International Journal of Intellectual Discourse (IJID)
ISSN: 2636-4832 Volume 5, Issue 4. December, 2022

Economic policy uncertainty and demand for money in Nigeria: New evidence from linear and nonlinear ARDL cointegration

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Abstract
The main objective of this paper is to examine the symmetric and asymmetric impact of economic policy uncertainty on demand for money in Nigeria. In money demand function, certain factors like the income, rates of interest and inflation added to exchange rate were identified to be key factors influencing the demand for money. Recent empirical studies investigate uncertainty as a likely factor influencing demand for money. Using a recently introduced economic policy uncertainty index and employing a quarterly data for Nigeria covering 1980Q1 to 2021Q4, the paper investigates the influence of economic policy uncertainty on the demand for cash balances. To realize this objective the linear ARDL and nonlinear ARDL econometric techniques were adopted. The linear ARDL result shows that the economic policy uncertainty have an influence over money demand in the period of short run. However, the effect does not extend to the long run period. The nonlinear ARDL estimates indicate that the economic policy uncertainty has both long and short run effect on the money demand. The results reveal the presence of asymmetric effect of economic policy uncertainty on money demand. In both linear and nonlinear models, the money demand function is stable. This has a policy implication.

Keywords: Demand for money; economic policy uncertainty; symmetric; asymmetric, Nigeria.

1. Introduction

The importance of money in monetary policy has been diminished as a result of the recent adoption of monetary policy strategy that is rule based by many industrialized and developing nations. Traversing all countries, inflation targeting has gained popularity as a monetary policy framework. The worldwide financial crisis which started in the United States in year 2007 has, however, revived focus on the influence of excess cash balances as a forecaster of inflation or its speeding up under any monetary policy strategy seeking to achieve a stable price (Taylor, 2012). A stable demand for money relationship has further reemerged as a crucial area of study in the pursuit for an adequate rule based monetary policy method to maintain a stable price. While a consistent money-demand function is crucial for monetary-targeting.

In an effort to understand the behavior of money demand, several hypotheses have been proposed. The quantity theory, the Keynesian theory, the inventory theory, also known as the Baumol-Tobin model, Friedman's theory, and the cash-in-advance model are some of these theories. These ideas all sought to pinpoint the primary factors that influence the need for money. These theoretical postulates led to the

identification of variables that influence the demand for money, including income, inflation, interest rates, and exchange rates. These hypotheses have been continuously validated empirically by research conducted in both developed and developing nations.

Friedman's (1984) first established a hypothesis that, an increase in the instability of the money supply increases the level of uncertainty, which in turn raises demand for money. In their demand for money models for various countries, numerous researchers incorporated the idea of "uncertainty" in a variety of forms adding uncertainty variable to the traditional determinants of money demand, following Friedman (1984). The demand for products and services may decline, investments in more secure and short-term financial instruments may increase, and other patterns of consumer and investor economic behavior may change as economic uncertainty rises. The wisest course of action for some investors and consumers might be to hold exclusively cash in their portfolios. This implies that the degree of demand for money may be influenced by uncertainty (Bahmani-Oskooee, et al. 2020). Clearly, uncertainty in a country is not just due to monetary or output volatility. Many other factors such as change in the tax system, change in government, terrorism, etc. can contribute to an uncertain environment (Baker et al. 2016).

By concentrating on Nigeria and enhancing current demand for cash balances to stand for uncertainty in economic policy, the study adds to the body of knowledge in this area. The Economic Policy Uncertainty (EPU) index, recently developed by Baker, Bloom, and Davis (2016), which was based on economic uncertainty that was news-based and policy-related, serves as a major predictor of money demand in the most recent models of demand for money. This uncertainty measure, which was derived by Economic Policy Uncertainty Group, takes into account a number of other significant variables in addition to production and money supply volatility. Thus, EPU index can be interpreted (to some degree) as a combination of fiscal and monetary policy-based uncertainties. Studies like those by Bahmani-Oskooee, Nayeri, & Maki-Nayeri, (2018) for the US; Bahmani and Nayeri, 2018 for Korea; and Ivanovski and Churchill, 2019 for Australia all make use of it.

Recent changes in Nigeria's markets are among the elements that have prompted our attention on that country. Nigeria's financial industry has been tightly controlled since the 1960s. Recently Nigeria appeared to achieve a relatively stabilized economic system with a new and advanced innovations in the financial system. Today, there are little capital controls, partially flexible exchange rates, and market-determined interest rates on the Nigerian market (Lewis, & Stein, 1997; Folarin, & Asongu, 2019).

Establishing the main factors influencing money demand in a developing economy like Nigeria has been an issue of concern to both policy makers and other stakeholders. It becomes imperative considering the importance attached to a stable money demand in formulation of monetary policy. (Folarin, & Asongu, 2019). However, despite the fact that there is an increasing interest in studies that focuses on the desire for cash balances in Nigeria, economic policy uncertainty has received little consideration.as a demand for money determinant. Indeed, the current global focus in money demand studies is on a country specific analysis, considering the variances among different individual nations in terms of specific problems.

In order to gain some intuition into the performance of the economic policy uncertainty measure in Nigeria, we plot it in Figure 1 below.

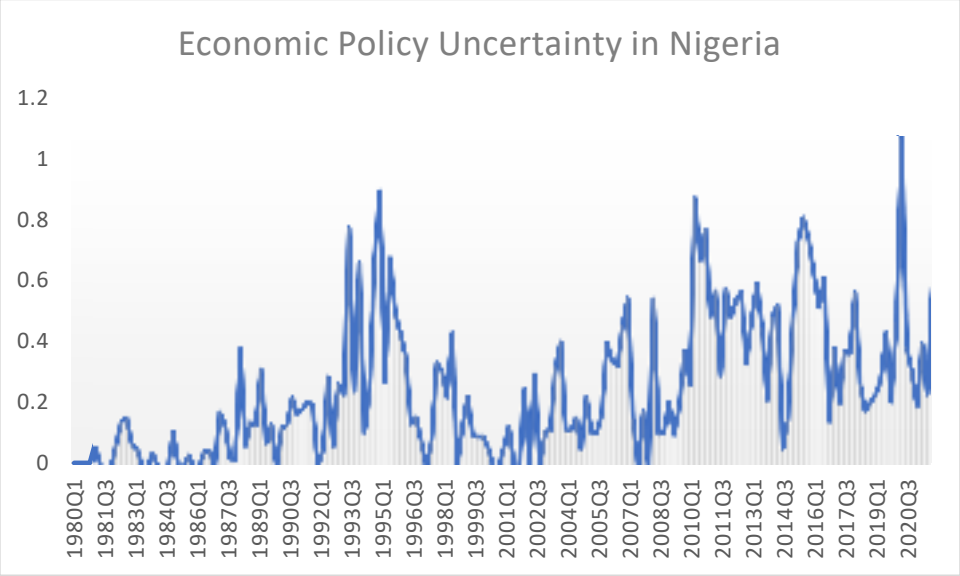

Figure 1 Measure of economic policy uncertainty in Nigeria
Source: World Bank, World development indicators 2021

Figure 1 depicts the EPU index for Nigeria and provides an intuition into the movement of the uncertainty index in Nigeria over the period.

Secondly, this study diverges from earlier studies by including a nonlinear approach to policy uncertainty. Including nonlinear adjustment of economic policy uncertainty variable implies an assessment of a possibility of having asymmetric reaction of money demand to variations in policy uncertainty factor. Do Nigerian react to an increase in uncertainty differently than they do to a decrease in uncertainty? The nonlinear model will help answer this question. To achieve this, besides the linear ARDL model, we apply the nonlinear ARDL model developed by Shin et al., (2014). The nonlinear ARDL model, enables us to separately monitor the effects of increases or a decline in the EPU index on money demand in Nigeria. The main aim of adopting the nonlinear model is that, under rising uncertainties, economic actors may exhibit more asymmetric (nonlinear) behaviors. Therefore, this methodology may create a big advantage for understanding whether the relationship between independent variable and the dependent variable are symmetric (linear) or asymmetric (nonlinear). Furthermore, this methodology may capture these asymmetric results more easily.

Thirdly, the study employed quarterly data in the analysis. The study employed a popular Gandolfo (1981) technique of interpolation of annual series to a quarterly series. The technique takes care of the problem associated with finite sample size. An evidenced based on Monte Carlo indicates that a rising frequency of series will increase the statistical test power employed in the study (Zhou et al.2016).

Subsequent part of the paper is organized as follows. Section 2 reviews the literature, section 3 discusses the methodology, data and estimation procedure, section 4 is results and discussion while section 5 is the conclusion.

2. Literature Review

To explain how money demand behaves in an economy, a number of theories have been proposed. The Keynesian theory serves as the foundational theoretical basis for this study, which examines the money demand function in Nigeria. The Keynesian

hypothesis holds that people need money as a "store of wealth" for either transactions, precautions, or speculation. These reasons suggest that people hold money for the first and second reasons in proportion to their income, which accounts for the positive association between earnings and money demand. Regarding the third motive, it may be inferred that the money demand and the interest rate are negatively correlated.

Furthermore, when interest rates are high, people may decide to keep money for speculative reasons by investing in bonds or other monetary instruments; however, when interest rates are low, people may decide to keep money in liquid form rather than financial instruments because the opportunity cost for keeping money is lower.

From the Keynesian theoretical background, the real demand for money can be expressed as;

$$\frac{M_t^d}{p} = f\left(y, i\right) \qquad (1)$$

Where, M_t^d is real money demand at time t, P is the level of price, y income and i interest rate. Other economic variables identified in the money demand function are the exchange rate and inflation. Thus, the long run money demand relationship in a nations is broadly influenced by the level of economic activity; an opportunity cost for keeping money, and the country`s domestic currency exchange rates.

Perhaps one of the richest areas of economics is the literature on money. Numerous books and articles have been written and published that discuss topics like the stability of the money demand and the factors that determine it demand. In order for changes in the money demand to have a predictable impact on the variables that the central bank is targeting, a successful monetary policy necessitates a stable money demand relation. Long after Friedman and Kuttner (1992), who argued for a stable long-run money demand equation, the empirical research and discussions on money demand stability remained. The majority of central banks in developed economies have traditionally targeted a specific interest rate, giving the appearance that the stability of money demand is unimportant.

In the demand for money literature, uncertainty has been integrated as additional explanatory variable to the demand for money models. This is added to the variables like income, inflation, interest rate and exchange rate. Some recent researchers have found that economic uncertainty has a substantial influence in influencing the behavior of money demand as well as the stable of the money demand relations (see, for example, Hossain, 2015; Hossain, 2019; Hossain & Arwatchanakarn, 2020).

In some studies, economic uncertainty is taken into account as the volatility of various independent variables (Klein 1977; Longstaff & Schwartz 1993; Choudhry 1999; Choi, & Oh, 2003; Atta-Mensah, 2004; Arize, Malindretos, & Grivoyannis, 2005; Greiber & Lemke 2005; zdemir, & Saygl, 2013; Lim, & Gan, 2015; BahmaniOskooee & Baek 2017; Shehu, et al. 2017; El-Rasheed, & Abdullah, 2017; Ongan, & Gocer, 2021; Murad et al. 2021; Bahmani-Oskooee, & Aftab, 2022. Conversely, in some findings, scholars apply indexes like the Optimal Economic Uncertainty used by Lim & Gan 2015; also, Economic Policy Uncertainty (EPU) index used by studies like Bahmani-Oskooee et al. 2015; Bahmani-Oskooee, Kones, & Kutan 2016; Bahmani-Oskooee & Nayeri 2018; Ivanovski, & Churchill, 2019. Few other money demand investigations which incorporated monetary uncertainty in their models are Ongan, and Gocer, (2021); Bahmani-Oskooee, and Arize, (2020); Bahmani-Oskooee, et al. (2020) on Japan, Bahmani-Oskooee et al., (2019) on some

emerging economies, while Oskooee, Mohsen and Majid Maki Nayeri (2018) uses it to study the US economy; and Oskooee, Mohsen and Majid Maki Nayeri (2017) applied it to Australian economy.

However, each study has a distinct perspective on how these various types of uncertainty affect the demand for money. For instance, Klein (1977) employed inflation uncertainty for the US and discovered positive impacts (applied time series analysis), indicating that rising inflation uncertainty causes a rise in demand for money in the US. Longstaff and Schwartz (1993) used bond rate uncertainty for the US and found negative effects, which shows that rising bond rates leads to a decrease in the money demand. For US, Choudhry (1999) employed the uncertainty of interest rates (Johansen multivariate cointegration tests and error correction model) and discovered favorable effects on the demand for money. Nicholas (1999) used inflation uncertainty (ARCH) for Greece and found negative effects on Greek money demand. Choi and Oh (2003) used output and monetary uncertainties (dynamic error correction model). They discovered opposing effects of output uncertainty and monetary uncertainty on US money demand, respectively. For eight less developed nations, Arize et al. (2005) used inflation uncertainty (cointegration and error correction model) and discovered negative effects on these nations' desire for money. For a few less developed nations, Bahmani-Oskooee (2013) employed exchange rate uncertainty (bound testing approach) and discovered both positive and negative effects. Money demand in South Korea was positively impacted by monetary uncertainty, according to Bahmani-Oskooee and Bahmani (2014) using an error-correction model. For sub-Saharan countries, Ho and Iyke (2017) used monetary uncertainty for Ghana and established negative effects on demand for money with a stable function.

In Nigeria, studies on money demand and uncertainty includes; El-Rasheed et al. (2017) using ARDL, monetary uncertainty on annual data covering 1980-2014. Established that monetary uncertainty significantly affects demand for money function in Nigeria. A stable money demand function. Aworinde (2018) employed annual data covering 1960 to 2015 using ARDL found that output and monetary uncertainties exert positive effects on money demand in Nigeria.

It should be noted that the concept of uncertainty in all above mentioned forms of independent variables is based on volatilities and are, thereby, scaled-measured by each scholar individually in this manner. It is established that there are differences across the various findings in terms of econometric methods applied, the time period and frequencies of the data used. These explained the mixed findings and conclusions across the studies.

3. Methodology

To formulate the long-run demand for money model in Nigeria, we utilize the standard specification as outlined in the literature given by:

$$\ln M_t^d = \psi_0 + \psi_1 \ln Y_t + \psi_2 r_t + \psi_3 \ln \pi_t + \psi_4 \ln ER_t + \psi_5 \ln EPU_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where M_t^d is the real quantity of money demanded, Y_t is the real income proxied by GDP at time t, r_t is the interest rate; π_t is the inflation rate; ER_t is the nominal effective exchange rate; EPU_t is the news based economic policy uncertainty index. ψ_0 is the intercept, $\psi_1, \psi_2, \psi_3, \psi_4$ and ψ_5 are parameters to be estimated. ε_t is the stochastic error term.

The apriori anticipation from money demand expressed in Equation (2) is that ψ_1 , the coefficient of income bears a positive relation with money demand; interest rate(ψ_2) and the consumer price index (ψ_3) has negative relations with money demand. The domestic currency exchange rate (ψ_4) can either a negative or positive influence on money demand. This however depends on whether the wealth or substitution effects overrides.when the local currency Naira for instance depreciates, citizens are presumed to keep more cash if the wealth effect overrides substitution effect.

Furthermore, since our main contribution in this paper is to investigate the influence of economic policy uncertainty on money demand, we adopt Bahmani-Oskooee et al. (2015) approach and added economic policy uncertainty variable to the series in Equation (2), symbolized by EPU_t. It is expected that the coefficient of ψ_5 could either be negative or positive which depends on how citizens allocate their assets holding during the period of uncertainty in economic policy.

Equation (2) presents a model in a long run form; it did not consider a short run form. To incorporate the short run analysis into the model, we utilize the Pesaran et al. (2001) ARDL method. The method contains an error correction mechanism that shows a speed of adjustment to the long run equilibrium position.

The ARDL model with an ecm is specified in equation (3) below;

$$\Delta \ln M_t^d = \delta_0 + \sum_{i=1}^{b} \alpha_1 \Delta \ln M_{t-i}^d + \sum_{i=1}^{c} \alpha_2 \Delta \ln Y_{t-i} + \sum_{i=1}^{d} \alpha_3 \Delta r_{t-i} + \sum_{i=1}^{f} \alpha_4 \Delta \ln \pi_{t-i} + \sum_{i=1}^{g} \alpha_5 \Delta \ln ER_{t-i} + \sum_{i=1}^{g} \alpha_6 \Delta \ln EPU_{t-i} + \nu_1 \ln M_{t-1}^d + \nu_2 \ln Y_{t-1} + \nu_3 r_{t-1} + \nu_4 \ln \pi_{t-1} + \nu_5 \ln ER_{t-1} + \nu_6 \ln EPU_{t-1} + \varepsilon_t \quad (3)$$

Where , M_t^d , Y_t, r_t π_t, ER_t with EPU_t are as defined earlier; Δ is the first difference operator; δ_0 is drift factor, b, c, d, e, f and g are the lag lengths. $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ and α_6 are the short-run multipliers. While, $\nu_1, \nu_2, \nu_3, \nu_4, \nu_5$ and ν_6 are the long-run multipliers; and ε_t is a white noise error term.

To capture the asymmetric effects of the EPU variable on money demand, the Shin et al. (2014) nonlinear ARDL method is adopted. The technique is considered to take care of the existence of possible asymmetric relations among the variables under study. We adopt the method because of the fact that rising uncertainties in the current innovative modern financial system may easily generate problems in asymmetric information generation. The model made it possible to decompose the EPU index as EPU^+ and EPU^- indexes representing increases and decreases in economic policy uncertainty variables respectively.

Breakdown of the EPU variable is done using the idea of a partial sum procedure in a following way:

$$EPU_t = EPU_0 + EPU_t^+ + EPU_t^- \quad (4)$$

Where EPU_t^+ and EPU_t^- represents the partial sum of positive (an increase in economic policy uncertainty) and the negative changes (a decrease in economic policy uncertainty). The partial sum for positive and negative deviations in the variable is produced through following formulas;

$$EPU_t^+ = \Sigma_{i=0}^{t} \Delta EPU_i^+ = \Sigma_{i=0}^{t} \max\left(\Delta EPU_i, 0\right) \quad (5)$$

$$EPU_t^- = \Sigma_{i=0}^{t} \Delta EPU_i^- = \Sigma_{i=0}^{t} \min\left(\Delta EPU_i, 0\right) \quad (6)$$

Hence, it will be easy to realize how the money demand reacts to changes in the variables of EPU^+ and EPU^- distinctly. Impliedly this technique will allow us to uncover whether the effects of the variations in EPU^+ and EPU^- are linear (symmetric) or nonlinear (asymmetric) on money demand.

Therefore, with the decomposed series, the subsequent nonlinear ARDL model resulting from the linear ARDL model in the third equation. This new nonlinear model encompasses all advantages of the linear ARDL model but in a nonlinearity form.

$$\Delta \ln M_t^d = \delta_0 + \sum_{i=1}^{b} \alpha_1 \Delta \ln M_{t-i}^d + \sum_{i=1}^{c} \alpha_2 \Delta \ln Y_{t-i} + \sum_{i=1}^{d} \alpha_3 \Delta r_{t-i} + \sum_{i=1}^{e} \alpha_4 \Delta \ln \pi_{t-i} + \sum_{i=1}^{f} \alpha_5 \Delta \ln ER_{t-i} + \sum_{i=1}^{g} \alpha_6 \Delta \ln EPU_{t-i}^{+} + \sum_{i=1}^{h} \alpha_7 \Delta \ln EPU_{t-i}^{-}$$
$$\nu_1 \ln M_{t-1}^d + \nu_2 \ln Y_{t-1} + \nu_3 r_{t-1} + \nu_4 \ln \pi_{t-1} + \nu_5 \ln ER_{t-1} + \nu_6 \ln EPU_{t-1}^{+} + \nu_7 \ln EPU_{t-1}^{-} + \varepsilon_t \quad (7)$$

The choice of this procedure is due to its efficacy in the presence of a mix order of integration, as the it follows the lower and upper bound F-values. The lower bound values are provided by assuming level stationary variables, i.e., I(0) and upper bound values are provided by assuming the first differenced stationary variables, i.e., I(1). Most of economic variables are either I(0) or I(1). Moreso, most significantly, this methodology allows us to test the asymmetrical effects of EPU^+ and EPU^- on the demand for money in the case of Nigeria.

Markedly, this framework has been effectively used to model short-run and long-run asymmetric cointegration relationships between economic policy uncertainty and money demand for the advanced and some developing economies (see for example, Bahmani-Oskooee, & Baek, 2017; Bahmani-Oskooee, & Maki-Nayeri, 2018; Ivanovski, & Churchill, 2019; Hossain, & Arwatchanakarn, 2020; Ongan, & Gocer, 2021; Murad,et al. 2021; Bahmani-Oskooee, & Aftab, 2022).

Additionally, in distinction to other estimation techniques for nonlinear relationships, such as threshold ECM advanced by Balke and Fomby (1997); Markov-switching ECM introduced by Psaradakis et al. (2004), and a smooth transition regression ECM proposed by Kapetanios et al. (2006), the nonlinear ARDL method will be applied to get a integrated model capable of merging nonlinearities in a long-run association with the error-correction system reasonably.

The long run asymmetric effect can be established with the use of Wald test by calculating the Null hypothesis for non-asymmetry $H_{0_g}: \nu_6^+ = \nu_7^-$ against an alternative for an asymmetry $H_A: \nu_6^+ \neq \nu_{7_{t-i}}^-$. Rejection of Null hypothesis shows a presence of asymmetrical impact of EPU_t on money demand. A long run impact of an increase or decrease in EPU_t are provided by $\delta_2 = \frac{-\nu^+}{\alpha_0}$ and $\delta_3 = \frac{-\nu^-}{\alpha_0}$ respectively.

A Wald test is use in testing cointegration amongst the series Wald-F test expressed thus, $H_0: \alpha = \nu_0 = \nu^+ = \nu^- = 0$.

3.1 Data

This study uses quarterly data of money supply, income proxied by GDP, interest rate, inflation, exchange rate and economic policy uncertainty index. The annual raw data was extracted from World Bank, World Development Indicators (WDI), 2022. Since data on money supply, interest rate and inflation are not obtainable in quarterly series, the Gandolfo (1981) interpolation process was used in this study to calculate the quarterly series from annual data. In carrying out the derivation of the interpolation procedure, the observed values are actually integrals. Therefore, we must integrate the quadratic function in order to get the quarterly formula. After satisfying all the conditions in any

particular year, the formula to compute the quarterly series are presented as follows:

1st Quarter:

$$y_t^{(1)} = 0.0546875y_{t-1} + 0.234375y_t - 0.0390625y_{t+1} \quad (8)$$

2nd Quarter:

$$y_t^{(2)} = 0.0078125y_{t-1} + 0.265625y_t - 0.0234375y_{t+1} \quad (9)$$

3rd Quarter:

$$y_t^{(3)} = -0.0234375y_{t-1} + 0.265625y_t + 0.0078125y_{t+1} \quad (10)$$

4th Quarter:

$$y_t^{(4)} = -0.0390625y_{t-1} + 0.234375y_t + 0.0546875y_{t+1} \quad (11)$$

Where y_t, y_{t-1}, y_{t+1} are the current, lag and lead values of the annual data. For example, to obtain the first quarter sequences for inflation, one may substitute the annual inflation values for y_t, y_{t-1} and y_{t+1} yt , equation (1). The same way was used to compute the series for second, third and fourth quarters, respectively. It is worth to point out here that, two annual observations will be loss due to the one period lead and lag values of the annual data. Therefore, we are able to compute the quarterly series from 1980:1 to 2021:3 from the annual data of the variables.

Gandolfo (1981) has several advantages over the other interpolation methods. This has been established for instance by Ogun (2010) where he found that Gandolfo (1981) is so robust and is based on order statistical theory which is not confined to any variable type, whether is stock or flow. Many researchers have applied the techniques in the previous literatures. These include Ogun (2010) to study infrastructure and poverty reduction in Nigeria; Baharumshah, et. al. (2006) who test twin deficits hypothesis in Indonesia, Malaysia, the Philippines and Thailand; Baharumshah and Lau (2007) who examines regime changes and the sustainability of fiscal imbalance in East Asian countries; and Goh and Wong (2010) who examine the effect of market size and government policy on Malaysia's outward foreign direct investment. Other works include Tang, & Shahbaz, (2013) that examines the relationship between electricity consumption and economic growth in Pakistan; Recently, Abu, & Staniewski, (2021) undertook an empirical investigation of the effect of corruption on domestic savings in Nigeria.

4. Results and Discussion

Before undertaking the linear ARDL and nonlinear ARDL analysis, a unit root test has to be carried out to determine the stationarity levels of the series. Both linear and nonlinear ARDL does not accommodate I(2) variables. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (P-P) unit root tests were carried out and the results displayed in table 1. The results indicates that none of the series is I(2) in all the tests results and that the dependent variable is integrated of order I(1) thereby fulfilling the conditions for both the linear ARDL and nonlinear ARDL.

Table 1: *Unit Root Tests*

A: **Augmented Dickey Fuller**

Variable	Level		First Difference	
	Intercept	**With Trend**	**Intercept**	**With Trend**
LMS	-1.2728	-0.0918	-5.6825***	-5.6864***
EPU	-10.8941**	-10.8588**	-9.3795***	-9.3473***
GDP	-1.4093	-2.3571	-2.5991*	-3.8497**

ER	-1.1775	-0.6667	-6.9884***	-7.1152***
ITR	-1.9621	-2.5582	-6.2599***	-6.5764***
LCPI	-1.8959	-2.2260	-6.3528***	-6.4698***
B: **Phillip-Peron**				
LMS	-1.7814	-1.8064	-6.4520***	-5.3325***
EPU	-07.1531***	-8.8196***	-9.1612***	-9.0156***
LGDP	-1.7948	-1.8389	-6.3183***	-6.3726***
ER	-1.8353	-1.6948	-6.5884***	-6.6697***
ITR	-0.8431	-2.1458	-6.4959***	-6.4631***
LCPI	-3.2154**	-3.1550*	-9.5465***	-9.2725***

Note: ***, **,and * imply significance at 1%, 5% and 10% levels respectively. The figures show the t-statistic value for testing the null hypothesis that the variable possess a unit root. The Scwarz Information Criterion (Schwert, 1987) is used in the lag length selection. The critical values for constant without trend are -3.479, -2.883 and -2.578 while that of constant with trend are -4.028, -3.443 and -3.146 for 1%, 5% and 10% respectively. For PP the bandwidths are determined based on the Newey-West using Bartlett Kernel.. The critical values for constant without trend are -3.479, -2.883 and -2.578 while that of constant with trend are -4.028, -3.443 and -3.146 for 1%, 5% and 10% respectively. The figures are based on Mackinnon (1991).

Next, we move to test for the cointegration relationship between the variables by applying the bound testing approach advanced by Pesaran et.al.(2001). The results of the bound testing is presented in table 2. Panel A is the asymmetric ARDL results while panel B presents the symmetric ARDL results. In both results, the bound testing indicates that the variables are cointegrated at the 5percent significance level.

Table 2 Bound Cointegration test Results

Significance Level	A - Asymmetric ARDL		B - Symmetric ARDL	
	Lower bound	Upper Bound	Lower Bound	Upper Bound
1%	2.88	3.99	3.06	4.15
5%	2.27	3.28	2.39	3.38
10%	1.99	2.94	2.08	3.00
F-Statistic	7.77		8.29	

Note: *,**, and *** indicate significant at 10%, 5% and 1% levels respectively. Critical values are cited from Pesaran *et al.* (2001) table.

The test results for the long run symmetric and asymmetric ARDL are presented in table 3. The results of the linear ARDL in the table shows that changes EPU bears a positive and insignificant effect on the money demand by Nigerians over a long run period. Changes in income (GDP) have a significant positive impact on the demand for money. This signifies that a rise in income lead to an increase in the demand for money. On the other hand, changes in the exchange rate (ER) bears a positive and significant influence on the money demand. This implies that appreciations in the domestic currency, Naira against say US dollar, causes the Nigerians to demand

more local currency, while depreciation in Naira can cause them to demand less local currency and more US dollars. The changes in the rate of interest bears no influences on the demand for money. This suggests that interest rate is not regarded as an alternate investment instrument by Nigerians.

However, the normalized coefficients for the nonlinear ARDL model estimates in panel A indicates that the EPU index of increase (EPU^+) have a significantly positive impact on the demand for money. A rise in EPU index led to a decrease in money demand. The index of a decrease (EPU^-) in the economic policy uncertainty bears a significantly negative influence on the money demand. A fall in EPU lead to a rise in the money demand. Similar studies of Bahmani-Oskooee, M., & Nayeri, M. M. (2018) had a similar finding in the case of Korea.

Table 3 Long run estimates of Asymmetric and Symmetric ARDL Models

Variables	A - Asymmetric ARDL		B - Symmetric ARDL	
	Coefficient	t-Statistics	Coefficient	t-Statistic
EPU	-	-	0.1002	0.3329(0.7397)
EPU^+	1.2814	2.0758(0.0397)	-	-
EPU^-	-1.4031	2.2092 (0.0287)	-	-
$LGDP$	0.2795	5.4054(0.0000)	0.2617	5.1269(0.0000)
LER	5.5842	0.5375 (0.0591)	-9.4182	-2.5111(0.0131)
$LCPI$	0.1449	-2.7046(0.0077)	-0.1432	-2.9499(0.0037)
ITR	5.1810	0.2064(0.8368)	1.4311	0.9458(0.3459)
Constant	1.0819	0.6465(0.0519)	-1.5463	-1.6809(0.0949)
R^2	0.97	-	0.97	-
F-statistics	4.723 (0.0000)	-	7.4471 (0.0007)	-
Asymmetric test (Wald test)	11.3558	34.0675 (0.0000)	-	-
JB	1.0841	0.5816	0.3245	-
RESET	0.8228(0.4120)	0.6771(0.4120)	0.3307	-
ARCH	1.2682(0.2005)	0.5492	0.2188	-
LM	1.9194(0.1506)	4.4472(0.1082)	0.1056	-
CUSSUM	Stable		Stable	

Note: *,**, and *** indicate significant at 1%, 5% and 10% levels respectively. Numbers in parenthesis are the p-values corresponding to the diagnostic tests.

Furthermore, the long run estimated coefficients of EPU shows that variations in the EPU have a significant impact on the money demand. The results indicates that an increase in the EPU index (EPU+) lead to a reduction in the demand for money, and a decrease in the EPU index (EPU-) lead to an rise in money demand. This suggest that Nigerians demand for more money when there is a fall in uncertainty in economic policies (EPU) while they demand fewer when the EPU upsurges. Thus, the long run effects of EPU+ and EPU- on the money demand seems asymmetric because their coefficients appear to have same sign but not having equal size (0.0.97 and 0.0287).

Also, the result for long run Wald test is significant further confirming the asymmetry. Furthermore, short run effects of the EPU+ and EPU- on money demand is also asymmetric because their coefficients estimates are in the same sign but not having same size. Also the short run Wald statistics results is significant which equally confirms existence of an asymmetry. It appears that policy uncertainty has short-run and long run effects on the money demand in Nigeria when asymmetric effects are introduced in the model.

Nevertheless, within the nonlinear model, variations in income (GDP) bears a positive and significant influences on the money demand in the period of long run. This suggests that a growth in income lead to increases in the money demand while a fall in income decreases demand for money.

Table 4 Short run estimates of Asymmetric and Symmetric ARDL Models

Variables	A - Asymmetric ARDL		B - Symmetric ARDL	
	Coefficient	t-Statistics	Coefficient	t-Statistic
ΔMS	0.3227	5.0748(0.0000)	0.3272	5.2155 (0.0000)
ΔEPU	-	-	2.3646	6.7714(0.0000)
ΔEPU^{+}	-5.8916	-9.6649 (0.0000)	-	-
ΔEPU^{-}	1.7218	-12.6763 (0.0000)	-	-
$\Delta LGDP$	0.2165	8.4655(0.0000)	0.2211	8.6020(0.0000)
ΔLER	7.2694	-0.6215(0.0000)	-1.8714	- 2.1096(0.0366)
$\Delta LCPI$	0.0844	7.8240(0.0000)	0.0838	7.6675(0.0000)
ΔITR	-1.3910	-6.7710(0.0000)	-4.1310	-4.5710(0.0029)
ECT_{t-1}	-0.2679	-8.0820 (0.0000)	-0.2888	-7.7822(0.0000)

Note: *,**, and *** indicate significant at 1%, 5% and 10% levels respectively. Numbers in parenthesis are the p-values corresponding to the diagnostic tests.

Table 4 presents the short run estimates for both the linear ARDL and nonlinear ARDL. Speed of adjustment to the long run equilibrium is a vital indicator of the significance of the results. The result of the ECT_{t-1} is both estimates are significant and bears a negative sign and at 1% level of significance indicating the adjustment speed to their long run equilibrium position. The degree of 0.27 obtained in the linear ARDL estimates suggests that the adjustment speed to restore long run equilibrium in the dynamic model will be corrected by approximately 27% from the previous quarter to the current quarter. For the nonlinear ARDL, it shows that long run adjustment will be restored from the preceding quarter to the present quarter by 29%.

The estimated models passed all diagnostic tests of serial correlation, heteroscedasticity, normality and Ramsey Reset. The model's structural stability test was conducted using the CUSUM and CUSUMQ and they all lies within the 5% critical boundaries implying parameter stability of the estimated models.

5. Conclusion

This study investigates the possible effects of economic policy uncertainties on money demand in Nigeria. In order to realize this

objective, the paper adopted both linear and nonlinear ARDL methods. The nonlinear ARDL model found evidence of significant impact of increase and reductions in economic policy uncertainties on the money demand. Nigerians hold additional money during the period of decreasing uncertainties in economic policy and they hold less when the economic policy uncertainty upsurges. More so, the effects of decrease in economic policy uncertainties exceeds the influences of rise in uncertainties on money demand. Hence it can be inferred that Nigerians are more subtle to drops in economic policy uncertainties than upsurges in terms of the money demand. Therefore, the study concludes that uncertainties in economic policy have influences on the level of money demand by the Nigerian economic agents. The demand for money function is stable.

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