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Comparative Study of the Relationship among Returns on Bitcoin, Stock Market and Exchange Rate

[1]Akim Umoru, [2]Margarete Igiozee, [3]Hussein Omomoh Oseni & [4]Mahmood Aliu

[1,2,3&4]Auchi Polytechnic, Auchi, Edo State, Nigeria

[1]https://orcid.org/0009-0005-5816-6534
[2]https://orcid.org/0009-0001-4419-2185
[3]https://orcid.org/0009-0009-2141-5305
[4]https://orcid.org/0009-0000-5955-5305

Corresponding author: umoruakim@gmail.com

ABSTRACT

Background: Exchange rate and stock market have essential roles in economic development, implementation of monetary and fiscal policies, and the development of the financial system, as well as the bitcoin markets. These variables work together for sustainable economic growth. Whatever happens to one affects the other.
Objective: This study looked at the relationship among the three variables of returns on bitcoin trading, stock market returns, and exchange rate returns.
Method: Ten oil-importing nations—Botswana, Hong Kong, Kenya, Morocco, Rwanda, Sweden, Switzerland, Tanzania, Turkey, and Uganda—are the subject of this study, which spans 10 years (2014–2023). Weekly data was gathered on variables such as bitcoin values, currency movements, and stock returns. In the study, Markov-switching regression was used.
Results: The results imply that, rather than being constant, the impact of bitcoin on stock market fluctuations in economies that import oil may be situational or market-specific. Currency exchange rates may be impacted by shifts in stock market indices and bitcoin commitments, as these factors might lower customers' purchasing power and increase the demand for foreign currency. Furthermore, it is discovered that this effect endures irrespective of the economic conditions.
Conclusion: It's not always the case, but there are situations and market settings in which the impact of Bitcoin on stock market swings is likely to be greater in oil-importing economies. Stock market indices and bitcoin commitments affect currency exchange rates because they dilute the purchasing power of domestic consumers and may increase demand for foreign money. No matter where the economy is in any particular era, the influence is still there. These findings are consistent with those of prior investigations, including those conducted by Miriam, Edgar, and Alejandro.
Unique Contribution: The current work, which addresses a gap in the existing literature, employs the Markov-switching regression. It aims to provide global firms, investors, and politicians with sound empirical findings.
Key Recommendations: In response to inflationary pressures, the government may decide to tighten monetary policy and raise interest rates in order to ensure future economic stability. The government may choose to enact monetary policy measures if it is sincere about stabilizing the value of the currency. Investors should place their money in bitcoin since it is a cryptocurrency that is independent of national fortunes, especially in light of the instability and changes in oil prices

Key words: Oil-importing, Returns on Bitcoins, Stock Markets, Exchange rates

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INTRODUCTION

The fast expansion of stock markets in developed nations has drawn substantial capital inflows to emerging markets in recent years (Beckmann et al., 2015). Emerging economies have grown in importance as developed countries' primary trading partners since the global financial crisis, and their influence in the world economy has grown. Sensoy and Tabak (2016) state that these are currently thought to be the primary causes of global economic growth. As to Lagoarde-Segot and Lucey's (2008) findings, developing nations encounter heightened levels of economic and political unpredictability, diminished competitiveness, inefficient information flow, less transparency, and decreased liquidity. This study focuses on foreign exchange returns, stock market returns, and stock market returns in emerging and developed nations due to the growing significance of Bitcoin to the global economy and the dearth of research on the subject. Our goal is to look into the connection between and Bitcoin returns. GARCH model (Hsing, 2011; Zhao, 2010), Johansen cointegration and Granger causality test (Brahmasrene and Jiranyakul, 2007), cointegration and vector error correction model (Acikalin et al., 2008; Sui and Sun, 2016), the wavelet approach (Afshan et al., 2018), and vector autoregression (VAR) are just a few of the estimation techniques used to examine the relationships. It is challenging to quantify the relationship between exchange rates and stock prices using conventional econometric approaches. This is because both variables are complex. For instance, market mood and the severity of the shock determine how stock prices respond to currency shocks. As such, we anticipate that the stock market will respond to changes in exchange rates in a unique way. This idea is supported by earlier research that revealed asymmetric or nonlinear correlations between variables, particularly in financial markets (Chang et al., 2020). Since the dollar continues to be one of the key factors influencing emerging market finance, it is simpler to establish a causal relationship between exchange rates and stock prices in emerging markets.

The performance of developing market stock markets is closely linked to the US dollar's value. This is due to emerging markets' excessive reliance on "capital flight," or the transfer of capital from these regions to the US, and commodity exports valued at US dollars. Rising dollar values usually result in lower emerging market stocks. Purchasing anything traded in emerging market currencies, including domestic stocks, is more affordable when the dollar is high. On the other hand, import prices will increase if emerging market currencies weaken relative to the dollar. This would have a big effect on businesses that depend on imported raw materials and might even have an effect on their stock values.

The connection between the foreign exchange market and stocks. Traders have been interested by a number of correlations, despite the lack of a definitive link being established. Academics and business professionals are likely to be interested in foreign currency and stock markets due to their significance in global trade. Keep in mind that while concentrating on particular events might be a useful method to comprehend the relationship between two markets, there is no assurance that these trends will hold true in the long run. It can be quite dangerous to base decisions on a single piece of information, such the correlation between equities and foreign exchange. When making judgments, traders and investors must take a variety of signals into account.

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It is comparatively simpler to demonstrate a causal relationship between foreign exchange and emerging market stock prices because the dollar continues to be one of the main concerns for emerging market finance. Rising dollar values usually result in lower emerging market stocks. This is due to the fact that domestic equities and anything valued in emerging market currencies decrease in value as the dollar appreciates. If a company's currency weakens compared to the US dollar, stock values of companies that depend on raw material imports may drop. Over the years, investors have become interested in a number of connections despite the absence of clear evidence. Traders and investors must take a number of factors into account when choosing what and when to trade. Even if the foreign exchange market is a fascinating factor to take into account when examining companies, it is insufficient on its own to correctly predict market moves. The fundamental idea behind portfolio allocation models is that investors must weigh the possible advantages and hazards of making stock market purchases. Despite their growing significance to trade and financial flows in the global economy, emerging nations are not well covered in the literature (Sui and Sun, 2016).

Moreover, conflicting findings have been obtained from the few research projects carried out in these markets (Afshan et al., 2018; Mikhaylov, 2018; Sui and Sun, 2016; Ivkov et al., 2018; Vitalis, et al., 2024). The dearth of definitive research on the correlation between stock markets and foreign exchange markets may lead to misinformation for international investors and multinational corporations exposed to exchange rate concerns. Markov switching regression is used in this work, which helps it satisfy the requirements of the body of existing literature. Serving international corporations, investors, and politicians is the goal.

Objectives of the study

This study's main goal is to examine the connections between exchange rates, stock market returns, and bitcoin returns. Because of its importance, this research study attempts to add to the body of knowledge already in existence and provide a tool or process that scholars, researchers, investors, policy analysts, and decision makers, can utilize in their respective effort.

Theoretical Review

The Efficient-Market Hypothesis (EMH)

According to Benoît Mandelbrot, the efficient market hypothesis was first proposed by French mathematician Louis Bachelier in 1900 in his doctoral thesis entitled ``The Theory of Speculation'', in which he discussed the fluctuations in commodity and stock prices. Bachelier's paper is now considered a milestone in financial mathematics, and it is speculated that he drew on ideas from Jules Renault's random walk model. It is agreed that Bachelier's work was ignored and then forgotten for a long time until it was discovered by Leonard Savage in the 1950s.Other empirical studies have found problems with the efficient market hypothesis (EMH) (Fama, Fisher, Jensen, and Roll, 1969). We know that value stocks, small-cap stocks, and undervalued stocks have historically produced abnormally high returns that exceed the range explained by the CAPM. Additional portfolio efficiency tests by Gibbons, Ross, and Shanken (1989) (GJR) led to the rejection of the CAPM, but such tests inevitably run into problems with common assumptions (see Rohr's critique).

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REVIEW OF EMPIRICAL LITERATURE

Series of empirical studies were significantly reviewed In the course of this research studies relating to the research. Maud and Evangelos (2021) use a Markov switching vector autoregressive (VAR) model to study the regime switching behavior of exchange rates and frontier stock market prices in submarkets on the relationship between foreign exchange and frontier stock markets. Frontier stock markets and foreign exchange markets each have their own low-volatility and high-volatility systems". High volatility/low returns" describes emerging markets, whereas "high volatility/positive returns" describes frontier stock markets. Contrary to popular belief, high volatility systems are less stable than low volatility systems. According to the Markov switching VAR model, the correlation between the foreign exchange market and the stock market changes depending on the current economic regime.

Stock market fluctuations are noticeable across the foreign exchange market, both in times of relative calm and in times of extreme crisis. However, the adverse effects are minimal at best. Sub-Saharan African (SSA) countries typically follow an equity-heavy strategy. Ivory Coast's stock market and foreign exchange market are independent of each other, regardless of its regime. Our results apply regardless of the model chosen and the degree of modification. Nkemdilim and Azuka (2021) used an autoregressive distributed lag (ARDL) approach to investigate the impact of sustained exchange rate fluctuations on Nigeria's economic performance. The purpose of this study was to answer the question why the recent efforts of the Nigerian financial authorities to achieve internal and external balance have failed.

This study used annual time series data from 1986 to 2019 and applied the autoregressive distributed lag (ARDL) method to investigate the short- and long-term effects of exchange rate fluctuations on economic growth. Nigeria's long-term economic growth was found to be adversely affected by the country's exchange rate, net foreign investment, and inflation rate. The study concludes that high exchange rate volatility has a negative impact on Nigeria's economic development. The report uses data to make the case for expanding Nigeria's agricultural exports and agricultural investment opportunities. If the government is serious about supporting Nigeria's economy, it will take steps to stabilize the country's foreign exchange market. We consider whether the inability to predict stock returns can explain the paradox of stock market participation.

Previous studies have primarily focused on how factors such as intelligence and financial literacy are related to stock market participation. Ebenizer and Peter's 2018 study, "Efficiency of Stock Markets: A Case of Selected OPEC Member Countries," uses monthly data on stock market indices from January 2005 to April 2016 to examine the stock market efficiency of selected OPEC member countries in the context of the random walk hypothesis and volatility approaches. Estimation of the ARCH type was carried out in addition to parametric (variance ratio: homoscedastic and heteroscedastic martingale) and nonparametric (Wright ranks and scores) tests. Only the Qatari stock market is found to be weak-form efficient by both parametric and nonparametric testing. The results on volatility reveal that OPEC countries' stock returns fluctuate on a monthly basis, with Qatar having the most variable stock returns and shocks to volatility of stock returns being asymmetric. First, investors should be aware of these shocks when making risk-return decisions

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of their portfolios; second, the results provide useful information to regulators to enable them to develop safeguard mechanisms to shield the market from possible asymmetric information emanating from the participants. To better understand the effects of the Covid-19 epidemic on developing nation capital markets, Hatono's (2021) Developing country stock market immunity during the pandemic combed through the empirical research literature. Stock market resilience in the event of a pandemic will be described in detail. We will examine how the Covid-19 case arose in developing nations, how the outbreak affected their stock markets, how resilient those markets were compared to those in wealthy nations, and the good and negative effects that government initiatives to combat Covid-19 had on those markets. The purpose of this conceptual paper, which draws on secondary data already published on the topic, is to demonstrate how a health crisis brought on by a pandemic can affect the stability of a stock market in a developing country. Morales-Zumaquero and Sosvilla-Rivero (2018) conducted an empirical examination of the data showing intra- and inter-spillovers between the foreign currency and stock markets from 1990 to 2015 (the UK, the US, the Euro area, Australia, Switzerland, Canada, and Japan).

After the 2008 global financial crisis, the SVAR framework and the C-GARCH method produced results that suggested long-run volatility ties were more stable than short-run volatility linkages. They find that stock markets dominate in transmitting both long-run and short-run volatility across all samples, with the exception of the period immediately following the global financial crisis, when foreign exchange markets behave as the dominant long-run volatility triggers. Tang and Yao (2018) looked at the relationship between stock prices and exchange rates in eleven developing economies (Argentina, Brazil, China, India, Indonesia, South Korea, Mexico, Russia, Saudi Arabia, South Africa, and Turkey) from 1988 to 2014. They found that the domestic financing structure, widely seen as a key means of interaction between stock markets and foreign exchange markets, had a significant impact on this relationship. Using Granger's co-integration method and multivariate causality tests, the results show that the proportion of direct and indirect financing within the company has a substantial impact on the correlation between the exchange rate and the share price. They also find that the coupling mechanism between the currency rate and developing market equities is heavily influenced by internal finance systems, with the exception of China.

METHOD

The study employed the Markov-Switching regression methodology.

Model Specification

Markov-Switching Regression

Considering two phases of the economy – low phase (P1) and high phase (P2) unobservable discrete random variable that represents the state of the observable random variable, g_{it}. Assuming that this density is normal, the distribution of g_{it} conditional on the process being governed by state p_{it}=j will be:

$$f\left({}^{g_{it}}/_{p_{it}} = j; \theta\right) = \left(2\pi\sigma_j^2\right)^{-\frac{1}{2}} * exp\{-\frac{\left(g_{it} - \mu_j\right)^2}{2\sigma_j^2}, j = 1,2$$

Where: μ_2 and $\sigma^2{}_j$ are regime-specific parameters

Unconditional probability that returns or changes in rates is in state j is:

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$$Q(p_{it} = j; \theta = \varphi_j, \quad j = 1,2$$
$$where \theta is a vector of relevant parameters in the\ 2 - state Markov - switching models;$$
$$\theta = [\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \varphi_1, \varphi_2]$$

Joint density of the returns and regimes is:

$$Q(g_{it}, p_{it} = j; \theta) = \varphi_j * \left(2\pi\sigma_j^2\right)^{-\frac{1}{2}} * exp\{-\frac{\left(g_{it} - \mu_j\right)^2}{2\sigma_j^2}, j = 1,2$$

Unconditional distribution of returns over the two regimes:

$$f(g_{it}, \theta) = \sum_{j=1}^{2} Q(g_{it}, p_{it} = j; \theta)$$

Unconditional probability that returns or growth rate has been generated by regime j:
= joint distribution/unconditional density

$$Q({p_{it}}^{j}/_{g_{it}}; \theta = \varphi_j * f({}^{g_{it}}/_{s_{it}} = j; \theta)/f(g_{it}; \theta)$$

Data Sources: Weekly data on Returns on exchange rates. Stock market returns and returns on bitcoin trading were gotten from investing.com (https://investing.com) for the period of ten years 2013-2022

RESULTS

Descriptive Statistics

The formula for calculating returns, which is the difference between the present rate and the rate in the most recent previous period for each of the three indices, was initially defined in the methodology chapter and then implemented in Microsoft Excel.

Unit Root Tests

Data distribution of the study can be viewed as time series for different countries, making them subject to high variation across time periods. To avoid spurious results, the test for stationarity was conducted for each variable.

Table 1: Unit Root Tests

I(0)- Level	Levin, Lin & Chu t*	Breitung t-stat	Im, Pesaran and Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square
Oil-Importing					
EXRR	-107.536***	-37.171***	-70.255***	1839.71***	2002.85***
ASI	-110.726***	-44.342***	-72.227***	1857.92***	2022.96***
Joint					
BTCR	-129.741***	-30.4083***	-81.4047***	2172.34***	2175.77***

*** significant at 1%; ** significant at 5%; * significant at 10%;

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Unit root was not present in any of the datasets in Table 1. All tests for data stationarity rejected the null hypothesis with statistical significance ($p<.01$) and accepted all alternative hypotheses.

Markov-Switching Regressions

The outputs in the M-S regressions section examine mutual effects in different regimes within the study period or in the presence of structural breaks. The equation specification comprised two regimes with switching mean regressors and four AR terms identified as non-switching.

Oil-Importing Countries

	BTC			**EXR**			**RST**		
	REX	**RST**	**C**	**RBTC**	**RST**	**C**	**REX**	**RBTC**	**C**
Regime 1	-0.3107**	0.3198*	-0.0025	-1.2350**	2.1108**	0.1032**	0.0616*	0.0031	0.0007
	(0.0956)	(0.0679)	(0.0019)	(0.0770)	(0.0886)	(0.0045)	(0.0279)	(0.0033)	(0.0005)
Regime 2	-1.4916	0.3360	0.2274**	-0.0052**	-0.0453**	0.0011**	-1.8041**	0.1925**	0.0001
	(0.7839)	(0.2785)	(0.0104)	(0.0016)	(0.0078)	(0.0002)	(0.2145)	(0.0538)	(0.0111)
AR(1)	-0.0049	0.8007		-0.1293**	0.0000		-0.0076		
AR(2)	0.0531**	0.0020		-0.0146	0.3341		0.0186		
AR(3)	0.0421*	0.0148		-0.0102	0.4934		-0.0192		
AR(4)	0.0269	0.1458		0.1574**	0.0000		0.0481**		
LOG(SIGMA)	-2.4177**	0.0000		-4.4444**	0		-3.8905**		
Transition parameters									
P11-C	2.9315**(0.1325)			-0.7998(0.5537)			3.7292**(0.2517)		
P21-C	0.9458**(0.2049)			-5.9736**(0.3385)			-0.1738 (0.5623)		
S.E. of regression	0.1059			0.0140			0.0218		
Durbin-Watson stat	2.1131			2.1230			1.9866		

The substantial correlation of -0.3107 shows that fluctuations in the currencies and stock markets of oil-importing economies have a negative and significant effect on Bitcoin profits. If there was a percentage shift in currency fluctuations, it would be reflected in bitcoin markets as a 0.31 percent change in price. Within the same model and economic environment, a rise in stock market returns causes a 0.31 percent increase in bitcoin returns. When the impacts are contrasted to observations made in a different economic condition characterised by extreme volatility, it becomes clear that

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bitcoin price fluctuations become immune to swings in stock market prices and currency values. The model's important autoregressive terms include the AR (2) and AR (3) terms. Coefficients of -0.0049 and 0.0269 for the first and last autoregressive terms, respectively, were not statistically significant, confirming that recent weekly returns from bitcoin have no bearing on its current value. The AR (2) term of 0.0531 confirms that the two-week-old volatility of bitcoin has a significant and direct influence on the current returns, such that a unit change in returns in a present week can aid bitcoin dealers in predicting that similar direction of returns would occur in a fortnight with five percent of the same magnitude.

The first regime's currency market returns were directly influenced by stock market returns and negatively affected by bitcoin returns (-1.235). (2.1108). Therefore, a 1% change in bitcoin will result in a 1.25% change in exchange rate returns in the opposite direction, and a 1% change in stock market returns will result in a 2% change in exchange rate returns. Even when the economy is in a different phase, these two predictors still have a large impact on the results on the currency markets. Changes to Bitcoin will reduce its considerable impact on exchange rates from 1.235 percent to 0.0005 percent. As the sign of currency returns changes from positive to negative (-0.0456), we can see that stock returns are following suit. The autoregressive variables in the formula verify that the most recent weekly return (-0.12) and the return of roughly a month ago (0.15), were the most accurate forecasters of recent exchange rate swings.

Estimates from the first regime demonstrate that only exchange rate returns predicted stock price fluctuations significantly, prompting us to switch to the final M S model for oil-importing countries that provides predictive variables for stock market returns. At the 5% significance level, Bitcoin only became a meaningful predictor after the coefficient increased from 0.003 to 0.1925 in the second regime. However, the exchange rate becomes an indirect predictor, with a one percent increase in the variable influencing a 1.804 percent decrease in stock market returns as economic conditions shift. The significant coefficient of AR(4) as a non-switching regressor in the model shows that only values of stock market returns over the last four weeks are able to predict outcomes of current RST considerably.

Each Durbin Watson statistic is close to 2, thus we know the models are not autocorrelated. AR/MA polynomial inverse roots verify AR coefficient stability and demonstrate that root locations are contained within the circle (appendix). The model's validity is confirmed by the significance of transition probabilities in understanding Bitcoin returns. For countries that export oil, the coefficient in the transition parameter for bitcoin returns is larger, suggesting that regime 1 is more likely to endure. The model for exchange rates shows, however, that transition probability is only significant for regime 2, suggesting that regime 2 events are more likely to occur and persist for a longer period of time in this model. According to the most recent stock return forecasting model, regime 1 is the most likely to endure. The graph of transition probability below supports this:

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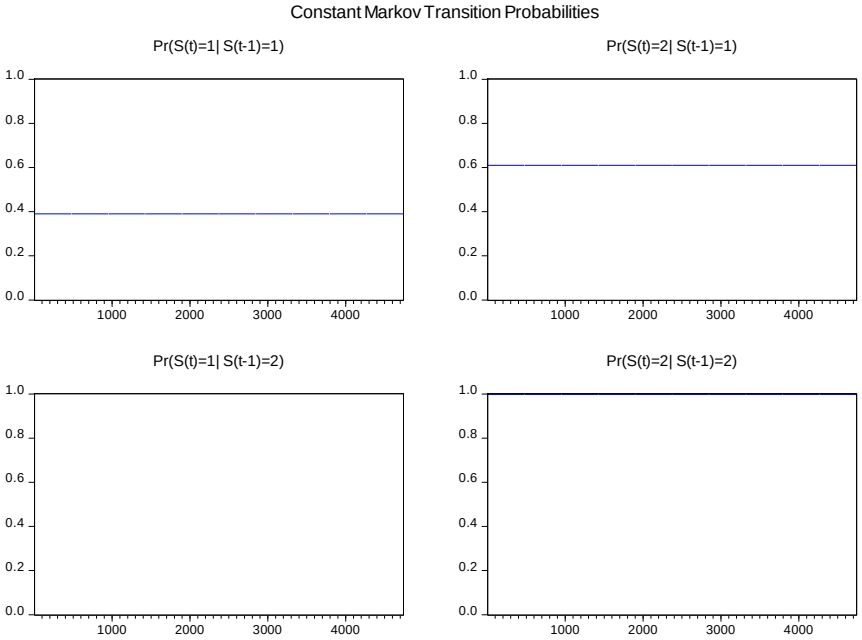
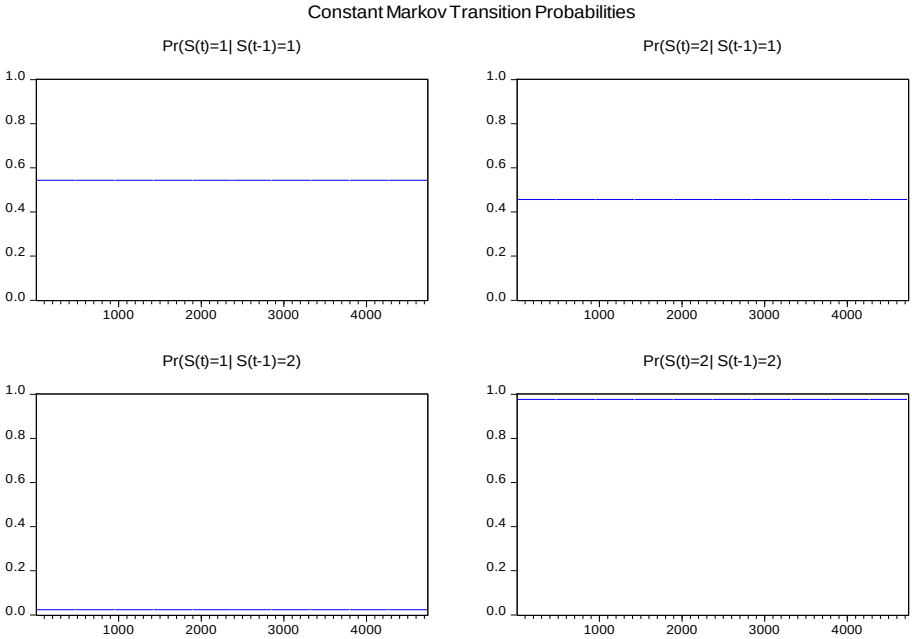


Transition Probabilities of Stock returns



Transition Probabilities of Bitcoin returns

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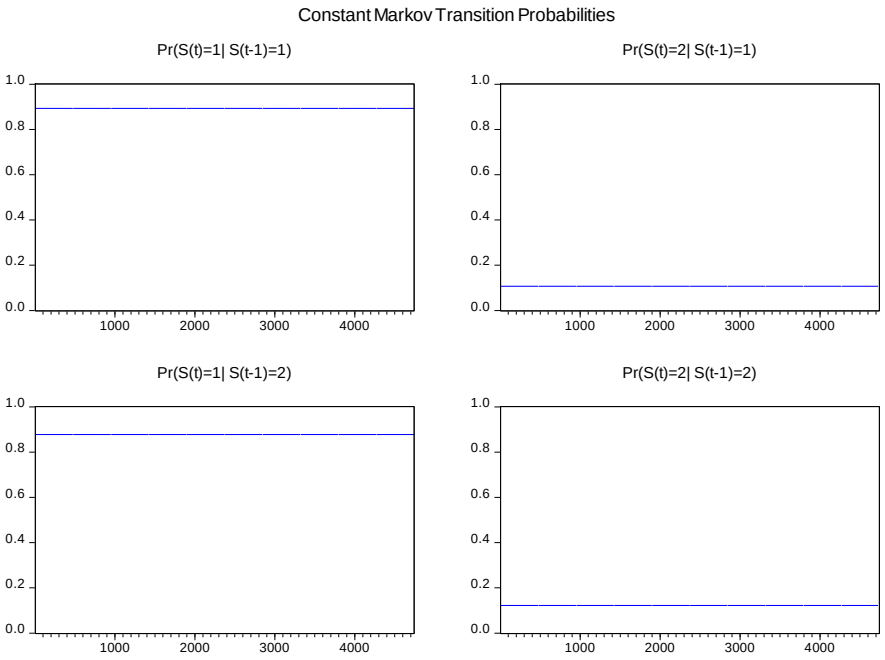

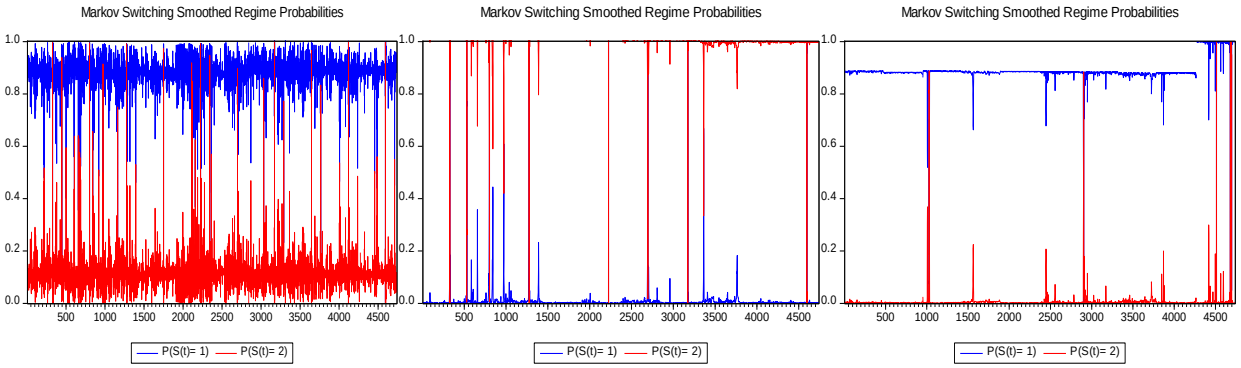

Bitcoin returns Stock Returns Exchange Rate Returns

CONCLUSIONS

The aim of this study was to examine the connections between exchange rates, stock market returns, and bitcoin returns. It employs the Markov-Switching Regressions technique. It was shown that the success of the stock market and fluctuations in Bitcoin were positively correlated. One element of the very speculative cryptocurrency sector is Bitcoin. Changes in the stock market affect trading methods and result in corresponding trading activities in the bitcoin market since investors and traders are always watching both markets for opportunities to profit from brief price moves. It has been observed that there are certain behavioral similarities between stock market and cryptocurrency investor behavior. Some investors may choose to sell off their assets in the event of a big decline in the stock market in order to lower their risk or make up lost revenue.We might

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expect a similar negative effect on Bitcoin prices if this selling pressure spreads to the cryptocurrency market. It was shown that exchange rates can fluctuate without reference to the price of bitcoin. Bitcoin is not correlated with any particular national currency because it is decentralized and operates independently of the financial system. Additionally, it was found that returns on currency volatility had a significant influence on stock returns. In other words, a nation's export and import competitiveness in global markets can be impacted by fluctuations in the value of its native currency. Businesses whose primary source of income is from outside sources could benefit from a domestic currency depreciation since it increases the attractiveness and competitiveness of exports. Therefore, it's probable that the stock prices of exporting companies will increase during a period of currency depreciation. Because it becomes more expensive to export goods to nations that use that currency, a decline in value can have the reverse effect on the value of a company's stock. Changes in the exchange rate can have an impact on investor sentiment and risk appetite. Unexpected or abrupt currency movements can add to the volatility and unpredictability of the market. This increased amount of uncertainty may make investors more risk cautious, which could lead to market sell-offs or increased volatility. Economic volatility, which is represented in the currency exchange rate, can have an effect on sentiment and confidence in the stock market.

There was no evidence of a substantial correlation between stock market results and Bitcoin adjustment. This illustrates how the two markets have different characteristics and adhere to different sets of regulations. On the one hand, the stock market represents ownership in publicly traded companies, whereas Bitcoin is a decentralized digital currency. Things like company profits, economic indicators, and corporate news on the stock market have less of an impact on Bitcoin than supply and demand dynamics, investor attitude, and regulatory developments. There are several kinds of regulars in different markets. When making investment selections, Stock Exchange investors use a variety of information, such as industry trends, firm fundamentals, and value indications (Gambo et al., 2021). However, speculators, early adopters, cryptocurrency enthusiasts, and regular investors visit the Bitcoin market. Because of the wide range of participant profiles and investing methods, there might not be a significant correlation between fluctuations in the stock market and Bitcoin. There have been short-term correlations found between Bitcoin and stock markets; nevertheless, in a different economic climate, stock market returns have been observed to respond to changes in the value of bitcoin. During times of extreme volatility, institutional investors and hedge funds may employ arbitrage opportunities or trading strategies that combine equities and Bitcoin.

Unique Contribution

Although scholars have extensively investigated the connection between stock and foreign exchange markets, most of the literature has focused on developed markets. Despite their growing importance for the global economy in terms of trade and financial flow, the literature on emerging markets is few (Sui and Sun, 2016). Furthermore, the limited research that have been done on these markets have had conflicting results (Afshan et al., 2018; Mikhaylov, 2018; Sui and Sun, 2016; ivkov et al., 2018). Foreign investors and multinational enterprises that are susceptible to exchange rate risk may be misled by the absence of conclusive research on the relationship between the stock and foreign exchange markets with the growing bitcoin markets. The current work, which

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addresses a gap in the existing literature, employs the Markov-switching regression. It aims to provide global firms, investors, and politicians with sound empirical findings.

Key Recommendations

Based on the study, it is therefore recommended that

1) Governmental constraints or security vulnerabilities that make trading illegal price should be highly discouraged.
2) In response to inflationary pressures, the government, acting through the Central banks, should tighten monetary policy by increasing interest rates.
3) The government may want to try out some monetary policy tools to help keep the value of the currency stable.
4) Since export and import oil prices are so volatile, investors are encouraged to put their money into bitcoin, which is not tied to the fortunes of any one country's economy.

Suggestions for Further Studies

Bitcoin's market cap and trading volume are miniscule in comparison to the massive forex market. Since the foreign currency and stock markets have been the subject of ongoing and substantial academic study, it follows that there is a pressing need to do similar research into the Bitcoin markets.

Ethical Clearance

Ethical clearance was sought and obtained from each participants used in this study. They were made to understand that the exercise was purely for academic purposes, and their participation was voluntary.

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The study was not funded.

Conflict of interest

There is no conflict of interest.

Authors' Contributions

OSENI Hussein Omomoh Conceived the study, including the design, UMORU Akim joined him in collating the data, IGIOZEE Margarete and ALIU Mahmood analyzed and interpreted the data while OSENI Hussein Omomoh wrote the final manuscript for publication in its current form.

Availability of data

The data sets on which conclusions were made for this study are available on reasonable request.

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