EXAMINING THE *IMPACT OF CRYPTO CURRENCIES ON MACROECONOMIC VARIABLES IN NIGERIA.*

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Abstract

This study employs a Vector Autoregression Model (VAR) and a Quantile Regression Technique to analyze the relationship between bitcoin price and major macroeconomic variables in Nigeria. The results from the multivariate VAR and the generated impulse response and variance decomposition indicate no strong statistically significant response of interest rate, inflation, and exchange rate to changes in bitcoin price. However, the study finds a positive relationship between the *stock market index and money supply with bitcoin price. From the estimated Quantile regression technique, results indicate that the price of the prime cryptocurrency bitcoin has a positive relationship with money supply and exchange rate across all quantiles. Results also indicate the positive relationship between bitcoin and the rate of inflation at high quantiles. Furthermore, results indicate the importance of cryptocurrency in explaining interest rates in the country at only the low and high quantiles. The study concludes that crypto currencies have implications for macroeconomic variables such as exchange rate, money supply, interest rate and inflation in the country. As a result, the study recommends the need for regulatory clarity in the country to encapsulate envisaged impact on macroeconomic variables,*

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so that Nigeria can reap the potential benefits from the novel asset class.

Introduction

According to Jonker (2018), decentralized cryptocurrencies such as bitcoin are capable of leading to a major alteration of the current retail payment system as well as the monetary system. According to Othman et al.(2020), cryptocurrencies are unsettling the standard channels of the traditional monetary system. Scheibe et al.(2015) notes that cryptocurrencies are distorting the concept of money in the modern world and the government's role in this field will eventually decline thereby inhibiting some effective tools of monetary policy. For them, virtual currencies constitute a serious risk to macroeconomic stability and their increased usage will lead to a fall in the use of "real" money, this will also lead to a decline in actual cash needed thus making monetary policy more difficult to conduct.

Nigeria ranks high among countries with high cryptocurrency adopters and usage. The high usage rate of cryptocurrencies in Nigeria is attributed to Nigerians' search for alternative investment opportunities. Sauer(2016) articulated this point clearly, noting that Virtual currencies are in trend owing to two factors. Firstly, as a way of protesting against traditional monetary authorities' policy decisions; secondly, as options to imbalances in several monetary systems caused by political uncertainty and other factors. Perhaps another perception currently making the waves is the classification of cryptocurrencies as "freedom money" that is without regulation.

Given the rapid, high, and increasing usage of cryptocurrencies in Nigeria. What then is the macroeconomic implications of cryptocurrency usage in Nigeria? Indeed there are concerns about

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their disruptive potential for financial system stability (Assenmacher, 2020). The Central Bank of Nigeria's recent pronouncement and directives to the Banks strongly support the apprehension that cryptocurrency usage has caused. Given the high level of usage of virtual currencies in Nigeria, can cryptocurrencies threaten the primary function of the Nigerian Central Bank, which is the objective of influencing inflation, financial stability, full employment, and economic activity. The relationship between cryptocurrencies and macroeconomic variables in Nigeria is understudied and unclear at the moment.

Literature review

Narayan et al, (2019) investigated the role of cryptocurrency on economic variables using correlation matrix. The study found that Bitcoin Price growth, significantly influences, currency appreciation the reduction in money velocity as well as raising inflation in Indonesia. According to the scholars, this finding justifies the policy stance of the Bank Indonesia on the Bitcoin market. Their findings also have lessons for other nations that will experience the effects of the sudden growth and emergence of the cryptocurrency market.

Nguyen et al. (2019) writing on bitcoin and money supply, finds substantial responses of four major cryptocurrencies including Bitcoin to contracting monetary policies in China. This suggests that monetary policies significantly impact cryptocurrency returns; however, this relationship was not established for the U.S.

Amihud and Cukierman(2018) also identified four macroeconomic problems that having a virtual currency such as bitcoin as a world currency would bring. First, they noted that sovereigns such as central banks will lose their ability to stabilize the economy in the face of economic shocks. Secondly the same sovereign institutions may no

longer earn seigniorage income usually earned from its own issued currency and may need to resort to increasing taxes to augment the fall in revenue. Third, Amihud and Cukierman(2018) noted another macroeconomic effect of having a single privately issued world currency such as bitcoin to be that, single nations will lose the ability to adjust exchange rate in case of shocks and this may result in harsher economic shocks. Fourthly, the high cost of producing such a currency will incur a dead-weight cost on the world economy.

According to Fernández-Villaverde (2017), private moneys are vulnerable to episodes of self-inflation and private issuers and could provide price stability if total circulation limit can be enforced . For him, a structure replete with private monies cannot guarantee price constancy, when possible, it will provide suboptimal amount of money.

According to Noam, (2019), the inability to control money in circulation has important implications for inflationary conditions in an economy. Where there exist several digital currencies in circulation with zero unified approach to supply, it will lead to hyperinflation with the value of these currencies diminishing to zero in the long run. Noam argued that inflation in the crypto-currency sector does imply general rise in the authorized currency. Where cryptos constitute a small fraction of the economy, the consequence will be inconsequential. Thus, issuing of currency outside of the regulation of a central bank will increase the amount of currency circulating in relation to products without the necessary and traditional monetary authorities counter-policies and ultimately breed inflation.

On the impact on interest rate, Noam observed that the potential impact of cryptocurrencies will be indirectly through the discount rate because of its influence on the interest rates that banks charge customers and the economy's prevailing interest rates. Noam argued that the impact is surely indirect. He noted that whenever issuers of cryptocurrency

give credit–the rates are dependent on the prevailing and pre-existing interest rate. When the latter are low, borrowers of fund will demand payment at a lower rate extended in crypto credit market and vice versa such that whenever such currency usage become large scale it could impact the effectiveness of the central bank.

According to Sauer, (2016) achieving the central bank's policy objectives of controlling the amount of money in circulation as well as interest rates are today more complicated in view of cryptocurrency usage. Monetary policy decisions Transmission channels are likely to be weakened, suggesting a new role of bankers' bank and the need to adapt to virtual currencies. For him, central banks could lose their ability to control the money supply, thus inhibiting a major monetary policy tool for managing inflation or sustaining price stability. This according to Sauer, (2016), can build distrust in a nation's monetary systems with consequential effects on economic activity. For Sauer , (2016), new issuers of money (means of payment) aside from the bankers' bank could potentially impact the supply of money. It is projected that Central banks may need to respond more aggressively to achieve their policy objective as a result of entrants such as bitcoin. He however acknowledges we are not there yet.

However Assenmacher (2020), denies that cryptocurrencies entail significant risk for monetary policy now or in the future. For her, given their low usage as well as "lack of moneyness", they will not have a consequential effect. According to her, it is stable coins that will have prospects if they are to be promoted by large corporations with a potential large usage rate. She adds that only a central bank digital currency as an official currency that is available to all, can cause significant risks and consequences for monetary policy and financial stability. In the same vein, Vidal-Tomás and Ibañez's (2018) study report that the cryptocurrency Bitcoin did not respond to monetary policy events from the Federal Reserve System, European Central Bank, Bank of England and Bank of Japan.

In contrast, Benigno (2019) argues that without doubt, the coming of cryptocurrencies is a major challenge to central banks in achieving their policy objectives. Benigno explained that the reason why central banks are planning their versions of digital currencies is because of the ability such digital assets can have in risking as well as jeopardizing the efficiency of central banks' operational tools and policy objectives on inflation and ultimately economic activity.

Kumah and Odei-Mensah (2021) posit that from an economic development standpoint, the "depth" and "width" of global stock markets may be impacted due to their level of exposure to cryptocurrencies, translating to uncertain and more costly equity financing for the domestic firms. Several studies also report a relationship between monetary policy announcements and cryptocurrencies. For example, Mora et al (2019) note that the role cryptocurrencies are playing in modern society will check traditional monetary systems. For them, the supply of money might be affected by the level of virtual currency in circulation, and they posit that cryptocurrencies will give rise to unregulated monetary systems because digital currencies are not issued by any central bank, nor is it backed by any government.

For Noam (2019) "Cryptocurrencies provide an important dimension of innovation to the evolution of the exchange medium we call money. However, they will, collectively and in volume, create real problems for the monetary system of a country. Central banks, which are institutions tasked with providing monetary stability, are more essential than ever. Yet they will see their problems rise while the power of their traditional tools to control money supply and interest rates—such as reserve requirements and the discount rates—are declining. But the new digital technologies— such as distributed ledgers—and new approaches provide regulatory bodies also with new and potentially powerful tools".

According to Noam (2019) cryptocurrencies emergence is believed to have implications for macroeconomic variables such as inflation. For example, in theory, private currencies are expected to promote competition. Therefore, in nations where there is a freefall in the official currency, residents are forced to search for alternative means of exchange.

Noam (2019) cited the case of Argentina, where inflation and an unstable national currency created a large black market for US dollars as people tried to save in dollars and took extreme adverse measures to secure the dollar. Crypto currency according to Noam provides a means of hedging against an inflationary official currency and such a shift towards cryptocurrency is justified, provided they are not inflationary. The study states that the usage of cryptocurrencies represents a shift from a monopoly system of government-issued national currency to one of several private issuers. A position that supports the age long economic theory of full competition. Though critics argue that the stability of prices in an economy will be affected by the absence of control over the amount of money supply. He said that a crypto currency enables users to circumvent the official inflationary currency, conduct transactions outside the banking system using the money, and helps them to safeguard their investments. However, such a transition to cryptocurrency stands to reason only when it does not promote inflation. There is no value in trading one sort of poor money for another that may be worse. As a result, it is vital to examine the inflationary tendencies of cryptocurrency. With a variety of digital currencies circulating and the absence of a centralized authority to regulate supply, the value of virtual currencies would ultimately depreciate to zero in the long term, resulting in high inflation, so it is believed. Even though the study acknowledges that in the case of paper money, hyperinflation did not occur when money was convertible into a commodity but occurred only when all constraints were removed. Moreover, Noam opines that the two monetary sectors are similar because the issuing of money outside of

traditional monetary authorities will raise money supply relative to products thereby triggering inflationary pressures.

Kumar Mallick and Arvind Mallik's (2021) paper highlights the connectedness between Cryptocurrencies (Bitcoin, Ethereum, Litecoin, Binance Coin) and Indian Currency foreign exchange (YEN, USD, EURO, GBP). The study utilizes daily data spanning the period December 17, 2019, to Jun 17, 2021. The result indicates that with the exception of Binance Coin with the US dollar, Ethereum with the YEN as well as Litecoin, no significant effect was observed between Indian rupee and Cryptocurrencies. The study also establishes a significant negative relationship between the USD and Litecoin suggesting the former may serve for diversification as well as hedging purposes. The study established that Indian foreign exchange markets do impact influence on cryptocurrency markets. This the authors linked to the absence of government legal association which influences public opinion, causing low adoption rate.

Methodology

Data
In the empirical analysis, the study made use of five macroeconomic variables: money supply (M2), the exchange rate(exr), inflation rate(inf), interest rate(int) and the stock market performance index (Alsi). The sample comprises monthly observations for the period July 2010 to May 2021. The duration of analysis and time is dictated by data availability. The variable definition and data constructed is as follows:

i.   Money supply denoted (m2). It measures the supply of money which comprises current account deposits, near money as well as cash. M2 comprises only of cash and current account deposits. M2 is more commonly viewed to gauge money

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supply as well as price levels, and as a basis of Central Bank monetary policy.

ii.   INT stands for interest rate. This is the 3 months' treasury bills rate charged by the Central Bank.

iii.   The exchange rate (Exr) is the data on exchange rate specifically, the study employs the BDC exchange rate.

iv.   Inflation, or the rate at which prices go up, is (inf). It is calculated as the log first difference in the Consumer Price Index (CPI).

v.   The Price of Bitcoin which is the proxy cryptocurrency (bitc).

Data on the prices of cryptocurrencies was obtained from yahoo finance, coinmarketcap.com, and CryproCompare.com. While data on the macroeconomic variables (Inflation rate, Money supply, Exchange rate and Interest rate) were obtained from the Central Bank of Nigeria statistical bulletin (2020) and CBN statistical online database.

Vector Autoregressive (VAR) Estimation Techniques
Establishing the time-series properties of the variables, and where we find no linear combination of the variables, that is stationary (i.e., no error correction representation). The study proposes to estimate a VAR model to explore the dynamic relationship between cryptocurrency and monetary aggregates. The VAR model was popularized by Sims (1980) and has several advantages. The VAR is a hybrid of the univariate and simultaneous equation models. The VAR approach generates a better forecast compared to traditional models. It is a flexible model as a variable can depend on its lag and lag of others. In addition, there is no need to distinguish endogenous from exogenous variables.

Consider a VAR of order P:

$$y_t = A_1\, y_{t-1} + \ldots + A_p\, y_{t-p} + Bx_t + \varepsilon_t$$

Where yt is a vector of K non-stationary I(1) variables, β constitute the vector of deterministic variables and Xt is the vector of innovations. The Vector Autoregression model (VAR) can be rewritten as,

$$y_t = A_0 + \sum_{k=1}^{p} A_k + y_{t-k} + e_t$$

To explore the dynamic interaction between bitcoin price and macroeconomic variables, the study exploits the vector autoregression (VAR) model of money supply, inflation, exchange rate, stock returns and interest rates. Consider a VAR of order P, where Y_t = [m2, alsi, int, inf, exr, bitc], where the variables are as previously defined. Y is a n x 1 vector of non-stationary I(1) variables, n refers to the number of variables in the system. A_0 represents a $n \times 1$ vector of constant terms, A_K represents a n x n matrix of coefficients, e_t is an n x 1 vector of independent and identically distributed error terms, and p is the order of autoregression and lags. The VAR is linearly specified to scrutinize the dynamic association between variables of interest in the VAR system. There are several lags when estimating a VAR, the optimal lag must be determined based on various information criteria such as the Akaike information criteria (AIC), Schwarz criteria (SIC), and Hannan- Quinn test.

The impulse response function curves are based on the generalized impulse method suggested by Pesaran and Shin, (1998). It presents the dynamic simulations indicating how an endogenous variable responds to shock to an exogenous variable over a period. The variance decompositions on the other hand present the extent of changes in the dependent variable that are attributed to the variable and others.

Impulse response functions and variance decompositions will then be estimated for the analysis and will be plotted. The impulse response function (IRF) traces out the reaction of the dependent variables in response to shocks to each of the identified variables. In this case, it traces out the responsiveness of the financial development measures in the VAR to shocks to the error term (Pesaran & Shin, 1998).

The Variance decompositions provide a slightly different method to the dynamics of the variables. They tell us the proportion of movements that are due to a variable versus those attributed to other variables in the system. "Information on the proportion of the movements in the dependent variables that are due to their "own" shocks, compared to shocks to the other variables".

Quantile regression
Koenker and Basset (1978) introduced Quantile regression method models as an alternative to the OLS method. A Quantile regression method is a popular method which models the quantiles of the dependent variable given a set of conditioning variables. The method estimates linear relationship between regressors and a specified quantile of the dependent variable. As opposed to the OLS regression model which analyzes the conditional mean of a dependent variable, Koenker and Basset quantile regression is concerned with other aspects of the conditional distribution. This permits a more complete description of the conditional distribution than an OLS conditional mean analysis. Quantile regression method describes how the 10th, 20th, 30th up to 90th percentile of the response variable, are affected by regressor variables. One advantage of the quantile regression approach is that strong distributional assumptions are not required, and it provides a distribution ally robust method. Focusing on the impact of cryptocurrency usage on macroeconomic variables in Nigeria. The linkage between cryptocurrency and macroeconomic variables can be described in the following equations:

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$\text{Log(M2)}_t = c + \beta1 \log(\text{Bitcoin})_t + \varepsilon_t$

$\text{Log(EXR)}_t = c + \beta2 \log(\text{Bitcoin})_t + \varepsilon_t$

$\text{INFC}_t = c + \beta3 \log(\text{Bitcoin})_t + \varepsilon_t$

$\text{INT}_t = c + \beta4 \log(\text{Bitcoin})_t + \varepsilon_t$

Where M2 is the Money supply, EXR denotes Exchange rate, INF is the inflation rate and INT is the interest rate, β_i(i=1,2,3,4) is the estimated coefficient and ε_t is the error term.

Adapting Lee and Zeng (2011), we employ nine quantiles (Θ = 01, 0.2…,0.9) breaking them into three parts: Low, Medium, and High. When two adjacent quantiles are statistically significant, then the portion is adjudged statistically significant.

Empirical analysis

Analysis of the Response of Monetary/Macroeconomic Variables to Shocks in Bitcoin Prices using the Vector Autoregression Model (VAR)

The study employs a Vector autoregression model (VAR) to analyze the interaction between bitcoin price and money supply, inflation, interest rate and exchange rate in Nigeria. By utilizing a VAR approach, we can discern the response of macroeconomic variables to changes in bitcoin prices. The VAR model multivariate framework offers a medium where changes in Nigeria's macroeconomic variables are assessed in relation to changes in bitcoin prices and changes in other variables.

The dynamic response of macroeconomic variables to changes in bitcoin prices can be traced using simulated responses of the estimated VAR system called Impulse Response Functions. Secondly, the importance of a variable in generating changes in its value and the variation of the value of other variables are assessed using a Forecast Error Variance Decomposition.

Impulse response functions

Figure 1 shows the response of interest rates, stock returns, inflation rates resulting from one standard deviation to innovation in bitcoin price for the period 2010:M7:01 to 2021. The impulse functions come with 95% confidence bounds to judge the statistical significance of the impulse response function. Looking at Figure 1, we can see that there is no statistically significant response of interest rate, inflation, exchange rate and stock market index, to shocks in the bitcoin price. However, for money supply, the impulse response results indicate that the macroeconomic series react to a shock in bitcoin price by appreciating.

The result demonstrates that bitcoin price significantly influenced money supply in Nigeria over the study period as money supply series reacts to a shock in bitcoin price by appreciating. This appreciation is statistically significant over the 30-month forecast period. Bitcoin price had a positive impact on the short-term interest rate, the effect was significant from the 1st to 10th month, after the 10th month it was however no longer statistically significant. For inflation rate and interest rate, however, bitcoin price results in a negative response although not statistically significant.

Response to Generalized One S.D. Innovations ± 2 S.E.
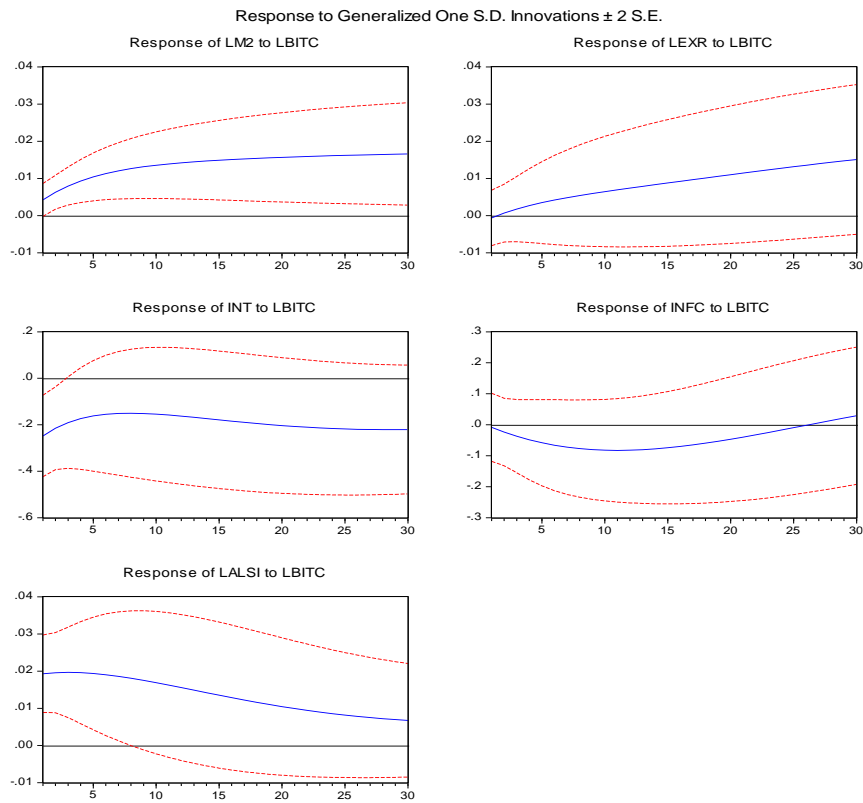
Figure 1: Results of the Impulse Response Function Showing the Responses of the Variables of Shocks in Bitcoin Prices

Further from the analysis of the impulse response function, the study estimated the forecast variance decomposition and the result is presented in Table 1

Table 1: Result of the Forecast Variance Decomposition

Variance Decomposition of LM2:

Period	S.E.	LM2	LEXR	INT	INFC	LALSI	LBITC
1	0.025489	100	0	0	0	0	0
5	0.054227	92.04236	0.092679	4.023689	0.015373	0.562693	3.263208
10	0.076726	77.73082	0.615898	11.92783	0.462983	1.051464	8.210996
15	0.095293	66.99846	1.218603	17.90928	1.522011	1.002969	11.34868
20	0.111192	60.04269	1.563202	21.58554	2.689373	0.789405	13.32979
25	0.124835	55.6625	1.64163	23.68326	3.593655	0.638566	14.78039
30	0.136602	52.88628	1.563254	24.8154	4.129515	0.63223	15.97332

Variance Decomposition of LEXR:

Period	S.E.	LM2	LEXR	INT	INFC	LALSI	LBITC
1	0.042616	1.863622	98.13638	0	0	0	0
5	0.091067	2.696178	94.83047	1.415159	0.039488	0.648229	0.370479
10	0.125803	3.897033	87.32712	5.094669	0.554185	2.029575	1.097422
15	0.152477	5.224028	78.96673	9.036381	1.823122	3.118316	1.831419
20	0.174469	6.633592	71.15198	12.40597	3.555581	3.652602	2.600274
25	0.192704	8.099076	64.36137	15.04112	5.324088	3.717868	3.456485
30	0.207756	9.599025	58.64612	17.01696	6.818208	3.502585	4.417104

Variance Decomposition of INT:

Period	S.E.	LM2	LEXR	INT	INFC	LALSI	LBITC
1	1.019097	4.88914	0.431779	94.67908	0	0	0
5	2.025613	8.947082	1.46246	88.30235	0.96991	0.273374	0.044821
10	2.586331	13.01417	3.45617	79.40661	3.294632	0.786878	0.041545
15	2.925858	15.64047	5.770122	71.93872	5.47743	0.96011	0.213147
20	3.153502	17.2363	8.118189	66.21275	6.888463	0.872437	0.671861
25	3.313686	18.1845	10.33825	61.82917	7.459039	0.860726	1.328322
30	3.432948	18.71681	12.29145	58.38088	7.428545	1.142339	2.039986

Variance Decomposition of INFC:

Period	S.E.	LM2	LEXR	INT	INFC	LALSI	LBITC
1	0.627741	0.525727	1.522283	4.018057	93.93393	0	0
5	1.202665	0.638796	8.186899	1.830032	87.39234	1.723584	0.228345
10	1.527479	0.858112	19.92666	2.7566	68.0963	7.657095	0.705231
15	1.805463	1.117908	28.47261	5.989086	49.48817	14.04352	0.888701
20	2.070487	1.40154	32.01129	9.152738	38.62222	18.02278	0.789439
25	2.299383	1.717023	32.47592	11.44079	34.10992	19.60909	0.647259
30	2.476626	2.075373	31.66421	12.94098	32.97758	19.72436	0.617493

Variance Decomposition of LALSI:

Period	S.E.	LM2	LEXR	INT	INFC	LALSI	LBITC
1	0.061213	1.519788	2.817176	0.340332	0.798709	94.524	0
5	0.127902	2.781697	7.625709	0.114014	5.688043	83.53447	0.256068
10	0.169058	4.01626	11.52252	0.151364	12.54462	71.09411	0.671123
15	0.192027	5.028812	13.07062	0.136414	17.67338	63.1505	0.94027
20	0.204208	5.977228	13.39294	0.15818	20.84611	58.52604	1.099498
25	0.210301	6.899585	13.23352	0.359152	22.40525	55.89484	1.207655
30	0.213504	7.769688	12.9589	0.802551	22.83841	54.33188	1.298573

Cholesky Ordering: LM2 LEXR INT INFC LALSI LBITC

Using a 30-month forecasting horizon, the results of the forecast variance decomposition reveals the proportion of the movement in the macroeconomic time series (money supply, inflation, interest rate, exchange rate, and stock market index) that are due to shocks in their series as opposed to shocks in bitcoin price. The estimated decompositions suggest that for money supply (M2), other than money supply itself, bitcoin price is the major source of shock. The contribution of bitcoin price to money supply lies between 0.00 to 15% over the 30-months forecast period. We can observe that by the first period, M2 accounted for 100% of the variation, while bitcoin prices and other macroeconomic variables do not explain (0%) variations in money supply and this increased to 11% in the 15th period and increased further to 15% in the 30th month period.

Analysis of the Macroeconomic Effects of Cryptocurrency Usage using the Quantile Regression Technique

Here the quantile regression estimation technique is used to analyze the macroeconomic effect of cryptocurrency usage in Nigeria. The results are reported in Table 2. The empirical estimation is carried out over the period July 2010 to June 2021. An inspection of Table 2 indicates different results. It can be observed from the second row of Table 2, that over the period July 2010 to June 2021, bitcoin price exhibited significant influence on money supply in Nigeria over the low, medium, and high quantile This suggest significant evidence of the importance of bitcoin prices on money supply in Nigeria. As shown in the third row of Table 2 crypto currency exert a positive influence on Naira(Nigeria) exchange rate at all quantiles. However, quite differently, the quantile regression estimation indicates the positive effect of cryptocurrency on inflation at high quantile. While interest rate had a negative relationship with crypto currency at both the low and high quantiles. There are no noticeable significant influences of cryptocurrency on interest rate in the medium quantiles likewise inflation in both the low and medium quantiles.

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Thus over the period 2010 to 2020, cryptocurrency exerted a positive and significant influence on exchange rate and money supply. While there is a positive influence on inflation rate at the upper quintiles. while it exerted a negative influence on interest rate at both the lower and higher quantiles

This reult is consistent with the findings of Noam (2019) who observed that private currencies were inflationary. Mallick and Mallick (2021) also reported the connectedness between Cryptocurrencies (Bitcoin, Ethereum, Litecoin, Binance Coin) and Indian Currency foreign exchange.

Table 2: Quantile Regression method (2010 to 2021)

| Macroeconomic variables | Quantile | | | | | | | | |
| | Low | | | Median | | | High | | |
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
M2	0.09a (0.000)	0.09a (0.000)	0.08a (0.000)	0.09a (0.000)	0.09a (0.000)	0.09a (0.000)	0.10a (0.000)	0.10a (0.000)	0.09a (0.000)
EXR	0.03b (0.054)	0.12a (0.000)	0.12a (0.000)	0.12a (0.000)	0.11a (0.000)	0.11a (0.000)	0.10a (0.000)	0.09a (0.000)	0.09a (0.000)
INF	0.00 (1.000)	0.50c (0.056)	0.34 (0.103)	0.14 (0.231)	0.06 (0.473)	0.07 (0.363)	0.26a (0.006)	0.37a (0.000)	0.34a (0.000)
INT	-0.49a (0.000)	-0.54b (0.000)	0.01 (0.964)	0.01 (0.918)	-0.07 (0.736)	-0.16 (0.462)	-0.28 (0.110)	-0.29b (0.049)	-0,20 (0.141)

Note: Values in parentheses ( ) are the p-values. The superscript a, b &c denote significance at the 1%, 5% and 10% respectively.

Conclusion
It has become increasingly important to understand the effect of cryptocurrency usage on the macro economy. In line with the research

objective for the study vis-à-vis investigating cryptocurrency usage and its impact on macroeconomic variables in Nigeria. Empirical results from the multivariate VAR and generated impulse response and variance decomposition indicate no strong statistically significant response of interest rate, inflation, and exchange rate to shocks in cryptocurrency which was proxied with bitcoin price. However, for other macroeconomic variables, such as money supply and stock market index, the derived impulse response results suggest that the two macroeconomic series react to a shock in bitcoin price by appreciating. This appreciation is statistically significant. Findings also demonstrate that bitcoin price significantly influenced money supply in Nigeria over the study period as money supply series reacts to a shock in bitcoin price by appreciating.

However, from the estimated Quantile regression technique, results indicate that cryptocurrency proxied by the prime bitcoin price plays an important role in influencing money supply and exchange rate across all quantiles. Results also indicate the positive influence of cryptocurrency in influencing inflationary pressure at high quantiles. While results point to the importance of cryptocurrency in explaining interest rates in the country at only the low and high quantiles.

The need therefore for Government to devise tools to study and evaluate these impacts cannot be overemphasized. The health of the economy depends to a large extent on macroeconomic stability and indeed financial system stability. The earlier government recognizes the impact and the need to provide clarity and regulation, the better it will be for financial system stability. Perhaps it is now useful to introduce "*fintecnomics'* as a branch of economics that will study the disruptive effects of the Fintech revolution to economies.

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