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## CRYPTOCURRENCY AND FINANCIAL INCLUSION: EMPIRICAL EVIDENCE FROM NIGERIA

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### Abstract

*The emergence marked the start of a new phase in financial innovation, upending established banking structures and revolutionizing financial inclusion across the globe. This study investigates the impact of cryptocurrency adoption on financial inclusion in Nigeria. The study employ monthly data spanning from January 2017 to August 2023, on simple static relationships amidst financial inclusion growth, and other explanatory variables, including the volume of cryptocurrency transactions, the number of cryptocurrency users, and internet mobile penetration. Preliminary analysis reveals significant positive correlations between the volume of cryptocurrency transactions, the number of cryptocurrency users, and financial inclusion measure. Increased internet mobile penetration also demonstrates a positive influence, suggesting that greater access to mobile internet facilitates broader participation through cryptocurrency. The results highlight the pivotal role of cryptocurrency in enhancing financial inclusion and depth, driving a more robust financial ecosystem. This study underscores the potential of digital currencies to augment traditional finance and stability in emerging markets. The study suggests policy to support more cryptocurrency adoption and mobile internet infrastructure, as such would bolster financial development in Nigeria.*

**Keywords:** Cryptocurrency, Financial inclusion, Static regression, Emerging economy, Internet penetration.

**JEL Code:** C10, C51, G21

### INTRODUCTION

The Bitcoin whitepaper, which proposed a decentralized peer-to-peer electronic cash system, is credited for sparking the development and transition of cryptocurrency (Nakamoto, 2008). The emergence marked the start of a new phase in financial innovation, upending established banking structures and changing how money is viewed and interacted with. Following the invention of Bitcoin, a multitude of substitute digital assets subsequently surfaced, each with a distinct use case and value proposition. Despite an initial belief that crypto assets posed hazards to businesses, the introduction of these assets has gained popularity among institutional and retail investors (Yakubu & Samuel, 2023). In 2017, the introduction of cryptocurrency futures options as the standard cryptocurrency derivative ushered in institutional funds, making the market capitalization soar (Zhu et al. 2017). Since then, the global activity in crypto assets has continued to increase, with a large concentration of activity in emerging market economies, rising over 2,300% since the third quarter of 2019 till date.

In Nigeria, cryptocurrency presents opportunities for the country, given the growing fintech sector and a younger populace ready to adopt digital advances. The country leads other African economies in terms of cryptocurrency adoption and traded transactions (Adeola, 2024). Nigeria's trade volume in cryptocurrency assets in 2020 was US\$352.00 million, significantly more than

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South Africa's and Kenya's respective volumes of US\$90.20 million and US\$85.00 million. Nigeria led the world in Bitcoin trading between January 2021 and June 2022, with US\$1.16 billion in transactions, demonstrating the country's substantial acceptance of the digital asset (Yakubu & Samuel, 2023).

The Nigerian financial system, which is made up of a combination of fintech companies, mobile money providers, and traditional banks, is at a turning point in its development where laws and technology meet. On February 5, 2021, the Central Bank of Nigeria (CBN) adopted a cautious stance regarding cryptocurrencies, telling financial institutions not to support transactions involving cryptocurrency because of worries about consumer protection, money laundering, and terrorist financing. The bank contended that the absence of KYC and anonymity of cryptocurrency left it vulnerable to unlawful usage, in violation of current laws (Okpalaojiego, 2021). Stakeholders in the industry have been debating this regulatory posture; supporters argue for a more proactive strategy to capitalize on the potential advantages of digital assets, while detractors point out the dangers of uncontrolled cryptocurrency activity.

Despite the growing interest in cryptocurrencies globally, there is a paucity of empirical research on their specific impact on financial inclusion in Nigeria. Previous studies such as Obiora (2023) and Adeola (2024) among others focused on various aspects of cryptocurrencies, from their technological underpinnings to their economic implications. They undermine the need for a nuanced examination of how cryptocurrencies are reshaping financial inclusion. Understanding how cryptocurrencies interact with financial inclusion is crucial for ensuring informed decision-making and policy formulation. Against this backdrop, this study examines the impact of cryptocurrencies on financial inclusion in Nigeria.

## LITERATURE REVIEW

The rise of technology has sparked a global shift in finance toward digital platforms (Buterin, 2015). Aalborg et al. (2018) note that the world would generally embrace technological evolution, moving from a system of physical to almost virtual currencies. The emergence of these crypto-asset markets exerted considerable impacts on global financial markets recognition (Ciaian et al., 2016). Prior studies across countries have provided different perspectives to how cryptocurrencies affect the economy (Barro, 2023; Cocco, 2022; Dandapani, 2023; Karim and Safiya, 2023; Narayan, 2023). Barro (2023) examined the impact of cryptocurrencies on women's financial empowerment in sub-Saharan Africa, focusing on regions with high gender disparities in financial access. The study used a mixed-methods approach, combining qualitative interviews with women entrepreneurs and quantitative analysis of financial behavior data. The research found that cryptocurrencies enhance women's financial autonomy, allowing them to participate more actively in economic activities and improve their financial independence. Cocco (2022) investigated the efficiency of cryptocurrency transactions compared to traditional banking services in Latin America. The study utilized transaction data from multiple Latin American countries, comparing the speed and cost of cryptocurrency transactions with those of traditional banks. The results indicated that cryptocurrencies offer faster and cheaper transaction options, which can be particularly beneficial for small and micro-enterprises seeking cost-effective payment solutions.

Dandapani (2023) explored how cryptocurrencies can reduce remittance costs, which are a major source of income for many developing countries. The study employed a comparative analysis of

remittance costs using traditional methods versus cryptocurrencies, drawing data from international remittance corridors. The analysis showed that cryptocurrencies significantly reduce transaction fees, making remittances more affordable for low-income individuals and increasing their access to financial resources. Karim and Safiya (2023) studied the use of cryptocurrencies among refugee populations in the Middle East, exploring how digital currencies can improve financial resilience. The study employed ethnographic methods, including participant observation and interviews with refugees using cryptocurrencies for everyday transactions. The findings indicated that cryptocurrencies provide refugees with a secure and portable means of managing their finances, increasing their access to essential services and resources.

Narayan (2023) examined the role of cryptocurrencies in enhancing financial inclusion in Southeast Asia, a region with significant unbanked populations. The researcher used econometric modeling to analyze data from multiple countries, focusing on the relationship between cryptocurrency adoption and financial inclusion metrics. The study found a positive correlation between cryptocurrency usage and improved financial inclusion, particularly in rural areas where traditional banking services are scarce.

In the domestic instance, some studies had considered explanation to how the cryptocurrencies affect the Nigerian economy (Akinbami, 2023; Simeon & Oyedokun, 2023; Olusegun et al., 2023; Ozili, 2023; Ahannaya et al., 2021). Akinbami (2023) conducted a study on the impact of cryptocurrencies in Nigeria, focusing on how digital currencies expand access to financial services for the unbanked population. The study used survey data from Nigerian cryptocurrency users, examining factors such as access to banking, transaction costs, and financial literacy. The results indicated that cryptocurrencies provide a viable alternative for financial transactions, reducing reliance on cash and increasing financial access for individuals without bank accounts.

Simeon and Oyedokun (2023) examined how the adoption of cryptocurrency has legal, tax, and other financial implications in Nigeria. Regardless of the regulatory issues offered by bitcoin technology, cryptocurrency improves financial inclusion, speeds up and lowers the cost of international remittances, and eases international trade, especially at the micro level. It has been found that there is no central authority, tax evasion, money laundering, terrorism financing, and cyber blackmail as financial repercussions. Olusegun et al. (2023) assessed the implications of the eNaira adoption on stability in Nigeria. An analysis of potential scenarios about the impact of the eNaira on the stability of the financial system was built using the available data on deposits and credits of financial institutions. The findings indicated that as the value of the eNaira increased, so will the number of small savers and banks' reliance on non-core financing sources and pro-cyclicality risk in financial institutions. The results also indicated that bank non-interest revenue would decrease, and the costs associated with financial institutions managing cash would go down.

Ozili (2023) investigates the global and local interest in internet information about cryptocurrency and the Nigeria central bank digital currency, named the eNaira. According to the survey, Japan and Brazil had the lowest levels of interest during the period in information regarding cryptocurrencies and the eNaira, while Nigeria registered the highest level of interest worldwide. The correlation results indicate that interest in eNaira information and interest in bitcoin information are significantly and positively correlated. According to the Granger causality

results, local and worldwide interest in eNaira information is influenced by information on cryptocurrencies. Ahannaya et al. (2021) investigate the effect of cryptocurrencies on the Nigeria Economy. According to the study report, blockchain technology offers benefits outside of the financial industry (a secure collection of vital data and information, such medical bills, voter records, and health records, among other things). The respondents were asked to complete a structured questionnaire to provide quantitative data. The findings showed that the use of cryptocurrencies, like Bitcoin and Ethereum, for online transactions has increased and is becoming nearly universally accepted.

### METHODOLOGY

This study adapts the model from Odeyale (2023) and examine the impact of cryptocurrency on the growth of financial inclusion in Nigeria. A regression analysis was performed to investigate the nature and strength of the relationship between the independent and dependent variables. Equation 1 (functional form) and Equation 2 (Linear Form) are adopted to show the relationship:

$$GFI_t = f(VCT_t, NCU_t, IMP_t) \quad (1)$$

$$GFI_t = \beta_0 + \beta_1 VCT_t + \beta_2 NCU_t + \beta_3 IMP_t + \mu_t \quad (2)$$

The variables are defined: GFI is the growth of financial inclusion - since this approximates the extent of financial depth, this study proxy it with the ratio of broad money (M2) to gross domestic products (GDP). VCT is the volume of cryptocurrency transactions, NCU is the number of cryptocurrency users and IMP is internet mobile penetration - been the proportion of people who own mobile devices and have access to the internet, making the bitcoin transactions possible. Better mobile and internet penetration also makes it easier to access digital financial services, which encourages the adoption of cryptocurrencies.  $\beta$ 's are the coefficients and  $\mu_t$  is the model's residuals.

The paper uses monthly data, obtained from secondary sources, covering January 2017 to August 2023. The dependent variable, GFI, was sourced from the CBN's statistical database, while the independent variables - VCT, NCU and IMP - are sourced from Coin Desk. Before the estimation of (2), the ascertain if the data are stationary or not, a unit root test was done to assess the stationarity of each individual variable using the Augmented-Dickey-Fuller (ADF). The unit root test confirms the random characterization for each variable by determining whether their series are stationary or not. To show the process, the study represent the variable as  $z_t$ , the ADF finds stationarity by denoting  $z_t$  assumes:

$$z_t = a_0 + \varphi z_{t-1} + \sum_{i=1}^{p-1} \delta_i \Delta z_{t-i} + \Omega_t \quad (3)$$

For  $i = 1, 2, \dots, p - 1$ ,  $p$  is lag length, and  $\Omega_t$  is Gaussian white noise. The equation is estimated with least square and test statistics,  $\tau_\mu = \hat{\varphi}_T - 1/se(\hat{\varphi}_T)$  is computed, and,  $se(\hat{\varphi}_T)$  is standard error of  $\hat{\varphi}_T$ . The null  $H_0: \varphi = 1$  (non-stationarity) is tested against the alternative,  $\varphi > 1$ , and rejected if  $\tau_\mu > ADF_\alpha$ , critical value generated by Dickey-Fuller limiting distribution.

### RESULTS AND DISCUSSION

This paper aims to investigate how cryptocurrency has affected financial inclusion in Nigeria. Before the main estimation, this study present preliminary information that characterized the variables. Table 1 presents the descriptive statistics (Panel A), the Pearson correlation coefficients (Panel B), and the stationarity test (Panel C). The variables are linearly and significantly positive correlated. The correlation is higher between the financial inclusion and volume of cryptocurrency transactions (0.659), moderate between financial inclusion and number of

cryptocurrency users (0.552) and lower between financial inclusion and internet mobile penetration (0.392). Narayan (2023) found a positive correlation between cryptocurrency usage and improved financial inclusion in rural areas where banking services are limited.

The ADF statistic identifies that this study refute the non-stationarity null for each variable, since  $\tau_{\mu} < ADF_{\alpha}$  in the different test equations (with or without trend included). This indicates that all the variables are stationary at levels, thus establishing that they are  $I(0)$ , and suitable for a linear OLS estimation to estimate the static relationship between financial inclusion, and the attendant explanatory variables. With a coefficient of 0.044, at 10% significance, the results show a positive and significant impact of the volume of bitcoin transaction ( $VCT_t$ ) on financial inclusion growth ( $GFI_t$ ). This implies that a percentage increase in volume of cryptocurrency transactions will increase the growth of financial inclusion by over 4.5%. As more cryptocurrency transactions occur, the financial inclusion system becomes more robust. The result shows that, at a 10% significance, the number of bitcoin users ( $NCU_t$ ) positively influences the expansion of financial inclusion. The coefficient suggests that the financial inclusion will increase by more than 29% for every unit increase in the number of bitcoin users. That is the increasing acceptance and integration of digital currencies contribute to financial innovation and inclusivity.

Moreso, the output indicates that, at 5% significance, internet mobile penetration ( $IMP_t$ ) had a somewhat beneficial impact on the expansion financial inclusion. The coefficient shows that a unit increase in internet mobile penetration causes a shift of more than 7.6% in the growth of financial inclusion. This highlights the pivotal role of cryptocurrency in enhancing financial inclusion, driving a more robust financial ecosystem in Nigeria. The R-squared ( $\bar{R}^2$ ) value indicates that the independent factors account for roughly 76% of the variance in the dependent variables. The remaining 24% variation in the dependent variable are unexplained by the model. The overall model, as indicated by the F-statistic of 16.83, is highly significant at 1%. The Durbin Watson statistic of 1.925 confirms that the residuals are not autocorrelated, satisfying the underlying assumption and makes the model's estimate suitable for policy formulation. This underscores the potential of digital currencies to augment traditional financing to foster growth and stability in emerging markets.

The result supports previous studies (Cocco, 2022; Dandapani, 2023; Ahannaya et al., 2021). Cocco (2022) revealed that cryptocurrencies offer faster transaction beneficial for small and micro-enterprises seeking cost-effective payment solutions. Dandapani (2023) indicated that cryptocurrencies provide refugees with a secure means financing increasing their access to essential services and resources". Ahannaya et al. (2021) showed that Bitcoin and Ethereum, has increased financial participation.

**Table 1: Preliminarily Analysis (Pre-Estimation Tests)**

Variable	$\mu$	$\sigma$	$\tilde{\mu}_1$	$\tilde{\mu}_3$	$GFI_t$	$VCT_t$	$NCU_t$	$IMP_t$
Panel A: Basic statistics					Panel B: Correlation			
$GFI_t$	824.6	90.6	0.281	2.166	1.000	<b>0.659</b>	<b>0.392</b>	<b>0.552</b>
$VCT_t$	79383.3	60102.7	0.974	2.725		1.000	<b>0.649</b>	0.476
$NCU_t$	11619.5	6103.5	0.053	1.895			1.000	<b>0.632</b>
$IMP_t$	86385.1	41783.0	0.487	2.002				1.000

Panel C: Stationarity test

<i>t</i> -stat	4.717	3.198	5.204	3.718
<i>pr</i> ( <i>t</i> -stat)	0.010	0.032	0.006	0.026
Order	I(0)	I(0)	I(0)	I(0)

**Note:** Panel A shows the statistics ( $\mu, \sigma, \tilde{q}_1, \tilde{q}_3$ ) for the variables, where  $\mu \equiv$  mean,  $\sigma \equiv$  Standard deviation,  $\tilde{\mu}_1 \equiv$  skewness coefficient  $\tilde{\mu}_3 \equiv k$  urtosis coefficient. Panel B is the Pearson correlation coefficients,  $r_{x_1x_2}$ , defined for linear correlation of a pair,  $x_i$  and  $x_j$ , having  $n$ -set  $[(x_{1,1}, x_{2,1}), (x_{1,2}, x_{2,2}), \dots, (x_{1,n}, x_{2,n})]$  with  $r_{x_1x_2} = \frac{\sum_i^n (x_{1,t} - \bar{x}_1)(x_{2,t} - \bar{x}_2)}{[\sqrt{(x_{1,t} - \bar{x}_1)^2} \sqrt{(x_{2,t} - \bar{x}_2)^2}]^{-1}}$ , and the value lies between -1 and +1. **Bold** values significant coefficients, using probability  $p|t| = 0$ . Panel C shows the stationarity test based on the ADF, defined in Equation (3). The null  $H_0: \varphi = 1$  (non-stationarity) is tested against the alternative,  $\varphi > 1$ , and rejected if  $\tau_\mu > ADF_\alpha$ , critical value generated by Dickey-Fuller limiting distribution. Order is order of integration.

**Source:** Authors (2024)

**Table 2: Main Analysis (Linear Estimation for  $GFI_t$ )**

Variable	Coef.	Estimates	$\sigma$	<i>t</i> -stat	<i>pr</i> ( <i>t</i> -stat)
Const.	$\beta_0$	6.183*	0.962	7.462	(0.000)
$VCT_t$	$\beta_1$	0.045***	0.024	1.851	(0.079)
$NCU_t$	$\beta_2$	0.290***	0.160	1.814	(0.083)
$IMP_t$	$\beta_3$	0.076**	0.030	2.506	(0.020)

Statistics

$\bar{R}^2$	0.760
F-stat.	16.83
Prob(F-stat.)	0.001
DW	1.925

**Note:** The variables are as defined. Const. is the Constant term. Coef. Is the coefficient of each variable in equation 3. The  $\bar{R}^2$  is the Adjusted R-square and the figures in parenthesis are estimates are the *p*-values, using  $prob|t| = 0$ , where \**p* ≤ 1%; \*\**p* ≤ 5%; \*\*\**p* ≤ 10%, with a 2-tailed test.

**Source:** Authors (2024)

**CONCLUSION AND RECOMMENDATIONS**

This paper examines the impact of cryptocurrency on the growth of financial inclusion in Nigeria. To ensure this, this study examines the effect of the volume of cryptocurrency transactions, the number of cryptocurrency users, and internet mobile penetration. Preliminary investigation reveals a positive correlation financial inclusion and these attendant variables considered. Moreso, increased cryptocurrency adoption contributes to financial inclusiveness.

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Also, the internet mobile penetration is also a significant factor, as higher connectivity levels facilitate easier access to cryptocurrency platforms, promoting broader financial depth.

Accordingly, some recommendations are offered. One, the government should establish clear and supportive regulatory frameworks that foster the growth of cryptocurrency markets while ensuring consumer protection and financial stability. Such regulations should encourage innovation and investment in the cryptocurrency space. Two, there should be continuous enhancement of internet and mobile penetration. Continued efforts to improve internet infrastructure and mobile penetration are crucial. Policies and investments aimed at expanding internet access, particularly in rural and underserved areas, will enable more Nigerians to participate in the cryptocurrency market, thereby deepening financial inclusion. The government should promote financial technological innovations. Encouraging and supporting FinTech innovations that integrate cryptocurrencies with traditional financial services can drive financial depth. This support can be in the form of funding, incubation programs, and partnerships between traditional financial institutions and FinTech startups. Establishing partnerships with global cryptocurrency platforms can enhance the integration of Nigerian financial markets with international markets, providing more opportunities for cross-border transactions and investments.

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