Financial Instability and Inequality Dynamics in the WAEMU

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ABSTRACT: This article assesses the effect of financial instability on income inequality and vice versa. The methodology used in this article is based on two approaches: the construction of the synthetic index of financial instability (SIFI) and the panel vector autoregressive (PVAR) approach. The results obtained help to explain that the disparity of income in a West African Economic and Monetary Union (WAEMU) country in each year negatively influences the stability of the financial sector the following year. Functions of impulse responses show that a shock to financial stability has a negative effect on itself and leads to a stable situation after seven periods. A rise in income inequality in WAEMU countries tends to mitigate financial instability at first, before boosting a higher level of instability. Following this increase, inequality will decline, but at a very slow pace.

JEL classification: G10, D63, C15, E37, E44, O55

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Introduction

The 2008 financial crisis - also referred to here as the Great Recession - continues to have a major effect on the global economy. Economic factors, such as the increase in inequality that has weakened effective consumption demand and spending, are believed to be the cause (Sheng, 2014). Many analysts have wondered whether inequality was partly responsible for the financial crisis. Among the most influential authors, Rajan (2010), followed by Kumhof and Ranciere (2011), suggested that an increase in inequality directly contributed to the credit boom in the 1930s and similarly in the first half of the year 2000. The analysis of disparities in the distribution of income and assets is essential to understanding the 2008 financial crisis and recovery (Raskin, 2013).

The question of the dynamics of inequality in this case is not foreign to the financial instability hypothesis. Minsky (1982) and the authors who expanded his thinking, including post-Keynesians Crotty (1993) and Keen (1995), had already suggested that the inequalities in distribution were likely to undermine financial stability and cause a reversal of the endogenous business cycles. Rajan (2010) was one of the first economists to attribute the 2008 financial crisis to the rise in income inequality, a thesis also shared by Krugman (2007) and Reich (2007).

It should be noted that the effects of the financial crisis are continuing to change on a day-by-day basis, so that the assessment of its consequences is still not easy. Furthermore, assessing the effects of the financial crisis on inequalities in West African Economic and Monetary Union (WAEMU) countries requires appropriate statistical approaches. The effort to understand the outcomes of the crisis requires constant observation and continuous adjustment of the analysis depending on the situation. The data that were available related to small chronological series that could be used for a panel data analysis, but did not allow for VAR or ECM modeling (based on temporal series). Therefore, to highlight the response functions for the different countries of the Union, data from the West African Central Bank (BCEAO) and the World Income Inequality Database (WIID) are used (Figure 1).

It has been shown that funding influences the distribution of income. However, little research has been devoted to examining the potential effect of financial policy on income inequality. This study analyzes the relationship between financial policies and income inequalities in WAEMU countries. Even if the financial system of the West African region is only weakly connected to the global financial system, the effects of the financial crisis were felt nonetheless. The narrowing of inequalities is a logical answer, but one that provokes questions about the relationship between the nature of the financial system and inequality in WAEMU countries, in particular, whether financial instability contributes to the widening of inequality in the Union. Through what mechanisms could the effects of the financial instability in the economies of WAEMU countries be transmitted to the inequalities within

a Union country?

The general objective of this article is to assess the relevance of financial instability to income inequality in the WAEMU as well as the converse. It will specifically: Identify explanatory factors of financial instability in WAEMU; Assess the effect of financial instability on income inequality in the Union and, conversely, that of income inequality on financial stability.

1 Literature Review

1.1 Theoretical Review

From debt to the financial crisis and inequality

Theoretically, the role of debt abuse in the advent of financial instability and widening inequality has been established for a long time. According to Rajan (2010), the growth of inequality has resulted in political pressure for easy credit. Due to the concerns of the middle class, the authorities have preferred to support household consumption by facilitating access to credit rather than promoting income growth.

Bordo and Meissner (2012) asserted that the concentration of income has certainly tended to increase during the upswings of business cycles, but it does not play a significant role in the growth of credit. In other words, income inequality should not be significantly related to systemic banking crises. Such a link regarding the Great Depression is particularly questionable to them. Contrary to what Kumhof and Ranciere (2011) suggested, the increasing use of consumer credit does not appear to be a result of the desire of households to maintain their standard of living in the context of stagnant incomes; it rather responds to their desire to appropriate new sustainable consumer properties. However, if the Great Recession had been caused by the increasing concentration of income, it would be a historic singularity in relation to previous episodes of macroeconomic instability. In this sense, Bordo and Meissner (2012) link the emergence of macro financial instability in the 2000s to the dynamics of financial innovation in a context of low interest rates. Inequalities would, in their view, have a negligible role.

Inequalities often increase in the expansion phase of the economic cycle. For example, Roine et al. (2009) show that the incomes of upper credit tranches are correlated with periods of economic expansion. Bordo and Meissner (2012) therefore suggest that rising inequality is not the cause of credit booms (and the financial crises that follow), but rather a consequence thereof. Furthermore, the authors argue that the rich are better able to benefit from the credit boom than the poor, which would explain the increase in inequality during credit booms. Therefore, rising inequality may be coincidental, but is more likely a consequence of

credit booms rather than the cause.

Wealth inequality and financial crisis

Growing inequality in wealth and its repercussions on the financial sphere are becoming increasingly important topics of public debate. Therefore, Raskin (2013) pointed out that the widening of income and wealth inequality is one of the most significant structural changes. Income inequality can hamper economic growth through its effects on consumption; the richest households tend to save more of their income, which depresses consumer spending, and hence aggregate demand. And wealth inequality may have even more profound macroeconomic implications, as the inequality is even greater than that of income.

On the one hand, poor families have fewer financial resources to protect themselves against shocks to their income, including problems of unemployment. On the other hand, most of their wealth is also real estate, what exposes more wealthy households to fluctuations in property prices.

Furthermore, Raskin (2013) argued that inequalities could also increase the effect of the financial crisis. The fall in property prices observed after 2006 reduced household wealth and restricted access to credit, which has led to reduced spending. This demand shock then led to a contraction in output. However, low - and middle - income households are also the main victims of the downturn in the labor market.

1.2 Empirical Review

Banking Sector and income inequality

The analysis of the consequences of the system of finance on income inequality has been the subject of several empirical developments. Kumhof and Ranciere (2011) provided new empirical elements and propose a general equilibrium model to reproduce the stylized facts that they update. According to them, the Great Depression and the Great Recession have two strong similarities: both follow a sharp increase in income inequality and an equally considerable rise in household leverage. The two authors believe that these developments are in close interaction with each other.

Recently, Sheng (2015), based on an extended post-Keynesian model, noted that the relationship between the savings rate and income inequality is negative if the savers' funds are borrowed for household spending and consumption, but positive if savings are channeled and used for investment in the production of enterprises. These results indicate that income inequality must be reduced to increase savings in deficit economies and reduce savings in surplus economies.

On the other hand, Johansson and Wang (2014) - using a modeling of the average method and generalized methods of moments (GMM) estimation - confirmed the positive relationship between financial repression and income inequality, that is, that financial repression tends to increase income inequality. They also noted that credit controls and barriers to entry in the banking sector are the two most important financial policies that affect inequality. These findings have important policy implications, not least for developing countries, where rising inequality is a major problem.

Seven and Coskun (2016) examined the contribution of banking development and the stock market to the reduction of income inequality and poverty in developing countries. Using a methodology of dynamic panel data for the period 1987 - 2011, the authors found that financial development promotes economic growth, but it does not necessarily benefit low incomes in emerging economies. For the link between finance and poverty, they found that neither the banks nor the stock markets play an important role in poverty reduction.

Finance, inequality and poverty

Gantman and Dabós (2012) showed that financial development has no statistically significant effect on economic growth. Rioja and Valev (2014) showed that in low-income countries, banks have a significant positive effect on capital accumulation. The stock market, however, did not contribute to capital accumulation or productivity growth in these countries.

By analyzing 47 developing economies from 1984 to 2008, Kpodar and Singh (2011) found that when institutions are weak, financial systems - specifically banks - are more likely to reduce poverty, but when institutions become more developed, financial systems based on the market become more effective at reducing poverty. Moreover, Kappel (2010) found that financial development can reduce poverty and income inequality. The effects of financial development on poverty are not only important in itself, it is also significantly greater than the effect on income inequality.

More recently, Uddin et al. (2014) studied the short- and long-term relationships between financial development, economic growth, and poverty reduction in Bangladesh, and showed the existence of a long-term relationship between these variables. Similarly, Abosedra et al. (2016) analyzed the relationship between financial development and poverty reduction in Egypt using data for the period 1975 to 2011. The authors found that financial development reduces poverty when domestic credit to the private sector is used as a proxy for financial development.

On the other hand, Jauch and Watzka (2016) analyzed the relationship between financial development and income inequality for developed countries and 138 developing countries between 1960 and 2008. The authors found that financial development increases income inequality after having controlled for fixed effects by country and possible endogeneity prob-

lems. Likewise, Sehrawat and Giri (2015) studied the link between finance and inequality in India for the period 1982 to 2012, suggesting that financial development exacerbates income inequality both in the long and short term. In turn, Rajan (2010) - based on a model of Kumhof and Ranciere (2011) - found that individuals with incomes in lower deciles borrow to increase their consumption more than do those with stagnant incomes. Kumhof and Ranciere (2011) model also worked with data from the Great Depression of the 1930s, prompting them to generalize that a rise in inequality can generate a credit boom which causes a financial crisis.

Bordo and Meissner (2012) provided further analysis of the phenomenon by including other variables in the model and increasing the sample to include data from 14 countries from 1920 to 2008 (rather than a single country for two periods as done by Kumhof and Ranciere (2011)). More recently, Seven and Yetkiner (2016), using panel data from 1991 to 2011, found that the development of the stock market has a positive effect on economic growth in high- and middle-income countries.

Monetary policy, credit expansion and financial crisis

Bordo and Meissner (2012) reported a strong relationship between credit growth and the emergence of a financial crisis. Moreover, their data showed that interest rate cuts (nominal and real) are also a significant determinant of credit growth, confirming the role of monetary policy in the formation of credit booms. Bordo and Meissner also discussed a study by Mendoza and Terrones (2008), which analyzed 49 credit booms in 48 countries between 1960 and 2006 and showed that financial crises usually follow an acceleration of credit growth. For their part, Schularick and Taylor (2012) found, using data from 1889 to the present, that the probability of a financial crisis occurring is related to credit growth.

Does an increase in inequality promote an acceleration of credit growth, thus increasing the risk that a financial crisis occurs? Bordo and Meissner (2012) answer was a definite no, either by isolating the 1%, with 0.01%, 5% and 10% richer.

Park and Shin (2015) examined the relationship between financial development and income inequality. Their findings suggested that financial development contributes to reducing inequality to some extent, but as additional financial products are developed, it eventually contributes to greater inequality.

2 Methodology. Theoretical framework

The methodology used in this article is based on two approaches:

- Construction of the Synthetic Index of Financial Instability (SIFI)

- Estimation of a PVAR model

2.1 Construction of the Synthetic Index of Financial Instability (SIFI)

Financial instability is the result of several phenomena from aggregate fluctuations describing the financial environment. Thus, it is important to capture financial instability using a synthetic index of financial instability (SIFI). To build a SIFI, it is necessary to rely on the elements of instability in the financial sphere. In the literature, there are different methods found for measuring the instability within an economic aggregate. One option is to use absolute values of the residuals of the regression of a variable considered on the long-term trend (Jeanneney and Kpodar, 2004). Another option is to extract the cyclical component of the variable source of instability because the cycle reflects all fluctuations around the trend component of a chronological series. It is this latter approach that is used in this work. Construction of the financial instability index is done in two steps:

Step 1: Analysis of Principal Components

Principal components analysis (PCA) brings out the similarities and differences between groups of individuals vis-à-vis the variables. The results of this analysis are used as the starting point of the development of the SIFI.

Step 2: Development of the SIFI

The level of instability of the financial system of a country was measured by the SIFI. This index is a combination of measures of instabilities related to the dimensions associated with this global instability, namely: the liquidity ratio, the domestic financing rate, the CFA Franc/U.S. Dollar exchange rate, and the interest rate. The coefficients used were determined using a factor analysis.[1] The SIFI used in this study was constructed from the factorial axes provided by the PCA. Based on the PCA results, the SIFI was developed through a combination of two axial indices. Each axial index was constructed using the variables correlated with that axis. For a country i and a set of variables correlated with a given axis j, the financial instability aspect associated with this axis is given by:

[1]Relevant only when the number of elements to be combined is not too small (i.e., at least four).

$$l_j(i) = \sum_{k=1}^{k} C_j^k \cdot V_k^i \tag{1}$$

where V_k^i is the value of the variable k for country i and C_j^k is the coordinate of the variable k on the axis j.

To make such a summation, we must ensure that the scale of measurement does not cause any variable to exceed another to the point that one cannot make a comparison between them. To solve this problem, all variables were normalized before they were included in the above formula. We used the z-transformation with the following formula:

$$V_k^{\bullet} = \frac{V_k - minV_k}{maxV_k - minV_k} \tag{2}$$

This formula has the disadvantage of being sensitive to extreme values to the introduction of a new value of the variable.

Once the axial indices were determined, the SIFI was calculated according to the following formula:

$$\left(\sum_{j=1}^{5} \lambda_j \cdot I_j(i)^{1/\alpha} \right)^{\alpha} \tag{3}$$

where λ_j is the weighting coefficient of axis j:

$$\lambda_j = \frac{\nu_j}{\sum_{j=1}^{5} \nu_j} \tag{4}$$

$I_j(i)$ is the contribution of the axis j with respect to the space formed by the five axes, in other words, it is the importance of inertia j in relation to the inertia of the five axes group, and α was set to equal 1.

2.2 Model to estimate: the PVAR model

This work aims to study the effect of changes in income inequality on the level of financial instability in the countries of the WAEMU. We used a vector autoregressive (VAR) model that highlights the relationships between a group of variables at one time, their lag values, and other variables considered as exogenous. Given the theoretical framework behind this investigation, and the panel data available for analysis, we used a panel vector autoregressive

model (PVAR) of p - order with fixed effects, represented by the following linear system:

$$Y_{it} = Y_{i,t-1}\Lambda_1 + Y_{i,t-2}\Lambda_2 + \cdots + Y_{i,t-p+1}\Lambda_{p-1} + Y_{i,t-p}\Lambda_p + X_{i,t}B + u_i + e_{i,t} \tag{5}$$

where $i \in \{1, \ldots, N\}$, $t \in \{1, \ldots, T_i\}$; $Y_{i,t}$ is the vector of k endogenous variables; $X_{i,t}$ is a vector of exogenous l variables; and u_i are the fixed effects and e_{it} are the error terms. The parameters to be estimated are the components of matrices Λ_1, Λ_2, ..., Λ_{p-1}, Λ_p and B.[2] The hypotheses underlying the model are the following:

$$E[e_{i,t}] = 0, \qquad E[e_{i,t}{}'e_{i,t}] = \Sigma, \qquad E[e_{i,t}{}'e_{i,s}] = 0 \text{ for } t > s. \tag{6}$$

The estimate used for PVAR is made by GMM. This method makes it possible to consider a probable correlation in the errors (Hansen, 1982). The endogenous biases are corrected using instrumental variables. However, their use can reduce the degree of freedom in the model. To remedy this, Holtz-Eakin et al. (1988) proposed using variables of lagged observations (thus supposedly uncorrelated to error terms) as instrumental variables. Before estimating the system specified above, it is required to determine the optimal p delay delays and the optimal delays instruments. The first is that which minimizes the criterion of the moment and the model selection (MMSC) proposed by Andrews and Lu (2001), based on the j statistic of Hansen (1982), which is the analogue of the maximum-based likelihood criteria such as AIC (Akaike, 1969), the BIC (Akaike, 1977; Rissanen, 1978; Schwarz, 1978), and HQ (Hannan and Quinn, 1979). Following the estimates, to confirm the stability of the PVAR, we applied a stability test which ensures that the modules of the proper values are smaller than the unit. This helped highlight the impulse response functions and to factorize the variance of forecast error.

Brief description of the variables

To achieve the objective of this work, we have recourse to the variables below, based on better economic literature (Table 1):

- **The Gini index:** a classic indicator for measuring inequality of income distribution in an economy. The Gini index has an annual value. It is used in this study to illustrate income inequality in each of the eight WAEMU countries.

[2]Panel VARs have been used to address a variety of issues of interest to macroeconomists and policymakers. Panel VARs are built with the same logic of standard VARs but, by adding a cross sectional dimension, they are a much more powerful tool to address interesting policy

- **The SIFI:** this indicator, as mentioned above, is the variable set up to capture the financial instability for each country in the study. The calculation of the SIFI is presented in the paragraphs above.

- **The ratio of the budget deficit/GDP:** this is the main (and only) control variable in this study. It is calculated as the difference between public expenditure and state revenue, related to GDP.

The data used in this study are from the BCEAO and WIDD and were abstracted for the eight WAEMU[3] countries for the period 1996 - 2011 (Table 2).[4]

3 Empirical results

3.1 Statistic description. The SIFI

Note that the development of the index is based on the results of the PCA performed on the financial variables (i.e., the liquidity ratio, the internal financing rate, the exchange rate CFA Franc/U.S. Dollars and interest rate). From the analysis of the histogram of the values (see Figure 2), both are retained in the two first axes because it integrates more than 91% of the information. In addition, the axes with eigenvalues greater than 1 are the first two. The coefficients from the PCA are presented in Table 3.

3.2 Results

This section presents the estimation results and makes interpretations based on the elements. From the selection criteria proposed by Andrews and Lu (2001), in Table 4, the optimal delay in the PVAR is of order 1. Table 5 confirms the stability of the estimated model. In fact, the associated eigenvalues are modules below unity. The graphical representation of the eigenvalues shows the previous conclusion and therefore allows subsequent to the modeling to comment impulse responses of interest variables.

The PVAR estimate

The result of the estimation of the PVAR can be explained by a high degree of informality and a low degree of banking penetration in the countries concerned. In fact, the financial sector in the WAEMU is still very underdeveloped.

[3]Benin, Burkina-Faso, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, Togo

[4]A function of the availability of data

An increase in the Gini index could mean that the richest increased their means of payment at the expense of the poorest. One should expect that this increase boosts savings enough that the supply of bank credit influences interest rates to the point of raising the level of financial instability. However, we do not observe this - economic agents in the sub - region do not show an increase in their income with increased savings. Similarly, the poor still earn less, and therefore high interest rates simply discourage them from borrowing from banks. The result is that the demand for bank credit will not explode and will instead sag, causing less fluctuation in financial aggregates.

Granger causality

The Granger causality analysis tests whether past values of a variable X influence the current value of another variable Y (so X is said to cause Y). In Table 6, we deduce that there exists a unidirectional causality. Indeed, income disparity in WAEMU countries in each year negatively influences the stability of the financial sector the following year. However, the levels of instability in the financial sector of a country do not affect the nature of income distribution.

Impulse response function and variance decomposition

Based on the variance decomposition of forecast errors, we noted that 43.16% of the variation of financial instability in WAEMU countries may be explained by the income inequalities inside them. On the other hand, the level of financial instability in these countries accounts for only 8% of variation in income inequality.

In terms of levels, Figure 3 shows that a shock on financial instability has a negative effect on itself and leads to a stable situation after seven times. On the other hand, an increase in income inequality in WAEMU countries tends to mitigate financial instability at first before boosting a higher level of instability. Following this increase, inequalities will decline but at a very slow pace.

4 Contribution of the finding

The analysis of the financial system and inequalities has occupied a prominent place in public debates both at times of crisis and at times of growth. Considering their supposedly close link could help to reduce inequalities in WAEMU countries. In this sense, the contribution of this research project will constitute an added value that will be shared by the research community, in that, the results that will be popularized may attract the interest of young researchers.

Also, the results will serve as a basis for advocacy at the level of public decision-makers in WAEMU countries for a more effective policy on fiscal inefficiency and reduction of inequality. Policy makers in WAEMU countries can be enlightened based on the results obtained, which may lead to a rethinking of current financial and anti - poverty policies.

Résumé

Cet article évalue la pertinence d'une instabilité financière par l'inégalité des revenus et inversement. La méthodologie utilisée dans cet article repose sur deux approches : la construction de l'Indice Synthétique d'Instabilité Financière (ISIF) et l'approche VAR considérée en panel faisant appel au PVAR. Les résultats obtenus permettent d'expliquer que la disparité des revenus dans un pays de l'UEMOA, une année donnée, influence négativement la volatilité du secteur financier l'année d'après. Des fonctions de réponses impulsionnelles montrent qu'un choc sur l'instabilité financière a un effet négatif sur lui-même et l'amène à une situation stable au bout de sept périodes. D'un autre côté, une hausse des inégalités de revenus dans les pays de l'UEMOA a tendance à atténuer l'instabilité financière dans un premier temps avant d'impulser une hausse du niveau d'instabilité. Par contre, suite à cette hausse, les inégalités vont baisser mais à un rythme très lent.

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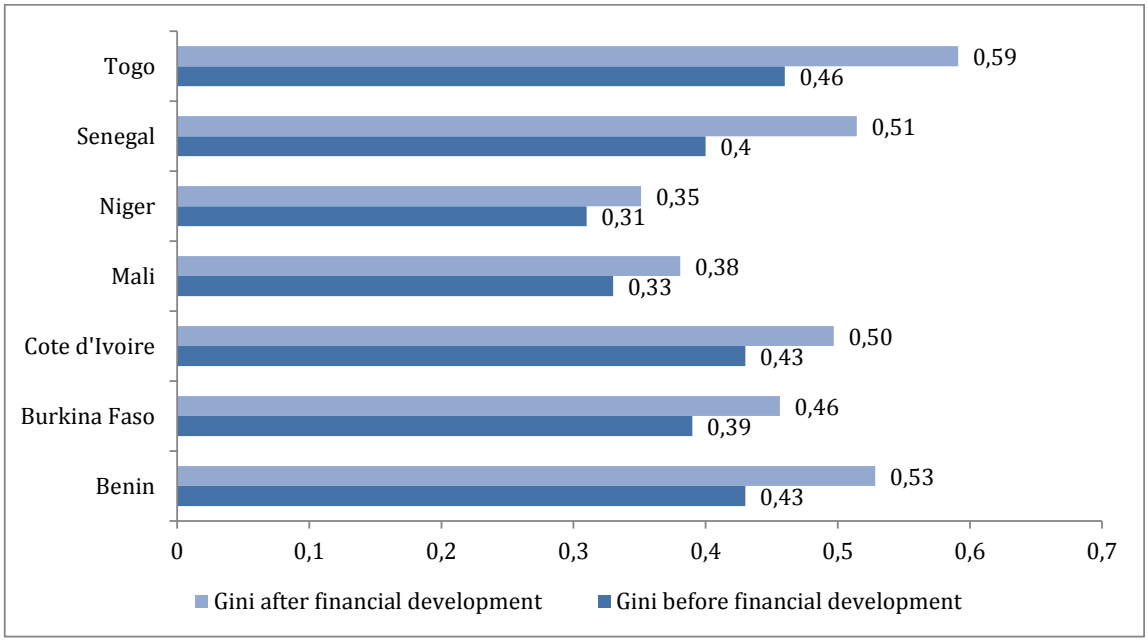
Figure 1: Inequality and financial development



Note: Author's calculations, 2016, based on WIID data.

Figure 2: Histogram of eigenvalues

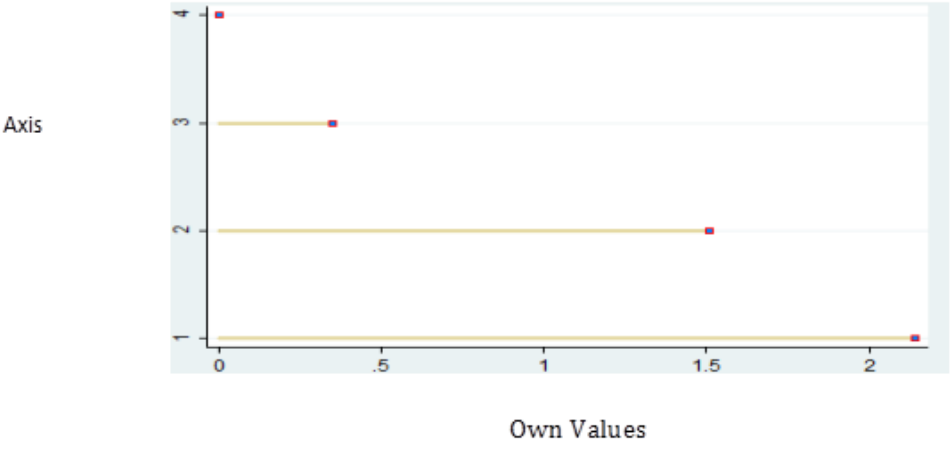


Figure 3: Impulse response functions

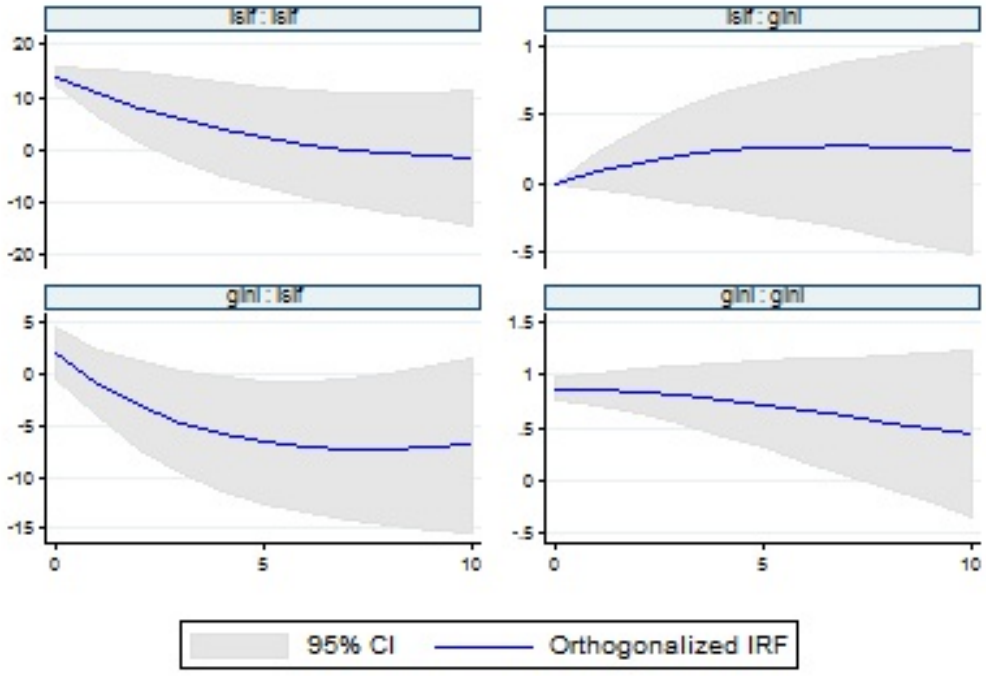


Table 1: Descriptive Statistics of Analyzed Variables

Variable	**Description**	**Measure**
SIFI	Synthetic index of financial instability	Index summarizing the fluctuations in descriptive variables of the financial sector
Gini	Gini index	Index measuring the inequality of income distribution in an economy
GOV_GDP	Budget balance rate	Overall budget balance (difference between public expenditure and state revenue) divided by GDP

Table 2: Statistic description

Synthetic index of financial instability in the WAEMU countries								
	Benin	**Burkina Faso**	**Ivory Coast**	**Guinea-Bissau**	**Mali**	**Niger**	**Senegal**	**Togo**
Average	48.335	48.335	48.335	48.335	48.335	48.335	48.335	48.335
Standard deviation	18.800	12.918	17.852	17.558	10.732	14.807	15.042	22.422
Min	24.279	27.165	26.911	20.188	31.154	30.152	28.397	21.839
Max	75.609	73.972	77.481	77.960	71.648	73.302	71.924	81.869
Gini index in the WAEMU countries								
	Benin	**Burkina Faso**	**Ivory Coast**	**Guinea-Bissau**	**Mali**	**Niger**	**Senegal**	**Togo**
Standard deviation	1.267	3.994	1.742	2.979	3.255	4.897	0.984	1.634
Min	34.076	38.146	38.445	34.980	31.122	29.962	36.761	33.450
Max	38.068	49.422	44.863	45.108	42.674	44.503	40.075	38.483

Table 3: Results of eigenvalues and weighting

Number of the axis	**Eigen value of the axis**	**Weighting value**
1	2.1441	0.5868
2	1.50999	0.4132

Table 4: Optimal delay

Delays	**CD**	**J**	**J-*p-value***	**MBIC**	**MAIC**	**MQIC**
1	0,9851049	13,63348	0,3247234	-40,09457	-10,36652	-22,34321
2	0,9947965	6,567878	0,5838888	-29,25082	-9,432122	-17,41658
3	0,9751067	1,957026	0,7436629	-15,95232	-6,042974	-10,0352

Table 5: Stability of the model

eigenvalues		
Real	**imaginary**	**module**
0.8775852	0.0799631	0.8812207
0.8775852	-0.0799631	0.8812207

Table 6: PVAR Estimation Result

	gini	**sifi**
GINI(-1)	0.984*	-2.757*
	(2E -10)	(0.017)
SIFI(-1)	0.006	0.771*
	(0.204)	(3E -7)
GOV_GDP	0.001	0.000
	(0.498)	0.981)

Note: * statistically significant at 5% level
( ) p-value

Table 7: Granger Causality

Equation	**Causes**	**Chi2**	**df**	***p-value***
Gini				
	SIFI	1,614	1	0,204
	All	1,614	1	0,204
SIFI				
	Gini*	5,677	1	0,017
	All*	5,677	1	0,017

Note: * statistically significant at 5% level