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Modeling Key Drivers of Nigeria's Economic Recession

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Abstract

This study makes a unique contribution by delving into the primary economic factors that led to Nigeria's economic recession. It does this by scrutinizing the bond yield and social progress, areas previously overlooked in related studies, and taking into account the country's population growth. We collected secondary data from the World Bank from 1989 to 2020 and analyzed it using a quantitative approach. The unit root test indicates that the unit root that could lead to an erroneous conclusion was eliminated to facilitate further econometrics analysis. The cointegrating analysis reveals evidence of cointegration, leading to the specification of VECM, a measure that confirms the long-term association among variables. The finding of this study based on OLS regression, reveals that while inflation has a negative impact on, the social progress index shows a positive impact on Nigeria's economic performance. It is concluded that both inflation and social progress modelled Nigerian economic development but differently. Therefore, the government must meet the social and environmental requirements necessary for the Nigerian population. This will create an enabling environment that will attract foreign investors to invest in the economy and enhance the growth of locally manufactured goods, ultimately leading to the recovery of the Nigerian economy from recession.

Keywords: GDP, Inflation, Social Progress, VECM.

Introduction

Compared to 2015–2016, when oil prices plummeted and Nigeria went through its first recession in 25 years, the macroeconomic environment is more difficult currently (1). Nigeria currently possesses fewer policy tools and buffers to mitigate negative effects. The excess crude account is running low, investor confidence is impacted by policy uncertainty, and foreign reserves are heavily dependent on short-term flows. Nigeria had a 6.3% annual growth rate in its economy before the recession of 2016. In comparison, the economy was increasing at a rate of 2.2% prior to the corona virus disease (COVID-19) pandemic era that contributed to economic decline due to lock-down of economic activities in the country which compounded the issues that led Nigeria to full recession. In 2014, inflation was in the single digits; in 2019, it was over 12%. In 2019, the overall government's budget deficit as a percentage of gross domestic product (GDP) was 4.4%, up from 1.8% in 2014. It is anticipated that underemployment and unemployment will rise, impacting low-income households and raising the proportion of the population at risk of poverty. Between 2020 and 2022, only agriculture is anticipated to favorably contribute to growth (2).

Nigeria is extremely susceptible to the COVID-19 pandemic's effects on the world economy, especially in light of the sharp drop in oil prices and the sharp increases in risk aversion observed in international financial markets (3-5). Across the country, 83 million Nigerians, or 40% of the population, live in poverty, while another 53 million are considered vulnerable. Many of these 53 million vulnerable people may become impoverished as a result of the COVID-19 epidemic. The length of the outbreak and its domestic spread determine how much of an impact it has on health, while oil prices determine how much of an impact it has on the economy. More than 80% of exports, 33% of bank sector credit, and 50% of government revenue come from oil. Growth in non-oil sectors and services is also impacted by oil prices, with pressure coming from foreign portfolio investors reevaluating risks and local liquidity management (6). The Nigerian Nati-

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onal Petroleum Company Limited (NNPCL) recently raised the average price of oil to eight hundred and ninety-seven naira (₦897) per liter across Nigeria's states. This has resulted in further hardship for the populace and worsened the country's economic outlook because Nigeria is still a mono-economy (7). A recession is defined as a two-quarter period during which there is a general decline in the level of economic activity relative to its long-term growth trend (8). Business fluctuations are changes in the economy over time between times of relatively fast expansion and recessions or contractions brought on by drops in the GDP, investment spending, consumer and company income, and inflation (8). It was also marked by an increase in debt, bankruptcy and the unemployment rate. A recession is, in essence, a time of overall economic downturn. However, two consecutive quarters of negative GDP growth are what economists refer to as a recession. A recession, as defined by the Business Dictionary, is a six-month period (two consecutive quarters) of overall economic deterioration, typically manifested as a contraction in the GDP. A recession is often elevated by government borrowing, declining average earnings, rising unemployment and heightened inequality (9).

The foundation of this study is Keynesian Demand and Supply Theory, which explains why most mainstream economists support the use of expansionary macroeconomic policy during recessions and think that low aggregate demand in the economy is the root cause of recessions. The preferred methods for bringing an economy out of a recession differ based on the economic theory that decision-makers adhere to. In order to spur economic growth, Keynesian economists favored higher government expenditure, whereas monetarists would prefer the use of expansionary monetary policy. In order to encourage company capital investment, supply-side economists proposed tax reductions. Conventional monetary policy can no longer be employed when interest rates approach the zero-interest rate policy boundary; instead, the government must take alternative steps to promote recovery. Keynesians contend that in situations where monetary policy fails, fiscal policy—such as tax cuts or higher government spending—works. Spending has a higher multiplier than tax cuts, thus it is more effective overall.

According to economists, a recession is a time when the nation's employment, investment, gross domestic product, income, and aggregate demand all drop. Nigeria possesses these attributes along with a few more, with the exception of a decrease in the cost of goods and services. Nigeria's recession is unique in that it is caused by a number of factors, including a high exchange rate, a balance of payments deficit, inflation—an increase in the cost of goods and services—poor output, rising unemployment, low income, and low aggregate demand. But the last recession wasn't a random event; rather, it was the consequence of past decisions and acts made by administrators and policymakers as well as the COVID-19 pandemic.

The effect of recession on economic growth has been the subject of numerous research studies conducted throughout the years. Nonetheless, many scholars have had divergent and contradictory views. A study looks into the economic downturn and possible solutions. He confirmed that a number of factors combined to cause Nigeria's economy to gradually move from a state of economic buoyancy to one of economic recession (10). He warned that if action is not taken, this recession will eventually turn into a complete economic meltdown, which could have disastrous, tragic, and lethal effects. Nigeria, the economic center of West Africa, has not changed since the global financial crisis was announced. Political figures, economists, and financial institution managers worldwide are now deeply concerned about the global economic and financial crises (10). Since the global financial crisis is the cornerstone and backbone of an inclusive, developing economy like Nigeria's, it is imperative to connect the global financial crisis and economic downturn to the prevalence of poverty in developing nations (11).

Another study looked at how Nigeria's macroeconomic stability and sustainable development were affected by the economic downturn between 1980 and 2016. For data analysis, the Ordinary Least Squares (OLS) approach was used (12). The findings indicate that these factors have a detrimental effect on both sustainable development and economic growth. Nigerians' socioeconomic and political lives are impacted by the recession, which should be investigated in order to identify its underlying causes and propose suggestions for long-term,

sustainable economic growth. According to this analysis, the Nigerian economy's deeper structural issues and over-reliance on foreign modern capitalist societies are the root causes of the country's current economic slump. A study investigated how business instructors in Nigeria perceived the effects of the economic downturn on their socioeconomic circumstances (13). The survey design used in the study was descriptive. Data was gathered using a standardized questionnaire with a five-point rating scale. The study's conclusions demonstrated how significantly Nigerians' socioeconomic lives were impacted by the economic downturn.

Research conducted an analysis of the primary factors contributing to the present economic downturn in Nigeria (14). The study provides theoretical insight into how government measures could be able to slow down the recession and improve the financial security of Nigerian citizens. According to the research findings, legacy issues, policy considerations, and political/security factors are the three key variables that contributed to the creation of Nigeria's economic slump. In the framework of the political economy approach, a study investigated the effects of the global economic downturn (15). Therefore, the goal of this study was to examine the major economic factors that contributed to the economic recession in Nigeria by examining the bond yield and social progress that were left out of previous related studies while accounting for Nigeria's population growth. This will add a new perspective to the body of knowledge.

Methodology

Data

For this study, secondary data was used, which came from World Bank Development indicators via https://www.macrotrends.net/global-metrics/countries/NGA/nigeria/ for the time under examination, which is from 1989 to 2022, for the main causes of Nigeria's economic recession that were taken into consideration. In order to guarantee the usability of trustworthy data, the 34-sample size purposive sampling technique was used to pick the chosen important economic indicators. The selection process was based on the consistency of the data availability without substantial missing values.

This study used a quantitative research design, and the secondary data was analyzed using econometric models like the unit root test, ordinary least square (OLS) regression, cointegration analysis, and vector error correction model (VECM), as well as descriptive statistics like mean and standard deviation for the data summary. The choice of the aforementioned econometrics models was based on the fact that the dataset collected for this study is continuous scale and time series data, which makes them suitable for the parametric econometric models used. The appropriate diagnostic tests, like Normality, skewness, and Kurtosis, for the reliability of the data were also conducted. EViews 12 and STATA 18.5 were the statistical program used for this study's analysis. The augmented dickey fuller (ADF) approach was used in this study to test for the presence of unit roots, which could lead to erroneous findings. The Johansen cointegration analysis approach, which uses the trace and max-eigen to determine the presence of cointegration among the series or variables of interest, is the cointegrating analysis approach used in this study. The OLS regression model aids in establishing the relationship between the variables of interest. It is important to understand that the VECM must be specified in cases when there is cointegration among the variables of interest. To establish the validity of the specified models, however, important diagnostic tests such as multicollinearity, autocorrelation, heteroscedasticity, model stability test, and normality of model residuals will be performed on the OLS regression and autocorrelation, and normality of model residuals, on the VECM.

Model Specification

The functional model for this study can be adequately specified as:

GDP = f (crude oil prices, inflation rate, unemployment rate, Bond yield, social progress index, pop-growth)…….. [1]

And the OLS regression model which is in accordance with the method employed in the work of Agri *et al*. (12) and can be expressed mathematically as follows:

$GDP_t = \beta_0 + \beta_1 Oil_t + \beta_2 Inf_t + \beta_3 Unemp_t + \beta_4 Bond_t + \beta_5 Social_t + \beta_6 Pop\text{-}growth_t + \mu_t$…….. [2]

To increase the model performance, logarithm was introduced to the GDP and have a new model as follows:

$InGDP_t = \beta_0 + \beta_1 Oil_t + \beta_2 Inf_t + \beta_3 Unemp_t + \beta_4 Bond_t + \beta_5 Social_t + \beta_6 Pop\text{-}growth_t + \mu_t$ ..... [3]

Where the GDP is the dependent variable that stand in for the economic performance, the selected key independent variables for modeling the economic recession includes the crude oil price (Oil), inflation (Inf), unemployment (Unemp), bond yield (Bond) and social progress index (Social) while the control variable is the population growth (pop-growth). The β_0 is the constant term, the β_1 to β_6 are the coefficient estimates of the predictor variables, the μ is the random error or residuals and the t is the given period in years. Meanwhile, Table 1 illustrate the variables description which includes the variables, measurement as obtained from World Bank Database and definition.

Table 1: Variables Description Obtained from World Bank Database

Variables	Measurement	Definition
Gross domestic product (GDP)	Billion US dollars (USD)	The entire monetary worth of goods and services produced in a nation over a specific time period is measured by its GDP.
Crude Oil price	USD Per Barrel	It is an essential commodity that drives other economic variables in the country (16). For instance, Nigeria operates under a mono-economy, where the price of other goods and services hinges on the price of crude oil, as all goods rely on this commodity for transportation.
Inflation rate	Percentage (%)	This is a reference to the general increase in prices of goods and services brought on by a high money supply. When the cost of gas and oil rises, inflation also rises.
Unemployment rate	Percentage (%)	An individual who is eager and able to work in this situation is unable to find gainful employment. According to Nigeria's current circumstances, the country's unemployment rate is at an all-time high.
Bond yield	Percentage (%)	This long-term debt security was issued to finance government spending by the Federal Government of Nigeria via the Debt Management Office. Since government bonds have the highest credit rating in the nation and are backed by the government, they are typically thought to be the safest bond investments.
Social progress index	Percentage (%)	This is a macroeconomic indicator that quantifies the degree to which countries meet the social and environmental requirements of their population.
Population growth	Percentage (%)	The phrase "population growth" refers to an increase in the total number of people within a population or varied group (17).

Results

Table 2: Descriptive Statistics

Statistics	GDP	Oil price	Inflation	Unemp	Bond yield	Social progress	Pop-Growth
Mean	239.08	48.633	19.110	4.82507	9.2497	38.3406	2.6326
Median	207.07	41.115	12.9418	3.994500	9.00310	37.925	2.6250
Maximum	574.18	109.450	72.8355	9.788000	15.5400	50.8242	2.8000
Minimum	27.752	12.280	5.3880	3.630830	5.18120	26.1299	2.41000
Std-Deviation	184.92	31.6801	16.8106	1.877083	2.70560	7.67254	0.10678
Skewness	0.2372	0.60778	-1.9091	-1.738125	0.47923	0.11645	-0.1912
Kurtosis	1.4294	2.04224	3.50904	3.397138	2.49619	1.79402	2.05465
Jarque-Bera	3.8137	3.39279	29.5725	19.88477	1.66101	2.13724	1.47329
Probability	0.1485	0.18334	0.06200	0.530048	0.43582	0.34348	0.47871
Observations	34	34	34	34	34	34	34

Table 2 shows that the average Nigerian GDP during the period under review was about 239 billion USD with a variability of about 185 billion USD, the average crude oil price was about 49 US dollars per barrel with a variability of about 32 US dollars per barrel, the average inflation rate was about 19% with a variability of about 17% during the period under review, the average unemployment rate was about 4.8% with a variability of about 1.9%, the average bond yield was about 9.2% with variability of about 2.7%, the average social progress index was about 38% with a variability of about 7.7%, and the average population growth was about 2.6% with a variability of about 0.1%. Additionally, the skewness of the dataset approaches zero. In contrast, the Kurtoses approaches 3 and their respective probabilities using Jarque-Bera exceed 0.05 significant levels, suggesting that the dataset is normally distributed, validating the reliability of the dataset collected.

Table 3: Unit Root Test

Differenced Series	T-statistic	P-value	Order
Δ^1GDP	-3.87	0.0058	I (1)
Δ^1Oil Price	-4.68	0.0007	I (1)
Δ^1Inflation	-6.07	0.0000	I (1)
Δ^1Unemployment	-3.27	0.0271	I (1)
Δ^1Bond Yield	-6.40	0.0003	I (1)
Δ^1Social Progress	-5.11	0.0012	I (1)
Δ^1 Pop-Growth	-6.37	0.0000	I (1)

Table 3 shows that all of the variables, that is, GDP, crude oil price, inflation, unemployment, bond yield, social progress, and population growth, are statistically significant at the 5% level after the first difference. This means that the unit root that could have led to the wrong conclusion is no longer present, which means that more econometric analysis can be done.

Table 4: OLS Regression

InGDP	Coefficient	Std. Error	t-Statistic	Prob.	VIF
C	-2.947521	1.468633	-2.006983	0.0549	NA
Oil Price	0.009809	0.002065	4.749510	0.0001	3.967303
Inflation	-0.004542	0.002380	-1.908484	0.0470	1.483566
Unemployment	0.005692	0.038738	0.146925	0.8843	4.900266
Bond yield	-0.051837	0.030017	-1.726954	0.0956	4.112738
Social progress	0.110732	0.014832	7.465977	0.0000	3.00167
Pop-growth	1.450144	0.509608	2.845606	0.0084	2.744323
R-squared	0.971992				
Adjusted R-squared	0.965768				
S.E. of regression	0.188697				
Sum squared resid	0.961372				
Log likelihood	12.37391				
F-statistic	156.1691				
Prob(F-statistic)	0.000000				

Table 4 shows that the overall model P-value of 0.000 is less than 0.05 significant level, implying that the OLS regression is statistically significant, suggesting that there is a significant linear relationship between the economic performance, crude oil price, inflation, unemployment, bond yield, and social progress while accounting for the population growth. More so, Table 4 shows that the coefficient estimates of the crude oil prices, social progress index, and population growth have a positive significant impact on the economic performance, indicating that an increase in the crude oil price, social progress, and population growth contribute to the rise in the economic performance. In contrast, the inflation rate has a significant negative influence on economic performance, indicating that an increase in the inflation rate contributes to a decline in economic performance, which yields further evidence of the country's economic recession. The variance

inflation factor (VIF) of all the explanatory variables is less than 5, indicating that the fitted OLS regression does not suffer from the problem of multicollinearity. The R-squared value of 0.972 indicates that 97.2% of the variability in economic performance can be explained by crude oil price, inflation, unemployment, bond yield, social progress, and population growth. The higher R-squared value and the model significance imply that the model is a good fit for the data.

Table 5: Unrestricted Cointegration Rank Test (Trace)

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.955843	253.5223	125.6154	0.0000
At most 1 *	0.881499	153.6821	95.75366	0.0000
At most 2 *	0.621654	85.43157	69.81889	0.0017
At most 3 *	0.567789	54.32932	47.85613	0.0109
At most 4	0.379100	27.48637	29.79707	0.0903
At most 5	0.280268	12.23564	15.49471	0.1460
At most 6	0.052081	1.711574	3.841466	0.1908

Note: Trace test indicates 4 cointegrating eqn(s) at the 0.05 level.

Table 5 shows that the first four cointegrating equations are statistically significant at the 5% level. This means that there is evidence of cointegration between the series. This means that economic performance is linked to the price of crude oil, inflation, unemployment, bond yield, social progress, and population growth over the long term. This further suggests that the specification of VECM is necessary.

Table 6: VECM

Equation		**Lag Parms**	**R-sq**	**P-value**
	GDP	9	0.4461	0.0296
	Oil Price	9	0.3476	0.0000
	Inflation	9	0.1147	0.0000
	Unemployment	9	0.9175	0.0000
	Bond Yield	9	0.7620	0.0000
	Social Progress	9	0.8159	0.0000
	Pop-Growth	9	0.5191	0.0032

Table 6 presents the results of the VECM, where each endogenous series has nine lag parameters. The corresponding p-values are less than the 0.05 significant level, indicating that the VECM is statistically significant. This suggests a long-term association between economic performance, the price of crude oil, inflation, unemployment, bond yield, social progress, and population growth.

Furthermore, the current economic recession in Nigeria is evident in Figure 1, which displays a slow growth pattern in the GDP, crude oil, inflation, unemployment, bond yield, social progress, and population growth. Figure 1 further shows that the oil price demonstrates a sharp increase from 2020 to 2022.

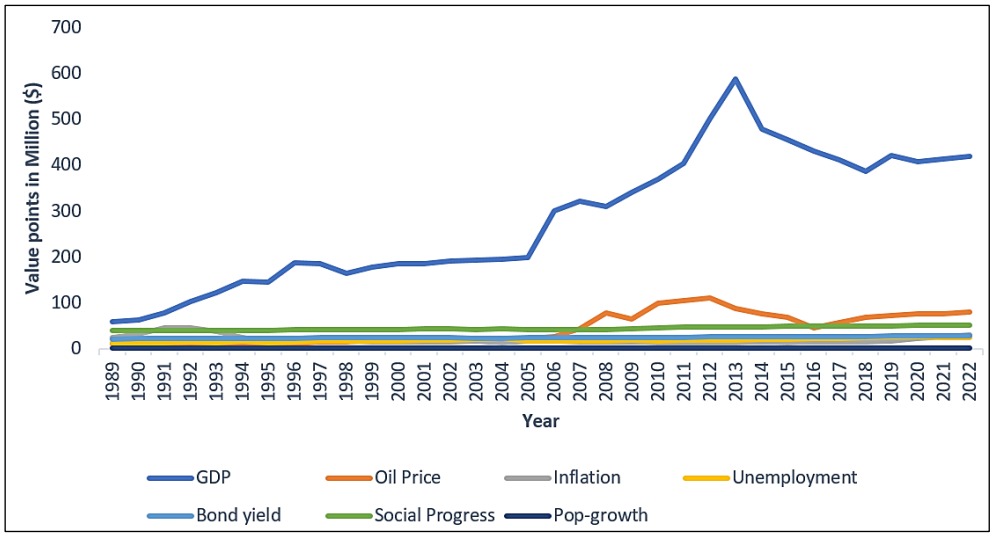

Figure 1: Graph of Economic Performance (GDP) and Other Key Economic Factors

Table 7: Diagnostic Tests for OLS Regression

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	4.938948	Prob. F(2,25)	0.0156
Obs*R-squared	9.629264	Prob. Chi-Square(2)	0.0581
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.834797	Prob. F(6,27)	0.1297
Obs*R-squared	9.847686	Prob. Chi-Square(6)	0.1312
Scaled explained SS	3.975367	Prob. Chi-Square(6)	0.6800

The results in Table 7 show that the OLS regression model residuals serial correlation P-value of 0.0581 is higher than the 0.05 significant level. This means that the regression model does not because the autocorrelation problem, which is what the OLS regression assumption of autocorrelation says should happen. Meanwhile, Table 7 further shows that the p-value of 0.1312 of the heteroscedasticity tests exceeds the 0.05 significant level, suggesting that the model does not suffer from the problem of heteroscedasticity and therefore upholds the assumption of homoscedasticity.

Furthermore, Figure 2 illustrates the normality test of the fitted OLS regression model residual, revealing a P-value of 0.627077 that surpasses the 0.05 significant level, confirming the model residual's normal distribution and satisfying the normality assumption. Figure 3 shows that the OLS model parameters fall within the two 95% confidence intervals, indicating that the fitted OLS regression model parameters are stable.

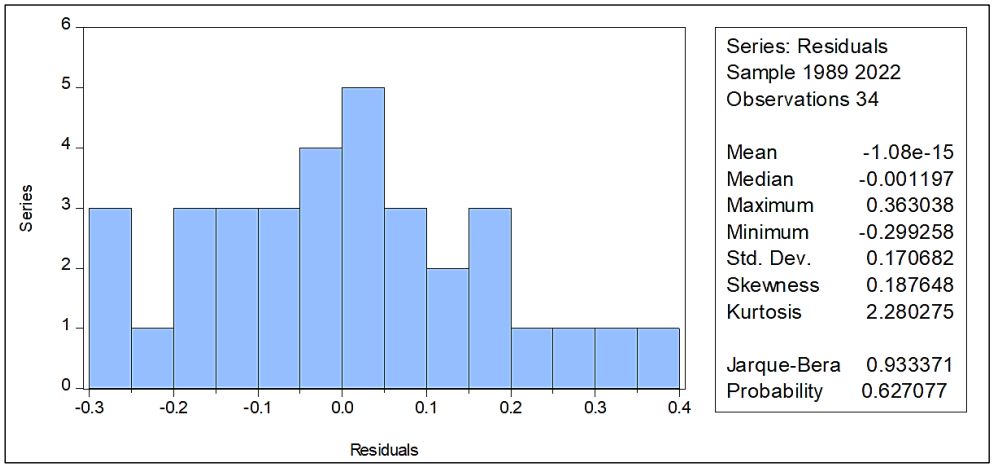

Figure 2: OLS Residual Normality Test

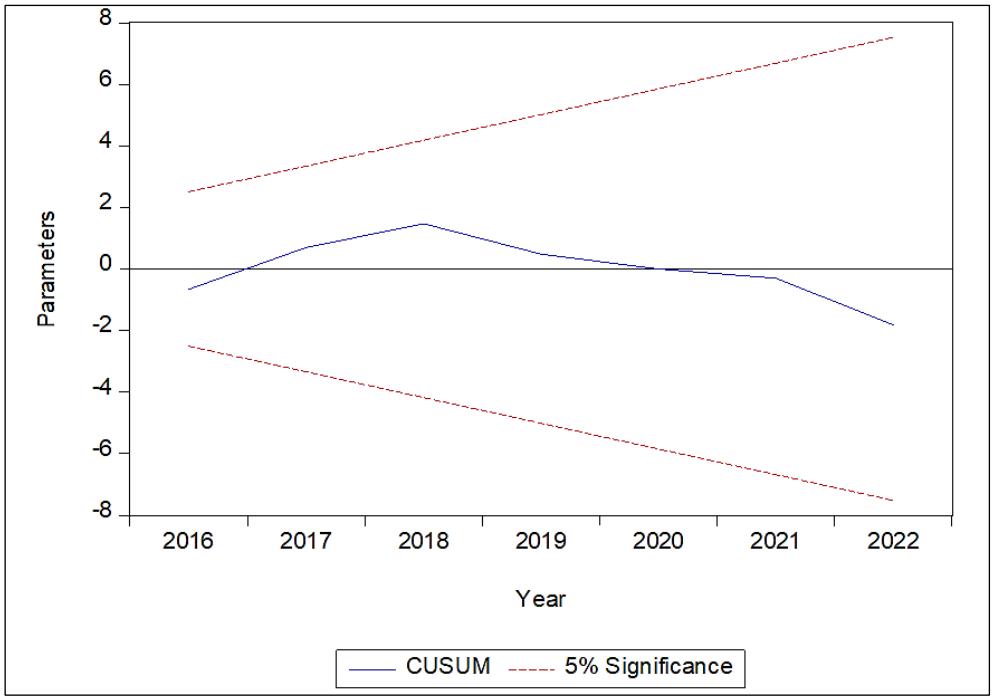

Figure 3: CUSUM Test of OLS Model Stability

Table 8: Vector Error Correction Residual Normality Tests

Component	Skewness	Chi-sq	df	Prob.*
1	-0.503470	1.309655	1	0.2525
2	-0.092061	0.043789	1	0.8342
3	-1.162222	6.978925	1	0.1182
4	1.329669	9.134770	1	0.1025
5	-0.722092	2.693985	1	0.1007
6	0.096590	0.048203	1	0.8262
7	0.844799	3.687374	1	0.0548
Joint		23.89670	7	0.3270

Table 8 demonstrates that the vector error correction (VEC) residual normality test P-values of all the endogenous variables surpass the 0.05 significant level, confirming the normal distribution of the VECM model residual. Table 9 also shows that the P-values of the VEC residual correlation test exceed the 0.05 significant level, suggesting that the VEC residual does not exhibit the problem of serial correlation.

Table 9: Vector Error Correction Residual Serial Correlation LM Tests

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	72.07345	49	0.0176	1.677281	(49, 14.6)	0.1401
2	79.97114	49	0.0034	2.132455	(49, 14.6)	0.0574
3	35.26595	49	0.9298	0.453612	(49, 14.6)	0.9800

Discussion

Based on the analysis of this study, Table 4 reveals that the coefficient estimates of crude oil prices, social progress index, and population growth significantly positively influence economic performance. This suggests that an increase in crude oil prices, social progress, and population growth leads to an improvement in economic performance. In contrast, the inflation rate significantly negatively impacts economic performance, suggesting that an increase in the inflation rate leads to a decline in economic performance. This, in turn, provides additional evidence of the country's economic recession. This aligns with the findings of Agri *et al.* (12) and Adetayo and Ben (10), who argue that key macroeconomic factors negatively impact economic growth, thereby contributing to the

economic recession. Figure 1 shows a sharp increase in the oil price from 2020 to 2022, leading to a significant increase in fuel prices in Nigeria. This has resulted in an economic downturn and significant hardship for the citizens (7).

The first four cointegrating equations in Table 5 are statistically significant at the 5% level. This means that there is evidence of cointegration between the series. This implies a long-term relationship between economic performance and the price of crude oil, inflation, unemployment, bond yield, social progress, and population growth. This further suggests that VECM specification is necessary. Table 6 presents the results of the VECM, where each endogenous series has nine lag parameters. The corresponding p-values are less than the 0.05 significant level, indicating that the VECM is statistically significant. This suggests a long-term association between economic performance, the price of crude oil, inflation, unemployment, bond yield, social progress, and population growth.

Conclusion

By exploring the main economic causes of Nigeria's economic slump, this paper offers a distinctive contribution. It accomplishes this by carefully examining socioeconomic advancement and bond yield - aspects that were previously disregarded in similar studies - and accounting for the nation's population increase. The results show that inflation hinders economic growth, a problem that is exacerbated by rising gasoline prices, which had a major role in the economic downturn that affected Nigeria and other developing countries. On the other hand, the social progress index has a positive impact on economic performance, according to the social progress that was included in this study to fill the vacuum left by earlier research. As a result, the government needs to provide for the social and environmental needs of the Nigerian people through sustainable economic policies that will combat inflation and enable an actionable price regulatory system that will make a good livelihood for Nigerian citizens. This would eventually lead to the Nigerian economy emerging from recession by fostering an environment that will draw in international investment and foster the expansion of locally produced goods.

Abbreviations

GDP: Gross Domestic Product, OLS: Ordinary Least Square, VECM: Vector Error Correction Model.

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Author Contributions

Okuwuise UY: Conceptualized the study and contributed to the literature review, Vincent Edewhor: Provided insights on the methodology, Abdulgaffar Muhammad: Led data analysis and interpretation, Igiagbe Joseph Ikpea: Assisting in data collection, Nelson C: Examined the data collecte, Jimoh Samuel Ikhide: Reviewed policy implications, Edirin Jeroh: Focused on financial aspects and supervised the manuscript preparation.

Conflict of Interest

The authors declare no conflict of interest.

Ethics Approval

Not applicable.

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