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The Effect of Crypto Currency on Exchange Rate in Nigeria

Babangida Danladi SAFIYANU[a], **Haruna Tijjani HARUNA**[b], **Idris Mohammed GURIN**[c], **Saifullahi Adam BAYERO**[d]

[a]Federal University, Gashua, Yobe State, Nigeria, Department of Business Administration, auduboko33@gmail.com, http://orcid.org/0000-0002-98476554

[b]Federal University, Gashua, Yobe State Yobe State, Nigeria, Department of Business Administration, telharoon@gmail.com,http://orcid.org/0000-0002-3278-0131

[c]Federal University, Gashua, Yobe State Yobe State, Nigeria, Department of Business Administration, mohammedgurin@gmail.com, http://orcid.org/0000-0001-7396-7448

[d]Bayero University, Kano Nigeria Department of Business Administration and Entrepreneurship, saifullahiadambayero@gmail.com, http://orcid.org/0000-0003-3677-1483

Abstract

In recent years, many changes in commercial activities have increased significantly. Electronic commerce continues to grow, but payment methods for services are growing, such as virtual currency. The acceptability and use of cryptocurrencies such as Bitcoin and other cryptocurrencies globally attracted the attention of economists and other financial experts in recent times. Nigeria is one of the most crypto-adopting countries globally. Still, the central bank recently issued a statement that appeared to be a ban on the usage of Bitcoin and other digital assets in the country. However, the scenario has changed as cryptocurrency grows and thrives in the country. Based on this, this study aims to examine the impact of Bitcoin on the exchange rate in Nigeria. The main independent variable is Bitcoin price volatility, specified as BTCE and controlled by the consumer price index and interest rate. The study used monthly time series data from January 2015 to December 2020 and analyzed using the Autoregressive Distributed lag model (ARDL). The result shows that Bitcoin price significantly affects the exchange rate in both the short and long run. A Higher Bitcoin price implies an appreciation of the domestic currency. Therefore, we recommend that the Nigerian government pay attention to the movement of cryptocurrency prices.

Keywords
Cryptocurrency, Exchange Rate, ARDL, Nigeria

1. INTRODUCTION

There have been several notable changes in commercial transactions in recent years. The growth of e-commerce and the form of payment for services and service providers also improved. There are different virtual currencies forms, including virtual currencies used in closed systems like cyberspace. These virtual currencies are generally not obtainable by legal tender and cannot be exchanged for legal tender (Dwi & Fazira, 2018). The second type is a virtual one-way currency, such as Amazon Coins or Facebook Credits and Microsoft Points which are no longer used today. This virtual currency can be purchased from legal tender but cannot be converted back into legal tender (Naheem, 2018). The last type is a two-way virtual currency. This virtual currency can be obtained from legal tender and redeemed with legal tender. Cryptocurrency, such as Bitcoin, is the primary example of this currency because it is not issued by the central authority (Vandezande, 2017). In addition to Bitcoin, there are also other cryptocurrencies, such as Litecoin (LTC), Ethereal (ETH), Ripple (XRP), etc.

When it comes to crypto adoption, Nigeria is one of the world's leaders (BBC, 2021). However, on 5th February 2021, the Central Bank of Nigeria (CBN) released a statement that looked to be prohibiting the usage of bitcoin and other digital assets in the country. While many perceived this to be the end of the crypto business in Nigeria, the situation has changed, with cryptocurrency continuing to grow and thrive in the country. The restriction has had little to no impact on cryptocurrency use in Nigeria, as many people have adjusted to the current situation. Crypto traders have found new ways to buy Bitcoin in the country and continue their crypto trades (Premium Times, 2021).

Several studies examine the volatility of cryptocurrency in different parts of the world; for example, Karim, Abdul-Rahman, Yau, Hwang, and Kadri (2021) investigated the determinants and volatility of cryptocurrency and concluded that financial markets have a significant relationship with the crypto market and macroeconomic determinants are positively correlated with cryptocurrency. One important implication of this finding is that the short-run and long-run effect on the exchange rate due to cryptocurrency volatility was not taken into consideration. The Crypto market is currently highly speculative, volatile, and vulnerable to speculative bubbles that could affect domestic currency exchange rates (Katsiampa, 2017). The study (Dwi & Fazira, 2018) found that Bitcoin price volatility significantly affects the exchange rate in the long run and higher Bitcoin price volatility implies higher risk.

The major question is, what are the short-run and long-run impacts of cryptocurrency price volatility on exchange rates in Nigeria? This is the thrust of this paper; the study considered the short-run and long-run effects of cryptocurrency price volatility in Nigeria using Bitcoin price volatility, interest rate, and consumer price index as independent variables and exchange rate as a dependent variable. Autoregressive Distributed Lag Model (ARDL) is used to investigate the relationship. ARDL model is more robust and performs better for small sample size data, suitable for this research.

2. LITERATURE REVIEW

Bitcoin is decentralized digital money that was first introduced in January of 2009. It is based on Satoshi Nakamoto's concepts, which were laid out in a white paper by the mysterious and pseudonymous Satoshi Nakamoto (Bitcoin project, 2021). The identity of the individual or people behind the technology is still unknown. Bitcoin promises reduced transaction fees than existing online payment methods, and it is run by a decentralized authority, unlike government-issued currencies.

Bitcoin is based on a distributed structure spread through a peer-to-peer computer network. No central trust authority governs or maintains this system, and users are free to transact with other participants without fear of being watched or supervised (Wang et al., 2017). Because Bitcoin is so liquid, anyone can exchange it for any currency at any moment. On the other hand, the Bitcoin protocol does not impose any restrictions on transfers, even if the identity of its users is unknown. In comparison to other currencies maintained by banks, this enables foreign transactions a lot of freedom and speed (Dyhrberg, 2016).

Bitcoin can be obtained through "mining". Mining is done by special hardware with a certain amount of computing power, measured in hashes per second. Hash can be considered somewhat similar to the processing power of the CPU microchip, which is measured in hertz to determine how many individual calculations can be achieved per second. The aggregate Bitcoin network has a cumulative computing power additive for all mining operations employed worldwide. For every one GigaHash per second (1 GH / s = 109 hash) each miner puts online, the amount will be added to the overall network power. Mining is quite competitive because someone who mines with more computing power or with greater efficiency has a better chance of finding new Bitcoin than others (Hayes, 2017). In addition to mining, Bitcoin can also be obtained in exchange for domestic currency such as dollars, euros, yuan, etc.

Several studies investigate the determinant and volatility of cryptocurrencies. Studies such as (Janicki, 2019; Karim et al., 2021) claim that macroeconomic determinants are correlated with the volatility of cryptocurrencies, and financial markets have a significant relationship with the crypto market. Dyhrberg (2016) examines the capabilities of Bitcoin as a financial asset using GARCH models; the result shows that Bitcoin is useful in risk management and important for risk-averse investors. The volatility of Bitcoin and its role as a medium of exchange and store of value was also examined by (Baur & Dimpfl, 2021), who found that Bitcoin cannot function as a medium of exchange and has only limited use as a risk diversifier. Chang et al. (2021) examine the relationship between the Bitcoin exchange rate and other financial indexes in time series. The findings show that the Bitcoin exchange rate and google search volume index have a bi-directional relationship in both the short run and long run. The VIX is significantly related to the Bitcoin exchange rate in the long term cointegration. Therefore, this study analyzed the short-run and long-run impact of Bitcoin price volatility on the exchange rate in Nigeria, taking into account the interest rate and consumer price index as a proxy of inflation.

3. METHODOLOGY

This study uses autoregressive distributed lag (ARDL) to analyze the research problem. The Naira exchange rate to the US dollar is used as the dependent variable. The independent variables consist of the bitcoin price volatility of the BTCE, interest rate, and consumer price index as a proxy of inflation variables are in a natural logarithm. A sample of 72 observations consists of monthly data from January 2015 to December 2020 from the Central Bank of Nigeria, while Bitcoin price volatility data from www.eoddata.com. The model specification in this research is as follows:

$$ERt = \beta o + \beta 1VOLBTCt + \beta 2CPIt + \beta 3INTR + et \ldots\ldots\ldots\ldots\ldots..(1)$$

Where;

ER is the natural logarithm of the exchange rate

VOL_BTCE is the price volatility of BTCE bitcoin

CPI is the consumer price index, and

INTR is the interest rate.

Cointegration of the ARDL Bound test does not require all the integrated variables in the same order. It is developed based on the variables integrated in the order I (0) and I (1) or when all the variables are integrated in the order I (1). Abound test is done to find out the long-run relationship based on theory. Without information about the long-run relationship of the variables in the model, therefore the model is presented below;

$$\Delta InEXR = \beta 0 + \sum_{i=0}^{p} \beta 1 \Delta\ InEXRt - 1 + \sum_{i=0}^{p} \beta 2 \Delta InVOLBTCt - 1 + \sum_{i=0}^{p} \beta 3 \Delta InCPIt - 1 + \sum_{i=0}^{p} \beta 4 \Delta\ InINTt - 1 + \lambda 1 InEXRt - 1 + \lambda 2 InVOLBTCt - 1 + \lambda 3 InCPIt - 1 + \lambda 4 InINTt - 1 + et \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

The coefficients $\lambda 1$ to $\lambda 4$ show the long relationship between the variables, and the coefficients show a dynamic short-run relationship among the variables. The symbol "p" denotes the optimum lags in the model, ln is the logarithm operation, and Δ indicates the difference operator. In the Bound test, the combination of F-statistic whose unstandardized asymptotic distribution in the null hypothesis that there is no cointegration. According to equation 1:

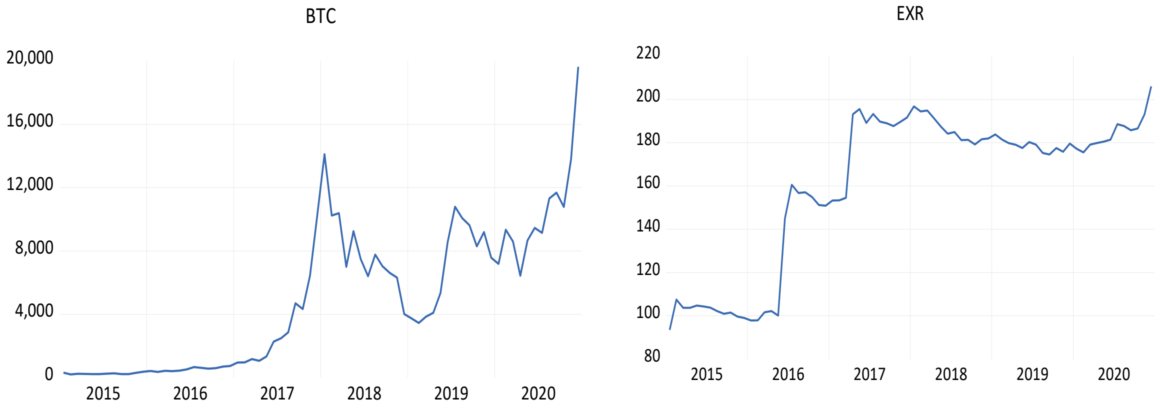
$$H0 = \beta 1 = \beta 2 = \beta 3 = 0$$

$$H1 = \beta 1 \neq \beta 2 \neq \beta 3 \neq 0$$

In this step, F-statistic will be compared with the critical value tabulated by Narayan (2004) and Pesaran et al. (2001). If the F-statistic is higher than the upper critical, the null hypothesis (no cointegration) can be rejected, so the long-run relationship does exist. F-statistic that is smaller than a lower critical value implies that there is no cointegration since we cannot reject the null hypothesis. Meanwhile, F-statistic greater than the lower critical value but smaller than the upper critical value means the cointegration cannot be decided. For a model with all variables stationary at first order (I(1)), the decision is made based on the upper critical value. For a model whose variables are stationary in the level, the lower critical value must be a single consideration.

4. RESULT

The stationary test is essential for making sure the character of the data is relevant to be analyzed using ARDL. This study employs augmented Dickey-Fuller (ADF) for the unit root test. Before this test, the data is plotted to investigate the behaviour of the data. Figure 6 indicates that several variables in the model experience a trend. This is possible that some variables are not stationary at the level.



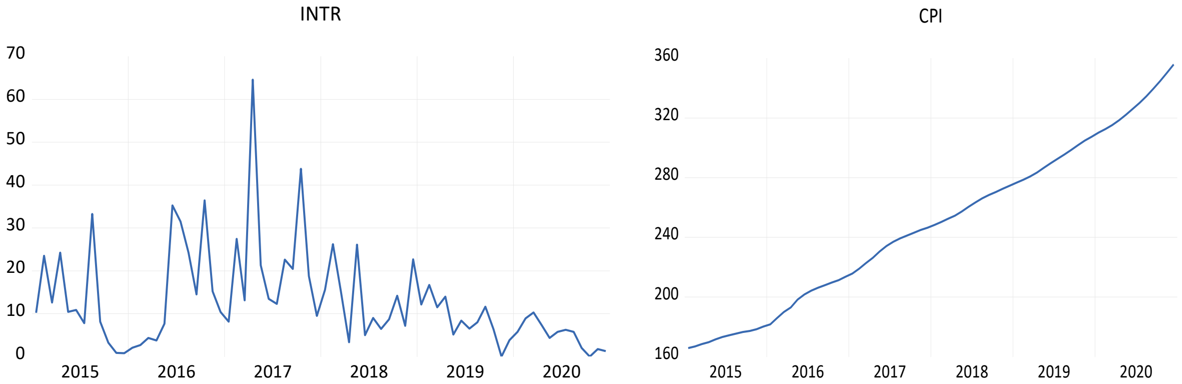


Figure 1. Trend analysis

From the diagrams, all the variables exhibit non-stationarity except interest rate. Furthermore, table 1 shows the unit root test using the augmented Dickey-Fuller method, which gives information on the stationarity of the variables. The exchange rate, the volatility of BTCE bitcoin price, and the consumer price index are stationary at first differencing while the interest rate is stationary at level.

Table 1. Unit Root Test

Variables	Constant				Order of intergration
	Levels	p-value	1st Difference	p-value	
VOL_BTC	-0.50526	0.8833	-7.826200	0.0000	(1)
EXR	-1.76421	0.3951	-7.717757	0.0000	(1)
CPI	-0.12003	0.9424	-4.954442	0.0001	(1)
INTR	-	-	-2.72151	0.0760	(0)

Cointegration Test

After determining the stationarity level of each variable, the next step is to test whether there is a long-term relationship between variables in the equation using the bound test approach. In table 3, the F-statistic (F-statistic = 16.46966) is higher than the critical upper Bound (4.37) at 1% significance, meaning the null hypothesis of the absence of cointegration is rejected. There is a linear combination of variables in stationary and integrated models, indicating a long-term relationship between exchange rate and independent variable volatility BTCE, consumer price index, and interest rate.

Table 2. Bound Test

Dependent variable In exchange rate

F-statistics = 16.46966 K = 3

Significant level	Lower Bound	Upper Bound	Decision
1%	2.37	3.2	Exist relationship
2.5%	2.79	3.67	Exit relationship
5%	3.15	4.08	Exit relationship
10%	3.65	4.66	Exit relationship

Table 3 displays the long-term estimation for ARDL based on Akaike information criteria. BTC price volatility is negatively related to exchange rate in the long run, while consumer price index and interest rate are positively related to exchange rate in the long run, and all are statistically significant.

Table 3. Long Run Estimation

ARDL Estimation. Dependent variable In exchange rate

Variables	Coefficient	Std. error	t-statistics	Prob.
VOLBTC	-0.04724	0.010178	4.637911	0.000
CPI	0.812185	0.016249	49.98292	0.000
INT	0.102741	0.012843	8.00043	0.000

Note: significant level 5% [p-value 0.05]

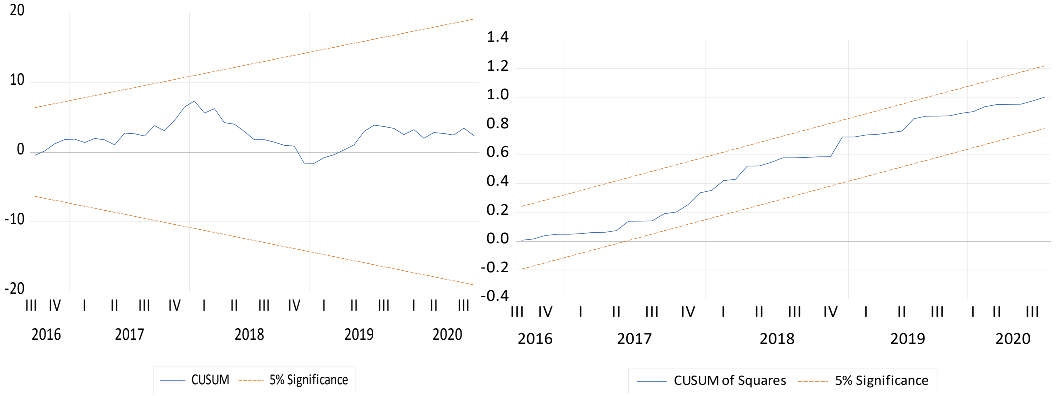
After performing cointegration tests, the error correction model (ECM) is estimated to capture short-term dynamics. ECM regression result shows that the consumer price index has no impact on the exchange rate in the short run, while the interest rate significantly impacts the exchange rate in the short run. One-period long-term residual estimate with negative and significant coefficients at a significant level of 5%, ensuring that long-term equilibrium convergence can be achieved. The speed adjustment of the ECM model is -0.51183, which shows that about 51% of the deviation from long-run equilibrium is adjusted every year. It also shows that it will take more than a year to adjust to equilibrium once disequilibrium occurs.

Table 4. ECM Regression Result

Variable	**Coefficient**	**Std. error**	**t-statistics**	**Probability**
D(EXR(-1))	0.604250	0.194353	3.109027	0.0031
D(CPI)	0.065219	1.80004	0.036272	0.9712
D(CPI(-1)	-0.676293	2.45198	-0.275814	0.7834
D(INT)	0.017446	0.006612	2.638416	0.0111
CointEq(-1)	-0.51183	0.241198	-0.26804	0.000

Stability tests are conducted using CUSUM and CUSUM of squares (CUSUMSQ) tests that reflect the stability of the estimated coefficients of the model while presenting a structural change in the correlation. The results are shown in figure 2 below. The result shows that the CUSUM and CUSUMSQ lie within the limits of the significance interval at the 5% threshold. Therefore, the coefficient appears stable.

Figure 2. Stability Test



The other diagnostic tests are the issue of heteroscedasticity and serial correlation. Table 5 indicates that there is no issue of autocorrelation error and heteroscedasticity since the F-statistic is higher than the critical value so the insignificant P-value confirms this statement for both of the tests.

Table 5. Diagnostic Test

	F-statistics	p-value
Serial correlation test	1.443954	Prob. F(2,43) 0.2472
Heteroscedasticity test	0.793406	Prob.F(14,45) 0.6709

5. DISCUSSION

In the long term, Bitcoin price volatility has a significant negative effect on the exchange rate in Nigeria. When the Bitcoin price is low, people would be willing to buy and hold, which raises the exchange rate as local currency needs to be converted to US Dollar before buying Bitcoin in the crypto market. An increase in the demand for the Dollar leads to an increase in the exchange rate and, hence, the local currency's depreciation. On another hand, when the price of Bitcoin is high many people may be willing to sell, and the demand for the Dollar will be low which will cause an appreciation of the local currency. This corresponds to the theory that says when there is an increase in exports the exchange rate will appreciate. This is also in line with the findings of (Dwi & Fazira, 2018), that a decrease in price volatility of BTCE and current account leads to an increase in exchange rates while an increase in money supply increases the exchange rate.

However, some countries do not recognize bitcoin as a valid paying tool and for countries that permit bitcoin, not all producers/sellers accept bitcoin as a means of payment. Therefore, bitcoin is more often used as an investment tool. High price volatility gives high-risk consequences so that the higher the bitcoin volatility the higher the risk. In the long term, if bitcoin prices are more volatile it will cause people to be less reluctant to invest in bitcoins. Hence, people tend to switch bitcoin to the regular currency so that the domestic currency will be appreciated.

6. CONCLUSION

Nigeria is one of the world's leaders. However, on 5th February 2021, the Central Bank of Nigeria (CBN) released a statement that looked to be prohibiting the usage of bitcoin and other digital assets in the country. While many perceived this to be the end of the crypto business in Nigeria, the situation has changed, with cryptocurrency continuing to grow and thrive in the country. The restriction has had little to no impact on cryptocurrency use in Nigeria, as many people have adjusted to the current situation. From the results analyzed above, it can be concluded that the volatility of bitcoin prices in the long term has a significant negative effect on the exchange rate. The higher the volatility the higher risk. So that when the price volatility increases, people will switch to other investments besides bitcoin. The magnitude of the risk of investing in virtual money will tend to lead people to investments in regular currency so that the domestic currency will be appreciated. Therefore, we recommend that the Nigerian government pay attention to the movement of cryptocurrency prices.

REFERENCES

Baur, D. G., & Dimpfl, T. (2021). The volatility of Bitcoin and its role as a medium of exchange and a store of value. *Empirical Economics*, *61*(5), 2663-2683.

Chang, C. Y., Lo, C. C., Cheng, J. C., Chen, T. L., Chi, L. Y., & Chen, C. C. (2021). Relationship between Bitcoin Exchange Rate and Other Financial Indexes in Time Series. *Mathematical Problems in Engineering*, 20(21), 1-9

Cheah, E. T., & Fry, J. (2015). Speculative bubbles in Bitcoin markets? An empirical investigation into the fundamental value of Bitcoin. *Economics Letters*, 130, 32-36.

Dwi R. and Fazira, N. (2018): The Effect of Cryptocurrency on Exchange Rate of China: Case Study of Bitcoin. *MPRA*, 93052

Dyhrberg, A.H. (2016). Bitcoin, gold and dollar-A Garch volatility analysis. *Finance Research Letters, 16*(1), 85-92

Naheem, M.A. (2018), "Regulating virtual currencies – the challenges of applying fiat currency laws to digital technology services", *Journal of Financial Crime*, 25 (2), 562-575.

Karim, B. A., Abdul-rahman, A., Hwang, j. Y. T., and Kadri, N. (2021). Portfolio diversification benefits of cryptocurrencies and ASEAN-5 stock markets. *The Journal of Asian Finance, Economics and Business*, 8(6), 567-577.

Narayan, P. K. (2004). Fiji's tourism demand: the ARDL approach to cointegration. *Tourism Economics*, 10(2), 193-206.

Sharma, G. D., Jain, M., Mahendru, M., Bansal, S., & Kumar, G. (2019). Emergence of Bitcoin as an investment alternative: A systematic review and research agenda. *International Journal of Business and Information*, 14(1), 47-84.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, 16(3), 289-326.

Vandezande, N. (2017). Virtual currencies under EU anti-money laundering law. *Computer law & security review*, 33(3), 341-353.