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RESEARCH ARTICLE

Income Diversification, Capital Requirement and Bank Profitability in the West African Economic and Monetary Union

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ARTICLE INFO	ABSTRACT
	The objective of this study is to analyze the role of regulatory capital in the relationship between bank income diversification and bank performance. Results from the generalized method of moments (GMM) show that banks that diversify their income are increasingly profitable. In a context of bank regulation, we find a negative sign associated with the interaction between income diversification and regulatory capital. This result implies that in a banking sector where banks' income is already diversified, regulation represents a counterweight that reduces bank performance. The results also show that bank credit is a key determinant of profitability. Furthermore, economic growth, asset tangibility and concentration positively influence ROE, while these variables are negatively related to ROA.

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INTRODUCTION

The banking sector is fundamental to the development of any country. Its role is primarily to facilitate the allocation of economic resources, but also to promote optimal risk management. To play this role to the full, the banking sector must be efficient. However, despite its importance in the development process, the banking sector is unfortunately not sufficiently efficient in developing countries, and particularly in the WAEMU countries. If we refer to Nyantaky and Sy's (2015) contribution on the banking system, it emerges that banks located in West Africa, are relatively less efficient than those located in other regions. Indeed, according to the AfDB's 2015 report on the performance of the banking system, the average cost/income ratio in the sub-region stands at 61%, compared with 48% in North Africa. As for operating expenses, they stand at 1.7% in North Africa, 1.5% in OECD countries, while around 6% in West Africa. In view of this situation, everything seems to indicate that banks in the sub-region are spending enormously to generate additional resources.

One of the avenues considered in the literature for increasing bank revenues is diversification. Revenue diversification, which consists in broadening the range of products or services offered, or exploring new sources of income complementary to the core business, is one of the strategies often explored (Porter, 1985). Today, non-interest-based activities are more numerous among banks' profit-making activities. By incorporating new sources of income or new assets, such as the provision of investments, brokerage services, share trading and underwriting services, the bank will diversify its asset portfolio (Meslier et al., 2014).

However, the literature is far from unanimous on the effects of diversification on bank profitability. For some authors, diversification improves bank profitability by promoting economies of scale and scope (Roger and Sinkey, 1999). It improves revenues by enabling banks to reach new customers with services tailored to their needs (Klein and Saidenberg, 1998).

In view of these contrasting results, another strand of the literature has examined the relationship between diversification and bank profitability in the context of banking regulation. Some researchers have found a positive effect of diversification on bank profitability, while others have highlighted more mixed results. In their analysis, Bebczuk and Galindo (2008) concluded that diversification of banking activities can improve profitability. Their research highlighted the importance of the banking regulatory context in this relationship. In contrast, Demirguc-Kunt et al, (2003) found more mixed results when the context of banking regulation was taken into account. This study showed that banking regulation can have a significant impact on the relationship between diversification and profitability. Certain regulatory aspects may hinder the profitability of diversification, thus calling into question the supposedly positive effect.

From a similar perspective, Meslier et al (2014) examined the benefits of income diversification in an emerging economy, while taking into account the context of banking regulation. Their results indicated that diversification can contribute positively to bank profitability, but they also highlighted the importance of regulatory and institutional factors in this relationship.

In the WAEMU, the regulatory environment has evolved substantially. The Basel II and Basel III standards came into force in 2018. The entry into force of these standards resulted in compliance with prudential standards (8.6%). The banking system's capital adequacy ratio fell to 10.9% in 2018 from 12.1% the previous year (BCEAO Banking Commission, 2022). In 2021, the adequacy ratio stabilized at around 12.6%. Over the same period, bank profitability began to decline. Indeed, the return on assets fell between 2013 and 2021, from 10.1% to 9.7% (BCEAO Banking Commission, 2022). In addition, income from customer transactions as a proportion of net banking income fell from 74.1% in 2013 to 61.9% in 2021. Income from securities transactions as a proportion of net banking income doubled from 16.5% in 2013 to 33.5% in 2021.

Given these contrasting trends, it seems to us that the effect of diversification on profitability is ambiguous in the UEMOA zone. Compliance with prudential standards does not also seem to go hand in hand with profitability. Hence the question: what role can regulatory capital play in the relationship between income diversification and bank performance?

Thus, the general objective is to examine the role of regulatory capital in the relationship between diversification and bank profitability in the WAEMU.

LITERATURE REVIEW

The relationship between diversification and banking performance

Initially focused on granting credit, banks are increasingly turning to so-called non-interest activities, generating new income from commissions and other fees. As these activities expand, banks develop new skills and expertise, which in turn increase their in-house know-how and profitability (Iskandar-Datta and McLaughlin, 2007). According to the theory of financial intermediation, diversification enables institutions to gain credibility in their role of selecting or monitoring borrowers at lower cost (Ramakrishnan and Thakor, 1984; Boyd and Prescott, 1986). Diversification is a necessity, as it significantly reduces the risk of financial distress in the event of difficulty (Bebczuk and Galindo ,2008 ; Berger et al 2010).

Although diversification tends to lower bank risk, some authors have pointed out that diversification tends to increase the costs faced by banks, resulting in lower profitability (Diamond, 1984; Leavine and Levine, 2007). By diversifying, the bank increases its degree of organizational complexity, the repercussions of which translate into significant efficiency losses (Kotrozo and Choi, 2006). For Stiroh (2006), diversification is associated with greater volatility in bank revenues, and generates a higher level of risk without increasing bank returns. Numerous studies have examined the impact of diversification on bank profitability in developed countries. Jouida and Hellara (2018) analyzed the effect of revenue diversification on the profitability of French financial institutions. Specifically, the study aimed to empirically test the influence of non-interest income on profitability. The study covered a sample of 290 financial institutions over the period 2002-2012. Methodologically, the authors used the dynamic panel generalized method of moments. The results showed a negative effect of revenue diversification on bank profitability. Using a sample of 272 Japanese cooperative banks, Harimaya and Ozaki (2021) analyzed the effect of diversification on their profitability over

the period 2009-2017. Applying OLS to the data, they succeed in establishing that loan portfolio diversification, particularly for traditional measures of concentration, leads to an improvement in cooperative bank efficiency.

Nisar et al (2018) investigated the effect of diversification on profitability and banking stability in South Asia. They apply the dynamic panel method to a sample of 200 commercial banks. They conclude that revenue diversification improves both bank profitability and financial stability. Additional results reveal that certain types of diversified activities have a different impact on profitability and stability. Indeed, while fees and commissions have a negative impact on the profitability and stability of South Asian commercial banks, other non-interest income has a positive effect.

Ammar and Boughrara (2019), study the effects of revenue diversification on bank profitability while highlighting the impact of switching to non-interest revenue sources on a sample of 275 banks from fourteen MENA countries from 1990-2011. The use of a GMM system shows that, overall, diversification improves bank profitability. Subsequently, analysis conducted after the distribution of non-interest income revealed that transaction-generating business lines contribute significantly to profitability and stability. Vidyarthi (2019), examines the dynamics between revenue diversification and performance (cost, profit, revenue, technical efficiency, pure technical and scale). Tobit regression results revealed an inverted U-shaped relationship between revenue diversification and efficiency parameters estimated for the entire panel, suggesting that banks should opt for limited diversification to improve profitability. Furthermore, the study by Zhang et al (2020) demonstrates that banking regulation plays a key role in the relationship between income diversification and bank profitability. The results suggest that regulations that promote an adequate bank intermediation rate can help improve bank profitability by exploiting the potential benefits of income diversification. This perspective underlines the importance of balanced banking regulation that promotes both income diversification and financial stability.

Relationship between regulation and banking performance

Banking regulation is a set of prudential measures such as restrictions and supervision imposed on the banking sector with the aim of preserving the stability of the banking system. For Berger (1995), there are five reasons to believe that higher capitalization should promote profitability. Firstly, banks with higher capital ratios lend prudently. Secondly, banks with higher capital should be able to reduce their cost of funding (Molyneux, 1993), because a high capital ratio is an important signal of solvency. Thirdly, a well-capitalized bank needs to borrow less to support a given level of assets. This can be important in emerging countries, where the ability to borrow is more subject to downtime. Fourthly, capital can be seen as a cushion to increase the share of risky assets, such as loans. When market conditions allow a bank to grant additional loans at an attractive yield, this should translate into greater profitability. Finally, an increase in capital can boost expected profits by reducing the expected cost of financial difficulties, including bankruptcy.

Djalilov and Piesse (2019) assess the effects of regulation on banking efficiency in 21 transition countries over the period 2002 to 2014. Methodologically, they use system GMMs and dynamic quantile panel regression. On the one hand, the system GMM results indicate that banking regulation improves bank efficiency. However, the results with dynamic panel quantile regression show that regulation has different effects at different quantiles. Psillaki and Mamatzakis (2017) analyze the effects of financial regulations, credit and labor market reforms on banking industry performance. Applying the SFA method and a panel model, they find that structural reforms exert a positive influence on bank performance. However, these reforms in the banking sector exert a negative influence if they are not accompanied by regulation and supervision aimed at limiting excessive credit expansion. Examining the determinants of banking performance on a sample of 49 banks in the MENA zone over the period 1998 to 2008, Naceur et al (2011) observe that the capitalization ratio (equity) is a major determinant of performance. Indeed, the results obtained by the Meta frontier method indicate that a high capital ratio is positively correlated with bank performance in all the equations estimated.

METHODOLOGY

The first part of the methodology is devoted to describing the variables, and the second to specifying the model.

Description of variables

The study covers the period 2011-2018 and is based on a sample of 70 banks in the UEMOA zone. The phenomenon we seek to explain is profitability, expressed in terms of ROA and ROE.

Table1: Study variables and their sources

Variables	Measurement	Source
LOAN	CREDACT : Ratio of client loans to total assets	BCEAO
ASSTANG	Tangibility of assets, calculated by dividing tangible assets by total assets.	BCEAO
CAR	Regulatory capital (CAR), calculated by dividing regulatory capital by total assets	BCEAO
ROE	Return on equity (ROE), calculated by dividing net income by the bank's equity	BCEAO
ROA	Return on assets (ROA), calculated by dividing net income by the bank's total assets	BCEAO
INCDIV	Diversification, as per Laeven and Levine (2007): $$\text{INCDIV}= 1-\left\lvert \frac{revenu\ d\,'\text{int}\,er\hat{e}t - revenu\ autre\ que\ d\,'\text{int}\,er\hat{e}t}{total\ revenu} \right\rvert$$	BCEAO
GDP	GDP : Annual growth rate of real GDP	WDI
INF	Inflation, captured by the growth rate of the consumer price index (CPI)	WDI
CONCE	Concentration, measured by the market share of the three largest banks	BCEAO

Model specification

Consider the following equation :

$$y_{i,t} = y_{i,t-1} + \beta X_{i,t} + u_t + v_t + e_{it} \tag{1}$$

Where y_{it} represents our explained variable, X_{it} represents the model's explanatory , u_i the bank-specific effect , v_t the time-specific effect and e_{it} the error term.

The equation, which is a growth equivalent, can be rewritten as follows:

$$y_{i,t} = \alpha y_{i,t-1} + \beta X_{i,t} + u_t + v_t + e_{it} \tag{2}$$

In this model, the presence of the lagged dependent variable precludes the use of standard econometric techniques. We employ the generalized method of moments in dynamic panel data, which allows controlling for individual and time-specific effects to address endogeneity biases of variables. There are two types of estimators: (a) the Arellano and Bond (1991) estimator or GMM in differences, and (b) the system GMM estimator. Note that the use of these estimators assumes quasi-stationarity of the equation's variables in levels and the absence of residual autocorrelation.

In the Arellano and Bond (1991) estimator, the strategy to address potential omitted variable bias related to specific effects is to difference the equation in levels. This yields the equation:

$$y_{i,t} - y_{i,t-1} = \alpha \left(y_{i,t-1} - y_{i,t-2} \right) + \beta \left(X_{i,t} - X_{i,t-1} \right) + \left(v_t - v_{t-1} \right) + \left(e_{it} - e_{i,t-1} \right) \qquad (3)$$

The first difference eliminates the bank-specific effect and consequently the bias from time-invariant omitted variables. By construction, the error term $\left(e_{i,t} - e_{i,t-1} \right)$ is correlated with the lagged differenced variable $\left(y_{i,t-1} - y_{i,t-2} \right)$. The first differences of the model's explanatory variables are instrumented by the lagged (in levels) values of these same variables. The resulting estimator is called the generalized method of moments in first differences and is consistent when T is fixed. However, this estimator has weak properties in finite samples. In particular, Kiviet (1995), Ziliak (1997), and Blundell and Bond (1998) show that the first-difference estimator can be severely biased, based on Monte Carlo simulations.

The potential existence of a significant bias in our study led us to favor the system estimator. Furthermore, Blundell et al. (2000) also show that the system estimator significantly improves precision gains and reduces the sampling bias compared to the first-difference estimator when the regressors are weakly exogenous and correlated with the individual effect.

In the case of highly persistent series, Arellano and Bover (1995) and Blundell and Bond (1998, 2000) show that it is preferable to use a system generalized method of moments (SYSGMM) estimator. This involves combining the first-difference estimator with additional conditions on the equations in levels.

The econometric specification of our study is given by:

$$
\begin{aligned}
ROA_{it} = {} & \alpha_i + \alpha_1 ROA_{it-1} + \alpha_2 ASSTANG_{it} + \alpha_3 INCDIV_{it} + \\
& \alpha_4 CAR_{it} + \alpha_5 LOAN_{it} + \alpha_6 GDP_{it} + \alpha_7 CONCE_{it} \\
& + \alpha_8 INF_{it} + \varepsilon_{it}
\end{aligned}
\qquad (4)
$$

$$
\begin{aligned}
ROE_{it} = {} & \alpha_i + \alpha_1 ROE_{it-1} + \alpha_2 ASSTANG_{it} + \alpha_3 INCDIV_{it} + \\
& \alpha_4 CAR_{it} + \alpha_5 LOAN_{it} + \alpha_6 GDP_{it} + \alpha_7 CONCE_{it} \\
& + \alpha_8 INF_{it} + \varepsilon_{it}
\end{aligned}
\qquad (5)
$$

In order to assess the contribution of regulatory capital in the relationship between income diversification and bank profitability, we introduce a multiplicative factor into the previous equation.

The resulting equation is:

$$
\begin{aligned}
ROA_{it} = {} & \alpha_i + \alpha_1 ROA_{it-1} + \alpha_2 ASSTANG_{it} + \alpha_3 INCDIV_{it} + \\
& \alpha_4 CAR_{it} + \alpha_5 INCDIV * CAR + \alpha_6 LOAN_{it} + \\
& \alpha_7 GDP_{it} + \alpha_8 CONCE_{it} + \alpha_9 INF_{it} + \varepsilon_{it}
\end{aligned}
\qquad (6)
$$

$$
\begin{aligned}
ROE_{it} = {} & \alpha_i + \alpha_1 ROE_{it-1} + \alpha_2 ASSTANG_{it} + \alpha_3 INCDIV_{it} + \\
& \alpha_4 CAR_{it} + \alpha_5 INCDIV * CAR + \alpha_6 LOAN_{it} + \\
& \alpha_7 GDP_{it} + \alpha_8 CONCE_{it} + \alpha_9 INF_{it} + \varepsilon_{it}
\end{aligned}
\qquad (7)
$$

RESULTS AND DISCUSSION

The presentation of the results will begin with descriptive analysis and conclude with a review of the estimation results.

Descriptive statistics

Income diversification shows an average value of 0.722, indicating a significant level of income diversification among banks in the WAEMU. It appears that the level of income diversification has low dispersion (standard deviation 0.23). However, the gap remains substantial between the most diversified banks and the least diversified banks.

Table 2: Descriptive statistics

Variable	Mean	Std, Dev,	Min	Max	Observations
LOAN	0,570	0,375	0,067	6,715	560
ASSTANG	0,046	0,056	0,000	0,506	560
CAR	0,109	0,180	0,004	1,478	560
ROE	0,191	2,839	-41,600	21,101	560
ROA	0,005	0,090	-0,446	1,000	560
INCDIV	0,722	0,238	0,000	0,999	560
GDP	5,481	2,719	-5,370	10,760	560
INF	1,770	2,617	-2,224	12,183	560
CONCE	65,151	16,790	41,943	100,000	560

Source: Author, based on data from the BCEAO and the World Bank

The average amount of bank credit represents 57% of assets. This variable shows little dispersion around the mean. The ROE variable has an average value of 19.1%, implying that banks are not sufficiently profitable in terms of their equity.

Table 2 summarizes the correlation between the variables. In general, these variables are weakly correlated, except for regulatory capital and asset tangibility, which show a correlation coefficient slightly above the average. This rules out the presumption of multicollinearity.

Table 3: Correlation matrix

	ROA	ROE	INCDIV	LOAN	ASSTANG	CAR	GDP	INF	CONCE
ROA	1,0000								
ROE	0,1942*	1,0000							
INCDIV	0,2529*	0,0507	1,0000						
LOAN	0,1036*	-0,011	0,1299*	1,0000					
ASSTANG	-0,332*	-0,049	-0,2804*	-0,1130*	1,0000				
CAR	-0,357*	-0,063	-0,3636*	-0,0882*	0,7045*	1,0000			
GDP	-0,0494	0,0365	0,0438	-0,0151	0,0127	-0,0006	1,0000		
INF	0,0247	-0,070	0,0108	-0,0140	-0,0103	0,0249	-0,229*	1,0000	
CONCE	-0,0677	-0,031	-0,0124	0,0459	0,0833*	0,2031*	-0,110*	0,1354*	1,0000

Source: Author, based on data from the BCEAO and the World Bank

INTERPRETATION OF RESULTS AND DISCUSSION

Table 4 presents a summary of the results regarding the link between income diversification and bank profitability.

The results indicate that banks which diversify their income become increasingly profitable.).

As with Laeven and Levine (2007), income diversification has a positive effect on bank profitability in the WAEMU region. This means that an increase in income diversification is associated with an increase in both asset and equity profitability of banks. This can be explained by the fact that banks diversifying their sources of income are better equipped to handle volatile economic conditions and reduce their dependence on a single sector or type of activity. Moreover, increased income diversification is also linked to a significant rise in return on equity (ROE), indicating that banks can generate higher profits for their shareholders through this diversification.

Table 4: Estimation results

VARIABLES	ROA	ROE
L1	0,544***	0,173***
	(0,000)	(0,000)
INCDIV	0,001**	0,322***
	(0,000)	(0,019)
ASSTANG	-0,368***	18,821***
	(0,004)	(0,462)
LOAN	0,035***	-0,030
	(0,002)	(0,053)
CAR	0,026***	-7,423***
	(0,001)	(0,176)
GDP	-0,005***	0,074***
	(0,000)	(0,003)
CONCE	-0,000***	0,022***
	(0,000)	(0,001)
INF	0,002***	-0,069***
	(0,000)	(0,003)
Constant	0,046***	-1,797***
	(0,002)	(0,077)
Observations	490	490
Number of ID	70	70
Standard errors in parentheses *** p<0,01, ** p<0,05, * p<0,1		

Source: Author, based on data from the BCEAO and the World Bank

The interaction between income diversification (INCDIV) and regulatory capital (CAR) has a significant effect on asset profitability (ROA) and equity profitability (ROE). The negative and significant effect on asset profitability suggests that when income diversification is combined with high regulatory capital, it may lead to a decrease in the banks' asset profitability. This result implies that in a banking sector where income is already diversified, regulation represents a counterbalance that reduces bank performance.

Regulatory capital has a positive and significant effect on ROA and a negative and highly significant effect on ROE. This indicates that an increase in regulatory capital is associated with a rise in asset profitability but a decrease in equity profitability. This may be due to the fact that banks with higher regulatory capital are better prepared to handle risks and economic disruptions, leading to better financial performance. However, regulatory capital has a negative and highly significant effect on return on equity (ROE), which might be because an increase in regulatory capital dilutes returns for shareholders, reducing equity profitability. Similar results are found in Berger (1995).

Table 5: Estimation results with regulatory capital as an Interaction variable

VARIABLES	ROA	ROE
L.1	0,543***	0,177***
	(0,001)	(0,000)
INCDIV	0,003***	0,649***
	(0,001)	(0,009)
ASSTANG	-0,368***	8,589***
	(0,004)	(0,202)
LOAN	0,035***	0,126***
	(0,001)	(0,021)
CAR	0,028***	-2,939***
	(0,001)	(0,078)
INCDIV*CAR	-0,006*	-1,472***
	(0,004)	(0,131)
GDP	-0,005***	0,053***
	(0,000)	(0,001)
CONCE	-0,000***	0,016***
	(0,000)	(0,000)
INF	0,002***	-0,075***
	(0,000)	(0,001)
Constant	0,044***	-1,526***
	(0,002)	(0,030)
Observations	490	490
Number of ID	70	70
Standard errors in parentheses *** p<0,01, ** p<0,05, * p<0,1		

Source: Author, based on data from the BCEAO and the World Bank

Asset tangibility has a negative and significant effect on ROA and a positive and highly significant effect on ROE. This suggests that as the share of tangible assets on banks' balance sheets increases, asset profitability decreases, but equity profitability increases significantly. Furthermore, the negative effect of asset tangibility on asset profitability (ROA) suggests that banks with assets primarily composed of tangible items such as mortgages or real estate may have lower asset profitability. Conversely, asset tangibility has a positive and significant effect on return on equity (ROE), suggesting that banks with tangible assets can generate higher returns for their shareholders.

The credit-to-assets ratio has a positive and significant effect on ROA but no significant effect on ROE. This implies that an increase in the credit-to-assets ratio is associated with higher asset profitability but does not significantly affect equity profitability. Thus, an increase in the credit-to-assets ratio is associated with a significant improvement in asset profitability (ROA). This may be due to the fact that banks extending more credit relative to their assets are able to generate higher interest income. However, the credit-to-assets ratio does not have a significant effect on return on equity (ROE), suggesting that this relationship is mainly influenced by other factors.

GDP growth rate has a negative and significant effect on ROA and a positive and significant effect on ROE. This suggests that an increase in GDP growth rate is associated with a decrease in asset profitability but an increase in equity profitability. This implies that banks may struggle to maintain profitability when the economy grows rapidly. However, the GDP growth rate has a positive and significant effect on return on equity (ROE). This observation can be explained by the fact that as the economy grows, investment and expansion opportunities multiply, leading to higher returns for bank shareholders. Similar conclusions are found by Gazi et al. (2024).

Bank concentration has a negative and significant effect on ROA and a positive and significant effect on ROE. This implies that an increase in bank concentration is associated with a decrease in asset profitability but an increase in equity profitability. The negative effect of bank concentration on asset profitability (ROA) suggests that banks operating in more concentrated banking markets tend to show lower profitability. This may be due to reduced competition and increased market power, which limits banks' ability to generate profits. Conversely, bank concentration has a positive and significant effect on return on equity (ROE), indicating that banks operating in more concentrated markets can achieve higher returns for their shareholders.

Inflation rate has a positive and significant effect on ROA and a negative and significant effect on ROE. This result shows that an increase in inflation rate is associated with an increase in asset profitability but a decrease in equity profitability. Moreover, this suggests that banks can benefit from higher interest margins in an inflationary environment. However, the inflation rate has a negative and significant effect on return on equity (ROE), which might be due to the impact of inflation on banks' costs and asset valuation. Similar results are found by Demirguc-Kunt and Huizinga (1999).

CONCLUSION

Our study analyzed the role of regulatory capital in the relationship between bank income diversification and bank performance. Specifically, it examined the effect of diversification on bank profitability in the WAEMU region and the impact of banking regulation on this relationship.

Theoretically, the analysis reveals that banks have significantly changed their business model over the past two decades. The traditional model based on the difference between loan and deposit interest rates is increasingly being replaced by a model that relies on both interest and non-interest income from activities and other financial services, hence the term diversification. Various empirical studies have examined the effects of this diversification on bank profitability, resulting in contrasting findings.

The factual analysis reveals a mixed evolution between interest income, non-interest income, and bank profitability in the WAEMU region. To corroborate or refute these findings, empirical analysis complements this study. Empirically, the estimation of the econometric model shows that banks that diversify their income are increasingly profitable. In a banking regulation context, a negative sign is observed associated with the interaction between income diversification and regulatory capital.

The results also indicate that bank credit is a determining factor of profitability. Furthermore, economic growth, asset tangibility, and concentration positively influence ROE, while these variables are negatively related to ROA. Based on these results, the following recommendations are made:

- Banks should maintain their income diversification and be effective in their intermediation to remain profitable.
- They should also manage their tangible assets effectively and implement strategies to leverage the prosperity of the WAEMU economies.

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