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Estimating Price and Exchange rate Hedging Elasticity of Cryptocurrency Demand in Nigeria

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Abstract

This study examined the price and exchange rate hedging elasticity of cryptocurrency demand in Nigeria. To achieve the objective, the study employed Autoregressive Distributed Lag (ADRL) model to estimate both the short-run and long-run response of demand to changes in crypto price, consumer income and exchange rate. The Study found among others that cryptocurrency is demanded as a financial asset (either as money for exchange purpose or asset for speculative purpose). It was discovered that cryptocurrency price changes have significant impact on cryptocurrency demand but price inelastic. Meaning that a percentage changes in crypto price leads to less than proportionate change in cryptocurrency demand. It was also discovered that Nigeria real exchange rate has negative relationship with cryptocurrency demand meaning that as Naira real exchange rate to dollar is falling, the demand for cryptocurrency is rising. Other factors that are influencing cryptocurrency demand in Nigeria include consumer income, cryptocurrency popularity, and inflation rate in the country. The study concludes that while price plays an important role in cryptocurrency demand, fluctuations in cryptocurrency demand is less than the fluctuation in its price. The implication is that there are several other factors (structural issues) including real exchange rate movement that influences demands for cryptocurrency other than its price that policy makers should explore.

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1. Introduction

To keep pace with the digitalized and globalized twenty-first century, there is a constant revolution of digital payment solutions around the globe (Urquhart, 2018; Joseph, 2020). One such revolution is the emergence of virtual currency or what is known today as cryptocurrency (Thompson, 2020). Cryptocurrency emerged intending to solve monetary and structural crisis rocking the global economy particularly the global financial crisis of 2008, the rising inflation rate across the globe, the masses over dependence on government backed monetary system that is assumed not transparent enough and enjoyed or manipulated by few individuals to their advantages (Halaburda, *et al*, 2020).

The cryptocurrency economy is thus driven by the belief in the power of the market and the need to develop a monetary system that is not controlled by the government, group of institutions, and few powerful individuals but is decentralized such that everyone within the ecosystem has a say in how the monetary system is governed. Having a decentralized cash system means that individuals may engage in "monetary transactions" without any third party involved (a peer-to-peer system) and without any authority that would for instance conduct a monetary policy (Halaburda et al, 2020).

Thus, the need to permit transactions between two or more people without relying on a third party like banks and where the transaction between the parties is not only anonymous but are jointly agreed upon led to the

introduction of cryptocurrency (Eloy, Juan, and Manuel, 2020). The technology boasts zero transaction cost including cross-border transaction, cutting out the activities of middlemen that drives inflation, and contributing to community-based finance system like crowdfunding (Yaser and Seyedjavad, 2019; Halaburda and Sarvary, 2016; Andolfatto, 2018; Haeringer and Halaburda, 2018).

However, despite the obvious advantages of cryptocurrency transactions it has several drawbacks including exposure to hackers, facilitates money laundering, lack of regulation (or difficult to regulate), poor scalability, and high volatility in its price which makes it difficult to function as a medium of exchange and store of value (Haeringer and Halaburda, 2018, Thompson, 2020). Beyond the obvious mentioned disadvantages, several literatures have argued that the ecosystem has created more problems particularly for the developing countries than it proposed to solve. For instance, the ecosystem proposed a system that facilitates zero transaction cost for cross border remittances, facilitates faster international peer-to-peer transaction, and increases financial inclusion but has increased the incidence of capital flight in developing countries, money laundering, and exchange rate crisis which in a way is blamed for the rising inflation across developing countries (Yaser and Seyedjavad, 2019; Nurgun and Holya, 2018).

The question average regulators and academicians are asking is why the sudden surge in cryptocurrency investment and transaction? Several studies using consumer behaviour theory have examined what is driving cryptocurrency demand particularly given the obvious fact that cryptocurrency price is subject to a high level of volatility (Urquhart, 2018; Yaser and Seyedjavad, 2019; Bolt and Van Oordt, 2020; Nurgun and Holya, 2018). Most of these studies have found that the need for an anonymous transaction, speculative purposes, online medium of exchange, international transaction, among others are the leading determinant of cryptocurrency demand (Arias-Oliva, Pelegrín-Borondo, and Matías-Clavero, 2019; Anna, 2021).

One aspect that has been largely ignored in literature is the role of cryptocurrency price (volatility) in crypto demand. Evidence has revealed that one of the criteria that most industry leaders use to dissuade people from investing in cryptocurrency is because of the volatility of cryptocurrency price (making the asset risky such that investor can loss its investment within hours or days), yet studies on consumer behaviour towards cryptocurrency have largely ignored cryptocurrency demand responses to its price volatility. Demand for money theories of Tobin, Baumol, and Friedman all argued that the relationship between demand for money as means of exchange is negative to interest rate while demand for money as financial instruments like bonds, shares, and portfolios are positively related to interest rate (Guru, 2021). Specifically, Baumol argued that demand for money as financial instruments rises as the instrument value (price) rises but demand for money as means of exchange is inversely related to its price (Guru, 2021; Gandal, Hamrick, Moore, and Oberman, 2018).

Whether this is true for cryptocurrency demand is yet to be established empirically and the degree of cryptocurrency price elasticity is well unknown despite the growing body of literature on the issue. A recent survey cited by Investment.com revealed that most Nigerians are fast embracing cryptocurrency because of exchange rate crisis in the country. *"Most people use cryptocurrency to send money to their relatives abroad, pay schools fees abroad and make different transaction that the official market/ channels could not allow them do because of scarcity and stringent bureaucratic process of accessing dollar in the countries" – Investment.com.* Establishing such a relationship is important to policymakers who would aim to introduce alternatives digital currencies like Central Bank Digital Currency (CBDC) that are not susceptible to such price volatility and are backed by the government.

2. Literature Review

2.1 Conceptual Literature

2.1.1 Cryptocurrency Definitional Issue

Since the emergence of the first cryptocurrency (bitcoin) from the work of one Satoshi Nakamoto (2008) in his or her seminal paper, 'Bitcoin: A Peer-to-Peer Electronic Cash System', the concept has been variously defined and explained with each discipline adopting the definition that best meet their goals and objectives. Conventionally, cryptocurrency is regarded as a part of the virtual currencies that are not backed by any central government or monetary authority. Technically, cryptocurrency are those digital currency that adopts the formula of cryptography for the creation and management of its currency units (Majumder, Routh, and Singha, 2019). It is blockchain technologies that facilitate peer-to-peer (P2P) commerce, individualization of products, and flexibilization of production methods. For a variety of reasons, this wave gained traction after the global financial crisis a decade ago (Gupta et al, 2020). For example, these technologies embrace a peer-to-peer mechanism and effectively eliminate the "middleman", like banks. Because with cryptocurrency, there is no need for credit and debit card, it just requires smart phone and the internet and two people can successfully conduct transaction.

Cryptocurrency are built on blockchain technologies and enable the creation of money without central banks or any financial institution. A blockchain is technology of digital ledger of transactions that is distributed across the network of computer systems

on the blockchain. Each block in the chain contains several transactions, and every time new transaction occurs a record of that transaction is added to every participant. This decentralized database managed by every participant is referred Distributed Ledger Technology (DLT). Thus, cryptocurrency represents both technology and technology enabled service. Whether cryptocurrency is money (used as means of exchange) or financial instruments remains a debated topic in literature.

2.1.2 Cryptocurrency as Money or Financial Instrument

Cryptocurrency is largely abstract in nature. Some literature has argued that cryptocurrency is money in the sense that they can be exchanged via peer-to-peer (Irina, 2018). However, cryptocurrency does not fulfill the basic characteristics of currency; for example, it is not backed by any issuer (Irina, 2018; David and Chuen, 2015). This argument has been refuted in some corners who argues that cryptocurrency is essentially not much different from standard currency. They argued that only small portion of our currency are in cash; most of the money is in electronic form, which means only the data stored on a computer. The monetary system operates in the existence of trust between monetary authority and the masses. The cryptocurrency is also built on trust between or among its users (Benjamin, 2013). Others argued that cryptocurrency is not money because it is susceptible to high volatility. This claim is relatively trashed in some quarters also who believe that stable coins like Tether (USDT) value is not volatile, but the fact that its value is pegged to another currency is an issue yet unresolved in literature.

The U.S. Financial Crimes Enforcement Network (FinCEN) argued that every exchange that involves the exchange of cryptocurrency with traditional fiat money should be regulated same way as money (Irina, 2018), which invariably means that cryptocurrency can serve as both money and other instrument depending on the usage. While some countries like Japan for the purpose of regulation have recognized bitcoin – the mother of all cryptocurrencies as money, it remains a puzzle for the classification given that other cryptocurrencies are not recognized as money within Japan. Some other countries have recognized and classified cryptocurrency as commodity that can be owned by individuals and can be used for exchange through a barter system. Example of such countries include Israel, Australia, and Estonia (Yilmaz and Hazar, 2018; Irina, 2018; Sun et al, 2020). Most cryptocurrency are issued like stocks in “initial coin offerings” and used to represent shares in online projects which means cryptocurrency used in this form is viewed as financial instrument. Germany also recognizes cryptocurrency as financial instrument which means it can serve as currency, commodity, and securities including various statistical indicators (Irina, 2018).

2.1.3 Cryptocurrency, Central Bank Digital Currency and Electronic Money.

With the surge in cryptocurrency across the globe numbering more than 13, 000 (Connor, 2021), the central banks across the globe have started rolling out their own digital currency. But what is the difference between Central Bank Digital Currency (CBDC) and cryptocurrency? CBDC is essentially the digital version of the nation fiat currency – its value is tied to the value of the nation fiat currency. It is essentially related to cryptocurrency in that both are digital coins but essentially different since CBDC are regulated by monetary authority and are pegged to the value of the country fiat currency. Cryptocurrency is not regulated, not backed by any monetary authority, and designed such that the value can be rising largely since most of the cryptocurrency have a fixed supply in context and this explain why most people demand for cryptocurrency as financial instrument (Connor, 2021, Irina, 2018; Sun et al, 2020).

The next question that rightly comes to mind is how does CBDC differs from our conventional electronic money in our bank account? Duncan (2021) pointed out that while the existing electronic naira, dollars, pounds, etc., are created by commercial banks lending within fractional reserve banking systems with the assets and liabilities involved are held on the balance sheets of these banks and their clients. In contrast, CBDC are solely issued by the central bank and liability would be held by the central banks. Thus, the central bank keeps its own reserve to back the liability on the digital currency.

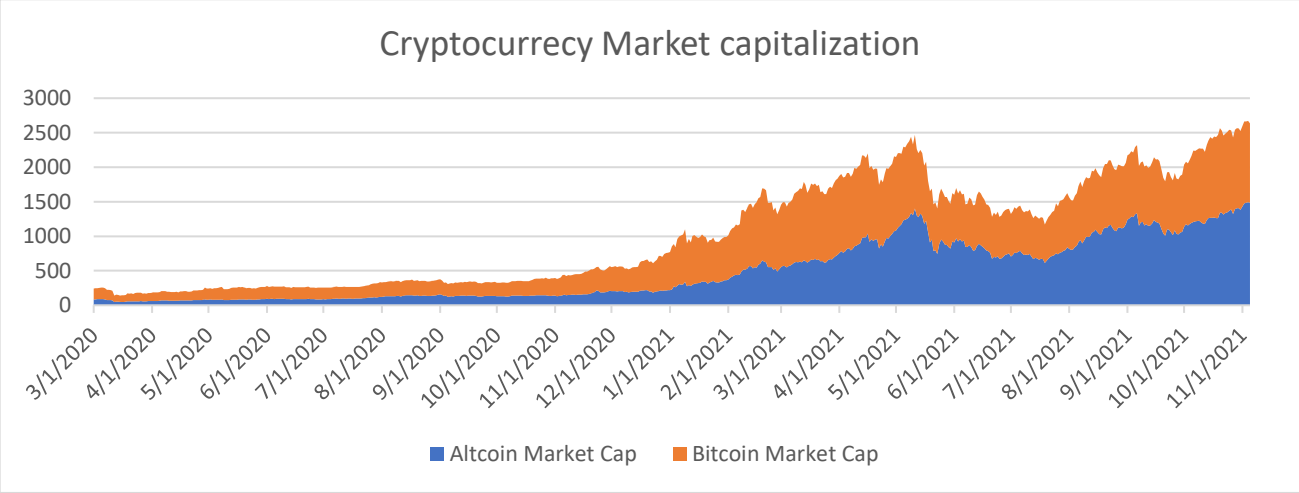
CBDC has several advantages over electronic notes, these include low or no transaction cost, fast and efficient transaction, facilitates more efficient international remittances, liability of the central bank, more secure payment system, facilitates financial inclusion, prevent fraud and money laundry, among others (Connor, 2021). But beyond being backed by a government and a monetary authority, most people have argued that CBDC are not in any way different from stable cryptocurrency coin like BSD and USDT coins since both are pegged to a fiat currency.

2.2 Trends in cryptocurrency Investment.

Since the surge of cryptocurrency in the global financial ecosystem, the value of cryptocurrency has skyrocketed particularly Bitcoin which has seen it value rose to $68, 000 before it falls below $40, 000 in January 2022 (Coinmaketcap, 2021). The rise in its value stem from several factors including but not limited to its ability to facilitates instant peer-to-peer transaction that bypass the conventional banking system, even across borders, without the need for a bank that could block the transaction or charge a fee (Zhu et al, 2021; Sun et al., 2020). As seen in Figure 1, cryptocurrency has seen a tremendous growth in 2021 with more than 7000 alternate coins rolled out in 2021 (Coinmarketcap, 2021).

One noticeable feature from Figure 1 is the level of volatility associated with cryptocurrency. For instance, Bitcoin price initially hit an all-time high of $64, 000 in April 2021 and slide back in to as low as $30,000 in July 2021. That same period as seen in Figure 1 witnessed a downward trend in bitcoin demand which consistent with portfolio demand theories of Tobin, Baumol, and Friedman (Guru, 2021). It is important to note that this study treats cryptocurrency as a financial instrument rather than as money since it is not legally recognized globally as medium of exchange.

Figure: Bitcoin and Alternate Coin Market Capitalization



Source: Yahoo Finance

Figure 2: Bitcoin Price Volatility since January 2021

Source: Yahoo Finance

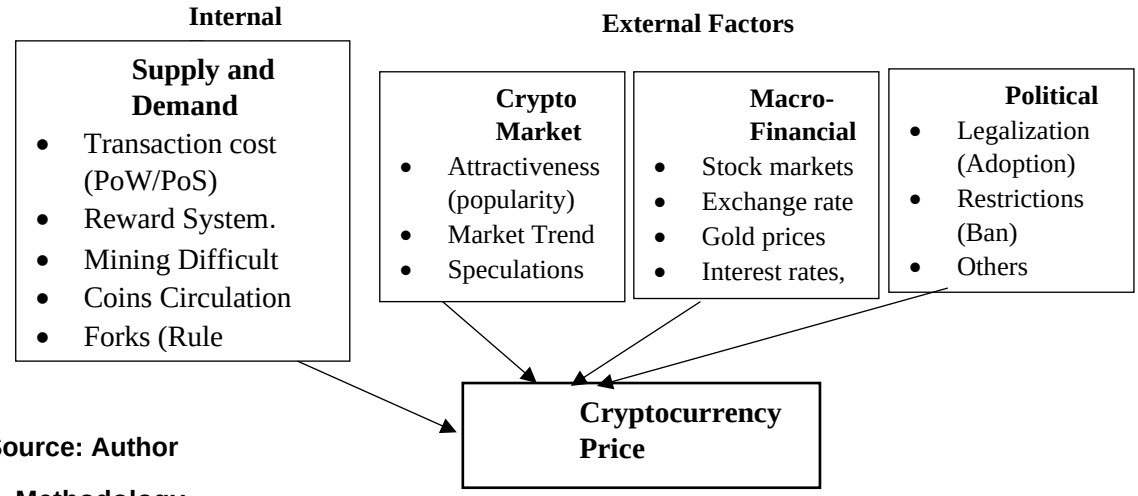
2.3 Empirical Literature

Several Literatures have made efforts to investigate cryptocurrency in relation to consumer behaviour, particularly as it relates to what is driving the demand for cryptocurrency (Arias-Oliva et al, 2019; Gupta et al, 2020; Sun et al, 2020). Other studies have focused more on examining the factors responsible for the price volatility or what is driving the price of cryptocurrencies (Biais et al, 2018; Cheah and Fry, 2015; Gandal, et al, 2018). In terms of factors driving cryptocurrency, literature suggested several factors including but not limited to profitability purposes, investment, risk tolerance, technology, the need to engage in anonymous transaction, online medium of exchange, international transaction, as a form of hedge against inflation and exchange rate depreciation, among others (Arias-Oliva et al, 2019; Gupta, Gupta, Mathew, and Sama, 2020).

Literature on cryptocurrencies price manipulation, elasticity, and volatility have suggested that cryptocurrency price is influenced by several factors including but not limited to demands (the different uses agents are putting cryptocurrency to use), the supply, demands, trends, other commodities prices including stock prices among others (Poyser (2017) categorize cryptocurrency drivers into internal and external factors. He argued that demand and supply of cryptocurrency are the two key internal factors driving cryptocurrency price while attractiveness (popularity), legalization (adoption), and few

macroeconomics factors (stock price, gold price, etc.) are the external drivers of cryptocurrency price. This is as summarized in Figure 3.

Figure 3: Factors Driving Cryptocurrency Price



Source: Author

3. Methodology

3.1 Model Specification

To determine price elasticity of cryptocurrency to demand for cryptocurrency we follow the work of Beenstock et al (1999), Alberini and Filippini (2011), and Espey and Espey (2004), where cryptocurrency demand is modeled as a function of cryptocurrency price and vector of other variables influencing cryptocurrency demand as in equation (1):

$$lnCrD_t = f(lnP_{e,t}, lnZ_{n,t}) \qquad (1)$$

Where $lnCrD_t$ represents the log of aggregate cryptocurrency demand, $lnP_{e,t}$ represents price of cryptocurrency, $lnZ_{n,t}$ and represents vector of other variables affecting demand for cryptocurrency. For sake of simplicity, the study will follow the like of Halaburda and Sarvary (2016) and Andolfatto (2018) and develop cryptocurrency price index using price of ten (10) most traded cryptocurrency as of January 2022 to capture cryptocurrency price.

A static model as in equation (1) assume that cryptocurrency demand is instantaneously adjusted toward long-term equilibrium when the cryptocurrency price (return on asset) or other variables changes. Such static model will fail to capture the model dynamic since cryptocurrency economy is technological driven, there is need to capture such effects when investigating long-term price and output elasticities. It is assumed that the actual cryptocurrency demand change between two periods t − 1 and t is only the partial fraction of the difference between the long-term desired cryptocurrency use at year t and the actual demand at year t − 1. Consequently, λ represents the rate of adjustment between any two time periods toward the long-term equilibrium demand. If λ equals 1, then the desired cryptocurrency use becomes identical to the actual demand.

$$lnCrD_t - lnCrD_{t-1} = \lambda(lnCrD^*{}_t - lnCrD_{t-1}) \qquad (2)$$

The aggregated long-term effects of a price elasticity can be estimated with equations (3) to (5). Equation (3), following the work of Alberini and Filippini (2011) expressed the desired cryptocurrency as a function of cryptocurrency price and vector of other variables and ϵ_t represents error term.

$$lnCrD^*{}_t = \alpha_0 + \alpha_1 lnP_{e,t} + \alpha_2 lnZ_t + \varepsilon_t \qquad (3)$$

If we substitute equation (3) into equation (2), we obtain equation (4) that is dynamic.

$$lnCrD_t = (1-\lambda)lnCrD_{t-1} + \lambda\alpha_0 + \lambda\alpha_1 lnP_{e,t} + \lambda\alpha_2 lnZ_t + \varepsilon_t \quad (4)$$

$$lnCrD_t = \phi lnCrD_{t-1} + \beta_0 + \beta_1 lnP_{e,t} + \beta_2 lnZ_t + \varepsilon_t \quad (5)$$

Where, $(1-\lambda) = \phi$, $\lambda\alpha_0 = \beta_0$; $\lambda\alpha_1 = \beta_1$; $\lambda\alpha_2 = \beta_2$, where β_1 and β_2 are short-term price elasticity and vector of other cryptocurrency demand variables. Literature suggested that exchange rate depreciation in developing countries like Nigeria is a key variable in cryptocurrency demand either as asset or money (medium of exchange). If we modify equation (4) to include exchange rate, Cryptocurrency news (an indicator of popularity), income and inflation rate, we can have equation (5).

$$lnCrD_t = \phi lnCrD_{t-1} + \beta_0 + \beta_1 lnP_{e,t} + \beta_2 lnREXC_t + \beta_3 lnNews_{e,t} + \beta_4 lnRGDP_t + \beta_5 INF_t + \varepsilon_t \quad (5)$$

This study applied dynamic ARDL bounds testing to estimate both the short-run and long-run effects (Pesaran, Shin, & Smith, 2001). Equation (5) can be expressed in the ARDL form as given in equation (6):

$$\Delta lnCrD_t = \beta_0 + \sum_{i=1}^{n-1} \beta_1 \Delta lnCrD_{t-i} + \sum_{i=0}^{M-1} \beta_2 \Delta lnPe_{t-i} + \sum_{i=0}^{M-1} \beta_3 \Delta lnREXC_{t-i} + \sum_{i=0}^{M-1} \beta_4 \Delta lnNEWS_{t-i} + \sum_{i=0}^{M-1} \beta_5 \Delta lnInRGDP_{t-i} + \sum_{i=0}^{M-1} \beta_6 \Delta INF_{t-i} + \varphi_1 lnCrD_{t-1} + \varphi_2 lnPe_{t-1} + \varphi_3 lnEXC_{t-1} + \varphi_4 lnNEWS_{t-1} + \varphi_5 lnRGDP_{t-1} + \varphi_6 INF_{t-1} + \mathcal{E}_t \dots\dots\dots (6)$$

Where *ln* is logarithm function, Δ is the first difference operator, and α_0 is the drift component. The expression with summation sign ($\beta_1 - \beta_6$) represents the short-run dynamics of the model, while the coefficients ($\varphi_1 - \varphi_6$) represents the long-run relationship and $\mathcal{E}_t$ is the serially uncorrelated disturbance with zero mean and constant variance. Once it is established that there exists a long-run relationship through the application of bounds cointegration test. The long-run relationship of the ARDL model can be estimated as given in equation (7).

$$lnCrD_t = \varphi_1 lnCrD_{t-1} + \varphi_2 lnPe_{t-1} + \varphi_3 lnREXC_{t-1} + \varphi_4 lnNEWS_{t-1} + \varphi_5 lnRGDP_{t-1} + \varphi_6 UNE_{t-1} + \mathcal{E}_t \quad (7)$$

While the short-run model can be estimated as given in equation (8) below:

$$\Delta lnCrD_{Lt} = \beta_0 + \sum_{i=1}^{n-1} \beta_1 \Delta lnCrD_{t-i} + \sum_{i=0}^{M-1} \beta_2 \Delta lnPe_{t-i} + \sum_{i=0}^{M-1} \beta_3 \Delta lnEXC_{t-i} + \sum_{i=0}^{M-1} \beta_4 \Delta lnNEWS_{t-i} + \sum_{i=0}^{M-1} \beta_5 \Delta lnInRGDP_{t-i} + \sum_{i=0}^{M-1} \beta_6 \Delta UNE_{t-i} + \varphi_1 ECM_{t-i} + \mathcal{E}_t \quad (8)$$

3.2 Data and Sources

The study employed monthly data on cryptocurrency (Bitcoin) price and demand between January 2017 to October 2021 using data from https://coinmarketcap.com/, the study following the work of Kristoufek (2015) and data from http://www.coindesk.com/price identified the use purposes of cryptocurrency. For trading or speculative purpose and for exchange. Thus, the the ratio between demand for cryptocurrency for speculative purpose (asset – trading, and conversion of fiat to volatile crypto) and demand for cryptocurrency as exchange transactions (conversion of fiat or volatile crypto to stable coin for exchange or peer-to-peer transaction) is provided and used in cryptocurrency demand. Data on real

GDP, inflation rate, and exchange rate for the case of Nigeria is sourced from IMF databank while Google trends news at http://trends.google.com/ is used to measure news (popularity) effects on cryptocurrency demand. All the data are converted to monthly where they are available in other frequencies like daily, weekly, or quarterly. Also, some database has already aggregated the crypto data into monthly data (see https://ng.investing.com/crypto/).

4. Result and Discussion

The series was first subjected to unit root test since economic modeled is built on the assumption that series are stationary at level. The stationarity result is presented in Table (2) using both Augmented Dickey Fuller (ADF) test and Philip Perron (PP) test. The result as in Table (2) reveals that all the series either integrated of order zero, I(0) or integrated of order one, I(1). Since the series are fractionally integrated the choice of ARDL is further justified. The study employed a combination of Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ) for the appropriate lag selection and where there is a conflict between the various criteria, AIC overrides others.

To establish the existence of long-run relationship between and among the series, the study followed the suggestion of Enders (2010) and Peters, Yaaba, Adetoba, Tomologu, and Tonuchi (2020) to conduct three basic check test; the bounds co-integration test to validate the existence of long-run relationship, the Breusch-Godfrey Serial Correlation test, and CUSUM square test to check stability of the model. The result as in Table (2) reveals that all the series either integrated of order zero, I(0) or integrated of order one, I(1). Since the series are fractionally integrated the choice of ARDL is further justified. The study employed a combination of Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ) for the appropriate lag selection and where there is a conflict between the various criteria, AIC overrides others.

Table 1: Augmented Dickey-Fuller and Philip Perron Test (trends and intercept)

Variable	ADF At Level	1st Difference	I(d)	Philip Perron At Level	1st difference	I(d)	Remarks
Crypto Demand (CrD)	-2.818933	-6.82674***	I(1)	-2.6793923	-6.47382***	I(1)	Stationary
Price (Pe)	-5.286482***	-	I(0)	-5.0973465***	-	I(0)	Stationary
Exchange rate (EXC)	-2.593424*	-7.4907245***	I(1)	-2.567093	-6.783594***	I(1)	Stationary
Popularity (NEWS)	-4.716731***	-	I(0)	-4.545271***	-	I(0)	Stationary
Inflation rate (INF)	-2.38927	- 8.37173***	I(1)	-1.95720	- 7.3682***	I(1)	Stationary
Real GDP (RGDP)	-1.205585	-9.8178395***	I(1)	-1.106722	-8.156339***	I(1)	Stationary

Significance is indicated as follows: ***, ** and * for 1%, 5% and 10% respectively, all variables are logged
Source: **Researcher's Computation**

Table 3: ARDL Models for Price and Output Elasticity in Nigeria

Variable	Model 1	Model 2	Model 3
Bounds F-Stats	6.366***	5.784***	4.572**
	LONG	**RUN**	**MODEL**
Crypto Demand (CrD_1)	0.823 (0.000)***	0.445 (0.002)***	0.863 (0.000)***
Price (Pe)	0.024 (0.046)**	0.034 (0.024)* *	0.018 (0.055)*
Exchange rate (EXC)	-	-0.372(0.002)** *	-0.502 (0.002)***
Popularity (NEWS)	-		0.497 (0.000)***
Real GDP (RGDP)	0.675(0.000)***	0.563 (0.010)***	0.318 (0.002)***
Inflation rate (INF)	0.241 (0.047)**	0.211 (0.022)**	0.328 (0.016)***
C	2.434 (0.060)*	0.918 (0.034)**	20.24 (0.005)***
R^2	0.6285	0.6524	0.6645
F*(p-value)	0.0000***	0.0000***	0.0000***
Breusch-g	0.4536	0.1982	0.3467
	SHORT	**RUN**	**MODEL**
Crypto Demand (CrD_1)	0.221 (0.000)**	0.237 (0.000)***	0.582 (0.038)***
Price (Pe)	-0.034 (0.000)***	0.024 (0.000)***	0.049 (0.001)***
Exchange rate (EXC)	-	-0.062 (0.038)***	-0.068 (0.002)***
Popularity (NEWS)	-	0.838 (0.000)***	0.630 (0.000)***
Real GDP (RGDP)	-	0.218 (0.081)**	0.210 (0.013)***
Inflation rate (INF)	0.302 (0.62)*	0.341 (0.052)**	0.365 (0.016)***
C	8.083 (0.000)***	-5.0768 (0. 073)*	0.488 (0.345)
ECM(-1)	-0.485 (0.000)***	-0.3405 (0.000)***	-0.453 (0.001)***
R^2	0.7864	0.7701	0.6854
F*(p-value)	0.0000	0.0000***	0.0003***
Breusch-g	0.6489	0.1344	0.1644

Significance is indicated as follows: ***, ** and * for 1%, 5% and 10% respectively, p-value in parenthesis. MPRI =(MPR*Infg), Breusch-G = Breusch-Godfrey Serial Correlation f-test p-value.

To establish the existence of long-run relationship between and among the series, the study followed the suggestion of Enders (2010) and Peters et al (2020) to conduct three basic check test; the bounds co-integration test to validate the existence of long-run relationship, the Breusch-Godfrey Serial Correlation test, and CUSUM square test to check stability of the model.

The basic check of long-run relationship and stability of the models reveals that all the models have long-run relationship at 1% level of significance, given that the F-statistics of the bounds test is greater than the 1% critical value for each of the models as seen in both Table 3 and 4. The data as in Table 3 revealed that demand for cryptocurrency is inelastic to the price of cryptocurrency as revealed by the price index in Table 3 both in the long-run and short-run. In order words, a proportionate change in crypto price will

leads to less than proportionate change in demand both at the long-run and short-run. The data revealed positive relationship between crypto demand and price in the long-run which is consistent with Tobin, Baumol, and Friedman Portfolio investment theory. This suffice that most people are demanding for cryptocurrency for investment purpose rather than means of exchange which is consistent with the findings of Kristoufek (2015). However, as revealed in Table 3, the first model short-run result revealed a negative relationship between asset price and demand indicating that more people are demanding for cryptocurrency in the short-run as money for exchange rather than financial instrument. But, when exchange rate and cryptocurrency hipping (popularity) was introduced the price and demand relationship becomes consistent with the long-run relationship.

Similarly, the result as in Table 3 revealed that as Nigeria currency is depreciating and exchange rate of naira to dollar is falling, the demand for cryptocurrency is rising and significant at 5 percent level of significance. The implication is that exchange rate depreciation is among the factors driving Nigerians into cryptocurrency. As a last ditch, the study introduced cryptocurrency popularity into the model as in Model 3. It was revealed that introducing popularity into the model does not change the model parameters sign, but it makes the price of Bitcoin not significant except at 10 percent. However, the sign and magnitude remain unchanged. It was also seen that cryptocurrency popularity has strong positive significant impact of cryptocurrency demand.

Table 4: ARDL Models for Price and Output Elasticity Global

Variable	Model 1	Model 2
Bounds F-Stats	6.366***	5.784***
	LONG	**RUN**
Crypto Demand (CrD_1)	0.674 (0.000)***	0.552 (0.002)***
Price (Pe)	0.062 (0.046)**	0.102 (0.040)***
Popularity (NEWS)	-	0.028 (0.021)**
C	2.992 (0.002)***	5.621 (0.034)**
R^2	0.6724	0.7491
F*(p-value)	0.0000***	0.0000***
Breusch-g	0.4362	0.2681
	SHORT	**RUN**
Crypto Demand (CrD_1)	0.221 (0.000)**	0.237 (0.000)***
Price (Pe)	-0.018 (0.000)***	-0.078 (0.040)**
Popularity (NEWS)	-	0.632 (0.010)**
C	6.680 (0.000)***	7.1356 (0. 003)*
ECM(-1)	-0.545 (0.000)***	-0.615 (0.000)***
R^2	0.6564	0.6465
F*(p-value)	0.0000	0.0000***
Breusch-g	0.342	0.400

Significance is indicated as follows: ***, ** and * for 1%, 5% and 10% respectively, p-value in parenthesis. MPRI =(MPR*Infg), Breusch-G = Breusch-Godfrey Serial Correlation f-test p-value.

The global data as in Table 4 is relatively consistent with the result from the data in Table 3. Data from Table 4 reveals that demand for cryptocurrency is positively inelastic and significant at 5 percent level of significance. Cryptocurrency price has positive significant impact on cryptocurrency demand in the long-run further indicating that cryptocurrency demand is largely influenced by speculative purpose or the use of crypto as financial instrument rather than as conventional money. However, price has a negative relationship with crypto demand in the short-run indicating that demand for crypto in the short-run is largely influenced by exchange purposes consistent with Nigeria data. Lastly, popularity of cryptocurrency also has positive impact on crypto demand in both short-run and long-run for global economy.

5. Conclusion and Policy implication

The study revealed that cryptocurrency price has positive significant impact on cryptocurrency demand, but the demand is price inelastic which means that while cryptocurrency demand might fluctuate relative to price, the relative response is

lower to the price volatility. Similarly, the more popular or the more hipping a cryptocurrency received the higher the demand for it. This explain why some meme coins with huge community rise in 15,000 percent despite being a meme coin. For the case of Nigeria, we see that exchange rate hedging plays an important role in cryptocurrency demand as people are trying to save their money value against dwindling value of naira they then to invest in cryptocurrency with more stability and higher yield. Most people would prefer to put their money in stable coins like Tether since its value is equivalent to US dollar and saves the investor from the inflation and exchange rate crises. The finding is consistent with economic theory particularly the portfolio investment theories of Tobin, Baumol, and Friedman and Keynes demand for money theory. We conclude that cryptocurrency demand in Nigeria and elsewhere is dominated by speculative motives. In order words, most people using cryptocurrency are speculating that the price will rise, and they will make gain which explain why demand for cryptocurrency rises when the price rises.

The implication is that crypto enthusiast is not likely to be deterred by cryptocurrency price volatility. It also means that Central Bank Digital Currency (CBDC) which are being rolled out by different central banks might struggle to compete with cryptocurrency without other value proposition. One of the arguments against cryptocurrency is that the currency is susceptible to high volatility and as revealed by our result crypto enthusiast are rarely bordered by that fact. One can argue that most crypto investors are risk loving individuals who derives more utility from higher investment gains and higher risk of investment loss compared to risk averse consumers who derives more utility from lower yield asset with minimal risk. Secondly, stable coins like Tether (USDT) value is pegged to dollar which means holding USDT is like holding dollar and this can be both used as medium of exchange and store value which Bitcoin has been accused of failing to achieve making cryptocurrency to be a step closer to fulfilling the medium of exchange feature of money.

Also, giving the high inflation rate across the globe, and the fact that most stable coin offers a guarantee on investment between 5-20% implies that even the risk averse investor will be willing to stake their investment in guaranteed cryptocurrency stake which should further concern regulators particularly from developing country in attempt to reduce incidence of financial instability and capital flight in the country. There is need to reevaluate the CBDC value proposition probably to include interest yielding savings that can be managed by the deposit money bank.

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