the Breusch-Pagan-Godfrey test of Heteroskedasticity also proves the variance in the model is homoscedastic, Tables 7 and 8.

Table 8. *Heteroskedasticity Test: Breusch-Pagan-Godfrey.*

F-statistic	1.454339	Prob. F (15,21)	0.2104
Obs*R-squared	18.85219	Prob. Chi-Square (15)	0.2205
Scaled explained SS	14.10819	Prob. Chi-Square (15)	0.5173

From the table we can observe that the chi-square probability of observed R- squared is 0.22 which fails to reject the null-hypothesis of homoscedasticity. The model is also free from serial correlation as proven by Breusch-Godfrey Serial Correlation LM Test shown in the following table.

Table 9. *Breusch-Godfrey Serial Correlation LM Test.*

F-statistic	1.024295	Prob. F (2,19)	0.3780
Obs*R-squared	3.601087	Prob. Chi-Square (2)	0.1652

The Breusch-Godfrey Serial Correlation LM Test result shows that the probability value of F-statistic and observed R-squared is greater than 5% significance level suggests accepting the null-hypothesis of no serial correlation in the model. The fitness of the model is measured by R-square which measures the part of dependent variable explained by the explanatory variable included in the model. As the rule of thumb, the value of R-square is required to be equal or greater than 65%.

The more the value of R-Square, the best fit the model. Accordingly, the value of R-square reported in table 6, is 0.85, which indicates 85% percent of the dependent variable; Current account deficit is explained by the explanatory variables included in the model. Implicitly, only 15 % of the dependent variable is explained by the residual. Therefore, we can conclude that the model is well fitted.

In addition, the normality and stability of the model is tested accordingly with Jacque Bera and Cumulative Sum (CUSUM) tests respectively and the model is found to have abnormally distributed residual and stable, respectively (Appendix 1). But, according to the classical linear model assumption, violation of the normal distribution of the residual can affect neither efficiency nor biasedness of the coefficient in a time series data, Green (2012).

The RAMSEY test for misspecification did not reject the null hypothesis of no misspecification. Thus, the functional form of the model is appropriate. Following estimation of the long run model, the next step is estimating the short-run dynamic coefficients associated with the long run relationships. The following table displays the result of the short run dynamics coefficient.

Table 10. *Short run Estimation result.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
ΔLNCA (-1)	0.284215	0.198184	1.434095	0.1622
ΔLNBD	1.057523	1.281868	0.824986	0.4161
ΔLNGDP	1.809112	0.832985	2.171842	0.0296**
ΔLNREER	0.735212	1.049086	0.700812	0.4890
ΔMS	4.347397	4.752737	0.914714	0.3679
ECM (-1)	-1.029002	0.470670	-2.186250	0.0370
C	-0.499525	0.717439	-0.696261	0.4918
R-squared	0.152821	F-statistic		0.871878
Adjusted R-squared	0.022457	Prob (F-statistic)		0.527323

4.3. Short-Run Estimates

The short run estimation result reveals that none of the variables except Real GDP included in the model has significant impact of current account deficit. Budget deficit has a positive coefficient similar to that of the long run estimation, but in the short run it is insignificant to affect the current account deficit. Therefore, it reflects that the Ricardian equivalence theory is valid in the short run and the long run estimation result proves the existence of Keynesian proposition for Ethiopia's data.

The estimation results reported in either in Table 6 or Table 9 didn't provide us the causality relationship which could exist among the variables included in the model. In order to find out the direction of causality extra statistical test is required to execute.

Arguably, VAR Granger Causality/Block Exogeneity Tests is the most commonly used test statistics to see the direction of causality and it is employed for this study as well.

4.4. VAR Granger Causality/Block Exogeneity Tests

As cointegration and long run relationships do not define the direction of causality. Table 10 shows the results of the Granger causality/Block Erogeneity tests.

Table 11. *VAR Granger Causality/Block Exogeneity Wald Tests.*

Dependent variable: LNCA			
Excluded	Chi-sq	df	Prob.
LNBD	16.59090	2	0.0436
LNGDP	9.12009	2	0.0633
LNREER	11.3461	2	0.0993
LNMS	15.27717	2	0.0465
All	18.220247	8	0.0412
Dependent variable: LNBD			
Excluded	Chi-sq	df	Prob.
LNCA	0.969725	2	0.0615
LNGDP	1.827592	2	0.0401
LNREER	0.668231	2	0.7160
LNMS	0.879922	2	0.6441
All	3.791183	8	0.8755

The essence of this test is to investigate the causal links amongst the variables; current account deficit, budget deficit, economic growth, real effective exchange rate and money supply development. This test is important in the sense that it informs us about the direction of causality amongst the variables. There are basically three possible outcomes: unidirectional, bidirectional or neutral relationships. In the first table when current account is a

dependent variable, the null hypothesis of block Exogeneity Wald test is rejected at 5% and 10% significant level for BD, MS, RGDP and REER, respectively which reflect that current account deficit granger caused by all the variables included in the model.

The second table tells us the different story, only BD and RGDP granger cause the current account and the overall Chi-sqr is low compared to the first table. An interesting conclusion generated from table 10 is that there is unidirectional causality between current account deficit and budget deficit.

5. Conclusions and Policy Recommendation

The primary goal of this article is to investigate the potential link between the Ethiopian economy's current account deficit and its budget deficit. The estimated empirical results based on time-series data from 1987 to 2021 generated the following conclusions using the ARDL model. First, current account deficits, budget deficits, real GDP, real exchange rate, and money supply are found to be cointegrated in the long run, implying that all of these macroeconomic variables are linked by an underlying equilibrium relationship. Second, the findings support the strong evidence pointing to a link between budget deficits and current account deficits. This significant and positive impact of budget deficits on current account deficits confirms the long-run evidence of the Keynesian proposition for Ethiopia. Furthermore, the short-run estimation result lends support to the Ricardian equivalence theory. Similarly, the Granger Causality/Block Exogeneity Tests show that there is a bidirectional causal relationship between the current account deficit and the budget deficit. Furthermore, other control variables such as real GDP, real effective exchange rate, and money supply have been found to be significant predictors of the ongoing current account deficit. The following policy recommendations are forwarded based on the result of the research.

As domestic balance is found to be crucial determinates for external balance, the fiscal authority is required to implement a prudent fiscal policy in order to minimize the current account deficit resulted from budget deficit.

Per the findings of the paper, economic growth has stabilizing impact on current account deficit in the long run, suggests that the government should implement a policy mix which can trigger the economic growth through export generating or import substitution activities.

The upward pressure on current account deficit from budget deficit is trough expenditure side, implying the government should implement Contractionary fiscal policy in order to minimize the ongoing current account deficit in the long-run.

As both monetary variables; money supply and exchange rate are found be a significant determinant for current account deficit in the long run, the monetary authority has to play an important role in implementing an optimal monetary policy in order to have appropriate money supply and stable exchange rate, by doing so it will narrow the current account deficit down in the long run. Besides, the monetary authority should revisit the credit channels which may possibly have an impact on the current account deficit.

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