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# Central Bank Independence and Inflation in Nigeria

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## Abstract
*In this study, the nexus between Central Bank Independence (CBI) and inflation is examined for the Nigerian economy. Utilising data spanning 1980-2012, due to data availability, and the Garriga CBI database developed from the Cukierman index, in a Dynamic Ordinary Least Squares and the Error Correction Mechanism, CBI was found to have a significantly negative impact on inflation in both long run and short run dynamic models respectively. Also, for robustness, the components of CBI such as personnel independence, political independence and financial independence were all significantly negative determinants of inflation in Nigeria in the long run. The long-run results further confirmed an inverse nexus between real per capita GDP, political freedom and inflation in Nigeria suggesting that pro-per capita income growth policies are necessarily not inflationary and that institutional quality reduces inflation in Nigeria. CBN reforms and financial depth were found to directly impact inflation in Nigeria. Since the enhancement of CBI dampens inflation in Nigeria, the laws establishing the CBN need to be reevaluated and strengthened to allow for its true independence so that it can perform its main objective of price stability.*

**Keywords: Central Bank Independence, Inflation, Cukierman Index**
**JEL Classification Codes: C13, E17, E31**

## 1. Introduction

Inflation in Nigeria has reached an alarming dimension and requires urgent, deliberate and conscientious attention. Coupled with the free fall of the naira, the hyperinflation currently experienced in Nigeria has dire implications for economic growth, investors' confidence, productivity, external balance, employment, income inequality and the overall well-being of the Nigerian people who mostly are grappling with extreme poverty and food insecurity (Abraham, 2024; Akinleye & Adekunle, 2019; Anyanwu, 1993; Mujahid, Uddin, Tabash, Ayubi, & Asad, 2021).

The problem of inflation in Nigeria dates back to 1951. It resulted from the policies of the Governments at the time aimed at stimulating

economic growth. In the decade post-independence, inflation assumed a negative growth in 1963, 1967 and 1968 and a value of 9% in 1966. Inflation hit double digit in 1969. The 1974 Udoji salary awards resulted in an inflation of 33.7% in 1975. It was a case of money supply not matched with production of goods and services. Inflation hovered between 40% in 1984 and 50.47% in 1989. Inflation in 1989 was induced by the Structural Adjustment Programme of the then military Government. Inflation averaged 30.64%, 12.33% and 11.80% in the decades 1990 – 1999, 2000 – 2009 and 2010 – 2019 respectively. This reflected a decline in the inflation figure from the 1990-1999 to 2010-2019 decades. However, inflation has been on a sharp increase since then. For the 2020, 2021 and 2022 periods, inflation averaged 16.35% (World Bank, 2022). Inflation reached 28.92% in December 2023 and has been on a persistent and consistent northward trajectory since then (National Bureau of Statistics, 2024).

The factors that were responsible for the rising inflation in Nigeria were largely external during the decade prior to independence. They included a decline in global output and increases in global export prices. Post-independence inflation has generally been caused by structural rigidities resulting from supply shock dynamics, increases in money supply, growth in government expenditure, banking sector financing, budget deficit, wage increase agitations, balance of payment crisis, currency devaluation, increases in cost of production resulting from climatic conditions, insecurity, terrorism, high energy cost and infrastructural decay (Anyanwu, 1993; Bawa, Abdullahi, & Ibrahim, 2016; Abusomwan, 2019; Abusomwan & Ohihon, 2022; Rapu, *et al.*, 2016; Yahaya, Saidu, & Sadi, 2022). Most recently, the removal of subsidy on prime motor spirit and the floating of the naira in the wake of the administration of President Bola Ahmed Tinubu in 2023 have exacerbated inflationary pressures in the country. All these supports the Classical, Keynesian, Cost-push and Structuralist theories of inflation.

Recent theorizing and empirical investigations seem to begin to focus on some other potential determinants of inflation, especially, in developing economies. Central Banks, the world over, are saddled with the main responsibility of ensuring stable prices in the economy. Their sensitivity as the apex regulatory financial institution has a large influence on the gaps and conflicts encountered in the formulation and implementation of monetary policies. Such degrees of responsiveness could be affected by their level of independence. Central Bank Independence (CBI) is beginning to gain relevance in theories of inflation and inflation targeting. Recent events culminating into the removal of the Governor of the Central Bank of Nigeria in 2023, the hyperinflation and the free fall of the naira, currently being witnessed, make the independence of the apex regulatory monetary and

financial institution in the country doubtful. The inflation witnessed in Nigeria from 2022 till date may not be unconnected with monetary policy misalignment, insider abuses, political interferences, distraction from the ruling political class, corruption and inexperience by the managers of the volume, cost, availability and direction of money in the economy who have been somewhat described as, 'round pegs in square holes' and 'stooges of the politicians', in terms of monetary management. Garriga and Rodriguez (2020) observed that limited evidence in the relationship between CBI and inflation still looms in developing countries.

This study therefore examines the long run and short run dynamic CBI-inflation nexus in Nigeria by exploring the Cukierman, Webb and Neyapti (1992) indexes which were updated by Garriga (2016) and harnessing the Stock and Watson (1993) Dynamic Ordinary Least Squares (DOLS) and Error Correction regression analytical methodologies.

The study is structured thus: Section 1 is the introduction; in section 2, the literature on the relationship between CBI and inflation is reviewed; the methodology of the study is presented in section 3; section 4 deals with the results and discussion. The conclusion and policy recommendations of the study are carried out in section 5.

## 2. Literature Review

### 2.1 Brief Theoretical Review

Several theories explaining the behaviour and determinants of inflation exist in economic literature. They include classical, Keynesian, monetary, demand-pull, cost-push, structural and imported theories of inflation. To the classical theorists, inflation results from 'too much money chasing too few goods. The classical theory of inflation is hinged on the quantity theory of money which attributes changes in the general level of prices to changes in the quantity of money in circulation that is not matched with the quantity of goods and services in the economy (Green, 1982; Seers, 1962).

The Keynesian theory of inflation stems from the Keynesian inflationary gap analysis. The theory postulates that when aggregate demand becomes greater than the full employment output level, a stimulation of prices arises which ensures that the monetary value of the full employment output is maintained. The amount by which the actual aggregate demand exceeds the level of national income which corresponds to full employment is defined as the Keynesian inflationary gap (Anyanwu, 1993; Keynes, 1936).

Demand-pull inflation theorizes inflation as a situation where in the short run when the economy is not necessarily in full employment equilibrium, the output supply does not sufficiently respond to increases in aggregate

demand which was stimulated by changes in any of the components of aggregate demand (consumption, investment, government expenditure and net export). This will inevitably result in price increases. The rise in the cost of factors of production or in the inputs utilized in the production process is the crux of the cost-push theory of inflation. The monetary theory of inflation states that inflation results from the growth of the money supply in the economy (Anyanwu, 1993; Keynes, 1936; Wolfgang, 1981).

The structuralism theory, also called the long-term theory of inflation, identifies rigidities, especially in developing economies, as the primary cause of inflation. Such rigidities include the inelasticity of export revenues to global market prices for primary/natural products which are the main components of exports in developing countries in Sub-Saharan Africa. The low export revenue shifts the import supply curve backwards leading to local production of the erstwhile imported goods with the attendant cost implications (arising from inefficiencies and comparative disadvantage in production) and ultimately, increases in prices. Also, structural rigidities result from the inelasticity of the supply of foodstuffs given that domestic food production does not usually match population growth. Prices of food increase and workers agitate for higher wages which results in spiralling inflation effects (Abraham, 2024; Anyanwu, 1993; Bernhard & Thomas, 1980; Fahlevi *et al*., 2020; Frisch, 1984).

## 2.2 Empirical Review

Bodea and Hicks (2015), in examining the relationship between CBI and price stability in a panel study of 78 countries for the 1973 – 2008 period found that; there is a difference between democracies and dictatorships in the likelihood of political interference and changes to the law because in democracies there are political oppositions and the freedom to expose the government; evidently, lower money supplies and robust money demand which dampen inflation expectation and inflation abound in democracies; the empirical results supported monetary discipline and credibility effects by political institutions.

Garriga and Rodriguez (2020) examined the impact of CBI on inflation in 118 developing countries for the 1980-2013 periods. A significantly negative nexus between CBI and inflation was found and the relationship was stronger in democratic countries than in non-democratic countries. Similarly, in a panel study of 17 Latin American countries for the period 1940-2019, Jacome and Pienknagura (2022) confirmed a significantly negative impact of CBI on inflation. Specifically, they found that an increase in CBI, which is synonymous with a movement from the $25^{th}$ to the $75^{th}$ percentile of the CBI historical distribution, resulted in the decline of inflation

to the historical median value, representing the 25th percentile of the historical distribution of inflation. They recommended that monetary authorities should be shielded from political influences to engender CBI.

Yahaya *et al*. (2022) employed mean group, common correlated effect mean group and augmented mean group regression methods in a panel data analysis of 14 African countries for the period 1985-2019 to investigate the effects of CBI and financial stability on inflation. Their findings also revealed a significant negative relationship between CBI and inflation. Greater independence of the central banks from political and government influence was recommended by their study.

In another examination of the CBI-inflation nexus and in a study of twenty Asian countries, employing the Generalized Method of Moments (GMM) estimation technique, Darwato (2020) empirically discovered an inverse relationship between CBI and inflation and further opined that the inverse relationship between CBI and inflation depends on institutional quality and the level of development of the financial sector. To ensure the independence of the Central Banks for inflation targeting, the study recommended the strengthening of the intermediation processes and ensuring quality institutions in the financial system.

Moreover, in a study of the influence of CBI on price stability in a panel data set of 124 countries for the period, 1970 to 2013, Nurbayev (2018) found that the effect of legal CBI on price stability depends on institutional quality which is proxied by the rule of law. A weak rule of law was observed to remove the significance of the CBI-price stability nexus. It was also found that whereas 67% of advanced countries possess the appropriate rule of law only 4.5% of developing countries had the required level of rule of law that maintains price stability through the enhancement of CBI. The study suggested that apart from strengthening the rule of law to engender CBI, which could be made possible only in the long run, other reforms such as a fixed exchange rate regime could temporarily check inflation in the face of weak CBI.

Dudchenko (2020) studied the role of CBI in banking and financial stability for 10 developed and 10 developing countries for the 1991 to 2012 period. Employing the panel fixed effect regression technique, it was established that CBI ensured banking stability. The study recommended the prioritizing of the goals and the independence of monetary policy of the Central Banks. Mujahid *et al.* (2021) found that institutional quality proxied by political stability, absence of violence, regulatory quality and the rule of law reduce inflation volatility in OECD countries, in a panel study of 182 countries for the period, 1998 to 2018. It was also found that the average inflation rates were significantly influenced by institutional quality. It was

suggested that volatility of inflation in OECD could be improved by strengthening institutions and advocating low exchange rate regimes.

Ozegbe and Kelikume (2022) in a study of the interactive effect of corruption and institutional quality on economic performance in Nigeria for the period 1970 to 2020 found that the corruption-institutional quality interaction exerted a negative and significant impact on economic performance in Nigeria. They recommended policy interventions which should focus on checking corruption and improving institutional qualities for enhanced economic performance in Nigeria.

However, Agoba, Abor, Osei, and Sa-Aadu (2017) in a study of the role of financial systems and institutional quality in 48 African countries for the 1970 -2012 period observed that CBI is not sufficient in lowering inflation in Africa and developing countries but that the impact of CBI on lowering inflation is stronger in the presence of a developed banking sector and institutional quality. Independent central bankers and policy makers in Africa were advised, by the study, to focus more on the development of the banking sector so as to effectively lower inflation levels in the region.

From the review of literature, the relative dearth of research in the relationship between CBI and inflation in Nigeria, the mixed results and the seeming erosion of the Central Bank of Nigeria independence in the face of hyperinflation and the falling value of the naira warrants a further examination of the CBI-inflation nexus for Nigeria.

## 3. Methodology

The model for this study is developed based on the empirical study of Garriga and Rodriguez (2020). Central Bank Independence, which depicts the lack of political interference in the administration of Central Banks, has gained global attention as an institutional tool for checking inflation since 1980s (Cukierman *et al.*, 1992; Garriga & Rodriguez, 2020; Garriga, 2016; Okorie, 2021; Swinburne & Branco, 1991). According to Rogoff (1985), monetary policy should be delegated to an independent Central Bank. Independent Central Banks are able to focus on their primary responsibility of ensuring price stability without interferences from the politicians who are mostly interested in the short term boosting of output and employment in order to win elections. To do these, they have unending appetite for enhanced government spending which usually results in budget deficit necessitating deficit financing through increased debt and/or printing more money which in turn exacerbates price instability and inflationary pressures in the economy.

CBI insulates Central banks from these political pressures and interferences and positions them for efficient and effective monetary management (Bernhard, Broz, & Clark, 2002; Garriga, 2016; Rogoff, 1985;

Qanas & Sawyer, 2023). The Stock and Watson (1993) Dynamic Ordinary Least Squares (DOLS) technique is chosen as the method for the long-run data analysis while the Error Correction Mechanism (ECM) is adopted for the short-run dynamic modeling. The choice of DOLS technique is because it provides estimates which are robust for serial correlation and endogeneity concerns existential for co-integrating relationships (Abusomwan & Ohihon, 2022). The DOLS model is constructed by transforming the long-run model in Equation 2 to a dynamic one (Stock & Watson, 1993).

### 3.1 Model Specification

The model specified for this study derives from the empirical review of the literature and the modification of the model developed by Garriga and Rodriguez (2020). The CBI-inflation relation by Garriga and Rodriguez is presented in Equation 1.

$$\Pi = Q\Pi_{it-1} + \beta_1 CBI + \beta_2 CBI_{it} * Dem_{it} + \delta X_{it-1} + \varepsilon_t + \eta_t + \mu_t \quad (1)$$

Where, $\Pi$ is inflation, CBI is Central Bank Independence, Dem is democracy, X is vector of time-varying control variables such as capital account openness, GDP per capita, trade openness, world inflation and political instability. t denotes the current period while t-1 represents immediate past period. $\beta_1$, $\beta_2$ and $\delta$ are the coefficients of the explanatory variables. $\varepsilon_t$ is the period-specific constant that account for common shocks, $\eta_t$ is the unobserved country specific effect that captures all time-invariant factors affecting the outcome while the error term is denoted as $\mu_t$ (Garriga & Rodriguez, 2020).

Modifying model 1, the general form of the baseline model of this study is presented in Equation (2).

$$INFL = (CBI, GDP, PDC, PR, REF) \quad (2)$$

From Equation (2), INFL is inflation, GDP is Gross Domestic Product per capita, PDC is private domestic credit to GDP ratio, PR is political right and REF is a dummy representing Central Bank reforms. Apart from CBI which is the explanatory variable of interest, PR and REF are institutional variables that indicate the level of freedom of institutions and reforms in the apex regulatory monetary and financial institution respectively. A free society is also reflected in the independence of the regulatory institutions including the Central Banks. PR takes the values of 1 (free) to 7 (not free). The society loses freedom with increases in the value of PR.

Specifically, the econometric form of the baseline model is specified in Equation (3).

$$INFL = \propto_0 + \propto_1 CBI + \propto_2 lnGDP + \propto_3 PDC + \propto_4 PR + \propto_5 REF + \mu \quad (3)$$

The variables in Equation (3) are as defined in Equation 2. The log transformation of Gross Domestic Product (lnGDP) was to standardize the data

in order to minimize the problem of heteroskedasticity in the series. The coefficient of lnGDP is interpreted as elasticity. μ is the stochastic error term.

The Stock and Watson (1993) DOLS model is specified for the long run relationship. Equation (4) is the modification of the baseline model (Equation 3) in line with the DOLS model.

$$INFL = \propto_0 + \propto_1 CBI + \propto_2 lnGDP + \propto_3 PDC + \propto_4 PR + \propto_5 REF + \sum_{i=1}^{5} \sum_{j=-q,p}^{2} \gamma_i \Delta X_{t-j} + \mu \quad (4)$$

The variables in Equation (4) are as defined in Equation 3. *X* is the vector of the explanatory variable (CBI, lnGDP, PDC, PR and REF) expressed in a dynamic form by introducing the lag difference operator (Δ). –*q* represents the lead while *p* represents the lag. The inclusion of the lags and leads is to make the errors independent (Edo, Okodua, & Odebiyi, 2019). The $\propto_i$ $(i = 1, 2, 3, 4, 5)$ are the long run coefficients of the explained variables. They explain the responsiveness of changes in INFL to changes in the explanatory variables. $\gamma_i$ $(1, 2, 3, 4, 5)$ are the coefficients of the first difference variables.

Error Correction Mechanism (ECM) is estimated for the short run dynamic relationship between CBI and inflation in Nigeria. As a precondition for ECM, tests for stationarity and co-integration are required. When the series are stationary at the same order e.g. I(0) or I(1), the hypothesis of a unit root is rejected and the likelihood of co-integration of the variables exists. Equations 5 and 6 show the Augmented Dickey Fuller unit root test specifications for intercept only and for trend and intercept respectively.

$$\Delta X_t = \beta_0 + \tau X_{t-1} + \delta_i \sum_{i=1}^{p} \Delta X_{t-p} + \varepsilon_t \quad (5)$$

$$\Delta X_t = \beta_0 + \beta_1 t + \tau X_{t-1} + \delta_i \sum_{i=1}^{p} \Delta X_{t-p} + \varepsilon_t \quad (6)$$

The co-integration tests proposed by Johansen (1988) and Johansen and Juselius (1990), to ascertain the long run relationship among the variables employed by the study, is also adopted. The ECM is specified in Equation 7.

$$\Delta INFL_t = \pi + \sum_{i=1}^{m} \sigma_i \Delta CBI_{t-1} + \sum_{i=1}^{n} \lambda_i \Delta lnGDP_{t-1} + \sum_{i=1}^{p} \tau_i \Delta PDC_{t-1} + \sum_{i=1}^{q} \delta_i \Delta PR_{t-1} + \sum_{i=1}^{r} \alpha_i \Delta REF_{t-1} + \psi ecm(-1) + \mu_i \quad (7)$$

All the variables are as explained in the long run model (Equation (3). $\Delta$ is the lag operator, $t-1$ represents a one period lag of the explanatory variable, $ecm(-1)$ is the one period lag of the residual from Equation (1), $\pi$ is the constant term, $\sigma, \lambda, \tau, \delta \; and \; \alpha$ are the short run dynamic parameters with expected signs as in Equation 2 while $\psi$ is the speed of adjustment from

temporary disequilibrium and is expected to be significant with a negative value.

The data utilized by the study spanned from 1980 to 2012 based on the availability of the global CBI data which only spans from 1970 to 2012 (Garriga, 2016). The data were sourced from World Bank (2022), World Development Indicator, Freedom House data database (Freedom House, 2022) and the CBI index computed by Garriga (2016) based on Cukierman *et al*. (1992) coding and weighing rules. The description and measurement of the variables are presented in Table 1.

From literature CBI is expected to have a negative relationship with inflation. An increase in central bank independence devoid of political interferences should allow the Central Bank to focus on its primary responsibility of ensuring price stability (Cukierman *et al.*, 1992; Garriga, 2020; Yahaya *et al*., 2022). Gross domestic product could stimulate inflation beyond the full employment equilibrium level. However, below the full employment equilibrium level, changes in GDP may not positively or significantly influence inflation (Anyanwu, 1993). The level of financial depth of the financial system measured as the ratio of private sector domestic credit to GDP is expected to deter inflation. This is because a well-developed financial system enhances efficiency and effectiveness of monetary management (Abusomwan, 2019). Increases in the political right (PR) index represent decrease in institutional freedom (Freedom House, 2022). Therefore PR is expected to have a positive coefficient in relation to inflation (Akinleye & Adekunle, 2019). Central Banking Reforms (REF) is expected to specifically engender CBI and inflation targeting and hence reduction in inflation.

**Table 1: Definition of Variables and Sources of Data used for the Regression Analysis**

| Variable | Definition | Source |
|---|---|---|
| Inflation (INFL) | Consumer Prices (Annual %) | WDI (World Bank, 2022) |
| Central Bank Independence (CBI) | Central Bank Independence (ranging from 0 to 1) | Garriga (2016) |
| Central Bank Independence: Personnel (CBI_P) | Central Bank Independence (Personnel Independence, ranging from 0 to 1) | Garriga (2016) |
| Central Bank Independence: Policy Independence (CBI_PI) | Central Bank Independence (Independence in Policy Formulation, ranging from 0 to 1) | Garriga (2016) |
| Central Bank Independence: Financial Independence (CBI_F) | Central Bank Independence (Limitation on Lending to Government, ranging from 0 to 1) | Garriga (2016) |
| log of Gross Domestic Product (lnGDP) | Log of Gross Domestic Product per capita ($) | WDI (World Bank, 2022) |
| Private Sector Domestic Credit to GDP ratio (PDC) | Ratio of Private Sector Credit to GDP (%) | WDI (World Bank, 2022) |
| Political Right (PR) | Freedom of institutions and individuals [ranging from 1 - 7, free(1), not free(7)] | Freedom House (2022) |
| Central Banking Reforms (REF) | Dummy variable that captures year of reform in Central Banking [Reform(1); No reform (0)] | Garriga (2016) |

Note: WDI is World Development Indicators; CBI_P, CBI_PI and CBI_F are the disaggregated CBI components.

Source: Authors' Design

## 4. Results and Discussion

### 4.1 Descriptive Statistics

The main statistical attributes of the time series employed by the study is summarized and described by the descriptive statistics of the study.

**Table 2: Descriptive Statistics**

| Variable | Obs. | Mean | Maxi. | Mini | S.D. |
|---|---|---|---|---|---|
| INFL | 33 | 20.46 | 72.83 | 5.38 | 18.21 |
| CBI | 33 | 0.483 | 0.602 | 0.387 | 0.076 |
| CBI_P | 33 | 0.552 | 0.645 | 0.457 | 0.071 |
| CBI_PI | 33 | 0.281 | 0.500 | 0.180 | 0.112 |
| CBI_F | 33 | 0.499 | 0.664 | 0.309 | 0.135 |
| GDP | 33 | 1051.5 | 2728.0 | 270.0 | 728.0 |
| PDC | 33 | 8.625 | 19.625 | 4.957 | 3.509 |
| PR | 33 | 4.848 | 7.000 | 2.000 | 1.603 |
| REF | 33 | 0.091 | 1.000 | 0.000 | 0.292 |

Note: These are raw data before the log transformation; Obs. is Observation; S.D. is Standard Deviation
Source: Authors' computations using Eviews 10 (2024).

Table 2 shows the descriptive statistics of the variables for the regression. Inflation averaged 20.46% for the period 1980 to 2012 with standard deviation of 18.21%, revealing a relatively high level of price instability with high variability. The aggregate index for Central Bank Independence (CBI) was 0.48 which is below half of the scale (0 – 1). This indicates a relative Central Bank of Nigeria dependence on political interferences. The disaggregated components of CBI which include, CBI_P, CBI_PI and CBI_F averaged 0.552, 0.281 and 0.449 respectively. CBI_PI which represents the independence of the Central Bank of Nigeria (CBN) in the formulation of monetary policy had the lowest score of 0.281. This indicates the lack of freedom of CBN in the formulation and implementation of monetary policy. The measures of institutional quality adopted for the study, PR has a mean of 4.84 which shows that the institutions in Nigeria lack quality and are generally weak. Per capita Gross Domestic Product (GDP) and Private sector domestic credit to GDP ratio (measure of financial depth) had mean values of $1051.5 and 8.625% respectively. Reforms in Central Bank of Nigeria only averaged 0.09 indicating the docility of the apex monetary regulatory institution in Nigeria.

## 4.2 Unit Root and Co-integration Tests

The diagnostics required before the DOLS and ECM models are analyzed include the test of stationarity (Unit Root Test) and the co-integration test. Whereas the stationarity test assesses the presence of unit root in the

series, the co-integration test ascertains the long run relationship amongst the variables employed for the regression analysis. The Augmented Dickey Fuller test for unit root is presented in Table 3 while the Johansen Co-integration test is shown in Table 4.

**Table 3: Unit Root Test Result (Trend and Intercept)**

| | **Augmented Dickey Fuller Test** | | | | | |
|---|---|---|---|---|---|---|
| | **Levels** | | | **First Difference** | | |
| Variable | Test Stat. | 5% Critical Value | Remark | Test Stat. | 5% Critical Value | Remark |
| | -2.341 | -3.548 | Not Stationary | -3.954 | -3.563 | Stationary I(1) |
| CBI | -2.601 | -3.558 | Not Stationary | -5.680 | -3.563 | Stationary I(1) |
| CBI_P | -2.353 | -3.558 | Not Stationary | -5.628 | -3.563 | Stationary I(1) |
| CBI_PI | -2.080 | -3.558 | Not Stationary | -5.739 | -3.563 | Stationary I(1) |
| CBI_F | -2.228 | -3.558 | Not Stationary | -5.620 | -3.563 | Stationary I(1) |
| lnGDP | -0.894 | -3.558 | Not Stationary | -8.176 | -3.563 | Stationary I(1) |
| PDC | -3.017 | -3.563 | Not Stationary | -5.215 | -3.574 | Stationary I(1) |
| PR | -1.630 | -3.595 | Not Stationary | -4.040 | -3.595 | Stationary I(1) |
| REF | -6.067 | -3.558 | Stationary I(0) | -10.502 | -3.563 | Stationary I(1) |

Source: Authors' computations using Eviews 10 (2024).

The Augmented Dickey Fuller stationarity test in Table 3 clearly shows that whereas all the variables were not stationary at levels, they became stationary at first difference [I(1)] allowing for the conduct of co-integration test presented in Table 4.

**Table 4: Johansen Co-integration Test Result**

| No. of Cointegrating Equation(s) | Eigenvalue | Trace | | Maximum Eigenvalue | |
|---|---|---|---|---|---|
| | | Test statistic | 0.05 critical value | Test statistic | 0.05 critical value |
| None* | 0.989 | 238.23 | 95.753 | 139.85 | 40.077 |
| At most 1* | 0.853 | 98.377 | 69.818 | 59.623 | 33.876 |
| At most 2 | 0.489 | 38.753 | 47.856 | 20.814 | 27.584 |
| At most 3 | 0.311 | 17.939 | 29.797 | 11.558 | 21.131 |
| At most 4 | 0.180 | 6.380 | 15.494 | 6.180 | 14.264 |
| At most 5 | 0.006 | 0.199 | 3.841 | 0.199 | 3.841 |

Note: * denotes rejection of the hypothesis at the 0.05 level.
Source: Authors' computations using Eviews 10 (2024).

It is evident from the Johansen co-integration test in Table 4 that a long run relationship exists amongst inflation, central bank independence, log of GDP per capita, ratio of private sector domestic credit to GDP, political right and central banking reforms in Nigeria since the hypothesis that there is at most 1 co-integrating equation is rejected by the trace and maximum eigenvalue statistics. Specifically, from the results of the trace statistic, the hypothesis that there is at most 1 co-integrating equation is rejected given that the critical t-statistic (69.82) falls short of the calculated t-value (98.38) at the 5 percent level of significance. Also, the Maximum Eigenvalue statistic, with a calculated t-value of 59.623 which is greater than the critical value (33.876) at the 5 percent level of significance, reveals that the variables employed by the study are co-integrated. Therefore a long run relationship exists amongst them.

Given that the series employed by the study are stationary and that the variables are co-integrated, the DOLS and ECM regression can be conducted and analyzed.

## 4.3 DOLS Result

The Stock and Watson (1993) Dynamic Ordinary Least Squares regression technique utilized by the study because of its robustness for endogeneity and heterogeneity concerns in regression analysis (Edo, Okodua, & Odebiyi, 2019).

**Table 5: The DOLS Regression Results**

| | Dependent Variable is Inflation (INFL) | | | |
|---|---|---|---|---|
| **Explanatory Variable** | **(1)** | **(2)** | **(3)** | **(4)** |
| CBI | -332.28*** (-4.13) | | | |
| CBI_P | | -309.11*** (-4.20) | | |
| CBI_PI | | | -137.62* (-1.89) | |
| CBI_F | | | | -158.24*** (-4.16) |
| lnGDP | -29.74*** (-3.77) | -31.03*** (-4.03) | -33.14*** (-4.27) | -31.32*** (-4.06) |
| PDC | 5.85** (2.50) | 5.18** (2.47) | 1.43 (0.45) | 4.97** (2.40) |
| PR | 9.15*** (4.36) | 9.37*** (4.96) | 0.63 (0.18) | 9.37*** (5.02) |
| REF | 574.39*** (3.59) | 167.62*** (-3.79) | -129.04** ('-2.58) | 148.91*** (3.64) |
| Constant | 271.08*** (3.94) | 295.75*** (4.20) | 272.78*** (4.30) | 208.13*** (3.85) |
| R-Squared | 0.8837 | 0.8857 | 0.9078 | 0.8862 |
| Adjusted R-Squared | 0.6254 | 0.6317 | 0.7028 | 0.6333 |
| Observations | 30 | 30 | 30 | 30 |

Note: t-statistics are in parenthesis; DOLS is Dynamic Ordinary Least Squares; (1) is the baseline model; (2), (3) and (4) are models 2, 3 and 4 that incorporate the disaggregated components of CBI which include Personnel, Policy and Financial Independence respectively into the baseline model.
(***) [**] and {*} denote significance at the 0.01, 0.05 and 0.10 levels respectively
Source: Authors' computations using Eviews 10 (2024).

The DOLS estimation is undertaken to investigate and analyze the long run CBI-Inflation nexus. The DOLS model in Table 5, confirms a significant and negative CBI-inflation nexus. This is evident in the baseline long run model (Model 1). 88.37% of the systematic variation in inflation is

explained by model 1, revealing a strong explanatory power. All the measures of CBI showed a negative relationship with inflation at the 1 percent level of significance except CBI_PI which recorded a 10% level of significance. This implies that enhancing CBI, especially via the guarantee of personnel and financial independence will reduce inflation in Nigeria. This no doubt is in line with the a-priori expectation and in support of the works of Garriga and Rodriguez (2020), Jacome and Pienknagura (2022) and Yahaya *et al*. (2022). The result is intuitively plausible given that the enhancement of CBI assures of non-political interferences by the political class and allows the Central Bank of Nigeria to focus on its primary mandate of price stability.

Also as expected, GDP per capita exerts a significantly negative influence on inflation in the long run at the 1 percent level This implies that pro-per capita growth policies are not necessarily inflationary in Nigeria. The control for financial depth (PDC) stimulates inflation in Nigeria at the 5 percent level. This is evident in the positive coefficients of the PDC variable and may be as a result of the shallowness and inefficiencies in the financial sector of the Nigerian economy. The results also confirm a long-run significantly positive nexus between lack of political freedom and inflation in Nigeria at the 1 percent level of significance (given that higher values of PR connote reduced political freedom individually and in the institutions of governance). This means that in the long run institutional quality, evidenced by the reduction of PR value, dampens inflation in Nigeria. This is consistent with the findings of Mujahid *et al.* (2021). Surprisingly the results revealed that central banking reform (REF) had a significantly positive influence on inflation. This may be traced to the inside lag (recognition lag) associated with the ill-timing of CB reforms, mal-handling of the information asymmetry related to the reforms, insider abuses and poor implementation of the reforms.

Table 5 also confirms the robustness of the baseline long run DOLS model. Models 2, 3 and 4 were specified by substituting the components of CBI into the baseline model to ascertain its disaggregated impacts on inflation. The results of the other models (2, 3 and 4) in Table 5 are identical to that of the baseline model. Therefore, the DOLS results are reliable for policy considerations.

## 4.4 ECM Results

The Error Correction Model (ECM) reveals the short run dynamic relationship between CBI, other control variables and inflation in Nigeria.

**Table 6: The Results for the Error Correction Model**

| | Dependent Variable is Inflation (INFL) | | |
|---|---|---|---|
| **Explanatory Variable** | **Coefficient** | **T-stat** | **Prob.** |
| DCBI | -17.364 | -4.317*** | 0.000 |
| DlnGDP | -11.635 | -66.450*** | 0.000 |
| DPDC | -0.417 | -7.939*** | 0.001 |
| DPR | 1.229 | 12.803*** | 0.000 |
| REF | -1.750 | -1.026 | 0.363 |
| ECT(-1) | -0.566 | -5.701*** | 0.000 |
| Constant ( C) | 0.511 | 6.083*** | 0.000 |
| R-Squared | | 0.9990 | |
| Adjusted R-Squared | | 0.9873 | |
| Observations | | 29 | |

Note: *** (**) and [*] denotes significance at the 0.01, 0.05 and 0.10 levels respectively. ECT is the Error Correction Term.
Source: Authors' computations using Eviews 10 (2024).

The result for the Error Correction Model (ECM) is presented in Table 6. From Table 6, the coefficient of determination of the short run dynamic model reveals that 99.99% of variation in inflation is explained by the explanatory variables in the ECM model. The ECT series for the error term were those generated from the long run DOLS model. Therefore the model is not prone to serial correlation and endogeneity biases. Also, the DOLS regression technique was adopted for the Error Correction Mechanism which guarantees robustness of the ECM results. The Error Correction Term (ECT) has the correct negative sign and is significant, indicating that 56.6% of the disequilibrium in the current period will be corrected in the next period.

It is evident from Table 6 that, as it was in the long run DOLS results, CBI also has a dampening effect on inflation in Nigeria at the one percent level of significance. This is explicit from the negative coefficient of CBI in the short run dynamic model. This supports the study of Bernhard *et al.* (2002). Also, as in the long run results, GDP per capita inversely had a short-run nexus with inflation in Nigeria. Moreover, as expected, institutional quality proxied by political right reduced inflation as in the long run results.

Interestingly, contrary to the long run results, the private sector domestic credit to GDP negatively determined inflation at the 1 percent significance level in the short run. This implies that whereas deepening the Nigerian financial sector dampens inflation in the short run, it worsens it in the long run. Whereas the long run result supports the findings of Ogbuagu and Ewubare (2014), the short run result does not support their findings. The negative short run nexus between financial deepening and inflation in Nigeria may not be unconnected with the widening financial dualism and growing shadow economy that characteristic of the overall Nigerian economy. Also, central banking reforms (REF) significantly impacted inflation negatively in the short run in opposition to the long run results. The long run negative of REF on inflation may result from the obsolescence of such reforms in the long run in a dynamic global environment. Also, in support of the findings of Agoba *et al.* (2017), the negative REF-inflation relation in the long run may be attributed to the relative underdevelopment and inefficiencies in the Nigerian Banking sector.

## 5. Conclusion and Recommendations

The long run and short run dynamic CBI-inflation nexus is empirically examined by this study against the backdrop of the persistent and hyperinflation currently pervading the Nigerian economy. A highly significant and negative CBI-inflation relation was ascertained by the study. This implies that enhancing central bank independence in Nigeria is price stabilizing and inflation dampening. An independent Central Bank of Nigeria (CBN) is devoid of governmental interferences and is able to focus on its primary function of monetary management and price stability. Also, since inflation in Nigeria is predominantly supply sided, an independent CBN sends positive signals of the domestic financial market to the global financial system which reacts by attracting financial resources from the global to the domestic economy thereby stimulating productivity and reducing inflation.

To enhance CBI for price stabilization in Nigeria, this study recommends that firstly, the law establishing the monetary and macroeconomic regulatory institutions in Nigeria needs to be reevaluated and strengthened to allow for the true independence of these institutions. Institutions saddled with the responsibility of monetary management such as the Central Bank of Nigeria must be made to be truly independent. The Nigerian Deposit Insurance Corporation saddled with the responsibility of ensuring investors' confidence and liquidity in the money market should also be devoid of unwarranted interferences. The legal and judicial institutions should be cleansed of executive manipulations and infringements. The anti-graft agencies are not to be left out. They should also be free to perform their

functions without biases. The freedom of these institutions from outside manipulations, especially, of the political class could be the joker that will stem the ugly tide of hyperinflation currently witnessed in Nigeria.

Secondly, the appointments of officers into managerial positions at the CBN and other regulatory financial institutions should be given serious consideration. Political party card holders should not be allowed into such institutions. The case of a sitting Central Bank Governor contemplating an elective position in the Government is an aberration and must never be heard of again in Nigeria.

Thirdly, increases in money supply through prudential monetary policy by the monetary authorities should be matched with productivity in the economy rather than by the request of the executive arm of government.

Finally, the institutions of the rule of law, governance and political processes in the country should be strengthened to engender investors' confidence for the growth in productivity rather than that of nominal money, which stimulates price instability, in the overall economy.

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