# Heterogeneity of Saving-Investment Causality and Fiscal Coordination Implication: The Case of an African Monetary Union

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# *« HETEROGENEITY OF SAVING-INVESTMENT CAUSALITY AND FISCAL COORDINATION IMPLICATION: THE CASE OF AN AFRICAN MONETARY UNION »*[1]

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**Abstract:**
*Monetary unions are characterized by contemporary institutional arrangements that entrust monetary policy to a supranational entity while fiscal policies are framed by rules imposed on the budget deficit. Limits on public deficits are usually justified by the idea that government deficits reduce national savings, which ultimately reduces domestic investment and economic growth. However, this idea that domestic savings must necessarily increase if investment increases cannot be taken for granted. Moreover, it is possible that within the union, countries reveal different saving-investment causality, which is capable of rendering considerable credibility and effectiveness of budgetary rules of government deficits systematic prohibition as a means to revitalize investment. This study raises the question of domestic savings-investment causality in an African monetary union with a focus on the WAEMU zone. It has been determined in each country from a methodology based on co integration vector representations analysis leading to error correction. The existence of a causality heterogeneity between savings-investment in this African monetary union leads to consider a new model of fiscal coordination in Africa incorporating this heterogeneity, including the adoption of a new budget rule more flexible based on a structural balance without public investment.*
Key words: monetary union, savings-investment causality, heterogeneity, fiscal coordination.
JEl Classification: C51; C59; E62; F43; H50; O40.

## 1. Introduction

The relationship between the domestic savings and investment is one of the biggest controversies in macroeconomics. At the heart of the debate is the question of the meaning of causality which occurs between these two variables. Is it saving that causes investment or is it investment that causes savings? As the theory of natural unemployment rate was the central issue in studies of monetary policy, the question of causality between savings and domestic investment is in turn decisive for fiscal policy. Indeed, the economic significance of government deficits is commonly built around the negative effects they have on the volume of domestic savings, and finally on capital formation. Behind this interpretation of the deficits is the idea that domestic savings consistently cause domestic investment. Government deficits then correspond to a public sector dissaving, which reduces domestic savings, which in turn will reduce investment. It is this view which usually justifies the choice of austerity fiscal policies or of the inter-temporal budget balance in developing countries plagued by budget problems with important consequences in terms of their external payments. If inversely, it is investment that causes savings, policies of abstinence from both the government and the private sector are needed and can be rather deflationary consequences. What matters then is the increase in capital expenditure with multiplier effects that we know. This indicated that the appropriate fiscal policy for an economy should be drawn under the constraint of the direction of causality which exists between savings and investment, and it also requires an empirical determination of causality given the indeterminacy theory that exists in this regard.

[1] This paper has been improved by taking into account relevant comments from participants of the third Annual international conference for Regional Integration in West Africa (ACRIA 3) under the topic: "Policy Coordination for Regional Integration in West Africa" at Dakar – Senegal, July 4-6, 2012, but the author is the only responsible of all mistakes which can remain in the paper.
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Transposed to the specific cases of monetary unions, the interest of savings-investment causation analysis is multiplied. Indeed, interest in the study of monetary unions, specifically their effectiveness, has grown with European unification. From this unification, came out several institutional arrangements covering fiscal and monetary aspects (Asongu, 2013a,b,c). The monetary policy was entrusted to a supranational and independent of political pressures entity, the European Central Bank, when fiscal policy remains the responsibility of national authorities. However, the definition of a Community budgetary criterion governing the expenditure in the EU[3] more binds the hands of public authorities of different countries. A maximum has been imposed on public deficits which must not exceed 3% of GDP. According to several authors (Palley, 1996; Alexiou, 2004). Indeed, the definition of the fiscal convergence criterion stated in the monetary union reflects the emergence of a neoliberal consensus which suggests that only balanced budgets or surpluses are the keys to revitalize domestic investment because government deficits absorb national savings that was intended for investment and thereby increases interest rates. Everything happens as the saving-investment causality is systematic and subject of consensus and more precisely, it would be exercised systematically from savings to investment.

Monetary union is a group of several countries with economies often structurally and / or conjunctural different sharing a common currency and striving to coordinate their policies. It is therefore likely that the degree of structural heterogeneity (productive structures, labor markets and financial structures) between countries remains long time after the unification with respect to circumstances heterogeneity that would normally fade over time. It comes as the specificity of each country may be indicative of saving-investment causality variance from one country to another within the monetary union, thereby putting into question the Community fiscal rule of government deficits systematic prohibition which is ultimately effective if all countries have similar causalities in the direction of domestic savings to domestic investment. In the presence of savings-investment heterogeneity causality, the fiscal community rule becomes like an asymmetric shock hitting member countries. Given that it allows the growth of domestic savings, it will be virtuous only in countries of the Union which has revealed causality from savings to investment. In other countries who do not reveal such causality, this rule will have recessive consequences. That is why the empirical analysis of saving-investment causality becomes important in the context of a monetary union as the WAEMU with institutional architecture relatively close to the EU and which could also introduce heterogeneities that actual arrangements would have difficulty to manage.

The purpose of this paper is to analyze the causality relationship between savings and investment in an African monetary union and particularly in the WAEMU zone. More specifically, we will (i) determine the causality direction between domestic savings and investment in each country and (ii) capture the major fiscal coordination implications in the monetary union.

The rest of the paper is organized as follows: Section 2 presents a brief literature review of major theoretical and empirical contributions to savings-investment relationship; Section 3 presents the methodology; Section 4 presents the data and the results obtained and Section 5 focus on economic policy implications.

## *2.* Empirical and theoretical debate on heterogeneity and the causality sense:

### 2.1. Causality direction between savings and investment: The theoretical indeterminacy.

[3] European Union.

The savings-investment relationship is generally known in theory through the divergent viewpoints that oppose economists especially concerning the causality direction that prevails. For economists called Classics and neoclassical, savings and investment equilibrium are made by interest rate on loanable funds market. Moreover, according to traditional analyzes of the link between finance and economic development, saving is the precondition for productive investment and economic growth, thus economic development (Gurley and Shaw, 1956; Goldsmith, 1969). For these authors, the main contribution of the financial system to economic growth is based on the fact that it ensures the efficient functioning of payment system, which mobilizes savings and improve its allocation to investment through positive real interest rates. The assumption of prior savings is also present in models of financial liberalization developed by Mckinnon (1973) and Shaw (1973). These models estimate that we can increase the level of domestic investment by stimulating the accumulation of domestic savings through real positive interest rates and an encouragement of competition between financial institutions. Bencivenga and Smith (1991) also showed that financial intermediaries, by the allocation of savings to illiquid assets process, and by reducing premature liquidation of profitable investments, improve capital productivity, and thus stimulate economic growth.

The analysis of Keynes (1936) proposes for its part, the reversal of causality, which traditionally runs from savings to investment. This new conception of the causal link between savings and investment developed by Keynes and recovery more precisely by the post-Keynesian theories (Godley and Cripps, 1985; Sodokin, 2004) theoretically offers an alternative approach to the savings and financial institutions role for economic development. In a post-Keynesian perspective, "finance" precedes the "savings" in the financing process of productive investment. Through an income multiplication process initiated by investment, it ultimately creates a savings in the economy.

Blecker (1997) goes further by stating that the traditional view that savings generally tends to precede the investment can be questioned for two reasons. The first reason is that economic policies aimed systematically increasing the savings rate may depress investment in contrast, because they have the immediate effect of significantly reducing aggregate demand. The second reason is that a reinterpretation of domestic savings role in case of international capital mobility environment is relatively high. Indeed, Blecker (1997) and especially Feldstein and Horioka (1980) mainly showed that if there is international capital mobility, savings will move to regions of the globe that offer a better return than the one of domestic savings. It follows that the association between domestic saving and domestic investment will be strong when capital mobility and economic integration is low. Other authors also share the view that investment precede saving in the process of income creation and multiplication. Skott (1989) following the Keynesians considers investment as the key variable. His argument is that firms first decide the level of investment to achieve, and later, income and savings are adjusted accordingly. For Gordon (1995) as for Harcourt and Spajic (1998), causation in fact, takes place from investment to savings.

### 2.2. Indeterminacy reinforced at the National Accountability level:

In open economy, there are four possible uses of goods and services produced. The national income identity expressed these four components of gross domestic product (GDP).

$$Y = C + I + G + EXn.$$

With $Y$ the GDP, $C$ the private consumption, $I$ the total investment, $G$ the government consumption and $EXn$ is net exports of goods and services obtained by the difference between exports of goods and services and imports of the same nature. According to this equation (in fact this equality purely accounting), domestic spending which are expenditure made on national territory, is the sum of consumption, investment, government spending and net exports. This equality shows the links between production and expenditure on the national territory. By changing the positions of certain variables in the equation, we get successively:

$Y - C - G = I + EXn$. We know that domestic savings is: $Y - C - G$.

Thus, $S = I + EXn$.

By subtracting $I$ from the two equation sides, the national income accounting identity can be rewritten like follow:

$S - I = EXn$.

This presentation of the national income accounts identity shows that net exports of an economy must be equal to the difference between its savings and investment.

By disaggregating domestic savings into private savings ($S^p$) and public ($S^g$), we obtain:

$$I = S^p + S^g - Exn.$$

Reasoning from this accounting identity, at the end of period, investment increases only as the two components of domestic savings increase. But it is extremely important to emphasize that this accounting identity is informational only. It teaches us only that domestic investment is equal to the sum of private and public savings net current account, not a causal relationship between variables.

The total savings in the economy is indeed the sum of budget surplus, household savings and retained earnings of private enterprises. How can we be sure that the increase in one component of domestic savings, for example, will leave other components unchanged? Indeed, an increase in taxes, while increasing public savings, will reduce disposable private income and hence private savings, thus leaving relatively unchanged the total savings; It is the neutrality of boosting investment policy funded on a prior rise in public savings which will be observed. Moreover, an increase in public savings can be sufficiently valued by the private sector which can then increase its consumption while reducing it savings, which once again, tend to leaves unchanged the volume of domestic savings.

We can multiply the examples, but the truth is evident: the relationship between these two macroeconomic variables (savings and investment) is ambiguous and complex. Solving the problem with an empirical point of view is one of the ways to resolve the indeterminacy.

### 2.3. Heterogeneity between countries and causality direction between savings and investment: Divergent empirical results.

The problem of heterogeneity in an economic and monetary union has been highlighted by several theoretical and empirical studies. Nguena, C. L., (2011) for example have undertake the problem of Individual Heterogeneity applied to Sub Saharan African context by verifying improvement in terms of specification and estimation of economic growth model, linked to the consideration or not of individual heterogeneity; He found that taking into account

individual heterogeneity improves the quality of the model; Thus this implies that the same economic policy may lead to different results in different countries and that it is desirable that economic policy decision for several countries must consider countries individual characteristics before implementation.

Concerning the types of causal relationship between savings and investment especially, although few in number, some empirical works are instructive. As such, we can first retain the studies of Palley (1996) for the U.S. case and Alexiou (2004) with regard to some countries in the euro zone. Both authors argue that the empirical determination of the saving-investment causality should inform the budgetary authority on the relative superiority of one or other budgetary option including: abstinence or increased investment expenditure. Palley (1996) adopts a methodology based on the Granger test and on analysis of impulse response functions to validate the hypothesis of Keynesian "paradox of thrift" on U.S. data. His findings are that investment tends to precede the increase in savings and an increase in savings greatly reduces the investment through its negative effect on aggregate demand. Alexiou (2004) adopts a similar approach to that adopted by Palley (1996) with a slightly different in that the impulse response functions have been abandoned in favor of an analysis of variance decomposition of error forecast. It leads to results that investment generally precedes savings in euro area countries retained, but the analysis of variance decomposition results still leaves a relative heterogeneity between countries. The author then concludes that these differences in results could find explanation by exploring the structures of these countries, including differences in financial structures. Greenidge et al (2004) undertook to test the theoretical hypothesis that one of the channels through which financial development affects economic growth is that it favors capital accumulation through greater allocation from savings to investment. The authors wanted to bring the savings-investment causality direction issue to the levels of financial development for the Caribbean and Latin America countries. The saving-investment causality was tested by using a methodology based on the recent cointegration. However, the authors do not systematically come to the result that the level of financial development shaped the saving-investment causality in their sample.

Studies of causation devoted to African countries do not relatively exist. Nevertheless, we have identified two of them. Elbadawi and Mwega (2000) find a causal rate of domestic savings to domestic investment in Sub-Saharan Africa using the Granger causality (1969) and aggregate data from across the region; Unlikely Agbetsiafa (2002) makes use of causality tests from vector representations error correction in countries like Ivory Coast, Nigeria, South Africa, Zambia and Kenya; Causality is everywhere from savings to investment, except in South Africa where prevails a bidirectional causality between domestic saving and investment.

At this point, two main conclusions emerge. The first which have a more methodological importance, is that the determination of causation is generally made on a case by case basis (by country) which has conditioned the use of countries time series. The second conclusion seems in turn related to the first well; Indeed, the saving-investment causality seems to be conditioned by national structural specificities, which requires to use countries-analyzes.

Methodological approaches within the studies that have analyzed empirically the savings - investment relationship are diverse and have not always addressed the important issue of

causality between these two variables. First, a number of studies have used ordinary least squares on a single equation to examine the savings - investment relationship. Therefore they have unfortunately suffered of the major econometric problem of simultaneity bias, due to the fact that they have neglected the possibility of return effect. Furthermore, these studies have made direct estimation without first analyzing the time series properties of saving and investment. However, as shown by Nelson and Plosser (1982), most macroeconomic time series are non stationary in levels. Then a large number of empirical studies have used cross-sectional estimates, which made extremely difficult to apply their results to a specific country. Finally, very few of these studies have involved Africa.

These empirical studies allow us to confirm the heterogeneity of saving-investment relationship in African sub region and therefore Africa. This situation has to been seriously undertaken if we plan to see the continental integration happen one day. However we have to verify it with an empirical investigation on WAEMU monetary union as a sample.

This study is therefore strongly motivated by the fact that firstly there is a theoretical indeterminacy concerning the causality direction between savings and investment; Secondly this indeterminacy is reinforced at the National Accounting level and thirdly there is divergent empirical results concerning the causality direction between savings and investment.
The total savings in the economy is indeed the sum of budget surplus, household savings and retained earnings of private enterprises. How can we be sure that the increase in one component of domestic savings, for example, will leave other components unchanged? Indeed, an increase in taxes, while increasing public savings, will reduce disposable private income and hence private savings, thus leaving relatively unchanged the total savings; It is the neutrality of boosting investment policy funded on a prior rise in public savings which will be observed. Moreover, an increase in public savings can be sufficiently valued by the private sector which can then increase its consumption while reducing it savings, which once again, tend to leaves unchanged the volume of domestic savings.
We can multiply the examples, but the truth is evident: the relationship between these two macroeconomic variables (savings and investment) is ambiguous and complex. Solving the problem with an empirical point of view is one of the ways to resolve the indeterminacy.

**3. Methodology.**

Methodological approaches within the studies that have analyzed empirically the savings - investment relationship are diverse and have not always addressed the important issue of causality between these two variables. First, a number of studies have used Ordinary Least Squares on a single equation to examine the savings - investment relationship. Therefore they have unfortunately suffered of the major econometric problem of simultaneity bias, due to the fact that they have neglected the possibility of return effect. Furthermore, these studies have made direct estimation without first analyzing the time series properties of saving and investment. However, as shown by Nelson and Plosser (1982), most macroeconomic time series are non stationary in levels. Then a large number of empirical studies have used cross-sectional estimates, which made it extremely difficult to apply their results to a specific country. Finally, very few of these studies have involved Africa.

This study goes beyond these methodological shortcomings by resorting exclusively to recent techniques within the time series econometrics to determine the causality direction.

Empirically, to test causality, it is common to apply the Granger causality test (1969). However, the cointegration technique promoted by Engle and Granger (1987) and Granger (1988) provides a significant contribution in conducting the causality tests. As part of our

study, tests of causality based on vector representations of error correction are used for each of the WAEMU countries.

**3.1. From cointegration to causality.**

The vector model with error correction requires that the series used are cointegrated. It is therefore important to first test the existence of cointegration relationships between the series (Johansen, 1988) prior to estimating equations of the VECM. The starting point is a VAR representation like follow:

$$x_t = \eta + \sum_{i=1}^{p-1} \Pi x_{t-i} + \varepsilon_t \qquad \textbf{(1)}$$

where *x* is a vector (*n x 1*) of variables that can be *I (0)* or *I (1).* $\Pi$ is a matrix (*n x n*) of coefficients, $\varepsilon$ is a vector *(n x 1)* of interference with normal properties.

If there is a cointegrating relationship between the variables *I (1),* the above equation must be change and we obtain the following vector representation with error correction VECM:

$$\Delta x_t = \eta + \sum_{i=1}^{p-1} \theta_i \Delta x_{t-1} + \Pi x_{t-1} + \varepsilon_t \quad \textbf{(2)}$$

Where $\Delta$ is the difference operator, and $\theta$ is a matrix (*n x n*) of coefficients. The rank, *r*, of the matrix $\Pi$ determines the number of cointegrating relationships. If the rank of this matrix is *n* or equal to zero, the VAR model is estimated respectively at level or at first difference; This due to the fact that there is no cointegrating relationship between variables in the model.

However, if the matrix rank $\Pi$ is less than *n*, then there are (*n x r*) matrices $\beta$ (cointegration parameters) and $\alpha$ (adjustment matrix that describes the weight with what each variable enters the equation) so that $\Pi = \alpha\beta'$ and, equation **(2)** is chosen as the model to be estimated. The matrix $\Pi$ is estimated (by the method of maximum likelihood) as an unrestricted VAR undergoing test to determine whether the restrictions implied by the reduced rank of the matrix $\Pi$ may be, or not, rejected.

The statistics used to determine the rank (cointegration) of the matrix $\Pi$ are given by the *Trace* statistic:

$\lambda_{trace} = -T \sum_{i=r+1}^{k} \log(1-\lambda_i)$, for r = 0, 1, …, k-1 and $\lambda_i$ the i-th eigenvalue of the matrix $\Pi$,

*T* = number of observations, k = number of variables, *r* = matrix rank.

and the statistics *maximum eingenvalue*, which is given by:

$\lambda_{\max} = -T\log(1-\lambda_r)$

The statistics of Johansen (1988) follow a probability distribution (similar to a $\chi^2$) tabulated using simulations by Johansen and Juselius (1990).

By performing the cointegration test (Johansen) on internal savings *(s)* and investment *(i)* variable (in neperien logarithm), the *VECM* representation between these two variables should be written:

$$\begin{bmatrix} \Delta i_t \\ \Delta s_t \end{bmatrix} = \begin{bmatrix} \eta_1 \\ \eta_2 \end{bmatrix} + \begin{bmatrix} \sum_{i=1}^{l} \delta_{1i} & \sum_{i=1}^{m} \gamma_{1i} \\ \sum_{i=1}^{l} \delta_{2i} & \sum_{i=1}^{m} \gamma_{2i} \end{bmatrix} \begin{bmatrix} \Delta i_{t-i} \\ \Delta s_{t-i} \end{bmatrix} + \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} \begin{bmatrix} \beta_1 & \beta_2 \end{bmatrix} \begin{bmatrix} i_{t-1} \\ s_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \quad \textbf{(3)}$$

Where $\alpha$ capture the adjustment speed from a state of imbalance to the long-term relationship. This imbalance is defined here as the gap that exists between lagged values of a variable of domestic saving and investment $\left[gap = i_{t-1} - \beta_1 - \beta_2 s_{t-1}\right]$. If saving and investment are cointegrated, the deviations from the long-run equilibrium has the effect in the short term, to induce changes in the evolution of one or all variables in order to force the system return to its long-run equilibrium.

The equation of cointegration between saving and investment is written:
$ECT_{t-1} = \beta_1 i_{t-1} + \beta_2 s_{t-1}$ and $ECT_{t-1} = i_{t-1} + (\beta_2 / \beta_1)\, s_{t-1}$ depending on whether it was normalized to investment or $ECT_{t-1} = (\beta_1 / \beta_2)\, i_{t-1} + s_{t-1}$ if we have normalized with respect to savings.

Unlike the Granger standard test (1969), this alternate methodology based on the error correction mechanism, consider the possibility that the passed value of a level variable (eg *y*) may help explain common variations of other variable (eg *x*), although past values of differentiated series *y* cannot. The intuition is as follows: If *x* and *y* follows a common and constant path over time, the common variations of *x* are partially the result of an adjustment of *x* in order to meet its alignment with it. This causality cannot be detected by the Granger standard test (1969) who has only identified the possibility that past changes in one variable can help explain current changes in another variable.
As for the Granger standard test, it is possible to determine causality in the opposite direction or when there is a causality in both directions. However, if the two variables are co integrated, causality exists in at least one direction. The result of total lack of causality in any direction identified by the test of Granger (1969) is switched off here; As soon as the series follow a common trend, there will always be at least one causality.

To perform the test, we rely on the representation **(3)** and estimated each following equation **(4)** and **(5)**, with *i* and *s* respectively investment and domestic savings.

$$\Delta i_t = \eta_1 + \sum_{i=1}^{l} \delta_{1i} \Delta i_{t-i} + \sum_{i=1}^{m} \gamma_{1i} \Delta s_{t-i} + \alpha_1 \left[\beta_1 i_{t-1} + \beta_2 s_{t-1}\right] + \varepsilon_{1t} \qquad \textbf{(4)}$$

$$\Delta s_t = \eta_2 + \sum_{i=1}^{l} \delta_{2i} \Delta i_{t-i} + \sum_{i=1}^{m} \gamma_{2i} \Delta s_{t-i} + \alpha_2 \left[\beta_1 i_{t-1} + \beta_2 s_{t-1}\right] + \varepsilon_{2t} \qquad \textbf{(5)}$$

This procedure is preferred to the standard Granger (1969) because it allows to show a temporal causality emanating from (i) the sum of independent variables coefficients in first difference and lagged ( $\sum \delta$ , $\sum \gamma$ ) et (ii) the return term $\alpha$ . In addition, the error correction model allows the identification of causality even though the lagged and differentiated coefficients of explanatory variables are not significant (Miller and Russek, 1990).

**3.2. Causality sources and types.**
There are therefore two causality sources, one from the cointegration equation if $\alpha \neq 0$ and the other from the differentiated and lagged variables coefficients. The cointegration equation (*ECT*) measures the relationship of long-term equilibrium, while the coefficients of lagged variables refer to the short-term dynamics. The significance of the coefficient associated with *ECT* highlights the existence of an error correction mechanism that leads to the variables return to their long term condition.
Given the existence of different sources of causality (short term or long term, which is impossible to perceive if we use the classic Granger causality test), we present three different tests used in the literature Recent: The short term causality test, the long-term causality test and the strong exogeneity test.

- The short term causality test.

In the previous model (3), to test « $\Delta s_t$ does not cause $\Delta i_t$ at short-term», we examines the significance of the coefficients of lagged variables by testing the null hypothesis *Ho*: All $\gamma_{1i} = 0$ by using Wald test. Failure to reject the null hypothesis implies that domestic savings does not cause domestic investment in the short term.

- The long-term causality test (or weak exogeneity).

The test of weak exogeneity which refers to the notion of long-term causality test (long-run non - causality test) is done by testing the null hypothesis $H_0: \alpha_1 = 0$, if the null hypothesis is not rejected it implies that domestic investment is "weakly exogenous" because it does not address the imbalance that can occur. If instead the null hypothesis is rejected, the change in investment is due to the influence of long-term equilibrium relationship and long-term causality is established from savings to investment. The null hypothesis is tested by using the maximum likelihood test (LR).

- The strong exogeneity test.

Finally, we present the strong exogeneity test, which imposes strong restrictions attached by testing the significance of lagged variables (short-term dynamics) and the equation cointegration ECT. This test verifies the short term and long term causality. In particular, « $\Delta s_t$ does not cause $\Delta i_t$ » if the null hypothesis Ho : All $\gamma_{1i} = \alpha_1 = 0$ is not rejected. The strong exogeneity test does not distinguish short-run and long-term causality; It is a more restrictive test that indicates the global causality in the system.

In summary, the non-significance of all coefficients tested involves the "strong exogeneity" of the variable (investment or savings).

## 4. Data source and empirical results.

### 4.1. Data source.

Data cover the period 1980-2010 for each country and source from the database of the World Bank (World Development Indicators, 2011). The sample includes all seven UEMOA member countries namely Benin, Burkina Faso, Ivory Coast, Guinea Bissau, Mali, Senegal and Togo.

### 4.2. Empirical investigation results:

4.2.1. Stationarity and Johansen cointegration tests results:

The observation of stationarity tests and Johansen cointegration tests results presented in annex lead us to conclude the following: The existence of cointegrating relationship between savings and investment in Benin, Mali and Senegal let us forecast at least the existence of a causal relationship between domestic saving and investment in each country.

4.2.2. Results of short and long term causality tests:

The table bellow provides estimation results summarize in each country of the various tests of causality. The estimation result details have been annexed. For four countries (Benin, Ivory Coast, Mali and Senegal), there is long-term causality between two variables. Specifically for Ivory Coast and Senegal, the direction of causality runs from savings to investment, while for Benin and Mali it is rather from investment to savings. The results also confirm the absence of a short-term causality between the two variables for all countries. The following table summarizes these different causality results country by country.

**Table: Abstract of causality test results.**

| Countries | Long term | | Short term |
|---|---|---|---|
| | ***s . . .?. . . i*** | ***i . . .? . . .s*** | ***s . . .?. . . i* or *i . . .? . . .s*** |
| **Benin** | | → (+) | absence |
| **Burkina Faso** | absence | | absence |

| | | | |
|---|---|---|---|
| **Ivory Coast** | $\rightarrow$(+) | | absence |
| **Guinea Bissau** | absence | | absence |
| **Mali** | | $\rightarrow$(+) | absence |
| **Senegal** | $\rightarrow$(+) | | absence |
| **Togo** | Absence | | absence |

*Source: Author's calculations with World Bank Data Base (2011)*

Finally we can affirm that we have three groups of countries in the WAEMU zone. The first group of countries for which a causality from savings to investment is long-term; This is Ivory Coast and Senegal. The second group consists of countries for which reverse causality prevails (Benin and Mali) and the third group of countries for which no causality is statistically significant (Burkina Faso, Guinea Bissau and Togo).

Following these results, it appears that the increased volume of domestic savings will ultimately ensure increased investment in only two countries: Ivory Coast and Senegal. In the rest of countries, an increase in savings does not have the same virtuous effects. Hence, it follows that the WAEMU zone countries do not all need equivalent therapies to stimulate strong and sustained economic growth.

## 5. Economic policy implications

Our empirical results show that for the two former countries (Ivory Coast and Senegal), policies of abstinence would be appropriate because they would generate a significant volume of domestic savings to finance domestic investment. It is therefore a problem of inadequate financial resources which explains the low investment and growth in these countries, including the existence of dual internal and external financial constraints. For other countries, an increase in their volume of domestic savings is not a necessary and sufficient condition to ensure capital formation and thereby ensure economic growth. Saving does not precede investment in these countries, and therefore, pro-savings policies are totally inappropriate. In these countries we should identify investment irreversibility factors in order to significantly reduce them and, ultimately increase investment spending. The strategy is to focus directly on investment, not on savings, because savings would neither have short- nor long-term virtuous effects.

The WAEMU zone's heterogeneity is like countries have different saving-investment dynamics and thus optimal fiscal policies that should be different. However, it should not be forgotten that these countries are members of a monetary union. It is clear from our results that the optimal budget strategies for these countries are not similar, we should not forget that fiscal policies in the WAEMU zone are constrained by a standard that limits public deficit, which can significantly reduce the discretion of national authorities in countries where the optimal fiscal strategy is directly related to the investment rate. Thus, as the recent debate on the practice of a single monetary policy in a heterogeneous union tends to lead to the need to integrate the heterogeneity in the monetary standard rules, as the heterogeneity issue in the union must also be present in the fiscal arrangements design in a monetary union. If the benefits of coordination in relation to different policies are well established, what should matter is choosing the right coordination which will eventually equalize between all partner countries, costs and benefits of membership in the union.

How then can heterogeneity and optimal coordination in the African monetary union be reconciled? This can be done by reflecting on a new fiscal rule that would be more appropriate and which will have the dual advantage of combining flexibility and credibility while promoting economic catch-up in the area. A flexible fiscal rule is a rule that does not

sanction the budgetary authorities frequently; But governments of the monetary union are not always able to respect the current fiscal convergence criteria. Moreover, a fiscal rule is credible when it punishes appropriately. However, the fiscal rule at community level in the monetary union goes against any deficit. We therefore feel that governments bind their hands while the critical development needs are felt. Therefore, questioning this criterion is important because macroeconomic costs associated with this rule are high. A ceiling on the current public deficit can be structurally depressing for growth. If, as suggested by some recent theoretical and empirical work, the potential growth is influenced by government spending that contribute to productive capital formation or to increase productivity, the fiscal policies rules that lead governments to reduce this type of expenditure are doubly harmful because: they generate pro-cyclical fiscal policies variations and lower the potential growth path of the economy in every recession. Yet it is possible to design a rule on the government deficit, which avoids this serious pitfall. Like Creel, Latreille and The Cacheux (2002), we advocate a *rule of nullity of the deficit*:

- *Structural*: A relevant fiscal indicator should reveal the orientation of discretionary fiscal policy. In this sense, the structural deficit, after corrections for cyclical effects on the total deficit, should be considered as an indicator of the stance of fiscal policy in the monetary union.
- *Without public investment*: The second criterion indicates that the public investment expenditure is not constrained by the rule. This would give monetary union member states a substantial leeway, allowing them to implement massive economic stimulus packages to offset the effects of the current stagnation of activity and, for countries that need it (Benin, Mali, Togo, Burkina Faso and Guinea Bissau in the case of WAEMU), to economically catch-up their partners by improving their public infrastructure and education supply, sources of potential growth.

Such rule would release free investment and ideally reflect the discretionary fiscal policy orientation; It would thus enjoy greater flexibility and credibility, but would face a major problem, particularly, the structural balance measure.

# Appendix

1) **BENIN**

- **Stationarity test :**

**Trend and intercept**

| | LEVEL | | First difference | | Second difference | |
|---|---|---|---|---|---|---|
| | ADF | CV | ADF | CV | ADF | CV |
| INV | 1.333036 | -3.587527 | -1.882750 | -3.603202 | -10.95744 | -3.603202 |
| S | -0.021983 | -3.587527 | -5.205564 | -3.595026 | / | / |

INV est I(2) et S est I(1)

- **Johansen cointégration test**

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.476314 | 32.81319 | 12.32090 | 0.0000 |
| At most 1 * | 0.459458 | 15.99477 | 4.129906 | 0.0001 |

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

**- Short term causality test**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| D(S) does not Granger Cause D(D(INV)) | 25 | 0.08756 | 0.77007 |
| D(D(INV)) does not Granger Cause D(S) | | 0.00053 | 0.98177 |

Causality absence

**- Long term Granger causality test**

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| S does not Granger Cause INV | 27 | 1.25565 | 0.27356 |
| INV does not Granger Cause S | | 28.2170 | 1.9E-05 |

Investment cause savings.

**2) <u>BURKINA-FASO</u>**

**- Stationarity test**

| | LEVEL | | First difference | | Second difference | |
|---|---|---|---|---|---|---|
| | ADF | CV | ADF | CV | ADF | CV |
| INV | -1.556921 | -3.603202 | -3.366407 | -3.603202 | -6.277407 | -3.612199 |
| S | -1.827521 | -3.690814 | -6.910576 | -3.690814 | | |

INV is I(2) when S is I(1)

- **Johansen cointégration test**

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None | 0.283826 | 6.414474 | 12.32090 | 0.3873 |
| At most 1 | 0.022276 | 0.405508 | 4.129906 | 0.5877 |

Trace test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

There is no cointegration relation.

**- Short term causality test**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| D(S) does not Granger Cause D(D(INV)) | 17 | 0.00807 | 0.92971 |
| D(D(INV)) does not Granger Cause D(S) | | 3.34621 | 0.08874 |

Causality absence

**- Granger causality test**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| S does not Granger Cause INV | 20 | 0.74040 | 0.40151 |
| INV does not Granger Cause S | | 0.06756 | 0.79804 |

Causality absence

**3) <u>IVORY COAST</u>**

- **Stationarity test**

| | LEVEL | | First difference | |
|---|---|---|---|---|
| INV | -2.527338 | -3.574244 | -4.774915 | -3.580623 |
| S | -1.696037 | -3.574244 | -5.657587 | -3.580623 |

All series are integreted in order 1

- **Johensen cointégration test**

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value |
|---|---|---|---|
| None | 0.166005 | 6.062838 | 12.32090 |
| At most 1 | 0.034396 | 0.980044 | 4.129906 |

Trace test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

There is no cointegration relation between investment and savings.

- **Short term causality test**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic |
|---|---|---|
| D(S) does not Granger Cause D(INV) | 28 | 0.71330 |
| D(INV) does not Granger Cause D(S) | | 0.09920 |

No causality

**- Granger causality test**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| S does not Granger Cause INV | 29 | 11.5909 | 0.00216 |
| INV does not Granger Cause S | | 0.10223 | 0.75173 |

S cause INV

**4) <u>GUINEE-BISSAU</u>**

- **Stationarity test**

| | LEVEL | | First difference | |
|---|---|---|---|---|
| INV | -1.743625 | -3.658446 | -4.724146 | -3.690814 |
| S | -2.105865 | -3.791172 | -6.040698 | -3.791172 |

All series are integreted in order 1.

- **Johansen cointégration test**

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None | 0.360295 | 6.255635 | 12.32090 | 0.4055 |
| At most 1 | 8.37E-05 | 0.001172 | 4.129906 | 0.9791 |

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

There is no cointegration

**- Short term causality test**

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| D(S) does not Granger Cause D(INV) | 14 | 0.00014 | 0.99061 |
| D(INV) does not Granger Cause D(S) | | 0.21735 | 0.65016 |

No causality.

**- Long term causality test**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| S does not Granger Cause INV | 16 | 1.61813 | 0.22564 |
| INV does not Granger Cause S | | 0.07774 | 0.78477 |

No causality

**5) <u>MALI</u>**

- **Stationarity test**

| | LEVEL | | First difference | |
|---|---|---|---|---|
| INV | 0.690846 | -3.595026 | -7.829135 | -3.595026 |
| S | 0.108273 | -3.603202 | -4.010726 | -3.622033 |

All series are cointegreted in order 1.

**- Johansen cointégration test**

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.636512 | 23.36405 | 12.32090 | 0.0005 |
| At most 1 | 0.003812 | 0.087840 | 4.129906 | 0.8076 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

There is no cointegration relation.

**- Short term causality test**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| D(S) does not Granger Cause D(INV) | 23 | 4.34151 | 0.05023 |
| D(INV) does not Granger Cause D(S) | | 3.08184 | 0.09448 |

No causality

**- Granger causality test**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| S does not Granger Cause INV | 25 | 0.34023 | 0.56563 |
| INV does not Granger Cause S | | 4.31284 | 0.04971 |

Investment cause savings.

**6) <u>SENEGAL</u>**

**- Unit root Test**

| | LEVEL | | First difference | |
|---|---|---|---|---|
| INV | -0.596670 | -3.574244 | -4.423356 | -3.580623 |
| S | 0.392427 | -3.580623 | -8.214434 | -3.580623 |

All series are integreted in first order.

**- Johansen cointégration test**

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.398607 | 15.28752 | 12.32090 | 0.0155 |
| At most 1 | 0.036782 | 1.049315 | 4.129906 | 0.3551 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

There is one cointegration relation.

**- Short term causality test**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| D(S) does not Granger Cause D(INV) | 28 | 1.29464 | 0.26598 |
| D(INV) does not Granger Cause D(S) | | 1.15262 | 0.29326 |

No causality

**- Test de causalité de Granger**

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| S does not Granger Cause INV | 29 | 9.90591 | 0.00410 |
| INV does not Granger Cause S | | 0.08860 | 0.76833 |

Domestic savings granger cause domestic investment.

**7) <u>TOGO</u>**

- **Stationarity test**

| | LEVEL | | First difference | |
|---|---|---|---|---|
| Variable | ADF | CV | ADF | CV |
| INV | -2.391790 | -3.603202 | -5.415838 | -3.612199 |
| S | -3.664734 | -3.603202 | | |

INV is stationary in first difference and S is at level.

- **Johansen cointegration test**

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None | 0.134879 | 5.437904 | 12.32090 | 0.5077 |
| At most 1 | 0.078446 | 1.960643 | 4.129906 | 0.1902 |

Trace test indicates no cointegration at the 0.05 level
* Denotes rejection of the hypothesis at the 0.05 level

There is no cointegration relation between INV and S.

**- Short term causality test.**

Lags: 1

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| S does not Granger Cause D(INV) | 24 | 2.23939 | 0.14941 |
| D(INV) does not Granger Cause S | | 0.08625 | 0.77188 |

No causality

**- Granger causality test (Long term).**

| Null Hypothesis: | Obs | F-Statistic | Probability |
|---|---|---|---|
| S does not Granger Cause INV | 25 | 2.85737 | 0.10508 |
| INV does not Granger Cause S | | 2.22934 | 0.14962 |

No causality

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