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Financial Development and Economic Growth in the WAEMU Zone: A Causality Analysis according to Granger

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Abstract

The present article deals with the empirical links between the financial development and the economic growth in the WAEMU zone. The sample includes eight countries and concerns the period 1990-2014. The study is based on the VAR approach (Vector auto regression), test of co-integration of Johansen and models with correction of error of the integrated variables. The results suggest that the financial development and the economic growth are co-integrated. Besides these relations are characterized by causality in the sense of Granger unidirectional going from the financial development towards the economic growth. These results show that the countries of the WAEMU zone have to set up appropriate measures to booster the development of their financial systems.

Keywords: Dols,Waemu,VAR, Granger

1. Introduction

What is the real link of causality which exists between the financial development and the economic growth? In other words, does the financial development constitute the cause of a strong economic growth? Or does the financial development can only occur in a context of strong economic growth? In theory positive relation between the financial development and the economic growth is obvious. Even if it is necessary to remember that the weight or the size of the positive effect of the financial development over the economic growth differs from a country to another and according to set of parameter (Kahn & Senhadji, 2000), quoted by Aka (2007); unanimity is however far from being reached on the sense of causality between the development of the financial system (bank, financial intermediary, stock and bonds markets etc.) and the economic growth seen under the growth of the real Gross Domestic Product point of view or the real Gross Domestic Product by state. In fact, if authors such as (Ang & Mc Kibbin, 2007); (Sing, 2008) and (Jiuliano & Ruiz-Arranz, 2009) support strongly that the financial development is the essential condition of a strong economic growth due to a better mobilization of the savings, an effective diversification of the risks, and an optimal evaluation of the investment projects; other researchers as (Robinson,1952), (Friedman & Schwartz, 1963) reveal with subtlety the passivity or the neutrality of the development of the financial system over the economic growth. It is thus advisable according to them to look for the sources of the growth somewhere else. Thus, as we can notice it there is no consensus on the link of causality between the financial development in the economic growth. So the objective of this study is to measure empirically the sense of causality between the financial development and the economic growth in the countries of WAEMU. This article uses the methodology of the panels data based on tests of Unitarian root and of cointegration and the tests of causality in the sense of Granger. The rest of the article will appear in the following way: The second section will review the literature then in the section 3 one will not only describe the data but also define the variables used for a successful study. The fourth section will expose the methodology followed by the presentation of the results of the section 5. AS for the section 6, it will be dedicated essentially to the conclusion and to the involvement of economic policies.

2. The Literature Review

The economic literature teaches us that numerous works were realized and gave different results concerning the effect of the financial system over the economic growth. In a general way the relation between finance and growth is that the finance has importance for the growth only when we consider its roles of satisfaction of the elements of the trade services. One of the defenders of this idea (Robinson, 1952), support that the economic

growth creates the range of financial services and that it is the cause of financial development. (Patrick, 1966) identifies two possible causal connections between the financial development and the economic growth. The first report or relationship is called the demand, seen as the demand of the financial services on which depends the real growth of the Gross Domestic Product, the marketing and the modernization of agriculture and the over sectors of subsistence. So, the creation of the modern financial institutions, their assets and financial responsibilities and related financial services are an answer to the request of these services by investors and savers in the real economy. From this point of view, more the growth of the national income will be important, bigger will be the demand of companies for needs for financing and thus for financial intermediation, because in most of situations companies do not have means to finance entirely their expansion. For the same reason, for a given growth rate, the more the credit spreads of growth will be important between the various business sectors, the more needs in financial intermediation will be important for favoring the transfer of savings between sectors in capacity of financing and sectors in need for financing. The financial system can support then the main sectors in phase of growth. In this case, an expansion of the financial system is inferred because of the real economic growth.

The second causal relationship between the financial development and the economic growth is called the funding offer (Patrick, 1966). The funding offer has two functions: the transfer of the resources of the traditional sector with low growth towards the modern sector with fast growth, and the entrepreneurial stimulation of the modern sectors. This implies that the creation of the financial institutions and their services occurs before the demand of companies. So the availability of financial services stimulates the demand of these services by the entrepreneurs of the modern sector rapidly expanding. (Benecivenga et al., 1991); (Levine & Zervos, 1996); (Levine, 1997); (Levine et al., 2000); (Krian et al., 2009). The appearance of the new theories of the endogenous economic growth gave a new boost to the report or relationship between the growth and the financial development as far as these models postulate that the behavior of savings influences directly not only the levels of income of balance but also the growth rates. So, financial markets can have a strong impact on the real economic activity. Indeed, for (Hermes, 1994), the theory of financial liberalization and the new theories of the growth suppose that the financial development leads to the economic growth. On the other hand, (Murinde & Eng, 1994), (Luintel & Khan, 1999) assert that the endogenous models of growth show a bidirectional relationship between the financial development and the economic growth.

The link between finance and growth sends back to the question of the financial repression. According to certain analyses, the preservation of the compulsory low interest rate more generally by all the public interventions to repress the banking activity does not allow to reach the optimal growth rate of the economy. In numerous development countries, the banking sector is brought to play a considerable role in the process of allowance of the resources because there is only few or no financial markets of public or private assets. As such, the governments consider it, very often, as a strategic sector and thus try to exercise a direct or indirect control over it.

Nevertheless, the financial repression, according to (Mc Kinnon, 1973) and (Shaw, 1973) and a large number of authors, leads to a slowing down of the economic growth. The notion of the financial repression was introduced by (McKinnon, 1973) and (Shaw, 1973) to characterize developing countries. In these countries, the governments control the banking system and play an important role in the allowance of the credit, by the preservation of negative interest rates in real terms, by the preservation of the interest rates improve for the priority sectors and the high compulsory reserves.

Through the use of these instruments, the monetary authorities perturb the relative prices and the allowance of the resources. The financial repression reduces the services supplied by the financial system to the savers, the entrepreneurs and the producers: it suppresses the innovative activity and slows down the economic growth (King & Livine, 1993) Consequently, the liberalization of the financial system has to favor first of all level of savings, by widening the offer of instruments of saving and by increasing the anticipated yield through higher real interest rates. The debtor interest rate which maximizes the growth is the rate of balance of the competitive market. This rate of balance is reached by releasing the credit rate, by paying a rate of market on the compulsory reserves or by eliminating them, and by the decrease of the inflation rate. To reach this interest rate of balance allows to increase the resources which the financial sector can arrange, because the competitive remuneration for bank deposits reduces the incitement to the regular consumption and attracts the savings which escaped previously the formal sector. The supporters of the financial liberalization show that this one also has an effect on the efficiency of the investment.

For (Mc Kinnon, 1973), in a financial repressed economy, the trend to finance the investments which bring back a yield hardly upper to the ceiling of the rate of credit is strong. Ceiling discourages the risk-taking on behalf of

the financial intermediaries and eliminates the investments with strong potential yield. (Shaw, 1973) shows that the ceiling of rate deteriorate the aversion for the risk and the preference for the liquidity of the financial intermediaries. Banks favor the no risky borrowers, with good reputation, and are not incited to exploit new opportunities occasions of more risky loans. On the other hand, when the rate is for the balance, the financial intermediaries can use their skills to assign in an efficient way a bigger volume of fund to be invested.

For (Dornbush & Reynoso, 1989), a financially repressed economy would be characterized by the fact that the channels of savings are often underdeveloped and the yield on the savings is negative and unstable. The financial intermediaries who collect the savings do not assure an optimal allowance of this one thanks to competitive means. Companies are discouraged from investing because bad financial policies reduce the yields or make them excessively unstable. Consequently, financial markets must be released to finance the investments and favor the economic growth. Considering the weaknesses of the financial system of the African countries, as well as its contrasted evolution, the majority of the research works agree only on the existence of a modest positive effect of the financial development on the growth in Africa.

The first works go back to (Bhatia & Khatkate, 1975). The objective of these authors was to show to what extent the financial development is a necessary and sufficient condition for the growth in Africa. The sample consists of 11 African countries (among which two of North Africa: Morocco and Tunisia) over the period 1960-1970. By means of graphs, the authors compare the evolution on behalf of financial assets to that of the level of development. The result are contrasted, the data do not reveal a narrow correlation between the financial development and the growth. The correlation is positive for certain countries as Kenya, Ivory Coast and Zambia, negative or non-correlation for others as Ghana, Mauritius and Sierra Leone. The weakness of the sample, the potential endogenous character of the financial development as well as the absence of variables of control of the level of economic development constitutes the main limits of this study.

For (Aka, 2007) the financial development leads to the economic growth by the intervention of the increase of the global productivity of the factors which it arouses. His study concerned 22 countries of sub-Saharan Africa. (M'hamed, 2007) in his study on the development of the financial systems and the economic growth, applied to developing countries reveal that the financial development influences positively the economic growth.

(Mbarek & Rachidi, 2008) by being interested in the sense of the causality between the financial development and the economic growth respectively in the developed countries and developing countries put forward that the financial development in a general way carry away inevitably the economic growth in the countries which made the object of their studies for approximate differences.

As we can notice it no study has precisely analyzed empirically the causality between the financial development and the economic growth in the WAEMU zone and this present analysis would like to do it.

3. Description of the Data and the Definition of Variables

The endogenous and exogenous variables which will be used in the analysis in data of panel which we shall make on the WAMU zone are the following ones:

Variables	Definition	expected sign
$LGDP_{real}$/head	The indicator of growth which we will use constitutes the endogenous variable of the various models which try to determine the empirical link which exists between the financial development and the growth. This variable is the logarithm of the gross domestic product per capita. $logGDP/head$.. The values of this variable are supplied by the data base of the world indicators of development.	variable expliquée
The inflation rate (TINF)	The justification of the use of the inflation rate as the explanatory variable of the growth is supplied by the economic literature. Indeed, when we use the inflation rate as source or not of the growth one wants to highlight the concept of the financial repression. We can easily notice that a high inflation rate characterizes most of the time economies in the grip of a financial repression. The high inflation can encourage the speculative and less productive investments and that could damage the growth, especially, all the more such a fact harms the long-term investments. The values are also supplied by the financial data of the World Bank.	Negative
The Investment Rate (S=INV//GD)	The ratio investment on GDP can be considered as a variant of an indicator of financial development. Indeed if this ratio is raised it would mean that the part of the investments in the GDP is also high. Now the Keynesian theory teaches us that the investments are fed by the savings, and these savings are themselves a characteristic variable of the development of the financial system. As well as the example of the other variables of this study, the values of the ratio INV/ GDP are supplied by the database of the World Bank.	Positive

The financial system (F)	The financial system indicates all the institutions and the agents who allow certain economic units during a period, to spend more than win and others to find an employment in surplus of their income on their expenses.(M'hamed, 2008). As we can read it, the financial system supplies to the various economic activities. The investments were one of the factors of economic growth; we conceive that the efficiency of a financial system depends on its capacity to mobilize an important volume of savings and to realize a good allowance. To better understand the influence of this variable on the economic growth we are going to assimilate it to the volume of credit granted to the private sector. This indicator is going to isolate the credits granted to the private sector, credits granted to the governments and to the public enterprises as well as credits of the central bank as in most of the works which dealt with the measure of the empirical link between the financial development and the economic growth.	Positive

4. Methodology

This section presents the main issues of the methodological approach dedicated to the study of the causality between the finance and the growth on data of panel. We successively present for that purpose the tests of Unitarian root on panel, the test of co-integration and the method of estimation of the relation of co-integration on panel.

4.1 Test of Unitarian Root on Panel of IPS (2003) and MW (1999)

The tests of Unitarian root which we use here are the ones of (Im, Pesaran, & shin, 2003) and of (Maddala & Wu, 1999). The objective of this paragraph is not to present in a detailed way the tests of Unitarian root on panel; but to tell in a very brief way, the intuition of these various tests. It would be interesting to point out that the first tests of Unitarian root on panel were realized by (Levin & Lin, 1992; 1993). However, these first generation tests present the limit to check the heterogeneousness of the panel only by the presence of individual and temporal fixed effects, by supposing the homogeneity of the autoregressive root under the alternative hypothesis. Indeed, it is not very probable that in case of rejection of the hypothesis of Unitarian root that we cannot accept the alternative hypothesis of an autoregressive root common to all the individuals. The contributions of (IPS, 2003) and (MW, 1999) allow to bring solutions to this problem.

4.1.1 The Tests of IPS (2003)

The specification of the model to be tested considered by IPS appears as follows:

$$\Delta yi = \alpha i + \rho i * \gamma i - 1 + \varepsilon it \tag{1}$$

i=1,2,3,4,……..N; t= 1,2,……T

where αi is the individual fixed effect and ρi a constant parameter.

The test of hypothesis of IPS is:

$HO: \rho i = 0$ for all $i = 1; 2; 3; 4 \ldots \ldots .. N$ against $H1: \rho i < 0$ for all $i = 1; 2,3 \ldots \ldots . N1$ and $\rho i = 0$ for all $i = N1 + 1, \ldots \ldots . N$

In case of absence of autocorrelation of the residues which are independent and identically distributed, IPS proposes the statistics of t_barNT defined as the average of N individual statistics of Dickey-Fuller:

$$t_{barNT} = 1N \sum tiTN1 \tag{2}$$

where tiT is the individual t-statistics of student associated with the nil hypothesis of the Unitarian root. The equation that arises at this level is the determination of the principle of t_barNT under the hypothesis of absence of autocorrelation of residues, for T invariable and N aiming towards the infinity and tiT independent and identically distributed, we can establish that the principle of the standardized average statistic $Ztbar\alpha$:

$$Ztbar\alpha = \sqrt{N}\sqrt{Var(tiT)} * \left(t_{barNT} - E(tiT)\right) \tag{3}$$

When we authorize the autocorrelation of residues, the statistics of the test of IPS for T and N finished on not rolled panel is:

$$Wtbar = \sqrt{N}\sqrt{N-1} * \sum (tiT(\rho i, 0)/\rho i = 0) \sim N(0,1) \tag{4}$$

For great T and N, or more in the case of a rolled panel and the residues are correlated of the same order for all the individuals, the statistic converge towards $Ztbar\alpha$.

4.1.2 The Test of MW (1999)

The test of MW is based on the meaning of the individual test of Unitarian root by combining p-values of N

individual independent Unitarian test of root:

$$PMW = \lambda = -2\sum ln\pi i \sim x^2(2N) \quad (5)$$

If the statistics of the tests of Unitarian roots are continued, p-values $i = 1,2 \ldots . N$ is independent and distributed according to a normal centered reduced $N(0,1)$. So under the nil hypothesis $2ln$ follows one $x^2(2N)$. For values of N raised, (Choi, 2001) proposes a standardized statistics which appears under the following form:

$$ZMW = (N - 1\lambda - E(-2ln\pi i))2a\sqrt{var(-2ln\pi i)} \quad (6)$$

We know that under the nil hypothesis,

$$E[-2ln(\pi i)] = 2 \text{ and } Var[-2ln(ln\pi i)] \quad (7)$$

Consequently, the statistics of $MW(N - 1\lambda)$ if p-values are independent and identically distributed, the statistics ZMW converges under the nil hypothesis towards a normal centered reduced, for N towards the infinity. (Breitung, 2000) finds that the test of IPS is powerful when the individual trends are taken into account and this test is very sensitive to the specification of a determinist tendency. On the other and, the test of MW has the advantage compared with the test of IPS that its value does not depend on various delays of the individual tests ADF. Furthermore, (Magdala & Win, 1999) find that the tests of MW are better to those of IPS. For these reasons, when the tests of IPS and MW lead to contradictory results, we are going to trust the test of MW.

4.2 Test of Cointégration of Pedroni

(Pedroni, 1999; 2004) proposes an extension of the relation of heterogeneous cointégration with several regressors. Following the example of the tests of IPS, Pedroni take into account the heterogeneousness by means of parameters which can differ from one individual to another. Such heterogeneousness can be situated at the same time at the level of the relations of cointégration and at the level of the short- term dynamics. So, under alternative hypothesis, there is a relation of cointégration for every individual, and the parameters of this relation are not inevitably the same for each of the individuals of the panel. The consideration of such heterogeneousness constitutes an undeniable advantage because in practice, it is rare that the vectors of cointegration be identical from an individual to another of the panel.

In these conditions, to impose in an erroneous way homogeneity of the vectors of cointégration would have as consequence a non-rejection of the no hypothesis of absence of cointégration, while the variables are cointegrated. However, the test of pedroni does not worry about the determination of the number of relations of cointégration; but it tests only the null hypothesis of absence of cointégration against the alternative hypothesis of existence of the relation of cointégration. The implementation of the tests of pedroni requires to estimate at first the following long-term relation

$$yit = \propto i + \delta it + \beta 1x1, it + \cdots \beta MixM, it + \varepsilon it \quad (8)$$

Where $i = 1 \ldots \ldots N$ indicate the number of individuals. $t = 1 \ldots \ldots \ldots, T$ the temporal dimension and $m = 1 \ldots \ldots . . M,$ the number of exogenous variables. The structure of the estimated remainders is the following one:

$$\widetilde{\varepsilon\, it} = \widetilde{\rho i}\, \widetilde{\varepsilon it} - 1 + \widetilde{\mu it} \quad (9)$$

Pedroni proposes seven tests of cointégration, among which four are based on the within (intra) dimension and the three ones on the between (inter) dimension. Both categories of tests are based on the null hypothesis of absence of cointégration. $\rho i = 1$ for all i, where ρi indicate the autoregressive term of remainder estimated under the alternative hypothesis. The distinction between both categories of tests is situated at the level of the specification of alternative hypothesis: for the tests based on the intra dimension the alternative hypothesis is: $\rho i =< 1$ for all i while $\tilde{n}$ for the tests based on the inter dimension, the alternative hypothesis is: $\rho i = \rho > 1$ for all i indicate the autoregressive term of remainder estimated under the alternative hypothesis. The distinction between both categories of tests is situated at the level of the specification of alternative hypothesis. We notice that the test based on the dimension to inter is more general as far as it authorizes the presence of heterogeneousness between the individuals under alternative hypothesis. The tests based on the within (intra) are: The statistics panel v, the statistic panel t (not parametric), and the statistics t (parametric).

4.3 Method of Estimation of the Cointégration in Panel

Although the statistics of the test of cointégration of Pedroni allow to conclude in the existence or not of the long-term relation between variables, they do not supply estimation by means of the VECM. So, after the tests of cointégration of (Pedroni, 1999), other methods are needed to estimate the relation between the variables of the

model. Among the techniques the most used to estimate the relation of cointégration on data of panel, we have: the valuer of the fully modified (FM) and the valuer the lesser dynamic squares (DOLS) developed by (KAO & CHIANG, 1998; 2001); the valuers with correction of error of (Pesaran, Shin, & Smith, 1999) namely Pooled Mean Group (PMG), Mean Group (MG), Dynamic Fixed Effet (DFE) and Static Fixed Effet (SFE). We retain within theb framework of this chapter both valuers of correction of error which follow: The DOLS and the PMG, on one hand (KAO & CHIANG, 1997) show that the valuer of the DOLS is more successful than the valuers of the DOLS and the FMOLS; on the other hand, as regards the PMG is the intermediate valuer between the valuers MG and DFE. We must note that these two valuers are the most used in the estimation of the relation of cointégration between the financial development and the economic growth by (Apergis et al., 2007), (Dufrenot et al., 2007) and (Loayza & Ranciere, 2006).

4.3.1 The Method of the Lesser Dynamics Squares (DOLS) of (Kao & Chiang, 1998; 2001)

The valuer of the DOLS in panel proposed by (Kao & Chiang, 1998; 2001) is inspired by the valuer in temporal sequence of (Stock & Watson, 1993). Let us consider the model with fixed effects of a regression in panel:

$$\Delta yi = \propto i + xit' * \beta + \mu it \tag{10}$$

$i = 1 \ldots\ldots N, t = 1 \ldots\ldots T$ where yit is a matrix of dimension (1,1). β is the vector of the slopes of dimension (k;1). $\propto i$ is the individual fixed effect, μit is the term of error supposed to be stationary. We also suppose that xit, a vector of dimension (k,1), is a process integrated by order 1 such as:

$$x'it = xit - 1 + \varepsilon it \tag{11}$$

The valuer of the DOLS is obtained from the following regression:

$$yit = \alpha i + x'it * \beta + \sum cijj = q2j = q1\Delta xi + j + vit \tag{12}$$

We can well notice that the characteristic equation of the valuer of the DOLS is an extension of a standard regression in which we integrate lags and leads into the relation of cointégration in order to reproduce asymptotically of the valuers without bias and avoid the problems bound to the estimation of the parameters of nuisance.

4.3.2 The Method of Pooled Mean Group of (Pesaran et al., 1999)

Test of Causality on Panel (Pesaran, Shin, & Smith, 1999) propose the valuer pooled mean group (PMG) which opposes a homogeneity of the long-term coefficients against a short- term heterogeneousness. Indeed, the hypothesis of homogeneity of the long-term coefficients rests on the fact that the budgetary constraints, the conditions of arbitration or moreover the identical technologies of production affect in the same way the various groups of countries. On the other hand the short-term heterogeneousness reveals the existence of a difference at level of the specification of the dynamics in every country.

As a matter of fact, the valuer PMG is an intermediary between the valuer MG (who consists in estimating separated equations for every country and in examining the distribution of the estimated coefficients, (in particular the average of the coefficients), and the valuer DFE, only the individual effects which can be fixed or unpredictable allow to make into account the heterogeneousness of the sample, while the coefficients of the exogenous variables are supposed constant. The model Autoregressive Distributed Lag postulated by (Pesaran et al., 1999) appears as follows:

$$yit = \sum \lambda ijpj = 1yit - j + \sum cijpj = 1xit - j + \mu i + \varepsilon it \tag{13}$$

with $t = 1.2.3 \ldots\ldots T$; $i = 1.2.3 \ldots\ldots N$. ρ the number of delay of the delayed endogenous variable, q the number of delay of the explanatory variables xit, μi the individual fixed effects λij the coefficients bound to the delayed endogenous variable and finally cij, the coefficients relating to regressors. The parameterization of the long-term equation gives the following specification:

$$\Delta yit = \emptyset iyi - 1 + \beta' xit + \sum \lambda ij * p - 1j = 1\Delta yit - j + \sum \delta ij\Delta * q' - 1j = 1\Delta xit - j + \mu i + \varepsilon it \tag{14}$$

where $t = 1.2 \ldots\ldots T$, $i = 1.2 \ldots\ldots N$

$$\emptyset i = -(1 - \sum \lambda ijpj = 1) \qquad \beta i = \delta ijqj = 1, \qquad \lambda ij = -\sum \lambda impm = j + 1$$
$$with\ j = 1.2.3 \ldots\ldots q - 1$$

(Pesaran et al., 1999) suppose that the model ARDL is stable, if the roots of the equation

$$-\sum \lambda ijppj = 1 \tag{15}$$

$zj = 0$ extend out of the Unitarian circle. This hypothesis which supposes $\emptyset i < 0$ and the existence of the long-term relation between

$$yit\ and\ xit\ is\ definied\ by\ yit = -\beta i\emptyset ixit + \theta it \quad (16)$$

Where θit is I(0), and the long-term coefficient

$$\gamma i = \beta i\emptyset i = \gamma' \quad (17)$$

is supposed to be the same for all the individuals of the panel.

5. Empirical Results

5.1 The Test of Unitarian Root in Panel

The first stage of our econometric analysis consisted in determining the order of integration of variables held in the specification of our model. This is the way tests of Unitarian root were administered for every country and by variable before administering the same Unitarian tests of root in panel and by variable. The results of the tests are reported in the table 1 by country and in the Table 2 in panel and by variable.

Table 1. Test of unitarian root on every country

Pays	GDP		F		S		Inflation	
	Level	DitT	Level	DitT	Leve!	DitT	Level	DitT
Benin	0.9997	0.4019	0.1159	0.1179	0.1922	0.0001	0.0006	0.0000
Burkina Faso	0.9993	0.0000	0.9378	0.0001	0.6933	0.0000	0.0003	0.0000
Côte d'Ivoire	0.9079	0.0664	0.0407	0.0053	0.2153	0.0000	0.0022	0.0000
Guinée Bissau	0.3661	0.0000	0.4540	0.3167	0.0791	0.0465	0.1186	0.0000
Mali	0.6567	0.0000	0.5824	0.0000	0.5734	0.0000	0.0005	0.0017
Niger	1.0000	0.0000	0.3189	0.1111	0.7820	0.0003	0.0002	0.0000
Sénégal	0.9793	0.0000	0.4203	0.0000	0.8746	0.0000	0.0010	0.0000
Togo	0.0186	0.0135	0.6617	0.0000	0.5691	0.0000	0.0008	0.0000

Source: our calculations.

This table recapitulates the test of Unitarian root made on every variable and for every country. The tests are made on variables in level and in first difference, and p-values are also recorded there. Let us note the hypothesis null of the test is the ''not stationarity''. So when p-value is lower than 0.05; there is well rejection of the null hypothesis; that implies that there is stationarity of the considered variable. Having said that, the analysis of the table above gives us to see that the GDP (Gross Domestic Product) is still at level only for Togo but, still in the first difference for all other countries of the WAEMU zone except for Benin and for Ivory Coast.

As regards the variable financial system; represented by the volume of credit granted to the private sector, we notice that this variable is stationary at level for Ivory Coast and stationary in the first difference for Burkina Faso; Mali; Senegal and Togo. As for the variable (INV/GDP) noted S, the results of the table 1 show that this one is stationary in the first difference for all the states. Finally the variable Inflation is stationary at level for all the countries except Guinea-Bissau for whom it is stationary in the first difference.

Table 2. Test of unitarian root in panel

Variables	Level		First Diff	
	P-value	Stat	P-value	Stat
Output(GDP)	1,0000	4.7119	0.0000	-13.8465
F	0.8421	1.0030	0.0000	-11.1373
S(lnv/GDP)	0.0007	-3.1804	0.0000	-15.8203
Inflation	0.0000	-8.1580	0.0000	-16.8670

Source: Our calculations.

This Table 2 synthesizes the results of the analysis of the stationarity of variables in panel. All p-values are lower than 0.05 when we consider the first difference. As a matter of fact when we consider the results of Table 2 which are the ones of the tests of Unitarian root in panel; they reveal that variables (INV/GDP) and INF are integrated by zero order that means stationary into level, whereas variables GDP (Gross Domestic Product) and F are integrated by order 1.

5.2 The Results of the Tests of Cointegration

Using results of the tests of stationarity by variable and by country and the results of stationarity in panel, tests of cointégration were administered in the ultimate purpose to highlight the likely existence of a long-term stable relation between the real GDP by inhabitant and the level of the financial development in the countries of the WAEMU. As we can learn from the economic literature, the tests of Johansen are based on estimations of maximum of credibility of an autoregressive vector of which order is specified according to the purposes of the study. Within the framework of the present study, the autoregressive vector is of order 1,2,3. The hypothesis null is the absence of vector of cointégration against the alternative hypothesis of existence of a vector of cointégration.. The results of the test of cointégration with the method of Johansen by country and by variable are represented in the Table 3.

Table 3. Johansen test of individual cointegration

Pays	r= 0		r =< 1		r=< 2		r =< 3	
	Stat	P-value	Stat	P-value	Stat	P-value	Stat	P-value
Benin	88.9093	0.0000	21.4700	0.1695	15.3946	0.1732	2.9587	0.8814
Burkina Faso	20.5373	0.6093	18.1271	0.3675	10.8031	0.5337	6.1310	0.4438
Côte d'Ivoire	20.9466	0.5766	18.6618	0.3286	11.2624	0.4867	1.8391	0.9776
Guinée Bissau	37.0595	0.0114	21.7432	0.1580	15.3744	0.1742	5.0227	0.5931
Mali	29.5494	0.0998	22.9057	0.1159	10.4537	0.5705	7.2868	0.3155
Niger	33.4683	0.0340	28.7559	0.0200	14.3629	0.2307	8.3435	0.2249
Sénégal	42.1254	0.0022	26.0336	0.0469	22.1289	0.0195	7.0106	0.3434
Togo	31.5195	0.0590	16.3545	0.5133	8.6425	0.7606	2.2380	0.9522

Source: our calculations.

Looking over the results of this table, it is very likely that it can exist a long-term stable relation between the financial development and the economic growth in certain countries of our sample of study. The major difficulty which prevents us from pronouncing ourselves in a definitive way is that the order of cointégration of variables is not clear between all the countries and calls us as a result to be cautious in such a scenario. To by-pass this difficulty we decided to administer the test of cointégration in panel of pedroni.

Table 4. Test of cointégration in panel of Pedroni

	Y dependent variable		F dependent variable	
Tests	Panel	Group	Panel	Group
Stats				
V	2,483		-0,8006	
Rho	1,517	2,449	0,9107	1,347
T	1,451	2,409	-0,2944	-0,5154
Adf	1,556	2,189	0,3198	-0,6401

Source: our calculations.

In this table, we want to see the variable to be considered as dependent. Then the test of cointégration is made for both variables financial development and Gross Domestic Product per inhabitant. The seven tests of pedroni have statistics lower than the critical values there is no cointégration in case the dependent variable is (F) the financial development. But in case we consider the real GDP per inhabitant as dependent variable, there is a relation of cointégration because 4 statistics give values superior to 1.96. Then the cointégration exists when the GDP is taken as dependent variable. In other words, the results of the Table 4 reveal the existence of a long-term stable relation between the financial development and the economic growth in the countries of WAEMU when the dependent variable is the real GDP a head here representative of the economic growth and the growth in the countries of WAEMU zone when the dependent variable is the real GDP per inhabitant in this case representative of the economic growth.

Finally before approaching the sense of the causality between our two variables of control namely the financial development and the economic growth, it is advisable to highlight the real implications of every explanatory

variable held in this study on the level of the explained variable and the results are condensed in the Table 5.

Table 5. DOLS regression for panel

Country	F		S		inflation	
	Coef	t-stat	Coef	t-stat	Coef	t-stat
Benin	10,02	0,7739	31,54	1,523	-60,22	-4,839
Burkina Faso	72,02	2,016	-161,8	-2,782	-48,41	-1,215
Côte d'Ivoire	-95,37	-6,325	69,9	4,036	-5,931	-0,1359
Guinée Bissau	-55,29	-2,526	131	11,84	-31,12	-6,281
Mali	1,164	0,02823	14,82	0,3516	20,09	0,3882
Niger	12,32	0,4801	-11,69	-6,065	-38,07	-10,75
Sénégal	288,6	6,662	223,9	8,122	-89,76	-3,1
Togo	67,06	1,639	-31,34	-0,3936	-202,6	-9,583
Panel	1'37,58	0,9717	33,28	6,881	-57	-12,56

Source: our calculations.

The Table 5 synthesizes two types of results: the estimation of the model by country and the estimation of the model in panel. The significativity of the various coefficients is verified by the t-stat. If the value is superior to 1.96 in absolute value, we can conclude that the obtained coefficient is significant. This rule of decision gives us to notice totally divergent results by country, but when we consider the results in panel all the coefficients of the various variables of the model have the expected sign but are not all significant as it is the case for the variable financial system.

5.3 *The Results of the Test of Causality*

The tests of cointégration of Pedroni and Johansen allowed to make tests of causality based on representations VECM's for the countries of the WAEMU zone where the hypothesis of cointégration is accepted at the level of significativity of 10%. For the countries where the non cointégration is highlighted; the tests of causality based on the VAR in first difference are led. The hypothesis which is null is the absence of non-causality. The Table 6 gives the results of the test of causality.

Table 6. Test of causality

Null Hypothesis:	F-Statistic	Prob.
F does not Granger Cause DGP	5.38605	0.0210
GDP does not Granger Cause F	2.07097	0.1513

Source: our calculations.

In the eyes of the results of the Table 6; it appears that the financial development causes in the sense of Granger the economic growth in the WAEMU zone. One the other hand the inverse causality exists as well in certain cases which mean that the economic growth could cause in the sense of Granger the financial development as the economic literature reveals us.

6. Conclusion and Implication of Economic Policy

The objective of this study was to examine empirically the link of causality which exists between the financial development and the economic growth specifically in the eight countries of the WAEMU zone. Variables held for that purpose in this study are among others the economic growth represented by the level of the real GDP per inhabitant (LGDP/Head), the ratio of the investments brought back to the GDP noted S and another variable F representative of the volume of credit granted to the private sector and which materializes the financial development. The methodology which is used is based on the tests of Unitarian root, the techniques of cointégration, the representation VECM's of cointégration variables and of representation VAR of non cointegrated variables. The results of our study show that in the countries of the WAEMU zone the financial development causes in the sens of Granger more or less economic growth. Then it emerges clearly that the financial development is an important determiner of the economic growth for the countries of WAEMU. Consequently the political authorities of this economic and monetary union have to take adequate measures to

allow the financial institutions to play completely their role in injecting force in the economic growth and therefore in the economic and social development of the countries of WAEMU. One should insist that these measures aim essentially at strengthening the legal environment in which the financial institutions work, to strengthen the system of regulation and supervision of banks, to favor the competition in the banking sector Aka (2008).

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