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OIL PRICE AND PUBLIC EXPENDITURE RELATIONSHIP IN NIGERIA: DOES THE LEVEL OF CORRUPTION MATTER?[5]

We employ the non-linear autoregressive distributed lag (NARDL) approach to examine if the oil price and public expenditure relationship are dependent on the level of corruption using Nigeria's quarterly data during the 1996-2019 period. The result of the NARDL-bounds test to co-integration demonstrates that there is a long-run relationship between the variables, and we found evidence of long-run asymmetry in this relationship. The estimation results indicate that both positive and negative shocks to oil price have a significant positive effect on public expenditure in the long run, and the impact of oil price on public expenditure depends on the level of corruption. In addition, the marginal effect of oil price on public expenditure varies at different levels of corruption. Other important factors that drive public expenditure in Nigeria, in the long run, include spending on internal security and debt service. Based on these outcomes, we proffer some policy recommendations.
Keywords: oil price; public expenditure; corruption; NARDL; Nigeria
JEL: E62; E64; H50; D72; D73

1. Introduction

One of the main reasons governments are put in place is to raise the living standards of their citizens via the provision of socio-economic infrastructure, including education and health facilities, and so on. To this end, public expenditure has long been recognized as a major tool governments use to manipulate resource allocation, stimulate and sustain desired levels of economic activity (Shonchoy, 2010). In addition, there is a general consensus that rising public expenditure in developing economies is essential for sustainable and steady productivity and economic growth because it translates to improved social wellbeing, alleviation of poverty, and reduction of unemployment (Kanano, 2006; Shonchoy, 2010;

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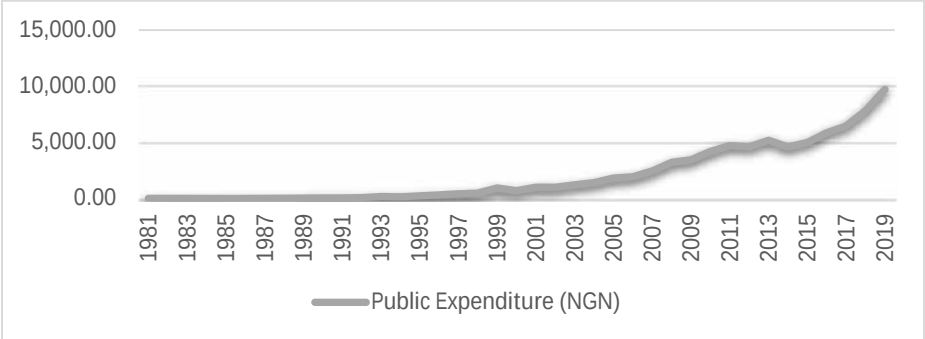
World Bank, 1994). Informed by this line of thought, successive governments in Nigeria have continuously favoured the expansion of public expenditure. Available statistics show that aggregate public expenditure (in Naira, NGN) maintained a rising trend in the last four decades except in a few years. From NGN11.41 billion in 1981, total public expenditure rose to NGN949.7 billion in 1999, NGN2.5 trillion in 2007, NGN5.2 trillion in 2013, and NGN9.7 trillion in 2019 (Figure 1).

Figure 1

Plots of aggregate public expenditure in Nigeria in billions of Naira

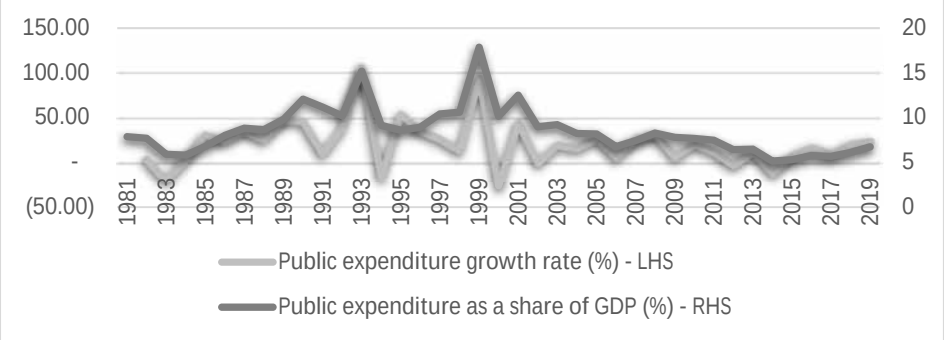


Source: Authors' computation based on the data collected from the Central Bank of Nigeria, 2019.

But in terms of growth rate and as a share of GDP, public expenditure showed an unimpressive performance as it increased sometimes and declined in other periods during the period under review. From 7.88 percent in 1981, public expenditure share in GDP rose to 17.85 percent in 1999, before it declined to 10.16 percent in 2000 and further to 5.15 percent in 2014. The share of public expenditure in GDP was 6.73 percent in 2019. In the same manner, public expenditure grew by 4.46 percent from 1981 to 1982 and further by 106.07 percent in 1993. Thereafter, its value fell by -26.02 percent in 2000, but it later rose by -11.53 percent in 2014. The growth of public expenditure was 24.33 percent in 2019 (Figure 2).

Figure 2

Plots of public expenditure growth rate (%) and as a share of GDP in Nigeria

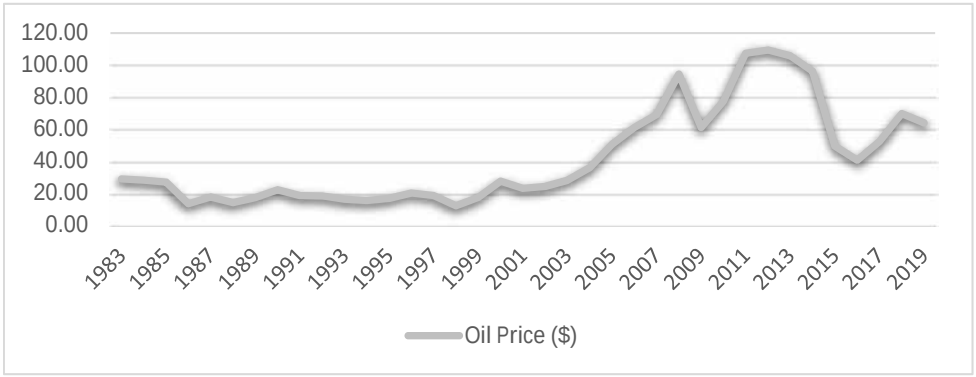


Source: Authors' computation based on the data collected from the Central Bank of Nigeria, 2019. Note: LHS and RHS denote left-hand side and right-hand side vertical axes, respectively.

Whereas the desire of successive Nigerian governments has been to sustain the growth of its expenditure occasioned by the rising demand for social and economic infrastructure, including the increasing need to provide internal security for the people and the nation, dwindling fortunes of the oil sector (the country's main source of revenue or income generation) makes it difficult to achieve this important objective. Given that proceeds from exports of oil is a major source of income for the government of Nigeria, unstable oil prices can leave lasting adverse effects on the country's public expenditure (see Aremo, Orisadare and Ekperiware 2012). It has also been suggested that uncertainty about future oil revenues and variability of such revenues arising from changes in oil price can influence the level of public expenditure in oil-dependent countries as governments reassess their expected income streams (Abdel-Latif, Osman, Ahmed, 2018; Dizaji, 2014; Farzanegan, 2011; Mourad, Hadadah, 2019). In fact, most times, revenues have fallen short due to low oil prices Nigerian government was compelled to adjust its expenditure downward, the same way high oil prices have led to an upward adjustment in public expenditure (Orhewere, Ogbeide-Osaretin, 2020). Thus, public expenditure tends to fluctuate in response to changes in oil prices (Adedokun, 2018; Oriakhi, Iyoha, 2013). Available statistics from the Organization of Petroleum Exporting Countries (OPEC) illustrates that oil prices fluctuated during the 1996-2019 period (Figure 3).

Figure 3

Plots oil price in United States dollars ($)



Source: Authors' computation based on the data collected from OPEC, 2020.

Looking at the movements in oil price and public expenditure in Nigeria, it is possible that changing oil price is responsible for changes in Nigeria's public expenditure. Thus, it is important to embark on an empirical examination to ascertain if oil price dictates the direction of public expenditure in Nigeria.

Besides, it is possible that the oil price and public expenditure relationship depends on the level of corruption in Nigeria. Corruption does not only raise the cost of public expenditure, it also encourages investment in capital-intensive projects where huge bribes can easily be extracted (Delavallade, 2006; Gupta, Davoodi, Tiongson, 2000; Mauro, 1996, 1998; Tanzi, 1998). In addition, evidence suggests that oil-dependent economies are often characterized by corruption and rent-seeking, poor governance, among other things (Busse, Gröning, 2013;

Karl, 2007; Sala-i-Martin, Subramanian, 2013). Moreover, high corruption in oil-dependent nations comes with many consequences, including huge government revenue losses with its adverse effect on public expenditure (Al-Kasim, Søreide, Williams, 2008).

Nigeria is Africa's largest producer and exporter of crude oil, and revenues from oil sales/exports accounts for over 70 percent of the government's earnings. Nigeria's high dependence on the oil sector has made the country highly vulnerable to changes in oil price. In addition, despite being Africa's leading oil exporter, corruption remains a serious problem, that the Nigerian economy and its people are contending with and several authors have blamed it (corruption) for the country's low level of development (Abu, Karim 2021; Abu, Staniewski, 2019). Also, the oil and gas sector of Nigeria has not been insulated from corruption because major stakeholders and players in the industry, including the Department of Petroleum Resources (DPR), international oil companies, Nigerian National Petroleum Corporation (NNPC), Ministry of Petroleum, and the indigenes of the oil-producing communities have been accused of aiding corrupt practices in the sector (Pérouse de Montclos, 2018). This view lends credence to the claims of corruption and mismanagement, lack of transparency and accountability in the dealings of the oil industry in Nigeria (Abu, Staniewski, 2019; Ijewereme, 2015; Obuah, 2010; Rexer, 2019).

The foregoing discussion suggests that changing oil price in the face of massive corruption in a country can aggravate instability in public expenditure. More so, regardless of movements in oil price, oil revenue losses caused by corrupt practices can reduce a country's ability to carry out development programmes, as well as financing infrastructural development or maintaining public services (Pérouse de Montclos, 2018).

Despite experiencing instability in oil price and growth in public expenditure amidst relatively high corruption, researchers have done little to empirically examine whether the oil price and public expenditure relationship is dependent on the level of corruption in Nigeria. In fact, existing studies on Nigeria focused either on the impact of oil price on public expenditure (Adedokun, 2018; Aregbeyen, Fasanya, 2017; Aremo et al., 2012; Jibir, Aluthge, 2019; Mohammad, Sani, 2020) or the effect of corruption on public expenditure (Aregbeyen, Akpan, 2013; Nelson, Yebimodei, 2018; Onogwu, 2018). In essence, no study has been conducted to examine if the impact of oil price on public spending depends on the corruption level in Nigeria. Interestingly, the recent study by Farzanegan (2017) suggested that the effect of oil price on government spending depends on corruption in the Middle East and North Africa (MENA) countries.

Thus, this study is important and contributes to the existing literature in a number of ways. It is the first attempt (to our knowledge) to investigate whether the impact of oil price on public expenditure is dependent on the level of corruption in Nigeria. Second, the study employs the non-linear autoregressive distributed lag (NARDL) approach to investigate the asymmetric impact (positive and negative shocks) of oil price on public expenditure given the level of corruption. Following the introductory part, the remainder of this paper is structured as follows. Section two is the review of previous and related studies, and the third section consists of the theoretical framework and the model. Issues relating to methodology, econometric techniques and data are addressed in section four, while results are presented and discussed in the fifth section. The conclusion is taken up in the last section.

Review of Previous Studies on Public Expenditure, Oil Price and Corruption

Although a number of studies have been conducted to empirically explore the effect of oil price on public expenditure or the impact of corruption on public expenditure, little has been done to investigate if the effect of oil price on public expenditure depends on a country's level of corruption. The empirical literature review is discussed under the following categories.

Oil Price and Public Expenditure

Abdel-Latif et al. (2018) analyzed the effect of oil price shocks on public expenditures on health and education in Saudi Arabia during the 1990Q1-2017Q2 period using the NARDL model. The empirical results confirm a significant positive impact of oil price (positive and negative) shocks on public expenditure on health and education both in the short-run and the long run. In addition, Farzanegan (2011) examined the dynamic effects of oil shocks on components of public expenditure in Iran. Using the impulse response functions and variance decomposition analyses, the empirical results show a significant response of military and security expenditure to shocks in oil revenue and oil price. In contrast, the social spending component of public expenditure showed no significant response to shocks in oil revenue and oil price.

In Nigeria, Mohammad and Sani (2020) employed the NARDL model to examine the asymmetric impact of oil price on public educational expenditure over the 1990-2016 period. The empirical results indicate the presence of a cointegrating (long-run) relationship between oil price and public expenditure on education. Also, Orhewere and Ogbeide-Osaretin (2020) investigated the impact of oil price volatility on capital expenditure over the 1970-2018 period. Using the vector error correction model (VECM), the empirical evidence from the variance decomposition and impulse response function analyses confirm that oil price volatility and oil revenue impact capital expenditure negatively. In addition, the authors confirmed a positive impact of oil price shocks on public expenditure on education both in the short-run and the long run. On their part, Jibir and Aluthge (2019) evaluated the factors that influenced public expenditure in Nigeria during the 1970-2017 period using the ARDL-bounds testing approach. The results demonstrate that oil price and oil revenue have a significant positive influence on public expenditure in Nigeria.

Furthermore, Adedokun (2018) investigated the effect of oil (price and revenue) shocks on the dynamic relationship between public revenues and expenditures in Nigeria from 1981 to 2014 by employing the Structural Vector Autoregression (SVAR), unrestricted VAR, and VECM. The results of the variance decomposition and impulse response function analyses illustrate that oil price and oil revenue have a significant effect on public expenditure in the short-run and the long run. Moreover, Aregbeyen and Fasanya (2017) assessed the influence of oil price volatility on the fiscal behaviour of the government in Nigeria from 1970 to 2013 using the multivariate VAR model. The authors found that real oil price shocks have a significant positive impact on public expenditure in the short-run and the long run. In the same vein, Aremo et al. (2012) employed the SVAR technique to examine the effect of the oil price shock on fiscal policy in Nigeria over the 1980-2009 period. The authors concluded

that whereas oil price shocks have a strong influence on public revenue, they did not proportionally translate to an increase in public expenditure.

Corruption and Public Expenditure

A few studies have been conducted to examine the effect of corruption on public expenditure. For example, Ondřej and Agata (2015) employed a panel regression method to analyze the relationship between corruption and public expenditure in 21 Organisation of Economic Cooperation and Development (OECD) countries over the 1998-2011 period. The results show that a higher level of corruption leads to an increase in public expenditure on defence and public services. On the other hand, public expenditure on education, health, recreation, culture and religion decreases at higher levels of corruption. Also, Haque and Kneller (2008) evaluated the growth effect of public investment in the presence of corruption in 66 countries over the 1970-2000 period using the three-stage least squares method. The results reveal that corruption increases public investment and reduces the returns to public investment, thus making it (public investment) ineffective in raising economic growth. In the same manner, Delavallade (2006) employed the three-stage least squares technique to determine the influence of corruption on the structure of government spending in 64 developing countries over the 1996-2001 period. The results demonstrate that corruption has a significant negative effect on social expenditure (education, health and social protection). In addition, corruption has a significant positive impact on public expenditure on public services and order, fuel and energy, culture, and defence, but a significant negative effect on social expenditure (education, health and social protection). Moreover, Gupta, de Mello and Sharan (2000) used a panel regression method to examine whether corruption is related to high levels of military expenditure in 120 countries from 1985 to 1998. The results suggest that corruption is associated with higher military expenditure and arms procurement.

Also, Gupta, Davoodi and Tiongson (2000) employed the Ordinary Least Squares (OLS) estimator to investigate the effect of corruption on indicators of provision of healthcare and education services in 128 advanced and developing countries over the 1985-1997 period. The results show that high levels of corruption have an adverse impact on a country's child and infant mortality rates, percentage of low-birthweight babies in total births, and dropout rates in primary schools. Elsewhere, Mauro (1998) empirically assessed the impact of corruption on the composition of public expenditure across countries. The empirical evidence shows a negative and significant effect of corruption on public expenditure on education (and health). Similarly, Mauro (1996) analyzed the effects of corruption on economic growth, investment, and the composition of public expenditure in over a hundred countries using the OLS and Two-Stage Least Squares (2SLS) estimators. The results indicate that public expenditure on education and health, transfer payments, social insurance and welfare payments, and current public expenditure are influenced negatively by a high level of corruption, while public consumption expenditure excluding education and defence increases at high levels of corruption.

Some authors have also made an attempt to examine the impact of corruption on public expenditure in Nigeria. For example, Onogwu (2018) assessed the impact of corruption on public expenditure and revenue in Nigeria from 1997 to 2017 using the OLS technique. The

empirical results indicate that at low levels of corruption, public expenditure and revenue tends to increase. Also, Nelson and Yebimodei (2018) evaluated the effect of corruption on public expenditure in Nigeria from 1994 to 2017 using the VAR model. The authors discovered that recurrent and capital public expenditures were reduced at high corruption levels. In addition, Aregbeyen and Akpan (2013) employed the OLS technique to assess the long-term determinants of public expenditure in Nigeria from 1960 to 2010. The results reveal that recurrent public expenditure reduces at low levels of corruption, while the level of public capital expenditure rises at low levels of corruption.

Oil price and corruption

Efforts have also been made by authors to evaluate the relationship between oil price (or oil rent) and corruption in oil-dependent economies. For example, Vogel (2020) investigated the effect of oil windfalls on corruption and the types of candidates elected under democracy in Brazil between 2000 and 2017. The results show evidence of a significant positive impact of oil royalties on corruption. In addition, the effects of windfalls on corruption are larger after elections during booms and lower during busts. Furthermore, Aslaksen (2010) employed a panel estimation technique to investigate the effect of natural resource abundance on corruption in 149 developed and developing countries over the 1970-2006 period. The results indicate that energy rent is associated with high corruption in government. In addition, oil quantity, oil reserves and mineral rents are associated with high levels of corruption in government regardless of whether the country is democratic or undemocratic. Moreover, Arezki and Brückner (2009) examined the effect of oil rents on corruption and state stability in 31 oil-exporting countries during the 1992-2005 period. Using a panel fixed effects regression, the authors found that increases in oil rents lead to significant increases in corruption.

A survey of the literature suggests that emphasis has been on exploring the effect of either oil price or corruption on public expenditure, but not the effect of both (oil price and corruption) on public expenditure. The only exception is the study by Farzanegan (2017). The author examined if the effect of oil rents on public (military) expenditure depends on the level of corruption in the MENA region from 1984 to 2014 using fixed-effects regressions. The empirical evidence illustrates that the impact of oil rents on public expenditure is dependent on the level of corruption.

To our knowledge, no study has been conducted to examine whether the effect of oil price on public expenditure is dependent on corruption level, particularly in Nigeria. Therefore, the present study extends the literature by examining if the effect of oil price on public expenditure is dependent on the level of corruption in Nigeria using the NARDL estimation technique.

Table 1

A Summary of Empirical Literature Review on Oil Price, Public Expenditure and Corruption

Author(s)	Country	Period	Method/Model	Findings
Oil Price and Public Expenditure				
Abdel-Latif et al. (2018)	Saudi Arabia	1990-2017	NARDL	Oil price shocks influence public expenditure on health and education positively both in the short-run and long-run.
Farzanegan (2011)	Iran	1959-2007	VAR	Military and security expenditure respond significantly to shocks in oil price and revenue.
Mohammad and Sani (2020)	Nigeria	1990-2016	NARDL	Positive and negative oil price shocks are directly related to public education expenditure.
Orhewere and Ogbeide-Osaretin (2020)	Nigeria	1970-2018	VECM	Oil price and revenue are directly related to expenditure on education, and inversely related to capital expenditure.
Jibir and Aluthge (2019)	Nigeria	1970-2019	ARDL	Oil price and revenue contribute to an increase in public expenditure in Nigeria.
Adedokun (2018)	Nigeria	1981-2014	SVAR, VAR and VECM	Oil price and revenue are directly related to public expenditure in the short-term and long-term.
Aregbeyen and Fasanya (2017)	Nigeria	1970-2013	VAR	Oil price shocks lead to a significant increase in public expenditure in the short-run and long run.
Corruption and Public Expenditure				
Ondřej and Agata (2015)	21 OECD countries	1998-2011	FE	Corruption is an increasing function of public expenditure on defence and public services, and inversely related to expenditure on education, health, recreation, culture and religion.
Haque and Kneller (2008)	66 countries	1970-2000	3SLS	Corruption leads to an increase in public investment, but it reduces the returns to public investment.
Delavallade (2006)	64 developing countries	1996-2001	3SLS	Corruption reduces expenditure on education, health and social protection, while it raises expenditure on public services and order, fuel and energy, culture, and defence.
Gupta, de Mello and Sharan (2000)	120 countries	1985-1998	FE	Corruption is associated with higher military expenditure and arms procurement.
Gupta, Davoodi and Tiongson (2000)	128 advanced and developing countries	1985-1997	OLS	Corruption reduces public expenditure on health and education.
Mauro (1998)	Cross country	1982-1995	2SLS	Corruption is associated with a reduction in public expenditure on education (and health).
Mauro (1996)	Cross country	1982-1995	OLS and 2SLS estimators	Higher levels of corruption reduce recurrent expenditure on education, health and social security, but it increases public consumption expenditure excluding education and defence.
Corruption and Public Expenditure				
Onogwu (2018)	Nigeria	1997-2017	OLS	Low level of corruption raises the level of public expenditure and revenue, and vice versa.
Nelson and Yebimodei (2018)	Nigeria	1994-2017	VAR	Recurrent and capital expenditures are inversely related to high corruption.

Author(s)	Country	Period	Method/Model	Findings
Aregbeyen and Akpan (2013)	Nigeria	1960-2010	OLS	Low corruption level reduces recurrent expenditure, while it raises the level of capital expenditure.
Oil price and corruption				
Vogel (2020)	Brazil	2000-2017	2SLS	Oil royalties encourage corruption, and the effects of oil windfalls on corruption are larger after elections during booms and lower during busts.
Aslaksen (2010)	149 developed and developing countries	1970-2006	FE	Oil quantity, reserves and rents are associated with higher corruption levels in government regardless of whether the country is democratic or undemocratic.
Arezki and Brückner (2009)	31 oil-exporting countries	1992-2005	FE	Oil rent causes significant increases in the level of corruption.

Note: ARDL=Autoregressive distributed lag model; NARDL=Non-linear autoregressive distributed lag model; OLS=Ordinary least squares; 2SLS=Two-stage least squares; 3SLS=Three-stage least squares; FE=Fixed effects estimation technique; SVAR=Structural vector autoregression; VAR=Vector autoregression; VECM=Vector error correction model.

Theoretical Framework and Model Specification

There exists no comprehensive theory that explains the relationship between oil price and public expenditure or the possibility of oil price impact on public expenditure depending on a country's level of corruption. Thus, it is not easy to come up with a theoretical model or empirical method that is universally agreed upon by authors in exploring the dependence of oil price-public expenditure nexus on the level of corruption. Interestingly, it has been hypothesized that changes in oil price can influence the level of public expenditure (Abdel-Latif et al., 2018; Adedokun, 2018; Farzanegan, 2011; Jibir, Aluthge, 2019; Mohammad, Sani, 2020; Orhewere, Ogbeide-Osaretin, 2020). This argument is valid for Nigeria, where proceeds from oil exports account for over 70 percent of government earnings. In addition, recent studies have argued that since Nigeria and its people depend largely on the oil sector, they advocated for the inclusion of oil price/revenue as a potential determinant when modelling the Nigerian economy or any economic variables therein (Abu, 2017; Abu, Gamal, 2020; Abu, Karim, 2021; Abu, Staniewski, 2019).

Moreover, Farzanegan (2017) showed that the level of corruption matters in how oil rents affect public expenditure, while certain studies suggested that public expenditure is dependent on the level of corruption (Fiorino, Galli, 2012; Hwang, 2002; Mauro, 1996, 1997; Tanzi, Davoodi, 1997). From the foregoing discussion, it is clear that public expenditure (PEX) can be influenced by changes in the oil price ($OILP$), the level of corruption (COR), and the interaction between oil price and corruption ($OILP * COR$). Thus, to capture this relationship, we specify an econometric model of the form:

$$PEX_t = \sigma_0 + \sigma_1 OILP_t + \sigma_2 COR_t + \sigma_3 OILP_t * COR_t + \mu_t \quad (1)$$

In addition to these variables of interest, we consider other potential drivers of public expenditure. For instance, past studies have placed an important role on debt servicing

($DEBTS$) in explaining the behaviour of public expenditure (Aregbeyen, Akpan, 2013; Mahdavi, 2004; Shonchoy, 2010; Ukwueze, 2015). These authors' submission is consistent with the 'debt-overhang hypothesis' that public debt burden can have a direct impact on public expenditure (Krugman, 1988). In addition, we believe that the extent of insecurity and government spending on internal security ($INTS$) in a country can affect the level of public expenditure. From Boko Haram terrorists in the Northeast, to banditry and kidnapping in the Northwest, to conflicts between Fulani herdsmen and farmers in the North-central and parts of Southern Nigeria, these undesirables have dire consequences on the public expenditure decision on internal security. The rising trend in insecurity has compelled the Nigerian government to commit huge resources on an annual basis to combat insecurity in the country.

Furthermore, inflation (INF) can have a lasting impact on public expenditure. For instance, increases in the general price level can push up the cost of producing public goods and services, which in turn raise the level of public expenditure (see Jibir and Aluthge 2019). Also, rising inflation tends to reduce the real value of debt stock or raise interest payments on debt, leading to a higher debt stock (Cooray, Schneider, 2013), and as a result, higher public expenditure. It has also been suggested that in a country where the corruption level is high, extra costs arising from corruption may raise the general price level, leaving a dampening impact on the level of public expenditure (Timofeyev, 2011). Taking all of these variables into consideration, the public expenditure model is re-specified as:

$$LogPEX_t = \sigma_0 + \sigma_1 LogOILP_t + \sigma_2 COR_t + \sigma_3 LogOILP_t * COR_t + \sigma_4 LogDEBTS_t + \sigma_5 LogINTS_t + \sigma_6 INF_t + \mu_t \quad (2)$$

where Log is the logarithm of the variables which is taken to reduce skewness. Through the oil price and corruption interaction, the marginal effects of changes in the two variables (i.e. oil price and corruption) can be computed via the partial derivative of equation (3) with respect to oil price given as:

$$\frac{\partial LogPEX_t}{\partial LogOILP_t} = \alpha_1 + \alpha_3(COR_t) \quad (3)$$

If the two coefficients (i.e. α_1 and α_3) in the partial derivative turn out to be positive, it implies that increasing oil price at low levels of corruption (an improvement in control of corruption) would increase public expenditure, and vice versa. But if the two coefficients have different signs, it suggests the existence of a threshold effect, which implies that the effect of oil price on public expenditure varies with the level of corruption. Hence, it is necessary to evaluate the marginal effects within our sample.

Methodology and Data

Data

This study uses quarterly data covering the 1996-2019 period. The period was chosen due to the availability of the data on control of corruption. The data on the variables were collected from various sources as follows. The data on public expenditure, spending on internal security and debt service, were collected from the Central Bank of Nigeria (CBN) Statistical

Bulletin. The data on oil price was collected from OPEC Annual Statistical Bulletin, inflation data from the World Development Indicators (WDI), and control of corruption from the World Governance Indicators (WGI).

The data are measured as follows. PEX is aggregate public expenditure in billions of US dollars. $OILP$ is the annual average price of crude oil base on OPEC Reference Basket (ORB) measured in US dollars. COR is captured by the control of corruption and it reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption. The index takes a value of -2.5 to 2.5. Higher values indicate that corruption is low, and vice versa. Thus, a positive sign of the coefficient of COR implies that a decrease in corruption has a positive effect on public expenditure, and vice versa. $DEBTS$ is debt servicing expenditure in billions of US dollars and $INTS$ is the total annual spending on internal security in billions of US dollars. $INF$is the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. It is important to state that public expenditure, debt servicing and spending on internal security, which are in local currency (i.e. Naira), were converted into US dollars, and their absolute values were transformed by taking their logarithm. The data are presented in Appendix 1.

Non-linear ARDL-bounds Test to Cointegration

In an attempt to evaluate the asymmetric effect of oil price on public expenditure, and the dependence of oil price and public expenditure nexus on the level of corruption in Nigeria, we employ the novel NARDL co-integration method. This technique which was advanced by Shin, Yu and Greenwood-Nimmo (2014), is an asymmetric expansion of the linear ARDL model (Pesaran, Shin, 1999; Pesaran, Shin, Smith, 2001). Following Shin et al. (2014), a non-linear (asymmetric) cointegrating relationship between oil price ($LogOILP$) and public expenditure ($LogPEX$) is expressed as:

$$\begin{aligned} LogPEX_t = {} & \alpha_1 + \beta^+ LogOILP_t^+ + \beta^- LogOILP_t^- + \alpha_2 COR_t \\ & + \alpha_3 (LogOILP_t * COR_t) + \alpha_4 LogDEBTS_t + \alpha_5 LogINTS_t \\ & + \alpha_6 INF_t + u_t \end{aligned} \tag{5}$$

where β^+ and β^- are the associated long-run parameters and $LogOILP_t$ is a $k \times 1$ vector of regressors decomposed as:

$$LogOILP_t = LogOILP_0 + LogOILP_t^+ + LogOILP_t^- \tag{6}$$

$LogOILP_t^+$ and $LogOILP_t^-$ are partial sum corresponding to positive and negative changes in $LogOILP_t$ which are generated by computing:

$$LogOILP_t^+ = \sum_{i=1}^{t} \Delta LogOILP_i^+ = \sum_{i=1}^{t} \max(\Delta LogOILP_i, 0) \tag{7}$$

$$LogOILP_t^- = \sum_{i=1}^{t} \Delta LogOILP_i^- = \sum_{i=1}^{t} \min(\Delta LogOILP_i, 0) \tag{8}$$

Shin et al. (2014) showed that associating equation (5) with the linear ARDL(p, q) model, a NARDL(p, q) model expressing the asymmetric relationship between oil price and public expenditure can be expressed as follows:

$$\begin{aligned}\Delta LogPEX_t = {} & \alpha_1 + \rho LogPEX_{t-1} + \theta^{+} LogOILP^{+}_{t-1} + \theta^{-} LogOILP^{-}_{t-1} + \alpha_2 COR_t \\ & + \alpha_3 OILP_t * COR_t + \alpha_4 LogDEBTS_t + \alpha_5 LogINTS_t + \alpha_6 INF_t \\ & + \sum_{i=1}^{p-1} \varphi_i \Delta LogPEX_{t-i} \\ & + \sum_{i=0}^{q_1} (\pi_i^{+} \Delta LogOILP^{+}_{t-i} + \pi_i^{-} \Delta LogOILP^{-}_{t-i}) + \sum_{i=0}^{q_2} \delta_i \Delta COR_t \\ & + \sum_{i=0}^{q_3} \delta_i \Delta OILP_t * COR_t + \sum_{i=0}^{q_4} \delta_i \Delta LogDEBTS_t \\ & + \sum_{i=0}^{q_5} \delta_i \Delta LogINTS_t + \sum_{i=0}^{q_6} \delta_i \Delta INF_t + \upsilon_t\end{aligned} \tag{9}$$

where:

$\theta^{+} = -\rho\beta^{+}$ and $\theta^{-} = -\rho\beta^{-}$

The procedure of the NARDL approach involves three basic steps. First is the estimation of the NARDL(p, q) model in equation 9 by the standard OLS. The second is to test the asymmetric (non-linear) cointegrating relationship among the variables, namely – $LogPEX_t$, $LogOILP^{+}_t$, $LogOILP^{-}_t$, COR_t, $LogOILP_t * COR_t$, $LogDEBTS_t$, $LogINTS_t$ and INF_t. In particular, the joint null hypothesis of no co-integration: $\rho = \theta^{+} = \theta^{-} = 0$ in equation 9 is tested by means of the bounds test procedure of Pesaran et al. (2001) and Shin et al. (2014) based on a modified Wald (F-statistic) test. The procedure uses two critical bounds, which are the upper [I(1)] and lower [I(0)] critical bounds. If the computed F-statistic exceeds the upper bound [I(1)], it implies the presence of a long-run equilibrium relationship. But if F-statistic is less than the lower bound [I(0)], the null hypothesis of no co-integration is accepted. Moreover, if the calculated F-statistic lies between the two critical bounds, the inference would be inconclusive (Athanasenas, Katrakilidis, Trachanas, 2014; David, Sakanko, Obilikwu, 2020). Finally, the long-run and the short-run symmetry relationship are tested using the standard Wald test. For long-run asymmetry, the relevant joint null hypothesis to be tested is $-\theta^{+}/\rho = -\theta^{-}/\rho$, while for short-run asymmetry, the joint null hypothesis to be tested is $\sum_{i=0}^{q} \pi_i^{+} = \sum_{i=0}^{q} \pi_i^{-}$.

Results and Discussion

Prior to investigating if the effect of oil price on public expenditure is dependent on the level of corruption in Nigeria, descriptive statistics, correlation analysis and unit root tests for the variables were computed.

Descriptive Statistics and Correlation Analysis

The descriptive statistics and correlation analysis are reported in Table 2. The descriptive statistics demonstrate that the mean public expenditure is US$20.22 billion, and the average value of oil price for the period under study is US$55.30. In addition, the mean control of corruption is -1.14, and the average inflation rate is 12.07 for the same period. More so, the average debt service is US$3.44 billion, while the average government expenditure on internal security is US$1.18 billion.

Table 2

Descriptive Statistics and Correlation Analysis

Descriptive Statistics						
	PEX	**OILP**	**COR**	**DEBTS**	**INTS**	**INF**
Mean	2.02E+10	55.2975	-1.1409	3.44E+09	1.18E+09	12.0648
Std. Dev.	7.98E+09	30.1854	0.1222	1.89E+09	6.34E+08	3.9077
Maximum	3.30E+10	109.4500	-0.8900	8.00E+09	2.30E+09	29.2683
Minimum	6.87E+09	12.2800	-1.4300	3.33E+08	2.46E+08	5.3880
Observations	93	93	72	93	93	93
Correlation Analysis						
	PEX	OILP	COR	INTS	DEBTS	INF
PEX	1.0000					
OILP	0.8118**	1.0000				
COR	0.4958**	0.3045**	1.0000			
INTS	0.9297**	0.7601**	0.4900**	1.0000		
DEBTS	0.5645**	0.2193*	0.1664	0.6037**	1.0000	
INF	-0.3319**	-0.4611	-0.1235	-0.3819	-0.0012	1.0000

* and ** denote statistical significance at 10% and 1% levels, respectively.
Source: Authors' computation.

Moreover, the correlation analysis indicates that public expenditure and oil price have a strong positive and significant association (0.81), while public expenditure and corruption have a moderate and significant positive correlation (0.50). In addition, there is a very strong positive and significant correlation between spending on internal security and public expenditure (0.93), a moderate positive and significant correlation between debt service and public expenditure (0.56), and a weak negative association between inflation and public expenditure (-0.33).

Results of Unit Root Tests

Although the NARDL method does not require conducting a unit root test, it is necessary to perform the test because the presence of I(2) series makes the computed F-statistic invalid (Athanasenas et al., 2014). The conventional Augmented Dickey-Fuller (ADF) test of Dickey and Fuller (1979) and Philips-Perron (PP) test of Phillips and Perron (1988) were conducted to ascertain the unit root status of the series.

The unit root tests results (Table 3) show that the series are a mixture of I(0) and I(1) because some variables are stationary at level, while others turned out stationary after their first

difference has been taken. These findings provide the justification for conducting the bounds test to co-integration.

Table 3

Results of Unit Root Tests

Series	ADF		PP		Decision
	Level	1st Diff.	Level	1st Diff.	
LPEX	-1.6457	-3.1852**	-0.9888	-3.4565**	I(1)
LOILP	-1.9003	-3.3464**	-1.3557	-3.6474**	I(1)
COR	-3.0277**	-	-2.3598	-3.2247**	I(0)
LDEBTS	-1.5027	-3.7355***	-1.3370	-4.6313***	I(1)
LINTS	-1.1412	-3.2747**	-0.7485	-3.5879***	I(1)
INF	-5.0085***	-	-4.8135***	-	I(0)

*Source: Authors' computation. ***and ** denote statistical significance at 1% and 5% levels, respectively.*

Result of NARDL-bounds Test to Cointegration

The NARDL-bounds test to co-integration result (Table 4) illustrates that the calculated F-statistic (3.61) is larger than the upper critical bound value (3.21) at 5% level. This indicates that there is a cointegrating relationship between the variables. Thus, a long-run relationship exists among the variables under consideration.

Table 4

Result of Bounds Test to Cointegration

Dependent Variable			Function				F-statistic	
$LogPEX$			$f(LogPEX/LogOILP^{+}, LogOILP^{-}, LogOILP * COR, LogDEBTS, LogINTS, INF)$				3.6115**	
Critical Values Bounds								
10%		5%		2.5%		1%		
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
1.92	2.89	2.17	3.21	2.43	3.51	2.73	3.90	

*Source: Authors' computation. ** denotes statistical significance at 5% level. Log is a logarithm.*

Results of Estimation of the NARDL Model

Having established the presence of a cointegrating (long-run) relationship between the variables, the NARDL model was estimated taking into consideration the optimal lag-length (2,2,2,0,1,1,1,1) as suggested by the Schwarz Information Criterion (SIC). In addition, the long-run and the short-run asymmetry tests (using the Wald restriction test) were computed and the results are reported in Table 5. The result of long-run asymmetry tests indicates that the F-statistic (5.97) is significant at 5% level, while there is no evidence of short-run asymmetry. Thus, there is a long-run asymmetric relationship between negative and positive changes in the price of oil and public expenditure.

Table 5

Results of Estimation of the NARDL Model

Panel A: Long-run Coefficients – Dependent variable is $LogPEX$				
Regressor	Coefficient	Std. Error	t-Statistic	Prob.
Constant	6.2173	1.0849	5.7304***	0.0000
$LogOILP^{+}$	0.3407	0.0931	3.6579***	0.0006
$LogOILP^{-}$	0.3784	0.0492	7.6984***	0.0000
COR	0.3777	0.0935	4.0412***	0.0002
$LogOILP * COR$	-1.0414	0.3398	-3.0645***	0.0035
$LogDEBTS$	0.3401	0.09530	3.5688***	0.0008
$LogINTS$	0.1303	0.0679	1.9170*	0.0611
INF	0.0017	0.0022	0.8012	0.4269
Panel B: Short-run Coefficients – Dependent variable is $\Delta LogPEX$				
Regressor	Coefficient	Std. Error	t-Statistic	Prob.
$\Delta LogPEX_{t-1}$	0.7278	0.0591	12.319***	0.0000
$\Delta LogOILP^{+}$	0.1036	0.0424	2.4437**	0.0182
$\Delta LogOILP^{-}$	0.0707	0.0727	0.9724	0.3357
$\Delta LogOILP^{-}_{t-1}$	-0.3114	0.0589	-5.2809***	0.0000
ΔCOR	0.1889	0.0584	3.2349***	0.0022
ΔCOR_{t-1}	-0.3283	0.0497	-6.6066***	0.0000
$\Delta(LogOILP * COR)$	-0.3284	0.1236	-2.6575**	0.0106
$\Delta LogDEBTS$	0.2802	0.0466	6.0177***	0.0000
$\Delta LogINF$	-0.0027	0.0008	-3.2822***	0.0019
u_{t-1}	-0.2115	0.0344	-6.1489***	0.0000
W_{LR}	5.9679**			
W_{SR}	1.1312			
R^2	0.92			

*, ** and *** *denote significance at 10% and 1%, respectively.* Δ *is the first difference operator. Superscripts "+" and "−" denote positive and negative partial sums, respectively.* u_{t-1} *is the coefficient of error term lagged by one period, representing the speed of adjustment back to equilibrium in the long run following a deviation from the equilibrium in the short-term.* W_{LR} *refers to the Wald test of long-run symmetry defined by* $-\hat{\theta}^{+}/\hat{\rho} = -\hat{\theta}^{-}/\hat{\rho}$. W_{SR} *is the short-run symmetry defined by* $\sum_{i=0}^{q}\pi_i^{+} = \sum_{i=0}^{q}\pi_i^{-}$. R^2 *is the coefficient of determination.*

Source: Authors' computation.

The long-run results (Panel A) indicate that both positive and negative shocks to oil price have a significant positive impact on public expenditure in the long run. A positive shock to oil price causes public expenditure to rise by a 0.34%, while a negative shock leads to a 0.38% increase in public expenditure at 1% level in the long run. In addition, the control of corruption has a significant positive effect on public expenditure in the long run. An increase in the control of corruption (reducing corruption) by 1 point leads to an increase in public expenditure by a 0.38% at 1% level in the long run.

Furthermore, the results demonstrate that the impact of oil price on public expenditure is dependent on the level of corruption in the long run and the relationship is significant. At low levels of corruption (an improvement in the control of corruption), raising oil price by 1% causes public expenditure to decline by approximately 1.04% at 1% level in the long run. Moreover, debt servicing has a significant positive impact on public expenditure in the long run. A 1% increase in debt service leads to a 0.34% increase in public expenditure at 1% level in the long run. In the same vein, spending on internal security has a positive and

significant effect on public expenditure in the long run. A 1% increase in expenditure on internal security leads to an increase in public expenditure by a 0.13% at 10% level in the long run.

The short-run results (Panel B) illustrate that a positive shock to oil price has a significant positive effect on public expenditure in the short run. A positive shock to oil price leads to a 0.10% increase in public expenditure at 5% level in the short run. Also, the control of corruption has a significant and positive impact on public expenditure in the short run. An increase in the control of corruption (reducing corruption) by 1 point causes public expenditure to increase by a 0.19% at 1% level in the short run. In addition, the impact of oil price on public expenditure is dependent on the level of corruption in the short run. At a lower level of corruption, raising oil price by 1% reduces public expenditure by 0.33% at 5% level in the short run. Furthermore, debt service has a significant and positive effect on public expenditure in the short run. A 1% increase in debt service raises public expenditure by a 0.28% at 1% level in the short run. On the other hand, inflation has a significant and negative effect on public expenditure in the short run. An increase in inflation by 1% reduces public expenditure by a 0.003% at 1% level in the short run. The coefficient of the error correction term lagged by one period is significant and correctly signed, and it illustrates that 21.15% of the deviation is corrected in the fourth quarter.

Results of Diagnostic Tests

The diagnostic test results are reported in Table 6. The result of the serial correlation test indicates that the test statistic is 2.97 with a probability value of 0.23. In addition, the heteroscedasticity test result illustrates that the test statistic is 11.79 with a probability of 0.81. Furthermore, the normality test result shows that the Jarque-Bera statistic is 3.62 and its probability is 0.16. More so, the Ramsey RESET F-statistic is 0.02 with a probability value of 0.88. These outcomes reveal that the estimated relationship is free from problems of serial correlation and heteroscedasticity, and it passes the non-normality and model misspecification tests.

Table 6

NARDL Model Diagnostic Tests

LM Test Statistic	Results
Serial Correlation: χ^2	2.9656 [0.2270]
Heteroscedasticity: χ^2	11.7863[0.8129]
Normality: Jarque-Bera	3.6232 [0.1634]
Functional Form: Ramsey RESET F-stat.	0.0213 [0.8846]

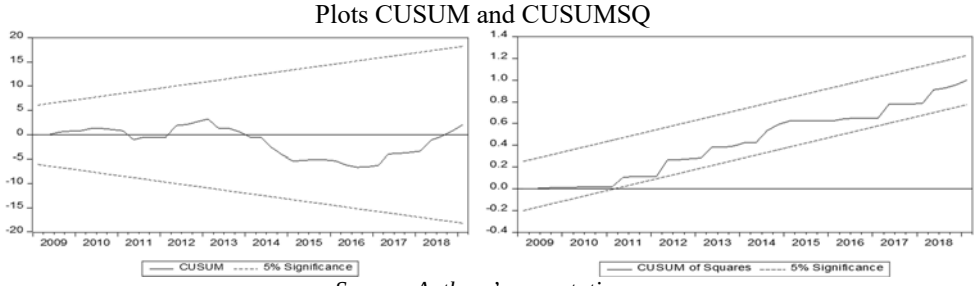
Source: Authors' computation. Probability values are in brackets.

Results of Stability Tests

The stability test results (Figure 4) indicate that the plots of the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) lie within the lower and upper bounds. These outcomes illustrate that the estimated model and the parameters are stable over the long term.

Figure 4

Plots CUSUM and CUSUMSQ



Source: Authors' computation.

Marginal Effects of Oil Price on Public Expenditure at Different Level of Corruption

We estimated the marginal impact of oil price at different levels of corruption, and reported the results in Table 7. The marginal effect of a positive shock to oil price on public expenditure at the mean control of corruption (i.e. -1.14) is 1.57. The marginal effect is 1.87 at the maximum value of control of corruption (i.e. -0.89) and 1.31 at the minimum value of control of corruption (i.e. -1.43). In addition, the marginal impact of a negative shock to oil price on public expenditure when the mean control of corruption is -1.14 is approximately 1.53. The marginal impact of a negative shock to oil price on public expenditure at the maximum control of corruption is 1.83, while the marginal effect of oil price on public expenditure is 1.27 when the control of corruption is at minimum (i.e. -1.43).

Table 7

Marginal Effects of Oil Price on Public Expenditure at Different Levels of Corruption

Level of Control of Corruption	Marginal effect of $LogOILP^{+}$	Marginal effect of $LogOILP^{-}$
Mean	1.5667	1.5289
Minimum (high level of corruption)	1.3053	1.2676
Maximum (low level of corruption)	1.8677	1.8299

Source: Authors' computation. Note: Marginal effects of (positive and negative) changes in oil price on public expenditure are calculated based on equation 4.

These empirical findings have some implications. The positive relationship between oil price and public expenditure is consistent with the findings of previous studies on Nigeria (Adedokun, 2018; Aregbeyen, Fasanya, 2017; Jibir, Aluthge, 2019). Therefore, rising oil prices raise the capacity of Nigeria and its government to earn higher revenue or income, which can be expended to provide public goods and services, leading to higher public expenditure.

In addition, the positive impact of reducing corruption on public expenditure lends support to the works of Nelson and Yebimodei (2018) and Onogwu (2018) on Nigeria. These authors found that rising corruption reduces public expenditure in Nigeria, and vice versa. This empirical finding suggests that if public sector corruption is high, government officials can

divert funds meant for the provision of socio-economic infrastructure (or public utilities) for personal use, leading to lower public expenditure.

Also, the positive sign of the coefficient of debt service lends support to the outcomes of past studies (Aregbeyen, Akpan, 2013; Mahdavi, 2004; Ukwueze, 2015). Thus, the higher the amount required to service Nigeria's huge debt, the higher the public expenditure.

In the same vein, the positive impact of spending on internal security on public expenditure illustrates that higher expenditure to curb rising insecurity such as banditry, kidnapping and insurgency, leads to an increase in public expenditure.

The negative effect of inflation on public expenditure in the short-run is consistent with the claim that higher inflation reduces the real value of debt stock (Cooray, Schneider, 2013), and consequently a decline in the real value of public expenditure.

Furthermore, the negative relationship between public expenditure and oil price-corruption interaction demonstrates that the effect of oil price on public expenditure varies at different levels of corruption. The impact of oil price on public expenditure is higher at a lower level of corruption (i.e. when the control of corruption is at maximum), while the effect of oil price on public spending is lower at a higher level of corruption (i.e. when the control of corruption is at minimum).

Conclusion

This study uses the NARDL technique to explore whether the effect of oil price on public expenditure depends on the level of corruption in Nigeria using quarterly data from 1996 to 2019. The bounds test to co-integration result demonstrates that there is a long-run relationship among the variables. We found evidence of the presence of asymmetry in the relationship as both negative and positive shocks to oil price have a significant positive impact on public expenditure in the long run. Also, the oil price and public expenditure relationship is dependent on the level of corruption. In addition, the marginal effect of oil price on public expenditure varies at different levels of corruption. In particular, at lesser levels of corruption, increasing oil price leads to higher public expenditure, and vice versa. Other significant drivers of public expenditure in the long run include spending on internal security and debt service. Based on these outcomes, we proffer some recommendations.

First, the government is advised to promote and sustain oil production since proceeds from oil exports account for the largest percentage of government earnings. To this end, efforts should be made to ensure that there is stability in the oil-rich Niger-Delta region, where most of the oil exploration is carried out. Second, there is a need for government to sustain the ongoing war against corruption to ensure judicious use and better management of proceeds from oil exports. Third, whereas we cannot advise the government to reduce spending on internal security in the face of rising banditry, kidnapping and insurgency, taking steps to ensure security can release funds to other critical sectors of the economy. Fourth, although inflation appears to have a short-run negative effect on public expenditure, it is important that the government (through the monetary authority) devises the means to check the excessive increase in inflation. Finally, the rising debt burden has become a serious problem as huge

funds are devoted to servicing Nigeria's debt on a yearly basis. To reverse this trend, efforts should be geared towards raising the government's revenue or earnings.

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Appendix 1

Data Used

YR	LogPEX	LogOILP	COR	LogOILP*COR	LogINTS	LogDEBTS	INF
1996Q1	10.18774	1.307303	-1.19	-1.55569	8.707472	9.384497	29.26829
1996Q2	10.21368	1.298299	-	-	8.706526	9.412316	24.08369
1996Q3	10.23962	1.289294	-	-	8.70558	9.440135	18.89908
1996Q4	10.26556	1.280289	-	-	8.704633	9.467955	13.71448
1997Q1	10.29149	1.271284	-	-	8.703687	9.495774	8.529874
1997Q2	10.30549	1.22578	-	-	8.71236	9.489001	8.8965
1997Q3	10.31948	1.180276	-	-	8.721032	9.482227	9.263126
1997Q4	10.33347	1.134773	-	-	8.729705	9.475454	9.629752
1998Q1	10.34746	1.089269	-1.16	-1.26355	8.738377	9.468681	9.996378
1998Q2	10.263	1.127556	-	-	8.708848	9.232039	9.151877
1998Q3	10.17854	1.165843	-	-	8.679318	8.995397	8.307376
1998Q4	10.09408	1.20413	-	-	8.649788	8.758755	7.462875
1999Q1	10.00962	1.242417	-	-	8.620258	8.522113	6.618373
1999Q2	9.966389	1.292024	-	-	8.563086	8.668681	6.697103
1999Q3	9.92316	1.341632	-	-	8.505914	8.815248	6.775833
1999Q4	9.879931	1.391239	-	-	8.448742	8.961815	6.854562
2000Q1	9.836702	1.440846	-1.22	-1.75783	8.391571	9.108383	6.933292
2000Q2	9.867213	1.421646	-	-	8.428785	9.116911	9.918381
2000Q3	9.897725	1.402445	-	-	8.465999	9.12544	12.90347
2000Q4	9.928236	1.383245	-	-	8.503213	9.133969	15.88856
2001Q1	9.958748	1.364044	-	-	8.540427	9.142498	18.87365
2001Q2	9.950347	1.369716	-	-	8.584892	9.13979	17.37438
2001Q3	9.941947	1.375387	-	-	8.629357	9.137082	15.87511
2001Q4	9.933546	1.381059	-	-	8.673822	9.134374	14.37585
2002Q1	9.925145	1.386731	-1.43	-1.98302	8.718286	9.131666	12.87658
2002Q2	9.938034	1.402213	-1.4125	-1.98063	8.7195	9.210931	13.16538
2002Q3	9.950922	1.417695	-1.395	-1.97769	8.720713	9.290197	13.45418
2002Q4	9.96381	1.433178	-1.3775	-1.9742	8.721926	9.369463	13.74298
2003Q1	9.976698	1.44866	-1.36	-1.97018	8.723139	9.448728	14.03178
2003Q2	9.989698	1.475706	-1.355	-1.99958	8.758568	9.450834	14.27335
2003Q3	10.0027	1.502752	-1.35	-2.02872	8.793998	9.45294	14.51491
2003Q4	10.0157	1.529799	-1.345	-2.05758	8.829427	9.455046	14.75647
2004Q1	10.0287	1.556845	-1.34	-2.08617	8.864856	9.457152	14.99803
2004Q2	10.0564	1.593757	-1.295	-2.06392	8.846765	9.461464	15.7144
2004Q3	10.08411	1.630669	-1.25	-2.03834	8.828674	9.465775	16.43076
2004Q4	10.11181	1.667582	-1.205	-2.00944	8.810583	9.470087	17.14713
2005Q1	10.13951	1.704494	-1.16	-1.97721	8.792492	9.474398	17.86349
2005Q2	10.14912	1.724845	-1.15	-1.98357	8.834945	9.427637	15.45393
2005Q3	10.15873	1.745196	-1.14	-1.98952	8.877397	9.380875	13.04436
2005Q4	10.16833	1.765548	-1.13	-1.99507	8.91985	9.334114	10.63479
2006Q1	10.17794	1.785899	-1.12	-2.00021	8.962302	9.287352	8.225222
2006Q2	10.20584	1.799262	-1.1025	-1.98369	9.011368	9.273031	7.515918
2006Q3	10.23373	1.812626	-1.085	-1.9667	9.060435	9.25871	6.806615
2006Q4	10.26163	1.825989	-1.0675	-1.94924	9.109501	9.244389	6.097311
2007Q1	10.28953	1.839352	-1.05	-1.93132	9.158567	9.230068	5.388008
2007Q2	10.32632	1.873315	-1.01	-1.89205	9.173997	9.299348	6.936275

YR	LogPEX	LogOILP	COR	LogOILP*COR	LogINTS	LogDEBTS	INF
2007Q3	10.36311	1.907277	-0.97	-1.85006	9.189427	9.368629	8.484542
2007Q4	10.3999	1.94124	-0.93	-1.80535	9.204856	9.437909	10.03281
2008Q1	10.43669	1.975202	-0.89	-1.75793	9.220286	9.507189	11.58108
2008Q2	10.41886	1.927841	-0.925	-1.78325	9.208422	9.437442	11.82455
2008Q3	10.40102	1.880479	-0.96	-1.80526	9.196558	9.367695	12.06802
2008Q4	10.38319	1.833118	-0.995	-1.82395	9.184694	9.297949	12.31149
2009Q1	10.36536	1.785757	-1.03	-1.83933	9.172831	9.228202	12.55496
2009Q2	10.38545	1.811573	-1.035	-1.87498	9.173042	9.281597	12.84627
2009Q3	10.40555	1.837389	-1.04	-1.91088	9.173253	9.334993	13.13758
2009Q4	10.42564	1.863205	-1.045	-1.94705	9.173464	9.388389	13.42889
2010Q1	10.44573	1.889021	-1.05	-1.98347	9.173676	9.441785	13.7202
2010Q2	10.45582	1.924578	-1.08	-2.07854	9.195264	9.465046	13.00016
2010Q3	10.46591	1.960134	-1.11	-2.17575	9.216852	9.488308	12.28011
2010Q4	10.47599	1.99569	-1.14	-2.27509	9.23844	9.511569	11.56007
2011Q1	10.48608	2.031247	-1.17	-2.37656	9.260028	9.534831	10.84003
2011Q2	10.48106	2.033239	-1.17	-2.37889	9.285528	9.559819	11.18447
2011Q3	10.47603	2.035231	-1.17	-2.38122	9.311028	9.584807	11.5289
2011Q4	10.47101	2.037224	-1.17	-2.38355	9.336529	9.609795	11.87334
2012Q1	10.46599	2.039216	-1.17	-2.38588	9.362029	9.634783	12.21778
2012Q2	10.47899	2.035605	-1.1825	-2.4071	9.338953	9.656418	11.28229
2012Q3	10.492	2.031994	-1.195	-2.42823	9.315876	9.678053	10.3468
2012Q4	10.50501	2.028384	-1.2075	-2.44927	9.2928	9.699689	9.411316
2013Q1	10.51802	2.024773	-1.22	-2.47022	9.269723	9.721324	8.475827
2013Q2	10.50386	2.014475	-1.2325	-2.48284	9.261346	9.734428	8.372492
2013Q3	10.4897	2.004177	-1.245	-2.4952	9.252968	9.747532	8.269157
2013Q4	10.47555	1.993879	-1.2575	-2.5073	9.244591	9.760635	8.165821
2014Q1	10.46139	1.983581	-1.27	-2.51915	9.236214	9.773739	8.062486
2014Q2	10.449	1.911315	-1.2225	-2.33658	9.258863	9.765124	8.299211
2014Q3	10.4366	1.839049	-1.175	-2.16088	9.281512	9.756508	8.535937
2014Q4	10.42421	1.766783	-1.1275	-1.99205	9.304161	9.747893	8.772662
2015Q1	10.41182	1.694517	-1.08	-1.83008	9.326811	9.739278	9.009387
2015Q2	10.39982	1.673447	-1.0675	-1.7864	9.299323	9.741997	10.67588
2015Q3	10.38782	1.652376	-1.055	-1.74326	9.271835	9.744716	12.34236
2015Q4	10.37582	1.631305	-1.0425	-1.70064	9.244348	9.747435	14.00885
2016Q1	10.36383	1.610234	-1.03	-1.65854	9.21686	9.750154	15.67534
2016Q2	10.35402	1.637571	-1.0425	-1.70717	9.191247	9.756509	15.88739
2016Q3	10.34421	1.664907	-1.055	-1.75648	9.165633	9.762865	16.09944
2016Q4	10.3344	1.692243	-1.0675	-1.80647	9.14002	9.76922	16.31149
2017Q1	10.32459	1.71958	-1.08	-1.85715	9.114406	9.775576	16.52354
2017Q2	10.3452	1.750618	-1.0725	-1.87754	9.136817	9.793905	15.41634
2017Q3	10.36581	1.781655	-1.065	-1.89746	9.159229	9.812235	14.30914
2017Q4	10.38641	1.812693	-1.0575	-1.91692	9.18164	9.830565	13.20193
2018Q1	10.40702	1.843731	-1.05	-1.93592	9.204052	9.848895	12.09473
2018Q2	10.43037	1.834411	-1.06	-1.94448	9.237579	9.862386	11.92025
2018Q3	10.45372	1.825091	-1.07	-1.95285	9.271107	9.875877	11.74576
2018Q4	10.47706	1.815771	-1.08	-1.96103	9.304635	9.889369	11.57128
2019Q1	10.50041	1.806451	-1.09	-1.96903	9.338162	9.90286	11.39679