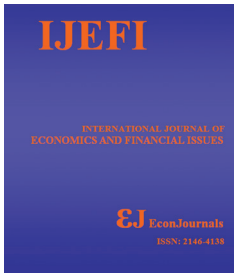

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Macroeconomic Indicators and Economic Growth in West Africa: Evidence from Dynamic Panel Models

Sani Abdullahi Sule[1], Lukman Hakim[1], Tetuko Rawidyo Putro[1], Putra Pamungakas[1], Kazeem Alasinrin Babatunde[2]*

[1]Department of Economics, Faculty of Economics and Business, Universitas Sebelas Maret, Surakarta, Indonesia, [2]Econometrics and Business Statistics Department, School of Business, Monash University Malaysia, Bandar Sunway, Selangor, Malaysia. *Email: alasinrinphd@gmail.com

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ABSTRACT

This study investigates the effect of macroeconomic indicators on West Africa economies where instability and external shocks constitute significant challenges. It employs dynamic panel models and the Generalized Method of Moments (GMM) procedure to account for endogeneity. The paper applied panel data from 1990 to 2022 on inflation, foreign direct investment, exchange rates, participation in the labour force, international reserves, and the COVID-19 effect. The results suggest that inflation and international reserves are major growth drivers, while exchange rate impact is minimal due to structural and governance constraints. The study, therefore, advocates for flexible monetary policies, improved regulatory frameworks, and strategic investments in human capital to foster the continent's economic resilience.

Keywords: Macroeconomic Indicators, COVID-19, Economic Growth, Labor Force, Exchange Rate, International Reserves, Foreign Direct Investment, Inflation
JEL Classifications: F43, C33, E62

1. INTRODUCTION

Economic growth is a prime consideration for policymakers of countries in West Africa, yet it is becoming difficult to maintain consistent growth because of macroeconomic fluctuations. Business cycles are, in essence, the expansionary and contractionary phases of the economy, affecting GDP growth, investment, and employment. Understanding these fluctuations in economic growth in the continent is essential, as countries within the region experience unique economic conditions characterized by structural limitations, external dependencies, and policy constraints (Akinlo, 2004; Babatunde et al., 2013; Essien et al., 2017). As part of the global economy, Africans are also exposed to external shocks, which can influence their business cycles and economic trajectories. Such shocks often magnify domestic economic fluctuations and challenge policymakers in promoting stable economic growth (Fielding and Shields, 2001). Past research shows macroeconomic volatility negatively affects economic productivity, especially in developing economies like West Africa (Lucas, 1977; Fischer, 1993). During an economic boom, investments and consumption increase, causing a rise in employment opportunities and growth. On the contrary, a contraction may bring about a decline in investment and an increase in unemployment, leading to a fall in economic development. In West Africa, where economies are often vulnerable to external shocks, such as global commodity price fluctuations, understanding the impacts of this volatility on growth becomes even more pertinent (Agyapong et al., 2019).

While scholars have studied macroeconomic indicators' impacts on economic growth, including inflation, foreign direct

investment, exchange rates, international reserves, and labour force participation, limited attention has been paid to how macroeconomic volatility influences economic growth in West African countries. Existing literature focuses mainly on static relationships or isolated indicators, neglecting the dynamic interactions and periodic fluctuations in macroeconomic volatility. Hence, this study explores the pattern and magnitude of macroeconomic volatility's influence on economic growth in a sample of 16 West African countries: Togo, Senegal, Guinea, Gambia, Cote d'Ivoire, Nigeria, Ghana, Niger, Mauritania, Liberia, Guinea-Bissau, Mali, Cape Verde, Sierra Leone and Benin. Burkina Faso. Using a dynamic panel data model, the present research investigates macroeconomic indicators on economic growth while controlling for country-specific fixed effects and possible endogeneities in the data. Focusing on the fluctuations in inflation, foreign direct investment, exchange rates, labour force participation, international reserves, and COVID-induced shocks to economic growth our analysis is conducted from 1990 to 2022.

This research contributes to the existing body of knowledge by analysing the effects of macroeconomic indicators on output growth within the West African context, addressing essentially the lack of understanding about macroeconomic cyclical fluctuations and external shocks impacting the national economy of the region. The study further conducts robust estimation for potential endogeneity issues, employing dynamic panel data with the Generalized Method of Moments (GMM). The results reveal the significant roles of international reserves and inflation volatility in influencing growth. At the same time, exchange rate fluctuations have a limited impact, possibly due to structural rigidities and policy constraints. The study also highlights the complex relationship between macroeconomic volatility and economic growth, providing valuable empirical evidence for policymakers on maintaining economic stability through flexible monetary policies and strategic reserve management (Balogun, 2007; Tchokote, 2015).

2. LITERATURE REVIEW

2.1. Business Cycle

The business cycle is one of the core concepts of macroeconomics, defined by time-varying expansion or contraction of overall economic activity. These can be either be classical business cycle or the growth cycle, as explained by McDermott and Scott (1999); Samuelson and Nordhaus (1995) and Harding and Pagan (2005). Each approach has different perspectives on how the economy works and takes a different tack on the nature of economic growth, especially in less developed countries (LDCs). The classical business cycle indicates a periodic expansion and contraction pattern of overall economic activity. The earliest work in this area may be traced back to Burns and Mitchell (1946), who described the cycle as a sequence of expansions, recessions, contractions, and subsequent recovery, entering the next cycle's expansion phase. The pattern is not strictly periodic; it reflects that some inherent variability or volatility in economic activity presents itself under internal and external influences (Abotsi and Ampah, 2024; Ashakah et al., 2025; Omoju et al., 2001). The major accomplishment, however, is identifying the turning points, as such moments delineate the phases of expansion and contraction, thereby allowing economists and policymakers to understand better the causes of and sometimes potential consequences of economic fluctuations. This study, thus, gives greater consideration to the developing countries' real business cycle while underscoring the necessity of studying them for formulating effective economic policies. Special features of developing economies include a high degree of sectoral concentration, vulnerability to outside shocks, and wide differences in economic integration. Hence, it follows that there must be very qualifying explanations of cycles influencing the dynamics of economic activity in these regions. A definite identification of turning points with the purification of distinctive phases of expansion and contraction presents an opportunity for the protagonist to contain the unfavourable effects and sustenance of growth.

Dynamic panel data analysis will examine the modern aspects interrelated to the business-economic growth nexus in West African countries. It will, therefore, investigate variables, for example, inflation, labour force participation, foreign exchange direct investment, exchange rates, international reserves, and the impact of the COVID-19 pandemic (Ibn-Mohammed et al., 2021). These variables will reveal these economies' structural characteristics and vulnerabilities within the business cycle context and point to effective policy interventions. Using the growth cycle ideas that Lucas (1987) in the work on business cycle asymmetries first suggested and that Kydland and Prescott (1990) would also later do in their works, where that cyclical output is viewed as deviations from the trend. When analyzing the growth cycle, the trend or permanent component is removed from the data to focus on the cyclical component. This will provide a cycle that represents the growth cycle.

2.2. GDP Growth Rate

The GDP growth rate is a basic macroeconomic indicator reflecting economic expansion over time. However, beyond this metric, economies seek to understand how broader phenomena such as inflation and global trade impact economic growth, particularly through foreign direct investment (FDI). The influence of the macroeconomic indicators, such as economic complexity, foreign exchange rates, and FDI, are strongly emphasized by Kasapi et al. (2019). The World Bank disagrees with this argument because macroeconomic indicators must incorporate variations in production output, interest rates, inflation, balance of payments, exchange rates, and FDI (World Bank, 2024). The study emphasizes the role of these macroeconomic indicators in the selected African economies.

Despite the significant influence of these macroeconomic indicators, the selected countries have faced challenges. For example, Nigeria continues to face foreign exchange shortages due to the restrictive policies of the central bank, which have effectively holed them up and stalled their imports of goods and services (Ezenwa, 2022). Inflation has shown a negative but significant relationship with economic development in Nigeria and South Africa, highlighting the complex interplay between inflation and foreign direct investment (Adeniyi, 2020). Even if FDI has a vital role during the economic growth transformation process, the fact

that one cannot presume that such investment yields an automatic and guaranteed result must also be considered.

The World Bank argues that developing countries must address many intertwined issues to encourage sustainable development and inclusivity, including low productivity, global competitiveness, economic resilience, tax-system-induced price distortion, and an unstable trading environment (World Bank, 2022; Oyeniran and Babatunde, 2015). Macroeconomic factors, such as inflation, exchange rates, and FDI, provide decisive directions for influencing economic outputs and, consequently, should be considered for state policy (Antwi et al., 2013).

2.3. Gross Domestic Product (GDP)

The Bureau of Economic Analysis defines GDP as the total monetary value of all goods and services a country produces within a year minus the value of goods and services used in production. Thus, the measure provides an overall estimate of a nation's total economic performance. GDP is vital for assessing health and economic growth, as it encompasses government spending, consumption, net exports and investment, providing a clear picture of economic performance. According to Dyan and Sheiner (2018) GDP is the sum of all consumption expenditure and total capital formation, personal consumption expenditure, net exports of goods and services, and total private domestic investment.

An overview of the GDP of select African nations shows that Nigeria's economic growth rate was $441.5 billion in 2021, making it the largest economy within the continent. South Africa follows closely with a GDP of $418 billion, making it the third in Africa. Algeria and Kenya stand at positions four and five, respectively (Kamer, 2022). Despite this considerable GDP, regional growth remained low at under 4% between 1995 and 2010, a trend that has led to overall poor growth in the per capita GDP at an average of only 2.1% annualized from 2000 to 2011 following the decade of stagnancy of per capita growth (IMF, 2012b). Research by Egbunike and Okerekeoti (2018), using data from 2011 to 2017 with multiple regression techniques, indicates various economic factors influencing GDP growth rates. This suggests that GDP is not just the ultimate target for growth; it is one of the essential yardsticks against which the nations take account of economic performance and subsequently compare one another with. Thus, knowledge about GDP dynamics should form the basis for sound monetary policy implementation and other developmental progress descriptions.

2.4. Exchange Rate

The extended growth model for Nigeria was estimated using annual data spanning from 1960 to 2011. This analysis used purchasing power parity (PPP) to ensure that the GDP figures were comparable across different years and economic conditions (Ozigbo et al., 2025). GMM used to enhance the robustness of results when endogeneity concerns arise, was adopted for estimating the coefficients in the growth model. Accounting for dynamic relationships, GMM examines how investment, inflation, FDI, and several other aggregate economic indicators influenced Nigeria's economic growth by capturing the complexities of the economy and offering insights into the structural factors affecting growth, thereby facilitating better-informed policy recommendations (Ibraheem, 2016). According to the findings, the exchange rate takes approximately 4 years to reach equilibrium. Specifically, on the other hand, the PPP methods suggest that there was a much smaller real exchange rate shift under the flexible regime compared to the fixed exchange rate regime. According to the GMM estimation, real exchange rate misalignment exerts an adverse but significant influence on overall economic prosperity over the period. The study suggests that a favourable exchange rate should be established to reduce the problem of exchange rate misalignment and maintain economic growth in the long run (Azu and Naziri, 2015).

Applying the behavioural equilibrium exchange rate-based (BEER) model, exchange rate policy coupled with output growth and interest rate differential are the most significant predictors of real exchange rate fluctuations (Essien et al., 2017). The study examines the impact of economic growth and real exchange rate on the factors that influence the equilibrium exchange rate, exploring the nature of their relationship. The main objective is determining how exchange rate fluctuations affected Nigeria's economic development between 2004 and 2014. GDP is also favourably impacted by a falling exchange rate, which increases the previous GDP, ER and FDI. Nigerian economic growth during this period was characterized by sustained expansion, which was facilitated by a sustained increase in these elements.

2.5. Foreign Direct Investment (FDI) Inflow

Majerova (2015) discovered that the Moroccan economy is the most favourable regarding the individual indicators. The horizontal axis of the angle in the current account deficit to GDP ratio indicates a substantial shortfall of approximately 4% on both sides compared to the Egyptian economy. Oluwatoyese et al. (2016) showed that trade balance, especially in terms of the value of food imports, are significant variables affecting economic performance in Nigeria. Azu and Naziri (2015) found that analysing the data using the VAR approach based on the Nigerian economic situation concluded that RER fluctuation was significantly controlled in terms of real GDP and foreign direct investment.

According to IMF (2012a), creating an FDI-friendly environment will be crucial. Algeria's trade inflows are low by international standards (around 1% of GDP), and the country missed the chance in the mid-2000s when significant FDI inflows were directed to other countries in the region. Furthermore, FDI mainly focuses on the oil industry without significantly impacting knowledge and private sector growth. Algeria's attractiveness has suffered from the 2009 decision requiring 51 national participation in all FDI projects. Opening up the FDI regime, at least in non-strategic sectors, would promote faster capital accumulation in the short term and could also encourage the diffusion of knowledge within the economy through a network of local suppliers.

2.6. Inflation

Drukker et al. (2005) suggest a model with two threshold points, identifying acceptable inflation thresholds at 11.2% and 12.0%. Based on these findings, Doguwa (2013) estimates that the inflation threshold at which it harms Nigeria's economy ranges

between 10.5% and 12%. These findings suggest that the inflation threshold at which it harms development in Nigeria is estimated to be between 10.5% and 12%. According to the findings, the inflation threshold level in South Africa is 4 per cent. Inflation and growth have a positive but negligible association at inflation levels below and up to 4%. When inflation exceeds 4%, the link becomes negative and substantial. These conclusions are supported by the robustness tests (Leshoro, 2012). In Nigeria, inflation has also been proven to impact overall national production considerably (Obim et al., 2018).

Majerova (2015) uses the period 2007-2012 through a magical polygon. Regarding individual indicators, Kenya's economy appears to be the most favourable. The angle's vertical axis divided GDP growth and inflation compared to Egypt's economy. For Nigeria's Economy, a previous study finds no significant effect on inflation rate with respect to Nigeria (Egbunike and Okerekeoti, 2018). Mohamed et al. (2018) argue that economic diversification is essential for maintaining the country's economic growth. However, Lawal et al. (2022) analyze time series data from 1986 to 2019, finding inflation's inverse relationship with the manufacturing sector, with statistically significant results. The study only concentrated on the manufacturing sector. However, this study will look at the aggregate economic output. Benson et al. (2022) analyze the South African economy and find that, in the short run, inflation and economic growth do not have a sufficiently significant impact on a company's performance variations.

2.7. International Reserves

These studies emphasize the importance of prudent management and adequate international reserves in maintaining economic stability and promoting growth. This is consequently important as the prudent management of international reserves has been critical to ensuring the stability and growth of the Nigerian economy (Oluwa, 2018). Similarly, Van der Merwe,(2018) examined South Africa and found that the country's adequate international reserves have significantly contributed to the stability and growth of the economy, particularly during periods of external economic shock. Ahmed (2017) underscored the importance of accumulated international reserves in providing economic stabilization and sustainable growth in Algeria. El-Ghazali (2020) analyzed the Egyptian economy and highlighted how managing international reserves has been instrumental in maintaining economic stability and promoting economic growth. Mwangi (2021)'s study provides insights into the importance of adequate international reserves in safeguarding exchange rate stability and supporting overall economic growth in Kenya. The importance of international reserves in maintaining economic stability has been discussed in various works (Wang, 2011).

2.8. Labor Force

In Nigeria, a growing and skilled workforce has proved to be an important determinant of economic growth (Oluwa, 2019). Similarly, Van der Merwe,(2018) studied the roles of the labour force in South Africa and found that its composition, including skills and education levels, has been a critical factor in the country's economic growth. Ahmed (2017) examined the Algerian scenario about labour structure contributing significantly to its economy. El-Mansour (2020) analysed Egypt's labour market and proved that the labour force's skills and makeup positively affect economic growth, particularly in the services and manufacturing sectors. In addition, Mwangi (2021) researched their effect in Kenya and described that dynamic population parameters supporting education and skills have made substantial contributions toward agricultural, manufacturing, and service sector activities. The skilled and growing labour were examined in the available literature as playing a vital role in economic growth (Doe, 2018).

2.9. COVID-19 Pandemic

Studies suggest that this pandemic is having a profound impact worldwide. Due to the various effects of the virus, African states face unique challenges in mitigating the consequences of the pandemic. Early work by Owusu and Moraes (2020) stressed that the socio-economic factors prompting the spread and severity of the COVID-19 pandemic should be looked at in localized contexts for Africa. This notion moved further to address the different configurations concerning the levels of population density, health infrastructure, and existing burden of diseases, propagating the impact of the pandemic on the continent by Tamasiga et al. (2022). The relationship between socioeconomic factors and COVID-19 severity and spread in African countries has been studied by Owusu and Moraes (2020). Their study urged policy-making to factor in COVID-19 impacts on population density, healthcare infrastructure, and the burden of pre-existing diseases. Tamasiga et al. (2022) built upon the idea by carefully analysing the relationships among these variables and providing a fuller picture of the socio-economic context shaping the pandemic's course on the continent.

Extensive research has been conducted on government responses to COVID-19, which reflect the panoply of strategies adopted across the African states. Anyangwe and Mtonga (2020) empirically analyzed the implementation and effectiveness of public health measures and how the challenges and successes of government responses were handled. Their work emphasized the importance of adaptive designing of policies that consider every region's relevant socio-economic and cultural context. The impact of COVID-19 on African economies is a key topic of scientific investigation. A thorough analysis of the economic impact was conducted by Smith and Johnson (2020), examining the differential effects on sectors and vulnerable populations. Their study emphasizes the importance of targeted economic interventions and support mechanisms to mediate the socio-economic impact of the pandemic.

International cooperation has been central to addressing the challenges raised by the pandemic under the guidance of the World Health Organization. In another study by Adebisi et al. (2022), a thorough investigation of collaborative efforts and challenges ensuring equitable access to vaccines across the continent has been reported. This research investigated international health cooperation dynamics and highlights the significance of a collective response to a global health crisis. The psychological and social dimensions have also been covered in the literature. Sneed et al. (2020), examined some of the pandemic's mental health challenges facing some African communities while calling for a response to the pandemic that embraced a holistic view, placing

equal value on psychosocial well-being compared to traditional public health measures. The literature is vast and enormously diverse, but a broad consensus exists that the COVID-19 pandemic shocks Africa's health, economics, international cooperation, and mental health. Understanding these layers is much to consider when proposing wide-ranging and context-sensitive strategies to cope with the challenges of the pandemic (Emam, 2024; Sabas et al., 2025).

3. METHODOLOGY

This study uses a dynamic panel data approach to examine the connection between business cycles and economic growth in 16 West African countries. The analysis focuses on the period from 1990 to 2022, capturing the region's long-term and recent macroeconomic shifts. The key variables selected include inflation, foreign direct investment (FDI), exchange rate, labour force, international reserves, and the impact of the COVID-19 pandemic, each representing essential macroeconomic indicators that influence the business cycle and economic growth.

3.1. Model Specification

The study employs a dynamic panel data model to represent the variables' inherent endogeneity and time-dependent nature. The model builds upon the following basic structure

$$GDP_{it} = \alpha + \beta_1 Inflation + \beta_2 FDI_{it} + \beta_3 Exchange\ rate_{it} + \beta_4 Labour\ force_{it} + \beta_5 International\ Reserves_{it} + \beta_6 COVID\text{-}19_{it} + \varepsilon_{it}$$

Where:

- I index the countries, and t indexes the years,
- GDP_{it} represents economic growth,
- α is the intercept,
- $\beta_1, \beta_2, \ldots, \beta_3$, are coefficients for each independent variable, and
- ε_{it} is the error term.

The study uses the System Generalized Method of Moments (SYSGMM) estimator to account for potential endogeneity and country-specific influences. This method is well-suited for dynamic panel data analysis as it enables reliable estimation even when lagged dependent variables are present and accounts for fixed effects.

3.2. Variable Definitions

Inflation: Represented by the Consumer Price Index (CPI), inflation captures the rate of price changes, which influences consumption, investment, and overall economic stability (Fischer, 1993).

Foreign Direct Investment (FDI): FDI inflows are a critical indicator of economic integration and growth potential in the region, often providing capital and technology transfers (Borensztein et al., 1998).

Exchange Rate: The variable reflects the local currency's stability, influencing trade balance and foreign investment attractiveness.

Labour Force: The total labour force variable represents the working population, an essential input in the production function and a driver of economic growth.

International Reserves: Reserves serve as a buffer for external shocks, particularly relevant for economies with fluctuating exchange rates and trade balances (Rodrik, 2008).

COVID-19 Impact: This variable captures the pandemic's economic effects through a binary indicator (0 for pre-COVID years, 1 for COVID years) to isolate structural changes during 2020 and subsequent years.

3.3. Estimation Procedure

The SYSGMM estimation approach is implemented to address endogeneity and account for lagged variables. Two-step robust standard errors handle potential heteroscedasticity and serial correlation issues. Additionally, diagnostic tests, including the Sargan and Arellano-Bond autocorrelation tests, are conducted to confirm the model's suitability and robustness.

This methodology allows for a comprehensive assessment of the variables influencing economic growth and provides insights into the West African region's economic resilience and vulnerabilities amidst business cycle fluctuations.

3.4. Estimation Technique

The Arellano-Bond Generalized Method of Moments (GMM) estimator addresses potential endogeneity issues, ensuring robust estimations by including lagged variables as instruments. This method captures the dynamic nature of the economic growth variable and allows for assessing persistence in GDP growth across different phases of the business cycle.

3.5. Diagnostic Tests

Diagnostic tests are conducted to validate the model, including:

- Sargan test: To check for over-identifying restrictions in the model, ensuring instruments' validity.
- Arellano-Bond test: To detect the presence of serial correlation in the first-differenced errors, confirming the model's robustness.

3.6. Conceptual Framework

This conceptual framework examines how labour force, foreign direct investment (FDI), international reserves, and inflation rates impact real GDP growth in African countries, with the COVID-19 pandemic as a control variable. It illustrates the relationships between these factors and their collective influence on economic performance. By systematically analyzing these variables, the framework enhances understanding of the drivers of economic growth in the region (Figure 1).

4. ANALYSIS OF WEST AFRICA DATA

The Sargan test for instrument validity is a statistical method used to check the instruments' validity to analyse a regression model employing the instrumental variable technique (Table 1). In particular, it checks for the null hypothesis that the instruments are orthogonal to the error term in the model and, hence, are good and valid to use in estimating the model, with a test statistic test = 24.09. The P-value corresponding to it is 0.724. A statistical significance of over 0.05 leads to a study conclusion that does

not reject the null hypothesis. This means there is no empirical evidence that the instruments are invalid; as such, it can be inferred that they are orthogonal to the error term. Therefore, based on the results of the Sargan test, instruments employed in the model can be considered valid and suitable for the purpose. This makes the regression estimates more accurate and reliable, thus increasing confidence in the conclusions made from the model regarding the nature of the variables' interrelation.

The Abond test for autocorrelation is applied to reveal the existence of serial correlation in the residuals connected with the regression model, which may lead to unsound estimates of the model (Table 2). In the results for West Africa, the t statistics for the first and second order are −1.8472 and −1.8155, respectively. The derived P-values are 0.0647 for the first and 0.0694 for the second. These P-values are very little from the conventional significance level of 0.05, so it can be stated that there may be some autocorrelation in the residuals. Moreover, the P-values suggest a slight tendency towards first-order serial correlation. This potential autocorrelation could mean that the model is not capturing all aspects of the data well, pointing to further analysis or refining model assumptions.

The coefficients of all models for the Lagged GDP are positive, though their significance varies across models. Among the four models, the SYSGMM and PLS models show the highest coefficients, showing that the past levels of GDP have a high degree of impact on the current GDP. In regard to the effect, the P-values for these models are notable and far below 0.05, indicating a strong relationship ($P < 0.001$). Similarly, FEM and FDGMM present more modest positive coefficients, although FEM is only significant at 0.05 FGF, and FDGMM is important at the 0.001 level. This shows that the past GDP significantly impacts the future GDP, especially in the dynamic models SYSGMM and FDGMM (Table 3).

Concerning the exchange rate, FEM and FDGMM estimates present negative coefficients associated with GDP; FEM's $P = 0.0001$, while FDGMM's $P = 0.000$. This entails that an increase in the exchange rate has a negative impact on the GDP in these models. Nevertheless, the coefficient obtained by the SYSGMM model is almost equal to zero and with no statistically significant associations ($P > 0.05$). Similarly, the PLS model only gives a slightly positive coefficient but with an insignificant level ($P > 0.05$). These conflicting findings reveal that different models allow the exchange rate consequences in various manners, and FEM, as well as FDGMM, are more sensitive to the fluctuation in the exchange rate.

As for FDI, the models do not show strong effects. In all models, the coefficients for FDI are near zero and for none of the models, P-values are significant, meaning that FDI might not significantly affect GDP in the short run. Not even the most sensitive models, such as FDGMM and SYSGMM, produce significant outcomes because the $P \geq 0.05$. Concerning the inflation rate, the findings are inconclusive. SYSGMM is positive and significant at 1% level; therefore, the argument that inflation can positively influence GDP in this model holds water. However, the FEM, FDGMM and PLS models are not significantly related with $P > 0.05$. It, therefore, implies that inflation has a larger impact on GDP in the SYSGMM model, which could be because inflation is a dynamic variable.

The FDGMM and SYSGMM models show a positive and significant result in International reserves, below 0.01 of P-values, implying that the higher international reserves are directly proportional to the GDP growth in these models. The FEM model also reveals a positive relationship but with a slightly higher P-value ($P < 0.05$). However, regarding the PLS model, the findings are insignificant, with a P-value of more than 0.05. This means that dynamic models better approximate the levels of interest rates, and therefore, models like FDGMM and SYSGMM are more appropriate.

Based on FEM for the Labor Force, both FEM and FDGMM exhibit positive causality with the GDP, with FEM having the highest coefficient and a $P = 0.000$ below 0.001. It is also noted that FDGMM is significant at 0.001 level. On the other hand, it is revealed that both SYSGMM and PLS have insignificant coefficients, with a $P > 0.05$. These statistics imply that the FEM and FDGMM models best portray the labour force changes, and the other models may underestimate or ignore them. Finally, COVID-19 is excluded from all models, which implies that COVID-19 could not be directly evaluated from these models. Further, while the constant is not significant in the RE model, a

Figure 1: Conceptual framework illustrating the relationship between macroeconomic indicators and economic growth in West Africa

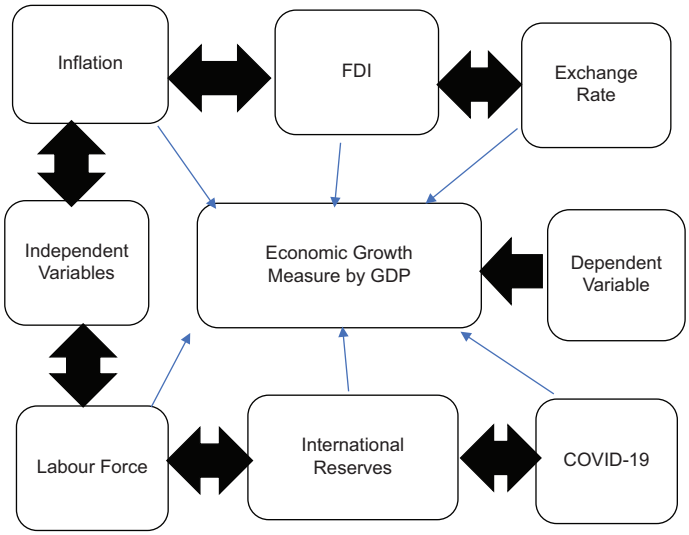

Table 1: Sargan test for instrument validity test of West Africa data

Test statistic: χ^2 (29)	24.09845
P-value: Prob > χ^2	0.7241

Source: Adapted from World Bank (2023). World Development Indicators

Table 2: Abond test for autocorrelation in West Africa

Order	*Z*	Prob >*Z*
1	−1.8472	0.0647
2	−1.8155	0.0694

Source: Adapted from World Bank (2023). World Development Indicators

large negative constant in the FEM model indicates that baseline GDP is low when no other variables are considered.

The impact regression results for West Africa examine how different independent variables affect GDP growth; it emphasizes statistical significance and sign (Table 4). The lagged GDP is also positively correlated with GDP growth with an observed P = 0.0000. This means that there is a relationship with a large coefficient of 0.7915 between the past GDP and the current GDP. The significance level of 0.00 at 5% level of significance re-echoes this argument. At the same time, the robust Z-value of 7.24 reinforces the strength of this association, suggesting that West African economies continue to sustain speed in GDP growth in relation to previous performance. The coefficient for the exchange rate is meagre at 0.0005 while the P-value is at 0.9920. Thus, the impact is insignificant. This finding means that the short-run movements in the exchange rate have little effect on the GDP growth in West Africa. This might mean either a low coefficient of responsiveness of the economy to exchange rate changes or other factors more dominant than exchange rates.

Domestic investment has a negative coefficient (−0.0125), but the coefficient is insignificant as the P > 0.05 (0.449). The non-significance of the coefficients means that in the short run, FDI has no large impact on the region's economic growth as measured by the GDP. This could be due to the time lag commonly attached to realising the FDI effects or perhaps, the misallocation of capital. On the other hand, the 'Inflation' variable flows positively with the 'GDP growth rate', with a coefficient of 0.0401 and h P = 0.0050. This has suggested that, in the short run, moderate inflation positively affects the GDP growth in West Africa. This positive relationship may be attendant to inflation-induced prices that stimulate economic activities or imply that inflationary forces in the region are well contained and correlated with expansionary economic forces.

International reserves are also found to have positive and significant impact on exports, with a coefficient of 0.0284 and a value of significance <0.0010. This result suggests that more IIR is needed for GDP growth, which might be attributed to financial stability, investor confidence, or countries' capacity to deal with external shocks. A good reserve position stability gives economic policies a buffer, which leads to growth.

The labour force exhibits a positive correlation with GDP, which is insignificant at the 5% level since the P = 0.1550. Although the coefficient (0.2036) indicates that an increase in the labour force may have a positive effect on GDP, the insignificance of this relation shows that labour force growth has a weak impact on GDP in the short run, probably because of employment problems or underutilization of workforce. COVID-19 is perhaps excluded from the model because other factors capture it or are not a separate variable in this model.

The lagged GDP presents an insignificant impact on GDP in the long run, indicating no significant relationship between past GDP growth and current GDP growth in the long run (Table 5). Hence, the economy does not depend on its past performance for continuous growth. The exchange rate (ER) coefficient is −0.0558 and insignificant at the 0.483 level. This suggests that fluctuations in the exchange rate do not affect the GDP growth rate in the long run. The economy's ability to sustain the long-run GDP growth rate is not very sensitive to fluctuations in the exchange rate. The negative correlation indicates that exchange rate depreciation is detrimental to economic growth, but again, the insignificance of the coefficient does not allow for a conclusive assertion.

Table 3: Comparison of fixed effects, first-differenced GMM, system GMM, and pooled least squares models for log GDP determinants

Variable	FEM	FDGMM	SYSGMM	PLS
GDP L1	0.2594	0.2459***	0.7915***	0.9865***
Exchange Rate (ER)	−0.5294**	−0.3434***	0.0005	0.0158
Foreign Direct Investment (FDI)	−0.0380	−0.0259	−0.0116	0.0239
Inflation Rate (INF)	−0.0043	0.0126	0.0401**	0.0226
Interest Rate (INTR)	0.0078	0.0284**	0.0106**	0.0037
Labor Force (LF)	2.8525***	1.5928***	0.2036	−0.0072
COVID-19	Omitted	Omitted	Omitted	Omitted
Constant (Cons)	−22.4288*	−4.4269	1.3990	−0.2108

*P<0.05, **P<0.01, ***P<0.001. Source: Adapted from World Bank (2023). World Development Indicators

Table 4: Short-run effect regression results for West Africa

Variable	Coefficient	Robust Std. Err.	Z	P
GDP L1	0.7915	0.1093	7.2400	0.0000
Exchange Rate (ER)	0.0005	0.0562	0.0100	0.9920
Foreign Direct Investment (FDI)	−0.0116	0.0154	−0.7600	0.4490
Inflation (INF)	0.0401	0.0144	2.7800	0.0050
International Reserves (INTR)	0.0284	0.0088	3.2300	0.0010
Labor Force (LF)	0.2036	0.1431	1.4200	0.1550
COVID-19	Omitted			
Constant	1.3990	1.7965	0.7800	0.4360

Source: Adapted from World Bank (2023). World Development Indicators

Similarly, FDI has an insignificant impact, with a coefficient of 0.1923 and a P = 0.161. While the positive coefficient indicates that higher levels of FDI could contribute to economic growth, FDI could not be seen as playing a decisive role in GDP growth in the long run for West Africa since the results are not statistically significant. This may be due to the structural problem or the problem of using FDI over time.

As for the coefficients, inflation on rate has the same coefficient and P-value as FDI (0.1923 and 0.161, respectively), which is significant at the 5% level and implies a positive, though insignificant effect on the GDP growth. This result perhaps means that inflation does not affect long-run economic growth because inflationary pressures in the region are relatively stable or counterbalanced by other forces.

On the other hand, the analysis of the impact of international reserves has confirmed the positive effect on the GDP growth rate; the coefficient is 0.1361, and the P = 0.026. This suggests that higher international reserves have a positive long-term relationship with GDP growth. The positive sign of the coefficient implies that good management of reserve position would contribute to economic stability, hence its ability to withstand shocks in the external environment and encourage long-run growth. As expected, the coefficient of the labour force is very large and positive but non-significant at P < 0.09. Thus, the findings imply that an outward-moving labour force may not be detrimental to the long-run GDP per capita growth, though it is less significant. While the coefficient for the labour force is just below the conventional significance level, it suggests a likelihood of enhanced growth through an increased labour force. Still, other conditions may be required to improve the impact.

The analysis reveals a positive association between the COVID-19 pandemic variable and GDP growth, with a coefficient of 0.5739412 and a P = 0.089. Although this relationship is not significant at the 5% level, it is statistically significant at the 10% level, indicating a moderate association. This suggests that while the COVID-19 pandemic presented substantial challenges, certain economic sectors may have experienced compensatory growth, possibly due to government interventions, digital expansion, or healthcare investment. Policymakers should consider these findings as an indication that resilience strategies and adaptive sectors can help buffer economies against external shocks, including pandemics.

In the analysis of impacts of independent variables, the short run and the long-run implications for GDP growth, differences in the importance of the variables are revealed over time (Table 6). Beginning with the lagged GDP variable (L1.GDP), a highly significant short-run coefficient, with a P = 0.000, suggests that past GDP plays a major role in determining current GDP growth in the short-run. By using P = 0.992 in both the short run and the long run, the exchange rate has no signification. This implies that a change in the exchange rate does not significantly affect the GDP growth rate in the short or long-run. This may suggest that the West African economies in this analysis might not greatly depend on fluctuations in exchange rates, suggesting that factors outside or internal economic structures of these economies may influence their growth.

Table 5: Long-run effect regression results for West Africa

Variable	Coefficient	Standard error	Z	P
GDP L1	0.0026	0.2691	0.01	0.992
Exchange Rate (ER)	−0.05587	0.07968	−0.70	0.483
Foreign Direct Investment (FDI)	0.1923	0.1372	1.40	0.161
Inflation (INF)	0.1923	0.1372	1.40	0.161
International Reserves (INTR)	0.1361	0.06118	2.22	0.026
Covid-19	9764346	0.5739412	1.70	0.089

Source: Adapted from World Bank (2023). World Development Indicators

Table 6: Analysis of short-run and long-run effects of independent variables on GDP growth

Variables	Short-run effect P-value	Long–run effect P-value	Significant level
Lag dependent variable: L1.Gdp	0.000		***
Independent variables: er	0.992	0.992	Not significant
Independent variables: fdi	0.449	0.483	Not significant
Independent variables: inf	0.005	0.161	**
Independent variables: intr	0.001	0.161	***Short-run, **Long-run
Independent variables: lf	0.155	0.026	***Short-run, **Long-run
Independent variables: covid		0.089	***Long-run

Source: Adapted from World Bank (2023). World Development Indicators

Similarly, FDI variables have no relationship with the GDP growth rate in the short and long run, with P = 0.449 and 0.483, respectively. This implies that unlike the often-reported positive impact of FDI on growth, it is not currently a significant driver of GDP growth in the region. This may be due to inefficiencies in deploying foreign capital or issues concerning the investment climate. However, the inflation rate contrasts the short-run situation with the long-run picture. In the case of the short-run form, it further shows that the inflation coefficient is highly significant at the P < 0.005 level, thus establishing that the inflation variable is important in determining GDP growth. This shows the aptness of sectors regarding inflationary impulses within the short run, whereby it can alter costs, consumption rates, and investments. The results further show that in the long run, the importance of inflation is reduced (P = 0.161), which means that it makes fluctuations in the short term only, and its impacts are not long-lasting.

International reserves are the other variable that warranted high analysis in the short run with a P = 0.001, which means that reserve has a role to play in the stabilization and economic growth in the short run. However, its effect is greatly reduced in the later periods with P = 0.161, though it remains a significant factor. This implies that although international reserve could be pivotal to meeting some current economic exigencies, it becomes less relevant as

long-term economic structures evolve. The labour force (LF) has an interesting picture as a whole. The condition for the labour force is not very important in the short run at a lower P = 0.155, which means a short-run change in labour has a negligible effect on GDP growth. However, when the time comes, labour force expansion and development are found to have a highly significant relationship with economic growth at P < 0.05 or 0.026. This means that although the daily or even hourly changes in labour may not directly affect the constant build-up of labour stock is a major factor in economic development.

Finally, the effect of COVID-19 does not present the short-run result, which is not included due to the absence of data. The prolonged impact of the pandemic on the economy remains significant, with a P = 0.089, thus showing the long-term significance of the pandemic. This implies that even though some of the direct shocks related to COVID-19 may not have been reflected in the short-run data, the effects of COVID-19 on economic conditions and growth are observed in the long run.

4.1. Convergence Estimation

The convergence estimation for West Africa, as computed to be 23.38%, captures the rate at which the income gap between countries in the region decreases with time. This value measures the extent to which the economic growth rates within different countries in West Africa are rising to a common level or growth rate. In the context of this analysis, the convergence rate is estimated by the coefficient of the lagged dependent variable calculated in the framework of the SYSGMM model. A convergence rate of 23.38% shows that 23% of differences in the economies of West African countries will diminish each period. This relatively greater degree of convergence indicates that countries with lower economic performance are closing the gap faster than those progressing better in the region.

4.2. Discussion

The findings of this research offer valuable insights into the complex interplay between key economic indicators and growth within West African economies. The study indicates that some variables, such as inflation and international reserves, contribute positively toward GDP growth. In contrast, others, such as exchange rates and foreign direct investment (FDI), require stronger institutional frameworks to generate better momentum. The ambiguous relationship between exchange rates and economic growth questions the usefulness of exchange rate fluctuations in stimulating GDP growth. This aligns with the findings of Adamu et al. (2025), implying that the dual nature of exchange rates may cloud their actual effects. Further, the limited positive impact of FDI substantiates the need for clarity as regards the local conditions and governance which can either catalyze or deter investment flows, strengthening the argument by Adediran (2023) assertions.

4.2.1. Theoretical implications

This study contributes to the theoretical discourse on economic development, emphasising institutional quality and governance in affecting economic growth indicators. The evidence presents the case in favour of a functioning institutional framework as central for attracting and retaining foreign direct investment (FDI) and stabilizing exchange rates, as they are often regarded as vital drivers for economic growth in developing countries. In addition, a positive relationship between inflation and GDP growth counters the classical standpoint of regarding inflation as solely detrimental, siding with a subtle view of inflation as stimulating aggregate demand for economic activities and drawing attention to the perspective of Adamu et al. (2025).

4.2.2. Policy implications

The implications of this research are multiple for policymakers of West Africa: Go down to ensure that the promulgation of the regulatory environment will provide for improved governance and transparency to provide confidence to investors and to maximize flows of FDI. Since it has to balance, Central banks are expected to have flexible monetary policies, recognizing, on the one hand, the potential for moderate inflation to contribute towards increased demand and, on the other hand, the need for steps to manage excessive inflation effectively. Long-run investments in education and vocational training are necessary for increasing labour productivity, especially in the context of huge unemployment among youth. Adequate international reserves would cushion the economy against external shocks. Sound fiscal governance and good reserve management by policymakers would hence remain critical.

4.2.3. Future research

Future research should focus on the following in line with the findings of the present study: Longitudinal Studies: Longitudinal analyses in assessing the relative significance of temporal changes in governance and the quality of institutions on the relationship between economic indicators and growth. Understanding how different industries react to economic cycles and external shocks in West African economies is very important. Considering the vulnerabilities exposed during this crisis, Work must be done on long-term effects on FDI, labour markets, and economic stability in West Africa post-COVID-19. Comparative studies on other regions facing similar economic challenges will help identify best practices and policy frameworks in durable icon enhancement and economic growth.

5. CONCLUSION

This study provides better insights into understanding this tangled web of relationships between economic indicators and growth in West African economies, thus supporting policy-making processes. By analyzing variables such as inflation, foreign direct investment (FDI), exchange rates, human capital, international reserves, and the impact of the COVID-19 pandemic, the research underscores the importance of institutional frameworks that can support resilient growth. Inflation management, for instance, is essential to maintaining purchasing power and providing a stable environment for consumer and investor decisions; hence, one cannot overemphasize this factor. Investments in human capital through education and skills development are important for harnessing the region's demographic dividend, especially with respect to its ability to engage the young population that has been on the

increase. Such prudent labour management would enhance productivity, reduce unemployment, and enhance workforce quality and economic resilience.

These findings emphasize the need for a nuanced approach to economic policymaking in West Africa that simultaneously works through structural challenges of the economies and manages short-term economic cycles. Strengthening governance, broadening an enabling environment for investment, and prudent fiscal policies would be crucial for providing long-term sustainability and stability against the ever-changing dynamics of the regional economy.

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