

Exchange Rate Regimes, Inflation, and Growth in the Economic Community of West African States

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How to cite this paper: Ndiaye, A., Fred, P., & Diallo, M. C. (2026). Exchange Rate Regimes, Inflation, and Growth in the Economic Community of West African States. *iBusiness*, 18, 234-253.

<https://doi.org/10.4236/ib.2026.184013>

Received: July 20, 2026

Accepted: October 27, 2026

Published: October 30, 2026

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Abstract

This study examines the relationships between exchange-rate movements, inflation, and economic growth in ECOWAS countries over 2000-2024, comparing the West African Monetary Zone (ZMOA) with the West African Economic and Monetary Union (WAEMU) and Cape Verde. Descriptive statistics reveal differences in growth, inflation, and nominal exchange-rate dynamics across the groups. Our central result is that, in the ZMOA, nominal exchange-rate movements Granger-cause inflation, which in turn is significantly and negatively associated with economic growth. This exchange-rate-inflation-growth sequence is not established for the WAEMU-Cape Verde group: exchange-rate movements do not Granger-cause inflation, and the inflation-growth coefficient is statistically insignificant. In the ZMOA, the direct coefficient on nominal depreciation in the growth regression is negative but insignificant; in the WAEMU-Cape Verde group, it is negative and significant only at the 10% level. Gross fixed capital formation is positively associated with growth in the latter group. These findings distinguish predictive precedence in the Granger test from conditional associations in the growth regressions; they do not establish a structural causal chain or prove that one exchange-rate regime causes superior macroeconomic performance, because the country groups also differ in institutional and structural characteristics.

Keywords

Exchange-Rate Regimes, Inflation, Economic Growth, Nominal Depreciation, ECOWAS

1. Introduction

In recent years, economic research has focused extensively on the potential effects of exchange rate policy on economic growth in both developed and developing countries. However, this impact has not been clearly established by economic theory.

The nature of the exchange rate regime adopted by a given country can affect medium-term growth in two ways: either directly through its effects on adjustments to shocks, or indirectly through its impact on other key determinants of economic growth, such as investment, foreign trade, and financial development (Bailliu, Lafrance, & Perrault 2003; Aloui & Sassi, 2005). However, authors disagree on the assessment of the effectiveness of exchange rate regimes. For example, Friedman (1953) argued against the system of fixed exchange rates, contending that they led to speculative crises and instability. The broader literature also examines the choice and classification of exchange-rate regimes, including fear of floating and the growth implications of fixed versus flexible arrangements (Bubula & Ötoker-Robe, 2002; Calvo & Reinhart, 2002; Ghosh et al., 1997; Levy-Yeyati & Sturzenegger, 2003; Reinhart & Rogoff, 2004). Work comparing declared and observed exchange-rate arrangements also informs this debate (Genberg & Swoboda, 2005).

For Mundell (1961), unlike Friedman, fixed exchange rates, in principle, reduce the uncertainties associated with international transactions. They therefore promote trade, investment, and, consequently, economic growth. However, in the event of large-scale real shocks, the rigidity of the nominal exchange rate could result in a relatively high adjustment cost. According to the author, under a flexible exchange rate regime, a significant deterioration in the terms of trade would lead to a nominal and real depreciation of the currency (provided inflation is under control), which should help revive domestic production and restore external equilibrium. In the context of a currency area characterized by a fixed exchange rate, restoring equilibrium requires adjustments in real terms (a contraction in domestic demand, and a decline in prices and wages). Related analyses consider the implications of monetary regimes for business cycles and welfare in small open economies (Dam & Linaa, 2005a, 2005b; Daria & Cúrdia, 2007; Kollmann, 2002).

According to McKinnon (1963), “small economies” also tend to be more open and exhibit fewer nominal rigidities. This is because economic openness implies greater resilience—that is, a greater ability to adapt to exogenous shocks. However, the benefit conferred by a fixed nominal exchange rate increases, and conversely, its opportunity cost decreases, as the share of international trade in economic activity rises.

Kenen’s (1969) approach highlights the nature of economic specialization. According to this approach, the impact of exogenous shocks affecting output and/or prices is largely determined by the degree of concentration in production. For example, heavy dependence on raw materials—particularly agricultural ones—makes an economy vulnerable to climate shocks. In contrast, a more diversified production structure limits the impact on the economy of shocks specific to a particular type of product, making the use of the nominal exchange rate for adjust-

ment purposes less significant.

However, [Dodge \(2007\)](#) argues that “a floating exchange rate regime can allow the economy to adjust more easily to shocks, in addition to playing an important role within a liberalized, market-based trade and financial order”. Furthermore, within a monetary zone, in order to respond to a shock occurring in one country of the zone, for example, the central bank that controls the currency must secure the consent of the other member countries of the zone before deciding on any potential manipulation of the common currency’s exchange rate.

Within ECOWAS, this study distinguishes between the West African Economic and Monetary Union (WAEMU) and the West African Monetary Zone (ZMOA). WAEMU comprises eight countries that share the CFA franc, which is pegged to the euro at a fixed rate: Benin, Burkina Faso, Côte d’Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. Cape Verde is not a member of WAEMU, but its escudo is pegged to the euro. The ZMOA sample used in this study comprises six countries: The Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone.

Recent studies on ECOWAS countries have yielded a variety of results. While [Simwaka \(2010\)](#) finds that fixed exchange rate regimes should be favored by ECOWAS countries, [Diop & Fall \(2011\)](#) argue that these countries can opt for either fixed or intermediate exchange rate regimes. In contrast, according to [Dupasquier et al. \(2005\)](#), the appropriate exchange rate regime for ECOWAS countries is a flexible exchange rate regime. These contradictory results highlight the importance of conducting a more in-depth analysis of the effects of exchange rate regimes on the economic performance of ECOWAS countries. Other studies also examine regime choice and economic performance in Africa and ECOWAS, including the case for intermediate regimes and the consequences of alternative exchange-rate arrangements ([Ajevskis & Vītola, 2009](#); [Bénassy-Quéré & Salins, 2010](#); [Camara, 2014](#); [Guellil et al., 2017](#); [Mathur & Subramanian, 2016](#); [Abouelkhair et al., 2018](#); [El Aboudi & El Bakkouchi, 2022](#)).

With this in mind, we will examine the impacts of fixed and flexible exchange rate regimes on the economic performance of ECOWAS countries. Do they play a decisive role in economic growth and inflation? Through what channels do exchange rate regimes affect economic growth in ECOWAS economies? Does exchange rate depreciation promote growth? What is the impact of inflation on economic growth?

A comparison between the West African Monetary Zone (ZMOA) and the combined WAEMU-Cape Verde group allows us to assess the differences in macroeconomic performance between the two monetary arrangements. However, this regional comparison alone does not allow us to identify a causal effect specific to the exchange rate regime. Indeed, the two groups also differ in their institutional, economic, and monetary characteristics.

From this perspective, exchange rate fluctuations are considered an observable dimension of changes in the exchange rate regime. A more in-depth analysis could complement this approach by introducing an explicit indicator of the exchange

rate regime—specifically, a de facto classification—as well as by examining the interaction between this indicator and exchange rate fluctuations. The results of this study are thus interpreted as highlighting macroeconomic differences between the groups studied, rather than as identifying an isolated causal effect of the exchange rate regime.

In the remainder of this paper, we will begin with a comparative analysis of the economic performance of the ZMOA, the UEMOA, and Cape Verde. Next, we will review the literature, followed by a presentation of our methodology and results.

2. Some Key Facts on the Exchange Rate Regime and Macroeconomic Performance in ECOWAS

The West African economy relies primarily on four countries. Nigeria (70% of regional GDP), Ghana, Côte d'Ivoire, and Senegal account for 90% of the bloc's GDP.

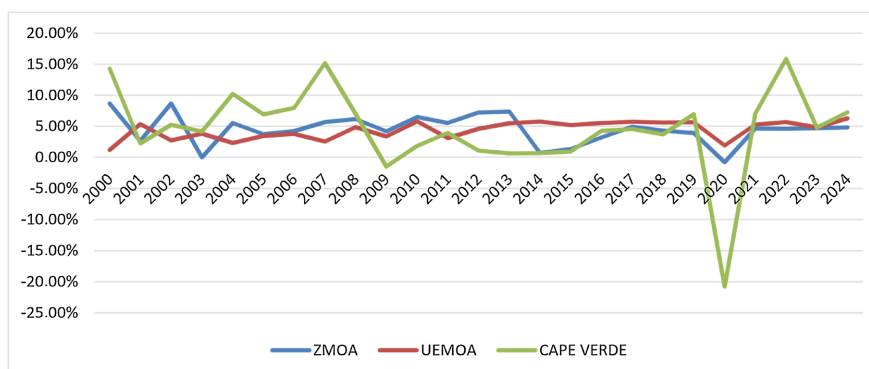
Exchange rate trends vary widely across ECOWAS. While the currencies of the West African Monetary Zone (ZMOA) countries have depreciated sharply, the CFA franc of the West African Economic and Monetary Union (UEMOA) and the Cape Verdean escudo have remained more stable.

The WAEMU countries are known as the leaders in the fight against inflation in sub-Saharan Africa. Among the fifteen ECOWAS countries, they have also recorded the highest growth rates since 2014.

In terms of compliance with the bloc's convergence criteria, the UEMOA countries perform better.

2.1. Comparative Analysis of Economic Growth

Figure 1 shows the average GDP growth-rate trends across the WAEMU, ZMOA, and Cape Verde over 2000–2024. WAEMU growth is comparatively stable, generally ranging between 2% and 6%. The ZMOA shows more fluctuation, including a slowdown around 2014–2015. Cape Verde displays greater volatility, including a sharp contraction in 2020 and a strong rebound in 2021–2022. These descriptive patterns should not, by themselves, be interpreted as evidence that the exchange-rate regime caused the differences in performance.

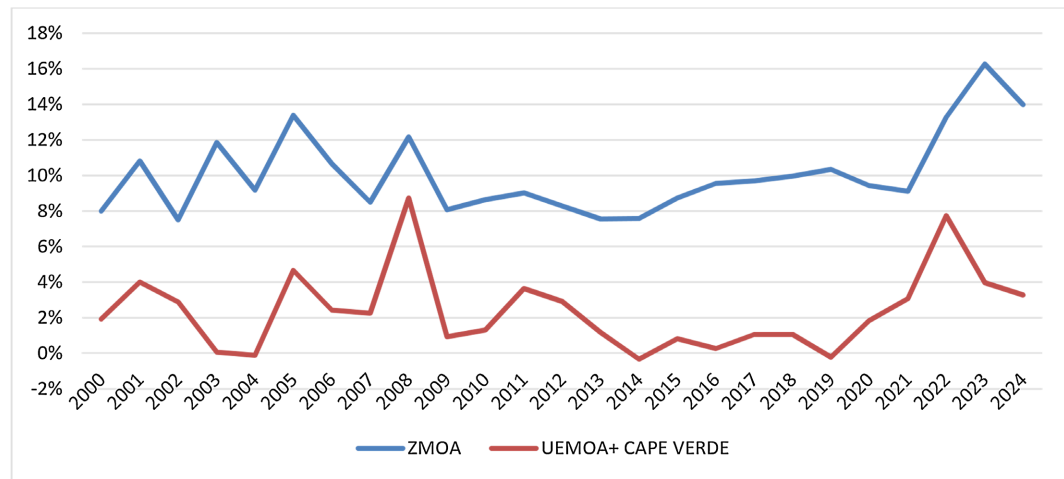


Source: calculations based on World Bank WDI data.

Figure 1. Trends in average GDP growth rates (%).

2.2. Comparative Analysis of Inflation

Figure 2 highlights contrasting inflation trends across the ZMOA, WAEMU, and Cape Verde over 2000-2024. Inflation in WAEMU is relatively stable compared with the more pronounced fluctuations observed in the ZMOA. Cape Verde also displays substantial variation, including negative inflation in 2020 and renewed price pressures in 2021-2022. These patterns are descriptive and do not isolate the effect of the exchange-rate regime from other country-specific factors.

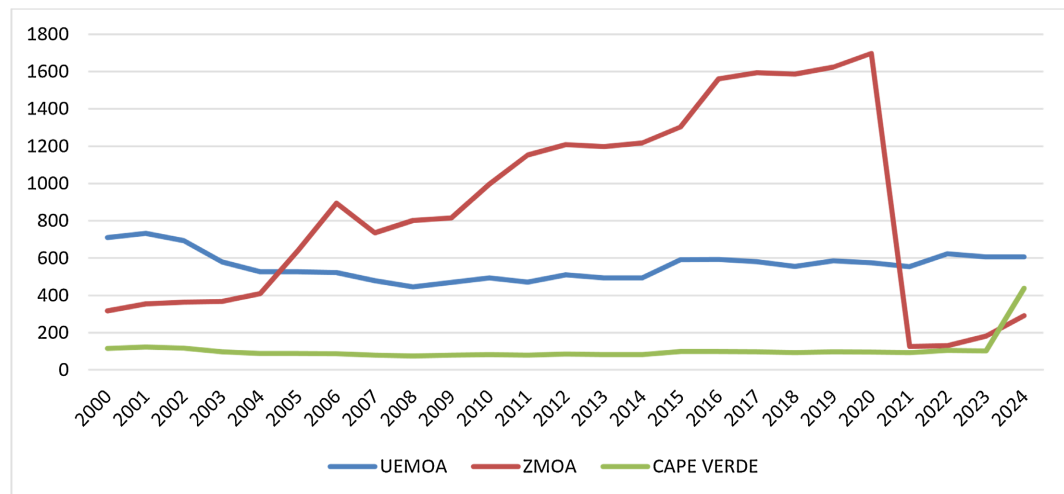


Source: Calculated based on World Bank WDI data

Figure 2. Inflation rates in ECOWAS (%) (Average inflation rates in each region over the period—in %).

2.3. Trends in Exchange Rates

Figure 3 presents the average official exchange-rate series for the three groups. The levels are reported for descriptive context only, because exchange-rate levels are affected by currency units.



Source: Authors' calculations based on World Bank WDI data.

Figure 3. Average official exchange rates for cape verde, WAEMU, and ZMOA (Units of national currency per 1 U.S. dollar).

Figure 3 compares average official exchange rates, expressed in units of national currency per U.S. dollar, across the three groups. WAEMU is relatively stable over the period, while the ZMOA series is more volatile. Cape Verde shows a sharp increase in 2024; this apparent break should be checked against the original World Bank series, the units, and any possible series-definition or redenomination changes before drawing substantive conclusions. Because exchange-rate levels depend on currency units, the figure is descriptive and should not be interpreted as a direct comparison of depreciation rates.

3. Review of Theoretical and Empirical Literature

Inflation and economic growth are two of the most fundamental and interconnected economic concepts. The relationship between these two variables has been extensively debated and studied in the economic literature, giving rise to various theories and models.

3.1. A Theoretical Review of Inflation and Economic Growth

Approaches differ depending on the school of economic thought.

Classical and Neoclassical Theories

Classical and neoclassical economic theories generally view inflation as harmful to economic growth. According to these perspectives, a rise in the general price level can lead to a reduction in investment and savings, thereby negatively affecting economic growth. The arguments put forward include:

- 1) Distortion of Relative Prices: Inflation distorts price signals, making it more difficult for businesses and consumers to make optimal decisions regarding production, consumption, and investment.
- 2) Erosion of Purchasing Power: High inflation reduces consumers' purchasing power, which can decrease aggregate demand and slow economic growth.
- 3) Uncertainty and Risk: Inflation creates economic uncertainty, discouraging long-term investment.

The Phillips Curve and Keynesian Perspectives

The Phillips Curve posits an inverse relationship between the unemployment rate and the inflation rate, suggesting that a certain level of inflation may be tolerated to achieve low unemployment and, consequently, higher economic growth in the short term. However, Keynesians recognize that this relationship may not hold in the long run, due to adaptive expectations and the effects of stagflation observed in the 1970s.

Endogenous Growth Models

Endogenous growth models incorporate inflation into the framework of economic growth dynamics. These models highlight several mechanisms through which inflation can influence growth: Broader models of long-run growth also emphasize capital accumulation and technological progress (Barro & Sala-i-Martin, 1995; Mankiw et al., 1992).

- 1) Effect on Capital Accumulation: Inflation can affect savings and investment

rates, thereby altering the growth rate of physical and human capital.

2) Innovation and Technological Progress: The uncertainty and costs associated with inflation can discourage innovation and slow technological progress, negatively impacting economic growth.

3) Menu and Transaction Costs: The costs associated with frequent price changes and transactions increase with inflation, reducing economic efficiency.

Monetarist Perspective

Monetarists, notably Milton Friedman, argue that inflation is essentially a monetary phenomenon, resulting from excessive growth in the money supply relative to output. According to this school of thought, moderate and stable inflation is necessary to ensure sound economic growth, while high and volatile inflation is harmful.

The relationship between inflation and economic growth remains a complex and debated topic. Theoretical perspectives and empirical evidence suggest that while inflation may stimulate growth in the short term under certain conditions, high and unstable inflation is generally detrimental to long-term economic growth. An economic policy framework aimed at maintaining moderate and stable inflation is therefore crucial for supporting sustainable economic growth. Policy discussions likewise emphasize the design and consequences of frameworks intended to maintain price stability (Schmidt-Hebbel, 2010).

3.2. Some Empirical Studies

- Exchange Rate Regimes and Economic Performance

Numerous empirical studies have been conducted to help formulate a clear choice of exchange rate regime. However, the results do not allow for formal conclusions and merely establish the merits of each type of exchange rate regime. Ghosh, Ostry, and Tsangarides (2010) confirmed this lack of consensus.

In the context of ECOWAS, there has been a proliferation of studies in recent years devoted to the future single currency in the region. The research has focused in particular on the issue of choosing an exchange rate regime. In this regard, Diop and Fall (2011), using a stochastic dynamic general equilibrium model that accounts for nominal rigidities, find that ECOWAS countries should favor fixed and intermediate exchange rate regimes. According to these authors, a fixed exchange rate regime offers several advantages, as it helps stabilize the economy without undermining growth performance. However, under this regime, the economy would be more exposed to exchange rate crises. Under these conditions, they believe that an intermediate exchange rate regime appears to be more appropriate.

Dupasquier et al. (2005) examine whether a monetary union is the appropriate exchange rate regime for ECOWAS countries. They conclude that a flexible exchange rate regime appears more suitable for the West African subregion.

Ripoll (2001) compared the macroeconomic performance of some twenty African countries, including those in the CFA zone, in terms of economic growth and inflation according to their exchange rate regimes. His results showed that inflation is significantly lower under fixed exchange rates. The author also demon-

strated that fixed and flexible exchange rate regimes exhibit virtually identical growth performance. However, intermediate exchange rate regimes achieve the best performance in terms of both inflation and growth.

The results obtained by (Diaw & Ka, 2012) highlight the positive effects of both types of exchange rate regimes on economic growth. However, the effect of the flexible exchange rate regime on growth is greater than that of the fixed exchange rate regime.

- Empirical Review of Inflation and Economic Growth

The relationship between economic growth and inflation in West Africa is a topic of interest to economists and policymakers in the region.

Empirical studies have yielded mixed results regarding the relationship between inflation and economic growth. Some studies show a significant negative relationship between high inflation and economic growth, while others identify thresholds beyond which inflation becomes harmful.

Several studies conducted in West Africa suggest a nonlinear relationship between inflation and economic growth. For example, a study by Ndoricimpa (2017) covering several countries in the region indicates that moderate inflation can have a positive or neutral effect on economic growth. However, when inflation exceeds a certain threshold (generally estimated to be between 5% and 10%), it becomes detrimental to growth. This threshold varies, however, from one country to another depending on specific structural characteristics. A study by Sarel (1996) identifies an inflation threshold of 8%, beyond which inflation begins to negatively affect economic growth. In contrast, countries with low to moderate inflation may not experience a significant impact on growth.

Sékou's (2014) study on the West African Economic and Monetary Union (UEMOA) identified an inflation threshold of 10 percent, beyond which inflation begins to significantly harm economic growth.

Furthermore, Okafor et al. (2018) conducted a study on inflation and economic growth in Nigeria over the period 1961-2016 using a parametric linear causality analysis. To do so, they applied the ARDL (AutoRegressive Distributed Lag) method. Their results suggest that an inflation threshold of 14% would be optimal for stimulating the Nigerian economy and putting it on a path to stable growth.

Ahorter et al. (2012) examined the impact of inflation on economic growth in West African Economic and Monetary Union (WAEMU) countries using a Keynesian model. They employed the least squares method on panel data. The results showed that there is a statistically significant negative long-term relationship between inflation and economic growth for WAEMU countries.

Morvillier (2019) conducted a study on the impact of currency undervaluation on the inflation growth relationship in 62 countries (18 advanced economies, 22 emerging economies, and 22 developing economies) over the period 1980-2015. The results reveal a negative inflation growth relationship for emerging economies, whereas inflation does not hinder growth in developing economies. Furthermore, the study shows that the greater the currency undervaluation, the more sig-

nificant the negative impact of inflation on growth.

Onuoha and Okorie (2020), using a dynamic OLS model across eleven (11) African countries over the period 1990-2019, sought to determine the relationship between inflation and variables related to capital, defense, and education spending. The results across the countries showed that changes in capital and defense spending exceeding 1 percent are associated with a gradual shift in inflation. Furthermore, spending on education and health appears to have a positive and inverse relationship with inflation, respectively; however, these relationships are insignificant. Studies show that macroeconomic stability—including exchange rate stability and the management of budget deficits—plays a crucial role in the relationship between growth and inflation. For example, Fosu's (2009) study showed that UEMOA countries, benefiting from a common currency and coordinated monetary policies, perform better in terms of inflation control compared to non-UEMOA countries. Evidence on exchange-rate regimes and inflation performance, including work on ECOWAS, is also relevant to this discussion (Ndiaye, 2021; Yamada, 2013).

4. Methodology

Before using a model to further analyze the relationships between the exchange rate regime, inflation, and economic growth, we will first conduct Granger causality tests.

4.1. Definition of Variables and Data Sources.

The study covers a panel of countries observed annually over the period 2000-2024. The theoretical sample comprises 15 countries, representing a maximum of 375 country-year observations. The ZMOA consists of six countries, corresponding to a theoretical maximum of 150 observations, while the UEMOA-Cape Verde group comprises nine countries, representing a theoretical maximum of 225 observations.

Table 1. Definitions of the variables used.

Variables	Variable Descriptions
TC	GDP growth rate (annual %)
INF	Inflation, Consumer Price Index (annual %)
TCO	Official exchange rate (units of local currency per 1 dollar)
FDI	Foreign direct investment, net inflows (% of GDP)
GFCF	Gross fixed capital formation (annual growth rate).
TO	Openness Ratio: $(X+M)/GDP$
TCN	Nominal Exchange Rate

Source: Authors' calculations.

Table 1 summarizes the variables and their definitions. The data are primarily

sourced from the World Bank's World Development Indicators (WDI) database. The main indicators used are: the annual real GDP growth rate (NY.GDP.MKTP.KD.ZG), inflation measured by the annual change in the consumer price index (FP.CPI.TOTL.ZG), the official exchange rate (PA.NUS.FCRF), and net foreign direct investment as a percentage of GDP (BX.KLT.DINV.WD.GD.ZS). Trade openness (TO) is calculated as foreign trade as a percentage of GDP.

The number of observations actually included in each estimation may be less than the theoretical number due to data availability, missing observations, and econometric transformations applied to the variables.

4.2. Causality Test

According to Granger's (1969) definition, one variable causes another if knowledge of the first variable's past improves the ability to forecast the second.

Granger causality can be formalized as follows, where, and Y_t are two stationary variables; by performing a linear regression of Y_t on the past values Y_p ($p < t$) and on the past values X_p , ($p < t$), if significant coefficients are obtained, then knowing their values can improve the forecast of Y_t ; we say that X_t cause Y_t . Instantaneous causality exists when the current value X_t appears as an additional explanatory variable in the previous regression. Thus, we propose to estimate the following model:

$$Y_t = a_0 + a_1 Y_{t-1} + \dots + a_p Y_{t-p} + b_1 X_{t-1} + \dots + b_p X_{t-p} + \varepsilon_t \quad (1)$$

$$X_t = c_0 + c_1 X_{t-1} + \dots + c_p X_{t-p} + d_1 Y_{t-1} + \dots + d_p Y_{t-p} + \mu_t \quad (2)$$

Y = inflation rate;

X = nominal exchange rate;

ε_t and μ_t are the error terms.

We will test the null hypothesis $H_0: a_1 = a_2 = \dots = a_p = 0$, against H_1 . H_0 is the hypothesis that X does not cause Y . Therefore, if H_0 is rejected, we will say that X (the exchange rate) causes Y (the inflation rate). Similarly, we will test $H_0: d_1 = d_2 = \dots = d_p = 0$, against H_1 ; in this case as well, if H_0 is rejected, we will say that Y (the inflation rate) causes X (the exchange rate).

4.3. The Model: The Relationship between the Exchange Rate Regime, Inflation, and Economic Growth

To examine the relationship between the exchange rate regime, inflation, and economic growth, we developed an econometric model based on previous empirical studies, notably those by Adeniran, Yusuf, and Adeyemi (2014), Okuneye and Sangosanya (2019), and Hatmanu, Cautisanu, and Ifrim (2020). Given the nature of the data collected and the theoretical requirements, we opted for a panel data regression model. This model can be expressed mathematically as follows:

$$TC_{it} = \alpha_0 + \alpha_1 INF_{it} + \alpha_2 TCO_{it} + \alpha_3 IDE_{it} + \alpha_4 FBCF_{it} + \alpha_5 TO_{it} + \mu_{it} \quad (3)$$

For the regression analysis, the official exchange rate (TCO), expressed as units of national currency per U.S. dollar, is replaced by a measure of nominal deprecia-

tion defined as the logarithmic change in that rate: $DEP_{it} = \ln(TCO_{it}) - \ln(TCO_{it-1})$. A positive value indicates that more units of national currency are required to purchase one U.S. dollar, which corresponds to nominal depreciation; a negative value indicates appreciation. This transformation measures the change in the exchange rate rather than its level. It does not, by itself, eliminate artificial breaks caused by redenominations or changes in series definitions; such observations must be checked in the source data. The resulting regression specification is:

$$TC_{it} = \alpha_0 + \alpha_1 INF_{it} + \alpha_2 DEP_{it} + \alpha_3 \Delta IDE_{it} + \alpha_4 \Delta FBCF_{it} + \alpha_5 \Delta TO_{it} + \mu_{it} \quad (4)$$

5. Results and Analysis

5.1. Granger Causality Test

Before applying the Granger-causality test between inflation and the nominal exchange-rate series, stationarity is examined using augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Appendices 3 and 4 report test statistics at level and first difference. The classifications in these tables need to be based on the corresponding critical values or p -values and on clearly stated deterministic terms; the statistics alone are not sufficient to verify the reported I(0)/I(1) labels. Variables identified as I(1) are intended to be used in first differences where required. The stationarity status of DEP, which is already constructed as a logarithmic change, should be verified separately before finalizing the specification.

Given the structure of the data, which consists of country-year observations, the causality analysis between the nominal exchange-rate series (TCN) and inflation (INF) uses the Dumitrescu-Hurlin panel-causality test. The tests are applied to individual country observations within each group, not to regional averages. The analysis covers 2000-2024 and uses one lag. This lag choice is motivated by the annual frequency and the limited time dimension, but should be understood as a parsimonious specification rather than a lag length selected by a reported formal criterion.

Data availability varies across countries. The manuscript reports 20 missing observations for the ZMOA and 9 for the WAEMU-Cape Verde group. Accordingly, 130 of the 150 theoretical ZMOA country-year observations and 216 of the 225 WAEMU-Cape Verde observations are reported as available after accounting for the lag. These counts should be reconciled with the effective sample sizes displayed in the original software output, because lagging and differencing can reduce the usable observations further.

The test is applied in both directions: first, the null hypothesis that changes in the nominal exchange rate do not cause inflation in the Granger sense; and second, the null hypothesis that inflation does not cause changes in the nominal exchange rate in the Granger sense. It should be noted that Granger causality refers to a relationship of temporal precedence and predictive power and does not, on its own, constitute proof of structural economic causality.

The results are reported in **Table 2** and **Table 3**. Regarding the results:

For the ZMOA, the null hypothesis that TCN does not Granger-cause INF is

rejected at the 1% significance level (reported $p = 0.0009$), while the null hypothesis that INF does not Granger-cause TCN is not rejected (reported $p = 0.3236$). The evidence therefore supports predictive precedence from the nominal exchange-rate series to inflation in this group, but not the reverse direction. This result does not, by itself, establish structural causation.

Table 2. Granger causality test for ZMOA.

ZONE	Test Hypothesis	p -value
ZMOA	D (TCN does not Granger-cause INF)	0.000***
	D (INF does not Granger-cause TCN)	0.323

Source: Authors' calculations. *** indicates statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. The null hypothesis is that the nominal exchange rate does not Granger-cause inflation, or vice versa.

For the WAEMU-Cape Verde sample, neither null hypothesis is rejected at conventional significance levels (reported p -values: 0.8784 for TCN to INF and 0.5887 for INF to TCN).

Table 3. Granger causality test: UEMOA + Cape Verde.

REGION	Test Hypothesis	p -value
UEMOA + Cape Verde	D (TCN does not Granger-cause INF)	0.588
	D (INF does not Granger-cause TCN)	0.878

Source: Authors' calculations.

5.2. Model Estimates and Results

5.2.1. ZMOA

Table 4 reports the preliminary diagnostic results for the ZMOA model. The interpretation of these tests depends on the exact procedure and null hypothesis used; the test names and null hypotheses should be stated explicitly.

- The reported Hsiao-test p -value is 0.0000. Its interpretation depends on the exact Hsiao procedure implemented and the null hypothesis tested; it should not be described as a test for endogeneity unless the software output and test specification explicitly establish that interpretation. The test name, null hypothesis, statistic, and decision rule should therefore be stated in the final manuscript.
- The reported Breusch-Pagan p -value is 1.0000. The manuscript must specify whether this is the LM test for random effects or a test for heteroskedasticity, because the null hypothesis and interpretation differ. The p -value alone, without identifying the exact test, is insufficient to support both interpretations.
- The Hausman test yields a reported p -value of 0.0000. Under the usual null hypothesis that the random-effects estimator is consistent, this result favors the fixed-effects specification over random effects.

Table 4. Results of preliminary tests (ZMOA).

Test	Probability
Hsiao	0.0000
Breusch-Pagan	1.0000
Hausman	0.0000

Source: Authors' calculations.

Interpretation of the Results

Table 5 reports the fixed-effects estimates for the ZMOA. Inflation has a negative and statistically significant coefficient at the 1% level. The first difference of FDI has a positive coefficient significant at the 10% level, as does the first difference of trade openness. The coefficient on DEP is negative but statistically insignificant ($p = 0.606$); therefore, these estimates do not provide statistical evidence of an independent association between nominal depreciation and growth in the ZMOA.

Table 5. Estimation of the fixed-effects model (ZMOA).

TC	Coeff.	Std. Err.	t	$p > t$
INF	-0.120320	0.016714	-7.19	0.0000***
D(FDI)	0.245396	0.142702	1.72	0.091*
D(GFCF)	0.007920	0.013143	0.60	0.549
DEP	-0.014608	0.028168	-0.52	0.606
D(TO)	0.088801	0.051940	1.71	0.093*
_cons	-0.158477	4.44315	-0.04	0.972

Source: Authors' calculations. *** indicates statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. The null hypothesis is that the nominal exchange rate does not Granger-cause inflation, or vice versa.

5.2.2. UEMOA + Cape Verde

- The preliminary diagnostics for the WAEMU-Cape Verde group are reported in **Table 6**. The Hausman test (reported $p = 0.0002$) favors fixed effects over random effects under the usual null hypothesis. The reported Hsiao-test result should be interpreted only after the exact test and null hypothesis have been identified in the methods and output.
- The Breusch-Pagan test is reported with $p = 1.0000$. Its implication depends on whether the reported statistic tests random effects or heteroskedasticity; identify the exact test before using it to justify the estimator.

Table 6. Results of preliminary tests (UEMOA + Cape Verde).

Test	Probability
Hsiao	0.0000
Breusch-Pagan	1.0000
Hausman	0.0002

Source: Authors' calculations.

Table 7. Estimation of the fixed-effects model (UEMOA + Cape Verde).

TC	Coeff.	Std. Err.	t	$p > t$
INF	0.002395	0.090648	0.03	0.979
D(FDI)	0.212059	0.116683	1.82	0.071
D(GFCF)	0.039317	0.010203	3.85	0.000
DEP	-0.005493	0.003115	-1.76	0.080
D(TO)	-0.027788	0.018492	-1.50	0.135
_cons	6.45462	1.48182	4.36	0.000

Source: Authors' calculations.

Interpretation of the Results

Table 7 reports the fixed-effects estimates for the WAEMU-Cape Verde group. The coefficient on FDI is positive and statistically significant at the 10% level ($p = 0.071$), not negative. Gross fixed capital formation has a positive coefficient significant at the 1% level. DEP has a negative coefficient that is significant at the 10% level only ($p = 0.080$). Inflation is statistically insignificant ($p = 0.979$), and the coefficient on trade openness is also statistically insignificant ($p = 0.135$).

6. Conclusion

The panel-causality tests and fixed-effects estimates provide the following results, subject to the specification and data checks discussed above:

- In the ZMOA, changes in the nominal exchange rate Granger-cause inflation, which in turn is significantly and negatively associated with economic growth. These two findings support an exchange-rate-inflation-growth sequence, although they do not prove a structural causal chain. The direct coefficient on nominal depreciation is negative but insignificant.
- In the WAEMU-Cape Verde group, this sequence is not demonstrated: exchange-rate changes do not Granger-cause inflation, and inflation is not significantly associated with growth. The coefficient on nominal depreciation is negative and statistically significant only at the 10% level. The estimates neither establish that depreciation caused lower growth nor rule out a negative association with growth.

The descriptive comparison shows lower and more stable inflation in WAEMU and Cape Verde than in the ZMOA over much of the period. This pattern is consistent with, but does not by itself prove, an effect of the exchange-rate arrangement, because the groups differ in other institutional and structural respects. Average growth was also higher in WAEMU and Cape Verde during parts of the period, but this descriptive difference should not be interpreted as a causal regime effect.

Taken together, the results show that exchange-rate flexibility alone does not guarantee strong economic performance, and the observed differences between

groups cannot be attributed solely to the exchange-rate regime. Institutional, structural, and monetary differences between the groups, as well as the limitations of the data and model specification, must be considered when interpreting the estimates.

7. Recommendations

1) In this context, the countries of the West African Monetary Zone (ZMOA) must ensure the stability of their exchange rate regimes to avoid currency depreciation and its corollaries—inflation and a loss of confidence in the currency as a store of value. A loss of confidence, in turn, fuels demand for dollars or the CFA franc as safe-haven currencies for savers. Exchange rate stability is essential for improving economic performance and meeting the community's convergence criteria.

2) As for WAEMU and Cape Verde, moving toward a fully flexible exchange rate regime carries risks of economic instability. However, dependence on the euro should be reduced by pegging the currency to a basket of convertible currencies (dollar, euro, yuan). Pegging the CFA franc to the SDR could be a solution.

3) The WAEMU framework for economic and monetary cooperation, which has proven its effectiveness by making its member countries the most integrated region on the African continent in economic, monetary, and financial terms, must be preserved and reformed. It could be opened up to ZMOA countries on an individual basis, with a view to accelerating the ECOWAS monetary integration process.

4) The performance of an exchange rate regime is judged by its ability to help absorb external shocks and restore external balance. However, no exchange rate regime is optimal for all countries and all times, and no exchange rate regime can compensate for the absence of sound economic policies and strong institutions. From this perspective, to achieve strong growth and structural competitiveness, the effective solution for ECOWAS countries is endogenous and integrated development.

Author Contributions

Amath Ndiaye: Conceptualization, methodology, supervision, manuscript revision, and writing. Philbert Fred: Data collection, econometric analysis, and interpretation of the manuscript's results. Mamadou Chérif Diallo: Literature review, contribution to the interpretation of the results, and manuscript revision. All authors have read and approved the final version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendices

Appendix 1: Descriptive Statistics for ZMOA

Variables	Mean	Standard Deviation	Minimum	Maximum
GDP	4393	5587	−30.1	26.5
INF	11,919	6713	0.8	41.5
TCN	90,972	7499	1	52.4
FDI	7311	14.74	−0.8	103.3
GFCF	18,972	7499	1	52.4
TSS	70,206	12,245	38.8	98.9
TO	40,088	34,528	0	116
TCO	930,325	2283.577	0.5	9565.1

Appendix 2: Descriptive Statistics for UEMOA and Cape Verde

Variables	Mean	Standard Deviation	Minimum	Maximum
GDP	4319	3648	−19.3	17.7
INF	2196	2776	−3.5	14.3
TCN	103,298	4964	92.7	36.1
FDI	2,586	2776	−2.8	13.8
GFCF	19,062	5902	5.8	36.1
TSS	72,632	19,133	26.8	99.5
TO	55,194	19,761	0	117.8
TCO	504,977	162,877	75.3	732.4

Appendix 3: ZMOA Unit Root Test

Test	ADF		PP		Conclusion
Series	Level	Difference	Level	Difference	
GDP	−3.87289	−8.01342	−5.64862	−16.4477	(0)
INF	−3.86155	−5.90185	−3.71867	−12.8657	(0)
TCN	2.23288	−4.29307	1.46011	−7.20138	(I)
IDE	−1.00355	−5.37931	−1.72323	−10.3866	(I)
GFCF	−0.86289	−5.39198	−1.01460	−7.68333	(I)
TSS	1.80476	−2.82048	1.61539	−3.52661	(I)
TO	−1.03883	−5.37549	−1.29652	−9.13522	(I)
TCO	5.27728	−2.42647	7.72655	−2.14166	(I)
DEP	3.12242	−1.33109	−18.8460	−16.6664	(I or 0)

Appendix 4: UEMOA + CAPE VERDE Unit Root Test

Test	ADF		PP		Conclusion
Series	Level	Difference	Level	Difference	
GDP	-4.42898	-8.24790	-8.29941	-27.0613	(0 or I)
INF	-6.27193	-10.3402	-7.51955	-19.0382	(0)
TCN	-0.04897	-8.83561	0.31877	-11.1092	(I)
IDE	-1.41841	-5.71979	-2.61780	-12.9379	(0 or I)
GFCF	2.93109	-5.12081	4.16695	-8.03613	(I)
TSS	1.41003	-2.45282	0.96141	-4.08977	(I)
TO	0.81957	-3.47120	0.61260	-4.99028	(I)
TCO	-4.73060	-5.10699	-2.93164	-6.10763	(0)
DEP	6.70002	-2.74910	-7.45619	-7.54298	(I or 0)