Twin Deficits : Empirical investigation for Togo

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Abstract

This paper investigates the hypothesis of twin deficits in Togo. There is a great economic debate about the twin deficits hypothesis which indicates a positive relationship between the current account deficit and the fiscal deficit resulting from changes in tax revenues or government expenditures. The presence of this link is rarely tested for developing countries. To examine the twin deficits in Togo, I use a Vector AutoRegression (VAR) framework, based on time series from the period 1975-2015. I find a unidirectional causality from the fiscal deficit to the current account deficit and this reveals the presence of twin deficits in Togo and also conformity with the Keynesian approach (conventional view).

JEL classification: E62, H62, F32, C32, C12

Keywords: Twin Deficits; Fiscal Deficit; Current Account Deficit; Granger Causality test in a VAR model

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1 Introduction

Today, exchanging with the world through international trade and transfers between residents of different countries is already an effective fact for any economy in the world. But it does not stop there, since the economic analysis with its sharp elements of dissecting the balance of payments (National accounts tool allowing to have an overview of the relations between an economy and the rest of the world) revealed that the various balances of the macroeconomic accounts are all characterized by interrelationships. Thus, no government can allow itself to believe in a simple exercise, in a discretionary way, of its budget without however considering the links that the latter (the nature of its balance) has with the economy as a whole. Nevertheless, the balance of all the accounts are not, in reality, in conformity with the theoretical predictions. This is the case for the current account and the budget balance, which involve the concept of twin deficits[1]. This gives rise to a question for developing economics : do twin deficits exist in Togo ?

Several studies on twin deficits have emerged in the advanced economies since the early 1980s, when globalization was truly emerging and expanding in the global economy. But although these studies are numerous in the examination of the links between the two deficits, there is no consensus in reality to resolve any ambiguity about the existence and exact nature of this relationship between the two aggregates. Results support the Keynesian hypothesis (the classic view) (Salvatore (2006)) and show that the current account balance and the budget are closely linked. From another point of view, Enders and Lee (1990), Kim (1995) and Kaufmann et al. (2002) found consistent evidence with the assumption of Ricardian Equivalence, i.e. no systematic relationship between the two deficits. Contrary to these works, Kouassi et al. (2004) confirm the hypothesis of targeting the current account by finding a sense of causality from the current account to the fiscal deficit. This plurality and diversity of results accentuate the undisputed interest in seeking out what about those other economies, especially for developing economies which face a lot of challenges in fiscal management.

This interest lies in the fact that it brings new and relevant elements in the redefinition of trade and fiscal policies. Moreover, the determination of any causality between the two deficits puts at the heart of the decision-making, which one of these deficits must be exploited to obtain satisfactory results on the other and vice versa. Finally, the interest of investigating in the causality between deficits is the possibility of establishing economic integrated policies, that incorporate simultaneously fiscal and trade policies instead of defining them separately and distinctly.

While it is true that studies of twin deficits are becoming more numerous in the economic

[1]The term “twin deficits” was initially used in the 1980s in the United States during Ronald Wilson Reagan’s tenure, when both the US current account and budget deficits increased significantly. Subsequent to these joint developments, the deterioration of the external balance was attributed to the emergence of huge budget deficits. This causal relationship is therefore known as the twin deficit hypothesis (Salvatore (2006))

literature, it is even more true that there is no such research focused on the countries of the West African Economic and Monetary Union (WAEMU), particularly on Togo. The latter thus enjoys the privilege of being treated first in a framework guided by econometric modeling adapted to empirical facts.

The remainder of this paper is organised as follows. First, a section reviews the literature on the causality of twin deficits. The second present data used in this paper, while the third defines and presents the model that I adopt in the study. The last section examines the results obtained and deduces the implications concerning the nature of the links between the two deficits.

2 Twin Deficits: Theoretical Debates, Empirical Controversies, and Trends

This section presents the theoretical and empirical debates relating to questions of the links between the fiscal and current account balances. I first present the theoretical elements on the subject and then the second subsection summarizes the empirical works that have studied twin deficits.

2.1 Theoretical developments

Theoretically, there are four (4) types of causal relationship between the current account deficit (ca) and the budget deficit (bd).

The first states that a high budget deficit is supposed to widen the current account deficit. This theory is consistent with standard Keynesian macroeconomic models through the approach established by the Mundell-Fleming model and Keynesian absorption theory. According to this approach, an increase in the budget deficit under a flexible exchange rate regime would induce an increase in the domestic real interest rate, which in turn attracts foreign capital and this leads to a current account deficit (Salvatore (2006)). In the case of a fixed exchange rate, the fiscal stimulus pushes up domestic prices and increases imports and this leads to a worsening of the current account balance (Anoruo and Ramchander (1998)).

Contrary to these theoretical developments, Summers (1988) postulates that the State can resort to fiscal policy to settle its external deficit. This would therefore consist of reducing current account imbalances by acting on the budget deficit. We would find ourselves in the case of unidirectional causality from the current account to the budgetary balance under the concept of *Current Account Targeting Hypothesis* (CATH).

The current account and budget balance nexus has attracted the attention of a third category of theory. This is the *Ricardian Equivalence Hypothesis* (REH) according to which the two (2) deficits are not related by any interaction. The REH states that assuming constant public

spending, the financing of the budget deficit that would come from lower taxes through borrowing will have no effect on private investment but will rather act on private savings instead of influence the external deficit. Therefore, the REH does not predict any causal relationship between the budget and the current account.

Finally, the question of twin deficits is also linked to the degree of international mobility of capital made more complex by the puzzle of Feldstein and Horioka (1980) (PFH). If saving and investment are not strongly correlated, reflecting high capital mobility, then the fiscal deficit and the current account deficit are expected to move together (Xie and Chen (2014)). Implicitly this means that there would be a bidirectional causality (or a retroactive relationship) from one deficit to another and vice versa.

2.2 Empirical works

Empirical studies have failed to reach a real consensus regarding the twin deficits.

The economic literature counts a large number of works carried out empirically with the aim of determining the nature of the possible link between the two deficits. Enders and Lee (1990) followed by Alse and Bahmani-oskooee (1992) gave the pioneer works on examinations of the ca-bd relationship. Subsequently we can cite the studies which document the existence and different types of this relationship : Afonso and Rault (2008), Anoruo and Ramchander (1998), Bagnai (2006), Baharumshah and Lau (2007), Corsetti and Müller (2006), Daly and Siddiki (2009), Fidrmuc (2003), Grier and Ye (2009), Hatemi-J and Shukur (2002), Holmes (2011), Kalou and Paleologou (2012), Kaufmann et al. (2002), Kim (1995), Kim and Roubini (2008), Kouassi et al. (2004), Makin and Narayan (2013), Marinheiro (2008), Trachanas and Katrakilidis (2013).

In general, the methodologies adopted in the various empirical studies range from simple correlation analysis to Granger causality analysis and error correction modeling, through VAR models. The results that emerge therefore appear to be very diverse.

Salvatore (2006) tested the twin deficits hypothesis through data from G-7 countries[2] for the period of 1973 - 2005 and find that an increase in the budget deficit leads to an increase in the current account deficit. Conversely, Kim and Roubini (2008) have studied, with a VAR model, the effects of the budget deficit on the current account deficit and the real exchange rate with data from the United States for the period between 1973 - 2004. The authors concluded that fiscal deficit shocks improve the current account balance and lead to real exchange rate depreciation. The data was referred to by the concept of "twin divergence". On the other hand, Holmes (2011), using US data from 1947 to 2009, found a non-linear relationship between the current account deficit and the budget deficit through the highlighting of a cointegration threshold and his results conform to the Keynesian theory.

Kalou and Paleologou (2012) re-examine the link between deficits and based on a vector

[2]the United States, Japan, Germany, Great Britain, France, Italy and Canada

error correction model (VECM) from annual data over the period from 1960 to 2007. They find a positive relationship between these deficits and a strong causal link from the current account to the budget deficit, thus confirming Current Account Targeting Hypothesis (CATH) in Greece.

Twin deficits have been studied for Malaysia by Tsen (2014) who shows that there is a long-term relationship between the external balance and its determinants, including the budget, and also between the budget balance and its determinants, including the external equilibrium balance. Moreover, the Current Account Targeting Hypothesis (CATH) and the Ricardian Equivalence Hypothesis (REH) dominate the relationship between the two (2) deficits.

As far as studies on African countries are concerned, there are not enough of them. However, we can cite Omoniyi et al. (2012) who used data from the period 1970 - 2008 and found a dual relationship between the two deficits in Nigeria. But Onafowora and Owoye (2006) and Owoye preceded them in 2006 and showed the presence of a positive relationship between the trade deficit and the budget deficit in the long and short term in Nigeria. Wissem (2007) looked at the pairing of the two deficits in a small economy like Tunisia with an error correction model. His results were in favor of REH.

3 Data

This subsection presents the source and the definitions of the variables of the study and then gives a brief description.

3.1 The variables of interest

The data used in this study are annual and cover the period from 1975 to 2015. They come from the BCEAO database and relate only to Togo. There are five (5) principal variables of the study that are defined in the following lines :

ca: represents the current account balance relative to GDP for the same year. Its nature (surplus or deficit) expresses the capacity of the economy to cover its internal demand to the point of not having recourse to resources from abroad.

sb: represents the budget balance relative to the GDP of the same year. It expresses the importance of the State's expenditure relative to its revenue garnered during the same year.

inv: is the investment rate (investment over GDP). It replaces the interest rate role in this study.

tc: is the exchange rate and is a determinant of saving and private investment.

dum: is the dummy variable that characterizes the occurrence of the devaluation of the CFA Franc in 1994.

3.2 Correlation and brief description

Correlation analysis The correlation matrix below shows a positive and significant linear correlation between the fiscal balance and the current account balance for Togo. This significance associated with the sign gives an omen that there may be a pairing of deficits. However, we stop there and the econometric modeling has to bring a confirmation or an invalidation of this. In addition, the investment shows a negative sign because it is considered as an expense and therefore contributes to reducing the balance.

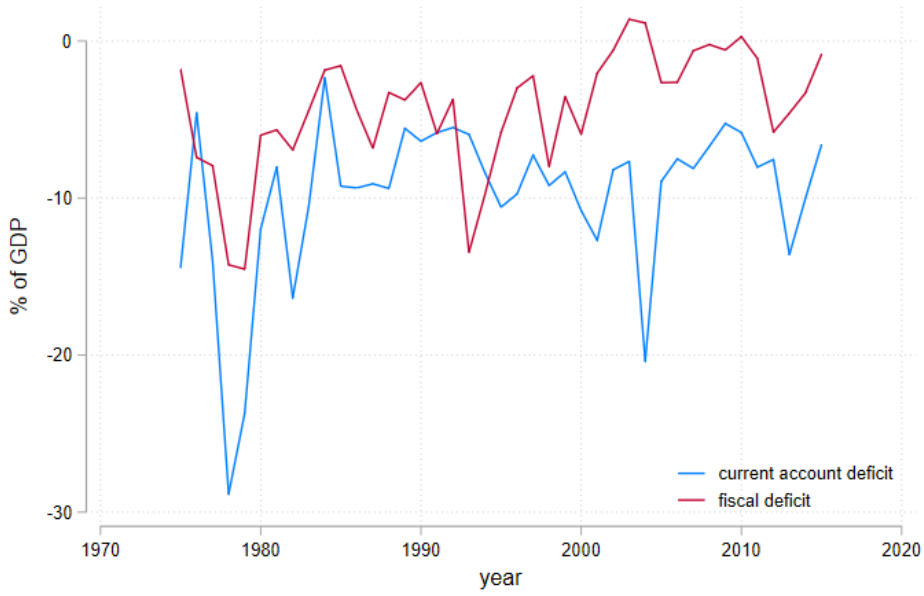
Table 1: Correlation matrix

	ca	sb	inv	tc
ca	1			
sb	0.4509*	1		
inv	-0.7087*	-0.3148*	1	
tc	0.2108*	0.4671*	-0.4386*	1

Source : BCEAO data on Togo, 1975 - 2015

This correlation analysis is relevant and conform regarding the evolution of both balances of our interest. The figure 1 shows that both balances evolve generally in the same sens and are generally negative. We have particular points to relate : (i) the huge drop in current account deficit due to the second oil crisis that occurred in the 1979 ; (ii) we can notice a second big decline current account balance about -20% of the GDP in 2004, because of political instability from the highly contested presidential elections.

Figure 1: Current deficit and Fiscal deficit



Source : BCEAO data on Togo, 1975 - 2015

4 Model

Several models have been proposed in the literature to analyze the deficits of countries and the results obviously differ from one author to another depending on the approach adopted. The following paragraphs focus first on the presentation of the theoretical model on which this study is based and then on the model that will be used for estimation purposes.

4.1 Theoretical model

The relationship between the current account deficit and the fiscal deficit can be theoretically demonstrated using the national accounts identity for an open economy :

$$Y_t = C_t + I_t + G_t + X_t - M_t \tag{1}$$

where Y_t is the GDP, C_t is the private consumption, I_t is the private investment, G_t is government expenditure (consumption), X_t is exports and M_t is imports. The equation 1 can be rewritten in terms of the trade balance $(X_t - M_t)$ as follows:

$$X_t - M_t = Y_t - C_t - I_t - G_t \tag{2}$$

Since the national saving S_t is equal to $Y_t - C_t - G_t$, the equation 2 can be rewritten as it follows :

$$X_t - M_t = S_t - I_t \tag{3}$$

National savings can be subdivided, in turn, into public savings (S_g) and private savings (S_p). Public savings is defined as $(T_t - G_t)$ and constitutes also the budget balance (called SB_t in the present paper), where T_t is the tax revenue and G_t is the public expenditure. When $(T_t - G_t)$ is positive, the government has a budget surplus and when it is negative, there is a budget deficit. The equation 3 can be written as follows:

$$X_t - M_t = S_p + \overbrace{T_t - G_t}^{SB_t} - I_t, \tag{4}$$

$$X_t - M_t = S_p - I_t + SB_t \tag{5}$$

where SB_t is the budget balance.

When $(X_t - M_t)$ is negative, it means a deficit of the current account, and then a country can finance the external sector by borrowing abroad. In other words, the country imports current consumption and exports future consumption.

The $S_p - I_t$ is the balance of savings and private investment. If private savings and investment are roughly the same or constant, then the external balance and the budget balance of the government will move in the same direction. If a change in budget deficit is offset by a change in savings, we are in the case of **Ricardian Equivalence**, which postulates that the budget and the current account are not linked (Algieri (2013)). An inter-temporal change between

taxes and budget deficits does not matter for the real interest rate, investment, or current account balance. This means that government deficits are neutral and twin deficits only occur as coincidences. Factors that influence the current account are factors such as the reaction of consumption to various shocks experienced by the economy (Kalou and Paleologou (2012)).

4.2 Estimation model

Since private savings and investment depend on the interest rate (ir_t), the exchange rate (tc_t) and the stock return (sr_t), the equation 5 can be rewritten as follows (Kalou and Paleologou (2012)):

$$X_t - M_t = S_p(ir_t, tc_t, sr_t) - I_t(ir_t, tc_t, sr_t) + SB_t \tag{6}$$

Given that Togo is part of WAEMU and therefore uses the common currency, the CFA Franc, the latter can only be included as exogenous in the relation described in 6. Moreover with regard to the interest rate, it is the same analysis because being of discretionary origin on the part of the BCEAO and therefore as this rate is the main determinant of the investment, it will be replaced by the investment rate, considered exogenous in this paper. It should be added that according to the literature and in regard to the economic theory, I consider that the relation which binds the two principal balances can be in one direction, both directions, or in the other direction. In this logic, it seems appropriate to specify a VAR model in which the explained vector is composed of the two (2) balances of my interest : *ca* and *sb*.

I end up with the VAR system in level, as following :

$$\begin{cases} ca_t = \sum_{t=1}^{p} a_{1i} * ca_{t-i} + \sum_{t=1}^{p} a_{2i} * sb_{t-i} + a_3 * inv_t + a_4 * tc + a_5 * dum + \mu_t \\ sb_t = \sum_{t=1}^{p} b_{1i} * ca_{t-i} + \sum_{t=1}^{p} b_{2i} * sb_{t-i} + b_3 * inv_t + b_4 * tc + b_5 * dum + \nu_t \end{cases}$$

However, the variables of interest will be considered in difference in the case where they are not both (2) stationary.

If at least one of the two (2) variables is not stationary, we will have to test the cointegration between them either by considering an approach by Johansen (1988) (if they are both I(1)), or an approach of cointegration of Pesaran et al. (2001) (for the case of a mix of I(0) and I(1)).

5 Results

This section is intended to present the various results obtained from the modeling of the link between the budget balance and the current account balance and to highlight the implications for economic policy. It is broken down into different stages such as the stationarity of the variables, the implementation of the model and its validation.

5.1 Test of stationarity of variables

The appropriate specification to adopt in the context of this study on Togo depends largely on the nature of the variables used there. Indeed, depending on whether the variables are all stationary or one I(0) and the other I(1) or even both integrated of order 1, a certain specification is allowed. This is why the first step in the present modeling relates to the tests of stationarity of the variables.

Table 2: Test of stationarity

Variables	**In level**		
	ADF	**KPSS**	**PP**
ca	-4.2687 *	0.2882 *	-3.9578 *
	(-3.50)	(0.463)	(-2.936)
sb	-4.1298 *	0.3855 *	-3.2577 *
	(-3.50)	(0.463)	(-2.936)

* Significant at 5%

( ) critical value

Source : BCEAO data on Togo, 1975 - 2015

The table 2 above shows that the variables used are both stationary. Indeed, the Augmented Dikey Fuller, KPSS and PP tests agree, because they all reveal the absence of unit roots within the series considered in level. With these results, one cannot consider testing the existence of any cointegration relationship. Moreover, the model to be adopted for the rest of the estimation is that of the system mentioned in the methodological section : a VAR model.

5.2 The optimal lag in the VAR

This part consists in determining the optimal number of lags that it seems appropriate to retain in the VAR specification. This selection involves the use of information criteria, the latter being calculated from the likelihood from each of the candidate models. There are several information criteria but, in the context of this study, we base ourselves on the four (4) most common criteria, which are as follows:

- AIC (Akaïke Information Criterion) ;
- SC (Schwartz Criterion) or BIC (Bayesian Information Criterion) ;
- HQ (Hannan-Quinn Criterion) ;
- FPE (Forecast Prediction Error)

The model, which tends to minimize the majority of the four (4) criteria, is retained. If we cannot decide, we use the statistical deviation applied to the sequence of the models associated with the different delays (Sequential model LR test).

Table 3: Choice of the optimal lag

Lags	**LogL**	**LR**	**df**	**p**	**FPE**	**AIC**	**HQ**	**SC**
0	-201.959				146.854	10.6646	10.7564	10.9205*
1	-195.525	12.869	4	0.012	129.908	10.5397	10.6928	10.9663
2	-188.804	13.442*	4	0.009	113.557*	10.4002*	10.6145*	10.9974

Source : BCEAO data on Togo, 1975 - 2015

According to the table 3, the optimal delay is **2**.

5.3 Model validation

The following elements validate the robustness of the estimated model. These are mainly the analysis of residuals and the stability of the VAR.

5.3.1 Residuals Autocorrelation

It is a question of checking if the residuals follow a white noise, by testing the nullity of the coefficients of autocorrelation intervening in their AR representation. This verification constitutes the principle of the Lagrange Multiplier test, the null hypothesis of which is "non-autocorrelation of the residuals". The results of this test summarized in the table below indicate that we accept at the 5% threshold that the residuals follow a white noise and are therefore not autocorrelated.

Table 4: Lagrange Multiplier Test

Lags	χ_2	**df**	**p-value**
1	1.4496	4	0.8355
2	4.1897	4	0.3809

Source : BCEAO data on Togo, 1975 - 2015

5.3.2 Stability of the VAR model

Here, it is a question of checking if all the eigenvalues resulting from the VAR representation are all of modules **less than 1**. This makes it possible to guarantee the good predictive properties of the VAR through its invertibility character. The table 7 of the appendices shows that the eigenvalues all have moduli less than unity and the graph 2 represents them.

5.4 Estimation of the model

The results of the estimation provided in the table 5 reveal that the VAR model implemented has been well specified and is globally significant. In addition, its explanatory character is high, especially since the R^2 of the two (2) equations are greater than 75%.

Table 5: Results of the VAR(2) model

	current account balance ca	**fiscal balance sb**
ca(-1)	-0.0023916	0.0303733
	(0.984)	(0.800)
ca(-2)	-0.3819815 **	-0.2000243 *
	(0.000)	(0.049)
sb(-1)	0.4747084 *	0.5558141 **
	(0.016)	(0.005)
sb(-2)	0.0561381	0.1186636
	(0.729)	(0.466)
inv	-0.4125611 **	-0.1348724 **
	(0.000)	(0.009)
tc	-0.0054621 **	0.000466
	(0.006)	(0.815)
dum_94	4.352559	-1.306491
	(0.234)	(0.722)
R^2	0.9369	0.7656
chi2	579.4147	127.3736
p-value	0.0000	0.0000
**** (resp. **) Significant at 5% (resp. 1%)***		

Source : BCEAO data on Togo, 1975 - 2015

Concerning the first equation (explaining the current account balance), we note that the current balance variable lagged by one period is not significant but is significant for lag 2 with a negative sign. This means a certain persistence of the previous balance but sanctioned by the delays occurring in the establishment of the State Financial Operations Table (TOFE). That said, to define the new trade policies for the coming year, the most recent complete information available to the Togolese State is only that of the previous year and not that in progress, which explains why It is the deficit of the latter which is significant in determining the values for the next financial year. The same is true for determining the budget balance in the second equation.

The budget deficit positively influences the trade deficit. This shows that **deficits are twins in Togo**. Indeed, from the coefficients of the budget balance, we deduce that an increase in the budget deficit of one point deteriorates the external deficit by about half a point. This shows that the Togolese State can reduce the external deficit by trying to reduce the budgetary one.

Besides these influences, it is noted that according to economic theory that the exchange rate has a negative impact on the trade balance. This situation is justified by the fact that a rise in the exchange rate depreciates the currency and inflates imports relative to exports. The result is a widening external deficit.

5.5 Causality between deficits

In order to consolidate the robustness of the results obtained, I carry out the test Granger causality. The latter allows me to test whether the past values of a variable X determine the current value of another variable Y, and in this case we will say that "X causes Y".

Table 6: Granger Causality

Equation	**chi2**	**df**	**p-value**
sb doesn't cause ca	9.7165	2	0.008
all variables don't cause ca	9.7165	2	0.008
ca doesn't cause sb	3.8711	2	0.144
all variables don't cause sb	3.8711	2	0.144

Source : BCEAO data on Togo, 1975 - 2015

The table 6 reveals that the causality between the two (2) deficits is unidirectional going from the budget deficit to the external deficit. The fiscal balance exerts a strong influence on the nature and size of the current account balance. This confirms the result found in the previous point. We are therefore in a situation of the Keynesian hypothesis (conventional point of view).

5.6 Shock analysis

Based on the impulse response functions represented on the graph 3 (in the Appendix), an analysis of the reactions following the shocks occurring in each of the deficits can be drawn.

shock on current account We are placed under a shock causing the external balance to fall drastically. This shock widens the deficit in the first two (2) years that follow and is absorbed after 4 to 5 years. In the same periods, the downward shock increases the budget balance. This confirms the sign obtained for the estimate and suggests an implied reaction of private investment sufficient to compensate the external deficit created and therefore this investment being taxed by the State inflates the coffers of the latter.

shock on budget balance We are in the case of a negative shock on the budget balance, which continues, drops slightly two (2) years later to fade and disappear after six (6) years. In response to this fall, which may be due for example to a drop in the level of taxation, companies will initially be encouraged in production and prompted to export, however in a second stage, if the budget deficit persists, government expenditure can stimulate economic activity to the point where companies are unable to cover domestic demand and this leads to an increase in imports which widens the external deficit in the third period.

6 Conclusion

The analysis of the existence of twin deficits in economies is a subject of great interest to many economists and remains among the topical issues little handled in Africa, particularly in Togo. It is for this purpose that this paper proposes to analyze the influence of the budget deficit on the current one and inversely, over the period from 1975 to 2015. There is theoretical foundation that links both of deficits, but this link can be non-existent, depending on dynamics of saving pattern in the country.

Through the tests on the stationarity of the variables we considered a Vectorial AutoRegressive - VAR (2) approach specified in the methodological section. The results obtained permit to highlight the positive influence of the budgetary balance on the current balance relatively more pronounced than the opposite direction. The analysis also reveals that the causality between the two (2) deficits is unidirectional, from budget deficit to external deficit.

From the various elements mentioned above, I conclude on the nature of the relationship between the two (2) deficits in Togo : **Togo has twin deficits respecting the Keynesian hypothesis**.

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Appendix

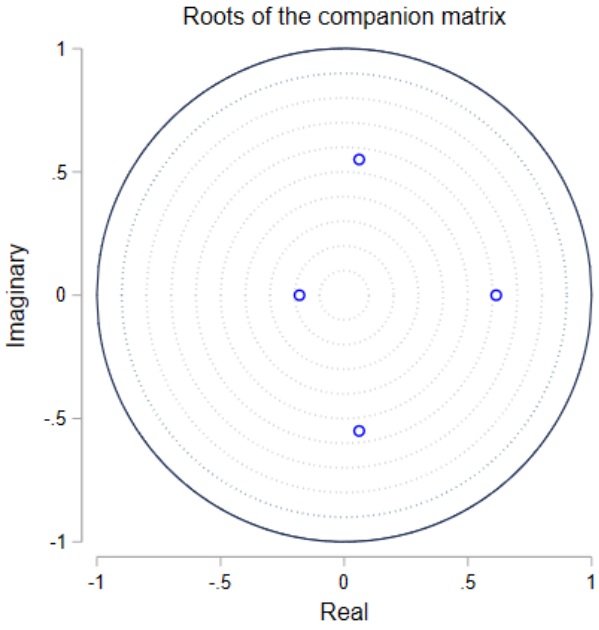
A - Stability of the VAR model

Table 7: Stability of eigenvalues of the VAR

Eigenvalues	Module
0.6140	0.6140
0.06024 + 0.5504i	0.5537
0.06024 + 0.5504i	0.5537
-0.1811	0.1811

Source : BCEAO data on Togo, 1975 - 2015

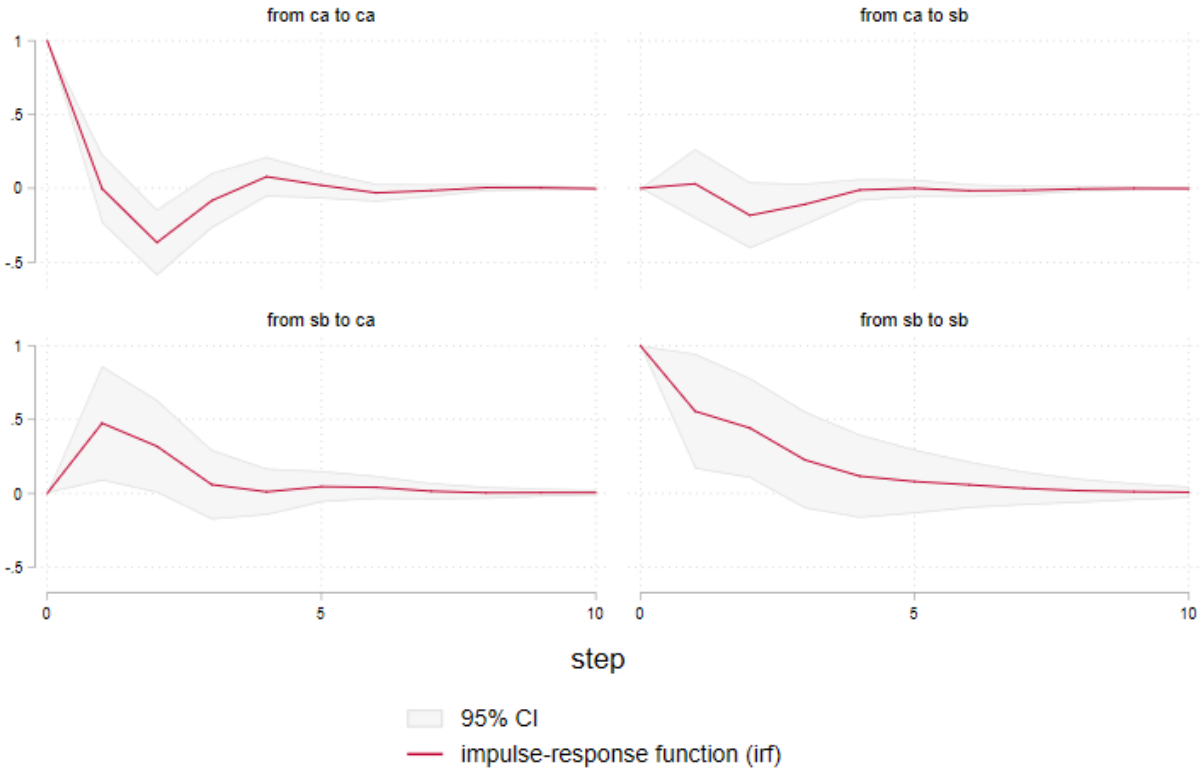
Figure 2: Representation of eigenvalues of the VAR



Source : BCEAO data on Togo, 1975 - 2015

B - Impulse response of the VAR(2)

Figure 3: Impulse response



Source : BCEAO data on Togo, 1975 - 2015