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Trade Openness And Inflation: Empirical Explanation of The Nexus In Nigeria

Musa Abdullahi Sakanko[1], David Joseph[2]

Abstract: This study aims to examine the effect of trade openness on the inflation rate in Nigeria using time series data collected from secondary sources. The data were analyzed using EViews10, revealing a cointegrating and one-way Granger causality relationship between the inflation rate and trade openness. Both short-run and long-run results demonstrate a significant and negative relationship between the inflation rate and trade openness in Nigeria. These findings are crucial for governments and policymakers when making decisions regarding the consumer price index and trade openness. We conclude that the government should work towards full diversification of the economy away from oil exports, manage the degree of trade liberalization, control the influx of goods, and regulate the money supply. This study adds to the debate on the inflation rate and trade openness in Nigeria, addressing both short-run and long-run effects. It also highlights the need for further research, given the limited studies focusing on the impact of trade openness measured as the value of net export divided by gross domestic product. Finally, this paper contributes to the scant literature on this subject.

Keywords: Trade Openness, International Trade, Inflation, ARCH, ARDL Bound Testing.

JEL Classifications: F15, F41, F43, P33, P45, E31, C22.

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Corresponding Author(s):

Musa Abdullahi Sakanko
Department of Economics, University of Jos, Plateau State, Nigeria. Email: sakanko2015@gmail.com

1. Introduction

For many decades, the people of West Asia and North Africa, from Yemen to Morocco, have endured excruciating experiences under autocratic tyrannical leadership until the first quarter of 2011, when a political revolution shook the system (Teti & Garvasio, 2011). Similarly, numerous Sub-Saharan African countries have leaders who turn public offices into hierarchical vacuums instead of facilitating free and fair elections, where all citizens have equal rights to participate in forming their governments. From an ethnic perspective, Africa as a continent contains two major divisions: North African Arabs and indigenous black Africans, also known as Sub-Saharans. Arab-Africans are often considered part of West Asia in the Arabian Peninsula.

Considering the significant benefits of international economic integration, no country can afford to isolate itself from the global economy (Haile, 2017). The removal of trade barriers and access to advanced markets have earned developing economies relatively higher national income and economic development (Ramzan, Kalsoom, & Zareen, 2013). Although international trade generally has positive effects, changes in domestic price levels with increased participation in international trade can unfortunately hinder the growth of domestic economies due to the adverse effects of inflation (Sakanko & David, 2017; Sakanko, Obilkwu & David, 2019).

In Nigeria, it is notable that with the decline in the trade-to-GDP ratio (aggregate of exports and imports as a percentage of GDP) from 48.57% in 1980 to 18.17% in 1981, there was a swift response in the inflation rate, rising from 9.97% in 1980 to 20.81% in 1981 (World Development Indicators [WDI], 2018). Similarly, declines in the trade-to-GDP ratio in 1988, 1994, 2012, and 2016, among other years, were followed by corresponding increases in inflation rates (Central Bank of Nigeria [CBN], 2017). Although there are periods when inflation drops with a rise in the trade-to-GDP ratio, a proportionate relationship between trade openness and inflation is often observed. This raises the question of whether trade openness truly influences inflation negatively in Nigeria.

Inflation creates obvious costs to economic, social, political, and other aspects of a country (Haile, 2017). Higher inflation rates typically have negative effects on any economy, including inefficient transactions, speculative wastage of resources, destruction of the basis for rational economic decisions, and damage to the credibility of government policies (Ashra, 2002). Higher inflation rates distort economic growth by reducing the propensity to save, as the purchasing power of money diminishes, ultimately affecting economic activities (Haile, 2017).

[1]Department of Economics, University of Jos, Plateau State, Nigeria. Email: sakanko2015@gmail.com
[2]Economics Department, Badamasi Babangida University Lapai, Niger State, Nigeria. Email: josephdavid970@gmail.com

Though the hypothesis suggests that economic openness to international trade reduces inflation through increased efficiency, better resource allocation, and improved capacity utilization (Ojoko, Adejumo, Adekanye, Victor & Obi-Egbedi, 2014), the issue remains whether trade openness changes inflation as expected (Haile, 2017). Increased openness to international trade affects inflation differently due to structural and country-specific factors such as exchange rate fluctuations, foreign investment inflows, and balance of payments (Sakanko & David, 2017; Sakanko, Obilikwu & David, 2019). There is no consensus on the interaction between higher trade openness and inflation.

In Nigeria, studies on inflation and trade openness are scarce. The only accessible study by Ojoko et al. (2014) used the VECM approach to investigate the effect of trade openness on inflation from 1970 to 2010. The study found a long-run relationship between trade openness and inflation, but the short- and long-run relationships were statistically insignificant.

Given the scarcity of studies on trade openness and inflation in Nigeria, understanding their relationship remains challenging. Ojoko et al. (2014) could not ascertain the exact nature of this relationship due to using an inappropriate estimation model and ignoring important post-estimation tests. This study aims to fill the gap by employing an appropriate model and conducting comprehensive tests and diagnostics. Additionally, it will expand the study period to 1980-2018 to capture recent changes in Nigeria's price level and trade openness.

2. Literature Review

This This study was built on the neoclassical theoretical framework because the theory assumes the absence of government intervention, rational profit and utility maximization, and perfect information. The forces of demand and supply are treated as drivers of the economy and advocate for economic liberalization or openness, which increases competition, hence economic growth and development.

Due to the absence of a universally agreed theoretical definition and measure (Kızılgöl & İpek, 2014), the concept of trade openness in economics is used to explain the extent to which countries are integrated with others and whether inward or outward-oriented economic policies are applied intensively (Saçık, 2009, cited in Kızılgöl & İpek, 2014). In its simplest form, trade openness refers to the level at which countries or economies allow or engage in trade with other countries or economies (Yakubu, 2016). According to Bowdler & Malik (2005, cited in Yakubu, 2016), it entails the degree to which countries or economies permit or have trading activities with other countries or economies, including import and export, foreign direct investment (FDI), borrowing and lending, and repatriation of funds abroad. Trade openness indicates the relative importance of international trade in the economy of a country, being the aggregate value of goods and services in international trade and reflecting the integration of countries into the world economy (Yakubu, 2016). Trade openness may, therefore, be seen as an indicator of the degree of globalization of an economy.

On the other hand, inflation in economics simply implies the persistent and sustained increase in the general price level of goods and services in an economy over a time period (Wikipedia, 2019). It is also the quantitative measure of the rate at which the average price level of a selected basket of goods and services in an economy increases over a period (Chen, 2019). As prices rise, a single unit of currency loses value as it buys fewer goods and services.

High rates of inflation caused by excessive growth of the money supply (Barro & Grilli, 1994), through excess demand relative to supply (demand-pull), and increased production costs (cost-push) can lead to increased labor wages due to higher prices for goods and services (Chen, 2019). Inflation usually has both negative and positive effects on economies, including hoarding, social unrest and revolts, hyperinflation (Wikipedia, 2019), inefficiency in resource allocation, reduction of unemployment due to nominal wage rigidity (Mankiw, 2002), encouragement of loans and investment instead of money hoarding, and avoidance of the inefficiencies associated with deflation (Chen, 2019). However, the implementation of monetary policy measures, which involve the actions of monetary authorities and financial regulators in determining the size and growth of the money supply through setting interest rates, open market operations, and banking reserve requirements (Taylor, 2008), has the ability to keep inflation rates in check (Chen, 2019), within permissible limits, and keep the economy running smoothly.

Though different measures of trade openness exist due to the lack of a perfect single measure, the ratio of trade to Gross Domestic Product (GDP) has become the best proxy for trade openness (Salimifar, Razmi & Taghizadegan, 2015; Ramzan, Kalsoom & Zaren, 2013; Haile, 2017; Ojoko et al., 2014; Yakubu, 2016; Saçık, 2009, cited in Kızılgöl & İpek, 2014). The trade-to-GDP ratio is calculated by dividing the aggregate value (sum) of imports and exports over a period by the GDP for the same period. Although called a ratio, it is expressed as a percentage and given as:

$$\text{Trade Openness} = \frac{\text{Export+Import}}{\text{Gross Domestic Product (GDP)}} \qquad \textbf{[1]}$$

Similarly, inflation is measured in several ways depending upon the types of goods and services considered. The inflation rate, the percentage change of a price index over time, is most widely computed by calculating the movement or change in a price index, typically the Consumer Price Index (CPI). Although the GDP implicit deflator is also used to measure inflation, it is less preferable because it excludes the prices of imported goods, which the CPI captures (Yakubu, 2016).

Empirically, numerous studies have been conducted from different perspectives, including regional, spatial, level of development, and indebtedness, to determine the nature of the correlation between trade openness and inflation. Certain studies have examined the relationship between trade openness and inflation from cross-country perspectives. For example, Salimifar, Razmi, and Taghizadegan (2015) employed the Autoregressive Distributed Lagged (ARDL) model to determine the relationship between trade openness and inflation in Iran from 1973 to 2010. They found a significant negative relationship between Iran's economic openness and inflation rate. Similarly, Ramzan, Kalsoom, and Zareen (2013) used Pearson's correlation and OLS to examine the relationship between inflation and trade openness in Pakistan from 1970-1971 to 2008-2009, finding a negative relationship. Mukhtar (2010) used multivariate co-integration and the Vector Error Correction Model (VECM) to empirically investigate Romer's hypothesis from 1960 to 2007 in Pakistan, confirming a negative long-run relationship. Rangkakulnuwat and Thurner (2017) corroborated these findings for Thailand.

In contrast, Sahu and Sharma (2018) used the ARDL bounds testing approach in India and found a significant positive relationship between inflation and trade openness, both in the short and long run. Zombe et al. (2017) found a significant positive relationship in Zambia using the Toda-Yamamoto approach. Kumar, Kapoor, and Poddar (2014) also revealed a significant positive relationship in India, while Munir and Kiani (2011) showed a significant positive relationship in Pakistan, rejecting Romer's hypothesis.

Few studies also considered countries within the same region, such as developed and developing, Africa, Asia, OECD, America, Caribbean, etc. For instance, Syed (2012) employed GMM to examine the relationship between openness and inflation in 158 countries (23 industrially developed and 135 developing countries). The results showed that increased trade openness negatively impacted inflation in developed countries and positively in developing countries. Sachsida and Mendonça (2015) found a negative relationship in 7 distinct groups using modern panel data techniques, supporting Romer's hypothesis. Lin (2010) established an inverse relationship for 106 countries from 1970-2007.

Furthermore, Lin, Mei, Wang, and Yao (2017) investigated trade openness and inflation with panel data from Sub-Saharan Africa, finding a robust inverse relationship. They discovered a positive relationship in countries with high Central Bank independence and a robust inverse relationship in those with low independence. This contrasts with Lotfalipour, Montazeri, and Sedighi (2013), who found a positive relationship in MENA countries from 1990-2010.

Kurihara (2013) found a proportionate relationship in Asian and OECD countries and an inverse relationship in Japan. Munir, Hasan, and Muhammad (2015) found an insignificant positive relationship in selected Asian countries from 1976 to 2010. Sepehrivand and Azizi (2016) found a significant positive relationship in D-8 countries. Thomas (2012) found that trade openness positively influences inflation in Caribbean countries, invalidating Romer's hypothesis.

This study's findings contribute to the ongoing debate and provide insights into the complex relationship between trade openness and inflation across different regions and countries.

3. Methodology

This study employs annual time series data from 1980 – 2017 to examine the relationship between trade openness and inflation rate in Nigeria. Data for inflation rate (measured by annual change in Consumer Price Index), Trade openness (measured by the ratio of aggregate trade to GDP), Oil Price (measured by annual price of Bonny light crude oil), Money supply (measured by growth of money supply), and exchange rate (measured by annual Naira to Dollar exchange rate) were sourced from the Central Bank of Nigeria (CBN)'s Annual Statistical Bulletin (ASB), while data on Per capita income (measured by annual change in real per capita income) was sourced from World Bank's World Development Indicators (WDI).

Due to the scanty nature of the study on trade openness and inflation rate in Nigeria, coupled with the absence of universal conformity in the nature in which trade openness impacts the inflation rate, this study will start by assuming the presence of a negative relationship between trade openness and inflation rate. Empirically, this can be expressed as:

$$lnP_t = a_0 - \delta_1 OPEN_t + \mu_t \quad \textbf{[1]}$$

Where; lnP denotes the natural logarithm of the change in the domestic price level (inflation rate); $OPEN$ denotes trade openness, which is measured by dividing aggregate trade (sum of export and import) in a period by nominal GDP in same period i.e. $\left(\frac{x+m}{y}\right)$; and a_0 , δ, μ and t denotes the intercept, slope coefficient, error term and the number of time series observation. Furthermore, from the literature, factors such as money supply, exchange rate, output growth, and oil prices are assumed to also influence the changes in the price level. In essence, **Equation (2)** transforms to;

$$lnP_t = a_0 - \delta_1 OPEN_t + \delta_2 OilP_t + \delta_3 M_{2_t} + \delta_4 EXCH_t + \delta_5 PcY_t + \mu_t \quad \textbf{[2]}$$

Where; $OilP$ denotes oil price (the price of Nigerian bonny light crude oil); M_2 is aggregate money supply; $EXCH$ denotes nominal Naira to Dollar exchange rate; PcY is the annual change in real per capita income; and other identities as previously stated.

To empirically estimate the nature of the relationship between trade openness and the inflation rate in Nigeria, the Autoregressive Distributed Lagged (ARDL) bound testing technique for co-integration will be employed. The choice of this model is guided by the numerous advantages which it has over other co-integration methods, such as its ability to examine co-integrating relationships regardless of the order of integration of the series, and its use of single reduce form equation which multaneously estimates the long run and short run parameters of the model coupled with its ability to allow variables have different optimal lags which are not obtainable in other methods (Abu, 2017). The ARDL model to be estimated is specified as follows:

$$\Delta lnP_t = a_0 - \delta_1 \sum_{i=0}^{n} \Delta\, OPEN_{t-1} + \delta_2 \sum_{i=0}^{n} \Delta\, OilP_{t-1} + \delta_3 \sum_{i=0}^{n} \Delta\, M_{2_{t-1}} + \delta_4 \sum_{i=0}^{n} \Delta\, EXCH_{t-1} + \delta_5 \sum_{i=0}^{n} \Delta\, PcY_{t-1} + \gamma_0 lnP_{t-1} + \gamma_1 OPEN_{t-1} + \gamma_2 OilP_{t-1} + \gamma_3 M_{2_{t-1}} + \gamma_4 EXCH_{t-1} + \gamma_5 PcY_{t-1} + \mu_t \quad \textbf{[3]}$$

Where; Δ is differentiation identity; POV_{t-1} is the lag of the dependent variables; and $\gamma_0 - \gamma_5$are the coefficient of the lagged undifferentiated (levels) variables in the model, from which the f-statistics used to compare the critical values of the bound test are obtained.

The ARDL technique for co-integrating (long-run) relationship requires that the series used in the model be integrated of order not more than one (I(1)), as the existence of a second-order integration (i.e., I(2)) of any series (variable) invalidates the use of the ARDL technique, which will as well produce nonsensical results. The ARDL bounds test is used to test the null hypothesis that no co-integration exists against the alternative hypothesis that co-integration exists, using the computed f-statistic obtained from the levels parameter of the conditional ECM to compare the critical values provided by Pesaran, Shin and Smith (2001) and/or Narayan (2005). As such, when the comput F-statistic is greater than the upper bound (I(1)), we reject the null hypothesis that no co-integrating (long-run) relationship exists between the series. If the F-statistic is less than the lower bound (I(0)), we accept the null hypothesis that there is no co-integration between the series. Furthermore, if the F-statistic falls between I(0) and I(1), our inference would be inconclusive.

It is worthy of note that the presence of correlation between series might not entail the presence of causality among the series. in essence, the presence of a correlation between inflation and trade openness (and other variables in the model) might not imply the presence of causality between them. Thus, to test for causality among the series, the Granger Causality test will be employed. To test this, the following VAR (Vector Autoregressive) model corresponding to **Equation (2)** is specified;

$$lnP_t = \alpha_0 + \theta_i \sum_{i=0}^{n} lnP_{t-i} + \beta_1 \sum_{i=0}^{n} OPEN_{t-i} + v_{t_1} \quad \textbf{[4.1]}$$

$$OPEN_t = \alpha_0 + \vartheta_i \sum_{i=0}^{n} OPEN_{t-i} + \varphi_1 \sum_{i=0}^{n} lnP_{t-i} + v_{t_2} \quad \textbf{[4.2]}$$

$$lnP_t = \alpha_0 + \sigma_i \sum_{i=0}^{n} lnP_{t-i} + \pi_1 \sum_{i=0}^{n} PcY_{t-i} + v_{t_9} \quad \textbf{[4.9]}$$

$$PcY_t = \alpha_0 + \omega_i \sum_{i=0}^{n} PcY_{t-i} + \lambda_1 \sum_{i=0}^{n} lnP_{t-i} + v_{t_{10}} \quad \textbf{[4.10]}$$

Where; $v_{t_1} - v_{t_{10}}$are error correction terms in both models; other identities are as previously specified. In testing the pair-wise causality between the variables in the model, the null hypothesis that the parameters (β_1, φ_1 ... β_1 and λ_1) in the models are jointly equal to zero (i.e. the absence of pair-wise Granger causality among the series) is tested against the alternative hypothesis that there exist Granger causality among the series. The f-statistics obtained from equating the parameters on the left-hand to zero with the corresponding p-value are then used to establish the presence of (non-) causality among the series. for inference, either to accept or reject the existence of Granger causality among the series. Even though the above political shaking remains true many doubts on the golden value of these particular waves of protests. By the time protests started to pose a real challenge to Zine el-Abidine Ben Ali, few were on the opinion that the revolts may definitely spread to other nearby Arab nations. Hence, the turmoil kicked off and moved around across the region: Yemen to Egypt, Jordan and Syria. Of course, many presumed that Arab leaders could be well-arranged and prepared to face the riots aiming to escape the fate of the Tunisian regime. With huge works executed by the typhoon of the protests, still, they still failed to dismiss many autocratic regimes.

4. Results And Discussion

a. Stationarity Test

In employing the ARDL bound testing technique for co-integrating (long-run) relationships to examine the nature of the relationship between trade openness and inflation in Nigeria, it is required that the series entering the model are checked for stationarity (unit root) because series used in ARDL bound testing technique is expected to be integrated of order not more than one (i.e. I(0) or I(1)), thus the existence of a second-order integration (i.e., I(2)) of any series (variable) in estimation invalidates the use of the ARDL technique, as it will produce nonsensical results. For this purpose, the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) were employed to conduct the unit root test for the series entering the model. The tests compare the null hypothesis of a series “has a unit root” against the alternative hypothesis that the series “does not have a unit root”.

Table 1: Result of Unit Root Tests

Variables	ADF	P-P	Order of Integration

P	–5.128101*	–2.952514*	I(1)
$OPEN$	–2.714723***	–2.596581***	I(0)
$OilP$	–5.197228*	–5.197228*	I(1)
M_2	–3.492305**	–3.444046**	I(0)
$EXCH$	–3.303326**	–3.303326**	I(1)
PcY	–3.333352**	–3.498926**	I(0)

Note: * (**) [***] denotes 1% (5%) [10%] level(s) of significance

Source: Authors' computation Using E-views 10

The result presented in **Table 1** shows that while both tests are in conformity with respect to the stationarity status of some series ($OPEN, OilP, M_2, EXCH\ and\ PcY$), there was disagreement among both tests in P. While Philips-Perron (P-P) statistics indicate that P is stationary at levels, Augmented Dickey-Fuller (ADF) statistics show that P is stationary after the first difference. Overall, the series ($P, OPEN, OilP, M_2, EXCH$ and PcY) are a mixture of I(0) and I(1), that is, while $OPEN, M_2$and PcY are stationary at levels (I(0)), others are stationary after first differencing (I(1)). This, therefore, validates the use of the ARDL bound testing technique to estimate the relationship between the variables.

b. ARDL Bound Testing for Co-integration

From the bound testing results presented in Table 2, it is shown that the computed f-statistics (10.61233) exceeds the upper bound (I(1)) at 1%, 5% and even 10% levels. This, therefore, indicates that the null hypothesis of no co-integrating (long-run) relationship between inflation rates and trade openness (and oil price, money supply, exchange rate, and per capita income) can be rejected. In essence, we conclude that there exists a significant co-integrating (long-run) relationship among the series.

Table 2: Result from Bound Test

Dependent Variable		**Function**		$k-1$	**F-Statistics**
P		$f(P/OPEN, OilP, M_2, EXCH, PcY)$		5	10.61233
Asymptotic critical values					
1%		5%		10%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
3.06	4.15	2.39	3.38	2.08	3.0

Source: Authors' Computations Using E-Views 10

c. Discussion of Long-Run and Short-Run Model

With With the establishment of the presence of a co-integrating (long-run) relationship between the inflation rate and trade openness (and oil price, money supply, exchange rate, and real per capita income), the ARDL model was estimated. Based on the Akaike Information Criterion (AIC), the optimal lag selection was given as (1,2,2,2,1,1).

The results presented in Table 3 and Table 4 represent the long-run and short-run estimates, respectively. From the long-run results, it is shown that trade openness impacts the inflation rate negatively at a 10 percent significance level. This entails that for a 1 percent increase in Nigeria's trade openness, the inflation rate will decrease significantly by 99.5%. This result corroborates the findings of Salimifar, Razmi, and Taghizadegan (2015); Ramzan, Kalsoom, and Zareen (2013); Mukhtar (2010); and Rangkakulnuwat and Thurner (2017).

Similarly, considering the factors that influence the movement of the general price level (inflation rate), such as the price of crude oil (Bonny light crude oil), money supply, exchange rate, and real per capita income, it is shown that while the price of crude oil and real per capita income have a negative and significant relationship with the inflation rate in Nigeria at the 5% and 1% significance levels, respectively, the growth of money supply and exchange rate have a significant positive relationship with the inflation rate at the 1% significance level. In essence, a 1 percent change in the price of crude oil (Bonny light crude oil) and per capita income tends to cause the Nigerian inflation rate to decline by 1.8% and 15%, respectively. In addition, changes in the growth of money supply in Nigeria and the nominal Naira to Dollar exchange rate will cause the inflation rate to fall by 4.5% and 1.5%, respectively.

Furthermore, the short-run results presented in Table 4 show that trade openness and the factors that influence the changes in the general price level explain about 86% of changes in the Nigerian general price level (inflation rate), as indicated by the R^2 value in the model. The short-run results indicate that while the degree of trade openness in the current period influences the inflation rate negatively and insignificantly, the degree of trade openness in Nigeria in the previous year (one period past) and the inflation rate are positively and significantly related at the 5% significance level. In essence, a 1 percent increase in the past year's degree of Nigeria's trade openness will cause the inflation rate to increase by 129.5%. This result, however, shows a clear disparity between the results obtained in the long-run estimates.

Additionally, the current price of crude oil, growth of money supply in the past year, current exchange rate, and current real per capita income pose a significant negative relationship with the inflation rate. This indicates

that for a 1 percent change in the current price of crude oil (Bonny light oil), past year's growth of money supply, current exchange rate, and current real per capita income, the inflation rate will decrease by 2.9%, 0.4%, 2.3%, 4.5%, and 15%, respectively.

The coefficient of the error correction term lagged by one period (ε_(t-1)) is negative, less than 1, and statistically significant, meeting our expectations. The sign of the coefficient indicates a fast speed of adjustment to equilibrium after a shock, suggesting that approximately 87% of the deviations or disequilibrium in the inflation rate will be corrected within one year.

Though the presence of a correlation between the inflation rate and the degree of trade openness (and oil price, exchange rate, money supply, and per capita income) might not necessarily imply causality, the Granger causality test results presented in Table 5 show that we can reject the null hypothesis of non-causality in Equations (4.2, 4.5, and 4.7) based on the resultant F-statistics and corresponding probability values, while we fail to reject the null hypothesis of the absence of causality in other equations. The results establish the presence of one-way causality running from the inflation rate to trade openness, money supply to inflation rate, and exchange rate to inflation rate, but not the other way around. This indicates that the inflation rate Granger causes trade openness, but not vice versa. Similarly, the exchange rate and money supply are indicated to Granger cause the inflation rate.

Table 3: Long-Run Estimates**,** Dependent Variable**:** lnP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$Constant$	5.586	1.657	3.370*	0.0036
$OPEN$	–0.995	0.529	–1.879***	0.0776
$OilP$	–0.018	0.009	2.109**	0.0500
M_2	0.045	0.017	2.606*	0.0184
$EXCH$	0.015	0.005	3.006*	0.0079
PcY	–0.1540	0.059	–2.626*	0.0177

Note: *, ** and *** indicates 1%, 5% and 10% significance level, *Source: Authors' Computations Using E-Views 10*

Table 4: Short-Run Estimates, Dependent Variable**:** ΔlnP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\Delta OPEN$	–0.140	0.388	–0.361	0.7225
$\Delta OPEN(-1)$	1.295	0.412	3.143*	0.0059
$\Delta OilP$	–0.029	0.009	–3.161*	0.0057
$\Delta OilP(-1)$	–0.002	0.010	–0.192	0.8500
ΔM_2	0.004	0.008	0.488	0.6317
$\Delta M_2(-1)$	–0.023	0.011	–2.101**	0.0509
$\Delta EXCH$	–0.045	0.006	–7.089*	0.0000
ΔPcY	–0.152	0.033	–4.630*	0.0002
ε_{t-1}	–0.872	0.087	–10.025*	0.0000
R^2	0.855			
Durbin-Watson stat	1.93			

Note: *(**) indicates 1% (5%) level of significance; Δ is the first difference operator. *Source: Authors' Computations Using E-Views 10*

Table 5: Granger Causality Test

Null Hypothesis:	Lags	Obs.	F-Statistic	Prob.
$OPEN$ does not Granger Cause P	2	31	0.32594	0.7248
P does not Granger Cause $OPEN$			3.53071	0.0440
$OilP$ does not Granger Cause P	2	31	0.86920	0.4311
P does not Granger Cause $OilP$			0.14260	0.8678
M_2 does not Granger Cause P	2	31	2.83573	0.0769
P does not Granger Cause M_2			0.63421	0.5384
$EXCH$ does not Granger Cause P	2	31	2.20242	0.1307
P does not Granger Cause $EXCH$			0.45810	0.6375
PcY does not Granger Cause P	2	31	0.84632	0.4405
P does not Granger Cause PcY			0.55478	0.5808

Source: Authors' Computations Using E-Views 10

Results of Diagnostics Tests

The diagnostics results reported in Table 6 show that the ARDL model employed passes the diagnostic tests including serial correlation (Breusch-Godfrey & Durbin-Watson stat.), normality (Jaque-Bera), functional form (Ramsey RESET) and heteroscedasticity. In addition, the plot of the Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residuals (CUSUMQ) (see Figures 1 & 2) which lies

within the 5% significant lines/critical boundaries, therefore confirms the stability of the model, then mean the model is suited for policy recommendation.

Table 6: Diagnostic Tests

Test Statistics	Result
Autocorrelation: Chi-Sqr(2)	2.150546 (0.3412)
Heteroscedasticity: Chi-Sqr(14)	13.74806 (0.4686)
Normality: Jaque-Bera	0.827994 (0.661003)
Functional Form: Ramsey RESET F-stat (1,16)	5.844515 (0.0279)

Source: Authors' Computations Using E-Views 10

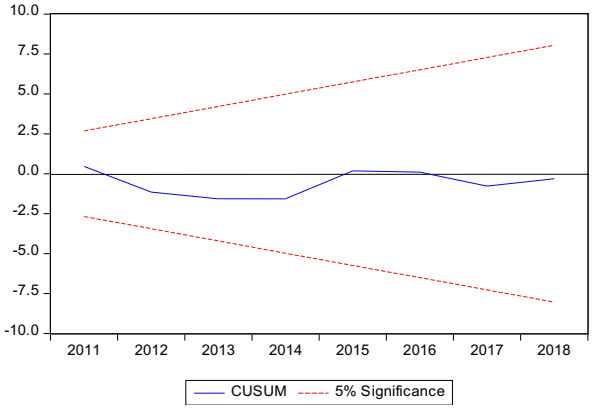

Figure 1: Plots of the Cumulative Sum (CUSUM) of Recursive Residuals

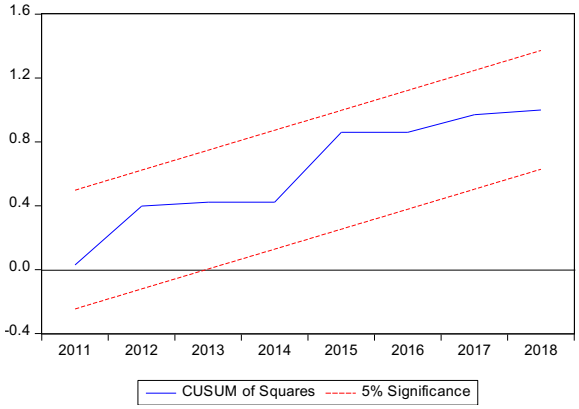

Figure 2: Plots of the Cumulative Sum (CUSUM) of squares of recursive residuals

5. Conclusion And Policy Implication

This study employed the Autoregressive Distributed Lagged (ARDL) bound testing technique and Granger causality test to examine the nature of the relationship between the inflation rate and trade openness in Nigeria from 1980 to 2018, considering the effects of oil price, money supply, exchange rate, and per capita income on the inflation rate. The results from the study indicate the presence of a co-integrating (long-run) relationship between the inflation rate and trade openness (and oil price, money supply, exchange rate, and per capita income), coupled with the existence of one-way Granger causality running from the inflation rate to trade openness, from the exchange rate to the inflation rate, and from the money supply to the inflation rate. Furthermore, while the long-run result shows that the inflation rate is significantly and negatively related to trade openness, oil price, exchange rate, money supply, and per capita income, the short-run result indicates a significant positive relationship between the inflation rate and the past year's degree of Nigeria's trade openness. Additionally, there is a significant negative relationship between the inflation rate and the current crude oil price, past year's growth of money supply, current exchange rate, and current per capita income.

With the degree of trade openness influencing the inflation rate positively in the short run by more than 100%, and trade openness impacting the inflation rate by more than 99%, it entails that a higher degree of openness of the Nigerian economy in the short run, without inflationary control measures in place, will lead to a rise in the domestic price level due to Nigerians' preference for foreign products over locally produced ones. Additionally, the changes in money supply and exchange rate posing a significant negative relationship with inflation in the short run, and otherwise in the long run, highlight the adverse effects of fluctuations in the exchange rate and increases in money supply in an economy.

In essence, the management of Nigeria's trade openness and the control of the extent to which goods and services move into the country are recommended for the monetary authorities and the central government. To improve the appreciation and worth of the Naira in foreign trade, the central government is advised to diversify the Nigerian economy away from the archaic crude oil contribution of more than 90% of the Nigerian export basket. Additionally, monetary authorities should control the money supply in the economy as it fuels the rise in the general price level.

6. Limitations and Recommendations for Further Study

This study faced several limitations. One major limitation was the difficulty in accessing current literature in Nigeria that discusses the correlation between the inflation rate and trade openness, compounded by the lack of extensive research on the topic within the region. Additionally, the data collection process was particularly challenging, especially in gathering accurate and up-to-date information on trade openness, which was both stressful and time-consuming.

For future studies, it is recommended to explore the effect of trade openness on domestic agricultural output in Nigeria. This area of research could provide valuable insights into how increased integration into global markets impacts the agricultural sector. Furthermore, examining the relationship between trade openness, exchange rate,

and household final expenditure in Nigeria could offer a comprehensive understanding of the broader economic implications of trade policies on household consumption patterns and overall economic stability. These recommendations aim to fill existing research gaps and contribute to a more detailed understanding of the dynamic interactions between trade openness and various economic variables in Nigeria.

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