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The Relationship Between Cryptocurrencies and the Trade Balance of Nigeria

Kripto Paralar ile Nijerya'nın Dış Ticaret Dengesi Arasındaki İlişki

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Abstract

Bitcoin has increased rapidly in value since the first day of its integration into today's markets. The increases experienced have directed the interest of global investors to this field over time. In addition to these developments, the increasing popularity of blockchain technology and the increase in the volume of cryptocurrencies have turned these currencies into an important tool for commercial activities. Although there are many studies to measure the international trade balance with exchange rates, no study has been found to examine the relationship between the change in cryptocurrency prices and the trade balance of countries. In this study, the relationship between the trade balance of Nigeria, one of the leading countries in the world in terms of cryptocurrency usage, and cryptocurrencies is analysed using NARDL analysis with coefficient symmetry test (2016/M4-2020/M12). According to the research results, Bitcoin and Litecoin can have significant long-term impact on Nigeria's trade balance.

Keywords: Cryptocurrencies, Trade Balance, Nardl, Coefficient Symmetry Test

Öz

Bitcoinin günümüz piyasalarına entegre oluşunun ilk gününden bugüne kadar değer olarak hızlı şekilde yükseliş kaydetmiştir. Yaşanan artışlar, küresel yatırımcıların ilgisini zamanla bu alana yönlendirmiştir. Bu gelişmelerin yanı sıra blockchain teknolojisinin popülerliğinin artması ve kripto para birimlerinin hacminin yükselmesi, bu para birimlerinin ticari faaliyetlerde de kullanılması açısından önemli bir araç haline dönüştürmüştür. Döviz kurları ile uluslararası ticaret dengesini ölçmeye yönelik birçok çalışma olmasına rağmen, kripto para birimi fiyatlarındaki

değişim ile ülkelerin ticaret dengesi arasındaki ilişkiyi inceleyen herhangi bir çalışma tespit edilememiştir. Bu çalışmada, kripto para kullanımı açısından dünyadaki öncü ülkelerden biri olan Nijerya'nın ticaret dengesi ile kripto para birimleri arasındaki ilişki NARDL analizi katsayı simetri testi ile kullanılarak incelenmiştir(2016/M4-2020/M12). Araştırma sonuçlarına göre, kripto para birimleri arasında yer alan Bitcoin ve Litecoin'in, Nijerya'nın ticaret dengesi üzerinde önemli ve uzun vadeli bir etkiye sahip olacağını göstermiştir.

Anahtar Kelimeler: Kripto para birimleri, Dış Ticaret Dengesi, Nardl, Katsayı Simetri Testi

Introduction

Cryptocurrencies have gained significant importance in the global economy, driven by technological advancements that expand investment options and diversify instruments for savers while reducing information access costs. Telek and Sit (2020) emphasize the ongoing transformations in investment and payment tools within the trade sector. In today's digital era, cryptocurrencies challenge traditional fiat currencies, offering an alternative form of currency without central regulatory control over money issuance (Sufian and Farooq, 2016). Given the stock-like trading nature of cryptocurrencies, their potential as a substitute for gold, and their tendency to appreciate during economic turbulence, it's reasonable that global stock indices, gold prices, and volatility indicators like the VIX and the U.S. Economic Policy Uncertainty Index influence their market values (Malladi and Dheeriya, 2021). Therefore, the evolution of cryptocurrencies has become more important for macroeconomic research.

The rise of e-commerce and internet-based global trade has brought revolutionary changes to international business. However, the efficiency of these processes has faced challenges due to the need for precise information and prolonged confirmation procedures for tracking goods, financial transactions, and information flows (Chang et al., 2019). To address these challenges and enhance transparency, blockchain technology is being introduced. Blockchain increases efficiency by eliminating paperwork, costs, and delays from third parties and promoting international trade. It facilitates easy interaction across geographical locations and fosters trust, making it necessary for organizations seeking success (Derindag et al., 2020). Traditional international transactions often encounter obstacles such as time zone differences and legal restrictions, posing risks

for banks and clients. In contrast, blockchain technology can complete transactions in ten minutes or less, regardless of time constraints, thanks to advancements in communication and hardware (Cekerevac and Cekerevac, 2022).

Moreover, blockchain technology can also be used to diminish intermediary costs, such as banking transaction costs. Networks are vital for transferring cryptocurrencies. Using the TRC20 token standard, developers can build decentralized apps (dApps) on the blockchain-based TRON (TRX) platform. TRC20, which enables programmers to write smart contracts on the TRON network, is comparable to Ethereum’s ERC20 token standard. On the TRON network, TRC20 tokens stand for digital assets and are used to make small payments. In addition, they are more accessible to maintain because they support many wallets, offer reduced transaction fees, and enable faster transactions thanks to TRON’s scalability (BingX, 2023). It enables flexibility, lower transaction fees, faster transactions, and wallet compatibility (BingX, 2023). In international trade operations, sudden price changes in exchange rates can be a big problem for traders. If traders use cryptocurrencies, the probability of incurring currency risk is higher. Tether USDT can be used in the TR20 network to protect from that risk. Tether USD can be used to diminish volatility during international trade operations. Moreover, digital tokens called utility tokens are utilized for blockchain-based goods and services that work on blockchain platforms. They run on Ethereum and are mostly ERC20, but other token forms like TRC10 and TRC20 have developed with the launching of new platforms (Kommuru et al.,2022). One of the essential objectives is to reduce transaction time in minutes.

Table 1

Transaction time in minutes

Cryptocurrencies	Transaction time in minutes
Bitcoin	40
Ethereum	14
Tether USD(USDT ERC-20)	14
Tether USD (USDT TRC-20)	2
USD Coin(USDC)	14
Ripple	Near-instant
Cardano	10

Solana	Near-instant
Dogecoin	40
Polkadot	2
Polygon	14
Shiba Inu	14
Tron	1

Source: (Statista, 2022)

In recent years, there’s been a noticeable improvement in transaction processing times for alternative cryptocurrencies, as indicated in **(Table 1)**. Unlike traditional currencies, the volatility of cryptocurrencies is not tied to their network characteristics but is driven by the dynamics of supply and demand in the cryptocurrency market. Additionally, macroeconomic indicators like Fed interest rate decisions, famous people’s tweets like Elon Musk’s messages and speculative attacks, and national decisions like the China ban on cryptocurrencies all significantly impact the price changes of cryptocurrencies. This external influence contributes to the high volatility of cryptocurrency values. As a result, cryptocurrency values can fluctuate during international trade transactions, making the Tether USD TRC-20 system a viable option for cross-border money transfers. While Bitcoin may have slower transaction speeds than some other cryptocurrencies, its volatility strongly influences the values of other cryptocurrencies. Bitcoin, Ethereum, Ripple, and Dogecoin are among the ten cryptocurrencies in terms of market capitalization (Forbes, 2024). In addition, Bitcoin is the gold of the blockchain system, and Ethereum is intensely used in smart contracts. Moreover, since Litecoin is the silver of cryptocurrencies and more coins can be generated through Litecoin than by Bitcoin(Investopedia), Litecoin is also popular with investors. Furthermore, due to the fast and cheap transactions, Dogecoin is also popular among cryptocurrency users. Since Ripple’s transaction time is nearly instant and is also used by financial institutions, it is widely used in the cryptocurrency market. For the given reasons, Bitcoin, Ethereum, Litecoin, and Dogecoin are vital standardized currencies in the blockchain system. Cryptocurrencies are important components of blockchain systems. In the future, when blockchain systems are more standardized in international trade and adopted by countries’ legal systems, cryptocurrencies can be more intensely used in foreign trade activities. Researchers are working hard to determine how CBDCs (central bank digital currencies) relate to international trade and assets, particularly cryptocurrencies (Bhaskar et al., 2022). In addition, Bitcoin can be used

for online cross-border transactions and domestic payments, and future growth in the payment ecosystem is expected to be crucial (Onyekwere et al.,2023). It can be interpreted that Bitcoin can be a standardized tool for international trade payments in the future.

Many studies focused on the nexus between the currencies and the trade balances(Arthur et al., 2022; Barkat et al., 2022; Berbenni, 2021; Eshetu and Eshetu, 2021; J. Mehtiyev et al., 2021; Jiang and Liu, 2022; Ozcelebi et al., 2021). Since cryptocurrencies have been becoming more critical for macroeconomic research and there is no research conducted between cryptocurrencies and the trade balance of countries, the probability of implementing standardized international trade operations via cryptocurrencies in the future, new research on the nexus between cryptocurrency and trade balance is needed.

As of 2020, Nigeria ranked third among the top 10 countries for cryptocurrency trade volumes, trailing behind the U.S. and Russia, with transactions exceeding \$400 million (BBC, 2021). Research by Trading Browser indicated that Nigeria has the highest number of cryptocurrency users and owners globally, with 45% of the population reportedly using or owning cryptocurrency in 2022, surpassing the U.K.'s population by 1.5 times (Nairametrics, 2023). Bitcoin, a blockchain-based cryptocurrency, has garnered significance in the FinTech industry, attracting attention from regulators, investors, and the media. It has achieved a global valuation exceeding \$2 trillion, making it the predominant virtual currency in Nigeria. With a reported acceptability rate of 97.5%, Bitcoin stands as the most widely used cryptocurrency, as per a survey encompassing 320 responses, and it is anticipated that Bitcoin will emerge as the most popular digital currency during the next five years (Onyekwere et al., 2023). In addition, Nigeria secured the seventh position in Chainalysis' 2020 study on global Bitcoin usage. Additionally, a Statista survey from March indicated that 32% of respondents utilize cryptocurrencies (Yahoo Finance). With Nigeria's inflation rate around 18% in 2021, the Nigerian naira has depreciated (Yahoo Finance). Bitcoin occasionally acts as a substitute for the dollar, making it possible to protect against the inflation of the naira, even though U.S. dollars may be difficult to find in Nigeria (Yahoo Finance). Because most Nigerians' purchases are imported, U.S. dollars are in high demand and frequently in short supply (Yahoo Finance). Due to these considerations, it can be easily stated that cryptocurrency is significant for Nigeria. For these reasons, Nigeria has been specially selected for this paper.

Although there is no direct research about the relationship between trade balance and cryptocurrencies value, there are some studies about cryptocurrency usage in the global economy.

The goal of this research is to strengthen the shortcomings of the current central bank digital currencies (CBDCs) that are based on fiat money by introducing a new cryptocurrency called Export Crypto. The strength of the global economy and the balance of commerce between nations determine the value of cryptocurrencies, with exports and a fair trade balance being important variables. The study modifies the model from CBDCs by including purchasing power parity (PPP) (Han et al., 2022). Moreover, Anuyahong and Ek-udom (2023) researched about the impact of cryptocurrency on global trade and commerce. While there are advantages to cryptocurrency, such as lower transaction costs, quicker settlement times, and greater transparency, there are drawbacks as well, such as legislative obstacles, security issues, and a lack of information (Anuyahong and Ek-udom, 2023). Although specific licensing regimes and focused enforcement operations have been implemented, there is no evidence that cryptocurrency regulatory measures drive traders to leave or enter impacted jurisdictions (Feinstein and Werbach, 2021). Moreover, due to their potential to boost GDP and enable international trade, crypto-assets with characteristics like ownership proof and encryption draw interest from investors. They increase the effectiveness and smoothness of the international trade process by removing conventional hurdles and risk (Mustafa, 2022). It can be interpreted that cryptocurrencies can be used during the international trade operations.

Han et al. (2022) focused on a new cryptocurrency called Export Crypto for international trade operations, and Anuyahong and Ek-udom (2023) researched the influence of cryptocurrencies on global trade and commerce. Mustafa (2022) mentioned the possibility of cryptocurrency usage for international trade operations and mentioned the regulatory frameworks for more standardized cryptocurrency usage. Although there is some research about cryptocurrency usage in international trade operations, there is no research that uses NARDL analysis to gauge the relationship between the price movements of cryptocurrencies and Nigeria's trade balance. That makes our research different from other research that focused on cryptocurrency usage in international trade operations. Moreover, in the methodology part of the study, Nigeria's trade balance is chosen as the dependent variable, and selected cryptocurrencies will be used as dependent variables. Naira/USD parity is chosen as a control variable, and NARDL analysis with a coefficient symmetry test

is applied. The main objective of this study is to examine the impact of cryptocurrency price fluctuations on Nigeria’s trade balances between 2016–M4 and 2020–M12, and the study is concluded with conclusions and various recommendations.

NARDL Analysis

In that research, all data were secondary. Cryptocurrency data were retrieved from (Investing.com). Naira/USD parity data were collected from (Investing.com), and the trade balance data were taken from (Trademap). As it was mentioned before, cryptocurrency data were chosen as Bitcoin, Litecoin, Ethereum and Dogecoin and Ripple.

Table 2

Dependent and Independent Variables

Dependent Variable	Trade Balance of Nigeria
Independent Variable	Bitcoin
Independent Variable	Ripple
Independent Variable	Litecoin
Independent Variable	Ethereum
Independent Variable	Dogecoin
Control Variable	USD/Naira Parity

The NARDL model stated that the independent factors’ asymmetrical effects on the dependent variables were positive and negative. As a result, the effects of the independent variables’ positive and negative changes on the dependent variables would be distinguished (Choochote et al., 2023)

$$Y_t = a_0 + b_1 Y_{t-1} + a_2 X_{t-k}^+ + a_3 X_{t-1}^- + a_4 C + v_t$$

In that equation Y is trade balance. Y_{t-1} is the lagged values dependent variable. a_0 is intercept. X_{t-k}^+ shows positive changes in independent variables, and X_{t-1}^- indicates the negative shifts of independent variables. C is the set of control variables and v_t is the residual. The justification of applying that analysis derives from the view that there is too much volatility in trade balances of countries and cryptocurrencies. In other words, there are frequent non-linear data tendencies. In addition, asymmetric effects will be observed. If the independent variables are found to be asymmetric, their impact will be measured in both positive and negative directions for the short-term and long-term impact. To

diagnose asymmetric variables, the coefficient symmetry test will be applied for the short run, long run, and short and long run (joint form). The smallest AIC models will be used as ideal criteria, and the lag values in the NARDL will be determined accordingly. Unless any asymmetric variable is found, ARDL model will be used. Robustness tests will also be implemented.

Application For Nigeria

Before implementing NARDL test coefficient symmetry test was used.

Table 3

Coefficient Symmetry Tests for Nigeria

Long-Run			
P-value			
BITCOIN	F-statistic	9.593111	0.0033
LITECOIN	F-statistic	5.453794	0.0195
USD/NAIRA	F-statistic	13.85827	0.0005

The test findings showed that (Table 3) using Bitcoin for short-run asymmetry was not feasible. Only Long-run asymmetry is accepted. Out of 500 models, NARDL (1,2,0,0) was selected as the optimal model since it had the lowest AIC score. The alteration in Nigeria's trade balance was unaffected by price changes in Ethereum, Dogecoin, and Ripple. USD/Naira parity was added as a control variable. The NARDL technique (Table 4) revealed that Bitcoin price fluctuations do not significantly impact Nigeria's trade balance in the short term. Bitcoin's positive and negative price changes are expected to have an important influence on Nigeria's trade balance. Moreover, it has been found that a positive price change in Litecoin's price can have a favorable long-term impact on Nigeria's trade balance. When the coefficient values are interpreted for Bitcoin and Litecoin, it can be mentioned that the positive price change of the Litecoin coefficient(12190.41) is much more than the coefficients of positive(-171.9607) and negative price changes(331.1648) in Bitcoin. In addition, when the coefficients are compared for positive and negative changes in Bitcoin prices, it can be indicated that the negative price change coefficient (331.1648) is more than the positive price change coefficient (-171.9607) (Table 4).

Table 4

NARDL Analysis for Nigeria

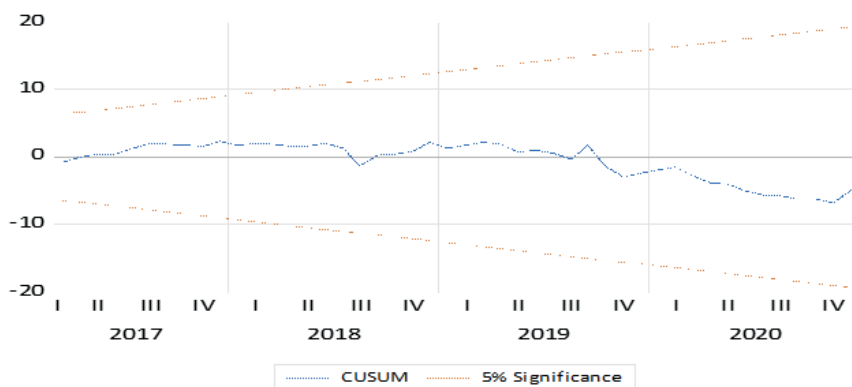
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TRADEBALANCE(-1)	-1.352909	0.144964	-9.332754	0.0000
@CUMDP(BIT-COIN(-1))	-171.9607	85.38611	-2.013919	0.0499
@CUMDN(BIT-COIN(-1))	331.1648	150.0962	2.206350	0.0324
@CUMDP (LITECOIN)	12190.41	5084.976	2.397338	0.0206
@CUMDN (LITECOIN)	-9023.881	9441.102	-0.955808	0.3442
@CUMDP (NAIRA/USD)	-13026.49	4836.480	-2.693382	0.0098
@CUMDN (NAIRA/USD)	-154696.1	42423.66	-3.646457	0.0007
D(BITCOIN)	23.63679	88.66868	0.266574	0.7910
D(BITCOIN(-1))	-123.2548	89.03999	-1.384264	0.1730

The model R-square was found to be 0.663714. The f-statistics is 0.00, which means the analysis can be implemented. In addition, for the robustness of the model, the ARDL bound test was also implemented. The f-statistic value was found to be 12.859330. That test statistic result exceeds the asymptotic sample size for I (0) and I (1), which are 2.040

and 3.240, respectively. Moreover, the Cusum test was also applied to test the model's robustness.

Figure 1

Cusum Test for Nigeria



Cusum test (Figure 1) indicates that there is no structural break problem in NARDL analysis. When the robustness test results are considered, it can be mentioned that there is no structural problem in the NARDL analysis.

Conclusion

This research is the first to investigate the short-term and long-term nexus between cryptocurrencies and Nigeria's trade balance between 2016-M4 and 2020-M12. Econometric analyses were conducted to observe the influence of cryptocurrencies (Bitcoin, Litecoin, Dogecoin, Ethereum, and Ripple) on Nigeria's trade balance. According to the research, Bitcoin and Litecoin usage can be more important for Nigeria's international trade transactions. Moreover, adverse changes in the first lag of the Bitcoin price movement significantly and positively influence Nigeria's trade balance. Positive price change can have a detrimental long-term impact on the same variables. It is evident from comparing the coefficients for positive and negative changes in Bitcoin prices that the negative price change coefficient is greater than the positive price change coefficient. In addition, when Bitcoin prices become cheaper, Nigerian traders can obtain them more in advance and use more Bitcoins for future international trade operations even if the Bitcoin price can rise fast. It has also been found that a positive price change in Litecoin is expected to have a long-term positive impact on Nigeria's trade

balance. It may be noted that the positive price change of the Litecoin coefficient is significantly greater than the coefficients of positive and negative price changes in Bitcoin when the coefficient values for Bitcoin and Litecoin are interpreted (**Table 4**). Although Litecoin is less popular than Bitcoin in the cryptocurrency system, Litecoin block construction efficiency is better than Bitcoin block construction efficiency in the blockchain system. So, due to block construction efficiency performance and NARDL research result, Litecoin payment can also be considered an alternative payment in international trade operations for Nigeria. When econometrical results are evaluated in the economic context, it can be mentioned that cryptocurrencies such as Bitcoin and Litecoin have similar long-term functions for influencing trade balance with regular foreign exchanges such as USD that are used in international trade operations in Nigeria.

Nevertheless, as mentioned before, compared to other cryptocurrencies, Bitcoin transaction speed in the peer-to-peer system is not fast enough compared to other cryptocurrencies. In the future, fast transaction times will be more critical for international trade transactions. In addition, Bitcoin's fast price change can also be problematic for foreign trade transactions. In other words, due to the fast price changes, systematic risk theory can occur and unearth the cryptocurrency exchange risk. Sudden price changes can negatively alter the international trade operations of the firms. When exporters get Bitcoin from importers, Bitcoin value can plummet fast, and exporters may lose much money. When an importer plans to buy Bitcoin for foreign trade transactions, Bitcoin's value can rise fast, and in that case, the importer has to pay more to obtain it. In order to solve that problem, Nigerian international traders can use Tether USD with TRC-20. After exporters get a Tether USD payment, if Bitcoin prices are not too high, they can convert Tether USD to Bitcoin and obtain goods and services that Bitcoin prices. In addition, importers may buy Tether USD in advance, and if Bitcoin prices are at moderate or low levels, they can exchange Tether USD for Bitcoin and save much money if they only need to pay the exporters with Bitcoin at the due date if Bitcoin's value increases fast at the due date. Exporters use Bitcoin and Litecoin for capital gain purposes, and with capital gains, they can invest more in their export activities. Cryptocurrencies offer cheaper and faster remittances, as well as creating new investment opportunities and creating new job opportunities in Nigeria. Socially, cryptocurrencies can increase financial inclusion in Nigeria, allowing individuals to interact more in the global economy and raise awareness of financial technologies. Moreover, Nigeria political system is between capitalism and socialism.

In that system, it is possible to use cryptocurrencies. With regulated framework of cryptocurrencies and their usage in international trade operations, cryptocurrency usage can be more widespread in Nigeria. In addition, if Nigeria wants to increase its international trade volumes, it can construct a national blockchain system and publish the rules of international trade in the blockchain system. Although the blockchain system is decentralized and trust-based, a state control mechanism is needed to prevent fraudulent activities. Moreover, Nigerian customs can also be integrated into the blockchain system. With blockchain technology, international trade documents can be reached faster at customs than regular systems. When information is given to customs in the blockchain system, that information cannot be changed due to the nature of the blockchain system. So, exporters and importers or their customs representatives must be more careful when sending documents to customs via the blockchain system. If the blockchain system is efficiently applied in Nigeria, international trade processes can be faster. In addition, legislation is needed for cryptocurrency payments. With the legislation, cryptocurrency payments in international trade can be more standardized. In addition, smart contracts for international trade in blockchain systems shall be feasible under Nigeria's and other side country laws. If it is not feasible, artificial intelligence shall give the warning, and a new smart contract has to be prepared. If the smart contracts are properly implemented, exporters and importers can confirm the contract. In the future, Nigerian banks can give more importance to cryptocurrency payments in international trade activities. Customers can open cryptocurrency accounts such as Tether USD, and when the money comes in, the bank can record the export value. The Central Bank of Nigeria and Nigeria Customs can also collect that information. With an effective blockchain system and the participation of governmental bodies under trade regulations, international trade processes can be more reliable and fast, and international trade volumes can increase with cryptocurrencies via standardized blockchain systems. There has been some research on using cryptocurrencies in international trade operations, but none that employs NARDL analysis to assess the relationship between cryptocurrency price fluctuations and Nigeria's trade balance. This sets our research apart from earlier studies examining cryptocurrencies' use in international trading. In that research, as a research limitation, Nigeria's trade balance was not available for some periods. That research can be expanded to other countries that give importance to cryptocurrency usage. Also, other important cryptocurrencies can be included in econometric analyses for Nigeria and other countries.

Declaration

In all processes of the article, TESAM's research and publication ethics principles were followed.

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