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Impact of Crude Oil Volatility on Stock Market Performance in Nigeria, over Two Decades

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Abstract Since the discovery of crude oil in Nigeria, the Nigerian economy has moved its productive basis from agriculture to crude oil, making it a mono-product economy that is heavily influenced by crude oil price changes, particularly in relation to stock market performance. As a result, using the Fully Modified Ordinary Least Squares (FMOLS) approach and Error Correction Model (ECM). This work empirically explores the nexus between crude oil price variations and stock market performance in Nigeria for the period 1981-2019. The impact of the exchange rate, inflation rate, and interest rate on the performance of the Nigerian stock market is also examined in the study. According to the empirical findings, both crude oil price variations and the exchange rate have a beneficial impact on Nigerian stock market performance, whilst inflation and interest rates have a negative impact. As a result, this study recommends, among other things, that Nigeria's economy be stimulated and diversified in order to reduce the country's overdependence on crude oil and thus mitigate the negative impact of such external shocks on the domestic economy, and that macroeconomic policies be formulated and properly implemented in order to achieve macroeconomic objectives such as exchange rate stability, price stability, interest rate regime stability, and economic growth.

Keywords: *oil price, economy, price, inflation, Nigeria*

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1. Introduction

Crude oil prices have been prone to big swings from time to time. The first significant global oil price shock happened from 1973 to 1974, when oil prices rose from $3 to $12 owing to the Arabian embargo [1] Between 1978 and 1979, the second global oil price shock occurred as a result of the Iranian revolution, when oil fields were shut down and oil prices surged from $12 to US$18 per barrel [2]. The third oil shock occurred during the Iraq–Iran conflict, which lasted from 1980 to 1990 and saw Iraq occupy Kuwait. Oil prices soared from US$28 to US$40 per barrel during that time due to increased demand worldwide. The recent oil price spikes were mild in comparison to the massive oil price shocks of 2008 and 2009, when the price of oil plunged from US$100 to US$47 per barrel due to the global financial crisis [3]. The growing theoretical and empirical research on the relationship between crude oil prices and stock markets demonstrates crude oil's importance to the global economy via its financial market influence. The debate over this issue has frequently focused on the impact of crude oil price fluctuations on financial market volatility, their direct impact on stock market performance, and the impact of exchange rate policy adjustments [4], necessitating further research into the crude oil price-stock nexus in oil-producing economies like Nigeria. Degiannakis, et al., [5] were of the opinion that a spike in oil prices coupled with greater aggregated demand considerably boosts stock market volatility in Europe. The Lagos Stock Exchange was founded in 1960 and is now known as the Nigerian Stock Exchange. It was renamed The Nigerian Stock Exchange in 1977 and branches were established in some of the country's major cities with the Nigerian Exchange's head office in Lagos and an office in Abuja. The Exchange first opened its doors in 1961, with around 19 equities listed. Government Stocks, Industrial Loan (Debenture/Preference) Stocks, and Equity/Ordinary Shares of Companies are among the 328 securities listed on the Exchange today with a total market value of roughly N28.26 trillion as of January 9, 2020 (Summary of Nigerian Stock Exchange Equities, 2020). The Nigerian Stock Exchange and the Securities & Exchange Commission (SEC) which implements the Investments & Securities Decree 1999 regulate transactions on the Exchange. Following the deregulation of the capital market in 1993, the Federal Government internationalized the market in 1995 by repealing regulations restricting foreign involvement in Nigeria's capital market. Foreigners can now participate in the Nigerian capital

market as both operators and investors following the repeal of the Exchange Control Act 1962 and the Nigerian Enterprise Promotion Decree 1989. Since June 2, 1987, the Exchange has been a member of the Reuters Electronic Contributor System which provides online global distribution of stock market data, trade statistics, the All-Share Index, business investment ratios, and company news (financial statements and corporate actions). According to the company's Memorandum of Association, the major aims of the Nigerian Stock Exchange are to develop an acceptable system for capital formation and to offer efficient resource allocation among competing alternatives. It is also expected to offer unique financing options for projects with long gestation periods. Furthermore, it aids in the maintenance of capital market discipline in terms of participants and investors and as a result, it aids in the broadening of share ownership in the market by providing an enabling environment and delivering and maintaining fair pricing for securities. The influence of changes in crude oil prices and other macroeconomic factors on the capital market has been characterized by a number of market failures one of which is the influence of crude oil prices and other macroeconomic variables on the capital market. The Nigerian Stock Exchange is the hub of the country's capital market. It acts as a catalyst for private and public savings to be mobilized and made available for constructive uses.

1.1. Background Information on Oil Fluctuation Global and in Nigeria

Several scholars have studied the relationship between crude oil price variations and macroeconomic activities. Many of these studies have found that fluctuations in oil prices have a big impact on domestic prices, GDP, investment, and savings [6]. Crude oil price variations relate to the volatility of crude oil prices on the worldwide market, which can be positive (a price increase) or negative (a price fall) (decrease in price). The economy is influenced by oil price fluctuations in a variety of ways [7]. Crude oil is one of the world's most fundamental energy sources, and it plays a critical part in the growth and development of many economies, including Nigeria's. Agriculture was the main source of government revenue in Nigeria before independence until the 1970s, when she moved her economic basis from agriculture to petroleum when Shell-BP discovered crude oil in commercial quantities for the first time at Oloibiri in 1958. In the 1970s, according to Iyoha [8], crude oil's contribution to Nigeria grew significantly. Several factors boosted crude oil's relative importance to the Nigerian economy, including increased crude oil output and exportation, Nigeria's participation in the Organization of Petroleum Exporting Countries (OPEC), and the quadrupling of oil prices following the Arab-Israeli war in late 1973. Nigeria is Africa's largest oil producer and, since July 1971, has been a member of the Organization of Petroleum Exporting Countries. Following the change in the 1970s, the Nigerian economy has become largely reliant on the oil sector, which today accounts for over 95% of export earnings and over 80% of government revenues [9]. Nigeria produced roughly 2.53 million barrels (402,000 m^3) per day in 2011, according to the International Energy Agency (2013) far below its oil production capability of nearly 3 million barrels (480,000 m^3) per day. In the 1973 Yom Kippur War (also known as the Arab-Israeli War) Egypt and Syria led a coalition of Arab states to attack Israel. OPEC increased the price of oil during the 1973 oil crisis and Arab oil-producing governments imposed a ban on oil shipments to Western Europe and the United States of America in retribution for supporting Israel. The worldwide oil supply was curtailed following the Iranian Revolution in 1979 which caused the price of oil to more than double. From 1980 onwards, the price of oil began to fall diminishing OPEC's grip over the global economy.

Non-OPEC members (such as the United States and the United Kingdom) were responsible for the 1980s oil glut that resulted in a drop in oil prices. According to World Bank analysis 2015 "oil prices dropped and remained low for almost two decades" when OPEC revised its policy to increase oil supplies in 1985 then plunged again in 2014 and 2020 due to the oil price war and Covid-19 in Nigeria. According to Akinkugbe-Filani [10] is vulnerable to sustained low oil prices. As a result it is a well-known fact that crude oil is a critical component of the Nigerian economy. As a result of its importance and the growing need for this product the oil market is susceptible to the dynamics of demand and supply resulting in crude oil price fluctuations. The study is confined to Nigeria and the focus is primarily on the Nigerian Stock Exchange Market and crude oil price fluctuations. It does not go into detail about other markets in the capital market nor does it address the causes that drive oil price fluctuations. Nigeria's inclusion as a case study is justified by the fact that it is Africa's largest exporter of crude oil and its stock exchange market holds great promise for worldwide portfolio diversification. To begin with the fluctuation in crude oil prices and the challenges they have provided to the Nigerian economy (as measured by the stock exchange market) since the nations productive base changed from agriculture to petroleum has highlighted the need to reconcile theory with actual realities. Second, the recent volatility in crude oil prices which began in mid-2014 has had a negative impact on Nigeria in a variety of ways particularly in areas such as infrastructure development, foreign reserves, currency crises, declining government revenue and an increase in cases of the country's inability to meet its financial obligations on time.

As a result of this development, a number of empirical studies on the relationship between crude oil price volatility and a variety of macroeconomic aggregates in Nigeria have been conducted [46] because of the nature and importance of crude oil in Nigeria as well as the fact that the stock market plays an important role in financial intermediation in both developed and emerging countries such as Nigeria. This research tends to attend to the following questions

i. Does the performance of Nigeria's stock exchange market depend on the price of crude oil?
ii. Is the Nigerian stock exchange influenced by the exchange rate?
iii. Is there any relationship between the price of crude oil prices, the exchange rate, the rate of inflation, the rate of interest and the performance of the Nigerian stock market?

The following assumptions have been developed in light of the study's goal:

i. Crude oil price fluctuations have no effect on Nigerian stock market performance.
ii. The stock market performance in Nigeria is unaffected by exchange rates.
iii. In Nigeria, the rate of inflation has little effect on the stock market.
iv. The stock market performance in Nigeria is unaffected by interest rates, crude oil prices.

In view of aforementioned question and hypotheses, this research is vital and necessary since fluctuations in crude oil prices have a direct impact on the exchange rate. The overall goal of this research is to determine the impact of crude oil price fluctuations on Nigerian stock market performance between 1981 and 2019. As a result, this research will help policymakers and investors understand the effectiveness of exchange rate regulation in limiting and forecasting stock market fluctuations in the face of dropping oil prices. Because Nigeria is an oil-dependent country, fluctuations in crude oil prices have a direct impact on the exchange rate and thus on the performance of the Nigeria stock market.

1.2. Objective of Study

The broad goal of this study is to estimate the influence of oil price shocks on oil sector stock prices in Nigeria, based on the problem statement above.

The following precise aims are sought in this study:

To ascertain the impact of oil price shocks on Nigerian oil sector stock prices?

Determine the dynamic impact of historical oil price fluctuations on Nigerian oil sector stock price fluctuations.

To see if oil price shocks have a major impact on changes in Nigeria's oil sector stock returns.

To ascertain the policy consequences of such a reaction on the Nigerian economy.

2. Literature Review

The capital market is described as a market for raising medium and long-term financing [11]. Ekezie, [12] also described the capital market as the market for long-term loanable funds dealings (that is, lending and borrowing). The capital market, according to Emekekue [13], is a portion of the financial market that facilitates the flow of medium and long-term cash to other economic units. It is a financial market where debt and equity securities (over a year) are purchased and traded. The capital market transfers savers' money to those who can put it to work, such as businesses or governments undertaking long-term investments. The Securities and Exchange Commission (SEC) is the primary regulator of Nigeria's capital market. The stock exchange market is an important part of the capital market. It plays a vital role in capital formation and has the ability to stimulate economic growth and development. The stock exchange market is an important part of the capital market; it plays an important role in capital production and can help to stimulate economic growth and development. The mobilization of resources for national development andinfrastructure expansion has been a major focus for a long time. This is because, in order to achieve long-term growth and development, finances must be allocated efficiently so that businesses and the economy can maximize their human, material, and managerial resources. In this context, every country has a financial system that serves as a tool for mobilizing resources in order to achieve economic progress. The stock market which is part of the capital market's wide classification serves as a rallying point for the market's overall activity. The stock market, according to Alile and Anao, [14] is the pivot around which all capital market activity revolves. As a result without the stock market's facilities, it's unclear whether the capital market can effectively perform its projected role of resource mobilization [15]. The stock market often known as the stock exchange or equity market, serves a number of purposes that help the economy flourish [45]. The stock market as an economic institution encourages capital formation and allocation efficiency. Second, the stock market can be used to mobilize and allocate savings. Finally, it enables governments and industry to raise long-term funds for new project finance. Fourthly by effectively allocating capital, the stock market mobilizes savings while allocating a bigger proportion of it to enterprises with a relatively high prospect as measured by their return on investment (ROI) and risk level. This indicates that capital resources are directed to enterprises with relatively high and rising productivity resulting in increased economic expansion and growth.

2.1. Empirical Review

Empirical research linking the variation in crude oil prices and stock market performance abounds in the literature. Despite the fact that a large amount of research has been undertaken on the impact of oil price variations on stock market performance there is still a literature gap. Now, this study takes a look at some of the empirical studies that have been done in this field in various parts of the world: Oil prices and stock markets are adversely connected, according to studies done by Sadorsky [16]; Papapetrou, [17]. Both of these studies used a multivariate vector auto-regression technique and used aggregated stock data. Sadorsky [16] looked at the influence of oil price shocks on market returns as well as two other significant macroeconomic indicators: industrial production and interest rates, using monthly data for the US economy. Positive oil price shocks effect real stock returns, according to the findings, and fluctuations in oil prices account for a larger share of the forecast error variation in stock returns than interest rate movements. The European economy, according to Papapetrou [17], is interdependent on oil and stock data, with oil prices having a considerable impact. This shows that positive oil price shocks lower real stock returns. Similarly, Rafailidis and Katrakilidis [18] discovered a negative relationship between oil prices and stock returns. Cobo-Reyes and Quirós, [19] investigated the link between oil price shocks and industrial production, as well as the link between oil price shocks and stock returns. The study's findings revealed that increases in oil prices have a negative impact on stock returns and industrial production and that these impacts are statistically significant while the effect on

stock returns is higher than the effect on industrial production. Although the exact relationship is partly reliant on the data frequency, employed. Basher and Sadorsky [20] found substantial evidence that oil price riseaffects stock price returns in emerging markets. The conditional relationship on the other hand is not symmetrical. Oil price increases have a favorable impact on excess stock market returns in developing countries for daily and monthly data whereas oil price declines have a positive and significant impact on emerging market returns for weekly and monthly data according to the study. Mehdi [47] also considers the impact of oil earnings on the Sudanese economy in the future. The author emphasizes the difficulties the government faces in formulating policies particularly with regard to the allocation of oil earnings, output diversification, and export structure. Liao and Chen [21] examined the impact of oil and gold prices on individual industries rather than the entire market, and discovered that oil price fluctuations affect both the electronic and rubber industrial sub-indices, with positive correlations between oil prices, electronic industrial sub-indices and rubber industrial sub-indices. Oil price volatility in general, has a negative impact on stock market behavior according to Aloui, et al. [22]. Oil price shocks come from low price elasticity of demand and supply, according to Baumeister and Peerman [23]. As a result, large price variations are required to clear the market or return it to equilibrium. They go on to say that the demand function has recently become less elastic (due to rising demand from emerging nations relative to substitutes like biofuels and green energy), which explains bigger oil price shocks. One of the first to use structural break estimating methodologies was Narayan and Narayan [24]. The relationship between oil and stock prices in Vietnam is modelled in this study. The authors show that the price of oil has a statistically significant long-run effect on the stock market with a percentage increase in oil prices increasing the stock price by 1.3 %. Chen [25] investigated whether high oil prices are pushing the stock market into bear territory by using monthly returns on the S&P 500 Price Index. According to the study's findings, an increase in oil prices has a significant likelihood of triggering a bear market. Ramos and Veiga [26] investigated the asymmetric effects of oil price changes on international stock markets and discovered that while oil price spikes depress international stock markets, oil price decreases do not always improve stock market profits. Furthermore, oil price volatility has a detrimental impact on foreign stock market returns according to the study. Both of these effects are limited to developed-country stock markets; emerging-market returns have not been shown to be affected by changes in oil prices. The field of methodology has made significant progress in the literature. Most previous studies used a multivariate vector auto-regression to establish if and how volatility spreads from one market to another, as well as the potential feedback effect in lead-lag scenarios. Accounting for asymmetry in stock data analysis produces robust findings, according to Zhu, et al. [27]. Ghosh and Kanjilal [28] demonstrated this by evaluating a non-linearity threshold co-integration (Gregory and Hasen, and Hatemi-J tests) for aggregated and disaggregated data in three phases when they explored the co-movements of crude oil prices and the Indian stock market. The analysis discovers no co-integrating relationship for the overall data set, but one for phase III of the sub data set. The presence of a long-run link in the sub data set suggests that shocks from the oil price to the stock market are transmitted asymmetrically.

Furthermore, using a bootstrap panel co-integration, Zhu, et al. [26] confirmed Arouri and Rault [29]'s stance, indicating that oil price shocks benefited the UAE, Qatar, Oman, Kuwait, and Bahrain but had no effect on Saudi Arabia. The co-integration approach in general, tends to support the long-term association between oil prices and stock market indications. This strategy ignores short-run relationships and is only necessary when the variables are differently integrated or ordered. As actual evidence continued to take heated disputes about the nature of the relationship between oil prices and the stock market, researchers developed a new model. In light of the foregoing, several research studies have used the vector auto-regression approach, wavelet, and non-linear autoregressive distributed lag model. Ono, [30] evaluated how oil prices affected BRIC actual stock returns (Brazil, Russia, India, and China). According to the study, actual stock returns in China, India, and Russia respond positively to some oil price indicators with statistical significance but not in Brazil. It also indicated that the asymmetric effects of oil price spikes and declines in India were statistically significant. Positive oil price shocks decrease emerging market stock prices and US dollar exchange rates in the near run according to Basher, et al. [31]. Adaramola [32] investigated the long-run and short-run dynamic effects of oil prices on stock returns in Nigeria finding a substantial positive short-run stock return and a significant negative long-run stock return to oil price shock. The impact of oil prices on the consumer price index and the stock market was investigated by Ansar and Asghar [33]. (KSE-100 Index). According to the findings, there is a positive association between oil prices, CPI, and the KSE-100 Index, but it is not very robust.

2.2. Theoretical Review

In scientific study, theories form the base for empirical investigation. In the past, studies of the impact of oil price volatility on stock markets have used several theories to support their findings. To examine the oil-stock space for China, An, et al., [34] used Shannon Entropy Information Theory whereas Arouri, et al., [35] used the value of equity theory. Because of his work on diversification and modern portfolio theory, Harry Markowitz has had a significant impact on finance literature. Treynor [36,37]; William [38] independently developed the capital asset pricing model (CAPM), an essential asset valuation tool based on Harry Markowitz's work. The needed rate of return on an asset is calculated using this methodology. The asset's sensitivity to systematic or non-diversifiable risk, as well as the return on market portfolio and risk-free return are all factors taken into account by the model.

3. Data and Methodology

3.1. Theory-based Framework

Various ideas have been used in the past to support analyses of the impact of oil price volatility on stock markets.

As a result, the theoretical foundation for this study comes from the Arbitrage Pricing Theory (APT).

3.2. Theory of Arbitrage Pricing

Arbitrage pricing theory (APT) is a multi-factor asset pricing model based on the assumption that an asset's returns may be forecasted using a linear relationship between the asset's expected return and a number of other macroeconomic variables that influence risk. Stephen Ross, an American economist, created this idea in 1976. The APT provides a multi-factor pricing model for securitized assets to analysts and investors. The APT provides analysts and investors with a multi-factor pricing model for securities that is based on the link between the projected return of a financial asset and its risk characteristics. The goal of the arbitrage pricing theory (APT) is to determine the fair market price of a security that has been temporarily mispriced. The Arbitrage Pricing Theory (APT) is a more flexible and complicated alternative to the Capital Asset Pricing Model (CAPM). The theory allows investors and analysts to tailor their studies to their specific needs. Arbitrage is the practice of the simultaneous purchase and sale of an asset on different exchanges, taking advantage of slight pricing discrepancies to lock in a risk-free profit for the trade. The arbitrage pricing theory provides traders with a model for calculating an asset's theoretical fair market value. Having determined that value, traders then look for slight deviations from the fair market price and trade accordingly. For example, if the APT pricing model determines the fair market value of a company's stock to be 50NGN, but the market price drops to 45NGN, the trader will buy the shares in the idea that additional market price action will rapidly "correct" the market price back to 50NGN/share. Thus, this study uses the Arbitrage Pricing Theory (APT) to link crude oil prices and other selected macroeconomic variables (such as the exchange rate, inflation rate, and interest rate) to stock market performance in Nigeria from 1981 to 2019. Its theoretical underpinning is derived from the APT, which assumes the following linear relationship

3.3. Method of Analysis

With the model above, this study used the Augmented Dickey Fuller (ADF) test for unit root to determine the impact of the Crude Oil Price (COP), Exchange Rate (ER), Inflation Rate (INFL), and Interest Rate (INTR) variables on the All-Share Index (ASI) variable. The study also used the Johansen co-integration test to determine the long-term link between the variables included in the research. The Fully Modified Ordinary Least Squares (FMOLS) approach was utilized by the scholars in this work to avoid the issues that can develop when performing regression analysis on clearly non-stationary series which can lead to erroneous conclusions. In addition, ECM is used in this work to repair any sort of dis-equilibrium in the near term.

The approaches used in this study on the other hand, are as follows:

3.3.1. Unit Root Test

This is the initial phase, and it entails determining whether the variables are stationary, and then determining the order of integration of the individual series under consideration in order to tackle the problem of serially correlated errors. Several approaches for determining the sequence of integration have been developed by scholars. The Augmented Dickey-Fuller (ADF) test, developed by Dickey and Fuller in 1979, is the most often used (1981). The null hypothesis of unit root (the series are non-stationary) is rejected in favor of the alternative hypotheses of no unit root in the Augmented Dickey-Fuller test (the series are stationary).

3.3.2. The Co-Integration Test

The next step is to check for co-integration between series of the same integration order. The notion of co-integration naturally arises from the examination and testing of unit roots. The test is about non-stationary time series variable modeling methods. "The theory of co-integration describes how to investigate the interrelationships between the long run trend in the variables that are differentiated in the Box-Jenkins technique," according to Maddala [39], as stated in Iyoha [8].

3.3.3. The Study has Limitations in Terms of Its Study

i. This study utilized secondary data and data gotten from secondary sources might have some element of inaccuracy because most data is often aggregated and averaged and this tends to reduce the reliability of the data for econometric analysis and evaluation. See Appendix I.
ii. Unavailability of up-to-date data for the research. For instance, data for 1981 to 1984 for the all-share index was not available.

4. Results and Discussion

This study includes descriptive statistics for the model, a correlation analysis to evaluate the relationship between the model's variables, and a preliminary look at the problem of multicollinearity or the relationship between the model's explanatory variables. The Augmented Dickey-Fuller unit root test is used to determine if individual variables are stationary and integrated in the same order. The long-run equilibrium relationship between the variables was then tested using the Johansen co-integration test. Given the presence of co-integration among the variables in the model, the FMOLS approach was used to provide optimal estimates of Co-integration regression, followed by the Error Correction Model to compensate for short-run dynamics. The model includes the all-share index, crude oil price, exchange rate, inflation rate, and interest rate as variables. The study took place over a 39-year period, from 1981 to 2019.

4.1. Descriptive Evaluation

Statistics that are descriptive, the mean of the all-share index is around 8.72, while the crude oil price is around 3.52 and the currency rate is around 3.92, according to Table 1. The inflation rate is 2.67 %, while the interest rate is an average of 2.54 %. Table 1 further demonstrates that the series has a high level of consistency, as all of the corresponding variables' mean and median values are within the series' maximum and minimum values. Table 1 includes all other pertinent facts. The skewness and Kurtosis statistics are important for determining the symmetry of the data's probability and the distribution's thickness, respectively. The null hypothesis of normality is tested against the alternative hypothesis of non-normalcy in the normality test. The null hypothesis of the regression is rejected if the probability value is smaller than the Jarque-Berra chi-square at the 5% level of significance. Table 1 shows that all of the variable probability values were bigger than the Jarque-Berra chi-square at the 5% level. As a result, they are all evenly dispersed.

4.2. Correlation Matrix

ASI has a substantial positive association with COP (76%) and ER (95%) in Table 2, but a poor positive correlation with INTR (35%) and a weak negative correlation with INFL (-28 %). COP has a substantial positive association with ER (71%) and INTR (40%) but a negative correlation with INFL (-40 %). INTR and ER have a weak positive association (32%), whereas INFL has a weak negative correlation (-20%). INFL and INTR have a significant inverse relationship (-72%). Finally, the absence of multicollinearity among the explanatory variables included in the model is indicated by the fact that none of the correlation coefficients of the respective regressors is equal to one.

4.3. Testing for Stationary

Most macroeconomic time series data in the literature is non-stationary, and using such non-stationary variables in empirical studies could lead to erroneous conclusions and, as a result, misguided policy recommendations [40]. As a result, we use the Augmented Dickey-Fuller (ADF) test to look into the time series properties, with the findings displayed in Table 3 and Table 4. Unit root test results for ADF are given in Table 3 and Table 4. It was discovered that when the test statistic value was compared to the Mackinnon critical value at 1%, 5%, and 10% level of significance, all of the variables except LnINFL and LnINTR were not stationary, whereas all of the variables were stationary at their first difference.

Table 1. Descriptive Statistics of data

	LNASI	LNCOP	LNER	LNINFL	LNINTR
Mean	8.721879	3.523443	3.915827	2.670161	2.543394
Median	9.361504	3.317816	4.775335	2.503074	5.685580
Maximum	10.82824	4.695468	5.723847	4.288265	18.18000
Minimum	4.764564	2.507972	-0.112302	1.684545	-31.45257
Std. Dev.	1.926789	0.705796	1.570318	0.715652	10.11380
Skewness	-0.822588	0.294418	-0.891238	0.930763	-1.182512
Kurtosis	2.271387	1.637975	2.774692	2.842861	5.038084
Jarque-Bera	4.721322	3.211018	4.707480	5.089539	14.21456
Probability	0.094358	0.200787	0.095013	0.078491	0.060819
Sum	305.2658	123.3205	137.0539	93.45564	89.01878
Sum Sq. Dev.	126.2255	16.93703	83.84058	17.41337	3477.821
Observations	35	35	35	35	35

Source: Author's Computation using E-views.

Table 2. Correlation Matrix

	LnASI	LnCOP	LnER	LnINFL	LnINTR
LnASI	1.000000				
LnCOP	0.758874	1.000000			
LnER	0.950752	0.713975	1.000000		
LnINFL	-0.278795	-0.397487	-0.199480	1.000000	
LnINTR	0.347726	0.396462	0.321717	-0.717152	1.000000

Source: Author's Computation using E-views.

Table 3. Unit Root Test(At Levels)

Variables	ADF Test Statistics	ADF Critical Value 1% Level	5% Level	10% Level	Order of Integration	Remarks
LnASI	-2.779633	-3.639407	-2.951125	-2.614300	I(0)	Not stationary
LnCOP	-1.033390	-3.615588	-2.941145	-2.609066	I(0)	Not Stationary
LnER	-2.094349	-3.615588	-2.941145	-2.609066	I(0)	Not Stationary
LnINFL	-3.398070	-3.615588	-2.941145	-2.609066	I(0)	Stationary
LnINTR	-7.231695	-3.615588	-2.941145	-2.609066	I(0)	Stationary

Source: Author's Computation using E-views.

Table 4. Unit Root Test(At First Difference)

Variables	ADF Test Statistics	ADF Critical Value 1% Level	5% Level	10% Level	Order of Integration	Remarks
LnASI	-3.803070	-3.646342	-2.954021	-2.615817	I(1)	Stationary
LnCOP	-5.930142	-3.621023	-2.943427	-2.610263	I(1)	Stationary
LnER	-5.215887	-3.621023	-2.943427	-2.610263	I(1)	Stationary
LnINFL	-6.894347	-3.626784	-2.945842	-2.611531	I(1)	Stationary
LnINTR	-9.831798	-3.621023	-2.943427	-2.610263	I(1)	Stationary

Source: Author's Computation using E-views.

4.4. Testing for Co-integration

In this part, we use the Johansen co-integration framework to perform the co-integration test. Table 5 and Table 6 illustrate the results of the Likelihood Ratio tests based on trace and the maximum Eigenvalue of the stochastic matrix, respectively. These tests show that there are five co-integrating vectors between the variables, indicating that they have a long-term relationship.

4.5. Fully Modified Ordinary Least Squares (FMOLS)

The results of the ADF and Co-integration tests indicated that the model's variables had long-run equilibrium relationships. As a result, the next step is to use the FMOLS method to predict long run elasticities (see equation 1). Table 7 shows the FMOLS study's estimated results.

The regression equation

$$\text{LnASI} = 4.276044 + 0.282420\text{LnCO} + 1.091313\text{LnER} - 0.270624\text{LnINFL} - 0.017309\text{LnINTR} \quad (1)$$

4.6. Analysis of FMOLS Result

The findings are evaluated in light of the study's goals. The study's objectives are assessed using the results of the coefficient and probability values. We explain the contribution and nature of the link between the all-share index and the independent variables in the model using the coefficient results. The constant term is 4.276044, which means that when the independent variables in the model are considered to be zero (i.e. held constant), the all-share index of the Nigeria Stock Exchange market will climb by around 4.276044 %.

Table 5. Co-integration test based on Trace

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.784784	118.2414	69.81889	0.0000
At most 1 *	0.678052	67.54965	47.85613	0.0003
At most 2 *	0.395294	30.14855	29.79707	0.0455
At most 3	0.266239	13.54915	15.49471	0.0962
At most 4	0.096075	3.333291	3.841466	0.0679

Trace test indicates 3 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level.

Table 6. Co-integration test based on maximum Eigenvalue

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.784784	50.69174	33.87687	0.0002
At most 1 *	0.678052	37.40110	27.58434	0.0020
At most 2	0.395294	16.59941	21.13162	0.1918
At most 3	0.266239	10.21585	14.26460	0.1981
At most 4	0.096075	3.333291	3.841466	0.0679

Table 7. Result of FMOLS

Dependent Variable: LnASI
Method: Fully Modified Least Squares (FMOLS)
Date: 07/11/21 Time: 17:35
Sample (adjusted): 1985 - 2019
Included observations: 35 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth= 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnCOP	0.282420	0.236106	1.196160	0.2410
LnER	1.091313	0.101385	10.76399	0.0000
LnINFL	-0.270624	0.226673	-1.193895	0.2419
LnINTR	-0.017309	0.015922	-1.087109	0.2856
C	4.276044	0.986419	4.334915	0.0002
R-squared	0.917337	Mean dependent var		8.721879
Adjusted R-squared	0.906315	S.D. dependent var		1.926789
S.E. of regression	0.589752	Sum squared resid		10.43424
Long-run variance	0.398806			

Source: Author's Computation using E-views.

4.7. Relationship between Crude Oil Price and Stock Market Performance in Nigeria

Hypothesis: Nigeria's stock market performance is unaffected by crude oil price fluctuations. The crude oil price elasticity coefficient is 0.282420, which means that a 1% increase in crude oil prices will result in a 0.282420% increase in the Nigerian Stock Exchange's all-share index. This means that if the international oil price rises, Nigeria's stock market will perform better. The likelihood value of 0.2410 however, indicates that it is statistically insignificant at a 5% level of significance. As a result, we reject the null hypothesis that the price of crude oil has no effect on stock market performance in Nigeria.

4.7.1. Relationship between Exchange Rate and Stock Market Performance in Nigeria

Hypothesis: In Nigeria, the exchange rate has no effect on stock market performance. The exchange rate elasticity coefficient is 1.091313, which means that a 1% increase in the Naira will result in a 1.091313 % gain in the Nigeria Stock Exchange's all-share index. It is implied that if the exchange rate rises individuals will spend less on imported goods and invest their savings in stocks and shares. The stock market performance in Nigeria would increase as a result of this. This is in line with Ayunku and Etale's findings [41]. The probability value of 0.0000 indicates that it is statistically significant at the 5% level of significance. As a result, we reject the null hypothesis that the exchange rate has no effect on stock market performance in Nigeria.

4.7.2. The Relationship between Nigeria's Inflation Rate and Stock Market Performance

Hypothesis: In Nigeria, the rate of inflation has no bearing on stock market performance. The elasticity coefficient of the inflation rate is 0.270624, which means that a 1% increase in inflation will result in a 0.270624 % drop in the Nigeria Stock Exchange's all-share index. In other words, if Nigeria's inflation rate rises, the investing public's purchasing power will fall, resulting in a drop in stock and share investments. This corresponds to the findings of [41,42]. The likelihood value of 0.2419, however, indicates that it is statistically insignificant at a 5% level of significance. As a result, we reject the null hypothesis that the rate of inflation has no effect on stock market performance in Nigeria.

4.7.3. In Nigeria, the Relationship between Interest Rates and Stock Market Performance is as Follows

Hypothesis: The stock market performance in Nigeria is unaffected by interest rates. The interest rate elasticity coefficient is − 0.017309, which means that a 1% increase in the interest rate will result in a 0.017309 % drop in the Nigeria Stock Exchange's all-share index. It is implied that if the interest rate on alternative risk-free fixed income investments is raised, the investing public will be discouraged from investing in stocks and shares causing the stock market to underperform. This observation is consistent with that of [41,43]. However, based on the probability value of 0.2856, it is statistically insignificant at the 5% level of significance. As a result, we reject the null hypothesis that interest rates have no effect on stock market performance in Nigeria.

4.8. Coefficient of Determination – R^2 and Adjusted R^2

The coefficient of determination (R^2) is 0.917, indicating that the model's independent variables explained 91.7 % of the fluctuations in the all-share index. Its adjusted counterpart is 0.906, indicating that the explanatory variables are responsible for 90.6 % of the variance in the Nigeria Stock Exchange's all-share index when degrees of freedom are taken into account.

4.9. Error Correction Model (ECM)

The study went on to investigate the short run dynamics among the series after establishing a long-run link between the variables through co-integration tests [44]. This was accomplished through the use of the ECM. The ECM method was used to assess the causality relationship between the dependent variable (ASI) and the independent factors in the short term (COP, ER, INFL and INTR). Table 8 shows a frugal ECM.

Table 8. Results of the parsimonious ECM test.

Dependent Variable: LnASI				
Method: Least Squares				
Date: 07/11/21 Time: 19:42				
Sample (adjusted): 1986 - 2017				
Included observations: 32 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.885738	0.608338	6.387464	0.0000
LnCOP	0.275528	0.154661	1.781495	0.0865
LnER	1.141168	0.076406	14.93556	0.0000
LnINFL	-0.196401	0.140288	-1.399982	0.1733
LnINTR	-0.009636	0.009768	-0.986505	0.3330
ECM(-1)	-0.935878	0.153315	-6.104280	0.0000
R-squared	0.963007	Mean dependent var		8.740637
Adjusted R-squared	0.955893	S.D. dependent var		1.839430
S.E. of regression	0.386310	Akaike info criterion		1.103007
Sum squared resid	3.880119	Schwarz criterion		1.377832
Log likelihood	-11.64811	Hannan-Quinn criter.		1.194104
F-statistic	135.3681	Durbin-Watson stat		1.169528
Prob(F-statistic)	0.000000			

Equation 2 of the regression could be rephrased as follows:

$$\begin{aligned} LnASI_t &= 3.89 + 0.28LnCOP_t + 1.14LnER_t \\ &- 0.1964LnINFL_t - 0.0096LnINTR_t - 0.9359ECM_t \end{aligned} \quad (2)$$

4.9.1. Analysis of Error Correction Model (ECM) Result

Table 8 shows that 93.59 % of the previous year's disequilibrium is rectified in the current year, according to the output of a parsimonious ECM. It's worth noting that the ECM's coefficient has a negative sign, as expected, and is statistically significant at 5% with a probability value of 0.0000. As a result, we can now confidently assert that the variables under investigation are co-integrated. The ECM coefficient of -0.935878 is correctly signed (and significant at the 5% level with a probability of 0.0000), indicating that the variables adapt at approximately 94% of their maximum rate. The ECM's coefficient of determination (R^2) is 0.963007, indicating that the model's independent variables explain approximately 96 % of the fluctuations in the all-share index. Its adjusted counterpart is 0.955893, indicating that explanatory variables in the error correction model can account for 96 % of changes in the Nigeria Stock Exchange's all-share index when degrees of freedom are taken into consideration. The F-statistic for ECM is 135.3681 with a probability of 0.000000, which is less than 0.05 and hence significant, meaning that the explanatory variables (COP, ER, INFL, and INTR) collectively have a significant impact on the Nigerian Stock Exchange's stock market performance. The importance of the composition and inclusion of the variables in the model is further confirmed by the F-statistics. As a result, the explanatory variables are both important in predicting Nigerian stock market performance. There is no autocorrelation, according to the Durbin-Watson statistics value of 1.169528.

A Summary of Findings

This research project has provided evidence on the examination of the impact of crude oil price on stock market performance in Nigeria by empirically investigating the relationship between crude oil price and stock market performance in Nigeria using annual time series data from 1981 to 2019.In order to discover the association between these factors, some statistical techniques were used. The average, standard deviation, probability value, Jarque Berra, and Chi-square of the variables were also calculated using descriptive statistics. To show the relationship between the variables, a correlation matrix was created. A Johansen co-integration test was used to determine the long-run equilibrium relationship between the all-share index, crude oil price, exchange rate, inflation rate, and interest rate: the results showed that they were co-integrated, indicating the existence of long-run equilibrium relationships among the model's variables which led to the estimation of long-run elasticities using the FMOLS method. In order to examine the impact of crude oil price changes on the stock market performance in Nigeria throughout the study period, estimation was aided by the use of statistical software (Econometric-views 9). As a result of the investigation, both crude oil prices and the exchange rate have a positive impact on Nigerian stock market performance, whereas inflation and interest rates have a negative impact on Nigerian stock market performance.

5. Conclusion

The overall implication of these findings is for the regulatory authorities in Nigeria to ensure that there is general stability in exchange rates so that the Naira can appreciate as well as put inflationary trends under control. At the same time, they should try to maintain a stable interest rate regime and effectively utilize the rents from the oil sector to develop the non-oil sectors of the economy in order to bring about the desired economic growth and national development, which, by extension, will empower the investing public to divert their savings to buy stocks and shares.

6. Recommended Actions

The researcher has studied and identified the impact of crude oil price fluctuations on the stock market performance in Nigeria and in the course of the study, he has taken into account factors such as exchange rate, inflation rate, and interest rate and studied how they influence stock market performance in Nigeria. Based on the empirical findings, the following recommendations are provided:

1. Attempts should be made to stimulate and increase the productive base of Nigeria's economy. The over-dependence of the Nigerian economy on crude oil as its major revenue source has made it vulnerable to fluctuations in crude oil prices, which are determined by the forces of demand and supply. Hence, there is the urgent need to diversify the productive base of the economy to include the production and exportation of other goods and services as this will translate to economic growth and development and ultimately enhance the wellbeing of the investing public;
2. Nigerians should desist from the excessive importation of foreign goods and services. Nevertheless, an attempt should be made to increase the importation of capital goods that have the capacity to boost local production, which will appreciate the Naira. Since the exchange rate has a positive impact on the all-share index, as observed from this study, the appreciation of the Naira will by extension boost the performance of the stock market in Nigeria.
3. Efforts should be put in place to ensure exchange rate stability because the problem of economic growth is undoubtedly surmountable via exchange rate management if only the constituted authorities demonstrate their prowess in the execution of necessary policies to bring about stability in Nigeria's exchange rates.
4. Macro-economic policies should be formulated and properly implemented so as to achieve the macro-economic objectives of exchange rate stability, price stability, stability in the interest rate

regime, and improvements in stock market performance to bring about the desired economic growth and development in Nigeria.

Acronym

CAPM - Capital Asset Pricing Model
APT- Alternative Pricing Theory
COP- Crude Oil Price
ER- Exchange Rate
INFL- Inflation Rate
INTR- Interest Rate
ASI- All-Share Index
ADF- Augmented Dickey-Fuller
ADF- Augmented Dickey-Fuller
ECM-Error Correction Model

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Appendix-I

Secondary data of the variables employed in the study

YEAR	ASI	COP	ER	INFL	INTR
1981	NA	3.526361	-0.481739	3.035434	-65.85715
1982	NA	3.477541	-0.395325	2.041220	-4.586180
1983	NA	3.368674	-0.322398	3.144583	-8.022386
1984	NA	3.339322	-0.265885	2.880321	4.342493
1985	4.764564	3.296207	-0.112302	2.006871	2.343231
1986	5.009435	2.604909	0.562197	1.743969	4.310292
1987	5.175698	2.875258	1.390296	2.423917	-4.769645
1988	5.350957	2.656055	1.512259	3.998384	-2.962676
1989	5.612654	2.851284	1.996703	3.921379	-6.612412
1990	6.048931	3.102791	2.084216	1.996060	17.46624
1991	6.509693	2.924236	2.293544	2.565718	0.990847
1992	6.836281	2.914522	2.850707	3.797510	-14.98717
1993	7.113981	2.793004	3.094219	4.046029	-7.052475
1994	7.556548	2.742774	3.091042	4.043577	-15.92023
1995	8.246727	2.824944	3.086487	4.288265	-31.45257
1996	8.692010	3.010128	3.085573	3.376563	-5.260784
1997	8.940968	2.937043	3.086030	2.143589	12.12661
1998	8.693141	2.507972	3.086030	2.302585	11.48467
1999	8.568683	2.858766	4.530878	1.890095	6.047248
2000	8.810039	3.317816	4.622027	1.935860	-1.140889
2001	9.228679	3.140698	4.711600	2.937573	12.13870
2002	9.361504	3.192942	4.792313	2.555676	3.023542
2003	9.652452	3.335770	4.861516	2.641198	9.935713
2004	10.11612	3.584907	4.889522	2.708050	-2.604847
2005	10.03788	3.923754	4.877256	2.882564	-1.593680
2006	10.24358	4.110874	4.857096	2.107786	-5.627968
2007	10.79494	4.234686	4.834773	1.684545	9.187171
2008	10.82824	4.544358	4.775335	2.449279	6.684909
2009	10.04722	4.108576	5.003275	2.530517	18.18000
2010	10.11761	4.348728	5.012633	2.618855	1.067736
2011	10.06022	4.677119	5.036043	2.383243	5.685580
2012	10.06188	4.695468	5.059425	2.503074	6.224809
2013	10.49701	4.662212	5.058218	2.137710	11.20162
2014	10.58177	4.567364	5.066070	2.086914	11.35621
2015	10.33745	3.901771	5.259784	2.198335	13.59615
2016	10.18957	3.707701	5.535324	2.752386	6.686234
2017	10.37851	3.961004	5.722899	2.804572	5.790567
2018	10.52369	4.245347	5.723847	2.492379	6.055977
2019	10.27713	4.159508	5.717093	2.500616	7.420047