# Digital Financial Innovation and Monetary Policy Transmission in West Africa: Panel Evidence from ECOWAS Economies


## Abstract

*This study examines how digital financial innovation (DFI) influences monetary policy transmission across 15 ECOWAS economies over the period 2000–2023. Using a composite DFI index constructed from mobile penetration, internet usage, financial inclusion, and banking infrastructure indicators, the analysis employs Feasible Generalised Least Squares with AR(1) correction and Panel Error Correction Models to assess the short- and long-run effects of DFI on inflation and lending rates. Results indicate that DFI exerts no statistically significant effect on inflation across the full panel, though sub-sample analysis reveals a significant inflation-reducing effect during the early phase of digital adoption (pre-2015) that dissipates thereafter. In contrast, digital financial deepening consistently and significantly reduces lending rates across all country groupings and time periods, suggesting that DFI enhances credit market efficiency and strengthens monetary policy transmission through the interest rate channel. The money supply remains the dominant determinant of inflation in the region, underscoring the continued relevance of conventional monetary instruments. These findings carry important implications for central banking strategy and digital finance regulation in West Africa.*



***Keywords**: Digital Financial Innovation, Monetary Policy Transmission, Panel Error Correction Model, Financial Inclusion, West Africa*

***JEL Classification**: E52, E44, O33, G23, C33, O55, F65*

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## 1.0 Introduction

Digital financial innovation (DFI) has become one of the most transformative forces shaping financial systems across developing regions, particularly in West Africa. The rapid expansion of mobile money platforms, agent banking, fintech credit, and digital payment ecosystems has contributed to rising financial inclusion and evolving financial intermediation structures. These developments are especially significant for the Economic Community of West African States (ECOWAS), where traditional financial systems have historically been shallow and dominated by cash-based transactions. Recent analyses show that digital payment innovations across Sub-Saharan Africa are reshaping the region's financial landscape by lowering transaction costs, deepening financial access, and improving payment efficiency (Ricci et al., 2025).

Monetary policy transmission defined as the channels through which central bank policy actions influence economic outcomes such as inflation, interest rates, and credit has long been constrained in West Africa. Structural challenges such as limited financial depth, high informality, and weak payment infrastructures often weaken the responsiveness of inflation and credit markets to policy actions. Financial inclusion and digital finance can modify these constraints: empirical evidence from ECOWAS countries, for instance, shows that changes in financial access significantly influence monetary policy targets, sometimes enhancing exchange rate appreciation but also creating complexities that can weaken price stability outcomes (Garbobiya et al., 2024). Similarly, a broader regional study covering Sub-Saharan Africa demonstrates that digital financial inclusion interacts dynamically with monetary policy transmission, exhibiting bi-directional causality that underscores the growing macroeconomic importance of digital finance (Esely and Taonezvi, 2024).

At the same time, emerging research highlights that digital financial instruments particularly e-money services strengthen specific channels of monetary policy. Evidence across 47 low-income and emerging economies indicates that e-money adoption enhances policy interest rate passthrough, boosts competition among lenders, and improves credit allocation efficiency (Huang et al., 2025). These findings suggest the potential for DFI to reshape West Africa's monetary transmission environment by expanding the range of financial actors, increasing market contestability, and altering liquidity conditions within the banking system.

Despite this potential, the net effect of DFI on inflation and lending dynamics remains theoretically ambiguous and empirically underexplored, especially within ECOWAS. While digital platforms can increase price transparency and market efficiency, they may also enable rapid credit expansion outside traditional regulatory boundaries, complicating central banks' control over money supply aggregates. Reports by the Bank for International Settlements further caution that although digital currencies and advanced payment systems can enhance monetary policy effectiveness, the weak transmission mechanisms in African economies require careful regulatory adaptation and policy coordination (Alberola & Mattei, 2022).

This study addresses these knowledge gaps by investigating how digital financial innovation influences monetary policy transmission across 15 ECOWAS countries from 2000 to 2023. Using panel estimation techniques including Feasible Generalized Least Squares (FGLS-AR(1)) and Panel Error Correction Models (PECM) the study examines the responsiveness of inflation and lending rates to DFI indicators over time. By distinguishing between short-run and long-run effects and accounting for heterogeneity across member states, the study contributes empirical clarity to the evolving relationship between digital finance and macroeconomic stability in the region.

Understanding this dynamic is crucial for designing effective regulatory frameworks, strengthening central banking strategies, and ensuring that the region's accelerating digital transformation supports price stability, financial deepening, and sustainable economic growth. As ECOWAS economies deepen their digital financial ecosystems, the interaction between technological innovation and monetary policy will increasingly shape the region's economic trajectory.

## 2.0 Literature review

The growing digitalization of financial systems has reshaped classical theories of monetary policy transmission, necessitating a re-examination of how digital channels mobile money, fintech platforms, digital payments, and Central Bank Digital Currencies (CBDCs) interact with the conventional interest rate, credit, expectations, and exchange rate channels. Classical monetary theory assumes a relatively stable money demand function, well-defined banking intermediation, and predictable policy pass-through. However, digital financial innovation challenges these

assumptions by altering transaction technologies, increasing velocity and creating new asset classes outside traditional oversight.

Digital payments reshape the fundamental behaviour of money demand. Mobile payments and e-wallets reduce reliance on physical cash and weaken the predictability of monetary aggregates (Das et al., 2023). In addition, digital payments accelerate monetary velocity by reducing transaction frictions and enabling instantaneous funds flow, making the transmission of monetary signals faster but also less predictable (Wang, 2024).

Theoretical developments suggest that digital financial innovation endogenizes the velocity of money. As transaction efficiency increases, households need fewer cash balances, making aggregate demand more interest-sensitive (Ankoma 2026). This implies that in digitalized economies, interest rate changes have amplified real effects. CBDCs represent a major theoretical shift. Scholars argue that CBDCs could strengthen monetary transmission by creating a direct link between policy rates and economic agents (Bordo & Levin, 2017; IMF Fintech Note, 2023). In theory, digital financial inclusion increases the responsiveness of households to monetary policy as more people gain access to savings, credit, and mobile financial services. However, digital inclusion that bypasses banks instead operating through mobile money may weaken transmission (Garbobiya et al., 2024).

The rapid expansion of digital finance across emerging and developing economies has transformed how monetary authorities influence economic activity, with significant implications for West Africa and the ECOWAS region. Recent studies have increasingly emphasized that digital financial innovation encompassing mobile banking, e-money platforms, online lending, fintech services, and central bank digital currencies has altered both the structure of financial intermediation and the speed at which monetary policy signals transmit through the economy. These developments have prompted renewed scholarly interest in reassessing core transmission channels considering new technological realities.

Das et al. (2023), concludes that CBDCs can strengthen monetary transmission, particularly the interest rate and bank-lending channels though effects are small in normal times and stronger during financial stress. Jiang et al. (2022), using Chinese provincial data, find that digital finance

reduces monetary policy effectiveness by destabilizing money demand and enabling circumvention of traditional credit controls. They also find strong spatial spillovers digital activity in one region affects neighboring regions.

Huang et al. (2025) shows that e-money systems in low-income and emerging economies often complement traditional banking. Their study demonstrates that e-money adoption enhances monetary policy pass-through by promoting competition, increasing deposits, and expanding access to electronic payments. Adenutsi (2025) provides global evidence that some digital currencies like CBDCs, and Ethereum enhance inflation targeting success, while cryptocurrencies introduce volatility that weakens policy outcomes. Wu and Zhang (2024) adopt a DSGE framework to quantify the macroeconomic effects of CBDCs. Their model shows that CBDC related interest rate shocks improve policy transmission.

Wang (2024) examine how digitalization reshapes monetary policy transmission in modern economies. His analysis integrates digital financial sectors, digital payments, cryptocurrencies, and online credit platforms into a system dynamics model, showing that digital finance accelerates the transmission of monetary impulses by enhancing the speed and efficiency of fund flows. The study further reveals that although digitalization may expedite certain channels, it can weaken others particularly the traditional bank lending channel by shifting financial activity toward platforms that operate outside conventional banking structures.

Within ECOWAS, Garbobiya et al. (2024) find that financial inclusion appreciates currencies but reduces monetary policy effectiveness. Using panel vector autoregression, the results indicate that digital inclusion increases consumer prices and interest rates possibly due to rising velocity and weaken policy control. Manasseh et al. (2025) found that fintech innovation in ECOWAS positively affects bank performance and efficiency. However, the study warns that fintech adoption may reduce banks' traditional role in credit intermediation over time.

Nigeria's e-Naira shows limited adoption and limited impact on policy transmission. A non-interest bearing CBDC raises the effective lower bound for interest rates, limiting monetary flexibility (Kure et al, 2024). In Brazil, Liang, Sampaio & Sarkisyan (2026) find that instant digital

payments reduce banks' deposit market power, increasing deposit rate responsiveness to policy changes and intensifying transmission.

Despite the growing global literature on digital finance and monetary policy, several important gaps remain for ECOWAS. Existing studies provide limited ECOWAS specific empirical evidence, as most focus on individual countries or narrow aspects of digital inclusion rather than examining regional patterns of digital financial innovation and their broader macro financial implications. There is also a lack of panel-based research that connects digital innovation directly to monetary transmission mechanisms across ECOWAS economies, making it difficult to understand how these innovations shape policy effectiveness at a regional level. Moreover, the unique structural characteristics of the sub region such as exceptionally high mobile money usage, relatively weak banking penetration, and varying degrees of financial development remain insufficiently captured in existing analyses. Finally, empirical evidence on CBDCs in Africa is minimal. This study therefore fills these gaps by providing a multi country panel analysis that examines how digital financial innovation influences monetary policy transmission in West Africa.

## 2.1 Theoretical Framework

This study is grounded in four interlocking theoretical traditions that collectively explain why and how digital financial innovation is expected to influence both inflation and lending rates: the Quantity Theory of Money and its digital extension; the Keynesian interest rate and bank lending channels; financial intermediation and information asymmetry theory; and the non-linear financial inclusion hypothesis. Together, these frameworks generate testable predictions that map directly onto the empirical specification and results reported in this paper.

### 2.1.1 The Quantity Theory of Money and the Digital Velocity Problem

The classical Quantity Theory of Money (QTM), expressed as MV = PY, constitutes the foundational theoretical anchor for interpreting this study's inflation findings. Under the monetarist formulation of Friedman (1963), where velocity (V) is assumed stable and output (Y) gravitates toward its natural rate in the long run, sustained changes in the money supply (M) translate proportionally into changes in the price level (P). This study's finding that broad money (M2) is the dominant and statistically significant driver of inflation across ECOWAS economies

while the DFI index exerts no robust effect is fully consistent with this monetarist prediction. It suggests that in West Africa, where monetary transmission channels remain structurally shallow and the formal financial system reaches only a fraction of the population, the classical money supply channel retains primacy over digital innovation effects in determining the price level. Conventional monetary policy instruments therefore remain the indispensable anchor for inflation control in the region.

However, digital financial innovation complicates this classical relationship by endogenising monetary velocity. As mobile money platforms and digital payment systems reduce transaction frictions and accelerate fund flows, V is no longer a stable exogenous parameter but an increasing function of the degree of digital financial penetration. Ankoma (2026) formalises this insight, demonstrating that financial innovation endogenises velocity such that the effective monetary identity becomes MV(DFI) = PY. This has a critical implication: even if central banks successfully control M, rising DFI can amplify the monetary impact of a given stock of money through an elevated V, partially offsetting the disinflationary discipline of tight monetary policy. This mechanism helps explain the structural break identified in this study the significant inflation-reducing effect of DFI observed before 2015 ($\beta = -0.053$, $p = 0.007$) reflects an early phase in which digital access improved price transparency and reduced cash-hoarding, suppressing V; as digital credit markets matured after 2015, endogenous money creation through mobile lending and fintech platforms began to re-accelerate V, neutralising the earlier disinflationary effect.

### 2.1.2 The Interest Rate Channel and the Bank Lending Channel

The Keynesian interest rate channel, as systematised by Mishkin (1995), posits that central bank policy rate changes alter the cost of borrowing across the economy, thereby influencing investment, consumption, and aggregate demand. In conventional theory, the effectiveness of this channel depends critically on the depth of financial intermediation: where banking systems are shallow and interest rate pass-through to lending rates is incomplete, monetary policy has limited traction on real economic outcomes. This is precisely the structural constraint facing ECOWAS central banks, where high informality and low banking penetration traditionally weaken pass-through. Digital financial innovation interacts with this channel in two theoretically distinct and empirically separable ways. First, the entry of fintech platforms, mobile lenders, and digital credit

intermediaries into the credit market increases competitive pressure on incumbent commercial banks, compressing their intermediation margins and driving down equilibrium lending rates independently of changes in the policy rate (Hasan et al., 2021). This competition-driven margin compression provides the primary theoretical mechanism for the robust lending rate-reducing effect of DFI documented in this study. Second, as previously unbanked households and informal enterprises gain access to formal credit through digital channels, the effective coverage of monetary policy signals expands: a larger share of economic agents now responds to interest rate changes transmitted through the formal financial system, strengthening aggregate pass-through (Huang et al., 2025).

The bank lending channel, as formalised by Bernanke and Blinder (1988), adds a supply-side dimension: beyond the price of credit, monetary policy also operates through the quantity of bank loans supplied to the economy. When central banks tighten policy, banks with constrained access to non-deposit funding are compelled to contract credit supply. Digital financial innovation modifies this channel by diversifying funding sources and expanding the lending base beyond the traditional banking sector (Wang, 2024). In the ECOWAS context, where mobile money operators and fintech lenders increasingly originate and disburse credit outside the conventional bank balance sheet, a growing share of total credit intermediation occurs beyond the direct reach of reserve requirements. This structural shift carries ambiguous implications: it may broaden aggregate credit access and strengthen the economy-wide transmission of monetary impulses through the interest rate channel, but it simultaneously reduces the central bank's leverage over the total supply of credit a tension that is theoretically consistent with the mixed DFI-inflation findings of this study.

### 2.1.3 Financial Intermediation Theory and Information Cost Reduction

Financial intermediation theory, rooted in the seminal contributions of Diamond and Dybvig (1983) and later extended by Freixas and Rochet (2008), holds that financial intermediaries exist to resolve information asymmetries between borrowers and lenders reducing adverse selection, mitigating moral hazard, and enabling efficient credit allocation. In economies characterised by pervasive information frictions and weak contract enforcement conditions prevalent across the ECOWAS region these information costs drive a persistent wedge between the cost of funds and

the lending rate, keeping credit expensive even when liquidity conditions are relatively accommodative. Digital financial innovation attacks these frictions directly: mobile transaction histories and digital payment data create observable credit footprints for borrowers who previously had none, enabling algorithmic credit scoring that reduces adverse selection costs; digital disbursement and repayment tracking mitigates moral hazard by improving lender monitoring capacity; and platform-based lending reduces the fixed infrastructure costs of credit origination (Hasan et al., 2021). Each of these mechanisms compresses the intermediation spread and pushes equilibrium lending rates downward. This information cost reduction channel provides a theoretically coherent and economically substantive explanation for the consistent and significant negative effect of DFI on lending rates documented in this study  an effect that is robust across the full sample ($\beta = -0.055$), WAEMU ($\beta = -0.038$) and non-WAEMU ($\beta = -0.112$) sub-samples, and the post-2015 period ($\beta = -0.053$).

### 2.1.4 The Non-Linear Financial Inclusion Hypothesis and the Structural Break

The fourth theoretical pillar directly motivates the temporal sub-sample analysis and explains the structural break observed around 2015 in the DFI-inflation relationship. Drawing on the non-linear finance-growth literature (Arcand et al., 2015; Samargandi et al., 2015), this study proposes a non-linear financial inclusion monetary transmission hypothesis: the macroeconomic effects of digital financial deepening are not constant across the adoption cycle but follow a two-phase arc. In the early adoption phase when DFI primarily extends basic payment, savings, and remittance services to previously unbanked populations the dominant effects are disinflationary. Price transparency improves as digital markets replace opaque informal markets; cash hoarding declines as mobile wallets provide a safer store of value, slowing the effective velocity of currency; and the formalisation of informal economic activity brings more transactions within the reach of monetary policy. These mechanisms plausibly underpin the significant inflation-reducing effect of DFI in the pre-2015 sub-sample ($\beta = -0.053$, $p = 0.007$). In the mature adoption phase as digital credit markets expand through mobile lending, buy-now-pay-later schemes, and fintech loan origination operating outside traditional reserve requirements the endogenous money creation effect intensifies, monetary velocity accelerates, and the earlier disinflationary impulse is offset or reversed. This two-phase theoretical prediction is precisely consistent with the positive and insignificant DFI-inflation coefficient observed in the post-2015 sub-sample ($\beta = +0.036$, $p =$

0.435). The structural break itself, validated by the Chow-type Wald test employed in this study, thus has a coherent theoretical foundation that strengthens the interpretive credibility of the empirical finding.

## 3.0 Methodology

### 3.1 Data and Variable construction

This study employs an annual panel of 15 ECOWAS countries over the period 2000–2023 (N = 15, T = 24). Data are sourced from the World Bank's World Development Indicators (WDI) and Global Findex database.

Financial innovation is proxied using a composite Digital Financial Innovation (DFI) index constructed from mobile penetration, internet usage, financial inclusion, and banking infrastructure indicators. The index captures the degree of digital financial deepening across ECOWAS economies.

Financial innovation is proxied using a Digital Financial Innovation (DFI) Index constructed from four indicators:

$$DFI_{it} = \frac{1}{K}\sum_{k=1}^{k} z_{kit} \quad (1)$$

Each component is normalized (0–100 scale) before aggregation.

1. Mobile phone subscriptions per 100 people
2. Internet users (% of population)
3. Account ownership at financial institutions (% adults)
4. Commercial bank branches per 100,000 adults

This index captures digital financial infrastructure, inclusion, and intermediation capacity. Other variables we had are inflation, lending rate, broad money, gdp growth and trade openness.

### 3.2 Panel Unit Root and Cointegration Tests

Given the time-series cross-sectional nature of the data, stationarity properties are examined using the Im–Pesaran–Shin (IPS) panel unit root test. Results indicate mixed orders of integration, with some variables I(0) and others I(1). Given this mixed integration structure, long-run relationships are tested using the Pedroni panel cointegration framework. Evidence of cointegration between inflation and DFI justifies estimation of an error correction model.

### 3.3 Baseline Estimation: FGLS with AR(1) Correction

The baseline specification is estimated using Feasible Generalised Least Squares (FGLS) with Prais–Winsten AR(1) correction to address: Serial correlation,Panel heteroskedasticity, Cross-sectional contemporaneous correlation. The baseline model is:

$$Y_{it} = \alpha + \beta_1 DFI_{it} + \beta_2 GDP_{it} + \beta_3 ln(M2)_{it} + \beta_4 Tradeit_{it} + u_{it} \quad (2)$$

Where $Y_{it}$ represents either inflation or lending rate

The disturbance term follows a country-specific AR(1) process:

$$u_{it} = \rho_i u_{i,t-1} + \varepsilon_{it} \quad (3)$$

FGLS estimation follows the Parks–Kmenta procedure, allowing for heteroskedasticity and contemporaneous cross-country correlation. Standard errors are clustered at the country level.

### 3.4 Panel Error Correction Model (ECM)

To capture long-run equilibrium dynamics, a panel error correction model is estimated using the Engle–Granger two-step procedure.

Long-run equation

$$Y_{it} = \alpha_i + \beta_1 DFI_{it} + \beta_2 GDP_{it} + \beta_3 ln(M2)_{it} + \beta_4 Trade_{it} + u_{it} \quad (4)$$

Short-run equation

$$\Delta Y_{it} = \gamma_0 + \lambda_{e\hat{}i,t-1} + \gamma_1 \Delta DFI_{it} + \gamma_2 \Delta GDP_{it} + \gamma_3 \Delta ln(M2)_{it} + \gamma_4 \Delta Trade_{it} + u_{it} \quad (5)$$

The coefficient λ measures the speed of adjustment toward long-run equilibrium. A negative and significant value confirms convergence.

### 3.5 Diagnostic and Robustness Check

The validity of the model is assessed using:

- White test for heteroskedasticity
- Breusch–Pagan test for panel heteroskedasticity
- Pesaran CD test for cross-sectional dependence
- Variance Inflation Factors (VIF) for multicollinearity

Robustness is further examined through:

- Sub-sample estimations (WAEMU vs non-WAEMU; pre- and post-2015)
- Structural break analysis using a Chow-type Wald test

## 4.0 Results and Discussion

### Descriptive statistics

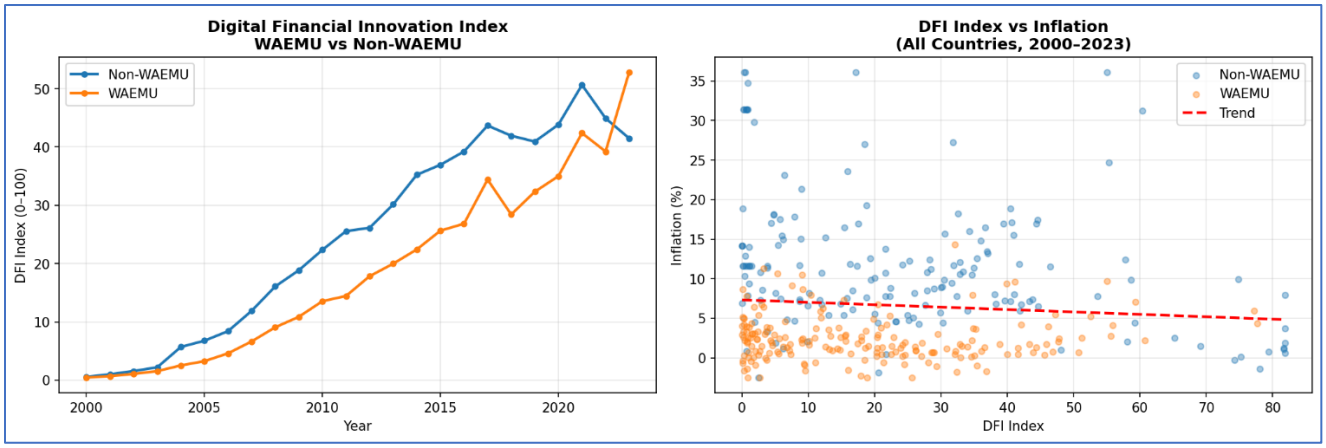



**Figure1: Digtal Financial Innovation in West Africa**

Figure 1 presents the trajectory of the Digital Financial Innovation (DFI) index across ECOWAS countries over the study period. The figure reveals a consistent upward trend in digital financial development, with notable cross-country heterogeneity. Countries with stronger telecommunications infrastructure and higher internet penetration exhibit substantially higher DFI scores, while others remain in early stages of digital financial adoption. The general upward trajectory reflects the rapid expansion of mobile money services, fintech platforms, and broader financial inclusion initiatives across the West African region, particularly accelerating after 2010. This divergence in DFI levels underscores the importance of controlling for country-specific characteristics in the estimation strategy.

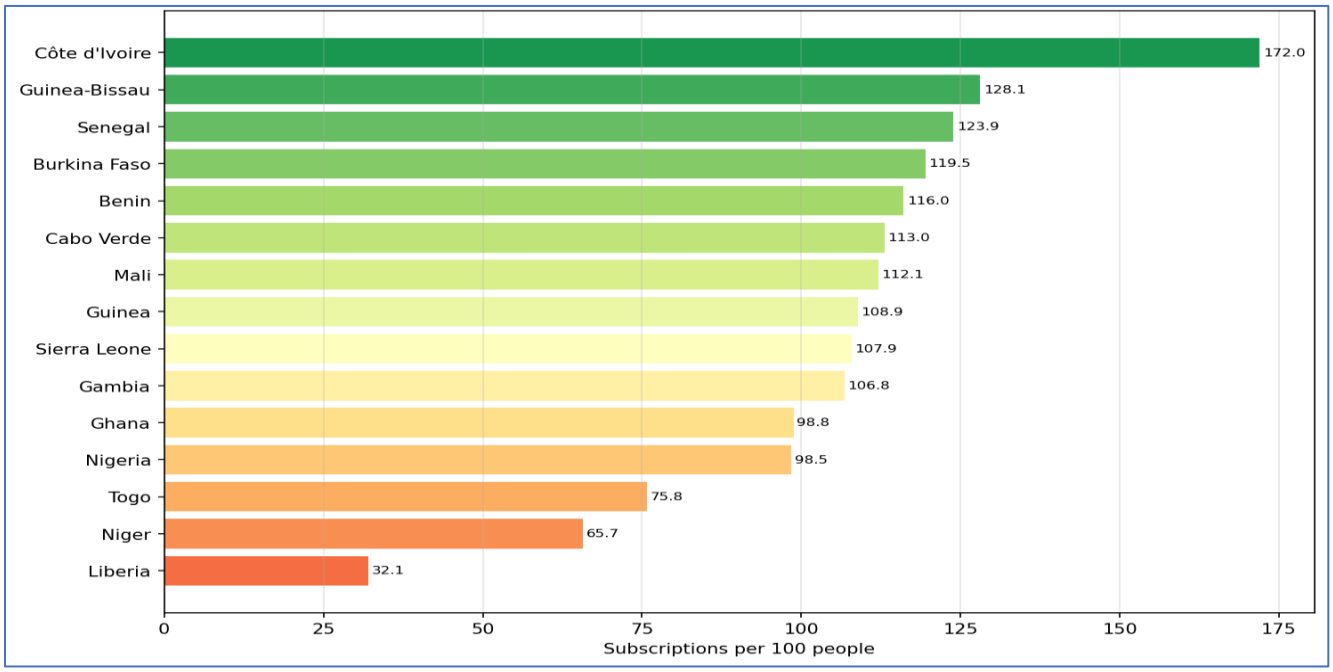



**Figure 2: Mobile subscription per 100 people.**

Figure 2 illustrates the growth in mobile phone subscriptions per 100 people across ECOWAS member states. The data confirm an unprecedented rise in mobile penetration, with several countries surpassing 100 subscriptions per 100 people by the end of the sample period, indicating multiple SIM ownership. This surge in mobile connectivity is a critical precondition for digital financial services, as it expands the potential user base for mobile banking and mobile money platforms. The rapid growth in subscriptions, particularly from the mid-2000s onward, aligns with the broader regional adoption of mobile money services such as M-Pesa, MTN Mobile Money, and Orange Money, which have become primary vehicles for financial inclusion in the sub-region.

Table1: Lm-pesaran-shin unit root test

| Variable | Avg_t | P_val | Order |
|---|---|---|---|
| dfi_index | -0.0275 | 1 | I(1) |
| inflation_w | -3.1568 | 0 | I(0) |
| lending_rate_w | -1.7568 | 0.2259 | I(1) |
| log_broad_money | -1.2949 | 0.7923 | I(1) |
| gdp_growth | -4.4867 | 0 | I(0) |
| trade_openness | -1.8513 | 0.1328 | I(1) |

Source: authors computation

The Im–Pesaran–Shin (IPS) panel unit root test results (Table 1) reveal a mixed order of integration among the variables. Inflation (Avg_t = −3.157, p = 0.000) and GDP growth (Avg_t = −4.487, p = 0.000) are stationary at levels, i.e., integrated of order zero [I(0)]. In contrast, the DFI index (Avg_t = −0.028, p = 1.000), lending rate (p = 0.226), log broad money (p = 0.792), and trade openness (p = 0.133) are non-stationary at levels and integrated of order one [I(1)]. This mixed integration structure rules out classical OLS estimation and motivates the use of a Panel Error Correction Model (ECM) to capture both short- and long-run dynamics, as well as FGLS-AR(1) to address residual serial correlation and cross-sectional heteroskedasticity. The presence of I(1) variables also justifies the subsequent Pedroni panel cointegration tests.

Table 2: Estimations

| DV | Model | Variable | Coeff | SE | T | P | Stars | R2 | N |
|---|---|---|---|---|---|---|---|---|---|
| inflation_w | FGLS-AR1 | const | 0.62 | 0.17 | 3.65 | 0.00 | *** | 0.01 | 288.00 |
| inflation_w | FGLS-AR1 | dfi_index | -0.01 | 0.01 | -1.04 | 0.32 | | 0.01 | 288.00 |
| inflation_w | FGLS-AR1 | gdp_growth | 0.04 | 0.06 | 0.67 | 0.52 | | 0.01 | 288.00 |
| inflation_w | FGLS-AR1 | log_broad_money | 0.28 | 0.49 | 0.57 | 0.58 | | 0.01 | 288.00 |
| inflation_w | FGLS-AR1 | trade_openness | -0.01 | 0.02 | -0.34 | 0.74 | | 0.01 | 288.00 |
| lending_rate_w | FGLS-AR1 | const | 0.40 | 0.48 | 0.83 | 0.42 | | 0.47 | 288.00 |
| lending_rate_w | FGLS-AR1 | dfi_index | -0.05 | 0.02 | -2.74 | 0.02 | ** | 0.47 | 288.00 |
| lending_rate_w | FGLS-AR1 | gdp_growth | -0.01 | 0.01 | -0.47 | 0.65 | | 0.47 | 288.00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| lending_rate_w | FGLS-AR1 | log_broad_money | 1.45 | 0.28 | 5.08 | 0.00 | *** | 0.47 | 288.00 |
| lending_rate_w | FGLS-AR1 | trade_openness | 0.06 | 0.02 | 2.80 | 0.02 | ** | 0.47 | 288.00 |
| inflation_w | ECM-LongRun | const | 0.00 | 0.00 | 0.16 | 0.88 | | 0.15 | 288.00 |
| inflation_w | ECM-LongRun | dfi_index | 0.00 | 0.02 | 0.22 | 0.83 | | 0.15 | 288.00 |
| inflation_w | ECM-LongRun | gdp_growth | 0.10 | 0.07 | 1.50 | 0.16 | | 0.15 | 288.00 |
| inflation_w | ECM-LongRun | log_broad_money | -1.22 | 0.13 | -9.18 | 0.00 | *** | 0.15 | 288.00 |
| inflation_w | ECM-LongRun | trade_openness | -0.11 | 0.09 | -1.23 | 0.24 | | 0.15 | 288.00 |
| inflation_w | ECM-ShortRun | const | 0.26 | 0.24 | 1.07 | 0.31 | | 0.29 | 276.00 |
| inflation_w | ECM-ShortRun | EC_lag(-1) | -0.54 | 0.09 | -5.74 | 0.00 | *** | 0.29 | 276.00 |
| inflation_w | ECM-ShortRun | Îdfi_index | -0.11 | 0.08 | -1.33 | 0.21 | | 0.29 | 276.00 |
| inflation_w | ECM-ShortRun | Îgdp_growth | 0.07 | 0.04 | 1.86 | 0.09 | * | 0.29 | 276.00 |
| inflation_w | ECM-ShortRun | Îlog_broad_money | -0.24 | 0.15 | -1.58 | 0.14 | | 0.29 | 276.00 |
| inflation_w | ECM-ShortRun | Îtrade_openness | 0.02 | 0.02 | 1.01 | 0.33 | | 0.29 | 276.00 |
| lending_rate_w | ECM-LongRun | const | 0.00 | 0.00 | -1.58 | 0.14 | | 0.22 | 288.00 |
| lending_rate_w | ECM-LongRun | dfi_index | -0.05 | 0.01 | -4.97 | 0.00 | *** | 0.22 | 288.00 |
| lending_rate_w | ECM-LongRun | gdp_growth | -0.04 | 0.02 | -1.75 | 0.11 | | 0.22 | 288.00 |
| lending_rate_w | ECM-LongRun | log_broad_money | 0.29 | 0.13 | 2.29 | 0.04 | ** | 0.22 | 288.00 |
| lending_rate_w | ECM-LongRun | trade_openness | -0.02 | 0.01 | -1.33 | 0.21 | | 0.22 | 288.00 |
| lending_rate_w | ECM-ShortRun | const | -0.16 | 0.02 | -8.90 | 0.00 | *** | 0.15 | 276.00 |
| lending_rate_w | ECM-ShortRun | EC_lag(-1) | -0.26 | 0.04 | -6.99 | 0.00 | *** | 0.15 | 276.00 |
| lending_rate_w | ECM-ShortRun | Îdfi_index | -0.01 | 0.01 | -0.79 | 0.45 | | 0.15 | 276.00 |
| lending_rate_w | ECM-ShortRun | Îgdp_growth | -0.01 | 0.01 | -0.91 | 0.38 | | 0.15 | 276.00 |
| lending_rate_w | ECM-ShortRun | Îlog_broad_money | 0.03 | 0.04 | 0.74 | 0.48 | | 0.15 | 276.00 |
| lending_rate_w | ECM-ShortRun | Îtrade_openness | 0.00 | 0.01 | 0.13 | 0.90 | | 0.15 | 276.00 |

Source: authors computation

Table 2 presents the baseline FGLS-AR(1) results and the Panel Error Correction Model (ECM) estimates for both inflation and lending rates. Several important findings emerge. First, regarding the effect of DFI on inflation, the FGLS-AR(1) baseline model yields a negative but statistically insignificant coefficient for the DFI index ($\beta = -0.012$, $p = 0.321$), suggesting no robust contemporaneous relationship between digital financial innovation and inflation in the short run across the full panel. This result is consistent in the ECM long-run equation ($\beta = 0.004$, $p = 0.834$), where DFI also remains insignificant. However, the ECM short-run equation reveals that the error correction term is negative and highly significant ($\lambda = -0.542$, $p < 0.001$), confirming that the system corrects approximately 54.2% of any deviation from the long-run equilibrium within one year. This rapid adjustment speed indicates meaningful dynamic macroeconomic linkages even in the absence of a direct DFI-inflation effect. Broad money (log M2) is the dominant driver of inflation in the long run ($\beta = -1.217$, $p < 0.001$), suggesting a monetary channel of inflation determination. Second, DFI significantly reduces lending rates. The FGLS baseline model shows that a one-unit increase in DFI reduces the lending rate by approximately 0.055 percentage points ($p = 0.019$), while the ECM long-run equation estimates a coefficient of $-0.045$ ($p < 0.001$), indicating a robust and persistent negative effect of digital financial deepening on borrowing costs. This finding supports the hypothesis that digital financial innovation improves credit market efficiency, reduces intermediation costs, and enhances monetary policy transmission through the interest rate channel. The positive and significant effect of broad money on lending rates in both the FGLS ($\beta = 1.446$, $p < 0.001$) and ECM long-run ($\beta = 0.291$, $p = 0.043$) models points to a complementary monetary expansion dynamic. Trade openness also shows a marginally positive

effect on lending rates (β = 0.061, p = 0.017), possibly reflecting exchange rate or external financing pressures. In the ECM short-run model for lending rates, the error correction term is again negative and significant (λ = −0.263, p < 0.001), confirming adjustment toward long-run equilibrium at a rate of approximately 26.3% per annum.

Table 3:Robustness Checks

| DV | Sub_sample | DFI_Coeff | SE | T | P | Stars | N |
|---|---|---|---|---|---|---|---|
| inflation_w | Full Sample (N=288) | -0.0116 | 0.0112 | -1.0402 | 0.3206 | | 288 |
| inflation_w | WAEMU Countries | -0.0014 | 0.0121 | -0.1196 | 0.9082 | | 192 |
| inflation_w | Non-WAEMU Countries | -0.006 | 0.0236 | -0.2559 | 0.8146 | | 96 |
| inflation_w | Pre-2015 (2000“2014) | -0.0529 | 0.016 | -3.3138 | 0.0069 | *** | 180 |
| inflation_w | Post-2015 (2015“2023) | 0.0357 | 0.0441 | 0.8102 | 0.435 | | 108 |
| lending_rate_w | Full Sample (N=288) | -0.0548 | 0.02 | -2.7429 | 0.0191 | ** | 288 |
| lending_rate_w | WAEMU Countries | -0.038 | 0.0043 | -8.9163 | 0 | *** | 192 |
| lending_rate_w | Non-WAEMU Countries | -0.1118 | 0.0328 | -3.4059 | 0.0423 | ** | 96 |
| lending_rate_w | Pre-2015 (2000“2014) | -0.0647 | 0.0444 | -1.4559 | 0.1733 | | 180 |
| lending_rate_w | Post-2015 (2015“2023) | -0.0528 | 0.0181 | -2.9241 | 0.0138 | ** | 108 |

Source: authors computation

Table 3 presents the sub-sample robustness checks for the DFI coefficient across different country groupings and time periods. For the inflation model, the DFI coefficient remains statistically insignificant across the full sample (β = −0.012), WAEMU countries (β = −0.001), and non-WAEMU countries (β = −0.006), confirming the baseline finding of no significant DFI-inflation link. Notably, however, the pre-2015 sub-sample yields a negative and highly significant coefficient (β = −0.053, p = 0.007), while the post-2015 estimate is positive and insignificant (β = 0.036, p = 0.435). This structural break in the DFI-inflation relationship suggests that the inflation-reducing effect of digital financial innovation may have been more operative during the early phase

of digital adoption, possibly through improved price transparency and financial inclusion, but has weakened or reversed as markets have matured and digital credit expanded. For the lending rate model, the DFI effect is robust across all sub-samples. The negative relationship is highly significant among WAEMU countries ($\beta = -0.038$, $p < 0.001$) and statistically significant among non-WAEMU countries ($\beta = -0.112$, $p = 0.042$), with non-WAEMU economies exhibiting a stronger effect. The post-2015 sub-sample yields a significant negative estimate ($\beta = -0.053$, $p = 0.014$), while the pre-2015 result is directionally consistent but falls short of conventional significance thresholds. Collectively, these robustness results validate the lending rate finding as stable across country groupings and time periods, while the DFI-inflation relationship appears more context-dependent and temporally heterogeneous.

## Conclusion

This study investigated how Digital Financial Innovation (DFI) affects monetary policy transmission across 15 ECOWAS countries between 2000 and 2023. Using panel data methods including FGLS-AR(1) and Panel Error Correction Models, the analysis focused on two key monetary policy outcomes: inflation and lending rates. The results show that digital financial innovation does not have a strong or consistent effect on inflation. While there is some evidence that DFI helped reduce inflation during the early years of digital financial adoption (before 2015), this effect faded over time as digital credit markets grew and became more complex. What drives inflation in West Africa is mainly the money supply, meaning that traditional monetary policy tools remain the most important instrument for controlling prices in the region. However, the story is different for lending rates. Digital financial innovation consistently and significantly reduces borrowing costs across all country groups and time periods examined. This means that as countries in West Africa deepen their digital financial systems, banks and financial institutions become more efficient, competition increases, and the cost of credit falls. This is an important finding because lower lending rates make it easier for businesses and households to access credit, which supports economic growth.

In simple terms, digital finance in West Africa is not yet powerful enough to directly control inflation, but it is clearly making credit cheaper and improving how monetary policy works through the banking system. Policymakers should therefore invest in expanding digital financial infrastructure, while continuing to rely on money supply management to keep inflation under control. Future research should explore how fintech regulation and cross-border digital payments further shape these outcomes across the region.

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