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THE RELATIONSHIP BETWEEN FISCAL DEFICIT AND CURRENT ACCOUNT DEFICIT IN THE CASE OF THE WEST AFRICAN MONETARY ZONE: A BIVARIATE DSEM/RDSEM APPROACH

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🆔 **Edmund Ayesu**[1+]
🆔 **John O. Olaomi**[2]

[1]*Centre for Social Science Research, Institute of Research, Innovation and Development, Kumasi Technical University; University of South Africa, Science Campus, Florida, Johannesburg, South Africa.*
Email: eayesu76@gmail.com

[2]*University of South Africa, Science Campus, Florida, Johannesburg, South Africa.*

(+ Corresponding author)

ABSTRACT

For the past three decades, the relationship between fiscal deficit and current account deficit has been a highly contested issue in macroeconomic research and policy. The debate has centered on whether deterioration in the fiscal balance negatively affects current account balance. Against this background, various studies have been conducted to ascertain the nature of the relationship between these two key macroeconomic variables; however, conclusions have been mixed. This study contributes to ongoing discourse by adopting a contemporary modelling framework to explore the relationship between the variables within the scope of the West African Monetary Zone (WAMZ). The study is based on the dynamic structural equation model (DSEM) and the residual dynamic structural equation model (RDSEM) and utilized annual secondary data spanning from 1990 to 2019. The study concluded that there is no direct relationship between fiscal and current account deficits, thus opposing the twin deficit hypothesis. However, there is a contemporaneous relationship between the two variables when the autoregressive relationship in the residuals is significant. We therefore establish that worsening current account and fiscal deficits occur concurrently and are driven by the lagged relationship with other factors not explicitly captured in the model.

Contribution/Originality: This study contributes to the existing literature on the twin deficit debate in the context of the West African Monetary Zone by adopting dynamic structural equation modeling, which is not commonly used in econometric literature.

1. INTRODUCTION

The past three decades have witnessed intense disagreements among macroeconomics researchers on the issue of fiscal deficit and its effects on current account deficit (Gebremariam, 2018). The central question of the disagreement is whether deterioration in the fiscal balance has any relationship with current account deficit. The debate hinges on two major theoretical blocs in macroeconomics – the Keynesian and Monetarist schools of thought – whose positions are diametrically opposed to each other on the issue. The empirical literature has further entrenched the disagreements as various econometric models have led to mixed conclusions in terms of strength of relationship and direction of effects. The studies have also produced inconsistent results for both developed and developing countries as well as regional economic blocs. In direct connection to the ongoing debate is the dilemma of policy option to manage these key variables that influence stability and growth.

At the level of the Economic Community of West African States (ECOWAS), one of the key issues on the policy table is the creation of a common currency area for its five Anglophone countries (Ghana, Nigeria, Sierra Leone, Liberia, and The Gambia) and Guinea (Francophone country) within the context of the West African Monetary Zone (WAMZ). This is a first-level policy strategy towards the creation of a common currency area for the entire ECOWAS region (WAMI, 2000). The WAMZ agenda has also established threshold requirements for member countries prior to the implementation of the single currency project. This is meant to minimize the possibility of extreme gainers and losers within the framework of the convergence criteria. In line with this, one of the key actions is prudent fiscal deficit management where member countries are expected to maintain a deficit level of not more than 4% of GDP after the year 2000.

It is, therefore, worth exploring the relationship between fiscal deficit and key macroeconomic variables, in this case, the current account deficit within the existing theoretical framework to identify strategic policy paths towards realizing key threshold indicators of the convergence criteria. This is because there are different policy implications for statistically significant or insignificant relationships between the two variables which may influence the adoption of a particular policy strategy. For instance, if there is a significant relationship between the two variables flowing from fiscal deficit to current account deficit, then it is strategically prudent to address the problem of fiscal deficit as an underlying cause to achieve a favorable current account balance. On the other hand, if there is no significant relationship between the two factors, then it is worth addressing the deficits independently to meet the convergence criteria. At the moment, however, the literature on the WAMZ has not adequately addressed the relationship between fiscal deficit and current account balance to support policy imperatives of member countries, and this study seeks to fill this gap.

The goal of the study is to establish the relationship between fiscal deficit and current account balance within the context of the WAMZ. Specifically, the study seeks to address the nature of the relationship between the two factors, whether positive or negative, as well as the strength of the relationship if it exists. The study also seeks to establish whether the direction of the relationship between the variables is unidirectional or bidirectional. By this, we seek to analyze whether the direction of relationship flows from fiscal deficit to current account deficit or vice versa or whether the relationship is contemporaneous. The study leverages on advances in dynamic structural equation modeling to provide empirical evidence to support policy activities of the WAMZ single currency project.

2. LITERATURE REVIEW

The relationship between fiscal and current account balances draws from macroeconomic theory (El-Baz, 2014; Holcombe, 2004). This emanates from the fundamental theory of national income accounting, which is formulated based on two approaches, the expenditure and income models. The expenditure model is given as:

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

Where:

Y is income.

C is consumption.

I is autonomous investment.

G is government expenditure.

X - M is net export.

The income model is given as:

$$Y = C + S + T + NT$$

Where:

Y is income.

C is consumption.

S is gross national savings.

T is tax revenue.

NT is net transfer payments.

The equilibrium condition requires the expenditure and income models to be equal, thus:

$$C + I + G + (X - M) = C + S + T + NT$$

$$(X - M) = (S - I) + (T - G)$$

In this case, $(X - M)$ measures current account balance, $(S - I)$ measures the saving–investment gap and $(G - T)$ measures the fiscal balance.

We can approximate private savings, which are savings from households and firms to national savings, and in that case we have:

$$(X - M) = (S_p - I) + (T - G)$$

The relationship between fiscal balance and current account balance depends on the response of the private savings (Wirasti & Widodo, 2017). In the Keynesian view, the savings–investment gap is fixed, such that current account runs into deficit when there is deficit in the fiscal balance, which sums up the twin deficit hypothesis (Wirasti & Widodo, 2017). The twin deficit hypothesis is also the bedrock of the Mundell–Fleming model, which argues that in an open economy fiscal shocks have a direct effect on current account imbalances under the conditions of a flexible exchange rate (Bayramoğlu & Oztürk, 2018; El-Baz, 2014; Gebremariam, 2018). This is because an increase in disposable income induces a higher domestic price level, which ultimately leads to the appreciation of exchange rate that increases imports at the expense of exports. However, the second theory, the Ricardian Equivalence Hypothesis, contends that fiscal deficit has no meaningful effect on current account deficit and that deterioration in fiscal balance resulting from tax cuts may increase households' incomes, which they would rather save to ameliorate a possible rise in future taxes at the expense of boosting aggregate demand (Barro, 1989; Bhat & Sharma, 2018; Shastri, Giri, & Mohapatra, 2017).

Also, under the Keynesian model, the relationship between fiscal deficit and current account deficit occurs in different forms (Wirasti & Widodo, 2017). It can be unidirectional, flowing from fiscal deficit to current account deficit with the former improving the latter. It can also be a reverse relationship flowing from current account deficit to deficit in the fiscal balance referred to as current account targeting, which espouses that deterioration in the current account balance dampens economic growth and results in fiscal deficit. The relationship can also be bidirectional where there is a feedback loop between the two factors. Under this situation, controlling one factor, for example, fiscal deficit to induce a favorable current account balance, will not be enough unless an effective exchange rate strategy is factored into policy formulation.

The contention in the empirical literature is not only on the nature of the relationship between the two key macroeconomic variables but also the direction of causality. Various empirical findings have either supported one direction of causality or the other depending on ideological orientation. For instance, Merza, Alawin, & Ala'Bashayreh (2012) argue that there is a long-run negative relationship between current account balance and budget deficit within the context of the Kuwaiti economy based on co-integration and the vector autoregressive (VAR) modelling framework. They explain that the direction of causality is from current account to fiscal deficit and that favorable current account expectations arouses government interest to increase expenditure, which affects

fiscal deficit. However, Suri & Shome (2013) concluded that there is no long-run relationship between fiscal deficit and current account deficit, which is consistent with the Ricardian Equivalence Hypothesis. They argue strongly that governments need to rein in deficit in the fiscal account by focusing on factors that promote private investment to shore up growth of the economy. By using the vector error correction model (VECM), it was established that the twin deficit hypothesis does not hold for the Egyptian economy and thus there is a reverse causality from current account deficit to fiscal deficit (El-Baz, 2014). Deterioration in the current accounts is what leads to an unfavorable fiscal balance for the Egyptian economy. However, in contrast to the Egyptian case, Ganchev, Stravrova, & Tsenkov (2012) utilized two different modelling frameworks (least squares and vector autoregressive (VAR) panel models) to ascertain the twin deficit hypothesis in relation to Central and Eastern European economies. The study had mixed conclusions based on the different models, that is, there is a moderately positive relationship between fiscal deficit and current account deficit based on the least squares panel model and no statistically significant relationship between the two variables based on the VAR panel model. It is worth noting that an earlier study based on a panel regression analysis involving a sample of 26 countries confirmed the twin deficit hypothesis, although the relationship is quite moderate (Bartolini & Lahiri, 2006).

They explained that investment continued to show no systematic response to fiscal deficit and that much of the savings shortfall requires external borrowing. Regarding studies on West African experiences with fiscal and current account deficits, Akalpler & Panshak (2019) used the autoregressive distributed lag model (ARDL) within a Granger causality framework for time series data spanning 26 years (1980–2016) on Nigeria and concluded in favor of the twin deficit hypothesis with a unidirectional effect. That is, the country's current account challenges could be linked with the problems of its fiscal deficit situation. On the other hand, Ghana's case refuted the twin deficit hypothesis based on the error correction and Granger causality models for 24 years' worth of time series data (Senadza & Aloryito, 2016). A major implication of this conclusion is that there is no statistical evidence to establish a direct link between the negative fiscal balance characteristic of the Ghanaian economy and the fluctuations in its current account balances, thus targeting fiscal surpluses cannot be a good policy option to improve the unfavorable current account situation. The Sierra Leonean economy also presents another interesting dimension to the controversy. Based on the use of the ARDL model, it was established that there is a long run relationship between fiscal deficit and current account deficit, which upholds the twin deficit hypothesis. However, in the short run, the twin deficit hypothesis is refuted and it was concluded that fiscal deficit deterioration is not responsible for current account problems faced by the country (Bakarr, 2014).

In contrast with the Sierra Leonean case, experiences of the West African Economic and Monetary Union (WAEMU), which is a single currency area for the Francophone West African countries, points to a bidirectional effect between fiscal deficit and current account deficit (Yeboua, 2016). That is, fiscal balance deterioration is implicated in the negative current account balances experienced by member countries and vice versa. The study is based on the panel VAR model with sample data spanning from 1975 to 2013. The study argues further that with the inclusion of foreign aid as an explanatory variable, the relationship between the two key variables is further strengthened.

3. METHODOLOGY

3.1. Data

The study is quantitative, and it is based on panel data spanning 30 years (1990–2019) for the six countries of the WAMZ. The data were obtained from opendataforafrica.org, an open access database for economic data owned by the African Development Bank. The modeling is based on dynamic structural equation models (DSEM) and was complemented by the residual dynamic structural equation model (RDSEM), which looks at dynamic relationship in the residuals to explore a possible indirect effect.

3.2. The DSEM Framework

The foundations of DSEM involves partitioning the panel variable of interest. That is, assuming we have a variable of interest Y_{it} with an independent variable X_{it}, we can decompose these into two components, thus:

$$Y_{it} = Y_{1,it} + Y_{2,i}$$

$$X_{it} = X_{1,it} + Y_{2,i}$$

for the ith subject at time t, where t is 1,2...T. $Y_{1,it}$ and $Y_{2,i}$ define the deviation of subject i at time t and subject-specific factors respectively for the variable of interest. The covariate X_{it} also have same descriptions. The DSEM is analyzed on two levels. That is, the between-level and within level stages of analysis. The between level analysis looks at the relationship among the subjects and are therefore subject-specific effects. Whereas the within-level measures the temporal relationship based on a specific locational deviation for the observations (Hamaker, Asparouhov, Bose, Schmied, & Muthen, 2018). In effect, both between-level and within-level effects are modelled separately in a DSEM structure. The between-level model is captured by the $Y_{2,i}$, which is time invariant and is modelled as:

$$Y_{2,i} = \alpha_2 + \Lambda_2 \eta_{2,i} + K_2 X_{2,i} + \varepsilon_{2,i}$$

$$\eta_{2,1} = \beta_2 + \theta_2 \eta_{2,i} + \Gamma_2 X_{2,i} + \xi_{2,i}$$

The vector $X_{2,i}$ is a vector of a subject-specific time invariant covariate. Similarly, $\eta_{2,1}$ represents subject-specific time invariant latent variables.

The internal relationship is presented below:

$$Y_{1,it} = \alpha_1 + \sum_{l=0}^{L} \Lambda_{1,l} \eta_{1,it-1} + \sum_{l=0}^{L} R_l Y_{1,i,t-1} + \sum_{l=0}^{L} K_{1,l} X_{1,i,t-1} + \varepsilon_{1,it}$$

$$\eta_{1,it} = \beta_2 + \sum_{l=0}^{L} \theta_{1,l} \eta_{1,i,t-1} + \sum_{l=0}^{L} Q_{1,l} Y_{1,i,t-1} + \sum_{l=0}^{L} \Gamma_{1,l} X_{1,i,t-1} + \xi_{1,it}$$

The variables $Y_{1,i,t}$ and $\eta_{1,i,t}$ are vectors of the observed covariate and latent variables, respectively, for subject i at time t. It should be noted that $X_{1,i,t-1}$ are fixed factors that enter the model without any distributional assumptions made about them. In actual fact, they are introduced into the model for the sake of completeness (Asparouhov, Hamaker, & Muthén, 2018a). $Y_{1,i,t-1}$ represents the lagged dependent variables serving as covariates. Under DSEM, we can also model the residual variances as random parameters in the internal framework. That is, the model recognizes that every subject has a different response and exposure to shocks and thus would have different residual experiences. The residual variance is a within-level quantity and if each subject is allowed to manifest its own variability in the residuals, then the residual is captured as latent, which becomes an

outcome in the between-level analysis. The residuals $e_i \sim N(0, \sigma_i)$ are different for every subject and are normally distributed. The random residual variances are stated as $\sigma_i = exp(\delta_{1i} + \tau_{2i})$, where δ_{1i} are factors for between-level model and τ_{2i} are innovations. The residual variance is expressed as a log-normal function to avoid the situation where model may generate some negative outputs. Variances are always positive, so the log-normal function preserves a positive output.

3.3. The RDSEM Framework

The RDSEM is similar to the DSEM except that the RDSEM retains the structural components of the DSEM and includes a dynamic residual component. As stated earlier, the DSEM builds on both structural and dynamic relationships with the variables. With this framework, we can explore contemporaneous relationships in the model. We summarize the RDSEM below since the differences lie with the within-level model.

The between level model is as follows:

$$Y_{2,i} = \alpha_2 + \Lambda_2 \eta_{2,i} + K_2 X_{2,i} + \varepsilon_{2,i}$$

$$\eta_{2,1} = \beta_2 + \theta_2 \eta_{2,i} + \Gamma_2 X_{2,i} + \xi_{2,i}$$

The vector $X_{2,i}$ is a vector of the subject-specific time invariant covariate. Similarly, $\eta_{2,i}$ represents the subject-specific time invariant latent variables.

The within-level model is as follows:

$$Y_{1,it} = \alpha_1 + \Lambda_{1,0} \eta_{1,it} + R_0 Y_{1,it} + K_{1,0} X_{1,it} + \widehat{Y}_{1,it}$$

$$\eta_{1,it} = v_1 + B_{1,0} \eta_{1,it} + Q_0 Y_{1,it} + \beta_2 X_{1,it} + \hat{\eta}_{1,it}$$

Where:

$$\widehat{Y}_{1,it} = \sum_{l=0}^{L} \Lambda_{i,l} \hat{\eta}_{1,i,t-1} + \sum_{l=0}^{L} R_l \widehat{Y}_{1,i,t-1} + \varepsilon_{1,it}$$

$$\hat{\eta}_{1,it} = \sum_{l=0}^{L} \Theta_{i,l} \hat{\eta}_{1,i,t-1} + \sum_{l=0}^{L} Q_l \widehat{Y}_{1,i,t-1} + \xi_{1,it}$$

In the RDSEM, the autoregressive effect of $\widehat{Y}_{1,i,t-1}$ on $\widehat{Y}_{1,it}$ is estimated indirectly through the residual effect. This contrasts with that of the DSEM, where the estimate is direct between the variable and its lagged factors.

3.4. The Empirical Model
3.4.1. Study Variables

The variables used in the model are observed continuous macroeconomic variables. The variables are fiscal balance, which is used as a proxy for fiscal deficit, and current accounts balance that is used as proxy for current account deficit.

The fiscal balance variable is measured as the difference between the government's total revenue and grants less total expenditure and net lending as a percentage of GDP. Where the data is negative for a particular year for a given subject, it means that the subject recorded a deficit. Current account balance is measured by the sum of trade balance, net services, net income, and net transfers expressed as a percentage of GDP. It has been described as a good indicator for the savings and investment behavior of the economy (Eita, Manuel, & Naimhwaka, 2018). Similarly, if the current account balance is negative this indicates a deficit, and when it is positive it indicates surplus.

The variables are defined in the analysis as follows:

Def is fiscal deficit.

Caccts is current accounts deficit.

The dependent variables are fiscal balance and current account balance, while the independent variables are the one-year lag of fiscal balance and current account balance.

Dependent variables: *Caccts, Def*

Independent variables: *Caccts -1, Def -1*.

3.4.2. Within-level Model

$$Def_{it} = \lambda_{1,i} + \gamma_{11,i} \, Def_{i,t-1} + \varepsilon_{1,it}$$

$$Def_{it} = \lambda_{1,i} + \gamma_{21,i} \, Caccts_{i,t-1} + \varepsilon_{1,it}$$

$$Caccts_{it} = \lambda_{2,i} + \gamma_{12,i} \, Def_{i,t-1} + \varepsilon_{2,it}$$

$$Caccts_{it} = \lambda_{2,i} + \gamma_{22,i} \, Caccts_{i,t-1} + \varepsilon_{2,it}$$

The parameters $\lambda_{1,i}$ and $\lambda_{2,i}$ are intercepts which varied with different research subjects. Also, $\gamma_{11,i}$ and $\gamma_{22,i}$ are first order autoregressive parameters for fiscal deficit and current account deficit, respectively. The remaining parameters, $\gamma_{12,i}$ and $\gamma_{21,i}$, are cross-lag parameters for the effects of current account deficit on fiscal deficit and fiscal deficit on current account deficit, respectively. $\varepsilon_{1,it}$, $\varepsilon_{2,it}$ are innovations that measure unexplained dynamic factors. The innovations are multivariate normal distributions with distinct individual subject variances, $\varepsilon_{1,it} \sim MN(0, \varphi_i)$ and $\varepsilon_{2,it} \sim MN(0, \varphi_i)$. These distinct variances become factors in the between-level model.

3.4.3. Between-level Model

The between-level model has two within-level mean parameters, μ_{def} and μ_{caccts}. It also estimates four parameters, two autoregressive and two cross-lagged ($\gamma_{11,i}$, $\gamma_{22,i}$ and $\gamma_{12,i}$, $\gamma_{21,i}$). The autoregressive

parameters are $\gamma_{11,i}$ and $\gamma_{22,i}$, while the rest are cross-lag parameters. Last, we estimate two log-normal parameters for the individual subject variances ($LogV_{def}$, $LogVcaccts$).

$$\mu_{def,i} = \theta_{def} + \sigma_{def,i}$$

$$\mu_{caccts.i} = \theta_{caccts} + \sigma_{caccts,i}$$

$$\gamma_{11,i} = \theta_{11} + \sigma_{11,i}$$

$$\gamma_{22,i} = \theta_{22} + \sigma_{22,i}$$

$$\gamma_{12,i} = \theta_{12} + \sigma_{12,i}$$

$$\gamma_{21,i} = \theta_{21} + \sigma_{21,i}$$

$$LogV_{def,i} = V_{def} + \sigma_{def,i}$$

$$LogV_{caccts,i} = V_{caccts} + \sigma_{caccts,i}$$

Where the residuals indicated by σ have zero means and variance-covariance Ω.

The estimation of the model is based on the work of Asparouhov et al. (2018a) using ®Mplus 8. The DSEM is estimated using Markov Chain Monte Carlo methods (MCMC) through the Gibbs sampler (Asparouhov et al., 2018a). The model parameters (latent and observed) are based on Bayesian methodology that defines the MCMC iterative algorithm to enhance the flexibility of the model in accommodating several pieces of information at one time compared to the maximum likelihood estimation (MLE) (Asparouhov et al., 2018a; Hamaker et al., 2018). Its flexibility is based on the underlying multiplicity of conditional probability distributions, which do not collectively change upon the addition of new model updates.

The credible interval metric for the parameters defined by the Bayesian analysis formed a good basis to judge the fitness of the parameters. The model fitness estimation for this study is based on the deviance information criterion (DIC), where all variables in the model, both dependent and independent, should be continuous (Asparouhov et al., 2018a).

The DSEM, as said earlier, is based on Bayesian principle where all latent parameters are assigned prior distributions. The prior probabilities could be from previous results or could be a general view that is assigned to facilitate the estimation of the posterior probabilities. Under ®Mplus 8, there are given default prior distributions built into the software, which facilitate easy estimations of the associated probabilities. The default prior

distributions for the means and intercepts are given as univariate normal distribution $N(0, 10)$ (Hamaker et al., 2018). However the covariance matrix is given a diffuse prior distribution of inverse Wishart distribution with a zero scale matrix and degrees of freedom, which equals the number of variables in the model minus one (Hamaker et al., 2018).

We thus have the within-level covariance prior distribution as the inverse Wishart distribution of $\psi^w = IW(0, -4)$. The between-level fixed effects prior distribution is $\lambda^j = (0, 10^{10})$ for all factors. Similarly, the covariance prior distribution for the between-level parameters is $\psi^b = IW(0, -13)$ and between-level fixed effects prior distribution is $\lambda^j = (0, 10^{10})$. Model two is $\psi^w = IW(0, -3)$ for the within level and between-level fixed effect prior to $\lambda = (0, 10^{10})$ for all factors. The between-level covariance prior distribution is $IW(0. -7)$.

Giving the Bayesian underpinnings of the DSEM, modelling with missing data gave results similar to missing at random (MAR) in large dataset, where MAR explains a systematic variation between the missing and observed data, but the variation can be explained by other observed variables in the dataset (Asparouhov, Hamaker, & Muthén, 2018b). Using Bayesian procedures for handling missing data, each iteration of the MCMC algorithm samples missing data from their conditional posterior (Hamaker et al., 2018). When we consider a first order autoregressive dynamic model as given by the study models, under a situation where there is missing data of subject i at time t, the conditional posterior of the missing value will depend on neighboring observations of the missing data, the value of the individual's autoregressive parameter at the current iteration of the MCMC, and the uncertainty that is expressed by the individual's residual variance (Hamaker et al., 2018).

3.4.4. RDSEM Model

For the within-level covariance, we included the parameter "time" into the model to enable us to model the trend in the data efficiently. This is one of the merits of RDSEM, which manages trend issues in the model explicitly rather than in traditional time series approaches.

$$def_{it} = \lambda_{1,i} + \lambda_{2,i} Caccts_{it} + \lambda_{3,i} Time_{it} + \xi_{it}$$

$$\xi_{it} = \phi_i \xi_{it-1} + v_{it}$$

$$\lambda_{1,i} = \theta_{10} + \sigma_{1,i}$$

$$\lambda_{2,i} = \theta_{20} + \sigma_{2,i}$$

$$\lambda_{3,i} = \theta_{30} + \sigma_{3,i}$$

$$\phi_i = \theta_{40} + \sigma_{4,i}$$

$$Caccts_i = \theta_{caccts} + \sigma_{caccts}$$

$$def_i = \theta_{def} + \sigma_{def}$$

Where, v_{it} is normally distributed $N(0, \sigma_w)$, and $\sigma_{j,i}$ are also normally distributed $N(0, \sigma_n)$.

4. RESULTS

4.1. The DSEM Results

Table 1 shows the initial properties underlying the estimation of the model within the Bayes framework. The model adopted 10,000 iterations with two chains and because we used only one thinning for the iterations, the output of the analysis was based on the entire 10,000 iterations. The algorithm is based on Gibbs, which is defaulted in the ®Mplus 8.2 software for the DSEM multilevel analysis. These properties ran through all the DSEMs used in the study.

Table-1. Model estimation properties.

Estimator	Bayes
Number of MCMC chains	2
Random seed for first chain	0
Starting value information	Unperturbed
Algorithm used for the MCMC	Gibbs (PX1)
Convergence criterion	0.500D-01
Maximum number of iterations	K-th iteration used for thinning

4.2. Model Fit Information

Table 2 presents the deviance information criterion (DIC) for the model fitness. The DIC and the estimated parameter results are 1922.78 and 17.31, respectively, and since these metrics are relatively low, we can pass the modes as being credible.

Table-2. Model fit information.

Metric	Output
Number of free parameters	16
Deviance (DIC)	1922.78
Estimated number of parameters (pD)	17.31

4.3. Between-level Estimates of Fixed Effect Parameters

The estimates for the fixed parameters of means and variances as well as 95% credibility intervals (CI) are presented in Table 3. The results show that the average current accounts balance across the countries as well as the cross-lagged fixed effect parameters, Beta2 and Beta3, have zeros in their CI. This means that they have no statistical significance in the explanation of the relationship between fiscal deficit and current accounts deficit. Also, the estimated mean of the previous year's fiscal balance on future current accounts balance (Beta2) is 0.004 and came with a relatively small variance of 0.18. Similarly, the mean effect of previous year's current account balance on future fiscal balance is zero with an estimated variance of 0.006. The relatively small mean and variance estimates indicate that the individual cross-lagged effects are close to zero.

The mean horizontal line across all the countries in the WAMZ around which fiscal balance varies is -3.616 (which indicates deficit) and around this average line comes a non-null spread of 7.41. This means that the countries stand wider apart in terms of their experiences with fiscal deficit. Further to this, the average autoregressive coefficient of all the countries with regard to their fiscal balance is 0.506 with a non-null variability of 0.165. This shows significant between-country variability with regard to the autoregressive effect of fiscal deficit among the

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studied countries. Since the average autoregressive value is relatively high and positive, it points to the likelihood of countries with higher deficits in previous years experiencing high deficits in the future.

Also, the average autoregressive coefficient of all the countries with regard to current account balances is 0.718 with a non-null variance of 0.085. We wish to emphasize that the relatively small variance of the average autoregressive score does not mean that the between-country spread is weak. This is because a variable is said to be stationary if its autoregressive parameter is within the interval (-1,1), and by this, the expected spread around the autoregressive parameter is likely to be small (McNeish & Hamaker, 2020). Thus, we can say the average autoregressive coefficient of current account balances among the countries in the WAMZ region reveals considerable between-country variability. This implies that current account realizations are directly influenced by previous year's shocks; however, the strength of influences is not the same across the board. Countries with deficits in their previous year's current account balances are likely to register a deficit in current account realization in future consecutive years, all other things remaining the same.

The average residual variances for fiscal balance and current account balance are exp(0.732) = 2.079 and exp(1.554) = 4.730, respectively. This means a large spread of country-specific variability in the data, such that it would have been problematic if we had represented a common variance for the entire sample. For instance, Nigeria's dominance in the West African market may present a different spread pattern in its macroeconomic flow variables compared to the remaining countries.

Table-3. Estimates of between-country fixed parameters.

Parameter	Estimate	Posterior S.D.	P-value	Lower 2.5%	Upper 2.5%	Sig.
Means						
Def	-3.616	1.817	0.020	-6.997	-0.304	*
Caccts	-9.328	7.564	0.055	-24.394	2.396	
Beta1(Def on Def-1)	0.506	0.334	0.020	0.006	0.978	*
Beta2(Caccts on Def-1)	0.004	0.438	0.490	-0.636	0.712	
Beta3 (Def on Caccts-1)	0.000	0.069	0.490	-0.121	0.116	
Beta4 (Caccts on Cacccts-1)	0.718	0.205	0.005	0.364	1.088	*
LOGV1	2.248	0.437	0.000	1.464	3.279	*
LOGV3	3.264	0.621	0.000	2.033	4.898	*
Variances						
Def	7.408	33.998	0.000	0.195	85.287	*
Caccts	171.863	1147.035	0.000	12.666	2769.025	*
Beta1 (Def on Def-1)	0.165	1.361	0.000	0.013	2.820	*
Beta2 (Caccts on Def-1)	0.178	3.221	0.000	0.001	5.340	*
Beta3 (Def on Caccts-1)	0.006	0.071	0.000	0.000	0.253	*
Beta4 (Caccts on Caccts-1)	0.085	0.531	0.000	0.016	1.140	*
LOGV1	0.732	2.779	0.000	0.099	7.546	*
LOGV3	1.554	6.756	0.000	0.286	13.290	*

4.4. Within Level Estimates of Parameters

Table 4 provides standardized within-level estimates of the parameter. This is based on autoregressive and cross-lagged analyses and their 95% credibility intervals (CI) for fiscal balance and current account balance. The model output is standardized to account for the variations in the unit of measurement of the variables for efficient interpretation of the parameter estimates. This enables us to focus closely on individual variable contributions to the model explanation achieved by conventional interpretation. ®Mplus made provisions for standardized random parameters by first standardizing individual parameters before averaging the same over sample space (McNeish & Hamaker, 2020).

The cross-lagged parameters, as indicated earlier in the fixed effects analysis, have zeros in their CIs and thus there is no statistically credible relationships flowing from fiscal balance to current account balance or vice versa.

That is, the data available cannot relate fiscal balance and current account balance, which is in contrast to the established view of the twin deficit hypothesis meaning that the results lean towards the Ricardian equivalence hypothesis. However, there is a non-null statistical relationship in the autoregressive relationship of fiscal balance with its one-year lag estimated at 0.53. This means that a previous year's shock of fiscal balance has a carry-over influence on its future realizations. Also, the autoregressive effect of current account balance is statistically credible, thus a previous year's current account balance has a carry-over effect on future realizations, which is estimated at 0.49.

Table-4. Standardized results of autoregressive and cross-lagged results.

Parameter	Estimate	Posterior S.D.	P-value	Lower 2.5%	Upper 2.5%	Sig.
Beta1 (Def on Def-1)	0.533	0.068	0.000	0.369	0.653	*
Beta2 (Caccts on Def-1)	0.001	0.061	0.495	–0.117	0.128	
Beta3 (Def on Caccts-1)	0.029	0.071	0.412	–0.124	0.138	
Beta4 (Caccts on Caccts-1)	0.633	0.092	0.000	0.479	0.795	*
LOGV1 (Def)	0.624	0.073	0.000	0.435	0.740	*
LOGV3 (Caccts)	0.498	0.091	0.000	0.289	0.636	*

4.5. The RDSEM Results

Tables 5, 6 and 7 show the entire results of the RDSEM analysis. The model fit information reveals a deviance score of 2086.99 with the number of estimated parameters at 25.32, which is higher than that of the DSEM result. Thus, the DSEM, in principle, is preferable to the RDSEM; however, the two models address different issues of the relationship between fiscal and current account balances.

Table-5. Model fit information.

Model fit metrics	Output
Number of free parameters	12
Deviance (DIC)	2086.987
Estimated number of parameters (pD)	25.322

Table-6. Estimates of fixed parameters.

Parameter	Estimate	Posterior S.D.	P-value	Lower 2.5%	Upper 2.5%	Sig,
Within						
Residual variance						
Def	9.237	3.226	0	7.395	12.179	*
Caccts	68.407	7.782	0	55.258	85.452	*
Between						
Means						
Def	6.693	21.423	0.409	–39.598	32.883	
Caccts	–9.218	6.846	0.05	–21.069	3.854	
Beta1 | Def on Caccts	0.145	0.233	0.168	–0.28	0.6	
Beta2 | Trend	–0.005	0.012	0.341	–0.019	0.018	
Phi	0.556	0.273	0.024	0.004	1.088	*
Variances						
Def	21.299	1299.426	0	0.454	2093.928	*
Caccts	126.088	734.602	0	31.024	1527.452	*
Beta1	0.12	1.776	0	0.018	1.545	*
Beta2	0	0.001	0	0	0.001	*
Phi	0.176	0.976	0	0.022	2.187	*

The fixed estimates of the residual variances of fiscal balance and current account balance are 9.24 and 68.41, respectively, and both have non-null credibility variances. This means that the two variables have reasonably high variabilities and their spread around their respective residual means is quite high. Also, the between-level means of

the parameters reveal that apart from the residual lagged relationship parameter, Phi, all the other parameters have zeros in their credibility intervals and thus their relationship has no significant statistical effects. Of much interest is the null credibility of the estimated trend parameter, Beta2. The trend parameter is fitted to measure the likelihood of the variables trending in a linear way apart from the fundamental assumption of the intensive longitudinal data (ILD) of a horizontal trend pattern. The null credibility result of the trend parameter means that there is no statistically significant linear trend pattern in the data across the respective subjects over time.

With regards to the within-level effects, the average autoregressive effect of the residual is 0.56 with a non-null variance of 0.18. Also, the standardized results show a non-null contemporaneous relationship between fiscal balance and current account balance, estimated as 0.235. This can be interpreted as a 100% increase in fiscal deficit and will result in a 23.5% rise in current account deficit, all other factors remaining the same. This is in contrast to the results obtained under the DSEM and may be attributed to the role played by the lags in the residual variable (Asparouhov & Muthén, 2019).

Table-7. Standard estimates of within parameters.

Parameter	Estimate	Posterior S.D.	P-value	Lower 2.5%	Upper 2.5%	Sig.
Beta1 | Def on Caccts	0.235	0.079	0.004	0.073	0.38	*
Beta2 | Trend	−0.015	0.017	0.22	−0.04	0.031	
Phi	0.542	0.085	0	0.384	0.71	*
Residual Variances						
Def	0.489	0.085	0	0.323	0.651	*
Caccts	1	0	0	1	1	

5. DISCUSSION

The results of the DSEM indicate that there is a positive carry-over effect of the previous year's fiscal balance on its future performance. Also, there is a carry-over effect of the previous year's current account realization on its future attainment. In both instances, the effects of the autoregressive influences with regards to fiscal and current account balances are not the same across countries. The significant variability in the deficits testify to significant structural differences in the economies of the WAMZ countries. Nigeria and Ghana are the dominant economies in the sub-region with reasonable political stability. Nigeria's economic clout has been sizeable, constituting about 60% of the entire West African economy with crude oil export as its major source of revenue (African Development Bank, 2018; Khobai, Kolisi, & Moyo, 2018). Ghana's economy has been driven by cocoa and gold exports, and until recently, crude oil (Ibrahim & Liu, 2018). Commodity prices have determined the performances of Nigeria's and Ghana's fiscal and current account balances because very little value is added to exportable commodities and would largely suffer price fragilities. On the other hand, the Mano Region countries (Sierra Leone, Liberia, and Guinea) have suffered untold episodes of prolonged civil unrest and disease epidemics, such as Ebola (Bausch, 2015). These incidents have greatly impacted their capacities to raise revenues to meet increased expenditure to finance critical growth sectors of their economies. They have experienced weak fiscal balances, especially from the time of the unrest, and it has affected revenue generation and expenditure (Bowles, Hjort, Melvin, & Werker, 2016).

The exports from the Mano Region include rubber from Liberia, diamond from Sierra Leone, and bauxite from the Republic of Guinea (Outram, 2016). Though these countries have well-endowed natural resources with economic value, they have not been able to position their production levels to influence their presence on the global market, like what Ghana and Nigeria have managed to do with regards to cocoa, gold, and crude oil. The structural weaknesses in terms of poor linkages in their respective production value chains constrain the capacities of the economies to leapfrog out of weak fiscal and current account balance positions (UNCTAD, 2017). A poor fiscal balance performance in a given year is likely to be repeated in the subsequent year unless favorable international market conditions bail out commodity prices. Shocks in international commodity prices do not usually ease abruptly and thus autoregressive influences on subsequent fiscal effects may be rigid.

Also, the results established that there is no statistically significant cross-lagged effect of the previous year's fiscal balance on the current account balance of the following year. The reverse case is also true, that there is no cross-lagged effect of the previous year's current account balance on future fiscal balance performance. This points to the fact that the DSEM does not lend support to the twin deficit hypothesis in the context of the WAMZ. This result is consistent with El-Baz (2014) and Suri & Shome (2013); however, it is inconsistent with Merza et al. (2012) and Ganchev (2010). There is thus no unidirectional or bidirectional relationship between fiscal balance and current account balance, confirming the Ricardian Equivalence Hypothesis.

Finally, under the RDSEM, the standardized results show a positive non-null relationship between fiscal balance and current account balance. This contrasted the results obtained under the DSEM and may be attributed to the contemporaneous effect of the RDSEM against the structuralist model adopted by the DSEM (Asparouhov & Muthén, 2019). That is, the relationship between fiscal and current account deficits is statistically significant if a significant autoregressive effect exists in the residuals. This means that the effect of the relationship among other key economic variables was not considered in the model that plays a critical role in defining the connection between fiscal deficit and current account deficit and this may be part of the reason why the debate is ongoing. We can therefore establish that worsening current account and fiscal deficits occur concurrently and are driven by the relationship between other external economic variables.

6. CONCLUSIONS AND POLICY RECOMMENDATION

The study concludes that there is no statistically significant effect of fiscal deficit on current account deficit, either unidirectionally or bidirectionally. However, when we allow an autoregressive relationship among the residuals, there is a significant positive relationship between fiscal deficit and current account deficit. That is, the relationship between fiscal deficit and current account deficit is affected by other external economic variables captured in a lagged relationship among the residuals. We therefore established that worsening current account and fiscal deficits occur concurrently and are driven by the lagged relationship in other factors not explicitly captured in the model. Fiscal deficit and current account balance have a contemporaneous relationship and thus can be managed independently. We recommend to the governments of the member countries' economies to look at increasing revenue or reducing expenditure to achieve the desired fiscal deficit targets of the convergence criteria.

REFERENCES

African Development Bank. (2018). West Africa economic outlook. Frican development bank group, Avenue Joseph Anoma, 01 BP 1387, Abidjan Cote d'Ivoire. Retrieved from: www.afdb.org.

Akalpler, E., & Panshak, Y. (2019). Dynamic relationship between budget deficit and current account deficit in the light of Nigerian empirical application. *Evolutionary and Institutional Economics Review, 16*(1), 159–179. Available at: https://doi.org/10.1007/s40844-019-00122-8.

Asparouhov, T., Hamaker, E. L., & Muthén, B. (2018a). Dynamic structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal, 25*(3), 359–388. Available at: https://doi.org/10.1080/10705511.2017.1406803.

Asparouhov, T., Hamaker, E. L., & Muthén, B. (2018b). Dynamic structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal, 25*(3), 359-388.

Asparouhov, T., & Muthén, B. (2019). Comparison of models for the analysis of intensive longitudinal data. *Structural Equation Modeling: A Multidisciplinary Journal, 27*(2), 1–23.

Bakarr, T. A. (2014). Fiscal deficits and current account imbalances: Evidence from Sierra Leone. *International Journal of Business and Social Science*, *5*(8), 256-269.

Barro, R. J. (1989). The ricardian approach to budget deficits. *Journal of Economic Perspectives*, *3*(2), 37–54.

Bartolini, L., & Lahiri, A. (2006). Twin deficits, twenty years later. *Current Issues in Economics and Finance*, *12*(7), 1-7.

Bausch, D. G. (2015). The year that Ebola virus took over west Africa: missed opportunities for prevention. *The American Journal of Tropical Medicine and Hygiene*, *92*(2), 229-232.

Bayramoğlu, A. T., & Oztürk, Z. (2018). Assessing the twin and triple deficit hypotheses in developing economies: A panel causality analysis, in Global approaches in Financial Economics, Banking and Finance (pp. 209–225). Cham: Springer.

Bhat, J. A., & Sharma, N. K. (2018). The twin-deficit hypothesis: Revisiting Indian economy in a nonlinear framework. *Journal of Financial Economic Policy*, *10*(3), 386-405. Available at: https://doi.org/10.1108/jfep-09-2017-0082.

Bowles, J., Hjort, J., Melvin, T., & Werker, E. (2016). Ebola, jobs and economic activity in Liberia. *J Epidemiol Community Health*, *70*(3), 271–277.

Eita, J. H., Manuel, V., & Naimhwaka, E. (2018). Macroeconomic variables and current account balance in Namibia. Munich Personal RePEc Archive, MPRA_paper_88818.pdf.

El-Baz, O. (2014). Empirical investigation of the twin deficits hypothesis: The Egyptian case (1990-2012). Munich Personal RePEc Archive, MPRA_paper_53428.pdf.

Ganchev, G. (2010). The twin deficit hypothesis: The case of Bulgaria. *Financial Theory and Practice*, *34*(4), 357–377.

Ganchev., G. T., Stravrova, E., & Tsenkov, V. (2012). Testing the twin deficit hypothesis: The case of central and Eastern Europe countries. *International Journal of Contemproary Economics and Administrative Science*, *2*(1), 1–21.

Gebremariam, T. K. (2018). The effect of budget deficit on current account deficit in Ethiopia: Investigating the twin deficits hypothesis. *International Journal of Economic and Management Science*, *7*(4), 1-6. Available at: https://doi.org/10.4172/2162-6359.1000530.

Hamaker, E. L., Asparouhov, T., Bose, S., Schmied, F., & Muthen, B. (2018). At the frontiers of modeling intensive longitudinal data: Dynamic structural equation modelsfor the affective measurements from the COGITO study. *Multivariate Behavioral Reserch*, *53*(6), 820-841. Available at: https://doi.org/10.1080/00273171.2018.1446819.

Holcombe, R. G. (2004). National income accounting and public policy. *The Review of Austian Economics*, *17*(4), 387–405.

Ibrahim, I., & Liu, H. (2018). *Challenges in promoting economic growth of Ghana through value added exports.* Paper presented at the in CBU International Conference Proceedings.

Khobai, H., Kolisi, N., & Moyo, C. (2018). The relationship between trade openness and economic growth: The case of Ghana and Nigeria. *International Journal of Economics and Financial Issues*, *8*(1), 77–82.

McNeish, D., & Hamaker, E. L. (2020). A primer on two-level dynamic structural equation models for intensive longitudinal data in Mplus. *Psychological Methods*, *25*(5), 610-635. Available at: https://doi.org/10.1037/met0000250.

Merza, E., Alawin, M., & Ala'Bashayreh. (2012). The relationship between current account and government budget balance the case of Kuwait. *International Journal of Humanities and Social Science*, *2*(7), 168–177.

Outram, Q. (2016). *Liberia: Economy. In: Frame, I, (ed.) Africa South of the Sahara 2017* (46th ed.): Europa Regional Surveys of the World. Routledge (Taylor & Francis).

Senadza, B., & Aloryito, G. K. (2016). The twin deficits hypothesis: Evidence from Ghana. *International Journal of Business and Economic Sciences Applied Research (IJBESAR)*, *9*(3), 55–62.

Shastri, S., Giri, A. K., & Mohapatra, G. (2017). An empirical investigation of the twin deficit hypothesis: Panel evidence from selected Asian economies. *Journal of Economic Research*, *22*, 1–22.

Suri, D., & Shome, S. (2013). The twin deficits hypothesis: A mirage in India. *International Journal of Research in Economics & Social Sciences*, *3*(12), 1–17.

UNCTAD. (2017). Diamond exports from Botwana and Sierra Leone: The role of institutions in mitigating the impact of commodity dependence on human development Background document to the Commodities and Development Report 2017. UNCTAD, Special Unit on Commodities, Pallais des Nations, CH-1211 Geneva 10. UNCTAD/SUC/2017/9.

WAMI. (2000). Accra declaration on creation of a second monetary zone. ECOWAS. Retrieved from: www.wami-imao.org.

Wirasti, A., & Widodo, T. (2017). Twin deficit hypothesis and Feldstein-Horioka hypothesis: Case study of Indonesia. Munich Personal RePEc Archive, MPRA_paper_77442.pdf.

Yeboua, K. (2016). Twin deficits phenomenon in West African economic and monetary union countries: Panel data analysis. *Asian Journal of Management Sciences & Education*, 5(2), 55-77.