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Examination of the Macroeconomic Effects of the e-Payment System on the Pathway to Cashless Economy in Nigeria

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Abstract

The exploration of the macroeconomic effects of the e-payment system in the realization of a cashless economy in Nigeria has not enjoyed sufficient scholarly inquiries. Based on this gap, this paper aims to determine whether the CBN's recent demonetization scheme on the path to a cashless economy is informed by evidence-based insight on the macroeconomic effects of the country's e-payment systems. The researchers appraise the policy and regulatory environment in Nigeria, and evaluate the challenges and opportunities for the government towards the development of a more reliable digital payments system. The study deployed an ARDL model to investigate the relationship between e-payments and macroeconomic conditions. Using a monthly frequency, the study shows that the macroeconomic effect of a cashless policy is not only limited and temporary but also sensitive to the measure of the macroeconomic conditions under consideration. The ATM looks to be inflationary; however, alternative e-payment channels such as POS, WEB, and MOBILE APPS are capable of causing price levels to fall. The research reveals that the digital mode of payments is highly advantageous to the macroeconomic survival of Nigeria. Also, there is a need to put in place policy and regulatory frameworks to ensure that the digital option has the capacity to serve the large population of the country in terms of technological and technical expertise. The study concludes that the growing presence of e-payment facilities is the way to go to strengthen macroeconomic conditions when the demonetization strategy is implemented on the route to a cashless economy.

Keywords: *E-payment; Cashless economy; Macroeconomic effect; Nigeria JEL Code: E42; G21; G23; G51; G53, 033.*

1. Introduction

A cashless economy is usually defined as a system where transactions can be affected without having to deploy physical cash as a means of exchange but through the use of credit and/or debit card payments for goods and services. However, while acknowledging that the advent of the internet and telecommunications technology has further deepened the application of electronic payment (e-payment) systems across the globe, payment for transactions in developing economies such as Nigeria is still predominantly in cash. That said, it is instructive that the conventional means of payment for transactions have been

widely alleged to be characterized by myriad challenges that make it difficult for monetary policy tools to be effective. Realizing the need to mitigate the said ineffectiveness of monetary policy attributable to relying solely on the deployment of physical cash as a means of exchange, the Central Bank of Nigeria (CBN) has since joined the growing practice of a cashless economy. The goal is to minimize the quantity of physical cash in circulation by discouraging the use of cash while encouraging the use of electronic payment methods (Gbanador, 2023). Essentially, the first stage of the Nigerian cashless policy took off at the subnational level in 2012, with the CBN using the case of Lagos State to experiment. While the second stage of the policy was initiated and implemented in Abia, Anambra, Kano, Ogun and Rivers, and the country's capital city (i.e. Abuja)in 2013, the nationwide implementation of the cashless policy kick-started on July, 2014 (see CBN, 2019).

However, while the concept of cashless payment is not meant to substitute but complement the usage of physical money, the recent CBN policy of demonetizing the high-value currency notes of N1000.00, N500.00, and N200.00 has since reawakened the debate on the macroeconomic effects of a cashless economy. For instance, the demonization scheme, which commenced on December 22, 2022, is expected to be a systematic and independent process of replacing the existing currency of higher denominations with new ones. This measure was expected to improve the naira's performance, cement the cashless policy, and make monetary policy more effective. However, the fact that the demonetization process includes limits on currency notes in order to entirely wipe them off the slate, resulting in lesser cash circulation in the economy, has fueled concerns about the macroeconomic implications of the cashless policy. However, it must be stated herein that prior to the start of the demonetization process, the Nigerian macroeconomic environment was dealing not just with the residual impacts of the COVID-19 pandemic but also with the exogenous spillover consequences of the Russian-Ukraine war.

Given the preceding, it is unclear whether the currentdynamics of the Nigerian macroeconomic environment are primarily due to the CBN's recent attempt to consolidate its cashless policy or to the country's economy's sensitivity to some of the aforementioned external occurrences. However, even though it was expected that the bank platform would be available to support the cashless policy via payment systems such as USSD, mobile money, money apps, fund transfer, online banking, and so on, the demonetization scheme appears to have been characterized by failed transactions and delays in payment confirmation due to pressure on the various bank platforms. As a result, there has been a growing assertion attributing the recent unprecedented upward rise in the inflation rate more to the demonetization scheme than an external shock. To validate or refute this position, the goal of this study is to revisit the historical nexus between the cashless policy and macroeconomic conditions. The innovation is to empirically examine if the demonetization scheme is relying on false inferencesorassertions about the macroeconomic effects of cashless policy. On this note, the contributions of this study to the literature on the subject matter are twofold.

First, the vast majority of existing studies not only relied on a content analysis approach in the absence of quantitative data but also focused on the effect of the cashless policy on the Nigerian payment system rather than macroeconomic conditions (see Okey, 2012; Odior and Banuso, 2012; Yaqub et al., 2013). The fact that studies by Ashike (2011), Adewoye (2013), Ajayi (2014), Alagh (2014), and Ugwoke et al. (2019), among others, focus on the impact of cashless policies on bank profits rather than macroeconomic conditions further suggests there is still a gap to fill in the literature on the subject matter, particularly from the perspective of the macroeconomic environment. Thus, while these latter studies are geared towards ascertaining the extent to which the cashless policy of the CBN of Nigeria has yielded the anticipated result of improving the payment system, we rely on the probable result of such an improved payment

system to test the hypothesis that cashless policy measured in terms of the e-payment system improves the Nigerian macroeconomic environment. Secondly, in addition to measuring macroeconomic conditions from domestic inflation and relative prices (exchange rate), we also consider different instruments of the e-payment system to determine whether the macroeconomic conditions respond differently to different indicators of cashless policy.

In addition to this introductory section, the remainder of this paper is structured as follows: Section 2 provides a brief literature review of the subject matter. Section 3 presents the data and offers some preliminary analysis. Section 4 housed the methodological section of the study. Section 5 presents and discusses the results, while Section 5 concludes the study.

2. Brief literature review

This study is anchored on the bank focus theory and technological innovation theory.According to bank focus theory, financial institutions can deliver services to customers through low-cost non-traditional channels like internet banking, POS systems and mobile payments instead of physical branch locations (Kapoor, 2014). This allows banks to offer a range of financial services remotely using electronic payment methods, eliminating the need for consumers to visit a bank branch. As the Central Bank of Nigeria's cashless policy centers on promoting electronic payments, this theory has relevance for examining the policy's implementation.

Schumpeter (1912) also argued that technological innovation and discovery are essential drivers of economic growth, which must be facilitated by the financial sector through efficient resource mobilization and allocation. Scholar posited that a well-functioning financial system is a prerequisite for thriving entrepreneurial activity in technological innovation, as translating novel ideas into tangible outputs has cost implications that entrepreneurs may not fully cover themselves. Schumpeter contended that an effective financial system can identify and provide financing to entrepreneurs with the highest potential to successfully commercialize innovative concepts into marketable products using novel production methods (Okoye, Adetiloye, Erin &Modebe, 2017).

The existing literature on the economic impacts of cashless policies can be divided into two categories. On the one hand, are those that focus on its effects on banking performance, and on the other hand are those that focus on the policy's overall economic effects. Adewoye (2013), for example, employed a survey method to empirically examine the effect of mobile banking on service delivery in the Nigerian commercial sector and concluded that the introduction of e-banking services enhances the efficiency of banks in rendering services to customers. In a related development, Ajayi (2014) also used a survey approach to investigate the effect of cashless monetary policy on the banking industry in Nigeria. The study shows that there are significant reasons and benefits inherent in the implementation of cashless policies. Using content analysis to evaluate the benefits and challenges of Nigeria's cashless policy, Osazevbaru, and Yomero (2015) conclude that the cashless policy offers immense benefits to the banking sector. In the case of Taiwo et al. (2016), they assessed the adoption of a cashless policy in the Nigerian financial system, and the estimates from their survey analysis suggest that accurate implementations matter for enhancing the effectiveness of the cashless policy.

Investigating the influence of a cashless policy on growth, Agu and Agu (2020), using quarterly data and the OLS technique, show that cashless policy impacts economic performance. Focusing on the banking performance effect of the cashless policy, Okafor (2020) also employs an econometric technique to demonstrate the significant and positive effects of cashless policy returns on assets. On the contrary, however, Nwakoby et al. (2020) report evidence of an inverse relationship in their investigation of the effect of cashless policy on the profitability of banks in Nigeria. Recently, Gbanador (2023) also investigated the effect of cashless policy on economic growth using the ARDL model. On the

one hand, the study finds a significant and positive impact of cashless policy indicators such as checks and internet banking on GDP, but a negative and insignificant impact of ATMs and GDP on the other hand. Using the case of the Malaysian economy, Ong and Chong (2023) examined the impact of cashless payment on the usage of the internet and mobile banking services using the ARDL model. The study finds that cashless payments such as credit transfers and charge cards, among others, have a significant impact on the usage of mobile banking.

From the foregoing, the bulk of the extant studies on the subject matter predominantly focus on the effects of cashless policy on banking performance, such that only a few of them examine the effect on economic growth. However, in addition to advancing the literature from the perspective of the economic effects of the cashless policy, one of the main innovations of this study is the measurement of the economic effect from the viewpoint of domestic inflation and relative prices (exchange rates) as alternative measures of macrocosmic conditions. More importantly, we hypothesized that inflation compared to the exchange rate responds differently to different indicators or instruments of the e-payment system.

3. Data and Preliminary Results

The monthly data utilized in this study, covering January 2009 and December 2019, include three alternative indicators of e-payment: automated teller machines (ATM), point of sale (POS), internet banking (WEB), and mobile money transfer (MOBILE). Other variables of interest include monetary policy variables, in this case the short-term interest rate (INTR), while macroeconomic conditions are measured in terms of the domestic inflation rate (INFL) and exchange rate (EXR), respectively. Each of these data sources was sourced and obtained from the CBN online database (http://statistics.cbn.gov.ng/cbn-onlinestats/) and the National Bureau of Statistics (NBS) online database (https://nigerianstat.gov.ng/elibrary/read/951), respectively. More importantly, the choice of the start date (i.e., January 2009) and the end date (December 2019) is determined by the availability of others. Thus, one of the non-technical goals of this study is to determine whether the recent demonetization scheme by the CBN conforms to the reality of the dynamics of the nexus between cashless policy (the e-payment system) and macroeconomic conditions.

A look at Table 1 shows that the average monthly inflation measure in terms of the consumer price index is 174.6, while the average exchange rate is N209 with the US dollar as the reference currency. Regarding the e-payment variables measured in billions of naira, the monthly mean statistics of the value of the e-payment channel utilized are 298.4 billion for ATM, 66.5 billion for POS, 68.6 billion for mobile money, and 13.3 billion for internet banking (WEB). What this portends is that for the period under consideration, the ATM-based electronic payment channel is the most utilized, while the Internet banking channel is the least utilized. In what appears to be suggesting the instability of Nigerian macroeconomic conditions, the standard deviation (Std. Dev.), which measures the deviation from the mean level, is evidently large for INFL and EXR, both of which are indicators of macroeconomic conditions in this study. With respect to the e-payment indicators, the standard deviation statistic seems to be relatively higher for ATM, making it the most volatile of the alternative electronic payment channels under consideration, while WEB, with the lowest standard deviation value, is the least volatile. The distribution statistics, on the other hand, reveal the series to be positively skewed, with the interest rate (INTR) being the only exception. For the kurtosis statistic, it is platykurtic for interest rate and the two alternative indicators of macroeconomic conditions. Whereas the statistic is mixed for the e-payment variables, as it is leptokurtic for web and mobile but platykurtic for POS and ATM. The non-zero value of the skewness statistic, coupled with

the fact that the kurtosis statistic is characterized by both thin and fat tails, leads to the rejection of the null hypothesis of normality distribution as reported in the Jarque-Bera statistic.

Table 1: Descriptive Statistics

	INFL	EXR	INTR	ATM	POS	MOBILE	WEB
Mean	174.64	209.04	11.40	298.40	66.50	68.60	13.30
Std. Dev.	61.84	67.34	2.74	188.60	88.90	123.30	22.20
Skewness	0.59	0.67	-1.00	0.10	1.45	3.01	5.30
Kurtosis	2.15	1.59	2.59	1.72	4.01	12.65	36.37
Jarque-Bera	11.48 (0.00)	20.76 (0.00)	22.93 (0.00)	9.21 (0.01)	51.76 (0.00)	711.55 (0.00)	6743.83 (0.00)

Note: The value in parenthesis are the probability values associated with Jarque-Bera normality test

In line with the standard practice in the literature, particularly when modelling with time series data, we further complement our preliminary analysis with unit root testing of each of the variables under consideration. Essentially, we employ both the standard augmented dickey-fuller (ADF) and its modified version, in this case, the DF-GLS, to test the stationarity property of the variables. Supporting our choice of estimation technique, for instance, the ARDL model, are the unit root testing results in Table 2, where the order of integration hovered around I(0) and I(1). Quite interesting is the consistency of the unit root results across both alternative tests considered.

Table 2: Unit Root Test

Variable	ADF test			DF-GLS test		
	Level	First Difference	I(d)	Level	First Difference	I(d)
INFL	-1.3865	-5.5155***	I(1)	-1.4321	-5.3789***	I(1)
EXR	-1.8308	-7.6877	I(1)	-1.4604	-7.5143***	I(1)
INTR	-2.0999	-10.8014	I(1)	-1.3669	-10.8476**	I(1)
ATM	-2.6471	-12.2929	I(1)	-2.6505	-12.1038***	I(1)
POS	-6.1691***	-	I(0)	-4.8022***	-	I(0)
MOBILE	-3.4630**	-	I(0)	-3.1905***		I(0)
WEB	-2.8426	-12.9964***	I(1)	-2.5568	-13.0032	I(1)

Note: The terms ADF and DF-GLS implies Augmented Dickey-Fuller unit root test and Dickey-Fuller Generalized Least Square unit root test, respectively. The exogenous lags are selected based the Schwarz info criteria (SIC), while ***, ** and * suggests a series is stationary at 1%, 5% and 10%, respectively.

1. Methodology

Deciphered from our unit root testing results presented in the immediate predicting section is the mixed order of integration, which herein motivates our preference for an econometric method that allows for the combination of variables of different order of integration, for instance, I(0) and I(1), in a single model framework, in this case the ARDL model. More importantly, compared to other approaches to conducting cointegration test, the ARDL – based bound co-integration testing method tends to offer strong long-run estimates even when certain endogenous variables are present in the model (Narayan, 2005). In fact, where the hypothesis of the null of no cointegration is rejected, the ARDL model allows us to captures both the short and long run estimates simultaneously. Thus, presented in equation (1) is our ARDL specification on the probable effects of cashless policy (e-payment) system on macroeconomic conditions.

$$\Delta \log Y_t = \alpha + \sum_{i=1}^{n} \beta_{1i} \Delta \log Y_{t-i} + \sum_{i=0}^{q1} \beta_{2i} \Delta \log INTR_{t-i} + \sum_{i=0}^{q2} \beta_{3i} \Delta \log ATM_{t-i} + \sum_{i=0}^{q3} \beta_{4i} \Delta \log POS_{t-i} + \sum_{i=0}^{q4} \beta_{5i} \Delta \log WEB_{t-i} + \sum_{i=0}^{q5} \beta_{6i} \Delta \log MOBILE_{t-i} + \lambda_1 \log Y_{t-1} + \lambda_2 \log INTR_{t-1} + \lambda_3 \log ATM_{t-1} + \lambda_4 \log POS_{t-1} + \lambda_5 \log WEB_{t-1} + \lambda_6 \log MOBILE_{t-1} + \varepsilon_t$$

The term in equation (1) representing economic conditions is measured and captured singly in terms of domestic inflation (INFL) and exchange rates (EXR), respectively. The interest rate (INTR), denoting conventional monetary policy, is measured in terms of the CBN monetary policy rate. The cashless policy variable is measured using different electronic payment channels, namely, ATM, POS, mobile money (MOBILE), and internet banking (WEB). From the economic point of view, we expect increasing interesting to stabilize the macroeconomic conditions by reducing inflation and strengthen the country's exchange rate. We also expect this hypothesis to hold for the effect of cashless policy on the macroeconomic conditions.

In order to determine the long-run cointegrating dynamic of macroeconomic conditions and its various determinants, the ARDL bound test requires that we estimate equation (1) and then restrict the parameters of the lag level (long run) to zero. For instance, the null hypothesis (no co-integration) is as follows:H_0:

$$\Delta \log Y_t = \alpha + \psi ECT_{t-1} + \sum_{i=1}^{p} \beta_{1i} \Delta \log Y_{t-i} + \sum_{i=0}^{q1} \beta_{2i} \Delta \log INTR_{t-i} + \sum_{i=0}^{q2} \beta_{3i} \Delta \log ATM_{t-i} + \sum_{i=0}^{q3} \beta_{3i} \Delta \log POS_{t-i} + \sum_{i=0}^{q4} \beta_{4i} \Delta \log WEB_{t-i} + \sum_{i=0}^{q5} \beta_{5i} \Delta \log MOBILE_{t-i} + \varepsilon_t$$

The error correction term is represented as ECT_{t-} in the equation while the parameter 1 capture the speed of adjustment of the model to its long-run equilibrium. Saying it differently, the term captures the rate of correction at time *t* of deviation from the long-run equilibrium at *t-1*

1. Empirical Results

Table 3 presents the estimates obtained from the estimation of the ARDL framework represented in equations (1) and (2). However, while the ARDL framework allows for the estimation of both the short-run and long-run dynamics and estimates, the null rejection of the null hypothesis of no convergence as reported in the lower part of Table 3 is an indication that only the short-run estimates of the dynamic are valid in the context of this study. That is irrespective of the measure of the macroeconomic conditions that is under consideration, the probable macroeconomic effects of the cashless policy is only evident in the short run situation. This by implication seems to confirm the widespread assumption that monetary policy's effect on real economic activity is limited and temporary. However, a further looks at Table 3 show that the coefficients on each of the indicators of the e- payment channels which proxies for cashless policy are only statistically significant when the macroeconomic conditions is measured as domestic inflation rather than relatively prices (exchange rate). This, among other things conformto our hypothesis that macroeconomic effect of the cashless policy may vary for different indicators of macroeconomic conditions and as well as sensitive to different instruments of e- payment channels. Having shown that the macroeconomic effect of the cashless policy for the period under consideration is only statistically viable when

the macroeconomic condition is examine from the viewpoint of domestic inflation, we then proceed to evaluate the elasticities of the coefficient in terms of the direction of the inflationary dynamic of the policy.

Table 3: ARDL estimates on the macroeconomic effects of cashless policy

Short-run estimates	**Macroeconomic Conditions**					
	ARDL (4,0,0,1,1,0) Dependent variable: INFL			***ARDL (3,0,0,0,0,0) Dependent variable: EXR***		
	Coefficient	***Standard Error***		***Coefficient***	***Standard Error***	
Constant	-0.0315	0.0247				
$\Delta INFL_{t-1}$	1.0100***	0.0056				
ΔEXR_{t-1}				0.9771***	0.0150	
$\Delta INTR_t$	-0.0148**	0.0058		0.0021	0.0252	
ΔATM_t	0.0058**	0.0024		-0.0034	0.0110	
ΔPOS_{t-1}	-0.0042***	0.0011				
ΔPOS_t	0.0013	0.0011		0.0053	0.0046	
ΔWEB_{t-1}	-0.0003	0.0010				
ΔWEB_t	-0.0026**	0.0011		-0.0011	0.0042	
$\Delta MOBILE_t$	-0.0020**	0.0009		-5.18E-05	0.0036	
Bound cointegration testing results						
	F-stat.	I(0)	I(1)	F-stat.	I(0)	I(1)
1%		3.72	5.16		3.72	5.16
5%	1.644	2.78	4.02	0.729	2.78	4.02
10%		2.35	3.50		2.35	3.50

Note: ***, ** and * implies significant at 1%, 5% and 10% levels of significance

First and foremost, we find the evidence of the inverse relationship between inflation and interest rates quite interesting and very much in line with the existing underlying economic intuition. For instance, an increasing interest rate or a tight monetary policy stance is expected to reduce inflation. On the other hand, however, we find the coefficient on the ATM to be positive, thus suggesting the ATM channel of e-payment is inflationary. This might have informed the decision of the CBN during the recent demonetization scheme to limit the amount of cash that can be withdrawn daily via ATM. Such a decision becomes necessary so as to minimize the inflationary effect of the ATM as an e-payment channel. Unlike the ATM, alternative e-payment channels such as POS, WEB, and MOBILE all exhibit the potential of reducing inflation as their respective

oefficients are negative and statistically significant.Thus, increasing the availability of these e-payment facilities, which in turn tends to manifest in an increase in the values of transactions performed via them, will limit the number of cash in circulation and, by extension, reduce inflation. But, while this evidence might have supported the CBN's recent demonetization scheme in the pathway to a cashless economy, the fact that the reality regarding the macroeconomic effects of the scheme suggests otherwise may not be

unconnected to the inadequacy of these facilities. More so is the fact that the Nigerian macroeconomic environment is overwhelmed with informal economic activities.

1. Conclusion

In our quest to determine whether the recent demonetization scheme of the CBN on the pathway to a cashless economy is informed by evidence-based insight on the macroeconomic effects of the e-payment systems in the country, we employ an ARDL model to investigate the nexus between e-payments and macroeconomic conditions. Using a time-series sample of a monthly frequency covering January 2009 and December 2019, we show that not only is the macroeconomic effect of cashless policy in terms of electronic payment systems limited and temporary, but it is also sensitive to the measure of the macroeconomic conditions that are under consideration. Compared to other channels of e-payment, the ATM appears to be inflationary, which seems to validate the decision of the CBN to limit the amount of cash that can be withdrawn daily via ATM during the recent demonetization scheme of the bank. However, while other alternative e-payment channels such as POS, WEB, and MOBILE have the potential to cause declining price levels, the fact that the recent reality regarding their macroeconomic effects tends to suggest otherwise may not be unconnected to the inadequacy of these facilities. To this end, the way forward is to increase the presence of these facilities to enhance their usage so as to maximize their effectiveness and strengthen macroeconomic conditions amid the implementation of the demonetization scheme on the pathway to the cashless economy.

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