



MOBILE MONEY PENETRATION AND FINANCIAL INCLUSION IN NIGERIA: A TOBIT APPROACH

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ABSTRACT

This study predicts within Tobit regression framework the relationship between mobile money penetration and financial inclusion in Nigeria. The study employs secondary data obtained from World Bank Global Financial Inclusion Database (2023) and IMF Financial Access Survey (2023) for a period between 2011 and 2021 respectively. Tobit estimation results via maximum likelihood estimator reveal that increase in the number of mobile money agents per 1,000 km² would significantly increase expected Nigeria financial inclusion index. However, this index will significantly fall with greater number of mobile money accounts and value of mobile money transactions during a reference year assuming that the number of mobile money agents per 1,000 km² remains the same over a period. Therefore, the study affirms that mobile money penetration produces mixed results for predicted Nigeria financial inclusion index. It increases with number of mobile money agents on one hand and fall with number of mobile money accounts and value of mobile money transactions on the other hand. The study recommends that there should be increase in the number of mobile money agents per 1,000 km² in Nigeria. Again, there should be policy redesign for control and regulations of mobile money accounts and mobile money transactions activities by governments and other stakeholders in the industry particularly mobile network operators.

Keywords: Mobile Technology, Mobile Money, Financial Inclusion, Tobit

Introduction

Financial inclusion (FI) is increasingly being recognised as a developmental goal among various economies particularly developing countries. The need to leverage on mobile money for improved financial inclusion has been documented by literature (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess 2018; Ahmad, Green & Jiang, 2020; Shaik, Galvee-Geo, Karjaluoto & Hinson, 2023). This is because mobile money (MM) as an alternative to armchair banking involves the use of mobile phone device that has now become a necessity material of life for almost everyone. It enables phone users to access and use financial services through a network of mobile money agents. This implies that high penetration of mobile money can allow mobile phone users who are previously excluded from formal financial system to be incorporated. Thus, facilitates increased financial inclusion. However, despite increase in the success recorded by Nigeria on financial inclusion level the exclusion rate is still significantly higher than the official set target with the country current FI rate at 64% in 2022 (UK Government, 2023; Wezel & Ree, 2023). But, recent evidence shows that market participation by mobile money players with many new registered mobile MM agents increased in 2022 (Giacomelli, 2023). This suggests that a research on relationship between mobile money penetration and financial inclusion in Nigeria is required given uptake investments in mobile money industry in the country. Such surge investment in mobile money industry is underpinned by diffusion of innovation theoretical postulation which relates to how financial services are provided to larger society through mobile phone device as a new technology.

According to Ahmad *et al.* (2020), empirical studies on mobile money are limited in supply due to MM relatively recent popularity but there is increasing availability of survey-based data on financial inclusion and mobile money. The vast majority of available research on mobile money particularly in developing countries can be categorised as less empirical-based studies lacking robust econometric estimations (for instance, see GSMA, 2021; 2023; CGAP,



2018). Nonetheless, armful quantitative empirical studies by Nyimbiri (2021), Hamdan, Lehmann-USchner and Menkhoff (2022), Shaik *et al.* (2023); have observed positive relationship between mobile money and higher financial inclusion in developing economies especially Africa. However, within the researchers’ available information, such econometric-based evidence is lacking or non-existence in Nigeria. The limited numbers of studies in this regard in Nigeria have either linked mobile money with formal inclusion of Small and Medium Scale Enterprises (e.g. Adebisi, 2022) or socioeconomic factors (see Sodipo *et al.*, 2021) at micro level further confirming lack of evidence of macro level financial inclusion impact of mobile money. This study therefore attempts to investigate at macro level relationship between mobile money and financial inclusion in Nigeria for a period between 2017 and 2022. The specific focus on the period of research is informed by the length and scope of data obtained from IMF Financial Access Survey (FAS, 2023) and World Bank data on Global Financial Inclusion (2023). A study of this nature is essential to existing literature by providing better understanding of empirical-based financial inclusion impact of mobile money on macro level in a developing country like Nigeria.

Methodology

This study employs ex-post facto research design to investigate the link between mobile money penetration and financial inclusion in Nigeria. According to Creswell (2014) consistent with Saka and Bolanle (2023), ex-post facto design permits testing of hypothesis and theory to infer empirical conclusion on relationship between two or more economic series. The study empirical model is specified in line with properties of Tobit regression method. Tobit regression is efficient where dependent variable is captured within specified minimum and maximum limits (Asongu & Odhiambo, 2021). In this study, possible financial inclusion rates (as censored variable) that Nigeria recorded between 2017 and 2022 is within 0% and 100% as minimum and maximum levels respectively (Global Financial Inclusion, 2023). The Tobit model is specified as:

$$FIC^*_t = \alpha_0 + \beta MMP_t + e_t \dots \dots \dots (equation 1)$$

Where; FIC^* = latent response variable (Financial Inclusion); MMP = vector of predictors (Mobile Money Penetration) and $e_{i,t} \approx$ independently and identically distributed (i.i.d.). $N(0, \sigma^2)$ does not depend on MMP_t .

Equation 1 is re-parameterised as:

$$USE^*_t = \alpha_0 + \beta_1 MAG_t + \beta_2 MAC_t + \beta_3 MVT_t + e_t \dots \dots \dots (equation 2)$$

Where,

USE = Use of financial institution to save (% age 15+); MAG = Mobile Money Agent (measured by number of registered mobile agents per 1,000 km²); MAC = Mobile Money Accounts (measured by number of registered mobile money accounts per 1,000 adults); MVT = Mobile Money Transaction Value (measured by value of mobile money transactions during a reference year (% of GDP). $\beta_1 - \beta_3$ are Tobit regression slope coefficients of mobile money penetration predictors.

Then, equation 2 is constrained to be feasible between these conditions;

$$USE_t = USE^*_t \text{ if } USE^*_t > \gamma$$

$$USE_t = 0, \text{ if } USE^*_t \leq \gamma$$

Note that variables measurements in this study are consistent with approaches by data sources which include World Bank Global Financial Inclusion (2023) and IMF FAS (2023). The period of data obtained ranges from 2017 to 2022. Lastly, equation 2 is analysed with maximum likelihood method of Tobit (Censored Normal) regression at 5% level of significance using EViews 9 as statistical analysis software.



Results

The maximum likelihood estimation results of Tobit analysis of equation 2 in the methodology section is presented as:

Table 1: Estimation Results of Censored Normal (TOBIT) Regression of Financial Inclusion Impacts of Mobile Money Penetration in Nigeria

Dependent Variable: USE				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	26.11506	0.786010	33.22485	0.0000
MAG	0.011985	0.005479	2.187628	0.0287
MAC	-0.057000	0.017560	-3.246112	0.0012
MVT	-0.586054	0.187139	-3.131655	0.0017
Error Distribution				
SCALE:C(5)	1.345575	0.286878	4.690416	0.0000
Akaike info criterion	4.340611			
Schwarz criterion	4.521472			
Log likelihood	-18.87336			
Avg. log likelihood	-1.715760			
Left censored obs.	0	Right censored obs.	0	
Uncensored obs.	11	Total obs.	11	

Source: Authors' Computations from EViews 9 (2023)

DISCUSSION

In the Table 1, it is shown that there are 11 observations for all the series employed in the study. This shows that the sample only adjusted for a period between 2011 and 2021 with study data on 2022 economic series grossly unavailable. For instance, data on Financial Inclusion index obtained from World Bank Global Financial Inclusion database does not provide information on 2022 statistics. In fact, data from World Bank on financial inclusion is only available for 2011, 2014, 2017 and 2021. Similarly, missing figure on 2022 also occurs with data obtained from IMF FAS (2023) report that only supplies 2017-2021 information. To correct for the missing figures which if untreated could have pronounce effect on the study estimations the study employed linear interpolation method to arrest the situation. The probability value of log likelihood ratio as indicated by *scale c(5)* (*prob. = 0.0000*) shows that all the mobile money penetration predictors used in this study are not simultaneously zero. Thus, statistic indicates good fitness of the study model. In the main Table 1, mixed results are obtained about the impact of mobile money penetration and financial inclusion in Nigeria. From the result, if the number of registered mobile money agents per 1,000 km² (*MAG: $\beta_1 = 0.012$; $p - value = 0.0287$*) is to increase by one per cent the expected Nigeria financial inclusion index (*USE*) would significantly increase by 1.2 per cent while other predictors in the model are assumed to be held constant. Thus, the greater the number of registered mobile money agents per 1,000 km² in Nigeria the higher the level of the country financial inclusion index.

On the other hand, increase in the number of mobile money accounts per 1,000 adults (*MAC: $\beta_2 = -0.057$; $p - value = 0.0012$*) by 1% would significantly lead to decrease in the predicted Nigeria



financial inclusion index by 5.7% with all other predictors being constant. This result implies that greater number of mobile money accounts will bring about corresponding 5.7% decrease in Nigeria financial index when measured by usage of financial services. Similarly, if the value of mobile money transactions during a reference year (% of GDP) ($MVT: \beta_2 = -0.086; p - value = 0.0017$) is to increase by 1% predicted financial inclusion index of Nigeria would significantly fall by 8.6% while other predictors in the model are held constant. Hence, the higher the value of mobile money transactions during a reference year the lower the Nigeria expected financial inclusion index. The outcomes about number of mobile agents and value of mobile money transactions obtained in this study significantly explain reasons why there is slow uptake of mobile money penetration in Nigeria as earlier claimed by Wezel and Ree (2023), Adebisi (2022) and Sodipo *et al.* (2021). However, the study observed positive relationship is consistent with Nyimbiri (2021), Hamdan *et al.* (2022), Shaik *et al.* (2023) that also found positive association between mobile money and higher financial inclusion in developing economies from Africa.

Conclusion

This study predicts within Tobit regression framework the relationship between mobile money penetration and financial inclusion in Nigeria. Analysis of data obtained from World Bank Global Financial Inclusion database (2023) and IMF FAS (2023) reveals that increase in the number of mobile money agents per 1,000 km² would significantly increase expected Nigeria financial inclusion index. However, this index will significantly fall with greater number of mobile money accounts and value of mobile money transactions during a reference year assuming that the number of mobile money agents per 1,000 km² remains the same over a period. Therefore, the study affirms that mobile money penetration produces mixed results for predicted Nigeria financial inclusion index. It increases with number of mobile money agents on one hand and fall with number of mobile money accounts and value of mobile money transactions on the other hand. The study recommends that there should be increase in the number of mobile money agents per 1,000 km² in Nigeria. Again, there should be policy redesign for control and regulations of mobile money accounts and mobile money transactions activities by governments and other stakeholders in the industry particularly mobile network operators.

Suggestions for Further Studies

This study analysed financial inclusion in Nigeria within the perspective of financial services usage. The argument here is that the application of financial index that incorporates both access and use of financial services or aggregate financial inclusion index that extends beyond access and usage could provide better results relative to mobile money penetration in Nigeria. Also, an expanded macro-level data on both mobile money penetration and financial inclusion in Nigeria is required in future research.

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