TESTING THE OIL REVENUE AND GOVERNMENT EXPENDITURE NEXUS IN NIGERIA

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Abstract

This study examines the nexus between oil revenue and government expenditure in Nigeria using time series data from 1987 to 2019. Auto-regressive Distributed lag(ARDL) model, Bound testing, and Augmented Dicky-Fuller unit root approaches were adopted to examine this objective empirically. The unit root tests also show that the variables are integrated at different orders. On the back of this, the Autoregressive model is employed to examine both short-and long-run relationships between oil revenue and government expenditure. Even though the explanatory variables, oil revenue, and government expenditure, do not have a statistically significant impact on government expenditure, but the bound testing shows the presence of a long-run relationship among the selected variables, This finding is, however, justifiable when considering the fact despite several plunges in oil prices and revenue, particularly during major global economic or health crises, the Nigerian government has consistently increased her expenditure, With this foregoing, government expenditure remains sticky downward even amidst a prolonged deceleration in oil revenue which accounts for more than 50% of total consolidated revenue..

Keywords: ARDL, Bound Testing, Government Expenditure, Oil revenue, Government debt, Oil price.

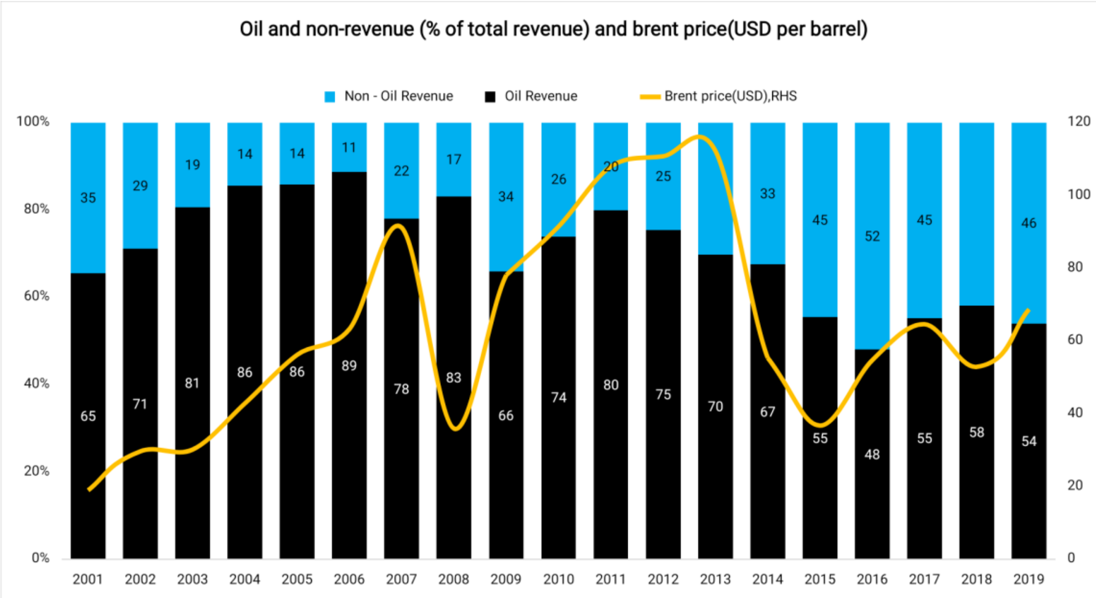
Introduction

Nigeria has continued to largely depend on oil revenue despite various shocks in the international oil market in addition to endogenous shocks such as vandalism, oil theft, mismanagement, non-remittance inter alia. However, oil price shock remained on the front burner. The incessant crash in oil prices has continued to increase Nigeria's fiscal weaknesses, and subdue her economic growth in the medium to long run.

More so, the share of Nigeria's oil revenue has declined from its peak in 2006 at 89% of total government revenue to 54% in 2019 and more than 50% in 2 020 due to the Covid-19 pandemic, total government revenue still trails the trajectory of oil prices as the non-oil sector depends on the performance of the oil sector. It is important to highlight that the heavy involvement of the federal government through her recurrent and capital expenditure across most sectors of the Nigerian economy has heightened a broad-based response of major sectors to oil price volatility.

Against this backdrop, the sentiments in the international oil market are crucial to Nigeria's government revenue as well as expenditure.

Figure 1: Oil Revenue and Non-Oil Revenue VS Brent price



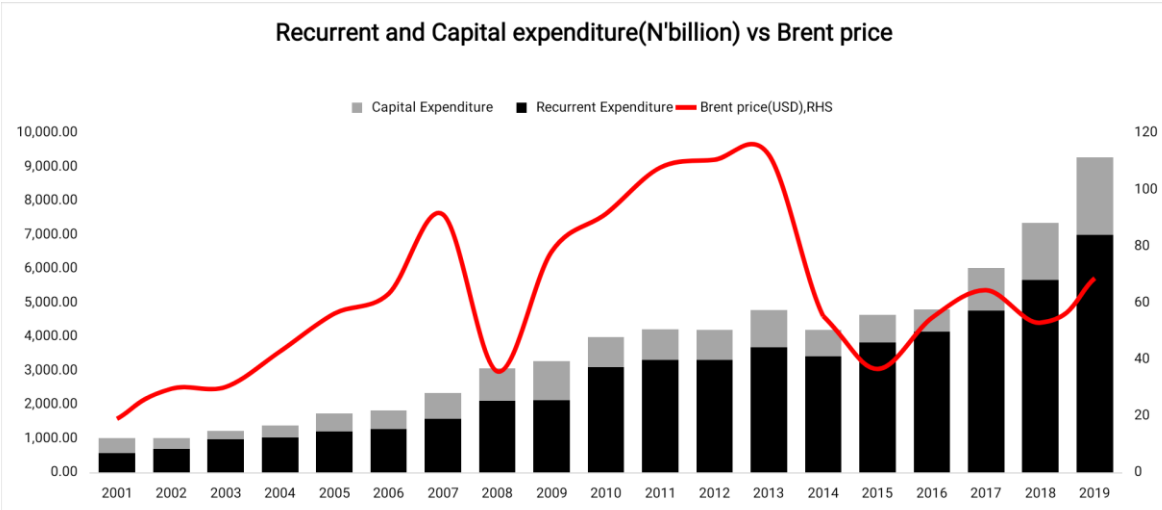
Source: CBN, author's illustration

Furthermore, two notable dips in oil prices in the last five years have created an indelible negative impact on Nigeria's economy. The first, which happened in 2016, was an account of the global oil supply glut which led to a dip in prices from over US$100 per barrel in 2014 to an average of US$43.53 per barrel in 2016. Not surprisingly, Nigeria's economy grappled with various challenges ranging from economic recession, consistent rise in inflation to an all-time high, distorted foreign exchange market, soared unemployment rate, and huge constraint to fiscal policy implementation, among others, as a result of the fall in oil revenue inflows.

The same scenario played out in 2020 when oil price dipped to a record low of US$7 per barrel on April 21, 2020, on the back of the restrictions to the movement of people globally to contain the spread of the Covid-19 pandemic. This halted major economic activities, and, in turn, reduced the demand for crude oil but supply was not reduced as most oil-dependent countries were still struggling with the fallout of lingered trade war between the US and China on oil demand and price outlook. Besides, the urgent need to support households and businesses during the pandemic put significant pressure on government expenditure globally which led to a less than the proportional reduction in the supply of crude oil despite the significant plunge in demand.

It is expedient for an oil-dependent country like Nigeria to continually assess how oil inflows have consistently determined her ability to meet various obligations to drive economic growth, such as addressing the country's infrastructural deficit, tax waivers to support budding entrepreneurs, and adequate financial support for the most vulnerable people in the economy.
On the expenditure side, even amidst series of plunges to oil prices and less impressive recovery in government revenue, especially the oil revenue component, government

expenditure has maintained an upward trend over time. For instance, total government expenditure rose by 134 percent between 2010 and 2019 compared with less than a 50% increase in revenue over the same periods. Although capital and recurrent expenditure went up by 158.97% and 125.04%, respectively, in the last 10 years, it is very worrisome to observe that capital expenditure is suboptimal despite elevated recurrent expenditure.



Source: CBN, author's illustration

Interestingly, Drummond, Daal, Srivastava, and Oliveira (2012) highlighted the same concern by arguing that mobilization of adequate resources is critical to infrastructural development in Africa counties. Even though these countries have an ambitious fiscal plan for economic transformation, limited resources have been the major drawback to capital expenditure which is usually growth enabling.

Therefore, meeting spending commitment has continued to be a major challenge to the Nigerian government, hence, resulting in a consistent rise in government borrowing from both the local debt markets and international financial market to bridge the ballooning fiscal deficit. More worrisome is the fact that the excess crude accounts that is supposed to serve as a fiscal buffer when consistent revenue decline has dried up (Adedokun, 2018).

This study, therefore, intends to test the exact nexus between oil revenue and expenditure in Nigeria, using the most recent data series. By so doing, the outcome would provide unique insight and practical policy implications to optimally manage the influence of oil price or revenue shortfall on government expenditure.

In a bid to avoid using a single approach to achieve the aforementioned broad objectives, the vector autoregressive model(VAR) will be employed in this study on three major various oil prices, government expenditure, and oil revenue. However, the study is organized as follows; relevant theoretical/conceptual review and empirical review are presented in section two. Section three shows the methods adopted for the study. Section four has the empirical results and discussion of findings, while section five shows the conclusion and policy implications.

Literature Review

Theoretical/ conceptual review

Several conceptual kinds of literature exist on the nexus between government revenue and expenditure. Buchanan and Wagner (1977) and Friedman (1978) postulate the first hypothesis on this concept. These scholars explained that government revenue is the sole determinant of her expenditure. In other words, the relationship between the two variables is unidirectional. Friedman, particularly stressed that high taxes usually correspond with higher government spending, hence, result in a greater budget deficit in the long run.

On the second hypothesis, Barro (1974); Peacock and Wiseman. (1979) argue through the “spend and tax hypothesis” that the government determines its expenditure before the inflow of the expected revenues. These scholars further hold that government expenditure rises significantly leading to higher taxes which consolidate the unidirectional causality between government revenue and expenditure.

Musgrave (1966) and Meltzer and Richard (1981) emphasize the third hypothesis by pointing out that there exists bidirectional causality between government revenue and expenditure. This is referred to as the fiscal synchronization hypothesis or the fiscal neutrality hypothesis. However, if this condition does not hold, it implies that the decision of government expenditure is devoid of government revenue, and vice versa (Darrat, 1998); (Von Furstenberg et al., 1986).

Conversely, Baghestani and McNown (1994) argue that none of the relationships explained above hold in their view. It was, however, posited that government revenue and expenditure are independently determined by the long-term economic development revealing a clear separation between public expenditure and revenue.

The concluding hypothesis is referred to as the institutional separation hypothesis which allows the separation decision on revenue to be determined in isolation of the allocations of government expenditure, therefore, no expected causal relationship between revenue and spending is expected (Al-Qudair, 2005).

Empirical Review

Different empirical evidence available on expenditure and revenue of the government, particularly on oil inflows in Nigeria reveals that this topic is very crucial to all stakeholders.

Farzanegan (2011) assesses the dynamic effect of the oil price shock on a different component of Iranian government spending by using the impulse response function and variance decomposition methodologies. The study, however, reveals that the country’s expenditure on military and security significantly responds to oil price shock from the pass-through on oil revenue and oil prices.

Hamdi and Sbia (2013) analyze the relationship between oil revenue, government expenditure, and economic growth in the Kingdom of Bahrain by adopting a multivariate co-integration analysis and error correction model. From their findings, oil revenue is shown as the major source of growth and core driver of government spending in the country.

Similarly, Damian C. and Harrison O. (2014) assess the relationship between both total and disaggregated government expenditure and capital expenditures, and total and disaggregated oil revenue and non-oil revenues in Nigeria using time series data that spans from 1970 to 2011. Co-integration techniques and VAR models which included an Error Correction

Mechanism (ECM) were used to analyze the objective of the study. Interestingly, the findings support the spend-tax hypothesis that indicates how changes in government expenditure influence her revenue. It also shows that an increase in government expenditure without a corresponding rise in revenue levels could worsen the fiscal deficit problem.

Balogun A. (2017) establishes the causality between government expenditure and government revenue in Nigeria using annual time series data from 1985 to 2015. Co-integration statistical and vector autoregressive techniques that incorporated an Error Correction Model (ECM) and Augmented Dickey-Fuller were adopted to establish the relationship between the variables.

Adebayo A. (2018) examines the effects of oil shocks (price and Revenue) on the dynamic relationship between government revenues and expenditures, and how it influences other major macroeconomic variables by adopting structural VAR (SVAR), unrestricted VAR, and Vector Error Correction (VEC) Models with data series between 1981 to 2014. The result reveals that oil price shocks predict series of fluctuation in government expenditure in the short run, but the predictive power of oil revenue is very strong in both the short run and long run. The outcome also consolidates the presence of a short-run fiscal synchronization hypothesis between oil revenue and government spending in the country, while in the long run, the spend-tax hypothesis becomes more apparent.

Abiodun Edward A. and Emmanuel O.(2020) [MC'dsauk2] study the effects of oil revenue on government expenditure in Nigeria for the scope of data from 1980 to 2018. By using the Autoregressive Distributed Lag Model (ARDL) with the Ordinary Least Square technique, the study reveals that there was a direct and significant relationship between oil revenue, non-oil revenue, exchange rate, and government expenditure, while external debt shows a positive but insignificant relationship with government expenditure, especially in the long run. Also, it was established that there exists a direct and significant relationship between the aforementioned independent variables and government expenditure in the short run.

It was, however, revealed that the spend-revenue condition prevails in Nigeria. That is, changes in government expenditure affect changes in government revenue. Furthermore, the Co-integration result shows that long-run equilibrium between government revenue and expenditure variables exists.

Data and Methodology

In line with most research works on the relationship between government expenditure and revenue, this study intends to adopt the popular Fasano and Wang (2002) method, although the focus is particularly on oil revenue and government expenditure nexus in Nigeria. The Vector Error Correction Model, Johansen Co-integration, and Augmented Dickey-Fuller unit root test are utilized in this study.

In this study, three crucial variables from 1988 to 2019 will be used. These variables include oil revenue (Oilrev), government total expenditure (TEXP), and government total debt (Debt) sourced from the Central Bank of Nigeria’s statistical bulletin.

Model specification

The relationships between oil revenues, government expenditure, and oil prices are shown empirically below:

TEXPt = f (Oilrev, Debt) ….. equ(1)

The model is expressed in econometrics form as shown below;

TEXPt = $\beta_0 + \beta_1$Oilrev + β_2Debt + ε ….. equ(2)

Where

Oilrev = Government oil revenue(N'billions)
Debt = Government debt (N'billions)
TEXP = Total government expenditure (N'billions)
Bs = parameters of equation 1, 2 and 3
ε = error or stochastic terms

Meanwhile, the apriori expectations about the signs all the coefficients is positive

Estimation technique

The study employs the Autoregressive Distributed Lag (ARDL) developed by Pesaran and Shin (1999) to analyze the nexus between oil revenue and government. The technique will help to shows the presence of the long-run relationship between the two variables as well as their unique interaction. ARDL is appropriate for this study as it allows for testing relationships without being constrained by the order of integration of each variable. Furthermore, the technique simultaneously produces both short- and long-run analyses for more useful insight.

$$\Delta LTEXP_t = \pi_0 + \pi_{1t}\sum_{t=1}^{n}\Delta LTEXP_{t-1} + \pi_{2t}\sum_{t=0}^{n}\Delta LOilrev_{t-1} + \pi_{3t}\sum_{t=0}^{n}\Delta LDebt_{t-1} + \pi_4 LTEXP_{t-1} + \pi_5 LDebt_{t-1} + \pi_6 LOilrev_{t-1} + \varepsilon_{t-1} \quad \text{….. equ(3)}$$

The sign "**Δ**" represents the difference operator. However, the bound testing hinges on the F-statistics whose distribution is non-standard given the condition of co-integration from which the null hypothesis is specified thus;

H_0: $\pi_4 = \pi_5 = \pi_6$; No co-integration
H_1: $\pi_4 \neq \pi_5 \neq \pi_6$; Co-integration

The specification helps to determine the presence of co-integration among the selected variables by comparing the F-statistic with the critical values in the lower and upper bounds. If the F-statistics is greater than the critical value of the upper bound, the null of no co-integration would be rejected; otherwise, it would be accepted. If the null hypothesis is rejected this implies the presence of co-integration. Having established the presence of a long-run relationship i.e the co-integration using the bound testing, the model below is thereafter estimated.

$$LTEXP_t = \pi_0 + \pi_{1t}\sum_{t=1}^{n} LTEXP_{t-1} + \pi_{2t}\sum_{t=0}^{n} LOilrev_{t-1} + \pi_{3t}\sum_{t=0}^{n} LDebt_{t-1} \quad \text{….. equ(4)}$$

The short-run dynamic co-efficient is obtained using the Error Correction Model to show the correction mechanism in establishing the disequilibrium in the model, usually refers to as the speed of adjustment. The short-run dynamics are further specified as follow;

$$\Delta LTEXP_t = \pi_0 + \pi_{1t}\sum_{t=1}^{n}\Delta LTEXP_{t-1} + \pi_{2t}\sum_{t=0}^{n}\Delta LOilrev_{t-1} + \pi_{3t}\sum_{t=0}^{n}\Delta LDebt_{t-1} + \pi_4 ECM_{t-1} \quad \text{….. equ(5)}$$

To establish the appropriateness of the model, two major diagnostics test, serial correlation, and heteroskedasticity tests are employed.

Time Series Properties of the Variables

Unit Root Tests

The stationary properties of each variable are determined using the Augmented Dickey-Fuller (ADF) Test. This technique is particularly common in empirical research as it does not require homoscedastic and uncorrelated errors in the underlying arrangement (Akaike, 1969);(Dickey and Fuller, 1979);(Dickey and Fuller, 1981);(Perron, 1989);(Phillips and Perron, 1988).

Result Presentation and Analysis

Stationarity and Cointegration Results

The stationary condition for each variable was assessed using the Augmented-Dicky fuller model. As shown in Table 1, the log of government total public debt and oil revenue are integrated at first order. In other words, these two variables are stationary at first difference as their respective t-statistics are substantially greater than the critical values at a 5 percent significant level. In the same vein, the log of government expenditure is stationary at level as t-statistics is greater than the critical value.

Table 1: Augmented Dickey-Fuller unit root test

	T-statistics	Critical value (5%)	Order of integration
LDebt	-4.080167	-2.960411	I(1)
LOilrev	-5.200166	-2.960411	I(1)
LTEXP	-3.973532	-2.991878	I(0)

Source: Author's computation

Auto-regressive Distributed Lag result

As a result of a different order of integration for each data series, this necessitates the adoption of an Auto-regressive Distributed Lag(ARDL) model.

Table 2: Result of Co-integration Test (Bound testing)

At a 5 percent significant level, the test statistics (F-statistics) of the ARDL bound testing at 4.90 is greater than the critical value of 4.85 as presented in Table 2. The reveals that the government expenditure, oil revenue, and government debt are bound by a long-run relationship.

ARDL Bounds Test		
Null Hypothesis: No long-run relationships exist		
Test Statistic	**Value**	**k**
F-statistic	**4.897769**	2
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.50%	4.41	5.52
1%	5.15	6.36

Source: Author's computation

Table 3: Long run result

Table 3 shows the long-run result estimated from the ARDL approach. From the result below the two explanatory variables, oil revenue and government, are not statistically significant as their probability value (P-value) is less than a 5 percent level of significance. This validates the assertion of Baghestani and McNown (1994) that government expenditure is determined independently of her revenue.

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DEBT)	-0.169240	0.749357	-0.225848	0.8233
LOG(OILREV)	0.370680	0.407056	0.910636	0.3719
C	8.273770	8.933897	0.926110	0.3640

Source: Author's computation

Table 4: Short Run Adjustment result

The short-run result also corroborates the long-run result. As shown in table 4, except for government expenditure lag one, which is significant at 5 percent level. Other explanatory variables are not statistically significant as their P-values are greater than 5 percent level. This also validates the assertion of Baghestani and McNown (1994) that government expenditure is determined independently of her revenue.

ARDL Cointegrating And Long Run Form

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(TEXP(-1))	-0.664430	0.200228	-3.318366	0.0030
DLOG(TEXP(-2))	-0.288579	0.189364	-1.523937	0.1412
DLOG(DEBT)	0.177265	0.134300	1.319914	0.1999
DLOG(OILREV)	0.046200	0.075450	0.612326	0.5463
CointEq(-1)	-0.124636	0.095469	-1.305514	0.2046

Source: Author's computation

Table 5: Serial Correlation Result

From the Breusch-Godfrey Serial Correlation LM Test, which helps to test autocorrelation or serial correlation problem, reveals the absence of serial correlation as its P-value at 0.6037 is less that 5 percent level of significant.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.517023	Prob. F(2,21)	0.6037
Obs*R-squared	1.407884	Prob. Chi-Square(2)	0.4946

Source: Author's computation

Table 5: Heteroskedasticity Test:

The null hypothesis postulates that a model is homoscedastic. The F-statistics and P-value are 1.19 and 0.36, respectively. This implies that the model is not characterized by a heteroscedasticity problem as the probability value is greater than a 5 percent significant level.

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.191051	Prob. F(6,23)	0.3458
Obs*R-squared	7.111625	Prob. Chi-Square(6)	0.3106
Scaled explained SS	4.011944	Prob. Chi-Square(6)	0.6751

Source: Author's computation

Conclusion and policy implications

This study examines the nexus between oil revenue and government expenditure in Nigeria. From the graphical illustrations shown in the earlier session, it was observed that government expenditure increased consistently despite shocks to oil revenue, especially in 2008 and 2015-2016. This shows that government usually explores other means of financing such as borrowing and upward review of taxes when oil revenue, which accounts for more than half of total government income, crashes. Hence, Nigeria's government expenditure is less responsive to the changes in oil revenue.

In addition, the Auto-regressive Distributed Lag (ARDL) model reveals that the impact of the explanatory variables; oil revenue and government debt, on the dependent variable, government expending are not statistically. Despite the lack of a significant relationship between oil revenue and government expenditure in Nigeria, the post-test statistics, heteroscedasticity and serial correlation, presented in the study reveals the absence of the problem in the error term.

Conclusively, it could imply that there is no major nexus between oil revenue and government expenditure in Nigeria as the government does not usually reduce her proposed expenditure even though there are clear challenges to oil revenue in the fiscal year. This could underpin the reason for an unprecedented rise in government debt levels in the last five years, in a bid to cover for the incessant shortfall in expected revenue without reducing or removing the inefficient components of the expenditure. Therefore, the Nigerian government needs to manage its expenditure more strategically by using a public-private partnership framework to deliver on crucial infrastructure and selling inefficient assets. This strategy will inevitably reduce the fiscal deficit significantly as the government seems not to be deterred by the sluggish rise in government revenue due to subdued oil inflows.

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Appendices

Null Hypothesis: D(LOG(OILPRICE)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.045674	0.0003
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOG(OILPRICE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.082324	0.7105
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOG(TEXP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.763629	0.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOG(TEXP) has a unit root
Exogenous: Constant
Lag Length: 8 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.973532	0.0058
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOG(OILREV)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.200166	0.0002
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOG(OILREV) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.399964	0.1497
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

*MacKinnon (1996) one-sided p-values.

Date: 03/21/21 Time: 01:21
Sample (adjusted): 1989 2019
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: LOG(OILPRICE) LOG(OILREV) LOG(TEXP)
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.717552	47.16556	29.79707	0.0002
At most 1	0.161770	7.973503	15.49471	0.4682
At most 2	0.077573	2.503143	3.841466	0.1136

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Dependent Variable: LOG(TEXP)
Method: ARDL
Date: 03/28/21 Time: 18:27
Sample (adjusted): 1990 2019
Included observations: 30 after adjustments
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): LOG(DEBT)
LOG(OILREV)

Fixed regressors: C
Number of models evalulated: 48
Selected Model: ARDL(3, 1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(TEXP(-1))	0.210933	0.196038	1.075982	0.2931
LOG(TEXP(-2))	0.375851	0.178700	2.103252	0.0466
LOG(TEXP(-3))	0.288579	0.189364	1.523937	0.1412
LOG(DEBT)	0.177265	0.134300	1.319914	0.1999
LOG(DEBT(-1))	-0.198359	0.128301	-1.546039	0.1357
LOG(OILREV)	0.046200	0.075450	0.612326	0.5463
C	1.031214	0.438558	2.351374	0.0276

R-squared	0.990613	Mean dependent var	7.127302
Adjusted R-squared	0.988164	S.D. dependent var	1.498105
S.E. of regression	0.162982	Akaike info criterion	-0.589389
Sum squared resid	0.610953	Schwarz criterion	-0.262443
Log likelihood	15.84083	Hannan-Quinn criter.	-0.484796
F-statistic	404.5343	Durbin-Watson stat	1.792842
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.517023	Prob. F(2,21)	0.6037
Obs*R-squared	1.407884	Prob. Chi-Square(2)	0.4946

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 03/28/21 Time: 18:33
Sample: 1990 2019
Included observations: 30
Presample missing value lagged residuals set to zero.

Variable	Coefficien	Std. Error	t-Statistic	Prob.

	t			
LOG(TEXP(-1))	-0.013322	0.605681	-0.021996	0.9827
LOG(TEXP(-2))	-0.181138	0.440708	-0.411015	0.6852
LOG(TEXP(-3))	0.176667	0.296763	0.595315	0.5580
LOG(DEBT)	-0.013706	0.147662	-0.092821	0.9269
LOG(DEBT(-1))	0.051303	0.147464	0.347903	0.7314
LOG(OILREV)	-0.015279	0.084992	-0.179766	0.8591
C	-0.024772	0.535634	-0.046249	0.9635
RESID(-1)	0.083472	0.671931	0.124227	0.9023
RESID(-2)	0.384944	0.497094	0.774389	0.4473

R-squared	0.046929	Mean dependent var	1.26E-16
Adjusted R-squared	-0.316145	S.D. dependent var	0.145146
S.E. of regression	0.166516	Akaike info criterion	-0.504122
Sum squared resid	0.582281	Schwarz criterion	-0.083763
Log likelihood	16.56183	Hannan-Quinn criter.	-0.369645
F-statistic	0.129256	Durbin-Watson stat	1.965135
Prob(F-statistic)	0.997130		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.191051	Prob. F(6,23)	0.3458
Obs*R-squared	7.111625	Prob. Chi-Square(6)	0.3106
Scaled explained SS	4.011944	Prob. Chi-Square(6)	0.6751

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 03/28/21 Time: 18:35
Sample: 1990 2019
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.023226	0.075739	-0.306662	0.7619
LOG(TEXP(-1))	-0.008386	0.033856	-0.247703	0.8066
LOG(TEXP(-2))	-0.053196	0.030861	-1.723706	0.0982
LOG(TEXP(-3))	0.038901	0.032703	1.189517	0.2464

LOG(DEBT)	0.034117	0.023194	1.470951	0.1549
LOG(DEBT(-1))	-0.014527	0.022158	-0.655623	0.5186
LOG(OILREV)	0.005996	0.013030	0.460126	0.6497

R-squared	0.237054	Mean dependent var	0.020365
Adjusted R-squared	0.038025	S.D. dependent var	0.028698
S.E. of regression	0.028147	Akaike info criterion	-4.101791
Sum squared resid	0.018222	Schwarz criterion	-3.774845
Log likelihood	68.52687	Hannan-Quinn criter.	-3.997198
F-statistic	1.191051	Durbin-Watson stat	1.858828
Prob(F-statistic)	0.345800		

ARDL Bounds Test
Date: 03/28/21 Time: 18:36
Sample: 1990 2019
Included observations: 30
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	4.897769	2

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Test Equation:
Dependent Variable: DLOG(TEXP)
Method: Least Squares
Date: 03/28/21 Time: 18:36
Sample: 1990 2019
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.

DLOG(TEXP(-1))	-0.739909	0.221857	-3.335076	0.0029
DLOG(TEXP(-2))	-0.318740	0.201490	-1.581914	0.1273
DLOG(DEBT)	0.109431	0.165115	0.662758	0.5141
C	1.248686	0.507557	2.460188	0.0218
LOG(DEBT(-1))	-0.048945	0.094903	-0.515741	0.6110
LOG(OILREV(-1))	-0.028071	0.098168	-0.285948	0.7775
LOG(TEXP(-1))	-0.041738	0.134418	-0.310511	0.7590

R-squared	0.530882	Mean dependent var	0.182238
Adjusted R-squared	0.408504	S.D. dependent var	0.213258
S.E. of regression	0.164014	Akaike info criterion	-0.576767
Sum squared resid	0.618713	Schwarz criterion	-0.249821
Log likelihood	15.65151	Hannan-Quinn criter.	-0.472174
F-statistic	4.338033	Durbin-Watson stat	1.879332
Prob(F-statistic)	0.004538		

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(TEXP)
Selected Model: ARDL(3, 1, 0)
Date: 03/28/21 Time: 19:49
Sample: 1987 2019
Included observations: 30

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(TEXP(-1))	-0.664430	0.200228	-3.318366	0.0030
DLOG(TEXP(-2))	-0.288579	0.189364	-1.523937	0.1412
DLOG(DEBT)	0.177265	0.134300	1.319914	0.1999
DLOG(OILREV)	0.046200	0.075450	0.612326	0.5463
CointEq(-1)	-0.124636	0.095469	-1.305514	0.2046

Cointeq = LOG(TEXP) - (-0.1692*LOG(DEBT) + 0.3707*LOG(OILREV) +

8.2738)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DEBT)	-0.169240	0.749357	-0.225848	0.8233
LOG(OILREV)	0.370680	0.407056	0.910636	0.3719
C	8.273770	8.933897	0.926110	0.3640